



# **Delivering the Millennium Development Goals To Reduce Maternal and Child Mortality**

**A Systematic Review of Impact Evaluation Evidence**

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# Abbreviations

CCT	Conditional cash transfers	NM	Neonatal mortality
DIME	Development Impact Evaluation Initiative	PPP	Purchasing power parity
HRITF	Health Results Innovation Trust Fund	PREM	Poverty Reduction and Economic Management network
IE	Impact evaluation	RCT	Randomized control trials
IEG	Independent Evaluation Group	SBA	Skilled birth attendance
IM	Infant mortality	SDN	Sustainable Development Network
IMCI	Integrated Management of Childhood Illness	SMP	Safe Motherhood Program
IV	Instrumental variable	SP	Social Protection
JSY	Janani Suraksha Yojana	TBA	Traditional birth attendants
MCH	Maternal and child health	U5	Under-five mortality
MDG	Millennium Development Goal	UNFPA	United Nations Population Fund
MM	maternal mortality	UNICEF	United Nations Children's Fund
MMR	Maternal mortality ratio	WHO	World Health Organization
NGO	Nongovernmental organization		





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# Preface

Many clinical interventions for maternal and child health have been rigorously evaluated in the laboratory or in efficacy trials of proof of concept under carefully controlled conditions; there is a strong evidence base on what protocols and procedures work biomedically. Yet utilization and provision of these measures is still low, perhaps because there is less evidence on how to implement these interventions in routine, nonclinical contexts. A systematic review can remedy this problem both by synthesizing the available information to try to identify generalizable lessons and by identifying key knowledge gaps (White and Waddington 2012; Mallett and others 2012).

As a rigorous methodological approach, systematic reviews exclude evidence unless it meets explicit quality criteria. This systematic review by the Independent Evaluation Group (IEG) uses evidence from rigorous impact evaluations to provide a thorough assessment of attributable improvements in maternal and child mortality outcomes from across the entire range of contexts and intervention types. By doing so, it promotes a deeper understanding of the barriers to progress as well as the effectiveness of different interventions in order to generate key lessons, guide policy decisions, and orient future research. This synthesis of research-derived evidence can be a tool to advance progress in these critical areas.

Although the strength of impact evaluations is their internal validity, or being able to make unbiased causal claims on the attribution of outcomes to a specific intervention, challenges of external validity confront every type of evaluation and synthesis when applying lessons from one specific context to a different place, time, or scale. Though the degree of generalizability of a study is never 100 percent, neither is it zero. The transferability of impact evaluation lessons is a function of similarity to the target context and means of implementation. Unfortunately, most impact evaluations, having spent much effort in establishing internal validity, provide few details on the contextual factors leading to observed outcomes – details that would help policy makers seeking to apply the best evidence to their own local cases. Despite being limited to the details offered in the individual studies, this review attempts to give some sense of context to aid in the judicious application of lessons learned to other environments.

Before establishing the research questions of this systematic review, the IEG team checked 61 existing systematic reviews on some aspect of maternal and child health in developing countries. Half of these reviews included causal attribution to both impact evaluations (experimental and quasi-experimental) and less robust quantitative and

qualitative methods. Many reviews lacked a method of measuring the quality of the included evidence. Nearly all analyzed the effectiveness of one type of intervention across specific outcomes; only two compared the effects of a range of interventions on a single mortality outcome. This activity underscored the importance of avoiding the use of low-quality evidence and inspired this review's outcome-oriented approach.

This systematic review is special in two ways. First, where most systematic reviews are intervention oriented in that they look at the range of outcomes produced by a narrowly defined set of interventions, this review is outcome oriented. Included evaluations cover any intervention within or outside of the health sector that examines the effect on the selected maternal and child health (MCH) outcomes. In this complex intervention and outcome space, where interventions and outcomes are connected by dense and often unknown causal pathways, this framework allows policy makers to explore the entire palette of options which may improve maternal or child mortality.

Second, to understand what is actually known about causal impacts of interventions on maternal and child mortality, this review is highly discriminating in the quality of evidence it includes. The reviewed evidence comes exclusively from impact evaluations that used experimental or quasi-experimental methods with a well-defined counterfactual and that credibly established the internal validity of causal claims of intervention impact.

Intervention impact is defined here as the difference in mortality (or skilled birth attendance) outcomes between a treatment group that receives the intervention and a statistically comparable control group that does not (the counterfactual). Impact evaluations are a relatively new form of evidence designed to overcome many of the confounding factors which limit the claims of causal attribution of other evaluation methods. The purpose of reviewing impact evaluation evidence in this systematic review is not to supplant existing evidence and received wisdom, but rather to understand how impact evaluation evidence corresponds to current strategic beliefs and the existing evidence undergirding current policy making for reducing maternal and child mortality, and to add value by underscoring areas where causal attribution of programs is beginning to be better understood.

With this review IEG aims to aid the World Bank and other practitioners in reaching the Millennium Development Goals in maternal and child mortality by pointing to promising interventions, raising a cautionary voice where evidence falters, and highlighting gaps in knowledge meriting further investigation with impact evaluation evidence developed within and beyond the World Bank. By addressing distal factors affecting maternal and child mortality – such as education, governance, economic, and environmental factors – this review complements both the evidence from health-

specific and biomedical reviews such as the *Lancet* series on maternal and child health and complement other evidence on project performance to strengthen evaluation, both within and outside IEG.



# Overview

## Delivering the Millennium Development Goals to Reduce Maternal and Child Mortality

Improved outcomes for women and children—more education, lower fertility rates, higher nutritional status, and lower incidence of illness, among other outcomes—have broad individual, family, and societal benefits. For nearly 15 years, the targets of the Millennium Development Goals (MDGs) have been a bellwether for progress, particularly for maternal and child health (MCH)—a two-thirds reduction in under-five mortality in MDG 4 and a three-quarters reduction in the maternal mortality ratio in MDG 5. After more than a decade of effort, these goals have proved difficult to attain and are unlikely to be achieved by 2015.

Interventions that may improve maternal and child health are numerous and spread across many development sectors. Even when such interventions are known to be effective in controlled conditions, however, questions remain about implementation, delivery, and uptake. This review gathers impact evaluation evidence of fielded interventions that aim to improve skilled birth attendance and reduce maternal and child mortality rates. To aid policy makers, it reviews effectiveness evidence from multiple sectors on the distal causes of maternal and child mortality, complementing the body of effectiveness evidence from reviews specific to the health sector (such as the *Lancet* series on maternal and child health) that focus on proximate interventions for intermediate outcomes.

This systematic review by the Independent Evaluation Group (IEG) is a learning exercise that looks beyond World Bank experience. In doing so, it draws on impact evaluations other than those conducted by the Bank or on Bank projects. It is intended to be used a reference for practitioners in the Bank and elsewhere with an interest in interventions that have demonstrated attributable improvements in skilled birth attendance and reductions in maternal and child mortality. This review also identifies important gaps in the impact evaluation evidence for interventions that may be effective in reducing maternal and child mortality but whose impacts have not yet been tested using robust impact evaluation methods.

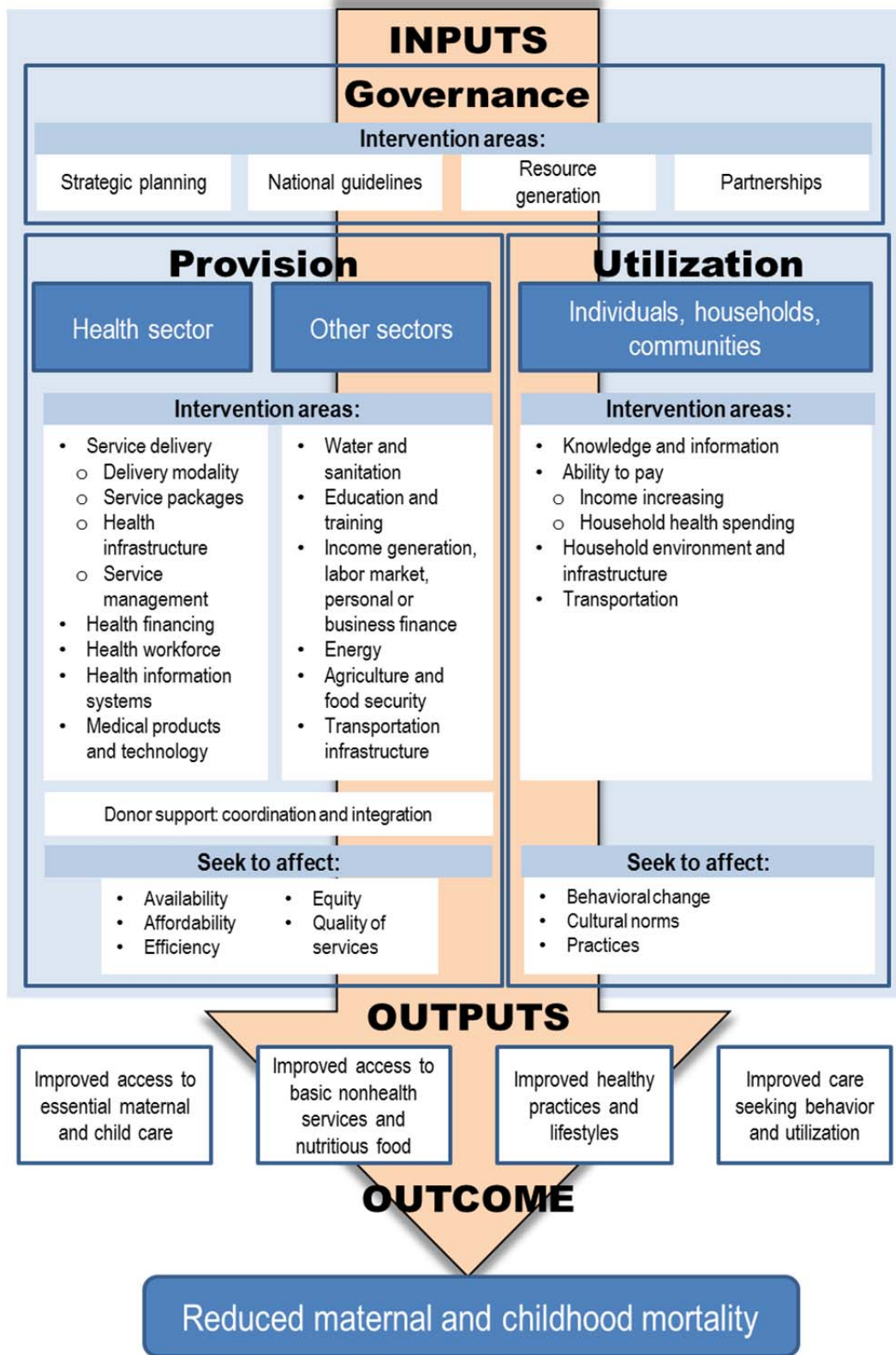
### Background

Worldwide, maternal deaths have decreased by 47 percent from 1990 to 2010—welcome progress but still far from the 75 percent reduction targeted by MDG 5 (WHO 2012). Maternal mortality rates remain 15 times higher in developing regions than in developed regions, and Sub-Saharan Africa

and Southern Asia together account for 85 percent of global maternal deaths. Clinical trials have demonstrated an ability to prevent or manage many of the causes of maternal death through clinical interventions administered by a skilled health care provider with adequate equipment and supplies. For this reason, and because maternal mortality data are problematic, skilled



Figure 1. Framework of Interventions Reducing Maternal and Child Mortality



Source: IEG

birth attendance (SBA) is included as the main intermediate indicator for MDG 5 in the hope that where SBA is high, reduced maternal mortality will necessarily follow. The proportion of deliveries in developing regions attended by skilled health personnel increased from 53 percent in 1990 to 63 percent in 2008 (UN 2012). Despite these gains, progress is still insufficient to achieve MDG 5: Only ten countries have succeeded in meeting MDG 5, and just nine additional countries are on track to achieve it by 2015 (WHO and others 2012).

In comparison to maternal mortality, reducing child deaths has seen greater progress. Globally, the mortality rate for children under five declined by 41 percent from 1990 to 2011 (UNICEF 2012). Neonatal mortality has also decreased during this time, but it has done so more slowly, and its share of under-five mortality continues to grow (IGME 2011). Notwithstanding significant recent progress in improving child health, the majority of child deaths take place in poor, rural, and remote areas affected by severe human resources shortages, minimal infrastructure, and inadequate health service quality (UNICEF 2009).

Causes of maternal, neonatal, infant, and under-five mortality are distinct, although maternal and neonatal mortality may be closely linked, as are infant and under-five mortality. The medical literature indicates hemorrhage, hypertension, and infections to be the major causes of maternal death during pregnancy and childbirth (WHO 2012). Moving along the continuum of care, most newborn deaths are caused by infections such as tetanus, intrapartum complications, and preterm birth (Lawn and others 2006), whereas the causes of death become very different for infant and under-five mortality where infectious diseases—especially pneumonia, diarrhea, and malaria—are responsible for more than half of deaths (UNICEF 2008; Black, Morris, and Bryce 2003).

Factors influencing maternal and child health are broad and complex, extending beyond the health sector to issues of governance, health utilization by individuals, households, and communities, and services from other sectors as well, including energy, water and sanitation, and education. In figure 1, the report develops a simplified conceptual model based on UNICEF's framework on the causes of maternal and child deaths (UNICEF 2009) that outlines the causal pathways by which various interventions may affect MCH outcomes. It also includes a taxonomy to classify the wide spectrum of potential interventions into three main categories: governance, provision (further subdivided into health—sometimes referred to as supply-side interventions in the health literature—and other sectors), and utilization, sometimes referred to as demand-side health interventions.

For most causes of death, clinical recommendations are known and treatments are relatively inexpensive. Yet maternal and child mortality continue to realize the least progress of all the MDGs. Knowing what to do is no longer the problem; knowing how to do it remains a challenge. The central problem is how to induce providers and users to adopt treatments and protocols established in the medical literature. This review, therefore, focuses on field evidence of policy interventions in developing countries.

## Objectives of the Review

This IEG report reviews all Bank and non-Bank impact evaluations with estimates of any

### Box 1. MCH Outcomes Selected for Review

- Skilled birth attendance
- Maternal mortality
- Neonatal mortality (0-28 days)
- Infant mortality (0-12 months)
- Under-five mortality (0-59 months)

## OVERVIEW

intervention's impact on at least one of five MCH outcomes—the incidence of skilled birth attendance, maternal mortality, and neonatal, infant, and under-five mortality (see box 1). The selected indicators encompass the entire continuum of MCH care and are used to track progress on MDGs 4 and 5. Because it is the main intermediate indicator for MDG 5, the report also examines skilled birth attendance as an intervention: It looks at the effects of skilled attendance at birth on health outcomes.

To aid policy makers seeking to reduce child or maternal mortality, this review takes an outcome-oriented approach, explicitly recognizing the multisectoral nature maternal and child health by aiming to collect all impact evaluations that include the above MCH indicators, regardless of the type or sector of intervention that produced them. This is in contrast to the intervention-oriented approach of most existing systematic reviews, which examine the effects of a single intervention type. Accordingly, this review aims to answer the following questions:

- What do we know about the attributable effects of available interventions on reducing maternal and child mortality and increasing skilled birth attendance?
- What do we know about the effects of increasing the number of births attended by skilled health personnel, as indicated by MDG 5, at the local or national level?
- What important knowledge gaps remain on interventions to reduce maternal and child mortality?

The purpose of reviewing impact evaluation evidence in this systematic review is not to supplant existing evidence and received wisdom, but rather to understand how impact evaluation evidence compliments, and perhaps challenges, current strategic beliefs

regarding the best ways to work to reduce maternal and child mortality.

## Methodology and Scope

A comprehensive search for all impact evaluations (including those of the World Bank) on the five target outcomes was conducted using electronic database searches, screening and hand-searches, and literature snowballing, and included both published and unpublished “grey literature” seeking peer review. The inclusion criteria required that studies (a) be experimental or quasi-experimental impact evaluations with a credible counterfactual, (b) completed between 1995 and 2012, (c) evaluate an intervention taking place in a low-income or middle-income country, and (d) report impacts on at least one of the mortality (or SBA) outcomes of interest.

By limiting the scope of the review to those impact evaluations that report estimates on the “ultimate” outcomes of interest (mortality and SBA), the review is able to report on the evidence for theories of change in interventions. Were the review to include impact evaluations that only reported intermediate outcomes, it would still be reliant on theories rather than causal evidence in some parts of the logic model moving from inputs to outcomes.

In an effort to provide viable large-scale policy options, efficacy studies and evaluations of interventions of a clinical nature were not selected for inclusion as these tend to be too small and tightly controlled in ideal conditions for practical applicability in the field. Studies not based on a counterfactual—what would have happened in the absence of the program—may be liable to confounding explanations of their results. Experimental and quasi-experimental impact evaluations of field studies, properly executed, can overcome these challenges.

## Box 2. Criteria for Ratings of Study Quality

Impact evaluation strategies are often grouped into two families, each with multiple members.

*Experimental* includes randomized control trials, and *quasi-experimental* includes differences (second order or higher), regression discontinuity, instrumental variables, or matching techniques.

The search process identified 95 studies that qualified as impact evaluations of field interventions from developing countries with estimates of impacts on skilled birth attendance or maternal or child mortality. These were subjected to a quality review to assess risk of bias. The process was based largely on strength of the internal validity of the study's identification strategy, that is, the degree of confidence that the reported impact estimates are unbiased and consistent, such that they establish a credible counterfactual.

The quality review criteria were based on previous impact evaluation work by the Independent Evaluation Group (IEG 2012) and over the following dimensions of internal validity:

- Establishment of identifying assumptions of the employed estimation strategy
- Alternative methods giving the same result
- Robustness checks to alternative specifications
- Representative sampling strategy
- Freedom from data generating and collection challenges
- Sufficient power and time to detect results.

Elements of construct validity (particularly with respect to mortality measurements) and external validity (for example, having a representative sample of policy interest) were also taken into account. Impact evaluations were rated AAA if all or nearly all of the criteria were met, the critical assumptions of the identification strategy were well-established, and there were few if any remaining threats to internal validity. Evaluations rated AA if most but not all criteria were met and there were no serious concerns with the identification strategy, although some may remain untested or unclear. Because impact evaluations with an A rating retained major concerns with the validity of the identifying assumptions, they are not used in the analysis of this systematic review.

The search exercises produced more than 7,000 studies of potential import, each of which was carefully reviewed according to the above inclusion criteria to yield 95 relevant studies. Of those, 62 studies were rated AAA (high quality) or AA (medium quality) based on the strength of their internal validity (see box 2) and are included in this review. These 62 studies include 68 impact evaluations; some studies included multiple treatment arms which are counted as separate impact evaluations.

Evaluation quality has implications for findings and policy decisions. Impact evaluations with a AAA rating connote established causality of the impact estimates, whereas those with a AA rating connote that causal claims are likely, if not fully, reliable. Evaluations graded A leave doubt to the causal claims of their reported associations, often in spite of the best efforts

of the authors given the available data, although these may yet be more reliable than other types of evaluation (for example, multivariate regression or single differencing). Only the 68 impact evaluations rated AAA and AA were of sufficiently high quality to be included in the analysis of the systematic review.

Within the 68 AAA and AA impact evaluations included, nearly half reported skilled birth attendance outcomes, and roughly one-third had neonatal or infant mortality outcomes. Just over a quarter of them reported under-five mortality outcomes. Just over 10 percent give findings on maternal mortality, likely because most studies have a sample size too small to detect changes in such an infrequently occurring outcome as maternal mortality.

## OVERVIEW

These evaluations come from both inside and outside the World Bank and cover a wide array of interventions. The World Bank was involved in 18 of the 68 included impact evaluations: 6 AAA and 12 AA. Of these, 9 had a World Bank author or coauthor, and 15 were of World Bank projects or projects supported by Bank financing.

As an analytic approach, the systematic review closely inspected the studies for trends of impacts within types of interventions. Because the coverage of interventions in the data for this review—as with all systematic reviews—is necessarily incomplete, this study focuses on reporting promising interventions that consistently find significant results rather than asserting that some interventions “do not work.” It is worth noting that there are many reasons why a study may yield a null result besides the intervention having no impact, including challenges of statistical power, contamination, attrition, uptake, and implementation.

Key findings are given only where established by AAA impact evaluations; AA impact evaluations are used either in support of findings established by AAA impact evaluations, to suggest potential trends where no AAA evaluations are available, or to illustrate the importance of considering

evaluation quality when drawing conclusions. Counts of the SBA and mortality outcomes reported by the included impact evaluations are given in figure 2, decomposed by quality of study (note that a single impact evaluation can report results for multiple outcomes).

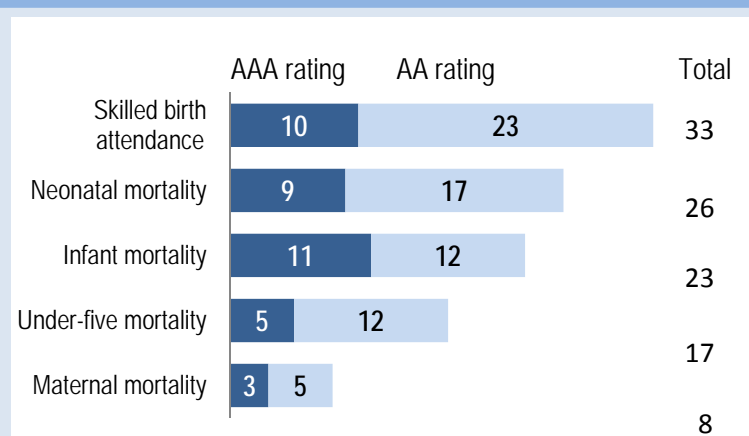
## Findings

The systematic review provides findings on what is known about the effects of interventions on skilled birth attendance, maternal mortality, neonatal mortality, infant mortality, and under-five mortality, as well as the effect of skilled birth attendance on these and other intermediate maternal and child health outcomes. Finally, the review highlights the main gaps in the body of impact evaluation knowledge for maternal and child mortality.

### WHAT DO WE KNOW ABOUT INTERVENTIONS THAT REDUCE MATERNAL AND CHILD MORTALITY?

The body of evidence from impact evaluations is still nascent and thin, so it does not cover all project variants in an intervention category or all settings in which that intervention may be applied. Concerns of external validity—how well lessons learned in one context can be applied to another context—are not unique to impact evaluations or systematic reviews; indeed, *all* evaluations have this challenge when applied beyond the original setting. Although the degree of generalizability is never 100 percent, neither is it zero. Because the number of impact evaluations of any intervention type is insufficient to analyze the factors that may explain variation in success when the impact evaluation evidence is mixed, this review indicates where the existing evidence is consistent, or nearly so, for a type of intervention affecting a given outcome or population. The appropriateness of transference of these lessons must be based

**Figure 2. Impact Evaluation Outcomes and Quality Rating**



Source: IEG

on their judicious application by policy makers to the target context.

Using the most reliable evidence available, findings on interventions are presented for which the existing impact evaluations demonstrate a high degree of consistency in attributable reductions of mortality indicators for mothers and children.

### ***Skilled Birth Attendance as an Outcome: Promising Interventions***

Because the main indicator for reducing maternal mortality in MDG 5 is “the proportion of births attended by skilled health personnel,” the systematic review begins by investigating impact evaluations of interventions that affect skilled birth attendance at a national or local level.

Demand-side financing interventions in Bangladesh, India, Nepal, Kenya, Rwanda, and El Salvador improved skilled birth attendance by increasing a household’s ability to pay and by giving health care providers incentives for through conditional cash transfers—targeted primarily at poor households—and voucher programs.<sup>[46,16,53,55,51,39,7]</sup>

Longer exposure to the interventions may be necessary to produce an impact. Indeed, the only demand-side financing intervention that did not produce significant results, *Progresa* in Mexico, was evaluated after only 18 months, perhaps before the project had time to affect behavior.<sup>[62]</sup>

### ***Skilled Birth Attendance as an Intervention: Promising Interventions***

Very few impact evaluations are able to isolate the effects of skilled birth attendance. Most often, interventions with impact evaluations combine SBA with other components. Although the outcomes below are attributable to the interventions as a whole, it is unclear if the effects are due to the SBA component, to

some other component, or to an interaction between them.

Evidence from Ukraine and China indicates that a combination of complementary intervention types—such as strengthening the SBA workforce while improving mothers’ knowledge and information—can effectively reduce maternal mortality.<sup>[52,23]</sup> However, a similar intervention in India found no such effect.<sup>[61]</sup>

Thin but internally robust evidence indicates that interventions with SBA as a major component reduced under-five mortality in Brazil and Uganda,<sup>[56,12]</sup> improved breastfeeding in India and Pakistan,<sup>[46, 61,10]</sup> and improved immunization rates and anthropometrics of children in Uganda.<sup>[12]</sup>

### ***Maternal Mortality: Promising Interventions***

Few studies report effects on maternal mortality. Although the majority report statistically insignificant effects, evidence of two AAA impact evaluations suggests significant reductions in maternal mortality that are attributable to integrated MCH interventions promoting skilled birth attendance through complementary and reinforcing strategies.

Specifically, the successful interventions aimed to promote skilled birth attendance by bundling training of health workers with increasing knowledge and information, as in Ukraine’s Mother and Infant Health Project<sup>[52]</sup> and in China’s Safe Motherhood Program by additionally bundling an insurance scheme.<sup>[23]</sup>

Successful interventions had both provision and utilization (supply side and demand side) components. Those studies that only had one—provision or utilization—did not demonstrate a detectable reduction in maternal mortality.

## OVERVIEW

### *Neonatal Mortality: Promising Interventions*

AAA-rated studies of interventions in India and Pakistan to improve mothers' knowledge and information to change home-based care practices, particularly those delivering service packages at the community level, demonstrate significant reductions of neonatal mortality—in the range of 14 percent to 30 percent.<sup>[9,10,61]</sup>

Interventions that provided newborn home visits along with community mobilization, such as women's group education sessions in India,<sup>[9,37]</sup> Bangladesh,<sup>[5]</sup> and Pakistan,<sup>[10]</sup> significantly reduced neonatal mortality.

Evidence from Indonesia and Taiwan, China, found that increasing girls' formal education through improving access to schools can significantly reduce newborn mortality.<sup>[19,17]</sup>

One AAA study found that increasing governance and the political agency of women is extremely important to reducing neonatal mortality in India.<sup>[8]</sup>

### *Infant Mortality: Promising Interventions*

Interventions in nonhealth sectors consistently and substantially lowered infant mortality. A variety of interventions to reduce pollution, identify sources of water contamination and improve quality, and increase school enrollment rates addressed the largest causes of child death (pneumonia and diarrhea) and lowered infant mortality rates in countries in Latin America and East and South Asia.<sup>[25,60,15,19]</sup>

Results from health sector provision interventions are limited and complex, although interventions to train health workers to provide family health services across the continuum of care and at the community level were found to have contributed to mortality reductions in Brazil, Indonesia, and India.<sup>[42,56,4,9]</sup> Limited but consistent evidence also suggests a link between expanded participation in processes that affect the

provision and funding of public health services and reductions in infant mortality.<sup>[8,30,11,33]</sup>

### *Under-Five Mortality: Promising Interventions*

Impact evaluations of interventions in nonhealth sectors consistently found large and significant effects in under-five mortality. These interventions included water and sanitation programs in Argentina, Bangladesh, Colombia, and Bolivia as well as a monitoring and evaluation project in Uganda and an education initiative in Indonesia. In some cases the reductions increased among younger mothers (Indonesia) and the poor (Argentina).<sup>[17,12,27,24,32,49]</sup>

Evidence from Brazil, Bolivia, and Uganda suggests that public participation in government budgets and in decisions on which health projects to implement and how to monitor health workers' compliance reduces under-five mortality because the public is more likely to both demand adequate health financing and use health services that they trust.<sup>[49,30,12]</sup>

Health sector interventions, such as *Programa Saúde da Família* in Brazil, affected only moderate reductions in under-five mortality compared to projects outside of the health sector.<sup>[56]</sup> In Bangladesh and Indonesia, service packages that combine interventions across the continuum of care also produced significant reductions in child mortality.<sup>[36,4]</sup> An AA impact evaluation of a similar intervention in Bangladesh was not significant, although this may be due to statistical power issues.<sup>[2]</sup>

## DISTRIBUTIONAL IMPACTS

In 2004, views in the World Bank on rising to the challenges of MDGs 4 and 5 focused on the fact that the poorest countries—and within those countries the poorest households—had the worst maternal and child health and were less likely to use effective interventions (World Bank 2004).

The findings of this review are consistent with those views. Though utilization among the poor remains a challenge, the impact evaluations reviewed found particularly beneficial outcomes among participants with poorer socioeconomic status. Although less than 30 percent of those evaluations reported heterogeneous effects of any type, those that differentiated results by socioeconomic status consistently reported larger impacts among the poor. Countries with a heavier child mortality burden at baseline or fewer births attended by skilled health personnel are more likely to see an impact on those outcomes.

## Quality of Evidence

When considering evidence, decision makers should take the quality of that evidence into account—even for impact evaluations. For example, in infant mortality, all three AAA impact evaluations of health services found attributable reductions in infant mortality. Yet health services have mixed results if no discernment of evaluation quality were made and AA and AAA studies were grouped together, as only two of four AA studies of similar interventions reported significant effects. This observation also underscores the need for more high-quality evidence.

### Box 3. Evidence for Large Global Strategies Is Thin and Mixed

#### Integrated Management of Childhood Illnesses

The Integrated Management of Childhood Illnesses (IMCI) program has been implemented in more than 100 countries, yet impact evaluation evidence of IMCI effects is both thin (only two studies included in the review) and mixed.<sup>[2,9]</sup> An AAA study on an IMCI program in India found significantly reduced early neonatal mortality and infant mortality in home births and no effect on facility births. No impact was found on under-five mortality from an AA quality study in Bangladesh.

#### Safe Motherhood Programs

Though evaluations of safe motherhood programs (SMPs) in China and Indonesia found positive impacts on increasing skilled birth attendance, results were mixed for mortality outcomes.<sup>[23,4]</sup> In China, the program reduced maternal mortality through complementary and reinforcing strategies to promote skilled birth attendance. The program in Indonesia, which placed strong emphasis on community-based care, did not have evidence of effects on maternal mortality or neonatal mortality, although it did have a one-third decrease in child mortality and marginally significant effects on infant mortality.

#### Demand-Side Financing

Conditional cash transfers (CCTs), vouchers, and other financial incentives significantly increased SBA in both low- and middle-income countries.<sup>[7,16,39,46,51,53,55,62]</sup> Only one AAA study of a conditional cash transfer included infant mortality as an outcome, finding a significant reduction from Mexico's Progreso.<sup>[6]</sup> No impact evaluations of demand financing interventions demonstrated a significant effect on maternal or neonatal mortality or even included under-five mortality as an outcome.

#### Increasing the Proportion of Births Attended

Although it is the main indicator for MDG 5, there is no evidence that *solely* “improving the proportion of births attended by skilled health personnel” improves mortality outcomes. Neonatal mortality was not significantly affected in India, as reported by an AAA and AA study.<sup>[46,39]</sup> The AA study also found no difference for maternal mortality outcomes, although statistical power may have been an issue. Still, *combining* skilled birth attendance interventions with quality and access elements can improve mortality outcomes.



### External Validity

Interventions affecting child mortality are multidimensional and causally complex. Interventions affecting maternal mortality and skilled birth attendance are causally simpler but require better-functioning health systems on both the provision and utilization sides. Contextual and environmental factors likely influence both sets of outcomes.

The particular contextual dimensions affecting interventions' external validity—or generalizability from one setting to another—are unknown and likely vast. With the limited set of impact evaluations available, tests of these associations are also limited. Still, this review does explore how literacy, income, and baseline maternal and child mortality and SBA are associated with the likelihood that an intervention will produce a statistically significant impact.

The evidence indicates diminishing marginal returns for interventions affecting skilled birth attendance and neonatal, infant, and child mortality. Interventions in more challenging areas are more likely to have an effect on SBA or child mortality.

However, the trends diverge by outcome for both income and literacy. Interventions in less literate and poorer areas were more likely to affect SBA and neonatal mortality than interventions in better-off and more literate contexts. The opposite is true for infant mortality. This suggests an interaction between environment and intervention, which may be an illustration of causal complexity. For a child exposed to risks for a longer period, environment may play a larger factor, but for SBA and neonatal outcomes, which have a shorter exposure period, focused interventions may have a better chance of working.

### KNOWLEDGE GAPS: WHAT DO WE STILL NEED TO KNOW?

This review also identifies areas where there is a critical lack of evidence, not just in the World Bank, but across all development institutions. Although addressing these gaps through more impact evaluations will not in itself solve the challenge of MDGs 4 and 5, expanding evidence in these areas can enable better decision making for investments to reduce deaths of mothers and children.

#### *Gaps in Intervention Coverage*

Although additional impact evaluation evidence would be welcome across all interventions, several gaps are particularly important, and quality evaluations are still spread thinly. IEG found no more than four AAA impact evaluations of a given mortality outcome for any one type of intervention—too few to reliably compare effectiveness of intervention classes across such very different contexts of application. Far more high-quality evaluations are needed to be able to make comparisons between interventions.

For skilled birth attendance as an outcome, there are very few studies on the effect of health infrastructure and none on nonhealth infrastructure.

Among studies that examine skilled birth attendance as an intervention, no high-quality evidence isolates its effect on maternal mortality. Given its prominence as a key indicator for MDG 5, more rigorous studies on the isolated effect of increasing SBA are clearly needed. The two studies that can isolate the effect of increasing the proportion of attended births indicate that there are no neonatal mortality differences at the district level between SBA and non-SBA births after more than two years of implementation of a large conditional cash transfer scheme in India, even for areas with higher quality of care.<sup>[46,39]</sup>

Although increasing the proportion of births attended promises to reduce mortality outcomes, there is currently no robust, rigorous field evidence that this is the case. As noted, that promise is more likely to be realized when SBA interventions are combined with improvements in the health workforce and knowledge and information for mothers. Indeed, for India, the challenge seems not to be inducing mothers to deliver at clinics, but the level of care and referral system they actually receive once there.

Additionally, more high-quality studies are needed on SBA interventions that include components of health infrastructure, health information, equipment and supplies, communication, and transport, as well as interventions in nonhealth sectors, such as road infrastructure improvements.

As the body of impact evaluations reporting maternal mortality effects is exceptionally sparse, additional research is needed for nearly all interventions. Specifically, more high-quality evidence is needed to identify effective interventions associated with family planning programs, universal health schemes, women's schooling, referral systems, transportation, and infrastructure of health facilities.

To improve the evidence base for neonatal mortality, more high-quality evidence is needed to identify effective interventions associated with referral systems and transportation and infrastructure improvement that affect the quality and availability of health care facilities for essential or emergency newborn care. Furthermore, additional information is needed on health financing interventions (for example, performance-based financing, contracting, or incentives for improving the quality of postnatal care). Evaluations addressing the utilization of health services, such as community health insurance and prepayment schemes, loan schemes and revolving funds,

and other innovative financial mechanisms, are notably missing for neonatal mortality and most other mortality outcomes. To the degree that the World Bank's current program of impact evaluations on results-based financing can address the question of its effects on maternal and child mortality, the Bank can help reduce this gap.

The number of evaluations estimating effects on infant mortality rates was relatively high, but more high-quality evaluations are needed in several sectors: health, governance, labor market, agriculture and nutrition, and transportation. More information is also needed on the effects of standardized programs on all child mortality indicators. Although it has been used in more than 80 countries (Bryce and others 2004), the Integrated Management of Childhood Illnesses service package and the equally widespread Safe Motherhood programs have few rigorous impact evaluations measuring their effects on child mortality. What evidence does exist most commonly reports a null effect of IMCI.

No high-quality evaluations of under-five mortality focused exclusively on either governance or utilization. There is a surprising lack of field-based impact evaluations reporting the mortality effects of interventions targeted at the three deadliest diseases for children under five: malaria, diarrhea, and pneumonia.

### *Gaps by Evaluation Components*

Impact evaluations can better inform policy decisions by including estimates of distributional impacts over population subgroups (heterogeneous effects) and integrating mixed methods to help unpack causal pathways and provide details to aid in appropriate application to other contexts, give estimates over time to inform temporal trajectories and sustainability of interventions, and report rigorous efficiency (cost-benefit) analysis.

*Gaps in Regional Coverage*

Future efforts to curb the stubbornly high rates of maternal and child mortality should consider the interventions found effective in this report. Although there are insufficient data to parse out the share of the variation in impact evaluation results that stems from the range of potentially important dimensions of context, it is reasonable to believe that inter-regional variation accounts for a large share of those differences. To the extent that results from one context are informative in design policies for another context, impact evaluations are a regional—if not global—public good with potentially large returns. Investments of knowledge should be made for regions and countries with the highest mortality rates and for the most vulnerable populations.

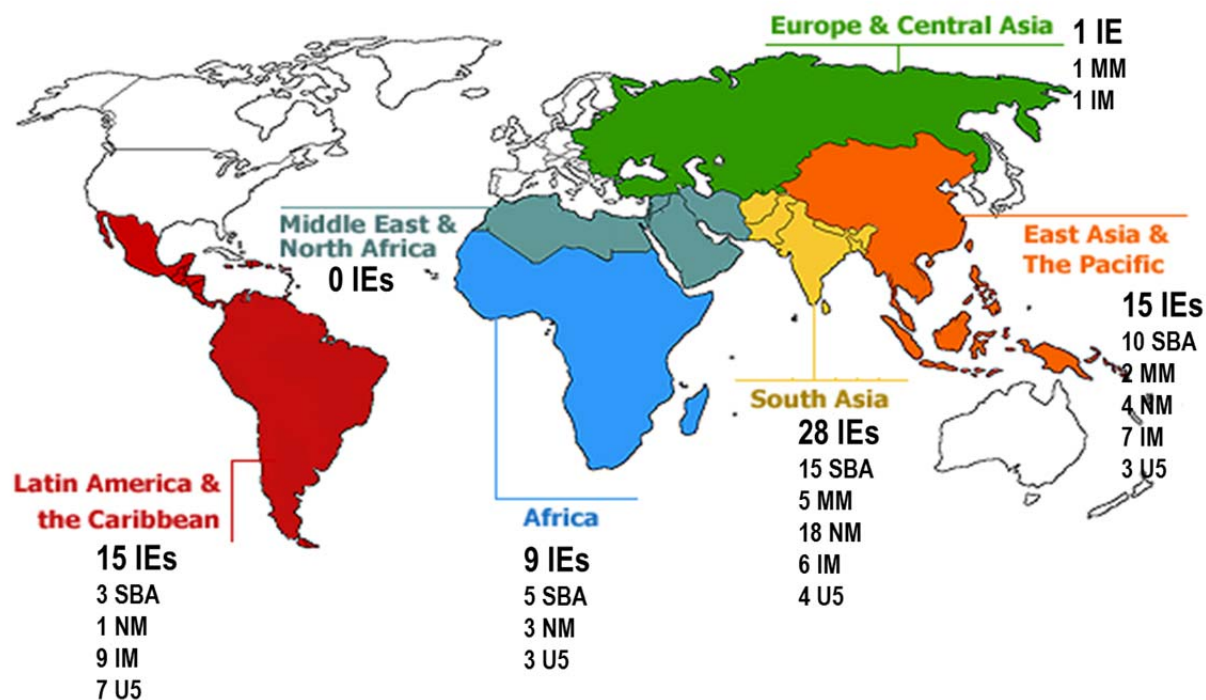
As figure 3 shows, there are large regional

disparities in the availability of evidence (for convenience, IEG uses World Bank regions). There is only one impact evaluation with SBA or maternal or child mortality outcomes from Europe and Central Asia, and none from the Middle East and North Africa, even though it is frequently ranked as the region with the third most severe challenges in SBA or mortality (see figure 4). Given its population size and diversity of contexts, the East Asia and Pacific Region is also underrepresented.

*Gaps by Severity of the MDG Shortfall*

Regional gaps are heightened when considering the relative difficulty of the challenges of prevailing SBA and maternal and child rates and levels. Figure 4 shows the number of AAA and AA impact evaluations by SBA and mortality rate over the six regions, along with indicators of the severity of the problem in each region. Results are

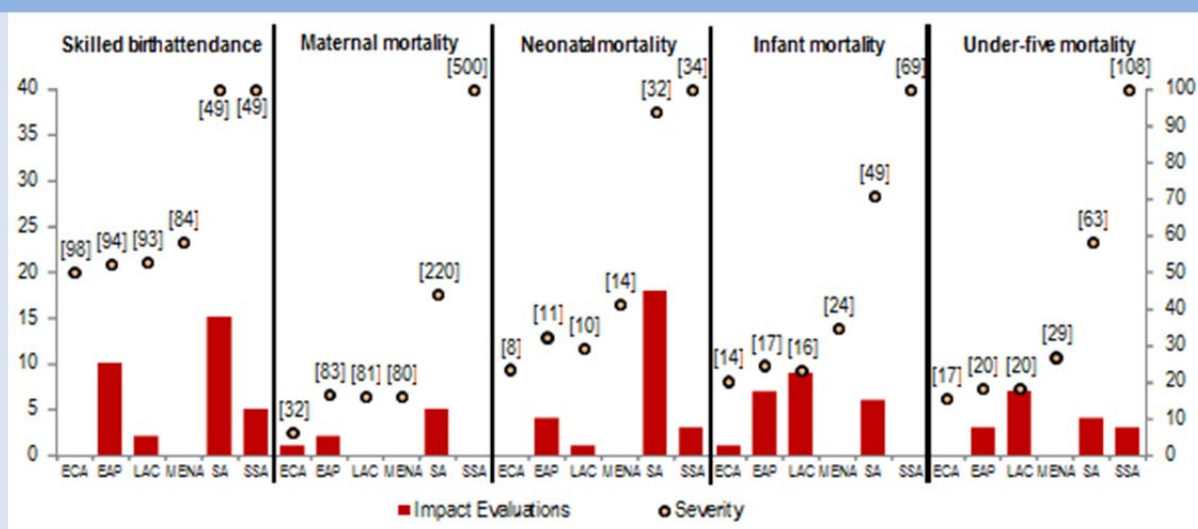
Figure 3. Impact Evaluation Coverage by Outcome and Region



Source: IEG

Note: World Bank regions have been used for convenience. SBA = skilled birth attendance; MM = maternal mortality; NM = neonatal mortality; IM = infant mortality; U5 = under-five mortality.

Figure 4. Regional Gaps Between Mortality Incidence and Impact Evaluation



Source: World Development Indicators.

Note: Numbers in [brackets] represent the actual (unindexed) percent of births attended by skilled health staff or standard mortality ratios measured per 100,000 live births in the case of maternal mortality and per 1,000 live births for the neonatal, infant, and under-five mortality; most recent years available. World Bank regions have been used for convenience. ECA = Europe and Central Asia; EAP = East Asia and Pacific; LAC = Latin America and the Caribbean; MENA = Middle East and North Africa; SA = South Asia; and SSA = Sub-Saharan Africa.

similar for comparisons by the number of deaths by region, although South Asia becomes the worst for skilled birth attendance and neonatal mortality. Regions that are suffering the worst are precisely the areas that have the least impact evaluation evidence, leaving policy makers with the greatest need the least information for policy-making. The result is similar when using the regions' share of global mothers not attended or maternal or child deaths.

Areas with the greatest need for solid evidence of impact evaluations have the shortest supply. In particular, South Asia and Sub-Saharan Africa consistently have the lowest SBA and highest maternal and child mortality, whether measured as rate of births or as global share of deaths. South Asia has several impact evaluations of interventions affecting skilled birth attendance (for which the region has the worst levels) and neonatal mortality (for which the region has the second highest rates). However, the area with largest global need for additional impact evaluation evidence is Sub-Saharan Africa, where there is

a critical lack of evidence on maternal, infant, and under-five mortality even as the region has the highest levels of these outcomes.

The lack of progress in these areas is clearly not because of the lack of impact evaluations (there are potentially many reasons for that, including lack of investments or poorly functioning institutions). However, where methodologically feasible, impact evaluations can indicate the attributable impacts of interventions, including those aimed at improving institutional quality, and thereby steer investment to more productive use. Without high-quality, regionally relevant impact evaluations, countries in these areas are left to make critical decisions with correlational evidence. Although impact evaluations often gather their own data through household surveys, impact evaluations of maternal and child mortality frequently rely, at least in part, on available administrative data. A correlation between areas with worse MCH outcomes and more difficult data environments may explain part of the gap in impact evaluation evidence for those areas. If

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so, greater investment in improving vital statistics data may be as important as impact evaluations research, and may even promote such evaluations by bringing down the cost of impact evaluation–specific data collection.

### *Gaps for the Strategy of the World Bank*

The World Bank’s, the written strategy for addressing these two MDGs lines up with this report’s taxonomical intervention categories of governance, service delivery, health workforce, health financing, and household ability to pay.

Furthermore, the de facto strategy for maternal and child mortality can be proxied by the Bank’s funding portfolio. Disaggregating the Bank’s portfolio by the top-level intervention groups of this report’s typology, Table 1 displays the volume of evidence against the volume of World Bank activities. The projects came from a portfolio check of the Health, Nutrition and Population, Social Protection, Poverty Reduction and Economic Management sector boards as well as projects from the Sustainable Development Network’s water, energy and mining, and social development sectors that were coded with health sector or theme codes. Together, these sectors cover the vast majority of those represented by the available impact evaluations. Inclusion of a Bank project was based on explicit mention of MCH objectives in the Project Appraisal Document.

**Table 1. All Impact Evaluations and World Bank Projects by Intervention Type, FY03–12**

Intervention type	All impact evaluations (N = 68)	World Bank projects (N = 109)
Governance	9	108
Donor support	0	28
Provision: Health sector	41	107
Provision: Nonhealth	14	9
Utilization	34	66

The World Bank would benefit from greater sectoral and geographical diversity in the projects evaluated. Currently, there are gaps between the body of global impact evaluation evidence and the distribution of Bank projects with maternal and child health objectives, especially in governance, health infrastructure, health information systems, and medical projects and technologies. Evaluations in key nonhealth sectors are also sparse: As a multisectoral leader, the World Bank has an advantage facilitating knowledge of health impacts of nonhealth projects and is encouraged to invest in impact evaluations measuring the potential maternal and child mortality-reducing effects of sectors such as energy, agriculture, and transportation. There are no impact evaluations of donor support activities (donor coordination, budgetary support, sectorwide approaches), although these may be inherently less evaluable by impact evaluation methods. While World Bank funding decisions should consider the full breadth of available evidence, these gaps signal an unmet need for more impact evaluations in these areas to strengthen the full body of evidence.

Only 15 of the 68 reviewed impact evaluations were of World Bank projects or Bank-financed interventions. As a group, these evaluated Bank interventions were effective in improving skilled birth attendance and reducing under-five mortality, but showed very small or no detectable impacts on maternal mortality, neonatal mortality, or infant mortality. Moreover, of those 15 impact evaluations, 11 were of projects from just three countries: Indonesia (5), Brazil (4), and India (2); such concentration is not in harmony with the global reach of the Bank’s mission. This representation is also incongruous with the level of burden faced by the regions. Evaluations with estimates of SBA and infant mortality impacts are concentrated in the regions with the second-lowest

burden for these outcomes, rather than in the areas where the most work is needed.

To the degree that the future work of the Bank's several impact evaluation bodies (Development Impact Evaluation Initiative (DIME), Health Results Innovation Trust Fund, and Strategic Impact Evaluation Fund) and hubs (such as DIME's program with the Ministry of Health of Nigeria) is able to estimate mortality impacts of these various intervention types across different regions, these gaps may be filled. Other units looking to conduct impact evaluations to address these gaps may wish to consult the Health, Nutrition and Populations Sector's excellent Impact Evaluation Toolkit.

## Conclusions

Although progress of MDGs 4 and 5 lags, this review gives reason for hope that advances can still be made. Countries where mortality rates are highest and SBA rates are lowest are more likely to observe an impact of appropriately designed interventions. Furthermore, where reported, existing impact evaluations indicated that lower socioeconomic status households realized larger benefits from these interventions.

Given the success of reducing child and maternal mortality illustrated by the impact evaluations reviewed, the World Bank and other development agencies should consider supporting:

- Bundled health interventions affecting both provision (supply side) and utilization (demand side) for both maternal and child mortality
- Formal education and community-based delivery of service packages with interventions affecting mothers' knowledge and information for neonatal mortality
- Energy and air pollution, water and sanitation, education, and governance

interventions affecting strategy and planning to affect child mortality, especially infant and under-five mortality

- Conditional cash transfer or voucher interventions that affect mothers' ability to pay to improve skilled birth attendance rates
- Health worker training in conjunction with the provision of family services and increasing household health knowledge to improve infant mortality
- Interventions with longer periods of exposure, which are more likely to report significant effects.

Although most interventions in the report's taxonomy already had "proof of concept" efficacy trials, the above interventions are those that have demonstrated effectiveness in the field. Many other interventions "made sense" in theory or concept but did not demonstrate attributable impacts on maternal or child mortality. Still, as the body of impact evaluation evidence is still relatively young, this list may change.

Unfortunately, without high-quality cost-benefit analysis, suggesting which among these effective interventions is most efficient is not possible. For the Bank, this underscores the importance of strengthening cost-effectiveness analysis in project preparation, as highlighted in the IEG report *Cost-Benefit Analysis in World Bank Projects* (IEG 2010a).

Considerable gaps in the impact evaluation evidence remain. Further impact evaluations should include policy-relevant evaluation components. Efforts for MCH-related impact evaluations should be prioritized within each mortality outcome for—

- Underrepresented interventions (either as a function of the Bank's portfolio or as a whole)
- Under-represented regions (either to reach some minimum representation

## OVERVIEW

level, or by severity of the MCH problem), especially Sub-Saharan Africa.

Though improved impact evaluation coverage of will not solve the challenges of MDGs 4 and 5, addressing knowledge gaps with further impact evaluation evidence from all corners—within and beyond the Bank—can help to influence evidence-based decision making and steer scarce resources toward more productive use.

Finally, the findings in this systematic review do not, in themselves, constitute a strategy for reducing maternal and child mortality. Rather, this review is intended to be a key input to inform such a strategy. Practitioners are encouraged to use these findings as a starting point in exploring appropriate strategies. Decisions to adopt a given recommendation should be done with careful examination of contextual similarities of the target area to those impact evaluations reported here, to encourage solutions that are technically correct, politically supportable, and administratively feasible.

# Management Response

*Coming soon*



# Chairperson's Summary: Committee on Development Effectiveness

*Coming soon*

# 1. Introduction: Background and Approach

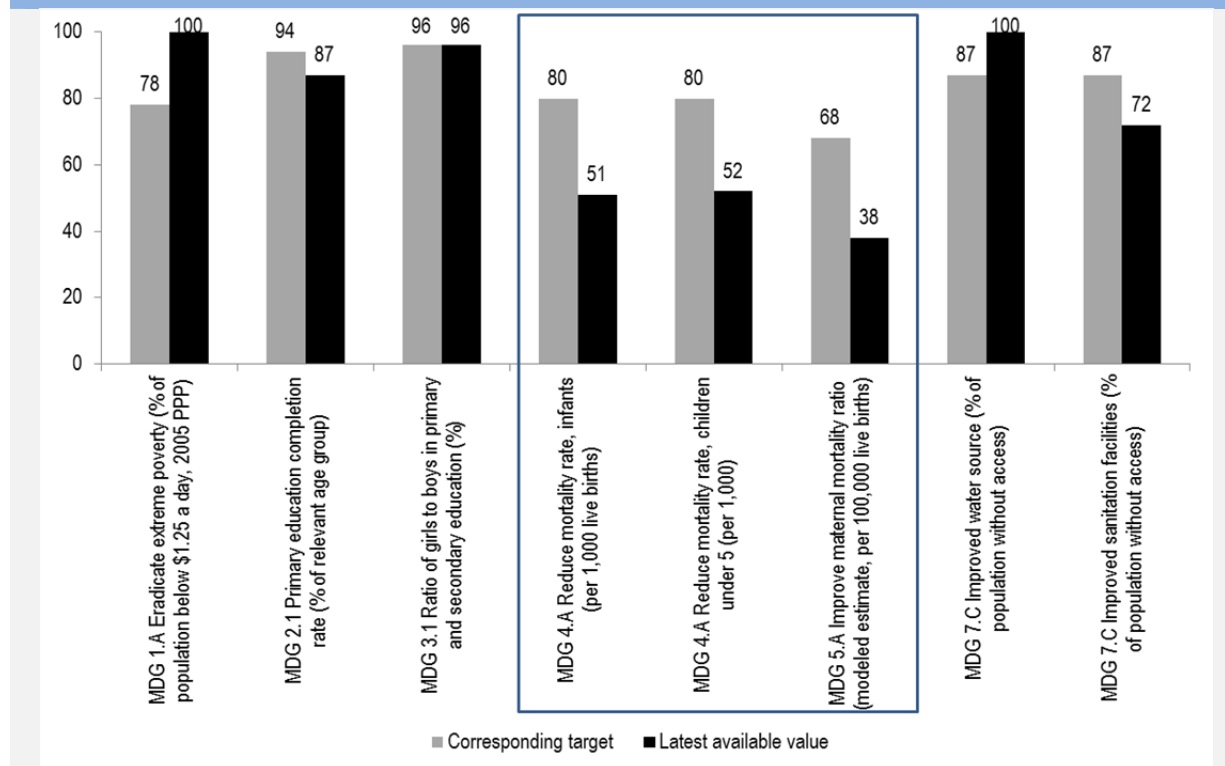
## Global Trends in Maternal and Child Health

1.1 Improved outcomes for women and children – more education, lower fertility rates, higher nutritional status, and lower incidence of illness, among others – have broad individual, family, and societal benefits (World Bank 2011). Although the evidence is thin on the causal relationship from maternal and child health (MCH) to growth or poverty reduction,<sup>1</sup> it is robust in establishing the intrinsic importance of general health to the individual and its instrumental importance as an input into the accumulation of human capital – which in turn is a determining factor of economic growth (WHO 2002). Several studies point to a strong correlation between health and poverty, although the direction of causality is uncertain (Strauss and Thomas 1998; Bloom and Canning 2000; WHO 2001; Gallup and Sachs 2001; Sachs and Malaney 2002; Madsen 2012). There is also evidence of a health-related poverty trap (Gallup and Sachs 2001; Bonds and others 2010).<sup>[13]</sup>

1.2 Despite the lack of good studies on the existence of a potential causal (instrumental) link between MCH and household or national wealth, maternal and child health is intrinsically valuable not only to mothers and children but also to the broader global community, as is evident from its prominent placement in the Millennium Development Goals (MDGs). Adopted in 2000, the MDGs aim to achieve specific goals of human welfare in developing countries by the year 2015. MDG 4 calls for a reduction in the under-five mortality rate by two-thirds between 1990 and 2015. MDG 5 calls for a reduction in the maternal mortality ratio (MMR) by three-quarters between 1990 and 2015 and for universal access to reproductive health care by 2015. Progress on MDGs 4 and 5 is closely coupled: improving maternal health leads to reductions in deaths among newborns and young children.

1.3 Although improvement on some of the MDGs, such as poverty reduction (MDG 1) and expanding access to water and sanitation (MDG 7), has been significant, advances in the MDGs for maternal and child health have been far more modest despite the increased efforts of developing countries and the international development community (see figure 1.1).<sup>2</sup>

Figure 1.1. Global Progress Toward the Millennium Development Goals



Source: World Bank 2012.

Note: PPP = purchasing power parity as of 2005.

1.4 There are challenges in improving health services across the continuum from pre-pregnancy through pregnancy, childbirth, the postnatal period, and into childhood (PMNCH 2010). Factors influencing maternal and child health are broad and complex, extending beyond the health sector to other sectors as well, including energy, water and sanitation, and education. Understanding areas of success, their determinants, and the constraints to more rapid progress is an important goal of the international development community and of the World Bank.

1.5 To this end, this systematic review by the Independent Evaluation Group is a learning exercise that looks beyond World Bank experience. In doing so, it draws on impact evaluations other than those conducted by the Bank or on Bank projects. It is intended to be used a reference for practitioners in the Bank and elsewhere with an interest in interventions that have demonstrated attributable improvements in skilled birth attendance (SBA) and reductions in maternal and child mortality. This review also identifies important gaps in the impact evaluation (IE) evidence for interventions that may be effective but whose impacts have not yet been tested using robust impact evaluation methods. Finally, it is intended to complement other evidence on project performance.<sup>3</sup>

## CURRENT PROGRESS IN MATERNAL HEALTH

1.6 A recently released report from the World Health Organization (WHO), United Nations Children's Fund (UNICEF), United Nations Population Fund (UNFPA), and the World Bank presents an updated look at global maternal mortality rates (MMRs) from 1990 to 2010. Worldwide, maternal deaths have decreased by 47 percent over this period, from 543,000 in 1990 to 287,000 in 2010. Though impressive, this falls well short of the MDG target of a 75 percent reduction, and substantial regional variation remains. Every MDG region has experienced a decline in maternal deaths (WHO 2012), but the MMR remained 15 times higher in developing regions than in developed regions.

1.7 Despite substantial decreases over the past two decades in Sub-Saharan Africa and South Asia, these two regions still accounted, respectively, for 56 percent and 29 percent of global maternal deaths in 2010. Of the 40 countries classified as having a high MMR ( $\geq 300$  maternal deaths per 100,000 live births), only four are outside of Sub-Saharan Africa. The region also experienced 91 percent of worldwide maternal deaths attributable to HIV/AIDS. Although the expansion of antiretroviral therapy has contributed to a recent decline in MMR in several Sub-Saharan Africa countries, regional progress is still negligible (for example, South Africa and Zimbabwe) or insufficient (for example, Zambia and Kenya) to reach MDG targets. Worldwide, among countries with 1990 maternal mortality rates labeled as moderate or worse ( $\geq 100$  maternal deaths per 100,000 live births), only nine countries are "on track" to reach the MDGs, 50 countries are "making progress," and 25 have made "insufficient" or "no progress" (WHO and others 2012).

1.8 The major causes of maternal mortality in developing countries are hypertension and heavy bleeding after childbirth, which are responsible for 18 percent and 35 percent and of obstetric deaths, respectively. In combination with infections, obstructed labor, and unsafe abortions, these five complications account for 80 percent of maternal deaths. Indirect causes, including malaria and HIV/AIDS, make up the remaining 20 percent (WHO 2012). The WHO asserts that most of these deaths can be prevented with adequate equipment, drugs, and medicines and if the woman receives the appropriate interventions from a skilled health provider (PMNCH 2010).

1.9 Birth attendance by skilled health providers has been designated an intermediate MDG, as it is believed to reduce maternal mortality. The proportion of deliveries in developing regions attended by skilled health personnel increased from 53 percent in 1990 to 63 percent in 2008 (UN 2012). However, progress is still insufficient to achieve MDG 5. The average annual decline in the MMR was 2.3

percent between 1990 and 2008, less than half of the 5.5 percent per year average required to meet the goal.

1.10 Fertility patterns also affect MCH outcomes. Pregnancies that carry a high risk (those that are closely spaced or occur at very young or older ages) can be averted through contraception (World Bank 2010). Across the developing world, women are having fewer children, although adolescent fertility remains relatively high. Contraceptive use has increased, but its perpetuation will require a sustained effort as the number of women entering reproductive age continues to grow (PMNCH 2010).

#### CURRENT PROGRESS IN CHILD HEALTH

1.11 As with maternal deaths, progress has been made in reducing child deaths, but much work is still to be done. Globally, the mortality rate for children under-five has declined by 41 percent, from 87 deaths per 1,000 live births in 1990 to 51 in 2011 (IGME 2012). The infant mortality rate (deaths within the first year of life) dropped from 61 deaths per 1,000 live births in 1990 to 37 in 2011, and the neonatal mortality rate (deaths within the first 28 days) also dropped from 32 deaths per 1,000 live births in 1990 to 22 in 2011 (IGME 201). However, under-five mortality continues to be high in Sub-Saharan Africa, where one child in nine (109 deaths per 1,000 live births) died before the age of five in 2011. South Asia has the second highest rate, with 62 deaths per 1,000 live births. Similarly, neonatal mortality continues to be high in these two regions (34 and 32 deaths per 1,000 live births, respectively).

1.12 Increasing evidence suggests that the MDG target can be reached only if substantial and accelerated action is taken to eliminate the leading killers of children (UN 2011): pneumonia, diarrhea, and malaria, which accounted for 43 percent of under-five deaths in 2008. Children under age five are the most vulnerable to malaria, and approximately one in every six child deaths in Africa is due to malaria. In countries where access to malaria control interventions has improved most significantly, overall child mortality rates have fallen by approximately 20 percent. Other major areas of concern are malnutrition, which contributes to one-third of under-five deaths, and neonatal mortality. The proportion of under-five deaths occurring during the neonatal period is increasing even as under-five mortality declines (IGME 2011). This trend is intimately connected to maternal health; a third of stillborn deaths in developing countries occur during birth, mainly due to maternal conditions such as hypertension and obstructed labor but also partly reflecting poor quality of care and management (PMNCH 2010).

## Pathways of Interventions on Reducing Maternal and Child Mortality

1.13 Rather than focusing on clinical interventions, this review looks at the role of governments, health and other sectors, communities, and households in populationwide strategies to improve health service access and affordability, care-seeking behavior, and healthy practices. Effective clinical interventions that reduce the main causes of maternal and child mortality are generally known by the global health community (for example, emergency obstetric care, immunization, or nutrient supplementation). The current challenge is in implementation and scale-up, and to that end, this review examines evidence of scaled, field-tested examples of these interventions.

1.14 To aid policy makers who are seeking to reduce child or maternal mortality, this review takes an outcome-oriented approach, focusing on the ultimate outcomes of the MDGs: maternal and child mortality. Specifically, the review focuses on the outcomes of skilled birth attendance, maternal mortality, neonatal mortality, infant mortality, and under-five mortality (see box 1.1). Anchoring the review on the ultimate outcomes of mortality rather than on intermediate outcomes of morbidity or care-seeking behavior allows it to report on interventions for which there is direct evidence of an effect on mortality. Intermediate outcomes still rely on theories of change and correlations rather than causal evidence to make inferences on their relationship to ultimate outcomes. This report will show that, in the case of the intermediate indicator for MDG 5 of “the proportion of births attended by skilled health personnel,” such inferences can be problematic.

1.15 By explicitly recognizing the multisectoral nature of maternal and child health, this review aims to collect all impact evaluations that include MCH indicators, regardless of the type or sector of intervention that produced them. This approach also facilitates policy makers’ use of complementary evidence from health-specific clinical reviews. This is in contrast to the intervention-oriented approach of most existing systematic reviews, which examine the effects of a single intervention type. Accordingly, this review aims to answer the following questions:

- What do we know about the attributable effects of available interventions on reducing maternal and child mortality and increasing skilled birth attendance?
- What do we know about the effects of increasing the number of births attended by skilled health personnel specifically, as indicated by MDG 5, and skilled birth attendance generally on maternal and child mortality and intermediate morbidity and health outcomes at the local or national level?

- What important knowledge gaps on interventions to reduce maternal and child mortality remain?

1.16 This outcome-oriented approach required a classification of all possible intervention types that might affect the selected outcomes of interest (see Box 1.1). The intervention areas outlined in Figure 1.2 present a taxonomy of intervention categories. The structure of this taxonomy was developed from a review of World Bank and WHO literature on MCH and was refined while gathering MCH-related impact evaluations and consulting with Human Development Network representatives and health economists during the planning stage.

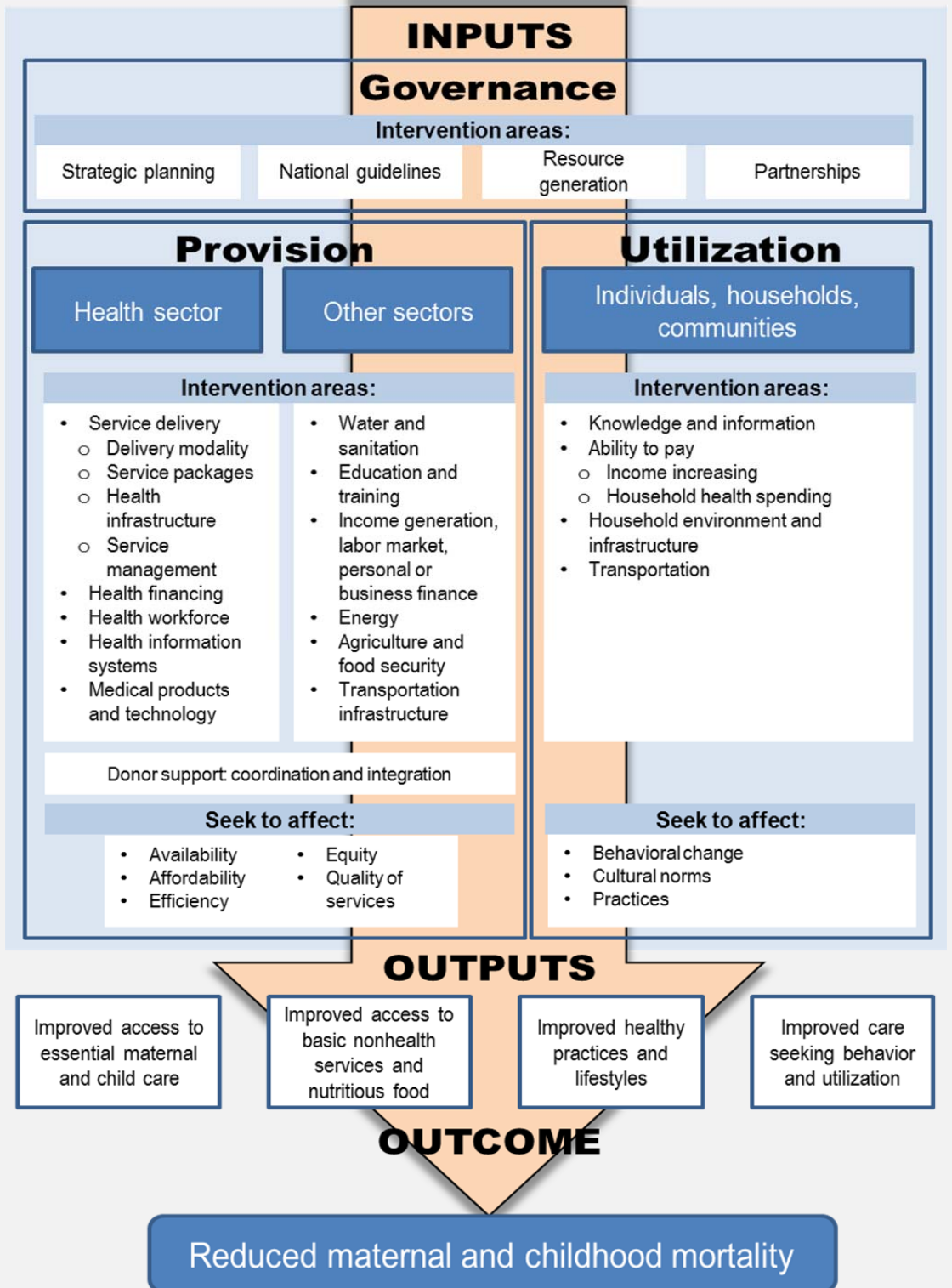
1.17 Maternal and child mortality is described as a function of two complex sets of causes. The first comprises proximate factors that have a direct effect on the probability of dying (Mosley and Chen 1984).<sup>4</sup> The second is a set of underlying causes of mortality (poverty, low levels of education, poor water and sanitation) that affect the proximate factors. This second set increases the likelihood of death by limiting awareness of and access to health care and basic services, social networks and coping strategies, and adequate nutrition. As a result of the quantity and complexity of these two sets of factors, policies can impact health outcomes through various pathways. Figure 1.2 outlines the conceptual links between the intervention families included in this review and maternal and child mortality. Appendix D is an extended discussion of the conceptual model.

1.18 As indicated in figure 1.2, interventions that aim to increase the demand of health care and enhance health practices can be grouped into three primary domains: governance (public policies and actions), provision, and utilization. Governance is important because effective coverage and integration of maternal- and child-care services require better policies and institutions. Through good governance, sufficient resources are allocated to maintain a functioning health service delivery system and to create appropriate legal frameworks and monitoring systems. Therefore, this category has six intervention types that address the stewardship roles of government and formal and informal oversight bodies at every level from national to community, such as strategy planning and public financial management.

#### Box 1.1. MCH Outcomes Selected for Review

Skilled birth attendance  
Maternal mortality  
Neonatal mortality (0-28 days)  
Infant mortality (0-12 months)  
Under-five mortality (0-59 months)

Figure 1.2. Framework of Interventions for Reducing Maternal and Child Mortality



Source: IEG



1.19 The provision of services is deemed essential in reducing maternal and child mortality. This category is grouped into three subcategories: donor support, the health sector, and other sectors. Following the WHO (2007) convention, the health sector is defined as the health system's "building blocks" – service delivery, health workforce, health information system, medical products and technologies, and health financing. Health sector interventions are ones that aim to improve these areas. They represent the bulk of health systems actions from the supply-side (Graham and others 2006). Other sectors include education, energy, labor market, agriculture, transportation infrastructure, and water and sanitation. The differentiation between the health sector and the other sectors is based on where the primary responsibility for an intervention lies. Dividing the interventions in such a way is not meant to imply that other sectors are or should be outside of the influence of health policy; health policy would likely benefit from greater involvement in other sectors such as water and sanitation.<sup>5</sup>

1.20 The utilization category describes interventions designed to directly affect actions taken by households as producers of health in terms of health practices and lifestyles and as users of health services; the category is similar to the concept of "health demand" elsewhere but without the implicit existence of a market. These interventions play a unique role in perceiving risks and signs of disease, an essential aspect of successful maternal and child health interventions. Moreover, households and individuals are recipients of information and knowledge on health practices. Ideally, increasing knowledge will translate into a change in behavior, although this is not always the case. Consequently, an important aspect to influence mortality outcomes is to identify the channels through which knowledge and information translate into behavior change for both individuals and communities. An additional element of utilization interventions is overcoming barriers to good health and access to necessary care, whether financial, geographical, or cultural. Health education, health insurance, and other financial incentives can be effective instruments to attain financial protection and increase health outcomes.

1.21 Definitions and examples of individual interventions are given in Appendix A. This taxonomy was used to classify all of the interventions found in the studies included in this review and is used to frame the data analysis and discussion. Each intervention could be classified in no more than three categories.

## **Maternal and Child Health Strategies at the World Bank**

1.22 The World Bank's strategy to reduce maternal and child mortality is implied by the 2007 Strategy and the Reproductive Health Action Plan 2010–15, which

contains elements that lend themselves to supporting certain actions. Furthermore, the Bank has published two strategies specific to MDGs 4 and 5 to improve maternal and child health (see table 1.1.).

Table 1.1. World Bank Strategies for MDGs 4 and 5

MDG 4: Improving Child Health	MDG 5: Improving Maternal Health
<p><b>Strengthen</b> national health systems for better results.</p> <p><b>Tie</b> financing to performance in improving children’s health and saving their lives.</p> <p><b>Protect</b> the poor from ill health and unaffordable costs and treatment.</p>	<p><b>Develop</b> more effective and efficient national health systems.</p> <p><b>Motivate</b> young people to delay pregnancy and achieve higher levels of education.</p> <p><b>Support</b> increased use of reproductive health services, focusing on assisted deliveries and family planning.</p> <p><b>Tie</b> financing to performance in maternal health programs.</p> <p><b>Protect</b> poor women from ill health and unaffordable costs and treatment.</p>

Source: <http://www.worldbank.org/mdgs/>.

These strategies line up with this report’s taxonomy categories of Governance; the health sector broadly – especially service delivery, health workforce, and health financing; and household ability to pay from the utilization family of interventions.

**Box 1.2. Overview of World Bank Activities in Maternal and Child Mortality**

To understand where the World Bank and its clients are concentrating support for maternal and child health, IEG conducted a portfolio check of World Bank activities. A universe of health projects was constructed using the database of World Bank project information. All projects that were approved between FY03 and FY12 with the following sector or theme codes selected:

Included sector codes	Included theme codes
<ul style="list-style-type: none"> <li>• Health</li> <li>• Compulsory health finance</li> <li>• Public administration health</li> <li>• Noncompulsory health finance</li> </ul>	<ul style="list-style-type: none"> <li>• Child health</li> <li>• Other communicable disease</li> <li>• Health system performance</li> <li>• Population and reproductive health</li> <li>• HIV/AIDS</li> <li>• Noncommunicable diseases and injury</li> <li>• Malaria</li> <li>• Tuberculosis</li> </ul>

This database was merged with an unpublished dataset of activities of the World Bank’s Health, Nutrition, and Poverty (HNP) department in Maternal Mortality, Under Five Mortality, Child Mortality, and Antenatal Care and Child Delivery Services. These projects, excluding supplemental financing, were subsequently coded against the definitions of the interventions in Appendix A.

Project Appraisal Documents and program documents identified by the HNP database as Antenatal Care and Child Delivery Services were re-screened and coded specifically to Skilled Birth Attendance as appropriate.

The projects with health coding from the Poverty Reduction and Economic Management (PREM) Network, the Social Protection (SP) Sector Board, and water, energy and mining, and social development projects within the Sustainable Development Network (SDN) were coded as these, combined with HNP, were the sectors to which the vast majority of the available impact evaluations included in the review pertained. The Project Appraisal Documents and program documents were first screened for MCH involvement in both project components for investment loans and prior actions for development policy loans. Those with MCH involvement were also coded following the above protocol.

As seen in the table below, the portfolio review yielded 109 projects over the last 10 years in HNP, PREM, SP, and the included sectors from SDN that seek to address at least one of the outcomes of interest (MCH mortality or SBA), with 77 in HNP, 31 in PREM and SP combined, and only 1 from the selected SDN sectors (in social development). Not surprisingly, given the networks from which the data are drawn, these projects are concentrated in the governance and health sectors.

An extended classification of World Bank maternal and child health activities is in Appendix I.

All: 109 projects		HNP: 77	PREM, SP: 31	Water, Energy and Mining, and Social Development from SDN: 1
Governance	108	77	30	1
Donor Support	28	27	1	0
Provision: Health sector	107	76	30	1
Provision: Nonhealth	9	7	2	0
Utilization	66	51	15	0

Source: IEG

Note: Projects within a sector board may be cross-listed over multiple intervention types.

## Search Strategy

1.23 The data for this review originate from completed studies with findings on the selected MCH outcomes. One study might include more than one impact evaluation if it evaluates multiple interventions (most often through multiple treatment arms). Included studies were identified through a detailed search strategy

that built on existing systematic review search frameworks consisting of electronic database searches, screening and hand searches, and literature snowballing. Round A served as the primary search period and included a pilot test of the electronic database search to refine the search terms used, whereas rounds B and C served as comprehensiveness checks. Table 1.2 identifies the resources consulted for each round; Appendix B includes a more detailed description of the search process for each source.

**Table 1.2. Three Rounds of Data Collection**

Round A: 376 Potential Studies	Round B: 47 Potential Studies	Round C: 22 Potential Studies
<ul style="list-style-type: none"> <li>• Large bibliographic databases</li> <li>• Top economic journals</li> <li>• Top health economists</li> <li>• Websites of research organizations</li> <li>• Websites of donor organizations</li> <li>• Global reports</li> <li>• World Bank databases</li> </ul>	<ul style="list-style-type: none"> <li>• Reviewed reference lists of systematic reviews</li> </ul>	<ul style="list-style-type: none"> <li>• Google Scholar</li> <li>• Snowballing from reference lists of impact evaluation identified in rounds A and B</li> </ul>

1.24 The search strategy included three rounds of data collection during which the team reviewed more than 7,000 search results. These were winnowed to 445 studies following a title and abstract review. These 445 studies were reduced to 95 following a brief full text review to confirm that they qualified for the systematic review. The selection criteria applied to these studies during the full-text review are in box 3.1.

1.25 The application of the selection criteria yielded 95 impact evaluations; of those, 62 studies met the minimum quality criteria for inclusion in the analysis of IEG’s review. A coding instrument with more than 300 fields was developed to record information about the intervention program, findings, data, external validity, cost analysis, and heterogeneous effects (see Appendix C). Figure 1.3 shows a flow diagram of the search and sifting process.

**Box 1.3. Selection Criteria for Study Inclusion**

During the three search rounds and initial text review, a set of selection criteria were applied to the titles, abstracts, and texts to generate a list of potential studies for inclusion in the analysis of the review.

*Study design:* Studies that evaluate interventions based on a quantitative experimental or quasi-experimental impact evaluation design with a well-defined counterfactual were included. Accepted designs include randomized experiments, double or triple differences, matching, instrumental variables, or regression discontinuity design.

*Location:* Studies of interventions that occur in a low-income or middle-income country,

based on World Bank classifications, were selected.

*Language:* The search focused on studies in English, although studies in Spanish, French, and Portuguese were included.

*Publication date:* Studies concluded since January 1, 1995, were included.

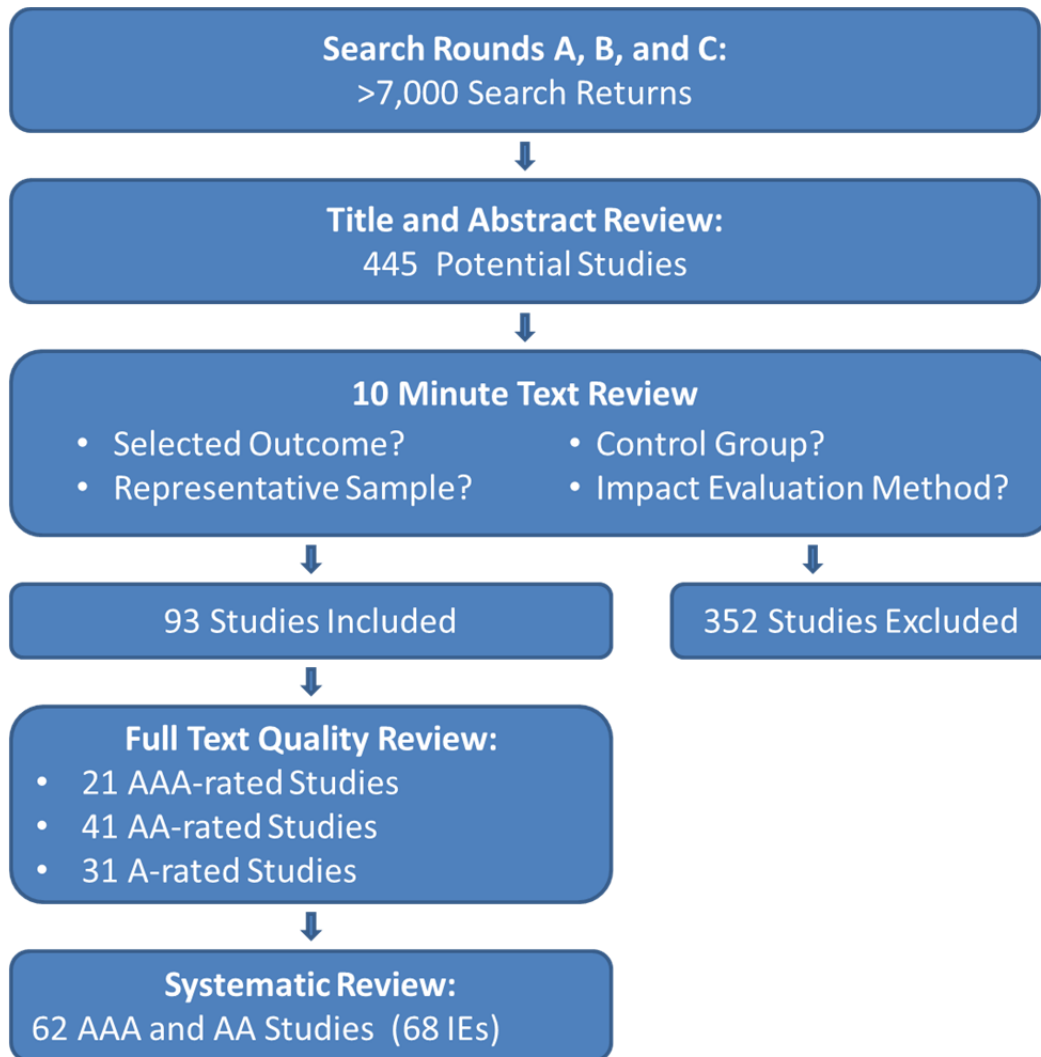
*Unit of analysis:* Studies that use aggregated national or regional data, as in cross-country or national interrupted time series analyses with few observations over multiple periods, were excluded.

*Peer review:* Impact evaluations subjected to peer review (for example, published in a quality journal or a book) or that are in the process of soliciting review from the research community (that is, “grey literature” of informally published impact evaluations such as working papers or papers presented in conferences) were included if publicly available.

*Nonclinical interventions:* The review includes effectiveness studies but excludes efficacy studies as they are often too controlled to be generalizable. This follows the classification of studies in the World Bank’s handbook *Impact Evaluation in Practice* (Gertler and others 2011), which describes efficacy studies as being tightly controlled experiments in very specific circumstances with heavy technical involvement from the researcher; effectiveness studies, on the other hand, give results of interventions implemented in the field under normal circumstances.

1.26 Impact evaluations were given quality ratings largely determined by the strength of the evaluation’s internal validity: the level of accuracy and reliability of its estimates of program effectiveness. Accuracy refers to having the point estimate “correct” and unbiased from all potentially confounding factors; reliability (alternately called consistency) is the notion that the variance caused by random error of unbiased estimates is small, such that random error is not drastically affecting the point estimate. To convincingly achieve high levels of internal validity, impact evaluations use a counterfactual to compare observed outcomes of the treatment group against what would have happened in the absence of the program. Several impact evaluation designs exist to establish a counterfactual, each with its own set of critical identifying assumptions. Impact evaluations are usually divided into two families with several members: Experimental designs include randomized control trials (RCTs) and their variants, whereas quasi-experimental designs include differencing techniques, regression discontinuity, instrumental variables, and matching.<sup>6</sup> Natural experiments could also be included in principle, subject to the credibility of the counterfactual employed. The review found none that met the other selection criteria for this review. More discussion of impact evaluation methods and challenges in implementation generally as well as for MCH-related issues specifically is presented in the Impact Evaluation Toolkit from the Health Nutrition and Population sector of the World Bank.<sup>7</sup>

Figure 1.3. Search Process for Impact Evaluations



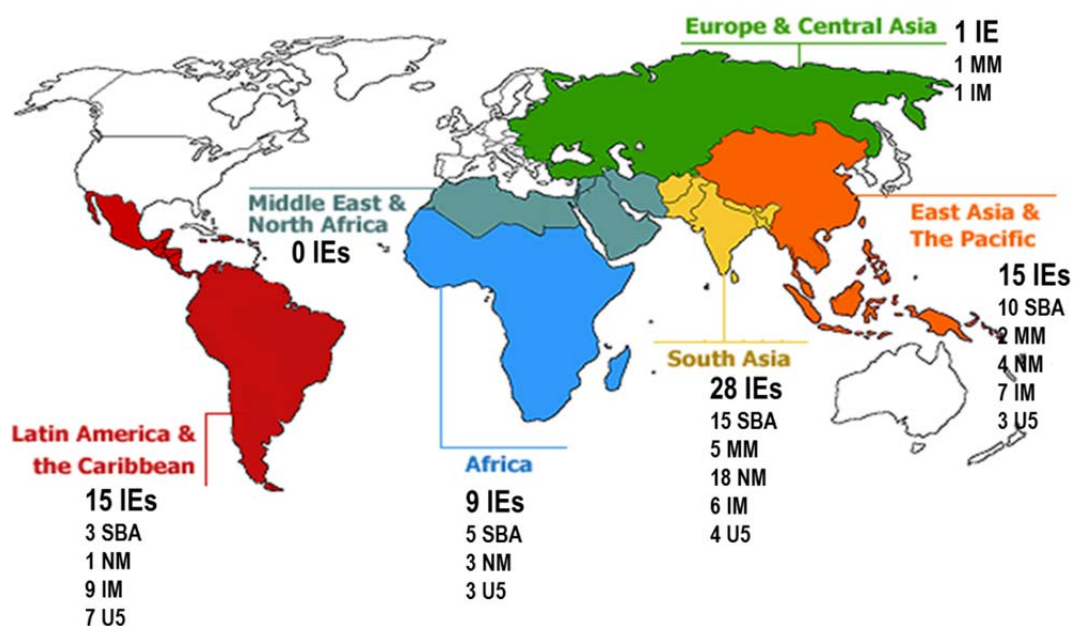
Source: IEG

1.27 Assessment of quality was determined by criteria established prior to the review and based on previous IEG work (IEG 2012) to judge risk of bias in the effect estimates. Foremost among these is the degree to which impact evaluations established the fact that their identifying assumptions, or conditions under which the estimation method is valid, were met. Existence and strength of robustness checks were likewise assayed. Finally, serious issues were considered regarding data collection, statistical power, external validity of sampling, and construct validity of the outcomes (which is especially important with outcomes that are prone to measurement error such as maternal mortality). Following these criteria, impact evaluations were graded AAA if all or nearly all of the criteria were met, the critical assumptions of the identification strategy were well-established, and few if any

threats to internal validity remain. IEG rated evaluations AA if most but not all criteria were met and there were no serious concerns with the identification strategy, although some may remain untested or unclear. Impact evaluations for which major concerns remained with the validity of the identifying assumptions were rated A.

1.28 Because the reliability of policy implications hinges in large part on the reliability of the internal validity of the evidence, this systematic review reports quality ratings of the studies used throughout. In application, AAA connotes established causality of the impact estimates, whereas those with an AA rating connote that causal claims are likely if not incontrovertible. Although the external validity of these studies depends on similarity to the target context, the causal attribution is established. Evaluations graded A leave doubt as to the causal claims of their reported associations, often in spite of the best efforts of the authors, given the available data. Although these may yet be more reliable than other types of evaluation (for example, multivariate regression or single differencing), they are not used in the analysis of the systematic review, although they are listed in Appendix G for reference purposes. Only the 68 impact evaluations rated AAA and AA were deemed sufficiently high in quality to be included in this analysis.

Figure 1.4. Impact Evaluation Coverage by Region and Outcome



Source: IEG

Note: SBA = skilled birth attendance; MM = maternal mortality; NM = neonatal mortality; IM = infant mortality; U5 = under-five mortality.

## DATA DESCRIPTION

1.29 The 68 AAA and AA impact evaluations included in this review cover all the report's defined outcomes of interest and 18 of the 27 established intervention types. The World Bank was involved in 18 of the included evaluations, of which 9 had a World Bank author or coauthor, and 15 were of World Bank projects or projects supported by World Bank financing (see Appendix F). As seen in figure 1.4, all of the world's regions except the Middle East and North Africa are represented, although there is just one impact evaluation on maternal and child mortality for Europe and Central Asia.

## METHOD OF ANALYSIS AND SYNTHESIS

1.30 The analysis of this report focuses on the AAA impact evaluations—those for which the internal validity of the study is very reliable. Evidence from AA studies is used to supplement those findings, but a distinction between the studies is always drawn.

1.31 Even where there is coverage of impact evaluations over intervention types, it is thin, and the evaluations are too dissimilar to allow for a credible meta-analysis: Outcomes may differ in their units of analysis, projects may yet have different elements, or context may be vastly different. Rather, IEG examines patterns of significance for clusters of interventions within each outcome. This review reports findings in which all or nearly all of the AAA impact evaluations within an intervention family report statistically significant impacts on a given outcome.

1.32 Importantly, an AAA impact evaluation does not imply a high-impact intervention. Similarly, a statistically significant impact does not necessarily connote a large impact. The review notes those instances where an intervention has a rather modest (or large) magnitude of the impact estimate. Moreover, standardized effect sizes are presented graphically by outcome for all AAA impact evaluations in Appendix J, allowing inspection of the magnitude of point estimates and standard errors.

1.33 Because of the potential for bias of the field of studies included in the review (see box 1.4), this report focuses on what seem to be promising avenues of intervention, rather than calling attention to potential dead ends. IEG thus reports on “what works,” based on the limited robust evidence available, rather than making assertions on what does not work. Still, the review does point out where there is a lack of high-quality impact evaluation evidence for important intervention types.



### Box 1.4. Challenges and Cautions for Systematic Reviews

Notwithstanding the thoroughness of the search strategy, there remain challenges to representativeness and interpretation of results that are common to all systematic reviews. This review meets or exceeds standard practice, such as it exists, in every instance.

**Challenges to representativeness of the interventions** arise from the fact that the process of selecting interventions to be evaluated by an impact evaluation is purposeful rather than random.

- Some types of projects are less amenable to impact evaluation methods and so will be underrepresented.
- Interventions that report on intermediate rather than final outcomes are excluded.
- Importantly, the lack of existing impact evaluations for a family of interventions indicates a need for evaluations in that area, not that the interventions are ineffective.

**Challenges to representativeness of the impact evaluations** are twofold.

- The review includes only concluded studies; it cannot use impact evaluations that are planned or in process.
- As with all reviews, the sample may suffer from file drawer bias or publication bias wherein studies that yield null results are not completed. Alternately, it has been hypothesized that only studies with experimental designs can be published with statistically insignificant results because of stronger internal validity; this may lead to a false conclusion that randomized trials are more likely to return null results.

**Challenges to interpretation of results** imply a need for thoughtful application of findings.

- Impact evaluations of projects funded by foreign aid likely underestimate the true effect of the intervention because they measure partial (or local) equilibrium effects rather than the general equilibrium effects resulting from the fungibility of government budgets, which allows countries to reallocate health funding away from of the foreign-funded activities (Wagstaff 2011).
- Null results must be interpreted carefully: they do not necessarily mean there is no effect. They may occur where there is measurement error, insufficient sample size (power) to detect an effect, spillover from treatment to the control group, differential attrition, insufficient behavioral incentives, or implementation challenges. Distinguishing the causes of a null result is often untenable.
- External validity is a persistent challenge. Applicability of results to a different context – time, place, or scale – is likely a function of project complexity (Woolcock 2012), administrative capacity, political supportability, and alignment with the most important barriers of the target environment. The ideas and processes of an intervention may have greater external validity than the intervention itself.

1.34 Chapter 2 covers impact evaluations that report outcomes on skilled birth attendance and maternal mortality. It also gives a review of impact evaluation evidence of maternal and child health outcomes resulting from skilled birth attendance. Chapter 3 relates impact evaluation evidence of interventions on child

mortality, expositing in turn results on neonatal, infant, and child mortality. Each of these outcome sections in Chapters 2 and 3 is structured to first characterize the issues around the outcome being reviewed, then describe the impact evaluations that report results for that outcome, categorizing the evaluations according to the three main families of interventions in the taxonomy – governance, provision (health sector and other sectors), and utilization – plus an additional category for projects that bundle components from different intervention types. Finally, each outcome section discusses findings from these evaluations in terms of promising interventions (what is known) and remaining knowledge gaps (what still needs to be known). Chapter 4 is a broad-ranging discussion of trends observed over the entire database of included impact evaluations, including comparisons of the strength of impact evaluation evidence with the World Bank’s activities.

1.35 In some sense, this review is a baseline for impact evaluation evidence in maternal and child mortality. As more impact evaluations are produced and the evidence thickens and perhaps coalesces around particular results, key findings reported here may become more certain. For now they should be taken as instructive but still preliminary.

## 2. Mothers

2.1 Mothers undertake considerable risk at childbirth, the level of which varies greatly across regions. The most recent accounting exercise estimated that 1 in every 4,700 mothers in developed countries will die during childbirth; that risk increases dramatically in developing regions; for instance in Sub-Saharan Africa it is 1 in 39 (WHO and others 2012).

2.2 Most of the causes of maternal mortality are obstetric and preventable. Clinical interventions to prevent or manage pregnancy and childbirth-related complications are well known (Campbell and Graham 2006; Graham and others 2006; Nyamtema, Urassa, and van Roosmalen 2011). Among these key strategies are enhanced maternal nutrition (increased food intake and supplementation with folic acid and iron); disease prevention and treatment (malaria, hepatitis B, and HIV); quality reproductive health services (family planning); adequate antenatal care (at least four visits, including basic preventive measures); skilled assistance at delivery, in particular active management of the third stage of labor; and basic and comprehensive emergency obstetric and postnatal care (Campbell and Graham 2006; Graham and others 2006; Wagstaff and others 2006).

2.3 Addressing factors that cause delays in identifying risks and in deciding to seek care, reaching a treatment facility, and receiving high-quality care – the “three-delay framework” (Thaddeus and Maine 1994) – is necessary to reduce maternal mortality. In delivering such interventions, health systems can play a crucial role, and their adequate preparation is essential to ensure that communities and women have access to high-quality services (Campbell and Graham 2006; Canavan 2009; Graham and others 2006).

2.4 Fostering skilled birth attendance (SBA) is believed to constitute a first step in any strategy that seeks to reduce maternal mortality and is enshrined as the primary indicator for maternal mortality in the fifth MDG. “Improving the proportion of births attended by skilled health personnel” is also the only indicator that explicitly refers to human resources in health.<sup>1</sup> The promotion of skilled attendance at delivery has been widely used in an effort to effectively manage delivery complications (obstructed labor, eclampsia, puerperal sepsis, and obstetric hemorrhage). Consequently, this chapter begins by examining 33 impact evaluations of the effects of a range of interventions on the use of skilled birth attendants by expectant mothers.

2.5 Yet rigorous field evidence on the effectiveness of skilled attendance in reducing maternal mortality has been known to be limited for several years

(Graham and others 2006). Thus, the chapter explores the 25 impact evaluations with evidence of attributable effects of SBA as an intervention.

2.6 Countries have pursued many strategies to reduce the risk of maternal death. Essential services for mothers and newborns are considered to be most effective when they are delivered in integrated packages through a functioning health system (UNICEF 2009). In poor settings where access to health systems is limited, outreach, family- and community-based interventions – particularly birth preparedness counseling, clean delivery, and promotion of health-seeking behavior – may provide an alternative modality to reach pregnant women and deliver these packages of interventions (Campbell and Graham 2006; Kerber and others 2007). The chapter culminates with evidence from eight studies on how these and other interventions perform in the field to reduce maternal mortality.

2.7 Given the complexities of both childbirth and the decision to seek skilled attendance, achieving the fifth MDG is likely to require complementary and reinforcing strategies. The reviewed impact evaluations cover a wide array of interventions, but they are particularly clustered around bundles of health provision (service delivery) and health utilization (household ability to pay and diffusion of knowledge and information). Findings of this chapter support the notion that interventions that focus on improving accessibility and quality of health care through combinations of health provision (health workforce training, delivery modalities, service packages) and on health utilization (schemes to improve ability to pay, diffusion of knowledge and information) tend to be associated with significant effects on the analyzed outcomes. Conversely, across outcomes, stand-alone interventions are less likely to yield significant impacts. As an important example, this review does not find any evidence that interventions aimed exclusively at improving the main MDG 5 indicator of increasing the proportion of births attended by skilled health personnel has any effect on mortality outcomes.

2.8 Table 2.1 indicates the intervention type and quality of study of the 36 impact evaluations used in the sections on maternal mortality and SBA as an outcome. The section on skilled birth attendance as an intervention has its own table based on seven AAA impact evaluations (see Appendix E). The numerator in each cell is the number of impact evaluations of that level reporting a statistically significant effect of that intervention on that outcome. The denominator is the total number of impact evaluations.

Table 2.1. Skilled Birth Attendance and Maternal Mortality: Intervention Type and Quality of Studies

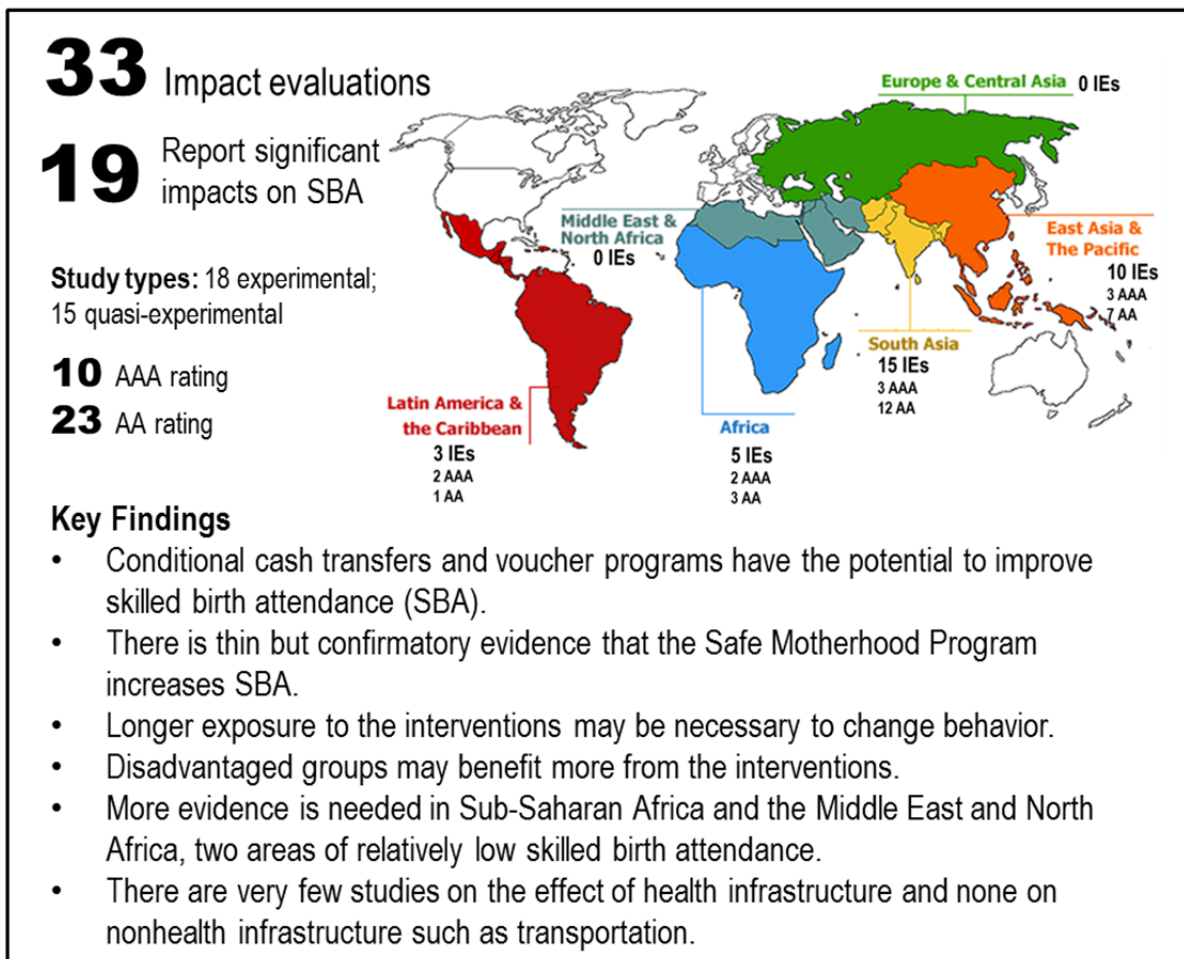
Intervention area			MDG 5: Improve maternal health					
			Skilled birth attendance		Maternal mortality			
			AAA	AA	AAA	AA		
Governance	Government or governance	Strategy planning, policy		0/2	0/1			
		Public financial management						
		Regulation and licensing						
		Monitoring and evaluation, accountability		1/1				
		Multisector coordination						
		Public-private partnership						
Provision	Donor support	Coordination						
		Integration						
	Health sector	Service delivery	Delivery modality		0/2	4/8	0/1	0/3
			Service packages		0/1	5/6		0/2
			Health infrastructure		1/1	0/1		
			Service management		2/2	0/1		
			Health workforce		1/2	3/7	2/2	0/2
		Health information system						
		Medical products and technologies						
		Health financing — supply		0/2	3/3			
	Other sector	Water and sanitation						
		Education and training			1/1			
		Income generation, labor market, personal or business finance						
Energy								
Agriculture and food security								
Transportation infrastructure								
Utilization	Household or individual	Ability to pay	Income increasing		2/3	2/2	0/1	
			Household health spending		1/1	3/3	1/1	0/1
		Knowledge and information		1/2	4/10	2/3	0/3	
		Household environment and infrastructure						
		Transportation		1/1				
Number of impact evaluations with significant effect / number of unique impact evaluations				5/10	13/23	2/3	0/5	

Source: IEG

## Skilled Birth Attendance as an Outcome

2.9 Skilled birth attendance is considered essential to ensuring safe delivery and care for a newborn (WHO 2005a). Skilled health personnel can save the life of the mother or child by the timely detection of complications during pregnancy and swift treatment or referral. Yet the proportion of deliveries in the developing world attended by skilled health personnel has increased by only 6 percent over the last decade, from 59 percent in 2000 to 65 percent in 2010 (UN 2012). This leaves more than one-third of deliveries in the developing world unattended by skilled personnel.

2.10 This section reviews evidence from impact evaluations of interventions aiming to increase SBA. Following the WHO definition, a skilled birth attendant is “an accredited health professional – such as a midwife, doctor, or nurse – who has been educated and trained to proficiency in the skills needed to manage normal (uncomplicated) pregnancies, childbirth and the immediate postnatal period, and in the identification, management, and referral of complications in women and newborns” (WHO 2004).



## CHAPTER 2 MOTHERS

2.11 Deliveries attended by a skilled professional can occur at home or in a health facility; the latter is referred to as institutional deliveries. Skilled care also requires adequate supplies and access to a functioning referral system. Many of the definitions of skilled birth attendance in the studies are consistent with that of the WHO, but in reality the attendants undoubtedly fell along a range of skill levels that deviate in some degree from the WHO's scenario. The specific skill levels of the attendants cannot be determined, so it is necessary to accept that the attendants in the interventions did in fact qualify as skilled personnel.

### DATA DESCRIPTION

2.12 The review identified 28 studies of 33 interventions that had SBA as an outcome. Nine of these were AAA studies (covering 10 interventions), of which 5 employed experimental and 4 used quasi-experimental methods. Five of the AAA and 13 of the AA studies reported significant results. The geographic distribution of the interventions is found in the map above. Most of the interventions targeted specific groups, with rural populations being the most common. The details of these studies are organized below according to the taxonomy of intervention families presented earlier.

### GOVERNANCE

2.13 The review did not find any study that focused on an intervention that was exclusively governance related. Two studies that bundled components of governance with other intervention types are further discussed in the Bundles section.<sup>[12,54]</sup>

### PROVISION: HEALTH SECTOR

2.14 The only health sector intervention evaluated by an AAA study combined **delivery modality, health workforce, and service packages**. Female health workers and traditional birth attendants in Pakistan were trained, and community health committees were formed to promote maternal and child health within the villages. The results were not statistically significant. Three AA evaluations found significant effects for four different health sector interventions (Bloom, Canning, and Sevilla 2003),<sup>[7,26]</sup> but the remaining two health sector interventions produced null results.<sup>[50,44]</sup>

### PROVISION: NONHEALTH SECTORS

2.15 An AA study evaluating an **education** program was the only nonhealth sector intervention, and it found a significant increase in SBA.<sup>[59]</sup>

## UTILIZATION

2.16 Both utilization interventions were conditional cash transfers (CCTs) that focused on **increasing income** to affect the ability to pay. The first was the well-known *Progresa* program (now *Oportunidades*) in Mexico.<sup>[62]</sup> Health facilities were required to provide delivery services for pregnant women enrolled in the program, but this did not significantly change the proportion of deliveries attended by skilled health personnel. *Janani Suraksha Yojana* (JSY), a government initiative in India, gave cash to women who delivered in a hospital or health facility.<sup>[46]</sup> The initiative also gave health workers incentives with a cash transfer for every delivery they attended. This combined effort led to a highly significant increase in both facility births and skilled birth attendance in general. An AA-quality study also evaluated JSY and found a significant increase in SBA.<sup>[39]</sup>

2.17 Three other AA-quality studies looking at the **ability to pay**, including **household spending**, also found similarly significant increases.<sup>[53,55,51]</sup> Two interventions that increased **knowledge and information** were insignificant.<sup>[48]</sup>

## BUNDLED INTERVENTION

2.18 The remaining AAA studies evaluated interventions that bundled components across the governance, provision, and utilization sectors. The first was *Comunidades Solidarias Rurales*, a conditional cash transfer program in El Salvador, that led to a significant increase in hospital deliveries. Unlike JSY and *Progresa*, this CCT included **health infrastructure** improvements in all participating areas.<sup>[16]</sup>

2.19 The second study examined two interventions encompassing **health financing** and **strategy planning and policy**. The Indonesian government identified 12 MCH and education outcomes of focus, and villages were given block grants to allocate as they chose to improve these outcomes.<sup>[54]</sup> In the first intervention, the amount of the villages' second-year grant was the same as the first year. In the second intervention, the second-year amount was dependent on the first year's performance (pay-for-performance program). Both interventions produced statistically insignificant results. A community monitoring intervention in Uganda combined **monitoring and evaluation and accountability** with **service management** and significantly increased SBA.<sup>[12]</sup> Community leaders met with staff from public health facilities to create action plans to improve health care in the facilities. Each plan included a provision for community members to monitor compliance.

2.20 A **health management** and **transportation** intervention in Zanzibar also significantly increased SBA by providing mobile phones to health facility workers so they could call expectant mothers and send reminder text messages to women in the



treatment group who had their own mobile phone.<sup>[41]</sup> All women in the treatment group were given vouchers with enough credit to call their primary care provider. Midwives and ambulance drivers were also given mobile phones to improve ambulance services.

2.21 Finally, two interventions used **knowledge and information** campaigns to try to increase skilled birth attendance. The first focused on the **delivery modality** of services by creating or expanding participatory women's groups that taught women about good delivery practices and care-seeking behavior.<sup>[61]</sup> The sessions emphasized facility delivery and proper health care practices during pregnancy; nevertheless, the evaluation did not find statistically significant differences.

2.22 The other intervention that addressed knowledge and information was the Safe Motherhood Program in China, which also tried to improve both the ability of households to pay and the health workforce in poor counties.<sup>[23]</sup> Subsidies for care were provided directly to participating women, and obstetric experts were deployed to support and train staff in primary health centers. This produced a highly significant but relatively small increase in hospital births. An AA-quality study of the same program found a much larger and still significant increase.<sup>[40]</sup>

2.23 Seven AA studies bundled components across intervention types. Six of the seven, encompassing eight different interventions, used some combination of **delivery modality, knowledge and information, health workforce, and service packages**. Four of these interventions reported at least marginal increases in SBA,<sup>[38,37,45,4]</sup> but the other four found null effects (see figure J.1 in Appendix J).<sup>[37,3,47]</sup> The remaining study, which did not demonstrate a significant impact, was a combination of **health infrastructure** and **strategy planning and policy** in Bolivia.<sup>[49]</sup>

## FINDINGS

### *What Works To Increase SBA?*

2.24 The evidence gathered from these different evaluations provides an opportunity to synthesize knowledge about increasing skilled birth attendance to highlight promising interventions and potential pitfalls in SBA.

2.25 There is evidence that interventions seeking to incentivize the behavior of providers or users of care are likely to yield positive impacts on SBA. These include demand financing programs (CCTs and vouchers) and interventions that reward the good performance of health workers. Two of the three AAA-quality impact evaluations that evaluated demand financing reported a significant impact on SBA.<sup>[46,16]</sup> With both JSY and *Comunidades Solidaria Rurales*, SBA increased by

approximately 17 percent relative to the mean. In the case of JSY, however, the authors attributed approximately 33 percent of the impact to substituting away from private care. Eligibility for JSY was fairly broad: in high-performing states women had to be below the poverty line and belong to a scheduled caste or tribe, but in low-performing states, all women were eligible. The effect was larger among the poor, the less educated, and those who belonged to scheduled castes or tribes.

2.26 In El Salvador, the *Comunidades Solidaria Rurales* program gave \$15 per month (\$20 for mothers with school-age children) to women conditional on prenatal care visits or on growth monitoring and vaccination of children. The program targeted the rural poor, a group in which less than 60 percent of births were attended by skilled personnel, which is well below the country average. Progresa gave women a similar amount of money (\$17), but the results were not significant, although this may be due to the relatively short evaluation period (18 months). All AA demand financing studies, including a pay-for-performance program in Rwanda, also reported significant increases.<sup>[53,55,51,39,7]</sup>

2.27 Although not as widely evaluated as demand-side financing, there is evidence that suggests that the widely used Safe Motherhood Program (SMP) produces consistently significant improvements in the proportion of deliveries attended by skilled health personnel (see box 2.1). The AAA study of SMP in China found a highly significant 6.3 percent increase in hospital deliveries, which is reinforced by an AA study of the same intervention that found that hospital deliveries increased by almost 150 percent relative to the baseline.<sup>[23,40]</sup> A second AA evaluation, this one of SMP in Indonesia, found a marginally significant, but still fairly large, 13 percent increase in SBA.<sup>[4]</sup>

2.28 Although these programs demonstrated successful results, supply-side constraints such as quality of care may limit the effectiveness of demand-side interventions, because people will be unable or unwilling to use health facilities (Lagarde, Haines, and Palmer 2007). The public monitoring program in Uganda caused health care utilization to increase dramatically, including SBA, which went up by almost 58 percent. The confidence interval on SBA is quite large, however, perhaps because of the small sample size (see Appendix J, figure J.1). The authors theorized that the substantial increase in utilization came from better quality of care.<sup>[12]</sup> This intervention suggests that an effective way to improve quality of care is to hold providers accountable by eliminating information gaps about aggregate health outcomes, aligning the expectations of users and providers, and establishing a clear monitoring mechanism. An AA evaluation of a CCT in Nepal also found higher impacts in areas with better quality of care.<sup>[55]</sup>

2.29 There is little evidence that community-based interventions to improve SBA are successful. The improvements to the Lady Health Workers Program in Pakistan<sup>[10]</sup> and the creation of participatory women's groups in India,<sup>[61]</sup> the only two AAA evaluations of community-based interventions, reported insignificant results. In the former, the government targeted rural communities where a majority of births still occurred at home without any skilled attendant. In the latter, the communities were located in areas of relatively high levels of maternal and neonatal mortality and had a high percentage of scheduled castes and tribes.

#### Box 2.1. Promoting Skilled Birth Attendance Through Health Education and Increased Access

Although a comparatively large number of impact evaluations address health education for mothers, few yield significant impacts. All the community-based interventions included educational meetings, and four other interventions included similar educational components, such as awareness campaigns or formal classes.<sup>[23,40,4,48]</sup> Among these four additional studies, the AAA evaluation of the SMP in China and the AA evaluation of the SMP in Indonesia are the only two that reported significant results; the other two AA studies were insignificant. When combined with the community-based findings above, the SMP study remains the only one of the three AAA studies that was significant, and only five of eleven health education interventions with AA evaluations were significant.

As with the community-based interventions, evaluations of these health education programs are concentrated within a single geographic area of Asia. Finally, few of the interventions were isolated health education programs, so it is not possible to determine whether it was health education in particular or rather some combination of the different components of these interventions that produced the null results.

Like quality of care, the evidence suggests that access to care is a potentially important supply-side constraint. The only AAA study to address increased access was that of the SMP in China, which established emergency medical centers.<sup>[23]</sup> It found a statistically significant increase in SBA, as did three AA studies.<sup>[40,4,26]</sup> The other two AA studies, however, produced null results.<sup>[49,50]</sup> These interventions undertook similar projects: they built new health facilities and increased the number of medical personnel.

2.30 Moreover, four of the seven interventions from AA evaluations on community-based approaches were also insignificant.<sup>[3,47,38,37,45]</sup> Yet because all community-based interventions occurred in South Asia, it is unknown whether they may produce different results in other regions.

2.31 There may be differential impacts across population groups, even if the intervention itself targeted disadvantaged communities. Four interventions from AAA IEs reported heterogeneous effects on individuals with different socio-economic status, location, and baseline level of SBA. The JSY program in India had a larger effect in the poorest locations and on the poorest women.<sup>[46]</sup> Although the full

sample estimates were not significant, Indonesia's pay-for-performance program had larger and marginally significant effects in areas with lower baseline values of SBA.<sup>[54]</sup>

2.32 In Zanzibar, the mobile phone intervention had no effect on rural residents but made urban residents almost five times more likely to deliver with a skilled attendant, as compared to the control group.<sup>[41]</sup> The evaluation of *Progresa* did not find a significantly different impact based on poverty status. However, it is important to note that the sample size for testing heterogeneous effects was much smaller than the original sample (N = 4,315 versus N = 446)<sup>[62]</sup> because the authors only included women with a poverty score below a certain level.

2.33 Moreover, interventions may produce unintended consequences, whether desirable or undesirable. Disregarding these effects may under- or overestimate the overall impact of the program. The JSY program negatively affected private health facilities by drawing to public facilities mothers who would have otherwise used private care.<sup>[46]</sup> Evidence from an AA impact evaluation in Nepal also suggests that women moved away from nongovernmental organization (NGO) facilities to public ones.<sup>[55]</sup> In neither case, however, did the substitution account for the full impact of the program.

2.34 For interventions to yield meaningful significant results, sufficient exposure time may be necessary to create awareness of the programs and change behavior. For instance, the Safe Motherhood Program in China had a greater effect on counties with longer exposure to the program.<sup>[23]</sup> An AA-quality study on a voucher program in Kenya found that participants in the group that had been exposed for two to four years were significantly more likely than the control group to use a skilled birth attendant, but there was no significant difference for those who had been exposed for less than a year.<sup>[53]</sup>

### *What Do We Still Need To Know?*

2.35 Despite the evidence from the reviewed studies, important knowledge gaps remain. Recognizing these gaps is crucial for understanding the limits of the existing evidence and for highlighting important areas for research.

2.36 There is little evidence on the cost of SBA interventions. Among all 28 studies, three attempted an informal estimation of the cost per facility delivery. JSY in India and the Safe Delivery Incentive Program in Nepal cost about \$357 and \$210, respectively, but these were lower-bound estimates, because program administration costs were not included.<sup>[46,55]</sup> The pay-for-performance intervention in Rwanda cost only \$4.59 per facility delivery.<sup>[7]</sup> Although providing incentives for workers through pay for performance appears to be a more cost-effective approach, the different contexts of the programs limit direct comparison between the

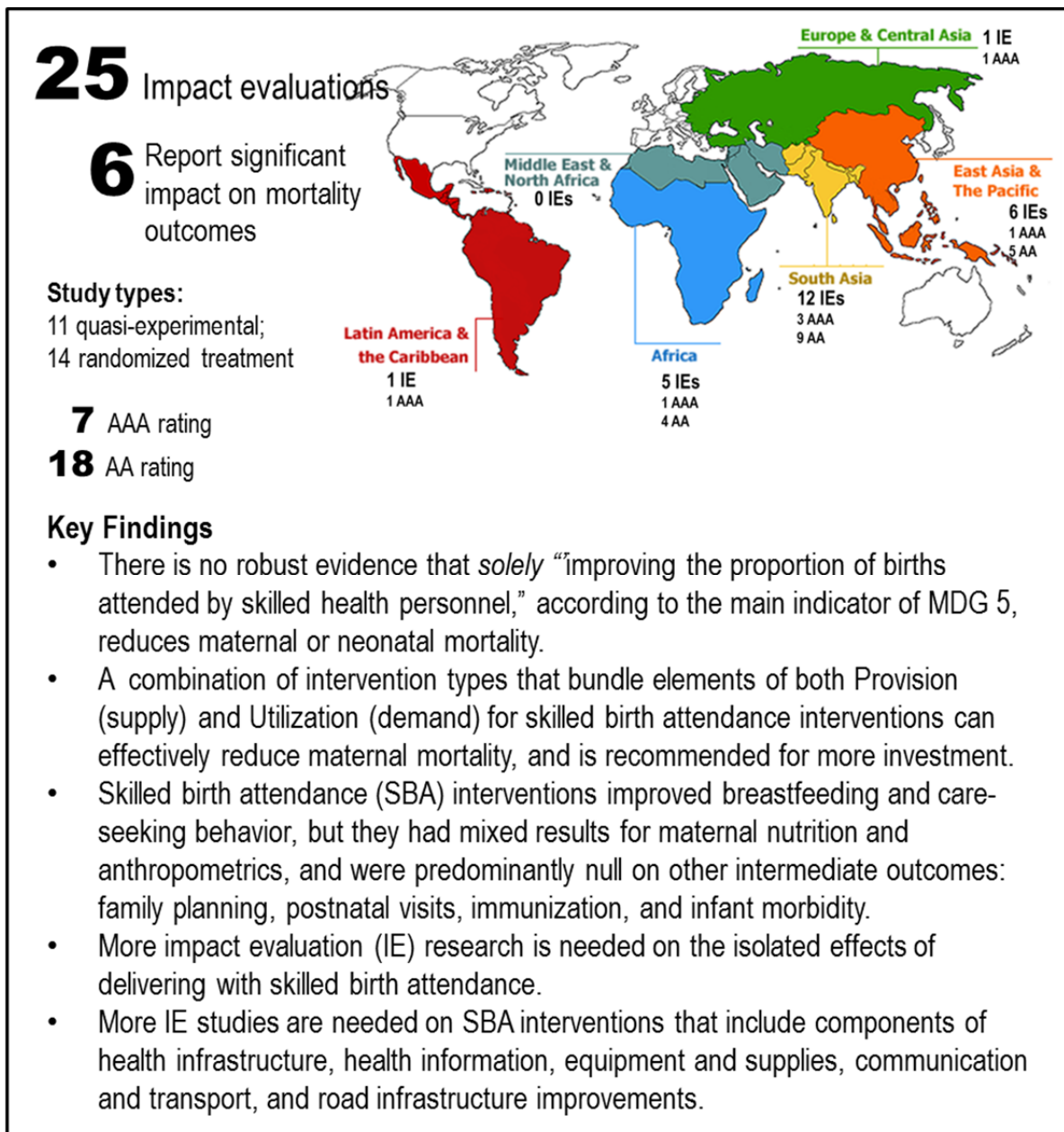
estimates. Additional cost estimates from AAA-quality impact evaluations are needed as well as estimates drawn from comparable contexts.

2.37 The geographical distribution of evidence is unequal, and when compared with the distribution of the problem's severity, major geographical gaps emerge. Sub-Saharan Africa is tied with South Asia for the lowest levels of skilled birth attendance, but Sub-Saharan Africa has only five evaluations to South Asia's twelve. Neither has more than three AAA studies. Furthermore, there are no impact evaluations from the Middle East and North Africa, the region with the third-highest burden. More AAA studies are needed across these regions to identify the best interventions to increase SBA.

2.38 Despite the growing literature on the role of health insurance on utilization of health care (Wagstaff and others 2009), no evidence was found on the impact of the insurance on SBA. Insurance can promote SBA by enabling access to quality health care. Impacts are likely to be significant where the insurance allows mothers to choose service from different providers. Additionally, evidence of the effect of health and nonhealth infrastructure, such as the construction of roads and health facilities, is very thin. Only one intervention, undertaken in Bolivia, estimated the impact of health facility construction.<sup>[49]</sup> This AA evaluation found no significant impact on SBA, even though infrastructure is believed to be crucial to improve the availability of primary and emergency care. Evidence on the effect of nonfinancial incentives on increasing skilled birth attendance was also missing and would be worth exploring given the limited resources of many of these countries.

## Skilled Birth Attendance as an Intervention

2.39 Where the previous section explored the ability of interventions to increase the proportion of births attended by skilled health personnel, this section examines the subsequent effects of births taking place in such a setting. Put another way, the previous section looks at the effect of SBA-enhancing interventions on outcomes up to and including birth being attended by skilled personnel, whereas this section looks at the effects following the birth event of such interventions, including maternal and neonatal mortality and intermediate morbidity and wellness outcomes.



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2.40 The “proportion of births attended by skilled health personnel” is one of the two indicators for MDG 5; the other is the maternal mortality rate, for which the attended births indicator is intended to proxy because MMR data are often unreliable. Because it is intended to proxy the maternal mortality rate, it is natural to examine the “downstream” (postbirth) effects of skilled birth attendance as an intervention.

2.41 Skilled birth attendance is often defined as encompassing a partnership of skilled attendants and an enabling environment of equipment, supplies, drugs, and transport for patient referral (see Graham, Bell, and Bullough 2001, for example).

2.42 According to WHO, most of the deaths and disabilities attributable to childbirth are avoidable with the application of well-known medical solutions. Immediate and effective professional care during and after labor and delivery is critical in reducing deaths for both women and their newborns. Both maternal and neonatal mortality are lower in countries where mothers giving birth get skilled professional care with the equipment, drugs, and other supplies needed for the effective and timely management of complications, based on evidence that includes historical records from developed countries (for example, Sweden, Denmark, Japan, the Netherlands) and case studies with a retrospective approach (Sri Lanka, Malaysia, Honduras) (WHO 2005a). The joint statement by WHO, UNFPA, UNICEF, and the World Bank also relied on the same historical records and stated that the key to reducing maternal mortality was the institution of fully professional maternity care (WHO 1999).

2.43 In contrast, Graham, Bell, and Bullough (2001) and MacDonagh (2005) caution that such historical data may have failed to control for confounding factors such as changes in other health care practices or the status of women in society. Moreover, as far back as 2001 and soon after the MDGs were established, AbouZahr and Wardlaw (2001) pointed out that unequivocal epidemiological evidence for the impact of skilled attendants at delivery on reducing maternal mortality is lacking and the evidence in favor of a causal link is still largely circumstantial. Being the primary indicator of MDG 5 suggests improvements in SBA alone are sufficient to reduce maternal mortality. The accuracy of that implication and the effects of SBA-related interventions that improve SBA rates in conjunction with improving other factors in maternal mortality logic models (for example, the “three-delay model”) need to be understood.

2.44 The conceptual model shown in Figure 1.2 helps to understand the highly complex pathways through which maternal and child mortality may be improved by different interventions. In the conceptual model, the activities that concern skilled attendants are labeled as **health workforce** interventions under the provision interventions by the **health sector**. Within the same sector, the activities and interventions that contribute to an enabling environment include **medical products**

**and technology** and **health information**, as well as **transportation** infrastructure under provision of interventions by other sectors.

2.45 Although not part of the most formal definitions of SBA, the sociocultural environment that surrounds women can also play a role in the provision and utilization of SBA services. Efforts to empower women are important. Improvement of their health is often impeded by the social and cultural environment and limited access to educational and economic opportunities. There are multiple interventions in the taxonomy to improve this: **knowledge and information** within utilization and provision within the **education** and **labor market** sectors. **Strategy planning and policy** of governance and other aspects of the political and policy context also play important roles in creating an enabling environment (see Figure 1.2).

#### DATA DESCRIPTION

2.46 The construct of a “skilled birth attendant” is not binary; it is a proportion along a continuum, with no meaningfully defined or generally accepted minimum. Consequently, this section includes all impact evaluations of interventions that aim to improve SBA generally, regardless of the absolute level of quality of the attendants or the enabling environment they actually attain.

2.47 The search exercise of this review produced 25 AAA and AA impact evaluations that assess SBA-related interventions of many of the intervention types described earlier. Training for health personnel (both licensed and community health workers and traditional birth attendants [TBAs]) and health education or awareness campaigns for women are the most commonly studied interventions.

2.48 There are seven AAA studies; four employed quasi-experimental designs<sup>[23, 46, 52, 56]</sup> and three were randomized treatment designs.<sup>[10, 12, 61]</sup> Broadly, large-scale programs were evaluated with quasi-experimental designs while RCTs were the most common for smaller, local interventions. The lengths of evaluated exposure of the seven studies range from two to eight years.

2.49 All seven AAA studies estimate program impacts on two to three mortality or intermediate outcomes. In aggregate, the seven studies have results for the four mortality outcomes covered in this report: maternal, neonatal, infant, and under-five. These studies also cover eight intermediate outcomes: fertility, child anthropometrics, immunization, infant morbidity, care-seeking behavior, breastfeeding, postnatal visit, and family planning. Detailed descriptions of these studies by intervention sector follow.

#### GOVERNANCE

2.50 The impact of community-based **monitoring and evaluation** of public dispensaries implemented in nine districts in Uganda was assessed in an AAA



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evaluation that explored the project's impacts on under-five mortality as well as fertility, anthropometrics, immunization, and family planning.<sup>[12]</sup> Each public dispensary was given a report card based on a baseline survey of users and a review of the dispensary's records. The report card was disseminated through community and staff meetings facilitated by local NGOs. Community representatives and medical staff created a shared action plan with monitoring provisions that were left to community members to enforce.

2.51 One AA impact evaluation in governance covers a **public-private partnership** intervention in Cambodia.<sup>[13]</sup>

### PROVISION: HEALTH SECTOR

2.52 Brazil's Family Health Program is a **service delivery** intervention that sends professional health care teams to communities to provide services such as counseling as well as preventive and recovery care that focuses on family health. Impacts on infant and under-five mortality as well as fertility were assessed in an AAA evaluation.<sup>[56]</sup>

2.53 Six AA impact evaluations focus on health sector projects. They cover a wider array of intervention types, including **delivery modality, health workforce, service management, service package, and medical products and technologies.**<sup>[14, 20, 26, 29, 44, 50]</sup>

### PROVISION: NONHEALTH SECTORS

2.54 The review found no impact evaluations of SBA projects identified as strictly pertaining to provision of services from other nonhealth sectors.

### UTILIZATION

2.55 The neonatal mortality, fertility, and breastfeeding impacts of the world's largest CCT program, JSY in India, were evaluated in an AAA study with nearly 430,000 observations.<sup>[46]</sup> The program is implemented at the district level to provide a cash incentive to women who give birth in a public health facility or with an accredited private health provider. The program is classified as an **ability-to-pay and income increasing** intervention to increase utilization. It is available to all women in low-performing states with low in-facility birth coverage and to poor women, women in a scheduled caste or tribe, and women with less than two children in high-performing states. The size of the transfer ranges from \$13 for urban mothers with fewer than two children to \$31 for poor rural women. It also pays health workers for delivery attendance. This is the only AAA evaluation that isolates the effect of increasing the number of births attended by skilled health personnel, keeping the quality of SBAs and the SBA environment at the status quo, as implied by the SBA indicator of MDG 5. The results of the study are valid for married women between the ages of 15 and 49 in districts where JSY has been implemented.

2.56 A **knowledge and information** intervention that promotes community mobilization through participatory women's groups implemented in three districts in India was evaluated for impacts on maternal mortality and neonatal mortality as well as infant morbidity, case-seeking behavior, and breastfeeding.<sup>[61]</sup> Information about clean delivery practices and care-seeking behavior was shared. Group members identified and prioritized maternal and newborn health problems in the community, collectively selected relevant strategies to address problems, implemented strategies and assessed results. The results are valid for women between the ages of 15 and 49 years who resided in the project area (Jharkhand and Orissa) and who had given birth during the study.

2.57 Four AA impact evaluations of utilization projects and programs cover **income increasing, household health spending, and ability to pay** interventions. <sup>[18, 39, 51, 53]</sup>

#### BUNDLED INTERVENTIONS

2.58 Three AAA impact evaluations in China, Pakistan, and Ukraine measure the effects of skilled birth projects that bundle components across provision and utilization intervention categories.

2.59 China's Program to Reduce Maternal Mortality and Eliminate Neonatal Tetanus was implemented at the county level and evaluated on maternal and neonatal mortality outcomes. <sup>[23]</sup> The program aims to reduce maternal mortality through enhancing qualified hospital delivery with three bundled interventions: two types of **knowledge and information** in health education and social mobilization, and **health infrastructure** enhancement. The results of the study are valid for the counties in China that implemented the program. The three criteria for selection were (1) being national poverty counties; (2) having baseline maternal mortality rates and neonatal tetanus incidence rates above the county's provincial average; and (3) having a budget provided by the provincial government capable of matching the central government's contribution at least one to one.

2.60 The Lady Health Workers Program in Pakistan is a **health workforce** and **knowledge and information** intervention package implemented at the village level.<sup>[10]</sup> Female health workers were trained in neonatal mortality, breastfeeding, and postnatal visits. They then promoted antenatal care and maternal health education, use of clean delivery kits, facility births, immediate newborn care, identification of danger signs, and care-seeking behavior. The results of the study are valid for married women in rural southern Pakistan with access to health workers and health facilities.

2.61 The Mother and Infant Health Project in Ukraine was implemented at the county level and bundles components from two intervention types: **health**

**workforce** through the provision of training on effective perinatal technologies for the project's maternities staff and **knowledge and information** through a health awareness campaign. The impact evaluation examined maternal and infant mortality as well as infant morbidity and family planning.<sup>[52]</sup>

2.62 There are seven AA impact evaluations of skilled birth projects with bundled components. [3, 4, 35, 37, 38, 45, 47]

2.63 Despite only seven AAA studies, all of the mortality outcomes assessed by this review are covered. Somewhat surprisingly, given that SBA falls within MDG 5 on maternal mortality, the most frequently assessed outcome of these SBA-related interventions is neonatal mortality rather than maternal mortality.

2.64 Among the AAA studies, regional representation is fairly even. There is one impact evaluation in East Europe (Ukraine), one in Latin America (Brazil), one in East Asia (China), three in South Asia (India and Pakistan), and one in Sub-Saharan Africa (Uganda). Taking together all 25 studies, the regional distribution skews dramatically to South Asia. There is one study in East Europe; one in Latin America; four in East Asia; twelve in South Asia; two in South East Asia; and five in Sub-Saharan Africa.

2.65 As a whole, the seven AAA studies touch on all of the World Bank's seven successful approaches<sup>2</sup> to improving maternal health outcomes but one. The seven approaches include strengthening outreach services and community-based approaches; improving education for girls and women; targeting public sector subsidies to poor families and disadvantaged areas; improving quality and availability of essential and emergency obstetric care services for the poor; promoting affordable maternal health services and scaling up adolescent sexual and reproductive health information and services; strengthening monitoring and evaluation; and developing effective poor-friendly referral systems. When the AA impact evaluations are included, all seven successful approaches are covered, including developing effective poor-friendly referral systems.

## FINDINGS

### *What Do We Know About the Effects of Skilled Birth Attendance?*

2.66 It is important to distinguish interventions that solely increase the proportion of births attended in a skilled birth environment from those that also include complementary interventions. The concept that skilled attendance at birth is the "single most critical intervention for ensuring safe motherhood" is based largely on historical records.<sup>3</sup> However, these historical data may have failed to control for confounding factors. Therefore, in this review IEG collects all robust impact evaluations that can answer this claim. IEG examines the results of evaluations that

can isolate the effect of increasing attendance at birth and explores the results of evaluations of interventions that combine increasing births attended with other intervention components.

*What Do We Know About the Effects of Only “Increasing the Proportion of Births Attended”?*

2.67 Despite an extensive search, this review identified only one AAA impact evaluation, the India JSY study, that can isolate the effect of increasing the proportion of births attended in a skilled birth environment (skilled health personnel with appropriate equipment and referral ability).<sup>4</sup> This illustrates that little impact evaluation evidence exists on whether SBA itself is effective or not, and thus there is little evidence on the effectiveness of the MDG injunction to increase the number of births attended by skilled health personnel.

2.68 In spite of the fact that only one AAA study can answer this question, that study covers a very important intervention: the world’s largest CCT program, operating in the world’s second most populous country. The India JSY study finds that the cash incentives do increase facility deliveries—and increase fertility—but they have no discernible effects on neonatal mortality. This null result is unlikely to be the result of the study being underpowered; there were more than 429,000 observations in the neonatal mortality specifications.

2.69 As indicated in the previous section, the authors of the AAA JSY study note that the statistically significant impact of the program on increasing skilled birth attendance as an outcome is driven by increased use of maternity services at health facilities below the district hospital, and one-third of that increase is due to a substitution from private to public providers. These lower-level facilities provide only basic health services and are less able to manage emergency complications at childbirth (however good the quality of care); the authors conjecture that this may be affecting the null result for neonatal mortality.

2.70 The quality of care in India was highly variable at the time of the initiation of the JSY program in 2005 (see, for example, Das and Gertler (2007) and Das and Hammer (2007), and this may have affected health outcomes. Notwithstanding this potential explanation, the India JSY study found that the null result persisted regardless of local quality of health care. The authors find that a one standard deviation increase in the quality-of-care index at primary health centers has no statistically significant effect on reducing neonatal mortality. The authors conclude that as of 2008, the end line in the instrumental variable-difference in differences estimation strategy, no evidence suggests that the JSY led to reductions in neonatal (within 28 days) or early neonatal mortality (within 24 hours), even in districts with better quality of care. The authors do not provide an estimate of the effect on maternal mortality citing a “lack of suitable data.”

2.71 This result is corroborated by an AA study on JSY.<sup>[39]</sup> Although the program significantly increased the proportion of births in a health facility and having a skilled attendant present at the time of delivery, the study reported null results for neonatal and perinatal mortality at the district level.<sup>5</sup> In addition, the study also reported a null result in maternal mortality, although the authors wonder if that result is underpowered. The sample size was as large as 182,869 households; however, the authors infer that perinatal, neonatal, and maternal deaths occurred at rates too small to be detected. Another AA paper on a voucher program in neighboring Bangladesh indicates that vouchers can improve take-up of delivering with SBA, which then affects the likelihood of postnatal care visits, but it gives no evidence on mortality or other postbirth outcomes.<sup>[51]</sup>

2.72 Taken as a whole, there is no evidence that increasing the proportion of births attended by skilled health personnel, as prescribed implicitly by the operational indicator of MDG 5, reduces maternal or neonatal mortality. The thin but consistent and internally robust evidence that does exist suggests that interventions that only increase the proportion of births attended may not have any impact on maternal or neonatal mortality. Thus, although increasing the share of attended births may be a necessary condition to improving these outcomes, it does not appear to be a sufficient condition. This does not necessarily suggest that SBA is not important, but at a minimum it does suggest that the “proportion of births attended by skilled health personnel” seems to be an unfounded, if not poor, proxy for maternal mortality in MDG 5.

### *What Do We Know About the Effects of Skilled Birth Attendance Bundled With Complementary Interventions?*

2.73 Although there is no evidence that interventions that solely improve the proportion of births attended by skilled health personnel reduce mortality, those that combine components to improve the proportion of births attended with complementary interventions to improve quality of care or patient knowledge can improve neonatal and maternal survival.

2.74 Most SBA-related impact evaluations evaluate the effect of improving SBA quality, rather than looking at the effect of giving birth in an SBA environment. Although the individual causal effect of these multiple components cannot be isolated, impact evaluations can indicate the effect of the overall intervention.

### *Impact on Maternal Mortality*

2.75 Three studies estimated the maternal mortality impact of a combination of interventions: Ukraine, health workforce and knowledge and information; China, health workforce, knowledge and information, and ability to pay/household health

spending; and India, delivery modality and knowledge and information) on maternal mortality.

2.76 The Ukraine and China evaluations reported significant reductions in maternal mortality. Both employed interventions addressing the provider (supply) and user (demand) sides. In Ukraine, being part of the program decreased maternal mortality by 63.22 deaths per 100,000 live births. Since basic medical care has been universally available, implementation of the project allows quality to be addressed rather than the quantity of medical care, which may have led to the reduction of maternal mortality.

2.77 China's Safe Motherhood Program is a comprehensive package of interventions that sought to improve hospital deliveries through health education, health infrastructure enhancement, social mobilization, and a household's ability to pay for health services through a subsidy. Still, the mortality gains were much smaller than in Ukraine: Seven years of exposure to the China program led to reductions in all-cause maternal mortality of 1.84 deaths per 100,000 live births and a reduction of 10.23 maternal deaths due to hemorrhage per 100,000 live births. In rural areas, significant geographical inequalities persist, but the comprehensive program may have helped physical and financial accessibility.

2.78 The India community study reported negative estimates for maternal mortality but was not sufficiently powered to detect significant differences. The program was predominantly user (demand) side intervention. According to the authors, qualitative evidence from the assessment of the trial's process showed that community mobilization through women's groups might have contributed to avoidance of some maternal deaths.

### *Impact on Child Mortality*

2.79 Three impact evaluations – China, India community, and Pakistan – estimated the impact of a combination of interventions on neonatal mortality. The India community and Pakistan interventions improved local capacity of health providers within the target populations or remote regions with high gender inequality by training local women or traditional birth attendants. These studies further divided the neonatal period into three categories: perinatal, stillbirth, and 0-6 days; early neonatal, 0-6 days; and late neonatal, 7-28 days, with slight variations, and estimated the impact. Both the India and Pakistan interventions reported significant mortality reductions in the perinatal and early neonatal periods – a 32 percent reduction in neonatal mortality for India and a 15 percent lower risk of dying for newborns in Pakistan. But neither had a significant impact for late neonatal mortality. With limited evidence, there is no clear effect of these interventions beyond the first seven days of life.

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2.80 In contrast, China’s comprehensive program showed significant impacts on neonatal mortality after two years of exposure and marginally significant results after four years, but no results after three, five, six, and seven years. Though reductions in maternal mortality were stable and consistent in the China intervention, its neonatal mortality effects were marginal and unstable.

2.81 Ten AA studies estimate the impact on neonatal mortality. [3, 14, 20, 29, 35, 37, 39, 44, 45, 47] All of them show negative impact, but only four are significant. [29, 35, 37, 45]

2.82 Infant mortality impacts were explored in the Ukraine and Brazil studies of bundled intervention types, but only the Brazil study showed significant reductions. Two AA studies also estimated the impact of SBA-related interventions on infant mortality, although neither found significant effects. [4, 13]

2.83 Under-five mortality effects were estimated in two AAA-rated impact evaluations – Brazil and Uganda – both of which found significant impacts. Brazil, with more focus on the provider-side interventions, had a highly centralized health care system that was not reaching the poor, but the program’s family and community-based health interventions effectively improved health in economically disadvantaged areas. In Uganda, where traditional top-down supervision is ineffective, community monitoring can play an important role in improving service delivery. The Uganda intervention focused on user-side components and showed significant and large effects of a reduction of 49.9 deaths per 1,000 live births. Two AA studies also estimated the impact on under-five mortality, although neither was significant. [4, 18]

2.84 Three impact evaluations (Ukraine, China, and India community) assessed both maternal mortality and either neonatal or infant mortality. In all three, either maternal mortality was significant or the child mortality outcome was significant, but not both, in spite of these outcomes being closely linked in the continuum of care. Although this phenomenon certainly merits further IE research, these early results suggest that SBA-related interventions may not be robust across the continuum of care.

### *Impact on Intermediate Outcomes*

2.85 If interventions with skilled birth attendance as a component have an effect on mortality, naturally they should also have effects on intermediate outcomes. The review finds that although evidence is consistent in finding a desirable effect on breastfeeding, it is thin, mixed, or unsupportive of an effect on immunization, anthropometrics, fertility, and infant morbidity outcomes.

2.86 Family planning and fertility are the most frequently studied intermediate outcome. The Ukraine study found significant impacts on family planning including on abortions and the use of contraceptive pills. The Uganda study also estimated

impacts of SBA with complementary interventions on family planning and found no significant results.

2.87 Fertility was estimated and found statistically significant in three AAA studies: Brazil, Uganda, and India JSY. However, although Brazil and Uganda found significant reductions in fertility from interventions that bundled SBA with complementary interventions, the India JSY study of SBA alone found significant increases in fertility.

2.88 Somewhat surprisingly, the review found no AAA studies that assessed the impact of SBA on maternal nutrition, although three AA studies found a significant and positive impact.<sup>[3, 20, 26]</sup>

2.89 Anthropometric impacts are found in the Uganda study, which reported a significant difference in means of weight-for-age z-scores of infants between the treatment and the control group of 0.14 standard deviations.

2.90 Infant morbidity impacts were estimated by both the India community and Ukraine studies. The Ukraine study found no significant treatment effect for total infant morbidity; the only component being affected is morbidity deviations (such as heart or lung abnormalities) in the perinatal period.<sup>6</sup> The India study found a significant and negative impact on cough, fever, and diarrhea.

2.91 The India study also estimated the impact on care-seeking behavior in the event of infant illness and found no significant differences between control and intervention clusters. The Pakistan study estimated the impact on the likelihood of mothers receiving postpartum visits by female health workers within three days of delivery and found a significant and positive impact. The Uganda study estimated impacts on immunization and reported average standardized effects, which are significantly positive for the younger cohorts (newborn, under 1 year of age, and 1-year-old).

2.92 The Pakistan study estimated the impact on mothers initiating breastfeeding within 30 minutes and on mothers secreting colostrum; both were significant and positive. The India community study estimated the impact on exclusive breastfeeding for the first six weeks and likewise found a significant and positive impact. The India JSY study estimated the impact on breastfeeding within one hour and found a significant and positive impact.

### *What Do We Still Need To Know?*

2.93 Most important, more high-quality research is needed on the effects of delivering with skilled birth attendance the key indicator for MDG 5. Although it is widely believed that professional skilled care at birth can greatly reduce maternal



and neonatal mortality, Graham and others (2001) and AbuZahr and Wardlaw (2001) pointed out more than a decade ago that there was no high-quality evidence to show that women delivering with skilled attendance have a lower risk of dying of maternal causes than women delivering without it. The extensive search conducted by this systematic review found only two studies produced since that time that address this important question (both found null results).

2.94 There are no high-quality studies on SBA interventions that include components of health infrastructure, health information, equipment and supplies, communication, and transport. Similarly, no high-quality studies on SBA interventions involve nonhealth sectors, including road infrastructure improvements, even though travel to clinics is identified as the second “delay” in the three-delay model of skilled birth assistance.

2.95 Most SBA interventions also affected one or multiple intermediate outcomes, such as fertility, anthropometrics, immunization, infant morbidity, care-seeking behavior, breastfeeding, postnatal visit, and family planning, which in theory can affect the ultimate outcomes of mortality. Although family planning and fertility are the most frequently assessed outcomes, maternal nutrition and maternal morbidity – especially important intermediate outcomes as shown in the logic model – are less frequently assessed (see Appendix E).

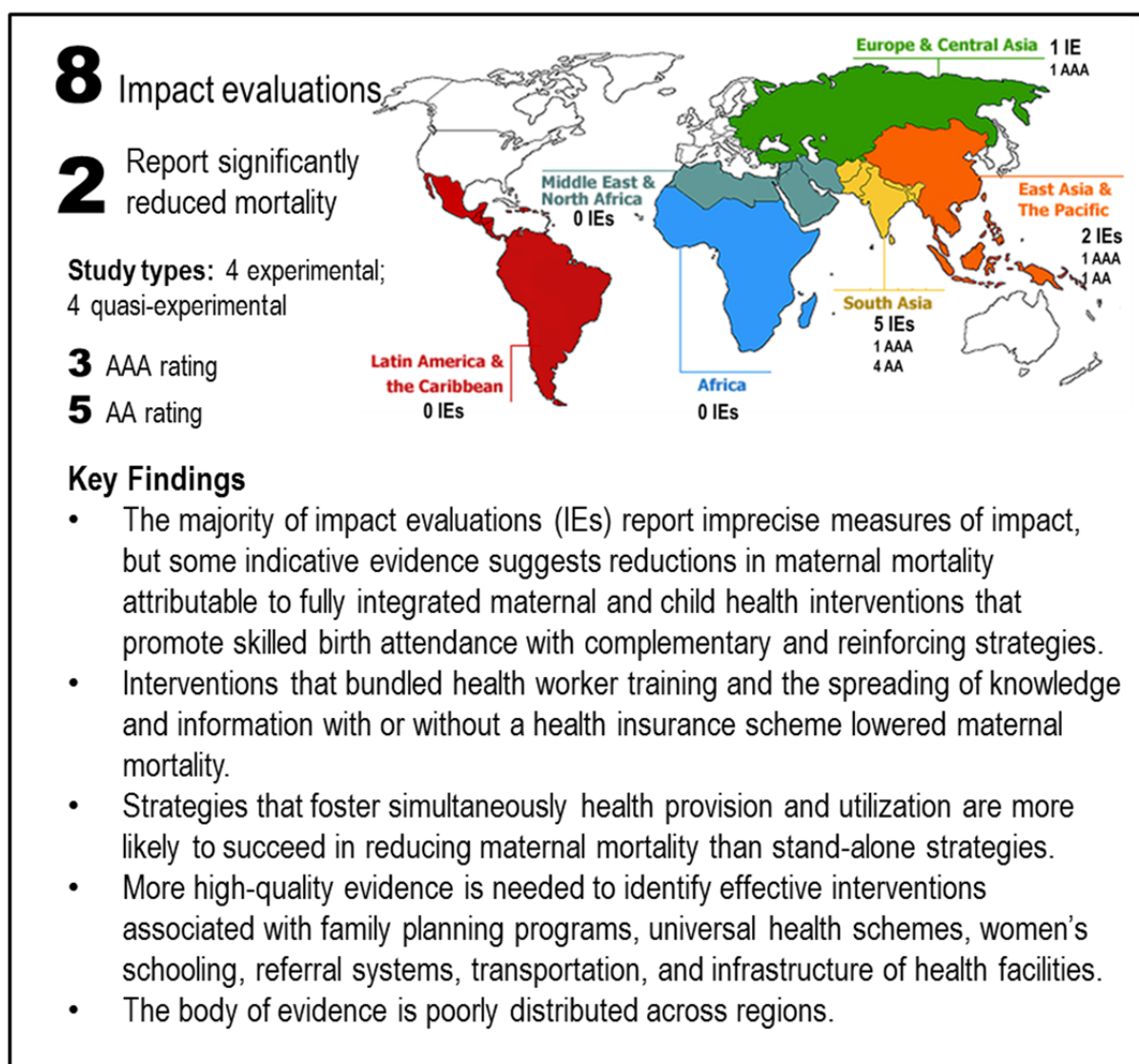
2.96 Eight studies<sup>[12, 23, 45, 47, 50, 52, 56, 61]</sup> of 25, including five<sup>[12, 23, 52, 56, 61]</sup> of the seven AAA impact evaluations, conducted a cost analysis. However, most of them reported costs or cost benefit results from a diverse set of methodologies and units of analysis that are not directly comparable. Among the seven AAA studies, five conducted a cost analysis, of which two are cost benefit, one is cost utility, one is a simple calculation of the total cost of the program per county per year, and the last is the intervention cost per household in the catchment areas. The China study shows the total cost of the program per county per year. The Brazil study shows the average costs per municipality. The study on the community participation program in India calculated financial and economic costs of setting up the intervention and running costs during the trial in relation to a do-nothing alternative. The Ukraine study calculated the cost for tangible and intangible benefits. The Uganda study estimates the intervention cost per household. None of them provides point estimates, a range of return on investment, or valuation of a statistical life.

2.97 There were three AA studies with more useful cost analyses if the identification strategy of the impacts had stronger internal validity; although none of them provides point estimates or a range of return on investment.<sup>[45, 47, 50]</sup> As a result of this heterogeneity of quality and approach, no comparisons of cost efficiency can be made, and the gap in understanding the cost effectiveness of these programs remains.

## Maternal Mortality

2.98 Although maternal mortality is a rare event in developed countries, it is a recurrent event in vast regions of the world. WHO estimates that 278,000 maternal deaths occurred worldwide in 2010. That is, each day almost 800 women die as result of complications related to pregnancy and childbirth. Yet the distribution of maternal deaths is not uniform across countries. Nearly all these deaths take place in developing countries. Sub-Saharan Africa and South Asia account for 56 and 29 percent of them, respectively. The maternal mortality ratio for Sub-Saharan Africa was estimated to be 500 per 100,000 live births, which is more than twice that of South Asia, six times as high as in Latin America, and 36 times higher than in high-income countries (WHO and others 2012).

2.99 Most maternal deaths are linked to obstetric causes in which hemorrhage,



hypertensive disorders, infections, obstructed labor, and unsafe abortions are the leading causes of maternal deaths (Khan and others 2006). A third of maternal deaths are also linked to medical conditions such as HIV/AIDS, malaria, poor nutrition, and heart conditions (Hussein and others 2012). In addition, underlying factors such as poverty, education, cultural and economic barriers, and institutional arrangements also affect maternal mortality (see figure in Appendix D).

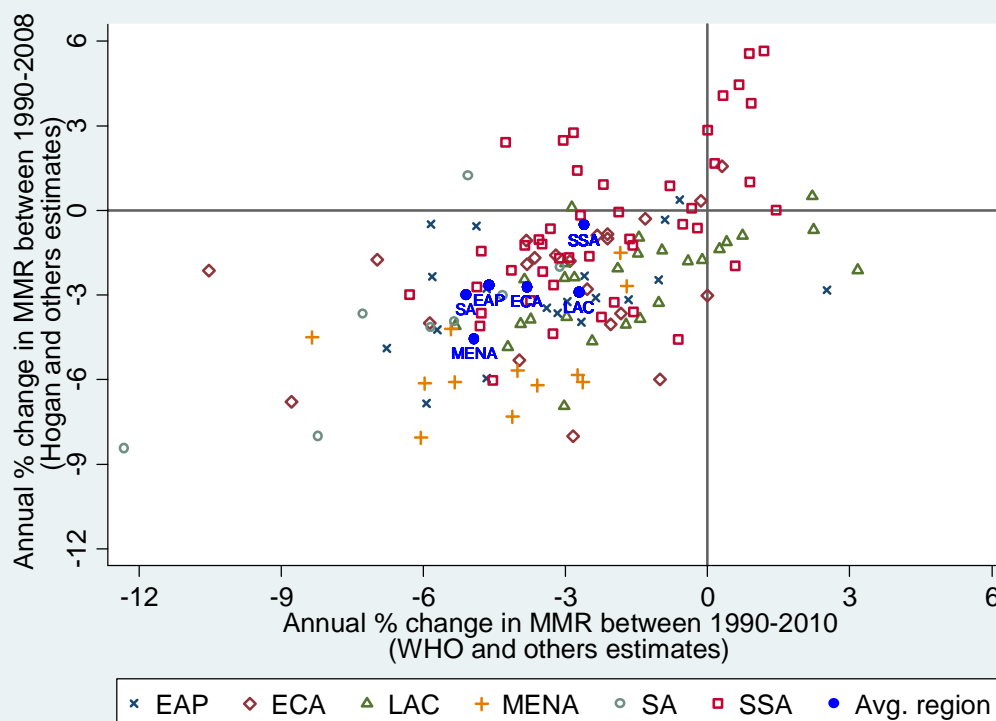
Consequently, no single intervention alone is thought to reduce the rate of maternal mortality (Campbell and Graham 2006; World Bank 2009, 2010). Packages promoted, along the continuum of care, by the WHO include family planning, safe abortion care, antenatal care, skilled birth attendance, and postpartum care (WHO 2010). Yet successful implementation of them requires functional and funded health systems, long-term and sustained commitments, monitoring and evaluation initiatives, and the existence of synergies with cross-sectoral policies (World Bank 2009).

2.100 Until very recently, there was a general perception that little progress had been made in reducing maternal mortality (UN 2009). The 2005 estimates reported by WHO, UNICEF, UNFPA, and the World Bank depicted a quite compelling figure of stagnation. According to these estimates, between 1990 and 2005 the worldwide maternal mortality ratio only decreased 0.37 percent annually (Hill and others 2007).

2.101 Yet two new empirical studies assert larger reductions of maternal mortality in the last 20 years, despite methodological differences between them. These new estimates indicate that between 1990 and 2010, the worldwide mortality rate decreased annually by 3.3 percent. Regional decomposition reveals a reduction by 5 percent in South Asia, East Asia and Pacific, and the Middle East and North Africa; by 3.8 percent in Europe and Central Asia; and by 2.6 percent in Latin America and the Caribbean and Sub-Saharan Africa. At the country level, however, the two studies indicate that there is a large dispersion in the reduction of maternal mortality across countries within regions (see figure 2.1).

2.102 Although these estimates are encouraging, they are still not large enough to achieve the fifth MDG. Better and more accurate assessments of the progress in maternal mortality call for substantive improvement in the quality of data upon which the estimates of maternal mortality are based, especially in regions where maternal mortality is highly prevalent.

Figure 2.1. Large Dispersion in the Reduction of Maternal Mortality Across Countries



Sources: Hogan and others 2010; WHO and others 2012.

Note: ECA = Europe and Central Asia; EAP = East Asia and the Pacific; LAC = Latin America and the Caribbean; MENA = Middle East and North Africa; SA = South Asia; SSA = Sub-Saharan Africa.

## DATA DESCRIPTION

2.103 Despite its high prevalence in vast regions of the world, very few studies evaluate the impact of development interventions—even MCH interventions—on maternal mortality. The search yielded only eight impact evaluations, three of which are AAA and five AA. The regional representation of the body of evidence does not reflect the distribution of the severity of the problem across regions. Among the reviewed evaluations, five are from South Asia (India, Bangladesh, and Pakistan); two are from East Asia and the Pacific (China); and one from Europe and Central Asia (Ukraine). Evaluations from Sub-Saharan Africa, Latin America and the Caribbean, and the Middle East and North Africa Regions are absent.

2.104 The evaluated studies are clustered around six types of interventions, as seen in table E.1 in Appendix E, with several interventions types utilized in a single study. Spreading knowledge and information emerges as the most common intervention component, with five studies reporting its inclusion. Health workforce training as well as delivery modalities are also core intervention components in four

## CHAPTER 2 MOTHERS

studies. Service packages and health insurance schemes appear as components in two studies. A conditional cash transfer scheme is considered in one study.

### PROVISION: HEALTH SECTOR

2.105 Only one AA study falls exclusively in the health sector, and it focuses primarily on training of traditional birth attendants. The evaluation followed an experimental design and was carried out in rural Pakistan. The TBAs were provided with clean delivery kits, and were asked to visit each woman at least three times during the pregnancy (at three, six, and nine months) to check for danger signs such as bleeding or eclampsia and to encourage women with such signs to seek emergency obstetrical care.<sup>[35]</sup> Although the study reports significant effects in reducing perinatal mortality, it does not report a significant effect on maternal mortality.

### UTILIZATION

2.106 Two AA quasi-experimental evaluations evaluate the effects of programs that ease the ability to pay for health care services in China and India, respectively. The study from China evaluates the impact of a demand-driven health insurance scheme, the New Cooperative Medical System. This program was implemented at the county level with local governments deciding premiums and benefits. No significant effects in reducing maternal mortality are reported.<sup>[18]</sup> The study from India evaluates the JSY conditional cash transfer program, in which the transfer depended on giving birth in a public health facility or being attended by a skilled health worker. The evaluations of the cash transfer scheme reported no reductions in maternal mortality.<sup>[39]</sup> Yet this late result does not reflect the introduction of supply-side complementary interventions, which were implemented under the National Rural Health Mission.

### BUNDLED INTERVENTIONS

2.107 Bundling health provision and utilization components is common across the reviewed studies. Five unique bundles of interventions are included in the sample of studies, as seen in table 2.2; three of the six were AAA and two reported significant reductions in maternal mortality, while the other three were AA and reported insignificant effects. The first AAA study evaluates China's Safe Motherhood Program. This program targeted rural areas and aimed to foster qualified hospital delivery by combining **health workforce training, knowledge and information diffusion**, and the introduction of an **insurance scheme**. The impact evaluation reported significant effects in reducing maternal mortality.<sup>[23]</sup> The second AAA study evaluates the impact of Ukraine's Mother and Infant Health Program, which combines **health workforce training** on effective perinatal technologies and the

promotion of evidence-based **knowledge and information**. The impact evaluation of this program reported a marginally significant reduction in maternal mortality when the evaluation accounted for the training provided by the program to the medical personnel.<sup>[52]</sup>

2.108 Among AAA evaluations of bundled interventions, one RCT studied an India intervention aimed to improve maternal health by bundling **delivery modality** and **knowledge and information** components. A community-based strategy with participatory women groups was used to increase knowledge and information. The impact evaluation reported no significant effects in reducing maternal mortality.<sup>[61]</sup> Two AA experimental studies from Bangladesh and India also use community-based strategies.<sup>[3,38]</sup> Those interventions bundle **delivery modality** and **knowledge and information**; the Bangladesh also includes **training of health workforce** (here TBAs) while the India intervention adds on a **service package** (home visits, active pregnancy and delivery notification system, and birth preparedness). Both evaluations reported insignificant effects in reducing maternal mortality.

## FINDINGS

### *What Do We Know About Reducing Maternal Mortality?*

2.109 MCH interventions that promote skilled birth attendance through interventions that simultaneously affect supply and demand tend to yield better results. Although the majority of studies report statistically insignificant effects (see details of the size effect of the interventions in figure J.2 in Appendix J), two impact evaluations of AAA suggest significant reductions in maternal mortality attributable to integrated MCH interventions that promote SBA through complementary and reinforcing strategies. More specifically, these successful interventions aimed to promote SBA by bundling the training of health workers with increasing knowledge and information, as in Ukraine's Mother and Infant Health Project<sup>[52]</sup> and China's Safe Motherhood Program, by additionally bundling an insurance scheme.<sup>[23]</sup>

2.110 Both successful interventions were implemented at the county level and aimed to improve the quality of birth delivery services (that is, increasing birth deliveries attended by trained personnel using upgraded technologies and evidence-based procedures). China's SMP was implemented by local governments and targeted poor counties with maternal mortality rates above the national average, but with the capacity to carry out the program and match the central government contribution. The program also switched from the traditional supply side reimbursement scheme to one where pregnant women get direct reimbursements. In addition, qualified obstetric personnel from provincial tertiary hospitals were

assigned for two weeks each year to primary maternal centers to help build local capacity.

2.111 The seven-year treatment program in China increased the hospital delivery rate by 3.9 per 100 live births and although it decreased all-cause maternal mortality by a modest 1.8 deaths per 100,000 live births, reductions in the maternal mortality ratio from hemorrhage were an order of magnitude larger at 10.2 deaths averted per 100,000 live births (a 12 percent reduction relative to a baseline measure).

2.112 In contrast, the Mother and Infant Health Project in Ukraine was implemented by the JSI Research and Training Institute with funding from the U.S. Agency for International Development and support from the Ministry of health of Ukraine. It targeted urban maternity hospitals through the provision of training on effective perinatal technologies, the development of centers of excellence to train medical personnel, and awareness campaigns to promote evidence-based good practices. The project also aimed to improve cooperation with local government institutions and medical universities to ensure the long-term sustainability of the project through the revision of national medical protocols and educational curricula of medical students and health care providers. Once spillovers and training of the medical personnel is accounted for in the impact evaluation specification, reduction in maternal mortality moves from not significant to barely significant at the 10 percent level.

2.113 Evidence suggests that interventions that bundle the training of TBAs with either a service package (home visits, active pregnancy and delivery notification system, and birth preparedness) or community-based strategies with participatory women groups may not be enough to reduce maternal mortality.<sup>[35,3]</sup> Stand-alone strategies affecting only the provision or utilization of services have not demonstrated a statistically significant impact on reducing maternal mortality.<sup>[39,18,35]</sup> Likewise, neither of the two additional studies of community-based strategies bundled with components of delivery modalities or knowledge and information yielded significant results.<sup>[38,61]</sup> Impact evaluations that reported nonsignificant effects on SBA outcomes were also unlikely to report significant impacts on maternal mortality.

2.114 In all these studies, maternal mortality is a secondary outcome. This finding is consistent with the common practice of interventions that aim at improving maternal mortality by affecting intermediate outcomes. In addition, the very nature of maternal death as a low incidence event, measured per 100,000 live births, imposes real difficulties for researchers trying to detect significant differences in maternal mortality, requiring the collection of large samples of data, especially in

countries where civil registration data is of poor quality. Out of a sample of 181 countries, only 16 percent have a civil registration data characterized as complete, with good attribution of cause of death (WHO and others 2012). This constraint thus not only imposes limitations for researchers but also demand from readers certain awareness when analyzing impact evaluation results. Unsurprisingly, of the 33 impact evaluations reporting impacts on SBA, only five of them also reported impacts on maternal mortality.

2.115 Overall, studies tend to be underpowered to detect changes in maternal mortality, let alone to report heterogeneous effects across population groups. All four cluster-randomized control trial studies produced imprecise estimates of the impact on maternal mortality. All of them acknowledged that they lacked statistical power to detect changes on maternal mortality. Although six of eight studies were unable to detect significant effects on maternal mortality possibly because of a lack of statistical power, three of them report significant improvements in maternal health outcomes such as puerperal sepsis and hemorrhage,<sup>[35]</sup> moderate depression,<sup>[61]</sup> and knowledge of danger signs, care practices, self-reported complications, and timely care seeking.<sup>[38]</sup> These are some of the risk factors for maternal mortality identified by the medical literature. It is reasonable to believe that reducing these risk factors may reduce maternal mortality, even if changes in the latter are not detectable.

2.116 None of the studies report heterogeneous effects, and only one study provides a cost-benefit measure of averting a maternal death, although limited. Also, the length of exposure to treatment across studies ranges from 0.75 to 7 years, with experimental studies having on average the shortest exposure to treatment (2 years) compared to quasi-experimental studies (4 years). In addition, the length of the exposure to treatment seems to be correlated with the significance.<sup>7</sup> Sustained interventions tend to yield effects on maternal mortality. The Safe Motherhood Program from China, for instance, reported significant effects on maternal mortality only after four years of intervention,<sup>[23]</sup> although they diminished in the last year.



Table 2.2. Impact on Maternal Mortality by Interventions

		AAA Studies			AA Studies				
		Ukraine Mother and Infant Health Project	China Safe Motherhood program	India, Orissa participatory intervention with women's groups	India JSY	Bangladesh effect of scaling up women's groups	China New Cooperative Medical System	India, Shivgarh community-based behavior change intervention	Pakistan training of TBAs
Provision	Health Sector	Service delivery	Delivery modality		●		●	●	●
			Service packages					●	●
		Health Workforce	●	●			●		●
Utilization	Household/ Individual	Ability to pay	Income increasing			●			
			Household health spending		●			●	
		Knowledge/Information	●	●	●		●		●

Note: Shading denotes an intervention that was found to significantly reduce maternal mortality rates.

Light blue shading: p<0.1      Dark blue shading: p<0.01

Source: IEG

### What Do We Still Need To Know?

2.117 The body of evidence is not uniformly distributed across regions. Despite being the region with the highest maternal mortality ratios and the largest share of the world's maternal deaths, Sub-Saharan Africa presents no impact evaluation studies with maternal mortality outcomes. Similarly, no impact evaluation studies of maternal mortality come from Latin America and the Caribbean or the Middle East and North Africa Regions.

2.118 Important gaps still remain in the impact evaluation evidence regarding which interventions are effective in reducing maternal mortality. The current body of evidence is thin across all intervention types. In particular, little is known about the impact of family planning policies on maternal mortality, despite declining fertility being a potential factor in explaining the overall downward trend observed for the maternal mortality ratio. Likewise, there are few evaluations on the impact of universal health insurance policies and women's education on averting maternal mortality. Also, there is scant evidence to identify effective interventions associated with referral systems, transportation, and infrastructure of health facilities.

2.119 The World Bank's Reproductive Health Action Plan 2010-15, based on successful country experiences from China, Iran, Malaysia, and Sri Lanka in

reducing maternal mortality, list strategic support for family planning, SBA, spread of preventive knowledge, training of health workers, and women's education policies (World Bank 2010). Yet AAA impact evaluations of the effects of such initiatives by the World Bank or other institutions on maternal mortality are scant across regions. To the degree that this paucity of evidence is a function of the lack of suitable data, the Bank and its member countries in these regions may be well served by strengthening the gathering of vital statistics.

## 3. Children

3.1 This chapter covers interventions that affect mortality from birth to five years. Three child mortality outcomes are examined: neonatal (0-28 days old), infant (under one year) and child (under five years of age). Thus, the interventions in this chapter cover the continuum of care from birth through early childhood. Newborns are primarily affected by circumstances at birth, whereas infant and child mortality is heavily driven by disease – diarrhea, malaria, and pneumonia.

3.2 Notwithstanding significant recent progress in improving child health, the majority of child deaths take place in poor, rural, and remote areas affected by severe human resources shortages, minimal infrastructure, and inadequate health service quality (UNICEF 2009). In such an environment, many children die from preventable causes: sepsis, asphyxia, and prematurity for newborns, and diarrhea, pneumonia, measles, malaria, HIV/ AIDS, and underlying causes of undernutrition for infants and children.

3.3 The Bellagio child survival study group estimated that if interventions shown in efficacy trials to improve child health were universally available and used, 63 percent of child deaths could be prevented (Jones and others 2003). Among effective preventive interventions are antenatal steroids, clean delivery, exclusive breastfeeding in the first six months, complementary feeding, access to water and sanitation, zinc and vitamin A supplementation, and measles and tetanus vaccination (Jones and others 2003). Treatment interventions include oral rehydration therapy; antibiotics for pneumonia, sepsis and dysentery; and antimalarials. The challenge now lies in effective delivery and uptake.

3.4 Newborn survival benefits from interventions along the continuum of care such as family planning services, antenatal care, and clean delivery. Because the majority of newborn deaths occur in poor households with limited access to health care services, family-community care of the newborn (exclusive breastfeeding, warmth protection, clean cord care, infection prevention, and care seeking for emergencies) is considered essential to prevent mortality in the first weeks of life (Lawn, Cousens, and Zupan 2005). Home-based care alone cannot effectively treat complications of preterm birth and asphyxia or of neonatal tetanus and community-acquired infections. Treatment for these illnesses should be provided jointly with key clinical interventions such as neonatal resuscitation, extra care for low birth weight babies, and access to emergency care. Diarrhea and pneumonia, the two leading causes of death of children under five in developing countries, are preventable with intersectoral action.

3.5 Poor-quality water supply and lack of sanitation in poor households and communities are important vectors of water-borne diseases. Interventions providing safe water sources, adequate sanitation, and the promotion of better hygiene practices, such as hand-washing, can reduce child mortality. Gunther and Fink (2011) estimated that universal coverage of water and sanitation infrastructure alone could lead to a total reduction of 2.2 million child deaths per year in the developing world. Yet to benefit from infrastructure and other health inputs, households must have some health knowledge and information, such as knowing to boil piped water for drinking (Jalan and Ravallion 2003).

3.6 Prevention of pneumonia starts by ensuring immunization (measles, *Haemophilus influenza* type B, and pneumococcal conjugate vaccines), adequate nutrition, and exclusive breastfeeding in the first six months, which reduces the probability of infection (UNICEF 2008). Environmental factors such as indoor air pollution can also cause pneumonia, so switching to cleaner fuels and using better stoves to increase fuel efficiency can decrease the risk of dying from pneumonia (Rehfuess 2006). Once a newborn is infected, survival depends on recognizing danger signs of the disease, ensuring access to medical care and antibiotics and monitoring effective treatment (Wardlaw, Johansson, and Hedge 2006). Community-based case management of pneumonia has been recognized to have a significant impact on under-five mortality (Sazawal and Black 2003).

3.7 In addition, Integrated Management of Childhood Illness (IMCI), developed by WHO and UNICEF, is considered an effective intervention to lower child mortality rates. Integration of neonatal health into IMCI programs is widely considered an essential instrument to reduce newborn deaths, although its integration is only in the beginning stages. IMCI focuses on improving health workers' case management skills, strengthening the health system, and addressing family and community practices in order to address the major causes of deaths in children (WHO 2005b). It has been implemented in more than 100 countries, and the most recent multicountry study, based on non-impact evaluation evidence, stated that it effectively reduced under-five mortality (WHO 2005a). However, as reported in this chapter, impact evaluations of IMCI or the integrated management of neonatal and childhood illness are few; the evidence that does exist is mixed and far from conclusive.

3.8 This chapter reviews 49 studies with 53 impact evaluations, 17 AAA and 36 AA. The breakdown by specific intervention type can be seen in Table 3.1. In contrast to Chapter 2 on mothers, governance and nonhealth sector interventions are better represented here. This difference is perhaps unsurprising, given the effect that improving water and sanitation and reducing air pollution can have on decreasing mortality. Energy interventions have also been evaluated to determine their effect on

children, but more evaluations are needed in nonhealth sectors such as infrastructure and transportation.

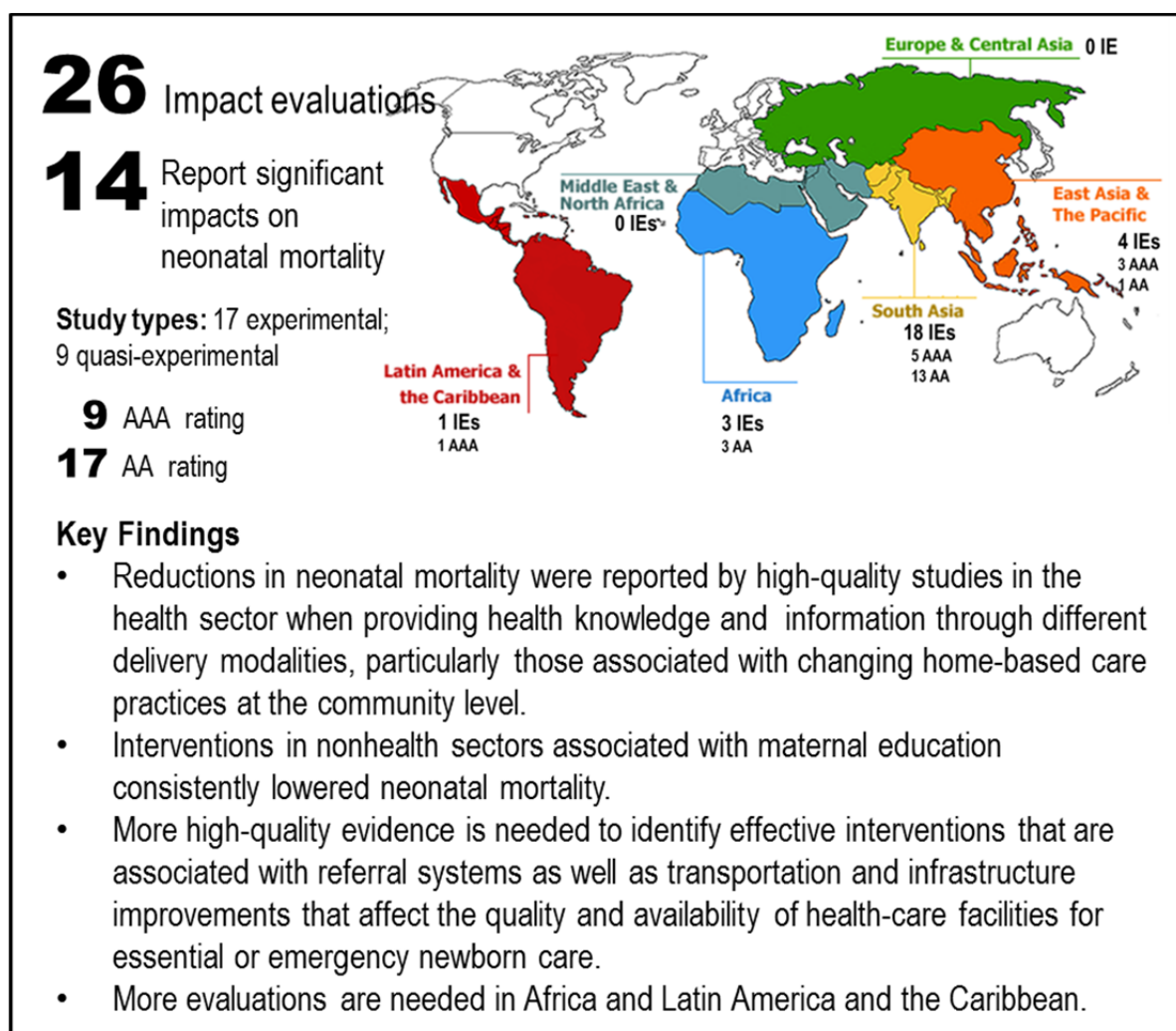
Table 3.1. Child Mortality: Intervention Type and Quality of Studies

Intervention type and subcategory			MDG 4: Reduce Child Mortality						
			Neonatal mortality		Infant mortality		Under-five mortality		
			AAA	AA	AAA	AA	AAA	AA	
Governance	Government/ governance	Strategy planning and policy	1/1		2/2	2/3	1/1	1/1	
		Public financial management				1/1		1/1	
		Regulation and licensing							
		Monitoring and evaluation, accountability					1/1		
		Multisector coordination							
		Public-private partnership							
Provision	Donor support	Coordination							
		Integration							
	Health sector	Service delivery	Delivery modality	2/2	6/12	1/1	1/3	1/1	1/1
			Service packages	2/2	5/8	1/1	1/2		2/3
			Health infrastructure						1/1
			Service management		0/1			1/1	1/1
		Health workforce	2/3	3/8	2/2	1/3		½	
		Health information system							
		Medical products and technologies						3/3	
		Health financing — supply				0/2			
	Other sector	Water and sanitation		1/1	2/2	1/2	2/2	2/2	
		Education and training	2/2		2/2	0/1	1/1	1/1	
		Income generation, labor market, personal or business finance							
Energy				2/2			1/1		
Agriculture and food security									
Transportation infrastructure									
Using	Household/ individual	Ability to pay	Income increasing	0/2	0/1	1/1			
			Household health spending	0/1				2/3	
		Knowledge and information	2/3	5/10	2/2	1/2		2/3	
		Household environment and infrastructure				0/1			
		Transportation							
Number of impact evaluations (IEs) with significant effect/number of unique IEs for indicator			6/9	8/17	11/11	5/12	5/5	10/12	

## Neonatal Mortality

3.9 Around 3 million babies annually die within seven days of birth in less developed regions, and an additional 1 million die before one month of life (Lawn, Cousens, and Zupan 2005).<sup>1</sup> Most infant and under-five deaths occur during the first month of life. Newborn deaths represent 40 percent of under-five mortality (Black and others 2003). So reducing child deaths by two-thirds by 2015, MDG 4 will depend largely on the extent to which countries can decrease neonatal mortality.

3.10 Even when a set of clinical cost-effective interventions has been shown to prevent newborn deaths,<sup>[20]</sup> more than half of newborn deaths in the developing world occur at home, without access to skilled care from preventable conditions such as sepsis (including pneumonia and tetanus), asphyxia (lack of oxygen at birth), and conditions from prematurity or low birth weight (WHO 2005a). Consequently, although child mortality has seen a substantial and sustainable decrease over the past 30 years, neonatal mortality improvements have been slow



and difficult to quantify, as the provision and utilization of interventions or packages of interventions targeting the neonatal period is neither universal nor comprehensive across regions and within countries. It will be essential to increase use and access to postnatal care at home and at health facilities, including access to emergency neonatal services, especially during the first days of life and for low-weight babies for whom the risk of dying is even greater.

#### DATA DESCRIPTION

3.11 Reducing newborn mortality starts with ensuring maternal health during pregnancy and delivery. The review includes a total of 23 studies – representing 26 impact evaluations – with neonatal mortality (early, late, or perinatal mortality) as a primary outcome of interest. Only three of these studies have neonatal mortality as an exclusive outcome of interest, as newborn health is intrinsically linked to maternal interventions and child programs.

3.12 Nine of the 26 of evaluations were rated AAA and 17 were AA. The findings of this section are based primarily on the AAA studies, which covered a variety of intervention groups. Standardized effect sizes and imputed confidence intervals can be seen visually in figure J.3 in Appendix J. The majority of AAA studies apply quasi-experimental methods (6), mainly instrumental variables and difference-in-difference approaches, as opposed to experimental designs (that is, RCTs) (3). The converse occurs for AA impact evaluations, 14 of 17 are RCTs – random allocation of treatment at the cluster, community, or health facility level.

3.13 The evaluations represent evidence from 11 developing countries, but the majority of AAA impact evaluations (5/9) were concentrated in the South Asia Region, followed by East Asia (3/9). Latin America and the Caribbean produced only one AAA evaluation. Sub-Saharan Africa has three such studies. All but one evaluation were carried out in low-income countries.

3.14 Most studies evaluate the following interventions: governance (1), provision (2), and interventions aimed at increasing the **utilization of health services** (2). The four studies left are concentrated on bundled interventions (numerous component activities). The reviewed impact evaluations address strategies considered in observational studies to reduce neonatal mortality (Darmstadt and others 2005), including antenatal care, SBA, community health education on safe motherhood and newborn care, maternal schooling, water and sanitation, and CCTs.

#### GOVERNANCE

3.15 The single evaluation that targeted the political agency of women (**governance**) found a 24 percent reduction on neonatal mortality as a result of

increased women's political representation, which was measured by women being elected to state legislative assemblies in India. In addition to a significant increase in health infrastructure in the states exposed to the treatment, the study found improved probabilities of attending antenatal care, taking iron supplements during pregnancy, giving birth in a government facility instead of at home, and early initiation of breastfeeding.

#### PROVISION: HEALTH SECTOR

3.16 Two impact evaluations evaluate interventions that are exclusively under health sector provision. One **service management** evaluation in Zimbabwe, comparing a five-visit antenatal care model with the standard model in a rural area, found no difference in perinatal mortality associated with reducing the number of visits for women who visited a health clinic for antenatal care. This finding provides evidence that a goal-oriented routine model was as effective as the standard model. An AA evaluation of a **health workforce** program to train TBAs in the Democratic Republic of Congo found, at a 95 percent confidence level, no reduction on perinatal mortality associated with either essential newborn care or training in a newborn resuscitation program. Other evaluations that examine health sector components as part of a bundled intervention are discussed below.

#### PROVISION: NONHEALTH SECTORS

3.17 Three evaluations examine nonhealth sector provision interventions, two of which fall in **education** and one in **water and sanitation**. Two maternal schooling studies in Indonesia and Taiwan, China, consistently showed positive effects on reducing newborn and infant mortality once endogeneity was taken into account. The studies applied quasi-experimental techniques and analyzed two reforms to increase the length of compulsory education, which as a consequence increased the number of schools in treated provinces. These studies assessed the net effect of the program; no sufficient information is provided on the causal chain. Using differing seasonal prenatal exposure to agrichemicals, an AA evaluation of water quality found detrimental effects of fertilizer on neonatal mortality among poor Indian children. Children of uneducated poor women were more affected.

#### UTILIZATION

3.18 Three quasi-experimental evaluations on two large well-known **income increasing** programs (**CCTs and financial incentives programs**) aiming to increase health care utilization were reviewed: one in Mexico's *Progresa* (now *Oportunidades*) and two in India on the impact of the JSY project on neonatal mortality at the district level. Although there are significant effects on infant mortality in Mexico associated with *Progresa*, there was no significant effect on neonatal mortality. As discussed in



Chapter 2 on the effect of SBA, India's financial incentive program was associated with positive effects on women's access to maternity services in both AA and AAA studies, but neither of the impact evaluations found a positive impact at the district level on improving neonatal or early neonatal mortality, even in districts with high quality of care.<sup>[46]</sup> The authors of the AA evaluation cited statistical power as a potential explanation of the null result. This evaluation also used a less robust exact match methodology for individual-level data and found a small but significant effect on perinatal and neonatal mortality.<sup>[39]</sup>

#### BUNDLED INTERVENTIONS

3.19 Four studies are concentrated on bundled interventions between health sector provision and utilization components across service delivery: **delivery modality** and **service packages; health workforce** (for example, training); and **knowledge and information**. Bundled interventions render mixed results. On one hand, two RCTs—one carried out in Jharkhand and Orissa, India,<sup>[61]</sup> and another in Makwanpur, Nepal<sup>[45]</sup>—aimed to improve home newborn care practices through health education (**knowledge and information**) delivered at the community level by women's groups (**delivery modality**) found a significant one-third reduction on neonatal mortality.

3.20 On the other hand, evidence on the impact of delivering newborn care packages<sup>2</sup> at the community level (**delivery-modality**) in large-scale trials gives mixed results. One 24-month AAA study in Pakistan<sup>[10]</sup> and a supporting 30-month AA study in Bangladesh<sup>[5]</sup> assessed essential care **service packages** through different delivery approaches. They show a positive effect on reducing neonatal mortality by promoting essential newborn care through home visits and community health education. The evaluation in Pakistan noted positive synergies of linking and delivering the package through female health system workers in collaboration with voluntary community health committees and TBAs. Its results, however, were affected by low coverage and take-up of the intervention and low follow-up rates caused by the competing demands of the health workers. Half of the intervention clusters (249) also established emergency transport funds. These community-based interventions are implemented under different contexts, and components as well as the quality of delivery might also vary.

3.21 Integrating newborn care into existing maternal and child programs, such as Safe Motherhood and Integrated Management of Neonatal and Childhood Illness, is a strategy believed to provide optimum care of newborns when health system constraints exist (Knippenberg and others 2005). Two relevant studies were included in the review. The Safe Motherhood Program in China<sup>[23]</sup> was implemented in counties with high maternal mortality and neonatal mortalities levels. It does not

demonstrate an impact on reducing newborn deaths, although, as discussed earlier, it does show a significant impact on reducing neonatal tetanus and maternal mortality through improving “health education, health infrastructure, and social mobilization.” Another study evaluated the IMNCI large trial in India.<sup>[9]</sup> It showed a significant effect on late and perinatal mortality, but not on early neonatal mortality, possibly, as authors noted, as the result of misclassification between stillborn and newborn deaths. However, it is important to note that the program’s effect was greater on home births, not in facility births, which is consistent with its findings on improved home-based care practices.

### *What Do We Know About Reducing Neonatal Mortality?*

3.22 Overall, AAA studies with interventions that fall under the **health sector** and provide **knowledge and information** demonstrate significant reductions on neonatal mortality, in particular those associated with delivering a service package at the community level. The only study targeting **governance** through an increased political representation of women reported positive impacts on newborn survival. Finally, evaluations aimed to increase **women’s schooling** reported significant reductions in neonatal mortality.

3.23 The results indicate that investing in female education has a significant positive effect on reducing neonatal mortality. Better-educated women are considered to be more efficient in ensuring the health of their children and families through promoting better nutrition, hygienic practices, and health seeking behavior.<sup>[19,17]</sup> Findings from these two national school reforms illustrate the intergenerational positive effect of schooling on neonatal survival. Similarly important, the findings show that increasing governance and political agency are extremely important instruments to reduce neonatal mortality.<sup>[8]</sup> Empowering women and communities through promoting the political representation of women is critical to improve policies and institutions, especially given that many countries still strive to integrate neonatal care into their maternal and child national programs.

3.24 Based on three AAA <sup>[9,10,61]</sup> and four AA impact evaluations,<sup>[37,45,47]</sup> the evidence also suggests that community-based approaches for delivering packages of neonatal care can significantly reduce early and perinatal mortality through improved, home-based, newborn care practices, such as exclusive breastfeeding, clean umbilical cord care, thermal care for the baby (for example, delaying the first bath and promoting skin-to-skin contact), and improved detection of danger signs and referral to skilled health facilities. The impact of these strategies is strengthened by the inclusion of linkages with trained community-health workers<sup>[10,9]</sup> or TBA training on safe delivery, such as the availability of a safe delivery kit, recognition of common obstetric and newborn

emergencies, and treatment of newborn asphyxia.<sup>[47,3]</sup> Interventions that provided home visits with community mobilization as in women's group education sessions in India,<sup>[9,37]</sup> Bangladesh,<sup>[5]</sup> and Pakistan<sup>[10]</sup> significantly reduced neonatal mortality.

### Box 3.1. Training of Traditional Birth Attendants in Delivering Neonatal Care: Evidence from Three AA Studies

Training of health workers, such as midwives, auxiliary nurses, and community health workers, is an important component in delivering service packages at the home or community level (WHO 2005a). Although most of the studies that include training are bundled with other components of the intervention, training nonhealth sector workers in delivering newborn care was the subject of three AA studies specifically targeting TBAs.<sup>[14,35,29]</sup>

Two of these evaluations were carried out in rural poor settings in Pakistan and Zambia. They found a significant impact of TBAs' training on lowering neonatal mortality (30–45 percent decline). One focused on maternal care; the other targeted newborn care practices. The program in the province of Sindh in Pakistan provided birth attendants with clean home delivery kits and trained them in early recognition of obstetric danger signs. Conversely, the community-based effectiveness trial in rural Zambia provided TBAs with skills targeting birth asphyxia and sepsis using an adaption of the neonatal resuscitation protocol as well as administration of antibiotics and referral.<sup>a</sup>

It is important to note that both studies build on an existing infrastructure for community health care delivery. In Zambia, TBAs were part of the extended health care system and have already received training in basic obstetric care and clean delivery. Similarly, the Lady Health Workers Program facilitated the link with TBAs in Pakistan. Each of these lady workers is attached to a government health facility, from which they receive training, a small allowance and medical supplies.

In contrast to these evaluations, a third randomized study, carried out in the Democratic Republic of Congo, where TBAs or nurse midwives are not as organized within the health system as in other settings and have limited training in essential newborn care, found no demonstrable effect of a newborn resuscitation program on neonatal or perinatal mortality. In all of these settings, at least half of births occurred at home, mostly with the assistance of traditional attendants.

a. Includes rapidly drying and warming the newborn, clearing airways, and evaluating respiratory effort, skin color, and tone.

3.25 The lessons from the evaluations of community-based interventions and health worker training are likely broadly applicable to poor rural settings, where most women deliver their babies at home with traditional birth assistance and limited access to emergency obstetric care. These are settings where infections are one of the main causes of newborn deaths and certain cultural practices, such as bathing within the first six hours, can increase the risk of dying for newborns.

3.26 Demand-side barriers can directly affect the likelihood of mothers to seek medical assistance for newborns. However, the review's findings show that CCTs

and financial incentives, while having positive effects on increasing SBA and in some instances reducing maternal mortality, do not reduce newborn deaths. Skilled professional care at delivery can reduce mortality from birth asphyxia and sepsis, treat premature babies, and manage complications (WHO 2005a). However, programs that target mothers' health may be missing the opportunity to affect early neonatal mortality, a time when death can be mitigated through medical care. More rigorous research is required on available demand-side interventions designed to reduce neonatal mortality, in particular, other voucher maternal programs in place in other regions such as Africa or Latin America and the Caribbean.

3.27 Integrating newborn care into the IMCI program, focused traditionally on infant and child health, significantly reduced late neonatal deaths in India in deliveries at home, but not those happening in the first days of life or in health facilities. The study indicates that the impact of the program would be strengthened by including prenatal care and referral systems, high-quality training to ensure adequate supervision, and timely supplies and task-based incentives for community health workers.<sup>[9]</sup>

3.28 Several studies included in the review highlight challenges that affect program implementation and their effectiveness at scale. For instance, home-based postnatal visits by trained workers can be seriously reduced as the result of poor geographic accessibility, high workload, and difficulties in receiving timely notification of deliveries because surveillance and registration systems are seldom in place to identify mothers and neonates.<sup>[10,5]</sup> Given the short period when mothers who deliver at home can be visited or treated by health workers and a newborn's health assessed, the lack of resources or coverage at the community level to monitor home births in the first days might lead to the underreporting of mortality rates and an underestimation of the programs' effects.

3.29 Information systems and strengthening vital statistics would help improve impact assessments. For instance, the evaluation of *Progres*a in Mexico<sup>[6]</sup> indicates that the underreporting of child deaths can underestimate the reduction in infant mortality at the municipality level.

#### *What Do We Still Need To Know?*

3.30 Important gaps exist in several types of interventions for neonatal mortality. The systematic review identified only one study on **strategy planning and policy**. Therefore, evaluations of interventions on decentralization, **monitoring systems**, or **public-private partnerships** are missing. In addition, only one evaluation was included on **service management**. Consequently, more evaluations are needed

associated with health sector interventions addressing **health infrastructure and health workforce**, such as improvement of the quality and availability of health care facilities for essential or emergency newborn care and the effect of increasing specialized newborn care skills at the facility level.

3.31 Following an adapted framework of the three-delay model for newborn mortality (Barnes-Josiah, Myntti, and Augustin 1998), a vast majority of evaluations included in the analysis provide evidence on interventions tackling the first delay on maternal and newborn care: deciding to seek appropriate medical help for an emergency or complication either by increasing **knowledge and information**, or by **modifying the behaviors or beliefs** to delay care. Most birth and neonatal deaths occur at home in rural settings with poor demand or lack of access to facility delivery and postnatal services. However, reaching an appropriate facility (the second delay) and receiving adequate care when a facility is reached (the third delay) are also important, yet only two AAA and two AA evaluations addressed these factors. No evaluation was identified that exclusively dealt with the availability of referral systems, including improved communications and roads, in rural poor areas.

3.32 Another knowledge gap is related to **health financing** interventions, such as performance-based financing, contracting, or incentives for improving the quality of postnatal care except for those included in the packages (for example, safe motherhood). Notably missing are evaluations that address the utilization of health services, such as community health insurance and prepayment schemes, loan schemes and revolving funds, and other innovative financial mechanisms.

3.33 More evidence is needed on the integration of newborn care in maternal and child programs. The review only found two AAA and one AA studies. In addition, more evidence is required on health systems' capacity in delivering integrated packages excluded from MCH strategies. Evaluations on promoting integrated packages, such as community-based interventions that act in combination with social protection and intersectoral action in **education, water and sanitation**, empowerment, and poverty reduction are missing.

3.34 1.22 Even though half of newborn deaths occurred in South Asian countries, the 10 countries with the highest neonatal mortality rates (NMR>45 per 1,000 live births) are all in Sub-Saharan Africa. Yet only 12 percent of evaluations took place in countries in the Africa Region (three studies). Two of them assessed the impact of TBA training, and one evaluated a program that reduced the number of antenatal visits. None of them was an AAA study. This evidence is needed on improving

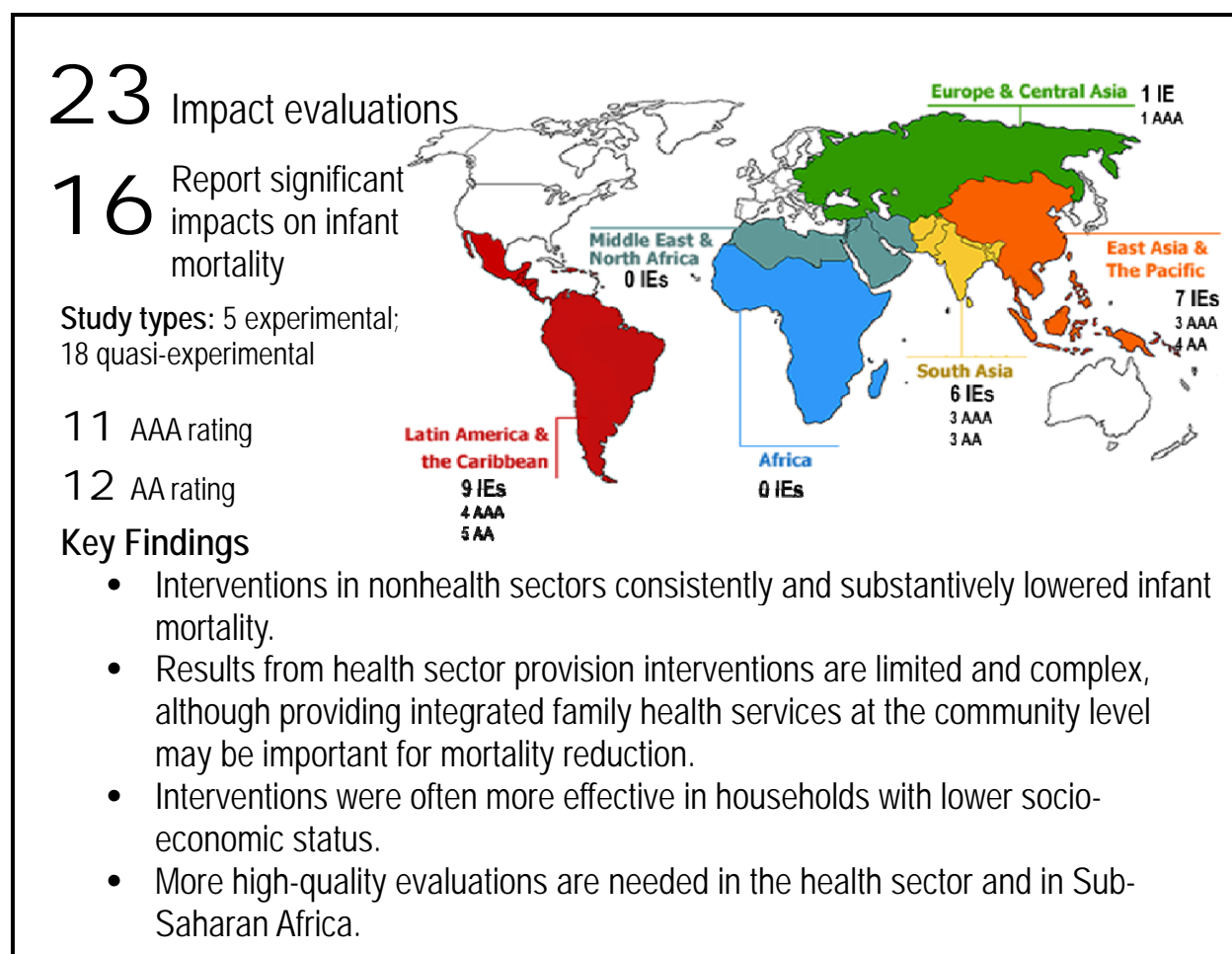
newborn practices, demand for newborn care, and quality of care in Sub-Saharan Africa.

3.35 None of the evaluations that were reviewed reported on heterogeneous effects. Information available to assess the cost-benefit and effectiveness of strategies is limited. Estimates from three studies show an incremental cost per newborn life saved between \$910 for a community-based participatory intervention in India<sup>[61]</sup> and \$3,442 for a similar intervention in Nepal<sup>[45]</sup> excluding health service strengthening costs. The costs of health personnel training and procurement of supplies for treating newborn infections at public hospitals vary between \$2,995 for a home care intervention in Bangladesh<sup>[5]</sup> and \$4,397 for a women's group intervention in Nepal.<sup>[45]</sup>

## Infant Mortality

3.36 Infant mortality rates have decreased worldwide during the past two decades, from 61 deaths per 1,000 live births in 1990 to 37 deaths per 1,000 live births in 2011 (IGME 2011). This progress is encouraging, but not sufficient to reach MDG 4 targets in most countries. An estimated 5 million children die during the first year of life (3 million within the first month), comprising 72 percent of all deaths within the first five years. Children born in Sub-Saharan Africa have the highest risk of death.

3.37 Deaths within the first year are generally classified by neonatal deaths (0-28 days) and postneonatal deaths (1-12 months), the causes of which are markedly different. The majority of neonatal deaths are due to complications at birth, while the leading causes of postneonatal deaths are pneumonia, diarrhea, and malaria. As neonatal mortality was treated separately in the previous section, this section focuses more broadly on interventions to address causes of death within the entire first year. It covers a wide spectrum of intervention types, including work in **governance, water and sanitation, energy, and education**, that can inform the main



challenges in preventing infant and early child deaths: the scale-up, delivery, and utilization of known interventions.

#### DATA DESCRIPTION

3.38 The team's search yielded 23 impact evaluations (22 studies) with infant mortality as an outcome, 11 of which are AAA and 12 of which are AA studies. Only five randomized controlled trials were found, whereas the remaining 18 utilize a quasi-experimental design (difference in difference being the most common). From all 23 evaluations, 12 different categories of interventions are represented, 7 impact evaluations report heterogeneous effects, and 3 offer cost analysis.

#### GOVERNANCE

3.39 Governance interventions are found in four studies, one of which is AAA and three of which are AA. Only one AAA study evaluates the effects of **strategy planning and policy**, and it is the only governance intervention to take place outside of South America. In India, an increase in the share of female-held seats in the state assembly reduced district-wide infant mortality by 1.4 percentage points, or a 14 percent reduction, at a marginal significance level (see figure J.4 in Appendix J).<sup>[8]</sup> For AA evaluations, one of two in **strategy** presents a significant effect and the remaining **public financial management** study also lowers mortality.<sup>[11,33,30]</sup>

#### PROVISION: HEALTH SECTOR

3.40 No AAA and only two AA studies sit squarely in the health sector. The majority of interventions bundle components of provision with household or individual utilization, and are addressed separately. The first AA study is an evaluation of a **health financing** intervention in Cambodia that tested two designs for contracting management of public facilities to nongovernmental organizations.<sup>[13]</sup> Neither treatment arm significantly reduced infant mortality, although this may be a result of insufficient statistical power because of the small sample size. Improvements to intermediate outcomes, such as diarrhea treatment and breastfeeding, were observed. The second study examined the Village Midwife program in India, combing **delivery modality, health workforce** and **service packages**. Once again, there was not a significant effect on infant mortality.<sup>[57]</sup>

#### PROVISION: NONHEALTH SECTOR

3.41 IEG found nine evaluations pertaining to the nonhealth sectors of energy, water and sanitation, and education. Six are AAA evaluations from interventions in Latin America and Asia, all of which find substantive results. Two **energy** studies find mortality reductions as a result of pollution regulation. In Mexico, the potential advertising benefits of voluntary pollution reduction by firms led to a 16 percent



decrease in infant mortality from respiratory illness.<sup>[25]</sup> In China, across high-polluting prefectures subject to a national pollution policy, there was a 21 percent reduction in infant mortality (excluding death from poisoning and injury).<sup>[60]</sup> The effect was stronger for daughters and all children of women with little education.

3.42 In the **water and sanitation** sector, a national piped water program decreased infant mortality in counties in Brazil, and more so in areas with higher baseline mortality rates.<sup>[28]</sup> In one district of Bangladesh, arsenic poisoning in backyard tube wells prompted households to instead obtain water from geographically distant sources. The evaluation found that this switch resulted in the usage of water contaminated with fecal pathogens and increased infant mortality by 27 percent at a marginal significance level (see figure J.4 in Appendix J).<sup>[24]</sup> Similar results were found when the study was replicated nationally, giving field evidence and causal credence to the importance of water and sanitation in infant mortality.

3.43 Higher parental **education** levels from a national school construction program lowered infant mortality in Taiwan, China, by 13 percent and in Indonesia by 43 percent.<sup>[19,17]</sup> In the latter program, the effect on mortality was smaller and less significant for infant deaths before the mother reached age 25, and the authors found that both the mother's and father's education levels were equally important.

3.44 Of three additional AA studies, another school construction intervention in Chile found no effect on infant mortality.<sup>[1]</sup> One **water and sanitation** intervention of improved infrastructure through a social fund in Peru found no overall effect, although an evaluation of agricultural water contamination in India reports a significant increase in infant mortality levels.<sup>[15,33]</sup>

#### UTILIZATION

3.45 One AAA study finds that *Progres*a (now *Oportunidades*), the well-known **income increasing** CCT program in Mexico, led to a 17 percent drop in infant mortality. The reduction was even higher in disadvantaged municipalities. The transfer was given to mothers and conditioned on school attendance and health checkups for children as well as preventative health care for pregnant and lactating women. An AA study of a **household environment and infrastructure** intervention that provided clean cook stoves found no effect.<sup>[22]</sup>

#### BUNDLED INTERVENTIONS

3.46 AAA evaluations of interventions that bundle provision and utilization components present positive results. A study on providing **health workforce** training in conjunction with a media campaign in Ukraine to provide **knowledge**

**and information** to improve safe motherhood practices found significant decreases in infant mortality.<sup>[52]</sup> An IMCI program in a northern state in India, which trained the **workforce** to deliver a specific **service package** and also increased household **knowledge**, found that infants who received the intervention faced a 15 percent lower hazard of dying (see figure J.4 in Appendix J). The effect was stronger for those born at home.<sup>[9]</sup> Two AA-quality interventions bundle provision components with **knowledge and information**, one of which is significant (table 3.2).<sup>[4,58]</sup>

Table 3.2. Comparison of Interventions That Bundle Similar Combinations of Health Provision and Utilization Components

				AAA studies		AA studies		
				Mother and Infant Health Project, Ukraine	Integrated Management of Childhood Illness Program, India	Village Midwife Program, Indonesia	Safe Motherhood Program, <sup>a</sup> Indonesia	Community-Based Kangaroo Mother Care Initiative, Bangladesh
Provision	Health sector	Service delivery	Delivery modality			•		•
			Service packages		•	•	•	
		Health workforce	•	•	•	•	•	
Utilization	Household or individual	Knowledge and information	•	•		•	•	

p<0.1    
  p<0.05    
  p<0.01

Source:

Note: Shading denotes an intervention that was found to significantly reduce infant mortality rates.

<sup>a</sup>The Safe Motherhood Program was a national follow-up program to the Village Midwife Program.

3.47 Two evaluations examine the same program at the intersection of governance and service provision. Brazil's *Programa Saúde da Família* decentralizes family health services by assigning health teams to a geographical area that includes about 3,500 people. The AAA evaluation shows a small but significant 5 percent decrease in

infant mortality.<sup>[56]</sup> The AA study of the same program finds that a 10 percent increase in coverage lowered mortality by 0.5 percent.<sup>[42]</sup>

#### FINDINGS

##### *What Do We Know About Reducing Infant Mortality?*

3.48 Overall, AAA evaluations of interventions that fall in nonhealth sectors offer compelling evidence of reductions in infant mortality. The estimated effects from interventions in **energy, education, and water and sanitation** are consistently large and significant and directly address causes of pneumonia and diarrhea, which together cause 29 percent of global deaths under the age of 5 (Liu and others 2012). It should be noted that, with the exception of two water and sanitation projects, all the other sector interventions were large-scale government programs that often required significant planning, resources, and sustained involvement.

3.49 Pollution regulations were effective both when mandatory at the prefecture level in China and when voluntary for firms across Mexico. The large effects of these programs may be due in part to the high levels of pollution in these countries, and less polluted areas might observe a smaller effect.<sup>[60,25]</sup> A primary school construction program in Indonesia is notable for its large 43 percent reduction in infant mortality. The authors of both school construction studies suggest that educated mothers may be better able to take advantage of available health resources for their children.<sup>[17,19]</sup> The results from Taiwan, China, also indicate that maternal education may be of greater value in preventing post-neonatal deaths. The water and sanitation evaluations emphasize this sector's importance in infant health, partially through reverse evidence of interventions that actually increase infant mortality.<sup>[28,24,15,33]</sup>

3.50 An examination of all AAA and AA health sector studies highlights the potential benefits of providing integrated family health care services at the community level. Of the seven health sector provision interventions with similar components, some commonalities arose from the three AAA evaluations and two of four AA evaluations that were significant. Ukraine's Mother and Infant Health Program (AAA), India's IMNCI (AAA), Brazil's *Programa Saúde da Família* (one AAA; one AA), and Indonesia's SMP (AA) all aimed to increase the supply of trained health workers providing services across the continuum of care.<sup>[52,9,56,42,4]</sup> Ukraine's Mother and Infant Health Project is a bit of an anomaly, as it provided technical training to well-educated hospital staff, but the remaining interventions provided these services directly to villages and communities, often making household visits.

3.51 Further analysis of these health sector evaluations is particularly challenging due to the complicated nature of health service provision. All of the above-mentioned interventions bundle at least one (and generally more) of the following four components: **delivery modality, service package, health workforce, and knowledge and information** (see table 3.2). From this small pool of impact evaluation evidence, it is not feasible to determine which component drives the results in each study, nor one component that is sufficient for success across studies. Two AA evaluations do provide one interesting piece of evidence by allowing a comparison of Indonesia's Village Midwife Program and its follow-up SMP.<sup>[57,4]</sup> The SMP found a marginally significant effect on infant mortality, although its predecessor did not. The programs were largely similar except for the lack of household outreach activities in the initial program, which the authors note as a potential reason for its failure. However, the **knowledge and information** component is present in nonsignificant studies and not a sure path to an effective intervention.

#### Box 3.2. Expanded Participation in Health Provision and Funding Decisions May Reduce Infant Mortality

One AAA and several AA evaluations of governance interventions establish a potential link between expanded participation in processes that affect the provision and funding of public health services and reductions in infant mortality. The authors of a study in India assert that female politicians are more likely to support policies and expenditures that favor public health services. Increasing the share of female-held seats in state assemblies, where public health provision decisions are made, lowered infant mortality by 14 percent.<sup>[8]</sup>

In regard to funding decisions, an AA study in Brazil shows that municipalities that adopted participatory budgeting saw a 10 percent decrease in infant mortality, and spent a greater proportion of the budget in health and sanitation.<sup>[30]</sup> Further, resources spent on health and sanitation had a significantly larger effect on infant mortality when allocated through participatory budgeting instead of non-participatory methods. The effect of social investment funds is shown in two AA evaluations with mixed results: It led to marginally significant decreases in infant mortality in Brazil but had no overall effect in a similar program in Peru (although it was significant for households living in extreme poverty).<sup>[11,33]</sup> This evidence on funding processes originates solely from AA evaluations in Latin America and requires further evaluations to confirm the results.

3.52 Across multiple sectors, several studies point to a trend in which interventions were more effective in poorer households. The evaluation of *Progres*a in rural Mexico examined a number of heterogeneous effects, and found a larger impact on infant mortality in more disadvantaged municipalities, or those with lower rates of electricity coverage, higher rates of illiteracy, and higher household

occupancy levels.<sup>[6]</sup> However, the study also found the program to be less successful in municipalities with lower levels of sanitation, as measured by access to piped water, presence of dirt floors, and percentage of workers in the primary sector (who are more likely to bring animal fecal matter into the home). The study draws a distinction between sanitation levels and socioeconomic levels and concludes that the rural CCT program required a minimum level of sanitation to be effective, and once met, households in more disadvantaged municipalities realized greater program benefits.

3.53 The positive impact of piped water in Brazil demonstrated similar results, where counties of low socioeconomic status demonstrated a greater mortality reduction, although only after a minimal level of development had been achieved.<sup>[28]</sup> Further, among counties with similarly high or low development levels, the provision of piped water had a stronger effect among those with higher baseline mortality rates. An AA evaluation of Peru's social development fund FONCODES revealed a similar trend, as it reported a significant mortality reduction for extremely poor households, although no effect was found for poor households.<sup>[33]</sup>

3.54 In the selected infant mortality impact evaluations, cost analysis exists in only three AAA studies. The provision of piped water in Brazil was found to be more cost effective when it occurred in areas with higher infant mortality compared to low (\$630 versus \$2010 per averted infant death, respectively).<sup>[28]</sup> The evaluation of the Mother and Infant Health Project in Ukraine found a cost-benefit ratio of 1 to 97 when it accounted for savings in delivery costs and the value of saved lives.<sup>[52]</sup> The evaluation of Brazil's *Programa Saúde da Família* asserts that the program is highly cost effective, although the authors only provide the number of lives saved over time and program administration costs per municipality.<sup>[56]</sup>

#### *What Do We Still Need To Know?*

3.55 Additional AAA studies are needed for all intervention categories. Within health provision, evaluations of community-based programs, workforce training activities, or health financing experiments would be particularly instructive. Sophisticated impact evaluations that could isolate the individual and complementary effects of the provision and utilization components of bundled interventions would be especially welcome. Impact evaluations of the effect of governance interventions on infant mortality are promising, but also quite sparse and arise almost completely from Latin America. Moreover, it is remarkable that more IEs of widely replicated interventions are not available. Of all the CCT, IMCI, and SMPs around the world, the team's search identified only one AAA study of each of these types of programs that estimated impacts on infant mortality.

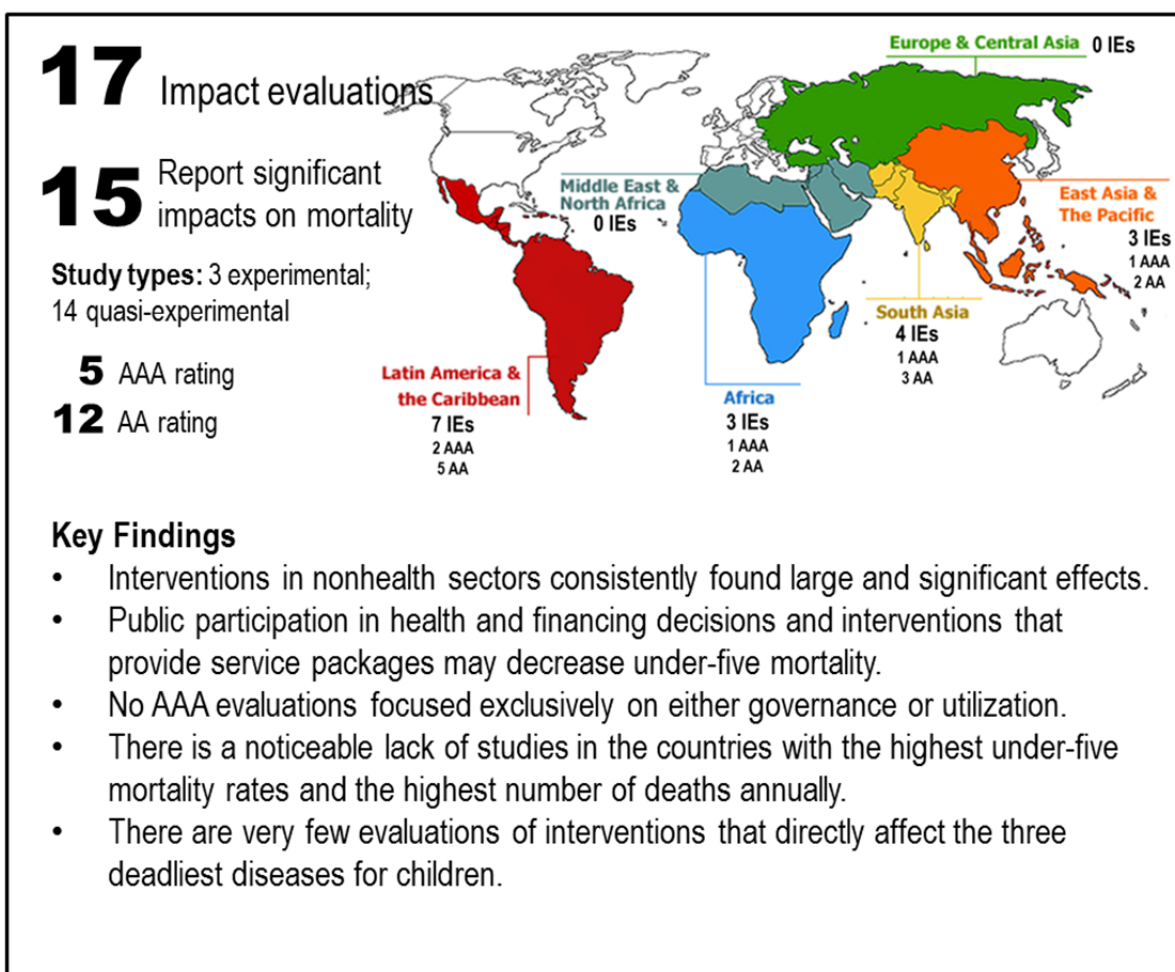
3.56 Finally, substantial gaps by geography also exist. Of 23 evaluations, 9 fall in Latin America and the Caribbean (5 in Brazil) and 6 each in South Asia and East Asia and the Pacific. No evaluations take place in Sub-Saharan Africa, despite the significant number of global infant deaths occurring in this region. Across all regions, only two low-income countries are represented (Bangladesh and Cambodia). Furthermore, there is little information from the five countries that contribute more than half of the global deaths of children under five: India, Nigeria, Democratic Republic of the Congo, Pakistan, and China (Liu and others 2012). Although India has relatively good coverage from four studies, there is only one from China, and the remaining three countries have none. Knowledge of effective interventions in these specific country contexts could have a considerable impact in lowering global child mortality levels.

## Under-Five Mortality

3.57 Globally, under-five mortality has fallen by approximately 20 percent in the last decade; despite this progress, 7.6 million under-five children still died in 2010 alone (Liu and others 2012), and few countries are on track to meet MDG 4. Given the inclusive nature of this indicator, which incorporates both neonatal and infant mortality, there is a greater breadth of possible interventions, ranging from antenatal care and birth attendance to infant care, nutrition and immunization programs, and water and sanitation improvements to prevent waterborne diseases.

### DATA DESCRIPTION

The review found 17 impact evaluations that addressed under-five mortality, five of which were AAA and 15 of which reported significant results. The significant studies covered 14 intervention types, and 8 of the studies (2 AAA and 6 AA) bundled multiple interventions into a single program.



## GOVERNANCE

3.58 Only one impact evaluation looked at an intervention that was wholly governance focused. The AA evaluation looked at **public financial management** in municipalities in southern Brazil and found a highly significant decrease caused by increased water and sanitation and health spending.<sup>[30]</sup>

## PROVISION: HEALTH SECTOR

3.59 One AA study evaluated an intervention that increased the availability of **medical products and technology**, and made changes to **service management**. It was marginally significant (see figure J.5 in Appendix J).<sup>[43]</sup>

## PROVISION: NONHEALTH SECTORS

3.60 The three AAA studies in nonhealth sectors were significant, and two of them evaluated **water and sanitation** programs. In Bangladesh, the government launched a district-level campaign encouraging people to switch water sources, which resulted in many families using contaminated water. This led to a large increase in child mortality, illustrating the importance of water quality for child health.<sup>[24]</sup> In Argentina, a national water privatization program led to reductions in under-five mortality, and the effect was larger in the poorest districts.<sup>[27]</sup> The third evaluation was in **education and training**. A nationally representative study, it evaluated the Indonesian primary school construction program, implemented at the district level, and identified a highly significant decrease in under-five mortality.<sup>[17]</sup> All three AA studies in **water and sanitation, education, and energy** found significant reductions.<sup>[32,1,31]</sup>

## UTILIZATION

3.61 The utilization intervention, evaluated in an AA study, aimed to improve health insurance in China, but it was not significant.<sup>[18]</sup>

## BUNDLED INTERVENTIONS

3.62 There were two AAA studies for bundled projects, and both were significant. The first was an evaluation of a public monitoring program in rural Uganda, which combined **monitoring and evaluation and accountability** with **service management**. Community groups and public health facilities created action plans that included provisions for monitoring the health workers' compliance. This resulted in a marginally significant decrease in child mortality (see figure J.5 in Appendix J).<sup>[12]</sup> The second AAA study, which looked at Brazil's **strategy planning and policy**, reviewed *Programa Saúde da Família*, a nationwide initiative to send medical teams out to communities in an attempt to change the **delivery modality** of health services. The program has decreased child mortality.<sup>[56]</sup> Five of the six AA studies that examined



bundled interventions found significant decreases.<sup>[4,36,21,34,49]</sup> The sixth was insignificant.<sup>[2]</sup>

## FINDINGS

### *What Do We Know About Reducing Under-Five Mortality?*

3.63 Only one of the five AAA evaluations directly changed health care provision. The evaluation of Brazil's *Programa Saúde da Família* covered 85 percent of Brazilian municipalities across all five regions, sending new medical teams to communities in an attempt to teach better health practices at the individual level.<sup>[56]</sup> Despite its direct relation to the health sector, the program only reduced child mortality by 3.9 percent.

3.64 The other four AAA interventions were in nonhealth sectors and consistently found large and significant reductions. The largest of these reductions, which was also highly significant, was from the central government's primary school construction program in Indonesia.<sup>[17]</sup> The authors found that an additional year of education in a household produced a 48.4 percent reduction in the number of child deaths per household. Although the authors were not explicit in this study about the causal link, they suggested that this reduction may be because educated women are more likely to take advantage of available health care for their children, such as immunizations. When analyzed for mothers younger than the age of 25, an increase in average education still significantly reduced child mortality, although the effect was smaller in magnitude.

3.65 Public monitoring of health facilities in Uganda was also successful in reducing under-five mortality without any direct inputs or changes in the health care system.<sup>[12]</sup> The intervention was essentially a nonhealth intervention in the health sector, with its primary goal being to improve the governance of the public health facilities. The intervention provided for community monitoring to ensure that specific improvements were made in existing healthcare provision. This exercise reduced under-five mortality by 34.7 percent, although the reduction was only marginally significant. This was likely the result of a power problem, because the authors used public health dispensaries as the unit of analysis and so had only 50 observations (see figure J.5 in the appendix). The authors hypothesized that the large drop could be a result of better service quality, which encouraged the community members to use the health facilities more. The project was large in scale – it covered 55,000 households – but it was limited to rural populations.

3.66 Additionally, water programs had a large impact on child mortality. This finding is unsurprising, given that diarrhea is one of the main causes of under-five deaths (Black and others 2003). As part of a larger structural reform program, the

Argentinean government privatized water companies that covered more than 30 percent of Argentina's municipalities. This led to an 8.4 percent reduction,<sup>[27]</sup> which grew larger in poorer districts when disaggregated by poverty level.

3.67 After finding arsenic in the shallow tube wells used by up to 15 percent of Bangladeshi families for their daily water supply, the government of Bangladesh and UNICEF started a public health campaign to convince families to use new water sources.<sup>[24]</sup> The switch led to a 28 percent increase in child mortality, as the authors predicted. Their logic was as follows: The new water sources often contained surface water, which is heavily contaminated compared to tube wells, and the sources are farther away, which increases the likelihood that families will let water sit because they cannot fetch it as often. Longer storage times increase the likelihood of fecal contamination, and therefore of diarrhea, because the water is frequently exposed to dirty hands or utensils.

3.68 Studies rated AA on water provision in Bolivia and on mechanisms that indirectly alter the provision of water supply in Colombia also found significant reductions in under-five mortality.<sup>[32,49]</sup>

3.69 Not only did nonhealth sector interventions produce large effects on child mortality, evidence suggests that they may be more cost effective than the included health care provision interventions. After five years, Brazil's *Programa Saúde da Família* was estimated to cost from \$21,976.78 to \$34,766.91 per life saved, although the number falls significantly over time.<sup>[56]</sup> An AA study on the Bolivian Social Investment Fund, which gave money to communities to implement their own projects, reported a similar cost at \$20,000 per death averted for health-care projects.<sup>[49]</sup> Conversely, the public monitoring program in Uganda was estimated to cost \$300 per death averted,<sup>[12]</sup> and the water projects supported by the Bolivian Social Investment Fund were cheaper than their health care counterparts, costing \$15,000 per death averted.

3.70 A second trend is a geographical one. Interventions in Latin America, a region with relatively low under-five mortality rates, were significant and often quite effective.<sup>3[31,27,56,30,49,1,32]</sup> Latin America accounted for seven of the fifteen significant impact evaluations – almost twice as many as any other region – and two of the five AAA studies. Four of the seven interventions produced a substantial reduction of 15 percent or more in under-five mortality. However, it is unclear exactly what drives this success. All were government programs, but so were six of the remaining eleven interventions. Only one of the seven interventions specifically targeted children, and only two had any special focus on rural or poor populations, which tend to have higher child mortality rates.<sup>[27,49]</sup> One might be tempted to

conclude that the interventions themselves were simply more effective, but although none of the interventions in other regions were *exactly* the same, there were similar water and educational programs in Bangladesh and Indonesia, respectively, which were even more effective than those in Latin America. More data would be needed to identify clear trends that could account for the singular success in Latin America.

### Box 3.3. Results from AA Studies

**Public participation** can work to reduce under-five mortality. Besides the Ugandan public monitoring intervention, the Bolivian Social Investment Fund<sup>[49]</sup> and Brazil's participatory budgeting program<sup>[30]</sup> were both successful interventions that relied on public participation. In the former, intervention communities were too isolated for effective direct government involvement, and the under-five mortality rate was quite high (94 deaths per 1,000 live births). In the latter, participatory budgeting allowed citizens to negotiate municipality budgetary allocations with elected officials, leading to significant increases in health and sanitation spending; sanitation infrastructure was particularly bad in these areas. Average education was low (3.1 years per person over 25 years old), as was per capita monthly income (R\$2,000). The under-five mortality rate was 50 deaths per 1,000 live births when the program started in the early 1990s, and but it fell by over 16 percent as a result of the new budgets.

**Service packages** have also produced significant declines in under-five mortality. Service packages combine interventions across the continuum of care, such as the Matlab program, which encompassed maternal services and fertility planning with vaccinations for children. Of the three interventions that rely on service packages, two of the three were significant, and all three found that service packages lead to a decrease in child mortality.

The first significant study evaluated the program in Matlab, Bangladesh, wherein community health workers were recruited for home delivery of family planning services including educating women about birth control.<sup>[36]</sup> Matlab was a very conservative area regarding the status of women, and educational attainment was low (an average of 1.4 years of schooling for a person more than 15 years old).

The second significant intervention was the World Bank's SMP in Indonesia,<sup>[4]</sup> where health workers were trained and an education campaign was undertaken to increase residents' awareness of what services were available to them. At the time, women had an average of 4.1 years of schooling, and nearly 60 percent were employed. The study population had an under-five mortality rate well above the national average (70 deaths per 1,000 live births instead of 38). In the intervention that was not significant – an IMCI program in Bangladesh – over half the women has some level of education, and over half of child deaths were caused by pneumonia, diarrhea, malnutrition, and measles.<sup>[2]</sup> The null result may have been a power issue, however, as the baseline census showed a substantially lower mortality rate than the authors had originally expected.

These packages often contain both health and nonhealth sector components, and the existing impact evaluations cannot isolate their effects. Future impact evaluations with multiple treatment arms to isolate these effects would contribute important policy information.

*What Do We Still Need To Know?*

3.71 The many significant studies in Latin America highlight the lack of evaluations where one would expect to find them. In 2011, about half of the 6.9 million child deaths occurred in only five countries (United Nations Inter-agency Group for Child Mortality Estimation 2012): India, Nigeria, the Democratic Republic of the Congo, Pakistan, and China. Notwithstanding, only one rigorous impact evaluation was completed since 1995 that examined how to reduce mortality in these countries. Yet even that study, an AA evaluation of health insurance in China, found no significant difference in treated and untreated groups.<sup>[18]</sup> Moreover, according to the World Development Indicators, the countries with the worst under-five mortality rates in 2010 were Somalia, Mali, Burkina Faso, Sierra Leone, and Chad (United Nations Inter-agency Group for Child Mortality Estimation 2012). Yet not a single intervention evaluated impacts on mortality in any of these countries. Policy makers are effectively left without any robust evidence on what to do to combat under-five mortality in any of the countries where the most children die or where they die most frequently.

3.72 In addition to the unexpected geographical gaps, there are noteworthy gaps by cause of death. An analysis of causes of under-five mortality in the 42 countries that accounted for 90 percent of such deaths in 2000 revealed that, after neonatal disorders, the biggest child killers are diarrhea, pneumonia and malaria, accounting for a combined total of over half of child deaths (Black, Morris, and Bryce 2003). While there are established methods of preventing and treating these illnesses (Jones and others 2003), one would still expect to see impact evaluations examining the scalability of these methods and which delivery modality has the greatest impact on under-five mortality. Since 1995, two public campaigns to distribute insecticide-treated nets are the only rigorously evaluated intervention that directly addresses one of these three illnesses. Water and sanitation interventions affect diarrhea, but none were undertaken with that as a specific goal, and there are no studies on the effect of large-scale provision or utilization of oral rehydration therapy on under-five mortality, which is the main antidiarrheal treatment. This indicates that there is still much to prove regarding these three major illnesses.

3.73 One additional trend is notable for its absence. The 2012 Millennium Development Goals Report (UN 2012) identified rural and poor children as the two most vulnerable groups for under-five mortality, but very few impact evaluations have been done on interventions that target either. In fact, only four of the evaluated interventions targeted rural populations, and only of those evaluations was AAA.<sup>[18,12,36,21]</sup> The single evaluated intervention that targeted a poor population – the SMP in Indonesia – was an AA study.<sup>[4]</sup> However, four of the five were at least

CHAPTER 3  
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marginally significant, and three of those four interventions led to at least a 30 percent reduction in under-five mortality among the target population.

3.74 These gaps and trends are important to inform future research and policy makers. As demonstrated, however, key areas of missing information prevent drawing more definitive conclusions or recommending more specific interventions. Evaluators should focus on high-mortality countries and on the interventions that could do the most to save children's lives.

## 4. Conclusions and Lessons

4.1 This systematic review has explored interventions that can be effective in increasing SBA, the effects of doing so, and interventions that can reduce maternal, neonatal, infant, and under-five mortality, each in turn. Examining this evidence in aggregate yields still more insights into potential ways to make progress toward MDGs 4 and 5.

### Findings

#### WHAT HAS WORKED IN REDUCING MORTALITY IN MOTHERS AND CHILDREN?

4.2 It is worth repeating that because of concerns about how representative publicly available impact evaluations are of all interventions that may affect maternal and child mortality, the findings IEG presents in this review are suggestive of promising interventions. Yet, as this body of literature is in its early stages, the findings in this review are instructive even if not conclusive. Policy makers should judiciously apply lessons from these impact evaluations to the degree they believe there is a contextual match for those evaluations described here.

4.3 Interventions across the continuum of care have demonstrated improvements in SBA and reductions in maternal and child mortality. These interventions are often particularly effective in reducing mortality rates and increasing SBA among the poor. Interventions aiming to improve the quality, knowledge, and access to services have been effective in improving prenatal, delivery, and maternal mortality outcomes. Service packages can be effective in reducing neonatal mortality. Interventions falling outside the traditional health sector can yield demonstrable reductions in infant and under-five mortality.

#### *Complementary and Reinforcing Strategies Can Be Effective Across All Outcomes*

4.4 Interventions with complementary and reinforcing strategies are those that improve quality of care, knowledge, and access to services. Integrated maternal and child health interventions that promote SBA in this way can positively impact maternal mortality,<sup>[52,23]</sup> while those that affect only provision or utilization have little impact on maternal mortality.<sup>[39,18,35]</sup> There is some evidence that community-based approaches are ineffective for promoting SBA.<sup>[10,61,37,3,47]</sup> However, those designed to address neonatal care can also reduce perinatal and early neonatal mortality, particularly when tied to health workforce improvements. The spread of knowledge and information to households and individuals is often found bundled with

interventions that reduce infant mortality. The specific effects of the SMP and IMCI programs, both recognized service packages, are discussed in Box 4.1.

4.5 Importantly, the practice of bundling interventions creates a simultaneity challenge in evaluation. By their nature, interventions with complementary and reinforcing strategies are complex and generally include multiple components. Because any one of the components or some combination may be driving the results, attribution becomes difficult. Regression analysis of the most commonly bundled interventions hints that combinations of delivery modality, service packages, and household knowledge and information are associated with an increased likelihood that an impact evaluation of an intervention with bundled components finds a significant effect on SBA and mortality outcomes. Sample size limits the ability to control for other explanations.

#### Box 4.1. Integrated Management of Childhood Illnesses and Safe Motherhood Programs

The IMCI program and the SMP are the two main global strategies to provide essential care for mothers and children. There are few impact evaluations on either of these strategies, and the evidence of their effects is mixed.

Surprisingly for an intervention of such broad international application (Bryce and others 2004), impact evaluation evidence of IMCI effects is both thin (only two studies) and mixed.<sup>[2,9]</sup> No impact was found on under-five mortality from an AA quality study in Bangladesh. Yet an AAA study on an IMCI program in neighboring India reported significantly reduced early neonatal mortality and infant mortality. The IMCI package included management of diarrhea, pneumonia, and complementary feeding and information on when to seek medical care. Interestingly, this intervention's effect on mortality outcomes was driven by changes in home births; no effect was found on facility births. The authors also noted a higher prevalence of optimal newborn care practices and increases in the timely seeking of health care from appropriate sources in intervention areas.

The two evaluations of SMP come from China and Indonesia and also provide mixed evidence.<sup>[23,4]</sup> In China, the program reduced maternal mortality, in particular that caused by postpartum hemorrhage, through complementary and reinforcing strategies to promote SBA. The program in Indonesia did not find evidence of effects on maternal mortality or neonatal mortality, although it did report a one-third decrease in child mortality and marginally significant effects on infant mortality. The two programs differ in that the Indonesia SMP places a strong emphasis on community-based care, including health and family planning services, antenatal care visits, work with TBAs, and a large community outreach and awareness component that aimed to address low demand for safe motherhood services.

*Interventions That Incentivize Utilization Can Improve Skilled Birth Attendance and Infant Mortality*

4.6 The findings show that CCTs, vouchers, and other financial incentives can significantly increase SBA and may reduce infant mortality. Two of the three AAA evaluations report significant impacts on skilled birth attendance,<sup>[46,16,62]</sup> and this is supported with evidence from all AA evaluations of demand financing interventions.<sup>[53,55,51,39,7]</sup> Only one AAA study examined effects on infant mortality.<sup>[6]</sup> Positive impacts were observed in studies from both low- and middle-income countries with varying coverage of health care services, though there is evidence that effects are stronger among the poor above a certain minimal threshold of hygiene<sup>[6]</sup> and those who receive better quality of care.<sup>[55]</sup> Additionally, achieving optimal impacts from demand financing interventions requires proper attention to creating program awareness.<sup>[39,55]</sup>

4.7 There is evidence of significant effects on SBA and infant mortality, but no AAA impact evaluations of demand financing interventions demonstrated a significant effect on maternal and neonatal mortality or even examined the effect of such schemes on under-five mortality. Because these programs often target mothers, there is a missed opportunity to affect maternal mortality and neonatal mortality within the first 24 hours, both of which are responsive to appropriate medical care. Further evidence is required with respect to available CCTs and maternal health voucher programs designed to reduce neonatal mortality.

*Nonhealth Sector Interventions Can Reduce Child Mortality*

4.8 Nonhealth interventions led to significant reductions in neonatal, infant, and under-five mortality. There were 13 such interventions, half of which were AAA, distributed among water and sanitation, 7;<sup>[15,33,28,24,27,32,49]</sup> education, 3;<sup>[17,19,1]</sup> and energy, 3.<sup>[60,25,31]</sup> All AAA impact evaluations of interventions in nonhealth sectors reported significant effects on child mortality levels, as did nearly all AA evaluations; only one water and sanitation intervention failed to impact infant mortality. Water and sanitation and energy interventions address pneumonia and diarrhea, two of the largest child killers, whereas education interventions can have large effects on all causes of child mortality.

4.9 Water and sanitation programs demonstrated effective reductions in child mortality levels through privatization of water provision and infrastructure improvement funded through social funds.<sup>[27,28,32,49]</sup> Two additional water and sanitation evaluations tell cautionary tales: one from an arsenic mitigation campaign in Bangladesh credited with saving lives that actually led to increases in infant and



under-five mortality, and another that exposed the impact of water contamination from agricultural chemicals in India on neonatal and infant mortality.<sup>[24,15]</sup> Although these latter studies do not provide evidence of an effective intervention, they certainly underscore the importance of water and sanitation in child health and point to areas in which future interventions should focus.

4.10 Energy sector impact evaluations shed light on the causal pathway by which mortality rates were lowered and further demonstrate the beneficial outcomes of utility privatization. The evaluations of the two pollution regulation interventions demonstrated lower infant mortality from respiratory infections and internal causes, and the electricity privatization evaluation decreased under-five deaths from diarrhea and food poisoning.

4.11 Evaluations of education interventions showed significant effects on multiple child mortality outcomes; one also increased SBA. For example, a school construction program in Indonesia boasts incredibly large reductions across all three child mortality outcomes: 53 percent in neonatal, 43 percent in infant, and 48 percent in under-five.<sup>[17]</sup> External validity may be a concern, however, as the impediments to better schooling and education often differ by country; merely building more schools may not produce the same results in other countries. Nevertheless, the effects of nonhealth sector interventions underscore the importance of improving basic living conditions and highlight pathways to reduce deaths from two of the leading child killers: pneumonia and diarrhea.

#### *Heterogeneous Effects: Impacts Are Often Strongest Among Disadvantaged Populations*

4.12 Among the 23 AAA and AA studies with heterogeneous effects on outcomes, by far the most common measure of disaggregation was by socioeconomic status. Included in socioeconomic status is any measure of poverty, income, assets, literacy, or level of education. Across the SBA and child mortality outcomes, the heterogeneous results support the same general conclusion: a program's impact on outcomes increases in more socioeconomically disadvantaged settings. The evidence of this impact is seen from CCTs;<sup>[46,6]</sup> a social investment fund;<sup>[11]</sup> and even water provision<sup>[27,28,15]</sup> and air pollution regulation.<sup>[60]</sup> Evaluations of *Progresal*<sup>[6]</sup> and piped water provision in Brazil,<sup>[28]</sup> however, demonstrated the need for intervention areas to reach a minimum threshold of sanitation and development before they demonstrated effectiveness, although other studies did not report on this relationship.

4.13 The lack of heterogeneous effects by rural versus urban location across studies was somewhat surprising. A mobile phone intervention to promote SBA is

the only study that explored heterogeneous effects on this dimension, finding that the program improved SBA for urban but not for rural residents.<sup>[41]</sup> The virtual absence of heterogeneous effects by

location may be due to the fact that many programs were targeted to rural areas — nearly half (29) of the 68 interventions that the team examined. For such studies, no information on rural versus urban impacts would have been available. While targeting of programs is common and useful, results should be interpreted and applied with care.

**Box 4.2. Counts of Targeted Interventions**

Of 68 interventions, 53 were targeted:

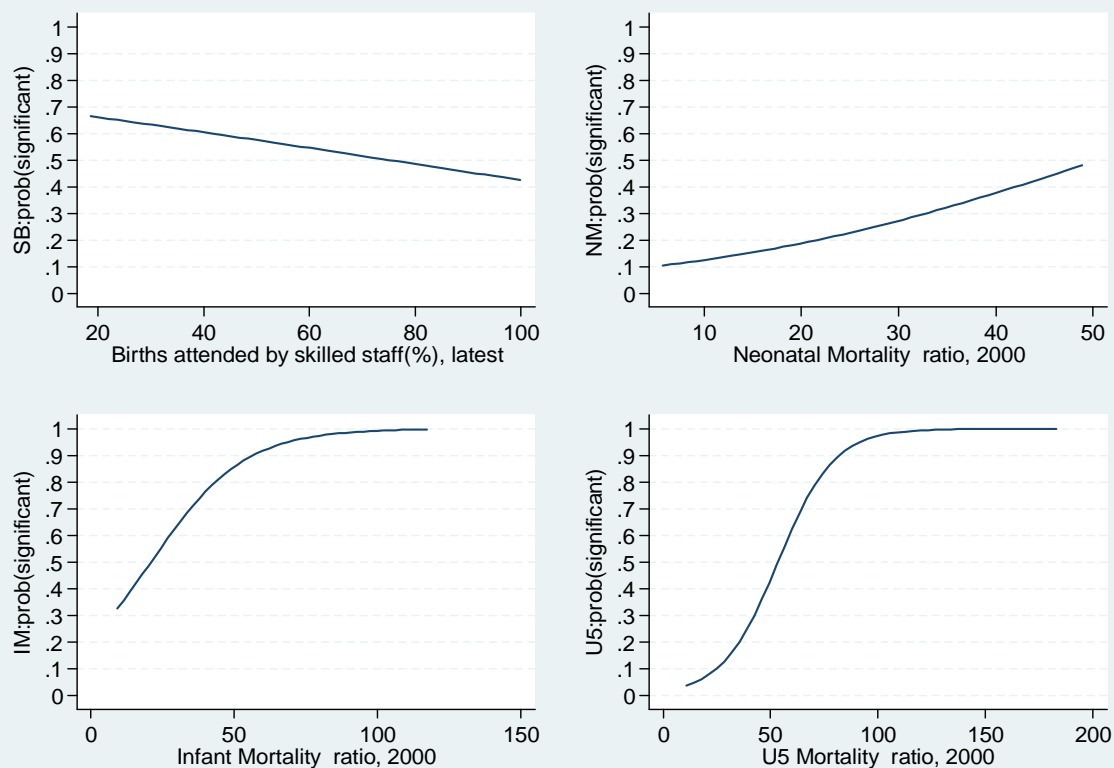
- 31 by gender
- 32 by location (rural, urban)
- 23 by age group
- 14 by poverty

*External Validity: Results Differ By National Mortality or SBA and Income Levels*

4.14 Interventions that yield significant results in one context may not necessarily work under different circumstances. A probabilistic analysis of the 68 impact evaluations used in this review sheds light on the relationship between the likelihood of an intervention having a statistically significant effect and two important contextual elements: the baseline levels of the country’s SBA and child mortality rates and the country’s income level. The small sample of studies and use of national data that may not fully reflect the location where the intervention takes place may be a concern. In Figure 4.1, impact evaluations of interventions in countries with lower percentages of attended births or higher child mortality outcomes are more likely to report significant results; the sample size for maternal mortality is too small. This may also suggest that in contexts where the severity of the problem is not extreme, MCH interventions may need to be tailored to achieve their goals of improving maternal and child health.

4.15 Together, these results imply diminishing marginal returns for SBA and maternal and child mortality interventions. although making additional gains is more difficult in areas already better at saving the lives of mothers and children, making progress is more likely in areas with more room for progress.

Figure 4.1. Beneficial Impacts Are More Likely To Be Observed in Problematic Areas

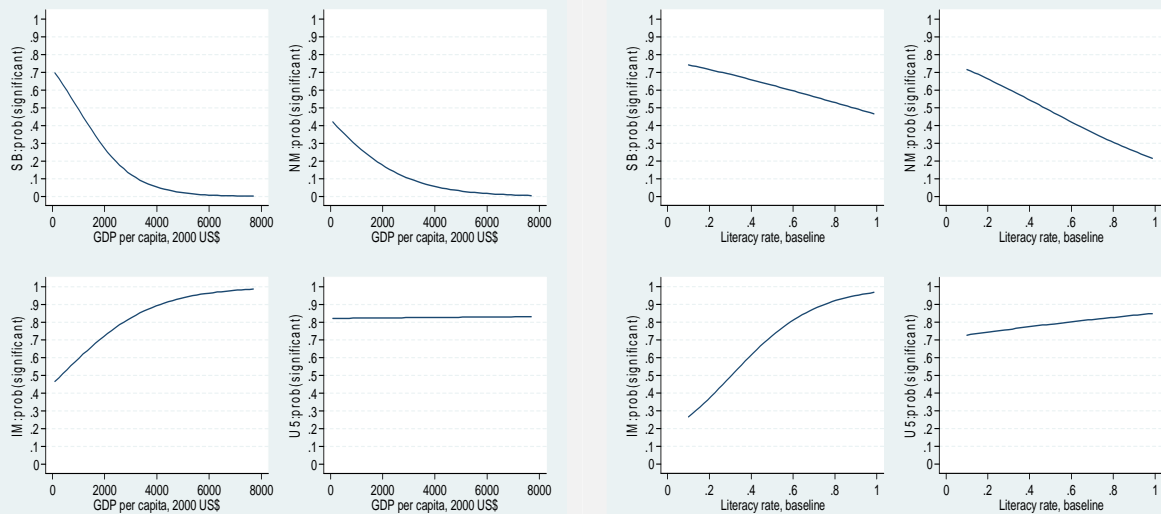


Source:

Note: The figure shows the relationship of the 2000 national SBA and mortality rates with the probability of an intervention causing a significant desirable effect. The figure is based on a probabilistic exercise where the dependent variable takes the value of 1 when the parameter reported in the study is statistically significant and has the expected sign, 0 otherwise. The exercise controls for type of evaluation and bias risk. SB = skilled birth attendance; NM = neonatal mortality; IM = infant mortality; U5 = under-five mortality.

4.16 The importance of tailoring interventions to specific contexts is further corroborated when analyzing the effect of country-specific income level and literacy rates and the significance of the effects obtained. In the case of SBA and neonatal mortality, interventions appear more likely to be effective in relatively poorer countries. Conversely, for the case of infant mortality, policies applied in relatively better-off contexts are more likely to yield significant results (see Figure 4.2). Under-five mortality seems to be uncorrelated with wealth or literacy, which is surprising, given its similarity to postneonatal infant mortality in causes of death.

**Figure 4.2. Beneficial Impacts Are More Likely To Be Observed in Poorer Countries for Skilled Birth Attendance and Neonatal Mortality, and in Richer Countries for Infant Mortality**



*Note:* The figure shows the relationship of the 2000 national gross domestic product (GDP) and literacy rates with the probability of an intervention causing a significant desirable effect. It is based on a probabilistic exercise where the dependent variable takes the value of 1 when the parameter reported in the study is statistically significant and has the expected sign, 0 otherwise. The exercise controls for type of evaluation and bias risk. SB = skilled birth attendance; NM = neonatal mortality; IM = infant mortality; U5 = under-five mortality.

4.17 The types of interventions studied may explain these findings. There are more impact evaluations of governance and nonhealth sector interventions in infant and under-five mortality. They may require a higher level of capacity and development as is more often found in relatively better-off countries. Alternately, this trend may be explained by differences in the nature of outcomes across the continuum of care: SBA and neonatal mortality may require less costly and a more limited set of interventions time clustered around delivery – which are easier for poor countries to tackle – whereas the more complex nature of infant and under-five mortality requires more varied interventions – making it more difficult for poor countries and more likely in relatively rich countries with better functioning health and nonhealth sectors.

4.18 This result is corroborated by the similar pattern of relationships between literacy rates and intervention effectiveness for SBA and mortality outcomes. Interventions with a more compact causal density may be less influenced by environmental factors such as mothers' literacy, whereas outcomes with a longer period of exposure to environmental risks may be more affected by environmental factors. Mothers in more literate areas may be better able to benefit from interventions affecting infant mortality, whereas mothers from less literate areas

may benefit disproportionately from interventions affecting birth and early neonatal mortality.

4.19 Taken together, these correlations hint at an interaction between program effectiveness and environment, suggesting a few factors that may affect the transferability of effects from one setting to another: baseline mortality, poverty, and literacy.

### *World Bank Projects and Financing*

4.20 Of the 68 interventions evaluated in this systematic review, 15 were of World Bank projects (4) or financing (11).<sup>1</sup> As seen in table 4.1, SBA was the most frequently evaluated outcome,<sup>2</sup> and the World Bank has had partial success in improving this outcome: six of the nine interventions produced significant increases, including two of the four AAA evaluations.<sup>[49,4,54,12,26,7,39,46]</sup>

Table 4.1. Number of Impact Evaluations by Type of World Bank Involvement

Type of involvement	SBA		MM		NM		IM		U5		Number of unique IEs
	AAA	AA	AAA	AA	AAA	AA	AAA	AA	AAA	AA	
Funding	1/3	3/4		0/1	0/1	0/2	1/1	1/3	1/1	1/1	11
Project	1/1	1/1					1/1	2/2	1/1	1/1	4
<b>Totals</b>	<b>2/4</b>	<b>4/5</b>		<b>0/1</b>	<b>0/1</b>	<b>0/2</b>	<b>2/2</b>	<b>3/5</b>	<b>2/2</b>	<b>2/2</b>	<b>15</b>

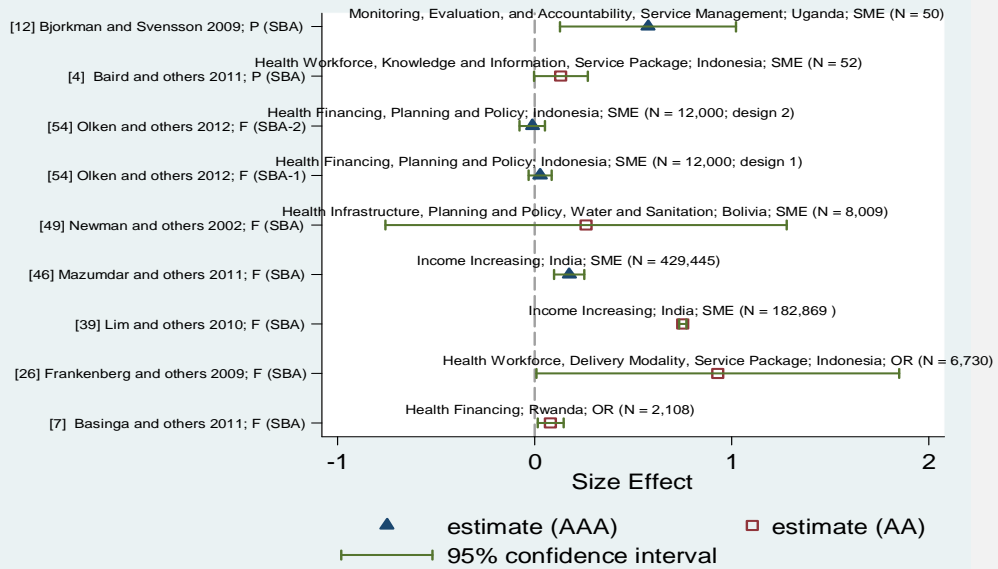
*Source:*

*Note:* The first number shows the number of significant studies; the second is the total number of evaluations of World Bank projects or financing with the specified outcome. IE = impact evaluation; SBA = skilled birth attendance; MM = maternal mortality; NM = neonatal mortality; IM = infant mortality; U5 = under-five mortality.

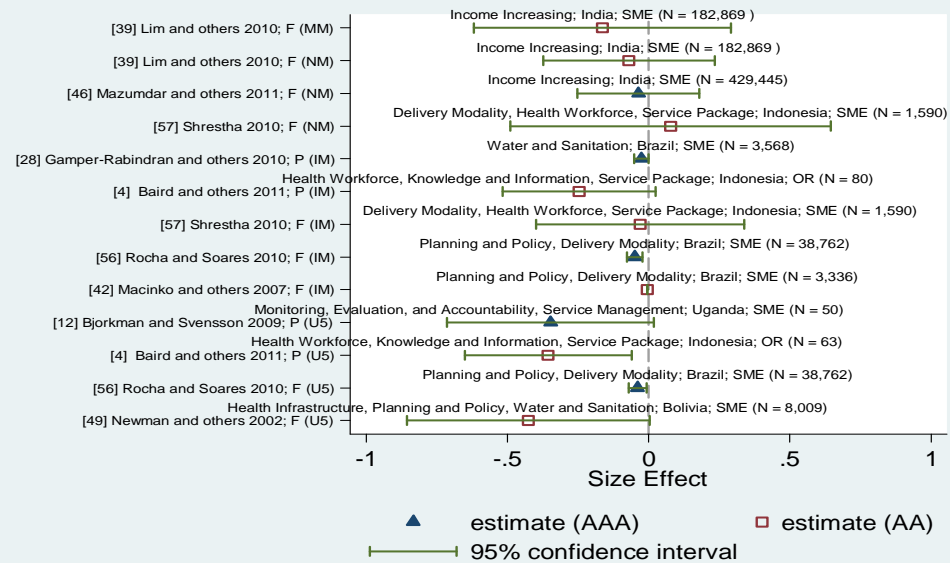
4.21 Bank projects and financing with an impact evaluation were unsuccessful in demonstrating significant impacts in maternal or neonatal mortality,<sup>[57, 39, 46]</sup> although again, the null finding in maternal mortality could be due to insufficient power. There were promising results in infant and under-five mortality, where a majority of the studies, including all three AAA evaluations, found significant reductions.<sup>[28, 57, 11, 56, 12, 42, 4, 33, 49]</sup> Still, it is worth noting that two of the three impact evaluations reporting significant point estimates indicated an effect of less than 5 percent reductions in infant mortality, as compared to an average reduction of closer to 20 percent for significant non-Bank interventions affecting infant mortality included in this review.

Figure 4.3. Impact Estimates and Confidence Intervals of World Bank–Financed Interventions and Projects

Impacts on Births Attended by Skilled Health Personnel



Impacts on Maternal and Child Mortality



Note: Numbers in brackets in the y-axis refer to the study number in the reference list. World Bank involvement type is indicated in the y-axis with letters P (projects) and F (funding). Size effect is measured as the impact effect expressed as percent of a baseline measure, standard mean effect (SME). For those studies reporting impact effect in terms of odds ratios (OR), the size effect was computed as the logarithm of the OR. The whiskers represent the 95% confidence interval of the impact estimates. Outcomes include: SBA = skilled birth attendance, MM = maternal mortality, NM = neonatal mortality, IM = infant mortality, and U5 = under-five mortality..

4.22 Only four of the 15 evaluated World Bank interventions were World Bank projects rather than World Bank financing. AAA studies evaluated projects to improve piped water provision in Brazil<sup>[28]</sup> and community monitoring in Uganda<sup>[12]</sup>, and two AA studies evaluated the SMP in Indonesia<sup>[4]</sup> and the Rural Poverty Reduction Program in Brazil.<sup>[11]</sup> Of the two AAA evaluations of World Bank projects, the Uganda study demonstrated a marginally significant but large reduction on infant mortality (even with low power) and significant, large increase in SBA, while the Brazil impact evaluation reported a significant reduction in under-five mortality. When the two AAA evaluations are taken with the two AA studies, the results mirror the general findings for World Bank interventions: significant reductions in all four projects in either infant or under-five mortality and significant increases in SBA for two of the three reporting on that outcome.

#### WHAT DO WE STILL NEED TO KNOW?

4.23 Though the global community has been working toward MDGs 4 and 5 for nearly 15 years, important gaps still remain in the impact evaluation evidence regarding which interventions are effective in reducing maternal and child mortality. Gaps include coverage of impact evaluations over the broader intervention space, gaps between evidence and the World Bank's MCH strategy and portfolio, and gaps in evidence by region. Other gaps exist in understanding the mechanisms through which these interventions work and the effectiveness of integrating them into current MCH strategies and evidence of similar interventions over multiple contexts.

#### *Gaps by Intervention Type*

4.24 Significant research gaps over the intervention space remain, especially regarding high-quality evidence. Even where there is evidence available on the effect of a type of intervention, that evidence is typically thin, often with only one or two studies, and drawn from a mix of AAA- and AA-rated studies. There are no more than four AAA-rated evaluations of a given mortality outcome for any one type of intervention – and even those are too disparate to make definitive conclusions on whether or under what conditions a class of interventions works generally. Worse, there are intervention families with no available evidence at all. The determination of effective interventions requires a more robust and more densely populated evidence base.

4.25 Particularly sparse are impact evaluations of interventions in governance, health information systems, health financing, and certain nonhealth sectors: income-generating or labor market interventions; agriculture, food security, and nutrition

interventions; and transportation infrastructure interventions. These areas have clear theoretical underpinnings of how they could lead to lower maternal and child mortality, but there is no impact evaluation evidence to support these models or specify what types of interventions might be more or less effective.

4.26 For those interventions that demonstrate promising results, important areas for further research still exist. Evaluators should investigate the further integration of effective services into mainstream health systems and across the continuum of care. For example, how can programs – like CCTs or the Integrated Management of Neonatal and Childhood Illness – that have demonstrated effectiveness on SBA and infant mortality outcomes improve neonatal health? Other research could include the repetition of promising interventions in various contexts and comparison of multiple interventions designs or delivery methods. For example, although some elements of the nonhealth sector look promising, such as water and sanitation, education, and energy, in reducing child mortality, still more studies are needed to establish the applicability of these findings to other settings and to understand the mechanisms by which they work.

4.27 Additionally, there is a need for evaluations that can tease out the potential synergies and dense causal pathways of the complementary and reinforcing strategies of bundled projects. Several studies in this review examine interventions with multiple salient components that make attribution difficult. Health sector interventions are unlikely to become less complex, but further evaluations of such bundled projects could usefully inform policy makers of the critical components and most advantageous combinations likely to yield results.

#### *Gaps by Evaluation Components*

4.28 The inclusion of additional components in impact evaluations in maternal and child health can increase their relevance. Distributional impacts of interventions on particularly relevant population subsets (those from lower socioeconomic groups, rural areas, or places with persistently higher mortality rates) and cost analysis are of significant interest to researchers, policy makers, and development practitioners.

4.29 Just one-third of studies in this review provide information on heterogeneous effects, although this is some of the most useful information an evaluation can provide. Such distributional disaggregation of impacts would allow more effective targeting of future programs.



4.30 Impact evaluations can do more to unpack the black box of causal pathways. The how and why of the intervention are as important as the estimated impact. Evaluation design, particularly for RCTs, can partially address this by evaluating multiple arms to understand behavioral response to different incentive structures. Impact evaluations that report both intermediate and ultimate outcomes could better establish the causal link between intervention and impact. By providing evidence that links intermediate and mortality outcomes, such impact evaluations could expand the body of available literature to be able to include evaluations that only report intermediate outcomes.

4.31 Additionally, greater integration of mixed methods would increase understanding of the causal pathways leading to observed outcomes. Process evaluation, focus groups, and other qualitative methods can uncover issues in design, implementation, or social context that affect a program's estimated impact, either positively or negatively. In addition to an improved understanding of the causal pathway, mixed methods provide valuable information for scaling-up programs or implementing them in a new context and telling the story of failure, or why something doesn't work. Mixed methods are particularly useful in these cases when an impact evaluation indicates a null result; complementary evaluation techniques can help tease out whether the findings is a function of challenges in statistical power, implementation, attrition, incentives, and so forth.

4.32 Most IEs evaluate an intervention at a single point in time (China's SMP being a notable exception), implying implicitly that impact findings are temporally stable. Yet, for nearly every outcome reviewed here, length of exposure is associated with the likelihood of observing a statistically significant effect of the intervention being evaluated. This has both internal and external validity implications. Impact evaluations may be able to establish causal attribution at a specific point in time, but their methods could be applied to elucidate the impact paths of an intervention over time, which need not be monotonically increasing, much less constant. Still, the finding that interventions are more likely to lead to desirable outcomes the longer they are in place implies a level of required patience for policy makers. Most interventions take time to deliver results.

4.33 Very few studies report cost analysis of any kind, and fewer still have any cost-effectiveness data. Where it does exist, the quality is generally poor, amounting to "back of the envelope" calculations, and disparate methods of calculation means estimates are not comparable. Cost information is critical to sound policy decisions, and its general absence in this pool of studies magnifies the call issued elsewhere for its inclusion in impact evaluations. Impact evaluations can provide an accurate

assessment of the mortality benefits of interventions, however, more careful accounting is needed on costs to aid policy makers trading off one set of interventions for another. For the Bank, this underscores the importance of strengthening cost-effectiveness analysis in project preparation, as highlighted in the IEG report *Cost-Benefit Analysis in World Bank Projects* (IEG 2010a).

*Gaps by Strategy: Leaps of Faith*

4.34 The absence of evidence in certain intervention families points to a larger problem of creating global strategies to improve maternal and child health when there is such a thin evidence base on understanding the attributable effects of the intervention set. Although addressing these gaps through more impact evaluations will not in itself solve the challenge of MDGs 4 and 5, evidence in these areas can increase the effectiveness of global strategies by enabling better decision making for investments to reduce deaths of mothers and children.

4.35 For example, increasing the proportion of births attended by skilled health personnel is an intermediate indicator for MDG 5, based on its role in helping to reduce maternal deaths, yet there is no quality impact evaluation evidence of this effect. The evidence is consistent regarding a null result on the effect of these interventions on neonatal mortality, but this is based on only two studies. In child health, the lack of sociobehavioral impact evaluations for popular strategies such as immunization campaigns is surprising, and evaluations of the mortality effects of standardized programs, such as IMCI and SMPs, are few in number. Impact evaluations with mortality outcomes for interventions addressing some of the main causes of child death, such as diarrhea or pneumonia, are also absent.

*Gaps for the Bank's Strategy*

4.36 As indicated in Chapter 1, the explicit strategy of the World Bank is largely reflected in the governance and health sector provision elements of this report's intervention taxonomy. The de facto maternal and child mortality strategy for the World Bank can be proxied by examining the types of projects that the Bank funds. The team executed a portfolio check of all projects approved by the Bank over the past decade in the Human Nutrition and Poverty, Poverty Reduction and Economic Management, and Social Protection sectors, as well as water, energy and mining, and social development projects in the Sustainable Development Network that were coded with health theme or sector outcomes. The project objectives were flagged for mentions of increasing SBA<sup>3</sup> or reducing maternal, infant, or under-five mortality (omitting neonatal mortality as a separate outcome). These filtered projects' components were mapped against the review's intervention framework.

Significantly, given the substantial effect that nonhealth sector interventions had on infant and child mortality, none of the water or energy projects had explicit MCH objectives. Project frequencies were compared to the findings in impact evaluation evidence by intervention and mortality or skilled birth outcome. The results can be seen in table 4.2; a detailed disaggregation is in Appendix I.

**Table 4.2. Projects from HNP, SP, PREM, and Select SDN Sectors Approved from FY03–12**

All: 109 projects	World Bank projects (of 109)	All impact evaluations (of 68)
Governance	108	9 (4 AAA, 5 AA)
Donor Support and Coordination	28	0
Provision: Health Sector	107	41 (11 AAA, 30 AA)
Provision: Nonhealth	9	14 (7 AAA, 7 AA)
Utilization	66	34 (10 AAA, 24 AA)

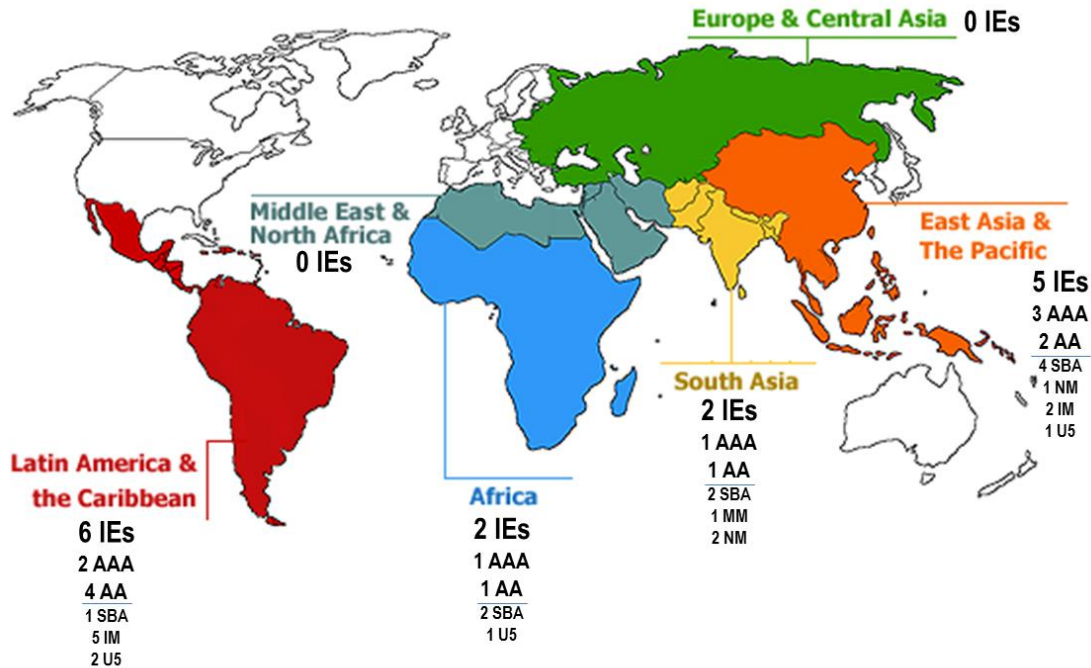
*Note:* HNP = Health, Nutrition, and Poverty Network; PREM = Poverty Reduction and Economic Management Network; SDN = Sustainable Development Network; SP = Social Protection Network.

4.37 Currently, there are gaps between the body of IE evidence and the distribution of Bank projects with maternal and child health objectives. Specifically, the World Bank has been quite active in the governance sector, an area where there are few impact evaluations. Within the health sector, the World Bank has funded numerous projects for intervention types with little to no IE evidence on mortality, such as health infrastructure, health information systems, and medical projects and technologies.<sup>4</sup> The Bank has had a nonnegligible number of activities with elements of donor support and coordination with MCH goals (for example, budgetary support, sectorwide approaches, basket funding, and direct bilateral funding of government efforts); though there are no impact evaluations in this area, that may be a function of inappropriate fit of impact evaluation methods to nationwide projects where establishment of a counterfactual is less clear. Still, although World Bank funding decisions should consider the full breadth of available evidence, these gaps signal an unmet need for more impact evaluations in these areas to strengthen the full body of evidence.

4.38 Although figure 4.4 shows significant regional gaps in the distribution of impact evaluations of World Bank projects or financing, it masks the full extent of the problem. Of the 15 interventions evaluated, 11 came from just three countries: All five of the East Asian and Pacific interventions took place in Indonesia, both South Asian interventions were in India, and four of the six interventions in Latin America and the Caribbean occurred in Brazil. This extreme concentration is out of harmony with the World Bank’s geographically diverse mission. It should actively encourage evaluations in a more representative sample of countries. It is possible

that these gaps are caused by regional or country variation in data quality and availability; measurement of maternal mortality in particular faces challenges in data collection and measurement error. When possible, the World Bank should work within countries to strengthen the measurement of vital statistics.

Figure 4.4. Regional Distribution of Impact Evaluations with World Bank Involvement



*Note:* World Bank regions have been used for convenience. SBA = skilled birth attendance; MM = maternal mortality; NM = neonatal mortality; IM = infant mortality; U5 = under-five mortality.

4.39 The Bank could benefit from not only more geographically diverse evaluations, but from evaluations that examined a greater diversity of outcomes across the regions. As shown in figure 4.5, South Asia and Sub-Saharan Africa have the highest burden of women delivering without SBA, but it is in East Asia and Pacific – the region with the second-lowest burden – that the World Bank has the greatest amount of evidence: four of the nine SBA interventions evaluated were in Indonesia, as compared to two each in South Asia and Sub-Saharan Africa. Similarly, five of the seven interventions aimed at decreasing infant mortality were in Latin America and the Caribbean, which has the second-lowest burden in that indicator. This information is useful, but having so much of the evidence for Bank projects and financing on these two indicators be concentrated in low-burden regions leaves the World Bank without causal evidence in the most problematic areas.

4.40 As an organization with breadth and depth, the World Bank should also work to contribute to thickening the evidence base in areas with numerous interventions but few or no impact evaluations, as illustrated in Appendix I. This is particularly true for evaluations in areas where the Bank has an advantage because of its cross-sectoral work. Specifically, there are no or few impact evaluations with estimated effects on maternal and child mortality in nonhealth sectors, such as energy, agriculture and food security, and transportation infrastructure, but these sectors have a clear logical link to health outcomes.

4.41 Fortunately, there is some recognition of this geographic imbalance. Of the 23 impact evaluations underway in Results Based Financing with the Bank's Health Results Innovation Trust Fund, more than half are in Sub-Saharan Africa. Outside of health financing, additional impact evaluations are under implementation through Strategic Impact Evaluation Fund and the Development Impact Evaluation Initiative, including the initiative's work with the government of Nigeria to evaluate a series of MCH-targeted interventions. Where appropriate and sufficiently powered, impact evaluations from these Bank groups would improve their relevance if they estimated program impacts on mortality. More IEs on other gaps would be welcome, be they by the Bank or others. Regions themselves are likewise encouraged to work to fill these gaps; as they do so, they are likely to find useful the Impact Evaluation Toolkit developed by HNP at the World Bank.<sup>5</sup>

### *Gaps by Region*

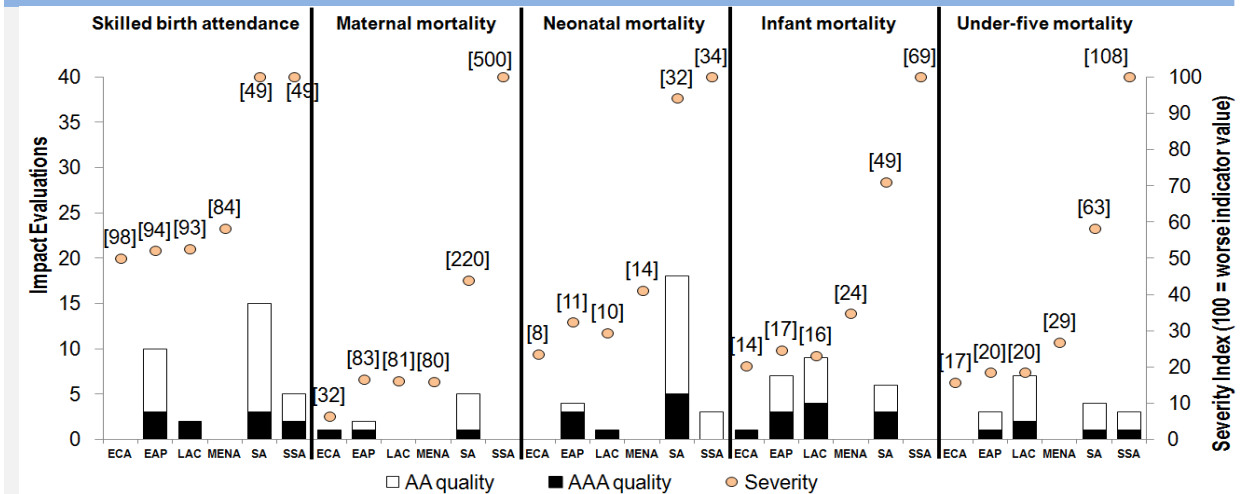
4.42 While complete enumeration of the contextual factors affecting the transference of impact evaluation implications from one context to another is unknown, it is reasonable to believe that external validity is higher within regions than across regions. Moreover, given the close relationship between maternal and child mortality and the importance of interventions that incorporate the continuum of care, evidence is needed across all outcomes in all regions of the world. Disappointingly, some regions are vastly underrepresented by impact evaluations on SBA and maternal and child mortality.

4.43 Across all outcomes, studies in Sub-Saharan Africa are few. Within the region, studies examining SBA are most frequent, and even then West Africa is still entirely absent. High numbers of infant and child mortality evaluations occur in Latin America, but no studies exist in the Caribbean or on maternal mortality in the Latin American and Caribbean Region. Studies in East Asia and Pacific are included for all outcomes, but with generally low representation and concentrated in few countries. There is only one impact evaluation in Europe and Central Asia, and none in the Middle East and North Africa Region.

*Gaps by Severity of the MDG Shortfall*

4.44 Imbalances in regional representation of impact evaluation evidence take on increased importance when considering current levels of SBA and mortality and regional variation in the progress needed to meet MDG targets. Figure 4.5 juxtaposes SBA and mortality severity levels with the number of evaluations per region. The lack of progress in these areas is clearly not because of the lack of impact evaluations; where methodologically feasible, impact evaluations can indicate the attributable impacts of interventions, including those aimed at improving institutional quality, and thereby steer investment to more productive use.

**Figure 4.5. Regional Gaps Between Mortality Incidence and Impact Evaluation Evidence**



Source: World Development Indicators.

Note: Numbers in brackets represent the actual (unindexed) percent of births attended by skilled health staff or standard mortality ratios measured per 100,000 live births in the case of maternal mortality and per 1,000 live births for the neonatal, infant, and under-five mortality, most recent years available. World Bank regions have been used for convenience. ECA = Europe and Central Asia; EAP = East Asia and Pacific; LAC = Latin America and the Caribbean; MENA = Middle East and North Africa; SA = South Asia; and SSA = Sub-Saharan Africa.

4.45 The low numbers of studies in Sub-Saharan Africa is particularly alarming against the high child mortality and maternal mortality rates in many countries in the region. Sub-Saharan Africa has the highest maternal mortality ratio, but there are no AAA or AA impact evaluations with maternal mortality as an outcome in the region. The top 10 countries with the highest neonatal mortality rates are all in Sub-Saharan Africa, but only 10 percent of the 30 evaluations of neonatal mortality are of interventions in this region. Of the five countries that make up more than half of global child deaths, there are no impact evaluations in Nigeria, the Democratic Republic of Congo, or Ethiopia.

4.46 Sub-Saharan Africa is not the only region of concern. China, which with India rounds out the list of five countries with the most child deaths, is particularly underrepresented. Although there are no impact evaluations from the Middle East and North Africa region it is in the middle of the distribution in mortality and SBA.

## Conclusion

4.47 Progress in reaching MDGs 4 and 5 to reduce child and maternal mortality has been slow. Overall, the evidence base on intervention effectiveness is remarkably thin. Furthermore, gaps remain by region, specifically in Sub-Saharan Africa; by outcome, particularly maternal mortality; and by evaluation components, namely heterogeneous effects, temporal exposure, mixed methods, and cost analysis. The World Bank, as a primary producer of impact evaluation evidence, would do well to provide leadership in closing these gaps.

4.48 Impact evaluations presented in this report provide some evidence of interventions that can accelerate progress in maternal and child mortality. Policy makers must be judicious in application of these lessons, but there is reason for hope. Provision of service packages that integrate care for mothers and children; improvement to the quality of maternal care in combination with increased access and maternal knowledge; vouchers and CCTs; projects improving governance; and interventions in water, education, and energy all enjoy a near-consensus of impact evaluation evidence for reducing maternal and child mortality.

4.49 Opportunely, the worst off may be easiest to help. Impact evaluations of interventions in countries with worse baseline SBA and mortality rates were more likely to find significant positive impacts of those interventions. Moreover, where the disaggregation exists in the evaluations, households of lower socioeconomic status experience greater beneficial impacts. Because households and countries with low rates of SBA and high rates of maternal and child mortality are more able to have their fate changed by appropriately designed interventions, MDGs 4 and 5 may still be within reach, even if not by the 2015 deadline.

4.50 Finally, the findings in this systematic review do not, in themselves, constitute a strategy for reducing maternal and child mortality. Rather, this review is intended to be a key input to inform such a strategy. Decisions to adopt a given intervention should be done with careful examination of contextual similarities of the target area to those impact evaluations reported here, to encourage solutions that are technically correct, politically supportable, and administratively feasible.

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## Appendix A: Intervention Definitions

Intervention Category	Intervention Type	Explanation	Examples
Donor support	Coordination	Development partners working together to maximize aid effectiveness	<ul style="list-style-type: none"> <li>• Sectorwide approaches</li> <li>• Basket funding</li> </ul>
	Integration	Alignment of donor support with partner countries' national development strategies, institutions, and processes	<ul style="list-style-type: none"> <li>• Bilateral support</li> <li>• Budget support</li> </ul>
Government, governance, or stewardship	Strategy planning and policy	Across the government entities, developing, implementing, and enforcing strategies and policies that affect health outcomes at national, regional, and community levels	<ul style="list-style-type: none"> <li>• Setting national priorities</li> <li>• National strategies for disease prevention, treatment, and control</li> <li>• Adoption of specific health standards or guidelines</li> <li>• National human-resource plans including training, deployment, retention, skill mix, and appropriate regulation</li> <li>• Social investment funds</li> <li>• Community-driven development</li> </ul>
	Public financial management	Public financial management deals with the budget cycle and its credibility, comprehensiveness, and transparency.	<ul style="list-style-type: none"> <li>• Revenue administration</li> <li>• Budget formulation</li> <li>• Accounting, recording, and financial reporting</li> <li>• External scrutiny and audit</li> <li>• Transparency of intergovernmental fiscal relations</li> <li>• Participatory budgeting</li> </ul>
	Regulation and licensing	They occur when government exerts control over the activities. In practice, regulatory action seeks to influence market entry and exit, remuneration of providers, quality and distribution of services, and standards and quality. Licensing of professionals to provide services is one of the key forms of regulation.	<ul style="list-style-type: none"> <li>• Regulation of civil society organizations</li> <li>• Regulation of pharmaceuticals</li> <li>• Licensing of professionals</li> <li>• Business regulations and taxation</li> <li>• Hospital and health facility accreditation</li> </ul>
	Monitoring and evaluation	Government-led monitoring and evaluation systems, which are linked to the health information systems, are important to determine whether policies and programs	<ul style="list-style-type: none"> <li>• Program assessment</li> <li>• Resource tracking</li> </ul>

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		are having an impact on targeted goals.	<ul style="list-style-type: none"> <li>• Promotion of accountability of local governance structures to the people</li> <li>• Citizen report card</li> </ul>
	Multisector coordination	Multisector coordination is a recognized relationship between part or parts of the health sector with parts of another sector that has been formed to take action on an issue to achieve health outcomes in a way that is more effective, efficient, or sustainable than could be achieved by the health sector acting alone. Government has the role to formulate national policies, strategies, and plans of action to launch and sustain primary health care as part of a comprehensive national health system and in coordination with other sectors.	<ul style="list-style-type: none"> <li>• Building systems of local government that incorporate representatives from health, education, and agriculture</li> </ul>
	Public-private partnership	It is characterized by the sharing of common objectives, as well as risks and rewards, as might be defined in a contract or manifested through a different arrangement, so as to effectively deliver a service or facility to the public. The private sector partner may be responsible for all or some project operations, and financing can come from either the public or private sector partners or both. The government provides legally structured environment which allows partnered structuring in service delivery.	<ul style="list-style-type: none"> <li>• Engaging in contracting arrangements to supplement government service provision or social marketing</li> <li>• Legal framework around contracting out</li> </ul>
Health sector	Delivery modality	The point at which resources and services are made available to the user	<ul style="list-style-type: none"> <li>• Clinical care (primary, secondary, and tertiary levels)</li> <li>• Community-based care (such as home-based care and home visits)</li> <li>• Mobile clinics</li> </ul>
	Service package	Bundling of any combination of interventions related to reproductive, maternal, newborn, and child health across the continuum of care.	<ul style="list-style-type: none"> <li>• Family planning services</li> <li>• Safe Motherhood Program</li> <li>• Antenatal care services</li> <li>• Integrated Management of Childhood Illness</li> <li>• Newborn care</li> </ul>
	Health infrastructure	Physical structure and operation of health facilities, including equipment, utilities, waste management,	<ul style="list-style-type: none"> <li>• Construction or improvement of physical facilities including emergency obstetric care, primary health care</li> </ul>

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	transport, and communication. It also involves investment decisions, with issues of specification, price, and procurement and considering the implications of investment in facilities, transport, or technologies for recurrent costs, staffing levels, skill needs, and maintenance systems.	facilities, hospitals, and maternity waiting homes
Service management	At facility level, making inputs (that is, financial resources, competent health care staff, adequate physical facilities and equipment, essential medicines and supplies, current clinical guidelines, and operational policies) available and accessible and properly used to carry out service delivery and produce desired health outcomes. It aims to maximize service coverage, quality, and safety, and minimize waste.	<ul style="list-style-type: none"> <li>• Quality assurance through provision of supervisory structures, standard treatment guidelines, management quality assurance processes, medical records audit, and health facility inspection, for example</li> <li>• Improvement of work environment</li> <li>• Regular planning and evaluation</li> <li>• Ensure prompt detection, management, and referral of complications</li> <li>• Design and apply appropriate strategies for timely responses to reduce delayed use of services and poor compliance with treatment</li> <li>• Supply and management of drugs and essential laboratory services</li> </ul>
Health workforce	The recruitment, training, deployment, and retention of qualified human resources	<ul style="list-style-type: none"> <li>• Training of health workers including emergency obstetric care, basic essential care, and prenatal care</li> <li>• Task shifting</li> <li>• Promoting deployment of midwives and skilled workers</li> <li>• Investment in health training institutions</li> <li>• Production of right number and mix of health workers by medical, nursing, and allied health schools</li> </ul>
Health information system	It ensures the production, analysis, dissemination, and use of reliable and timely information on health determinants, health systems performance, and health status.	<ul style="list-style-type: none"> <li>• Enhanced data use, including synthesis and analysis of information and linkages to prioritization, planning, and budgeting as part of evidence-based decision-making for health</li> <li>• Promoting civil registration, vital statistics, and systems to collect information about pregnant women</li> </ul>
Medical products and technologies	Availability of essential medical products and technologies of assured quality, safety, efficacy, and	<ul style="list-style-type: none"> <li>• Insecticide treated net</li> <li>• Clean delivery kit</li> </ul>

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		cost-effectiveness, and their scientifically sound and cost-effective use.	<ul style="list-style-type: none"> <li>• Contraceptives</li> <li>• Micronutrient supplementation</li> <li>• Parental antibiotics</li> </ul>
	Health financing (supply-side)	Health financing is concerned with how financial resources are generated, allocated, and used in health systems. It involves provider payment strategies.	<ul style="list-style-type: none"> <li>• Long term financing strategy (sustainable and sufficient source of health financing)</li> <li>• Result-based financing</li> <li>• Performance-based payment</li> <li>• Contracting mechanism</li> </ul>
Other sector	Water and sanitation	Public infrastructure that improves hygiene and the quality and quantity of drinking water. It can contribute to better maternal and child health outcomes.	<ul style="list-style-type: none"> <li>• Access to safe water, for example, water supply (piped water), water quality, sanitation (latrines, sewer connection, septic system), and hygiene (soap)</li> </ul>
	Education and training	Education is likely to contribute to better health outcomes. Education among girls especially contributes the health of the next generation.	<ul style="list-style-type: none"> <li>• Access and equity to basic education, particularly for girls</li> </ul>
	Income generation and labor market	Higher income increases access to health services. For women, it increases the likelihood of receiving antenatal care and skilled care during pregnancy and the probability of a child being immunized, sleeping under bednets, receiving oral rehydration therapy, and being taken to a formal provider when sick.	<ul style="list-style-type: none"> <li>• Provision of credit and employment opportunities for women</li> <li>• Vocational training for women</li> </ul>
	Energy	Cleaner energy can remove the health risk factors.	<ul style="list-style-type: none"> <li>• Electrification</li> </ul>
	Agriculture and food security	Agricultural policies that focus on women's access to resources (land, training, agricultural inputs); their role in production; and their income from agriculture are likely to have greater impact on nutrition than policies that do not focus on women.	<ul style="list-style-type: none"> <li>• Access to food and nutrition services, such as community-based nutrition programs</li> </ul>
	Transportation infrastructure	Public transportation and roads increase access to health facilities and reduce delays, which contributing to the reduction of maternal and child mortalities.	<ul style="list-style-type: none"> <li>• Public transportation system</li> <li>• Building roads</li> </ul>
Household or individual	Ability to pay: income increasing	Measures to increase income to afford expenditures for health services	<ul style="list-style-type: none"> <li>• Conditional cash transfers (that is, monetary transfers made to households over a certain time period when complying with certain health behaviors)</li> <li>• Unconditional cash transfers</li> <li>• Incentives to reduce cost of lost working time</li> </ul>

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	Ability to pay: household health spending (demand side)	Measures to reduce out-of-pocket expenditures for health services	<ul style="list-style-type: none"> <li>• Health insurance</li> <li>• Voucher for utilization</li> <li>• User fee exemption</li> <li>• Community-loan funds</li> </ul>
	Knowledge and information	Measures to improve public knowledge and provide accurate information regarding health services and appropriate care	<ul style="list-style-type: none"> <li>• Linking communities and health systems through dialogue and mobilization</li> <li>• Community participatory groups for health education</li> <li>• Mass media campaigns</li> <li>• Provide information on when identifying danger signs for mothers and children and birth preparedness</li> </ul>
	Household environment and infrastructure	Arrangements to improve the household environment and infrastructure and remove health risk factors such as indoor air pollution)	<ul style="list-style-type: none"> <li>• Provide nonharmful energy such as improved stoves which decrease indoor air pollution</li> </ul>
	Transportation	Measures to increase access to health facilities in timely manner	<ul style="list-style-type: none"> <li>• Making arrangements with local transporters and organizing emergency interest-free loans, referral funds to finance a system of radio calls and ambulances, and community-loan funds to pay for transport</li> </ul>

# Appendix B: Expanded Search Strategy

## Overview

The data for the systematic review originate from completed (or nearly completed) impact evaluations with selected maternal and child health (MCH) outcomes: neonatal, infant, and under-five mortality, skilled birth attendance, and maternal mortality. Potential studies were identified through a detailed search strategy built on existing systematic review frameworks (Card, Kluve, and Weber 2010; Drabo, Perez-Arce, and Yoong 2011; IEG 2010b, 2011). The search strategy included three rounds of data collection. Potential studies were then submitted to a full text review and, if they qualified as impact evaluations with the selected outcomes, to the coding process (see coding strategy in Appendix C for additional information).

Three categories of search terms captured studies of interest, using a pilot test to modify the terms as necessary. These terms provided the basis for the bibliographic database search that took place during Round A and identified the majority of potential studies. Round A also included searches of other research, evaluation, and donor organizations, World Bank databases, top economic journals, and the *curricula vitae* of top health economists. As possible, the search team looked at the title, subject, and abstract for each result. After eliminating duplicates, 376 potential studies remained after Round A.

Rounds B and C served as comprehensiveness checks. During Round B, reference lists of systematic reviews were examined that focused on maternal and child health. After looking at the title, then subject or abstract, 47 potential studies were identified. Round C involved a snowballing activity, in which reference lists were reviewed for all of the studies selected for coding and two comprehensive searches of Google Scholar were performed, identifying 22 potential studies.

## Search Terms

The creation of three categories of search terms allowed the capture of studies that used appropriate experimental or quasi-experimental methods to estimate the impact of an intervention on the selected MCH outcomes in low- or middle-income countries: (A) outcomes, (B) methods, and (C) low- and middle-income country.

Each search term category has a universe of related search terms likely to be found in the title, subject, or abstract of relevant studies. The search term categories should be joined by AND, while the list of search terms should be joined by OR, as shown below:

A. Outcomes

(child mortality) OR (under-five mortality) OR (infant mortality) OR (neonatal mortality) OR (child death) OR (postnatal mortality) OR (maternal mortality) OR (births attended by skilled health) OR (birth attendant) OR (birth attendance) OR (attended delivery) OR (institutional delivery) OR (health facility delivery) OR (hospital) OR (midwife) OR (family health) OR (health facility) OR (skilled delivery care) OR (skilled services at delivery) OR skilled attendance)

AND

B. Methods

(impact) OR (effectiveness) OR (randomized control trial) OR (randomized trial) OR (control trial) OR (RCT) OR (counterfactual) OR (natural experiment) OR (experimental) OR (quasi experimental) OR (difference in difference) OR (double difference) OR (regression discontinuity) OR (matching) OR (instrumental variable) OR (fixed effects) OR (control area) OR (treatment area) OR (control group) OR (treatment group) OR (panel data)

AND

C. Low- and Middle-Income Countries

(Afghanistan) OR (Albania) OR (Algeria) OR (American Samoa) OR (Angola) OR (Antigua and Barbuda) OR (Argentina) OR (Armenia) OR (Azerbaijan) OR (Bangladesh) OR (Belarus) OR (Belize) OR (Benin) OR (Bhutan) OR (Bolivia) OR (Bosnia and Herzegovina) OR (Botswana) OR (Brazil) OR (Bulgaria) OR (Burkina Faso) OR (Burundi) OR (Cambodia) OR (Cameroon) OR (Cape Verde) OR (Central African Republic) OR (Chad) OR (Chile) OR (China) OR (Colombia) OR (Comoros) OR (Congo ) OR (Republic of Congo) OR (Costa Rica) OR (Côte d'Ivoire) OR (Ivory Coast) OR (Cuba) OR (Djibouti) OR (Dominica) OR (Dominican Republic) OR (Ecuador) OR (Egypt ) OR (El Salvador) OR (Eritrea) OR (Ethiopia) OR (Fiji) OR (Gabon) OR (Gambia) OR (Georgia) OR (Ghana) OR (Grenada) OR (Guatemala) OR (Guinea) OR (Guinea-Bissau) OR (Guyana) OR (Haiti) OR (Honduras) OR (India) OR (Indonesia) OR (Iran) OR (Iraq) OR (Jamaica) OR (Jordan) OR (Kazakhstan) OR (Kenya) OR (Kiribati) OR (Korea) OR (Kosovo) OR (Kyrgyz Republic) OR (Kyrgyzstan) OR (Laos) OR (Latvia) OR (Lebanon) OR (Lesotho) OR (Liberia) OR (Libya) OR (Lithuania) OR (Macedonia) OR (Madagascar) OR (Malawi) OR (Malaysia) OR (Maldives) OR (Mali) OR (Marshall Islands) OR (Mauritania) OR (Mauritius) OR (Mayotte) OR (Mexico) OR (Micronesia) OR (Moldova) OR (Mongolia) OR (Montenegro) OR (Morocco) OR (Mozambique) OR (Myanmar) OR



## APPENDIX B EXPANDED SEARCH STRATEGY

(Namibia) OR (Nepal) OR (Nicaragua) OR (Niger) OR (Nigeria) OR (Pakistan) OR (Palau) OR (Panama) OR (Papua New Guinea) OR (Paraguay) OR (Peru) OR (Philippines) OR (Romania) OR (Russia) OR (Rwanda) OR (Samoa) OR (São Tomé and Príncipe) OR (Senegal) OR (Serbia) OR (Seychelles) OR (Sierra Leone) OR (Solomon Islands) OR (Somalia) OR (South Africa) OR (South Sudan) OR (Sri Lanka) OR (St. Kitts and Nevis) OR (St. Lucia) OR (St. Vincent and the Grenadines) OR (Sudan) OR (Suriname) OR (Swaziland) OR (Syrian Arab Republic) OR (Tajikistan) OR (Tanzania) OR (Thailand) OR (Timor-Leste) OR (East Timor) OR (Togo) OR (Tonga) OR (Tunisia) OR (Turkey) OR (Turkmenistan) OR (Tuvalu) OR (Uganda) OR (Ukraine) OR (Uruguay) OR (Uzbekistan) OR (Vanuatu) OR (Venezuela) OR (Vietnam) OR (West Bank and Gaza) OR (Yemen) OR (Zambia) OR (Zimbabwe) OR (Latin America) OR (Central America) OR (Caribbean) OR (Eastern Europe) OR (South Asia) OR (Southeast Asia) OR (Africa)

### PILOT TEST

A pilot test ensured that the terms would capture relevant articles, and additional terms were added after the pilot test was performed to fine-tune the search strategy (already reflected in the terms shown above). In preparation for this systematic review, the systematic review team had identified relevant impact evaluations that satisfied the outcomes, methods, and country location criteria. A subset of these studies were selected to pilot test the search strategy in the EconLit and Science Direct databases. All seven pilot articles in EconLit were easily located, whereas Science Direct required a combination of two separate searches to limit the total results to a reasonable number that still captured relevant studies. Although only four of the five pilot test articles were found in Science Direct using this strategy, the fifth article was discovered through a search in another database.

### Round A: Bibliographic Databases

The categories guided the search of relevant bibliographic databases. The ideal search strategy was the combination of search terms A and B and C, although the exact terms of the search were adapted to each database in order to exclude high numbers of irrelevant results. The number of results yielded from each database is provided in table B.1.

Table B.1. Bibliographic Database Search Results

Database	Total Results	Potential IEs
EconLit	296	46
Science Direct*	2,448 (400)	81
PopLine	1,037	54
Dialog	589	41
PubMed/MedLine	719	44
ERIC	195	11
ArticleFirst	47	7
Social Sciences Citation Index	27	7
SSRN	718	21
IDEAS*	2375 (200)	3
CENTRAL*	5, 216 (1,400)	34

\*Search truncated due to lack of relevant results; actual results examined shown in parentheses.

From the total results for each database, a review of titles, subjects, and abstracts identified the relevant impact evaluations. The number of potential impact evaluations reflects unique studies, as duplicates were eliminated using EndNote or as they were otherwise discovered, and these numbers would vary if the databases were searched in a different order. Searches were truncated if the previous 100 results had not yielded any relevant studies.

### Round A: Supplemental Sources

The majority of results were expected to be found through the bibliographic databases noted above; these were supplemented by a number of searches in other sources. This method also served as an additional check on the comprehensiveness of the initial bibliographic search strategy.

#### IMPACT EVALUATION-FOCUSED ORGANIZATIONS

Four organizations offered online databases of impact evaluations:

- Abdul Latif Jameel Poverty Action Lab (J-PAL)
- Innovations for Poverty Action (IPA)
- International Initiative for Impact Evaluation (3IE)
- Network of Networks for Impact Evaluation (NONIE)

All available publications were browsed. Thirteen relevant impact evaluations were identified.

APPENDIX B  
EXPANDED SEARCH STRATEGY

RELEVANT RESEARCH ORGANIZATIONS

Several institutions are involved in relevant MCH research, although they are not focused solely on impact evaluation. Their websites were searched. Table B.2 reports the results.

Table B.1. Research Organization Search Results

Organization name	Potential IEs
Population Council	5
International Food Policy Research Institute (IFPRI)	1
RAND Corporation	2
Institute for the Study of Labor (IZA)	5
Global Development Network (GDN)	5
Bureau for Research and Economic Analysis of Development (BREAD)	Only duplicates
<i>Note:</i> IE = impact evaluation.	

TOP ECONOMIC JOURNALS

A search was conducted for A AND C (that is, outcomes and low-/middle-income country) in top economic journals. The list of selected journals in table B.3 was created using the IDEAS/RePEc ranking and Wagstaff and Culyer's (2011) list of the top 100 journals in health economics.

Table B.2. Economic Journal Search Results

Journal title	Total results	Potential IEs	Duplicates
<i>Quarterly Journal of Economics</i>	5	2	1
<i>American Economic Review</i>	55	2	2
<i>Journal of Political Economy</i>	3	1	1
<i>Journal of Economic Literature</i>	20	0	0
<i>Journal of Economic Growth</i>	2	0	0
<i>Review of Economic Studies</i>	1	0	0
<i>Journal of Economic Perspectives</i>	2	0	0
<i>Economic Policy</i>	0	0	0
<i>Journal of Human Resources</i>	7	1	1
<i>Journal of Development Effectiveness (2009-2010)</i>	10	3	3
<i>Note:</i> IE = impact evaluation.			

## TOP HEALTH ECONOMISTS

The *curricula vitae* of the top 10 health economists, according to Wagstaff and Culyer (2011), were browsed in search of additional relevant publications. As several of the economists identified in this list focus on U.S. domestic issues, eight economists who focus on international health or impact evaluation were added (see table B.4). Three new results were found.

Table B.3. Health Economists

Top 10 Health Economists	International health and impact evaluation economists
1. David Cutler	Jere Behrman
2. Jonathan Gruber	David Card
3. Frank A. Sloan	Esther Duflo
4. Adam Wagstaff	Pascaline Dupas
4. W.Kip Vixcusi	Paul Gertler
6. Janet M. Currie	Michael Kremer
6. Michael Grossman	Benjamin Olken
8. Mark V. Pauly	Mark Rosenzweig
9. Eddy van Doorslaer	
10. Frank J. Chaloupka	
10. Joseph P. Newhouse	

## WEBSITES OF DONOR ORGANIZATIONS

A search was conducted of other bilateral and multilateral organizations, including DFID, Inter-American Development Bank, Asian Development Bank, and the U.S. Agency for International Development. Search strategies varied based on the website. No new results were found.

## GLOBAL REPORTS

IEG also reviewed text and references of *World Development Reports* from the World Bank and *World Health Reports* from the World Health Organization for relevant publications.

*World Development Reports*: Potential impact evaluations were identified from the references of the 2012 report on *Gender Equality and Development* and the 2004 report on *Making Services Work for Poor People*. From the hundreds of references that were reviewed, IEG only pulled three potential evaluations that the team had not already identified.

## APPENDIX B EXPANDED SEARCH STRATEGY

*World Health Report*: The 2005 report on *Maternal and Child Health* generated one new potential impact evaluation. Reports from 1999 and 2002-04 had sections relevant to MCH, although a review of citations did not reveal any additional studies.

### WORLD BANK DATABASES

World Bank databases were consulted to identify additional IEs with Bank involvement. The primary source was a database compiled by IEG for the report entitled *The World Bank Group Impact Evaluations: Relevance and Effectiveness*, which includes IEs from the Development Impact Evaluation Initiative database, impact evaluations identified by literature reviews for previous IEG reports, or other impact evaluations provided to the IEG team by World Bank staff (IEG 2012). A search of this database identified six additional IEs.

### OTHER

Additional impact evaluations were discovered through seminars or conversations with other colleagues.

## Round B: Systematic Reviews

The reference lists of 61 systematic reviews focused on maternal and child health were gathered. Each title was reviewed, followed by assessing the abstracts of those that seemed relevant and eliminating any that were already included. Another 47 potential studies were found through this process.

## Round C: Google Scholar and Snowball Sampling

### GOOGLE SCHOLAR

After completing the first two rounds of coding, a final search used Google Scholar to locate additional studies. The Google Scholar search mechanism's character limit makes it very difficult to narrow searches to a manageable number of relevant results. After trying various searches, the team identified four searches that returned a majority of the relevant articles. In total, the four searches returned 1,477,730 results; the second search made up the majority with 1,444,000 results. A search of the first 200 in each of the four searches identified only two new potential studies.

### SNOWBALL SAMPLING

As part of the coding process, the reference list of each impact evaluation was reviewed. Similar to the approach for the reference lists of the systematic reviews,

the staff identified relevant titles, checked subjects and abstracts, and eliminated any duplicates. Through this process, 22 potential studies were gathered.

## Screening Studies

The following inclusion and exclusion criteria were applied to the titles, subjects, and abstracts of the studies to generate a list of potential impact evaluations:

- *Outcomes:* Studies that evaluate outcome indicators of child mortality (neonatal, infant, and under five), birth attendance, or maternal mortality were included. In addition, any studies that include skilled birth attendance as an intervention were included. A list of citations for studies that fall within the scope of our matrix of interventions and outcomes was maintained elsewhere.
- *Study design:* Studies that evaluate interventions based on quantitative experimental or quasi-experimental impact evaluation design with a well-defined counterfactual were included.
- *Location:* Studies of interventions that occur in a low-income or middle-income country, based on World Bank classifications, were selected.
- *Language:* The search focused on studies in English, although those in Spanish, French, and Portuguese were included.
- *Publication date:* Studies completed since January 1, 1995, were included.
- *Unit of analysis:* Studies that use regional or national time series data were excluded.
- *Peer review:* Impact evaluations that have been subjected to peer review (for example, published in a quality journal or a book) or are in the process of eliciting feedback from the research community (such as working papers or papers presented in conferences) were included.
- *Nonclinical interventions:* Following the classification of efficacy and effectiveness studies in the World Bank's handbook *Impact Evaluation in Practice* (Gertler and others 2011), only effectiveness studies were included. Efficacy studies and evaluations of interventions of a clinical nature were not included.

The titles, subjects, and abstracts did not always provide enough information to determine if the study met the selection criteria, particularly regarding outcomes and study design. When it was unclear, the study was treated as a potential impact evaluation to give it further consideration.

## Search Results

In total, the team reviewed more than 7,000 search results across Rounds A, B, and C. From a title and abstract review of these, 445 potential studies were identified. After a further 10-minute text review of these studies, 95 studies were included as impact evaluations of the selected outcomes on a representative sample, and 350 studies were excluded for not meeting this criteria. These 95 studies received a full text review for quality. There were 21 AAA studies, 41 AA studies, and 33 A studies. The 62 AAA and AA studies included 68 impact evaluations and were coded according to the strategy identified in Appendix C.

# Appendix C: Approach to Coding Impacts Evaluations and Coding Instrument

After identifying studies based on title and abstract review and as outlined in the search strategy (see Appendix B), they retrieved and read in full, and the following approach was used to code the documents.

## Step 1: 10-Minute Review

Each study received a 10-minute review, or a brief full-text examination, to find the information described below. If the answer of any of the questions below was no, the study was not included for coding.

- *Outcome of interest:* Does the study include at least one of the selected outcomes of interest: neonatal, infant, or under-five mortality; skilled birth attendance; or maternal mortality? Or does the study include an intervention of skilled birth attendance that looks at any outcomes within the MCH matrix?
- *Counterfactual:* Does the study use a counterfactual, that is, information on others who do not receive the treatment? Studies that use time-series or before-after observations on the same treatment group BUT do not have a control group are not to be included. Studies without a control group but that provide convincing exogenous variation in the treatment should be placed in a separate folder in EndNote for potential use.
- *Impact evaluation method:* Does the study utilize an appropriate impact evaluation method: randomized experiment, double or triple difference, matching, instrumental variable, regression discontinuity, or other method?
- *Representative:* Does the study take place outside of a controlled environment and in a real-world context (that is, not in a lab)?
- *Effectiveness:* Is the study an effectiveness study, rather than an efficacy study or an evaluation of an intervention of a clinical nature?
- *Intervention:* Does the study correspond to intervention types and constructs outlined in the approach paper and as defined (see box C.1)?



### Box C.1. Defining “Interventions”

1. The treatment is a specific, time-limited purposeful public policy intervention. Most impact evaluations fall in this category.
2. The treatment is a general public policy intervention. When it comes to impact evaluations of general public policy interventions, one popular way to identify causal impacts is through instrumental variable methods based on “natural” experiments or policy reforms that change the distribution of the treatment in the sample without directly affecting the outcome of interest.
3. The treatment is not a policy intervention, but is a natural experiment that can be replicated by policy.

## Step 2: Quality Rating

For each study that passed the 10-minute review, the full text was read and a quality rating determined. Internal validity was the primary consideration, but also factored in was any other major concerns with the study (for example, data collection methods, sample size and representativeness, power, policy replicability).

Each study was *double coded* (two junior or one junior and one senior coder filled out the Quality and Evaluation Design section and provided a quality rating) or *double rated* (one junior coder filled out the Quality and Evaluation Design section with a rating and one senior coder provided only a quality rating). Any disputes were settled after a third reading and rating by a senior coder.

The attached coding instrument provides each variable included in the Quality and Evaluation Design section, while key questions requiring additional guidance are outlined below.

- *Assessment of internal validity/quality of evaluation design* is done vis-à-vis the estimation strategy used to evaluate impacts (see box C.2). The starting point is then to first identify the evaluation design (randomized or quasi-experimental) and IE methods (difference-in-difference, matching, instrumental variables, or regression discontinuity) used to identify impacts by the study. Subsequently, reviewers assessed whether the relevant identification assumptions have been satisfied or adequately discussed, and coded this information as all, some, or none (that is, all, some, or none of the identification assumptions have been satisfied) for each of the methods used in study. Note that in adjacent columns where reviewers coded the extent to which assumptions have been satisfied, they were expected to document the reasons why they coded it as all, some, or none.

**Box C.2: Quality of Evaluation Design and Internal Validity**

The quality of evaluation design is the most critical determinant of impact evaluation quality; it is the linchpin for estimating the share of the change in outcomes attributable to the intervention. The starting point for this exercise is identifying the evaluation design (experimental or quasi-experimental) and method (difference-in-difference, matching, instrumental variables, or regression discontinuity) used to identify program impacts. The next step is assessing whether the report provides a discussion of the assumptions or conditions under which the estimation method is valid:

- *Assumptions under randomized experiment:* (i) balanced treatment and control groups (the two groups having no statistically significant difference in main baseline or time-invariant characteristics); and (ii) noncompliance or attrition (minimal incidence of beneficiaries not receiving treatment or leaving the program, and vice versa).
- *Assumptions under double difference:* (i) parallel trending (the treatment and control groups progress similarly in terms of the outcomes of interests); and (ii) time-varying confounders (no time-variant variables that may affect the progress of the outcomes other than the intervention).
- *Assumptions under matching:* (i) common support (the overlap in terms of propensity scores or matching variables between the treatment and control group); (ii) balancing checks (the treatment and control groups having no statistically significant difference in main observable characteristics); (iii) matching on outcomes or covariates (the variables used to match are not affected by the intervention); and (iv) selection on unobservables (there should be a discussion of potential selection bias due to unobservable differences between the treatment and control).
- *Assumptions under instrumental variables:* (i) first stage tested (the relationship between the intervention and the instrument is statistically significant; F-test or Wald test); and (ii) exclusion restriction (the instrument affects the outcome only via the intervention).
- *Assumptions under regression discontinuity:* (i) sorting around the assignment rule (beneficiaries tricking the rule to be eligible for the treatment); and (ii) balanced covariates at discontinuity (the two subgroups above and below the eligibility cutoff have statistically similar characteristics).

- *Assessment of the strength and stability of findings, usually achieved through various types of robustness checks.* After determining the main impact evaluation method, robustness checks were coded based on the following questions:

1. Did the evaluation use multiple estimation methods?
  2. Did the evaluation use multiple specifications?
  3. Did the evaluation perform other robustness analyses (for instance, falsification tests, alternative ways to measure the treatment, multiple control groups, sensitivity analysis and bounds)?
- *Rate overall quality of IEs based on the assessment of internal validity, robustness of findings, and any other major concerns.* Reviewers rated the impact evaluations as being A (not meeting most of the criteria), AA (meeting some, but not all, of the criteria), or AAA (meeting most of the criteria).

### Step 3: Code Relevant Information

After determining a rating for each study, additional information from AA and AAA studies was coded. Information was recorded in all of the following categories for both AA and AAA studies, although all variables were only coded for AAA studies.

- *Study information:*
  - Country, author, year and type of publication
  - Type of World Bank involvement
- *Program or intervention information:*
  - Program or intervention name, description, targeting (by age, gender, rural or urban, or poverty level), and policy objective
  - Intervention classification in up to three categories (see Appendix A and endnote 5)
  - Intervention duration, length of exposure, delivery modality, implementer, and level of operation
- *Findings given for neonatal, perinatal, early neonatal, and late neonatal mortality; infant mortality; under-five mortality; skilled birth attendance in any setting, hospital delivery, facility delivery, or home delivery with a skilled attendant; and maternal mortality:*
  - Unit of analysis, sample size, baseline value
  - Estimate, standard error or confidence interval, significance level, t-statistic, p-value
- *Data:*
  - Sample size (total, treatment, control), data type, data source
  - Baseline information (maternal education, poverty or income levels, age, household size, or other relevant indicators)
  - Data collection procedures and use of retrospective data

- Sampling strategy
- *External validity:*
  - Comparison of sample and target population
  - Type of government involvement or support
  - Barriers and enablers to intervention implementation, scaling up, and sustainability
- *Cost analysis:*
  - Presence and type of cost analysis
  - Cost analysis methodology and estimates, given by outcome
- *Heterogeneous effects:*
  - Estimates of any heterogeneous effects and for what subgroups, given by outcome

The full dataset will be published separately and will include the full coding instrument.

# Appendix D: Expanded Discussion of Conceptual Model

Identifying pathways through which policies can reduce maternal and childhood mortality is a complex undertaking as factors underlying these processes are multiple. The figure below presents an extended conceptual model outlining the inputs, activities, and outputs necessary to implement strategies aiming to reduce maternal and child mortality.

Diseases and infections such as malaria, measles, pneumonia, or neonatal tetanus coupled with obstetric and postnatal complications (birth asphyxia or untreated eclampsia) for mothers and newborns are among the main direct causes of maternal and child deaths (Black, Morris, and Bryce 2003; Graham and others 2006; WHO 2005a). High prevalence of anemia and malnutrition also affect directly and indirectly the possibility of survival by increasing the risk of illness as well as complications during childbirth. Mothers' undernutrition is linked with low birth weight in babies, who are at an increasing risk of dying or developing chronic diseases. These deaths, nevertheless, can be prevented with cost-effective clinical interventions proven to reduce the risk of dying (Campbell and Graham 2006; Jones and others 2003; Wagstaff and others 2006).

Following a continuum of care approach, essential services for mothers, newborns, and children are most effective when they are delivered in integrated packages through a functioning health system at critical points during the life cycle of mothers and children (UNICEF 2009); no single intervention can effectively reduce the rate of mortality alone (Campbell and Graham 2006). Among key strategies identified are enhanced nutrition (increased food intake and supplementation with folic acid and iron); safe water, sanitation, and hygiene facilities and practices (particularly important for promoting clean delivery and prevention of diarrhea); disease prevention and treatment; quality reproductive health services; adequate antenatal care; skilled assistance at delivery; basic and comprehensive emergency obstetric and newborn care; postnatal care and Integrated Management of Neonatal and Childhood Illnesses (UNICEF 2009). Educating girls and empowering women are potentially the core strategy for creating an enabling environment for promoting maternal and child health.

These strategies impact indirect factors necessary to overcome the diverse barriers that hinder good health and access to necessary care services such as poverty, low education levels, poor roads and transport infrastructures, cultural norms, and lack of awareness or confidence in health services. As indicated in figure D.1,

interventions can be grouped into three primary domains: governance (public policies and actions), provision of health services and other nonhealth services, and interventions aiming to increase the demand of health care and enhance health practices. Effective coverage of maternal and child care services requires policies integrating MCH in their programs and allocating sufficient resources to maintain a functioning health-service delivery system. By ensuring a legal framework and promoting monitoring systems, countries can guarantee availability of a skilled health workforce, vaccines and essential drugs as well as ensuring women and children rights to access health services.

The provision of health services and their utilization are essential in reducing maternal and child mortality. As such, health system's actions from the supply-side aiming to improve service delivery, through for example modernizing available health infrastructure and ensuring the training, deployment, and adequate skills of health workers in delivering such interventions, are essential. Similarly, health financing strategies can improve access and efficiency by enhancing providers' performance and optimizing the use of funds. Resources such as personnel, facilities, equipment, supplies, or funds are necessary to deliver these interventions.

On the other hand, households are producers of health in terms of healthy practices and lifestyles and are users of health services. Perceiving risks and diseases is an essential part of the causal chain to health outcomes and necessary for maternal and child health interventions. Individuals and households obtain information and knowledge on health practices or incentives to utilize health services when needed. Ideally, increasing knowledge will translate into a change in behavior, but this is not always the case. Therefore, an important aspect to influence mortality outcomes is to identify the channels through which knowledge and information is translated to behavioral change not only at the individual level but at the community level. An additional significant component of demand-side interventions is to provide individuals with the means to overcome the diverse barriers hindering access to good health and to necessary care (for example, financial, geographical, cultural). Among these means are health insurance, cash transfers and financial incentives that can be effective instruments to attain financial protection and increase health outcomes.

Figure D.1. Pathways to Reduce Maternal and Child Mortality THIS FIG TITLE NEEDS TO BE FORMATTED

## Appendix E: Table of Studies of Skilled Birth Attendance as an Intervention

Intervention type	Ukraine	Brazil	China	India, Janani Suraksha Yojana	India, Community based	Pakistan	Uganda	Shares of impact evaluations of SBA interventions with beneficial impact on outcomes			
								AAA	AA	Total	
1. Governance							Monitoring and evaluation	1/1	0/2 <sup>b</sup>	1/3	
2. Provision		Service delivery						1/1	1/6	2/7	
3. Utilization				Ability to pay	Knowledge and information			1/2	0/5 <sup>b</sup>	1/7	
4. Combination of provision and utilization	Training, knowledge, and information		Training, knowledge, and information Ability to pay			Training, knowledge, and information		3/3	5/9 <sup>b</sup>	8/12	
<b>Outcomes</b>											
Final outcomes	Maternal mortality	-		-		(-)			2/3	1/6	3/9
	Neonatal mortality			(-)	(-)	-	-		2/4	6/12 <sup>b</sup>	8/16
	Infant mortality	(-)	-						1/2	0/3 <sup>b</sup>	1/5
	Under-five mortality		-					-	2/2	0/2	2/4
Intermediate outcomes	Family planning	+					(+)	1/2	2/6 <sup>b</sup>	3/8 <sup>b</sup>	
	Fertility		-		+			2/3 <sup>a</sup>	1/1	3/4 <sup>a</sup>	
	Maternal nutrition								3/5 <sup>b</sup>	3/5 <sup>b</sup>	
	Postnatal visit								1/4 <sup>b</sup>	1/4 <sup>b</sup>	



**APPENDIX C**  
**APPROACH TO CODING IMPACTS EVALUATIONS AND CODING INSTRUMENT**

	Immunization							+	1/1	2/6 <sup>b</sup>	3/7 <sup>b</sup>
	Infant morbidity	mixed						-	1/2	2/6 <sup>b</sup>	3/8 <sup>b</sup>
	Anthropometric s								+	1/1	1/1
	Breastfeeding				+	+	+		3/3	6/8 <sup>b</sup>	9/11 <sup>b</sup>
	Care-seeking					(+)			0/1	7/8 <sup>b</sup>	7/9 <sup>b</sup>

*Note:* Numerators in the shaded portion in the upper right are the number of studies of SBA interventions that find an impact on at least one mortality outcome (maternal, neonatal, infant, and under-five). + = positive and significant; (+) = positive but not significant; - = negative; (-) = negative but not significant.

<sup>a</sup>One study in the denominator demonstrates lower contraceptive use and abortion rate due to the SBA intervention.

<sup>b</sup>At least one study with two treatment arms is counted twice in the denominator.

## Appendix F: AAA and AA Studies Included in Systematic Review

Table F.1. AAA Studies Included in the Systematic Review

Reference Number	Author(s)	Country	Method <sup>a</sup>	Project	Intervention Category <sup>b</sup>	Intervention Type <sup>c</sup>	Outcomes	Cost Information	Heterogeneous Effects
6	Barham 2011	Mexico	DD	Progresa	Utilization	Income increasing	Neonatal mortality, infant mortality**	Cost benefit	Socio-economic status; baseline mortality
8	Bhalotra and Clots-Figueras 2011	India	IV	Women's political representation	Governance	Strategy planning and policy	Neonatal mortality***, infant mortality*		
9	Bhandari and others 2012	India	RE	Integrated Management of Neonatal and Childhood Illness	Provision: Health; Utilization	Service packages; health workforce; knowledge and information	Neonatal mortality**, infant mortality**		Location of birth
10	Bhutta and others 2011	Pakistan	RE	Community health workers and health committees	Provision: Health	Delivery modality; health workforce; service package			
12	Bjorkman and Svensson 2009 <sup>WB and P</sup>	Uganda	RE	Community-based monitoring	Governance; Provision: Health	Monitoring and evaluation, accountability; service management	Skilled birth attendance, neonatal mortality**	Cost utility	
16	de Brauw and Peterman 2011	El Salvador	RD	Comunidades Solidarias Rurales	Provision: Health; Utilization	Income increasing; health infrastructure			

APPENDIX F  
AAA AND AA STUDIES INCLUDED IN SYSTEMATIC REVIEW

Reference Number	Author(s)	Country	Method <sup>a</sup>	Project	Intervention Category <sup>b</sup>	Intervention Type <sup>c</sup>	Outcomes	Cost Information	Heterogeneous Effects
17	Breierova and Duflo 2004	Indonesia	IV	Sekolah Dasar INPRES Program (school construction)	Provision: Other	Education and training			Mother's age
19	Chou and others 2007	Taiwan, China	IV	School construction	Provision: Other	Education and training	Skilled birth attendance**, under-five mortality*		
23	Feng and others 2010	China	MA+DD	Safe Motherhood Program	Provision: Health; Utilization	Health workforce; knowledge and information; household health spending		Administrative cost	Province
24	Field and others 2011	Bangladesh	DD	Arsenic mitigation	Provision: Other	Water and sanitation	Skilled birth attendance**		Primary water source; cause of death
25	Foster and others 2009	Mexico	DD	Clean Industry Program	Provision: Other	Energy			
27	Galiani and others 2005	Argentina	MA+DD	Water company privatization	Provision: Other	Water and sanitation	Neonatal mortality***, infant mortality***, under-five mortality***		Socio-economic status
28	Gamper-Rabindran and others 2010 <sup>WB and P</sup>	Brazil	OT	Piped water provision	Provision: Other	Water and sanitation	Neonatal mortality***, infant mortality***	Cost utility	Baseline mortality
41	Lund and others 2012	Zanzibar, Tanzania	RE	Wired Mothers Initiative	Provision: Health;	Service management; transportation	Skilled birth attendance***,		Socio-economic status

APPENDIX F  
AAA AND AA STUDIES INCLUDED IN SYSTEMATIC REVIEW

Reference Number	Author(s)	Country	Method <sup>a</sup>	Project	Intervention Category <sup>b</sup>	Intervention Type <sup>c</sup>	Outcomes	Cost Information	Heterogeneous Effects
					Utilization		maternal mortality**, neonatal mortality		
46	Mazumdar and others 2011 <sup>WB and A,F</sup>	India	DD+IV	Janani Suraksha Yojana	Utilization	Income increasing			Socio-economic status; maternal education
52	Nizalova and Vyshnya 2010	Ukraine	DD	Mother and Infant Health Project	Provision: Health; Utilization	Health workforce; knowledge and information	infant mortality*, under-five mortality***	Cost benefit	
54	Olken and others 2012 <sup>WB and A,F</sup>	Indonesia	RE	Progam National Pemberdayaan Masyarakat--Generasi Sehat dan Cerdas (Generasi)	Governance; Provision: Health	Health financing; strategy planning and policy <sup>d</sup>	Infant mortality***	Administrative cost	Baseline mortality
56	Rocha and Soares 2010 <sup>WB and A,F</sup>	Brazil	DD	Programa Saude da Familia	Governance; Provision: Health	Strategy planning and policy; delivery modality	Infant mortality**	Cost benefit	
60	Tanaka 2010	China	DD	Air Pollution Prevention and Control Law	Provision: Other	Energy	Skilled birth attendance***		Gender; level of maternal education
61	Tripathy and others 2010	India	RE	Women's groups	Provision: Health; Utilization	Delivery modality; knowledge and information	Skilled birth attendance***, maternal mortality	Cost utility	
62	Urquieta and others 2009	Mexico	RE+DD	Oportunidades	Provision: Other	Income increasing	Maternal mortality*, infant mortality***		

## APPENDIX F

### AAA AND AA STUDIES INCLUDED IN SYSTEMATIC REVIEW

Note: \* Significant at 10 percent; \*\* Significant at 5 percent; \*\*\* Significant at 1 percent.

<sup>a</sup>DD = difference-in-difference; IV = instrumental variable; MA = matching; RDD = regression discontinuity; RE = randomized; OT = other impact evaluation methods.

<sup>b</sup>Main intervention category as classified by authors, according to definitions given in Appendix A.

<sup>c</sup>Intervention type as classified by authors, according to definitions given in Appendix A.

<sup>WB</sup> World Bank involvement, either through a World Bank author or co-author (<sup>WB and A</sup>) or an evaluation of a World Bank project (<sup>WB and P</sup>) or project supported by Bank financing (<sup>WB and F</sup>) or a combination (<sup>WB and A,F</sup>; <sup>WB and A,P</sup>).

<sup>d</sup>The study included two treatment arms.

Table F.2. AA Studies Included in the Systematic Review

Reference Number	Author(s)	Country	Method <sup>a</sup>	Project	Intervention Category <sup>b</sup>	Intervention Type <sup>c</sup>	Outcomes	Cost Information	Heterogeneous Effects
1	Aguilar Rivera 2012	Chile	IV	Educational reform in 1966	Provision: Other	Education and training	Infant mortality, under-five mortality*		
2	Arifeen and others 2009	Bangladesh	RE	Integrated Management of Childhood Illness	Provision: Health; Utilization	Health workforce; service package; knowledge and information	Under-five mortality		
3	Azad and others 2010	Bangladesh	RE	Community-based women's groups	Provision: Health; Utilization	Knowledge and information; health workforce; delivery modality	Skilled birth attendance, neonatal mortality		
4	Baird and others 2011 <sup>WB</sup> and P	Indonesia	DD	Safe Motherhood Program	Provision: Health; Utilization	Health workforce; knowledge and information; service package	Skilled birth attendance*, infant mortality*, under-five mortality**		
5	Baqi and others 2008	Bangladesh	RE	Projahnmo	Provision: Health; Utilization	Delivery modality; knowledge and information; service package <sup>d</sup>	Neonatal mortality***	Cost utility	
7	Basinga and others 2011 <sup>WB</sup> and A,F	Rwanda	DD	Payment for performance scheme	Provision: Health	Health financing	Skilled birth attendance**	Administrative cost	

APPENDIX F  
AAA AND AA STUDIES INCLUDED IN SYSTEMATIC REVIEW

Reference Number	Author(s)	Country	Method <sup>a</sup>	Project	Intervention Category <sup>b</sup>	Intervention Type <sup>c</sup>	Outcomes	Cost Information	Heterogeneous Effects
11	Binswanger and others 2009 <sup>WB</sup> and A,P	Brazil	MA+DD	Northeast Rural Development Program under the Rural Poverty Reduction Program	Governance	Strategy planning and policy	Infant mortality*		
13	Bhushan and others 2007 <sup>WB</sup> and A	Cambodia	RE+IV	Contracting facility management	Provision: Health	Health financing <sup>d</sup>	Skilled birth attendance <sup>***</sup> , infant mortality		
14	Bose and others 2011	Democratic Republic of Congo	RE	First Breath resuscitation trial	Provision: Health	Health workforce	Neonatal mortality		
15	Brainerd and Menon 2012	India	IV	Agrichemicals	Provision: Other	Water and sanitation	Neonatal mortality <sup>**</sup> , infant mortality <sup>**</sup>		Socio-economic status; maternal education
18	Chen and Jin 2012	China	MA+DD	National Cooperative Medical System	Utilization	Household health spending	Maternal mortality, under-five mortality		
20	Darmstadt and others 2010	Bangladesh	RE	Projahnmo	Provision: Health; Utilization	Delivery modality; service package; knowledge and information	Neonatal mortality		
21	Deuchert and Wunsch 2010	Malawi	OT	Roll Back Malaria Initiative	Provision: Health; Utilization	Medical products and technologies; household health spending	Under-five mortality*		
22	Duflo and others 2012	India	RE	Indoor cookstove	Utilization	Household environment and infrastructure	Infant mortality		

APPENDIX F  
AAA AND AA STUDIES INCLUDED IN SYSTEMATIC REVIEW

Reference Number	Author(s)	Country	Method <sup>a</sup>	Project	Intervention Category <sup>b</sup>	Intervention Type <sup>c</sup>	Outcomes	Cost Information	Heterogeneous Effects
26	Frankenberg and others 2009 <sup>WB</sup>	Indonesia	OT	Village Midwife Program	Provision: Health	Health workforce; delivery modality; service package	Skilled birth attendance**		Maternal education
29	Gill and others 2011	Zambia	RE	Lufwanyama Neonatal Survival Project	Provision: Health	Health workforce; service package	Neonatal mortality**		Child age
30	Goncalves 2009	Brazil	DD	Participatory budgeting	Governance	Public financial management	Infant mortality***, under-five mortality***		
31	Gonzalez-Eiras and Rossi 2007	Argentina	DD	Electricity privatization	Provision: Other	Energy	Under-five mortality***		
32	Granados and Sanchez 2013	Colombia	DD	Water and sewerage provision reform	Provision: Other	Water and sanitation	Under-five mortality*		
33	Instituto Apoyo 2000 <sup>WB</sup>	Peru	OT	Fondo de compensación social	Governance; Provision: Other	Water and sanitation; strategy planning and policy	Infant mortality		Socio-economic status
34	Ishida and others 2011	Togo	OT	National Health Program	Provision: Health; Utilization	Medical products and technologies; household health spending	Under-five mortality**		Child age
35	Jokhio and others 2005	Pakistan	RE	Traditional birth attendant training	Provision: Health	Health workforce; delivery modality; service package	Maternal mortality, neonatal mortality***		
36	Joshi and Schultz 2012	Bangladesh	RE	Matlab Demographic Surveillance System	Provision: Health; Utilization	Delivery modality; knowledge and information; service package	Under-five mortality***	Cost utility	Gender; age



APPENDIX F  
AAA AND AA STUDIES INCLUDED IN SYSTEMATIC REVIEW

Reference Number	Author(s)	Country	Method <sup>a</sup>	Project	Intervention Category <sup>b</sup>	Intervention Type <sup>c</sup>	Outcomes	Cost Information	Heterogeneous Effects
37	Kumar and others 2008	India	RE	Shivgarh community-based behavior change management	Provision: Health; Utilization	Service package; delivery modality; knowledge and information <sup>d</sup>	Skilled birth attendance*, neonatal mortality***		
38	Kumar and others 2012	India	RE	Shivgarh community-based behavior change management	Provision: Health; Utilization	Service package; knowledge and information; delivery modality	Skilled birth attendance*, maternal mortality		
39	Lim and others 2010 <sup>WB</sup>	India	DD	Janani Suraksha Yojana	Utilization	Income Increasing	Skilled birth attendance**, maternal mortality, neonatal mortality		Region
40	Liu and others 2010	China	DD	Safe Motherhood Program	Provision: Health; Utilization	Health workforce; service package; household health spending	Skilled birth attendance***		
42	Macinko and others 2007 <sup>WB</sup>	Brazil	OT	Family Health Program	Governance; Provision: Health	Strategy planning and policy; delivery modality	Infant mortality***		Region
43	Maitra and Pal 2007	Bangladesh	OT	Early childbirth, hospital delivery, and vaccination	Provision: Health	Service management; medical products and technology	Under-five mortality*		
44	Majoko and others 2007	Zimbabwe	RE	Antenatal care	Provision: Health	Service management	Skilled birth attendance, neonatal mortality		

APPENDIX F  
AAA AND AA STUDIES INCLUDED IN SYSTEMATIC REVIEW

Reference Number	Author(s)	Country	Method <sup>a</sup>	Project	Intervention Category <sup>b</sup>	Intervention Type <sup>c</sup>	Outcomes	Cost Information	Heterogeneous Effects
45	Manandhar and others 2004	Nepal	RE	Mother Infant Research Activities, Makwanpur district trial	Provision: Health; Utilization	Delivery modality; knowledge and information	Skilled birth attendance**, neonatal mortality**	Cost utility	
47	Midhet and Becker 2010	Pakistan	RE	Community-based men's and women's groups	Provision: Health; Utilization	Delivery modality; health workforce; knowledge and information; transportation <sup>d</sup>	Skilled birth attendance, neonatal mortality**	Cost benefit	
48	Mullany and others 2007	Nepal	RE	Antenatal health education	Utilization	Knowledge and information	Skilled birth attendance		
49	Newman and others 2002 <sup>WB</sup> and A,F	Bolivia	MA+DD	Social Investment Fund	Governance; Provision: Health and Other	Health infrastructure; water and sanitation; strategy planning and policy	Skilled birth attendance, under-five mortality*	Cost utility	Maternal antenatal care
50	Ngoc and Quoc 2010	Vietnam	MA	Young Medical Volunteers for Rural Mountain Project	Provision: Health	Health workforce	Skilled birth attendance	Administrative cost	
51	Nguyen and others 2012	Bangladesh	DD	Demand-Side Financing Program	Utilization	Household health spending	Skilled birth attendance**		
53	Obare and others 2012	Kenya	MA	Reproductive health vouchers	Utilization	Household health spending	Skilled birth attendance***		Exposure duration
55	Powell-Jackson and Hanson 2012	Nepal	MA	Safe Delivery Incentive Program	Utilization	Income increasing	Under-five mortality***	Cost utility	Region; quality of care

APPENDIX F  
AAA AND AA STUDIES INCLUDED IN SYSTEMATIC REVIEW

Reference Number	Author(s)	Country	Method <sup>a</sup>	Project	Intervention Category <sup>b</sup>	Intervention Type <sup>c</sup>	Outcomes	Cost Information	Heterogeneous Effects
57	Shrestha 2010 <sup>WB</sup>	Indonesia	OT	Village Midwife Program	Provision: Health	Delivery modality; health workforce; service package	Neonatal mortality, infant mortality		
58	Sloan and others 2008	Bangladesh	RE	Integrated Nutrition Program and Community-Based Kangaroo Mother Care Program	Provision: Health; Utilization	Delivery modality; health workforce; knowledge and information	Neonatal mortality, infant mortality		
59	Somanathan 2008 <sup>WB and A</sup>	Indonesia	IV	Sekolah Dasar INPRES Program (school construction)	Provision: Other	Education and training	Skilled birth attendance <sup>***</sup>		

Note: \* Significant at 10 percent; \*\* Significant at 5 percent; \*\*\* Significant at 1 percent.

<sup>a</sup>DD = difference-in-difference; IV = instrumental variable; MA = matching; RDD = regression discontinuity; RE = randomized; OT = other impact evaluation methods.

<sup>b</sup>Intervention category as classified by authors, according to definitions given in Appendix A.

<sup>c</sup>Intervention type as classified by authors, according to definitions given in Appendix A.

<sup>WB</sup> World Bank involvement, either through a World Bank author or co-author (<sup>WB and A</sup>) or an evaluation of a World Bank project (<sup>WB and P</sup>) or project supported by Bank financing (<sup>WB and F</sup>) or a combination (<sup>WB and A,F</sup>; <sup>WB and A,P</sup>).

<sup>d</sup>The study included two treatment arms.

# Appendix G: List of A Studies

Studies that received an “A” rating did not meet most of the criteria for inclusion. They are listed for informational purposes.

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## APPENDIX G

### LIST OF A STUDIES

- Gloyd, Stephen, Florencia Floriano, Maria Seunda, Maria Ana Chadreque, Jules Mihigo Nyangezi, and Angelina Platas. 2001. "Impact of traditional birth attendant training in Mozambique: A controlled study." *Journal of Midwifery & Women's Health* 46 (4): 210-16.
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# Appendix I: Expanded Bank's Portfolio Review Table

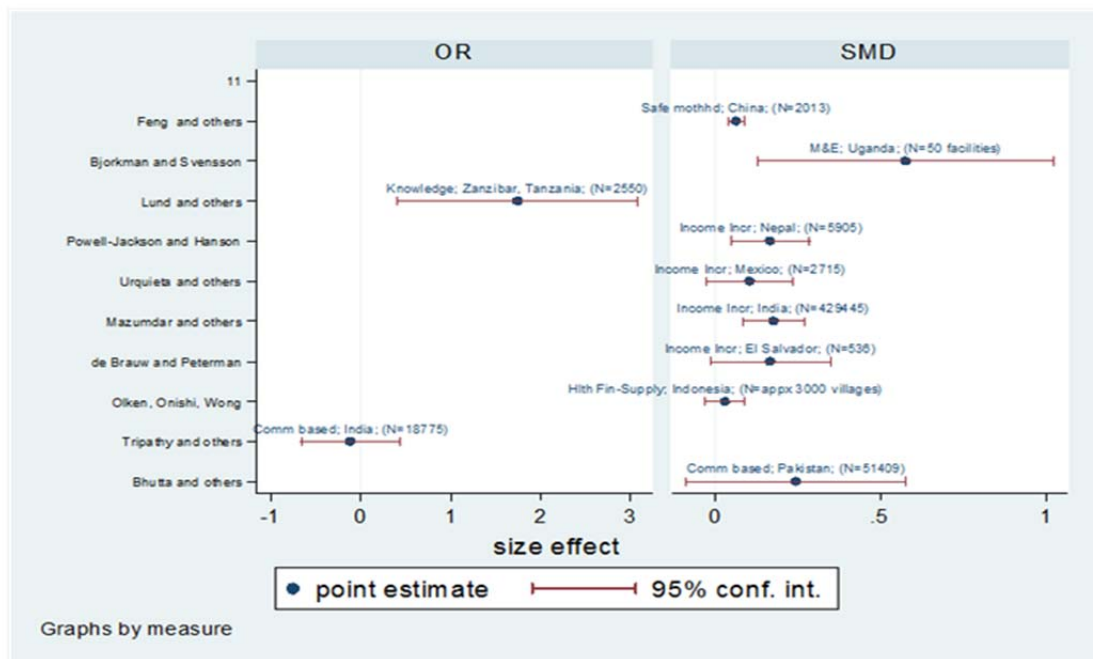
Interventions		Outcomes and Indicators		MDG 5: Improve maternal health		MDG 4: Reduce child mortality		
				Percentage of births attended by skilled health personnel	Maternal mortality ratio	Infant mortality rate	Under-5 mortality rate	
Governance	Government/ Governance	Strategy planning, policy		0(3)/50	0/64	4(5)/56	2(2)/66	
		Public financial management		0/25	0/33	1(1)/31	1(1)/32	
		Regulation/licensing		0/25	0/31	0/27	0/27	
		Monitoring and evaluation/accountability		1(1)/48	0/65	0/51	1(1)/60	
		Multi-sector coordination		0/9	0/15	0/12	0/18	
		Public-private partnership		0/16	0/16	0/14	0/19	
Provision	Donor support	Coordination		0/19	0/19	0/18	0/18	
		Integration		0/4	0/3	0/2	0/3	
	Health sector	Service delivery	Delivery modality		4(10)/34	0(4)/39	2(4)/30	2(2)/37
			Service packages		4(7)/39	0(2)/45	2(3)/35	2(3)/44
			Health infrastructure		1(2)/25	0/36	0/29	1(1)/30
			Service management		2(3)/28	0/43	0/37	2(2)/41
		Health workforce		3(9)/43	2(4)/52	3(5)/45	1(2)/48	
		Health information system		0/20	0/24	0/24	0/20	
		Medical products and technologies		0/36	0/40	0/35	3(3)/39	
	Health financing -- supply		3(5)/40	0/49	0(2)/42	0/47		
	Other Sector	Water/sanitation		0/2	0/2	3(4)/2	4(4)/3	
		Education/training		1(1)/2		2(3)/1	2(2)/1	
		Income generation /labor market /personal or		0/1	0/1		0/1	
		Energy				2(2)/0	1(1)/0	
		Agriculture/food security					0/1	
Utilization	Household /individual	Transportation infrastructure						
		Ability to pay	Income increasing		4(5)/6	0(1)/8	1(1)/7	0/8
			Household health spending		4(4)/14	1(2)/21	0/20	2(3)/24
		Knowledge/information		4(12)/24	2(6)/30	3(4)/29	2(3)/33	
		Household environment & infrastructure		0/2	0/3	0(1)/2	0/1	
Transportation		1(1)/0						
<b>Totals</b>				17(33)/61	2(8)/74	16(23)/62	15(17)/74	

Note: The table conveys the team's findings regarding the Bank's MCH strategy. The first number is the number of AAA- or AA-rated impact evaluations with a significant beneficial effect; in parentheses is the total number of AAA- or AA-rated impact evaluations, and in the denominator is the number of Bank-approved projects with components in the specified area over the past decade.



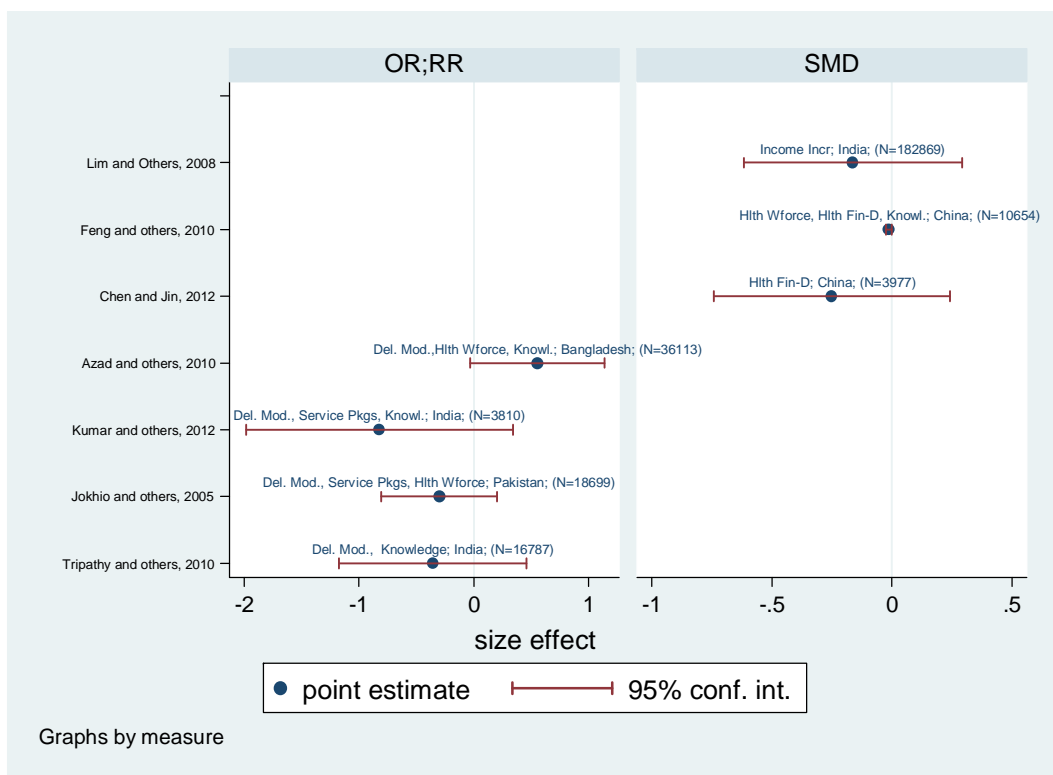
## Appendix J: Standardized Effect Size

Figure J.1. Standard Effect Size for AAA- and AA-Rated Impact Evaluations of Skilled Birth Attendance



*Note:* Numbers in brackets in the y-axis refer to the study number in the reference list. World Bank involvement type is indicated in the y-axis with letters P (projects) and F (funding). Size effect is measured as the impact effect expressed as percent of a baseline measure (SMD [standard mean deviation]). For those studies reporting impact effect in terms of odds ratios (OR), the size effect was computed as the logarithm of the OR. The confidence intervals reflect the confidence interval of the impact estimates. Outcomes include: SBA = skilled birth attendance, MM = maternal mortality, NM = neonatal mortality, IM = infant mortality, and U5 = under-five mortality.

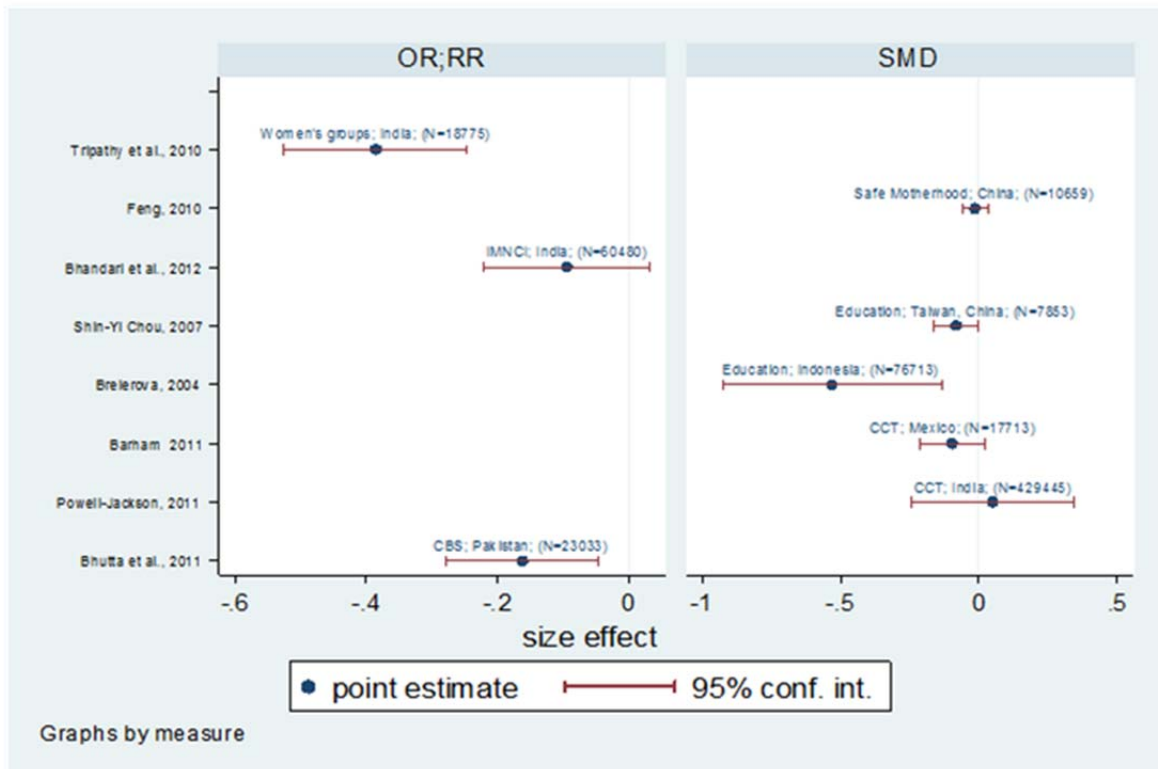
Figure J.2. Standard Effect Size for AAA- and AA-Rated Impact Evaluations of Maternal Mortality



*Note:* Numbers in brackets in the y-axis refer to the study number in the reference list. World Bank involvement type is indicated in the y-axis with letters P (projects) and F (funding). Size effect is measured as the impact effect expressed as percent of a baseline measure (SMD [standard mean deviation]). For those studies reporting impact effect in terms of odds ratios (OR) or relative risk (RR), the size effect was computed as the logarithm of the OR or RR. The confidence intervals reflect the confidence interval of the impact estimates. Outcomes include: SBA = skilled birth attendance, MM = maternal mortality, NM = neonatal mortality, IM = infant mortality, and U5 = under-five mortality.

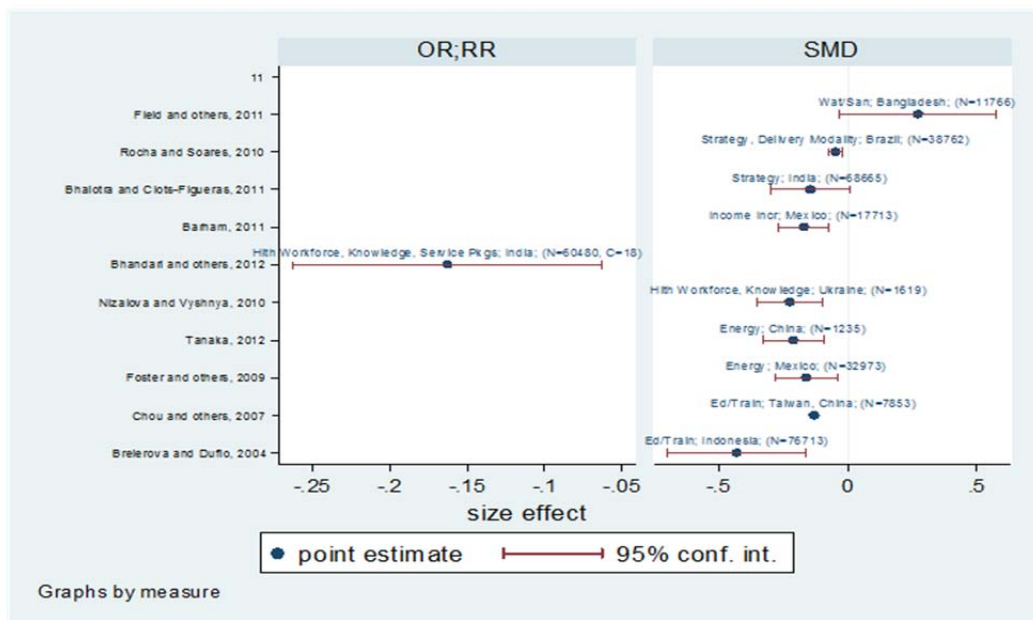
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Figure J.3. Standard Effect Size for AAA- and AA-Rated Impact Evaluations of Neonatal Mortality



*Note:* Numbers in brackets in the y-axis refer to the study number in the reference list. World Bank involvement type is indicated in the y-axis with letters P (projects) and F (funding). Size effect is measured as the impact effect expressed as percent of a baseline measure (SMD [standard mean deviation]). For those studies reporting impact effect in terms of odds ratios (OR), relative risk (RR), or hazard ratio (HR), the size effect was computed as the logarithm of the OR, RR, or HR. The confidence intervals reflect the confidence interval of the impact estimates. Outcomes include: SBA = skilled birth attendance, MM = maternal mortality, NM = neonatal mortality, IM = infant mortality, and U5 = under-five mortality.

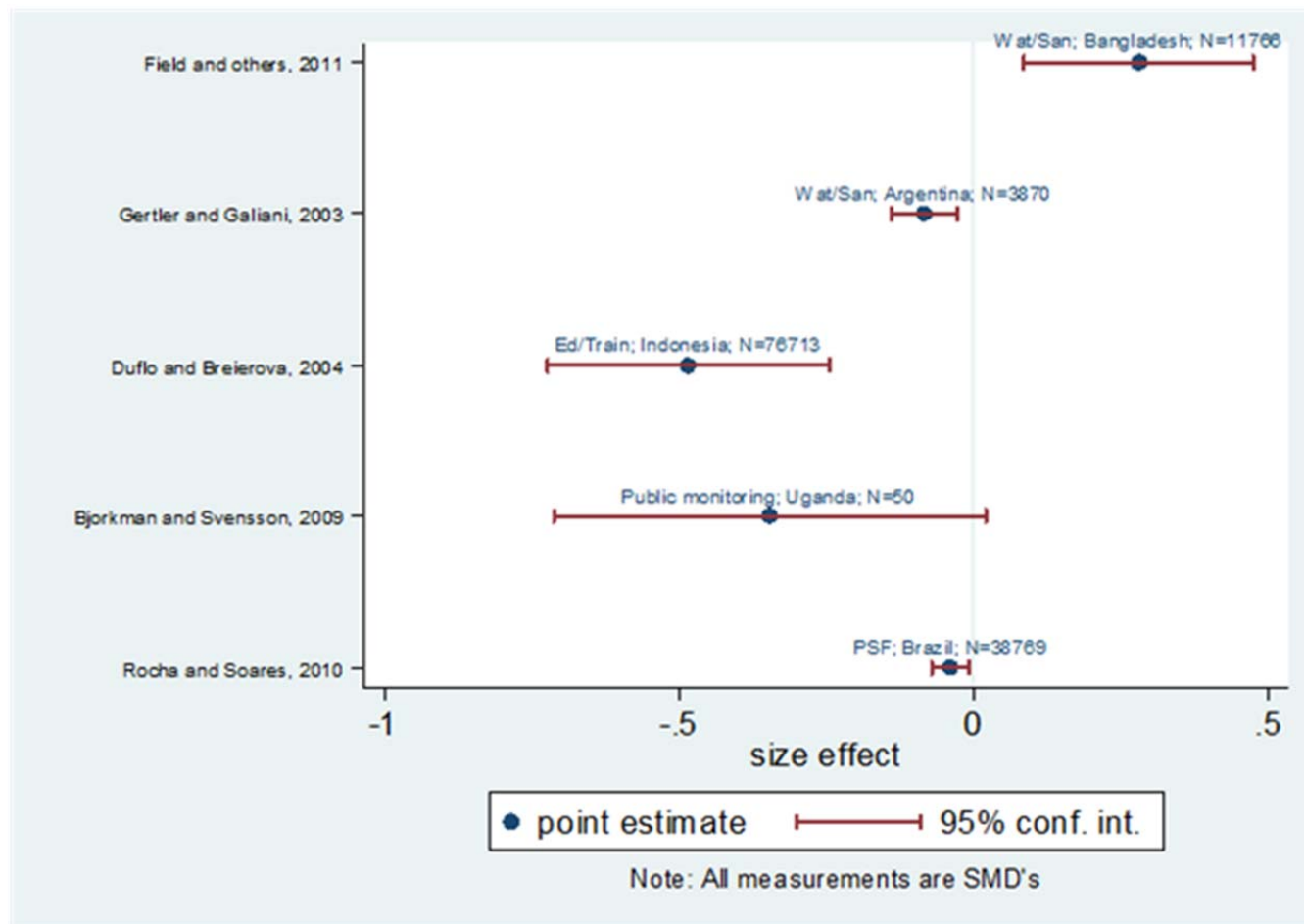
Figure J.4. Standard Effect Size for AAA- and AA-Rated Impact Evaluations of Infant Mortality



*Note:* Numbers in brackets in the y-axis refer to the study number in the reference list. World Bank involvement type is indicated in the y-axis with letters P (projects) and F (funding). Size effect is measured as the impact effect expressed as percent of a baseline measure (SMD [standard mean deviation]). For those studies reporting impact effect in terms of odds ratios (OR), relative risk (RR), or hazard ratio (HR), the size effect was computed as the logarithm of the OR, RR, or HR. The confidence intervals reflect the confidence interval of the impact estimates. Outcomes include: SBA = skilled birth attendance, MM = maternal mortality, NM = neonatal mortality, IM = infant mortality, and U5 = under-five mortality.

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Figure J.5. Standard Effect Size for AAA- and AA-Rated Impact Evaluations of Under-Five Mortality



*Note:* Numbers in brackets in the y-axis refer to the study number in the reference list. World Bank involvement type is indicated in the y-axis with letters P (projects) and F (funding). Size effect is measured as the impact effect expressed as percent of a baseline measure (standard mean deviation). For those studies reporting impact effect in terms of odds ratios (OR), the size effect was computed as the logarithm of the OR. The confidence intervals reflect the confidence interval of the impact estimates. Outcomes include: SBA = skilled birth attendance, MM = maternal mortality, NM = neonatal mortality, IM = infant mortality, and U5 = under-five mortality.

# Notes

## Chapter 1 CHECK FORMATTING; IT IS INCONSISTENT THROUGHOUT NOTES.

<sup>1</sup>This lack of evidence does not establish that there is no link between economic growth or poverty reduction and maternal and child morbidity. Rather, there have been few reliable studies done with an evaluation strategy which could credibly establish or refute such a link (Greene and Merrick 2005).

<sup>2</sup>In comparison to the efforts made for combating communicable diseases, MCH received relatively less attention from the international community until the 2000 Millennium Summit where the MDGs were adopted. Since then, a number of global partnerships and initiatives have been established. The Partnership for Maternal, Newborn & Child Health aims to raise awareness and advocacy related to reproductive and child health. New initiatives, including the Global Campaign for the Health MDGs, focus on MCH. The World Bank has renewed its commitment to increase investments in gender through addressing adolescent motherhood as a priority area for the sixteenth replenishment of Individual Development Account resources (World Bank 2010).

<sup>3</sup>A systematic review is an overview of primary research on a particular research question that tries to methodically identify, select, synthesize, and appraise all high-quality research evidence relevant to the question in order to answer it. Systematic reviews may or may not contain meta-analyses (the use of statistical methods to summarize the results of independent studies), and meta-analyses may or may not be drawn from a systematic review of studies.

<sup>4</sup>Mosley and Chen (1984) suggest five groups: (1) maternal factors: age, parity, and birth interval; (2) environmental contamination: air, food, water, fingers, skin, soil, inanimate objects, and insect vectors; (3) nutrient deficiency: calories, protein, and micronutrients (vitamins and minerals); (4) injury: accidental and intentional; and (5) personal illness control: personal preventive measures and medical treatment.

<sup>5</sup>Some interventions could have been categorized into more than three intervention types. Coders took the three most relevant types. For example, Midhet and Becker<sup>[47]</sup> evaluated a community-based intervention of men's and women's groups with additional training for local health workers in Pakistan. This was coded as an intervention with important elements of **delivery modality** as it was testing men- versus women-only groups; **knowledge and information** as it was designed to teach men and women important maternal and child health-related material; and **health workforce** as it trained health workers. The intervention also provided means of emergency transportation, but because the evaluation gave very little attention to this element and did not provide any information on its take-up within the program, the coding limits the intervention types to the above three rather than supplanting any of them with **transportation**.

<sup>6</sup>Other statistical methods, including multivariate regression using a single cross-section, are generally not considered impact evaluations and are not included in this review.

<sup>7</sup>See the IE Toolkit's external website at <http://web.worldbank.org/WBSITE/EXTERNAL/TOPICS/EXTHEALTHNUTRITIONANDPOPULATION/EXTHSD/EXTIMPEVALTK/0,,contentMDK:23262154~pagePK:64168427~piPK:64168435~theSitePK:8811876,00.html>.

## Chapter 2

<sup>1</sup>WHO defines a skilled birth attendant as “an accredited health professional – such as a midwife, doctor, or nurse – who has been educated and trained to proficiency in the skills needed to manage normal (uncomplicated) pregnancies, childbirth and the immediate postnatal period, and in the identification, management, and referral of complications in women and newborns.”

<sup>2</sup>For a list of the seven successful approaches to maternal health outcomes, see the World Bank website at

<http://web.worldbank.org/WBSITE/EXTERNAL/TOPICS/EXTHEALTHNUTRITIONANDPOPULATION/EXTPRH/0,,contentMDK:20200260~menuPK:645470~pagePK:148956~piPK:216618~theSitePK:376855,00.html/>.

<sup>3</sup>See the UNFPA website at <http://www.unfpa.org/public/mothers/pid/4383> for details.

<sup>4</sup>The study examined heterogeneity in the effect of the JSY program on mortality with respect to the structural quality of care of health care providers. The measure of structural quality of care is made up of six components: 24-hour service availability; staffing; training of staff; basic infrastructure; equipment; and drugs.

<sup>5</sup>The study used two impact evaluation methods: difference in differences at the district level and exact-matching at the household level. Because the differences in differences was a stronger, more robust identification method, the report used its result (nonsignificant impact on perinatal, neonatal, and maternal deaths) The matching showed a significant reduction in the probability of perinatal and neonatal deaths but a null result for maternal mortality again.

As a matter of interest, the AAA study on JSY also used a difference in differences identification strategy to estimate district-level effects, but also used an instrumental variable to improve identification and construct validity of when the reform took effect.

The difference-in-difference strategies for both the AAA and AA JSY studies used repeated cross section data to create a district-level panel.

<sup>6</sup>Other infant morbidity outcomes tested in the Ukraine Mother and Infant Health Project study but found to be not significant include infection, nervous system and respiratory system complications, congenital anomalies, and perinatal deviations.

<sup>7</sup>A simple mean-comparison test rejects the equality of time exposure between those studies reporting significant and insignificant results (P value: 0.0055).

### Chapter 3

<sup>1</sup>Neonatal mortality is defined as those deaths occurring in the first 28 days of life. Deaths occurring during the first week of life are referred to as early neonatal mortality, and those occurring after the seventh day but before the 28th day of life are late neonatal deaths. Prenatal mortality refers to deaths occurring between 22 weeks (154 days) of gestation and seven days after birth (Lander 2006).

<sup>2</sup>Packages for essential newborn care includes birth preparedness, clean delivery, cord care, thermal care (skin-to-skin care), breastfeeding promotion, and danger sign recognition.

<sup>3</sup>Granados and Sanchez (2013) found a significant reduction in under-five mortality due to infectious diseases, but there was heterogeneity in their results for overall child mortality. Child mortality fell in municipalities that underwent reform before 1994 and those that used private or mixed capital reforms, but it actually increased in reformed municipalities that had more than 2,500 subscribers. The authors hypothesize that this may be due to the smaller increase in water provision in the larger municipalities.

### Chapter 4

<sup>1</sup>The most common intervention type among World Bank projects and interventions with Bank financing was **strategy planning and policy**, which was used in 7 of the 15 interventions, including in the only intervention to focus uniquely on governance. It was included in six of the eight bundled interventions; the remaining six evaluations were divided between the health sector (3), other provision sectors (1), and utilization (2).

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<sup>2</sup>Of the four World Bank projects, only two evaluate the effect on SBA, and only one of the two explicitly lists SBA as a Project Development Outcome.

<sup>3</sup>This review has cast doubt on the assumption that the proportion of deliveries attended by skilled health personnel is a robust indicator for maternal or neonatal mortality. As it is no more of an intrinsically valuable outcome than other indicators (for example, mortality or antenatal care), project designers may want to explore including more relevant indicators in their project development objectives.

<sup>4</sup>It is possible, especially for medical products and technologies, that the rigorous studies that do exist are clinical evaluations or efficacy trials, rather than behavioral impact evaluations.

<sup>5</sup><http://web.worldbank.org/WBSITE/EXTERNAL/TOPICS/EXTHEALTHNUTRITIONANDPOPULATION/EXTHSD/EXTIMPEVALTK/0,,contentMDK:23262154~pagePK:64168427~piPK:64168435~theSitePK:8811876,00.html>.