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Women: more than mothers

20 years ago, the Safe Motherhood Initiative was launched by WHO and others to help reduce the severe global burden of pregnancy-related illness and death. Sadly, today, most of that burden remains unchanged. Over 300 million women in the developing world suffer from illness brought about by pregnancy and childbirth; nearly 536 000 die each year. Additionally, newborn babies whose mothers die in childbirth are three to ten times more likely to die within 2 years than those whose mothers survive. It is disappointing that little progress has been made to halt these largely preventable deaths. On Oct 18–20, 2007, to mark the initiative’s 20th anniversary, the Women Deliver conference in London, UK, aims to reflect on the immense challenges faced by women and their families. This week’s issue of The Lancet includes research and policy articles that should inform discussion and action that flows from the conference.

New estimates of maternal mortality for 2005, and regional mortality trends since 1990, are described by Ken Hill and colleagues, who show that most deaths occur in sub-Saharan Africa and Asia, with very little improvement in sub-Saharan Africa in the past 15 years. At a global rate of decline of only 2·5%, and no significant decline in sub-Saharan Africa, it is unlikely that Millennium Development Goal 5—to reduce maternal mortality by three quarters by 2015—will be met. Hill stresses the difficulties in accurately measuring maternal mortality and calls for a greater investment in development and validation of the newer methods, as well as improving countries’ civil registration systems. Later this year, The Lancet will be launching its own report on this crucial issue at the Global Forum for Health Research in Beijing, China (Oct 29–Nov 2, 2007).

Among the interventions that have a significant effect on maternal mortality is access to safe abortion. Gilda Sedgh and colleagues present new findings on global rates and trends of all abortions. They found that despite the worldwide abortion rate slowly declining between 1995 and 2003, the unsafe abortion rate was essentially unchanged. The authors make a clear and compelling case for better access to contraception as well as safe and legal abortion services as a core tenet of improving the health of women worldwide. Indeed, as Carine Ronsmans and colleagues show, access to safe abortions is among the factors that have led to a substantial decrease in maternal mortality in Bangladesh during the past 30 years.

For 20 years, maternal and child survival have struggled for attention on political agendas. The perceptions and constraints that have plagued the Safe Motherhood Initiative are discussed by Jeremy Shiffman and Stephanie Smith as well as by Ann Starrs. Much can be learned from the HIV/AIDS world. The strong wave of AIDS activism in the 1980s and 1990s, and well-organised groups of civil society demanding access to life-saving services has given justified prominence to HIV/AIDS. Activism around maternal and child health has not gained anywhere near the same traction—a sad reflection of the low status accorded to women’s issues in political circles.

Those working on HIV/AIDS developed a clear strategy for success, which was to take the issue beyond medical and public-health spheres so that it became recognised as a socioeconomic issue. Here, it is encouraging to see that the maternal health community has also shifted its thinking. That women are not only mothers but highly valuable contributors to society is the theme of the conference. The links between maternal health, women’s status, and broader development are reviewed by Rohini Pande and colleagues. They support the notion that investing in women and their health pays off for governments as well as families.

The idea of the continuum of care (the continuity of care throughout the life cycle) is still relatively new and The Partnership for Maternal, Newborn and Child Health, launched as a larger, broader successor to the Safe Motherhood inter-agency group, is yet to find its comparative advantage among the plethora of global organisations. However, a flurry of new initiatives together with huge sums of money, suggest that a momentum is building to tackle maternal and child health.

This is a crucial moment to redress an appalling historical neglect. It is time for a new wave of 21st century activism to throw a bright light on the low status of women. The need is known as is the knowledge to fix it. More money exists than ever, and a range of existing global initiatives has yielded useful experiences and lessons. There can be no more excuses and no further delay. Women’s rights are worth fighting for; their lives can and must be saved. ■ The Lancet
Chillies: out of the frying pan and into the clinic?

The humble chilli pepper has been a hot topic for the media lately. Last week, a restaurant’s pot of burning chillies accidentally sparked fears of a chemical attack on a busy shopping street in London. BBC Radio 4 listeners recently heard how chilli peppers are preventing elephants from raiding food crops in the drought-affected Zambezi Basin. And, in the Oct 4 issue of Nature, researchers opened new doors for the use of capsaicin—the component of chilli peppers that makes them spicy—in therapeutics.

Alexander Binshtok and colleagues found that capsaicin along with a derivative of the anaesthetic lidocaine (QX-314) could, unlike existing local anaesthetics, block pain neurons in rats without disrupting other functions such as movement and touch. The duo work together because capsaicin opens TRPV1 channels, which are only found in nociceptors, allowing QX-314, which cannot permeate cell membranes alone, to selectively block the neurons.

Capsaicin is not new to medicine. Although the compound causes irritation to human beings by activating nociceptors, repeated or lengthy application desensitises this class of neurons. As a result, topical creams with capsaicin are used to treat pain in postherpetic neuralgia, diabetic neuropathy, osteoarthritis, and rheumatoid arthritis. Efficacy in the treatment of musculoskeletal or neuropathic pain, however, is moderate to poor for most patients, and many discontinue treatment because of a common side-effect—an intolerable burning sensation.

This fiery problem also makes capsaicin not such a cool choice for selectively blocking nociceptors. The authors of the Nature paper are testing other compounds that can activate the TRPV1 channel without the burn. Interestingly, the venom of the Trinidad chevron tarantula also activates the receptor. But chilli (or tarantula) farms for medicinal purposes seem an unlikely scenario.

The new initiative will build on the Grand Challenges in Global Health initiative that the Foundation launched in 2003. In that initiative the Foundation, in partnership with the US National Institutes of Health, assembled an international expert panel to identify the major scientific and technological roadblocks obstructing progress in global health. The panel ultimately drew up a list of 14 challenges, ranging from creating new childhood vaccines to enhancing the nutritional value of staple crops. To date, $450 million of Foundation funds as well as funds from the Wellcome Trust and the Canadian Institutes of Health Research have gone to support more than 40 projects in more than 30 countries.

But these investments have been conservative, with grants, by and large, going to well-established researchers. The investments of this new programme will, no doubt, prove to be far more risky. Indeed, most are likely to fail. But even if the programme fails to lead to major breakthroughs, it could still enrich the field of global health with new ideas, new people, and new ways of thinking. ■ The Lancet

Global health is too important to be left to global health experts. That is why a new initiative announced by the Bill & Melinda Gates Foundation in Cape Town on Oct 9 is welcome. The initiative, a 5-year US$100 million grant programme called Grand Challenges Explorations, will provide hundreds of small start-up grants to researchers who come forward with promising new ideas to tackle key problems in global health.

The initiative is modelled on the investment strategies favoured by venture capitalists. Initial grants will be about $100,000 but more funds will become available if projects show progress. Successful projects could ultimately receive millions. The Foundation promises that the application process will be simple and the grant-review process swift.

The goal is to encourage scientists who might never have worked in the field of global health or even medicine to start to think about global health problems and hopefully come up with new, even unorthodox solutions, and to make it easier for researchers in the developing world to secure grants.

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Time for new ideas and fresh faces

The Lancet
Delivering for women

20 years ago the global health community came together to highlight the most striking inequity in public health: half a million women, 99% of them in the developing world, were dying every year in pregnancy and childbirth. High fertility, inadequate and inaccessible health services, and women’s low status meant that women in the poorest regions of the world were 500 times more likely to die from pregnancy-related complications (one in 20 risk) than women in northern Europe (one in 10 000 risk). The global Safe Motherhood Initiative was launched to generate political will, identify effective interventions, and mobilise resources that would rectify this horrifying injustice.

Today, 20 years into the initiative, maternal mortality has declined in some regions, especially in middle-income countries in Latin America and northern Africa, as documented by Ken Hill and colleagues in today’s Lancet. But dismally, we are nowhere near the goals of reduction of global maternal mortality by 50% (the target set in 1987) or 75% (the target set by Millennium Development Goal [MDG] 5, accepted by the UN and heads of state in 2000). Progress has been achieved in other areas, including much greater awareness of the issue and an enormous increase in knowledge about what works and what does not. But without substantial decreases in maternal mortality, what is there to celebrate in 2007? As the 20th anniversary approached, this dilemma was faced by the agencies, organisations, donors, and individuals who helped launch the initiative.

After many years of sometimes heated debate about what strategies should have priority, over the past 18–24 months a broad consensus has emerged within the maternal health community about the core health-sector strategies for reduction of maternal mortality. First, comprehensive reproductive health care, including family planning and safe abortion, or where necessary, postabortion care. Second, skilled care for all pregnant women by a qualified midwife, nurse, or doctor during pregnancy and especially during childbirth. Third, emergency care for all women and infants with life-threatening complications. These strategies are the basic elements that must be in place if a country with high maternal mortality is to bring its rate down significantly, but are by no means exclusive. There is growing attention to the need for timely postnatal care for both mothers and newborn babies, preferably within the first 2–3 days after birth. And although research has not shown that antenatal care directly reduces maternal mortality, good quality antenatal care is linked with greater use of skilled care during childbirth. Generally, we know what to do to save the lives of women and mothers—and, in 2007, we do not need another technical conference to debate the issue of basic strategy.

The Saving Newborn Lives project, launched in 2000, has brought particular attention to the problem of neonatal mortality. Newborn babies account for almost 40% of child deaths, and this percentage has been increasing as child mortality has declined. Most deaths of newborn babies are directly related to the mother’s poor health or to inadequate care during and after pregnancy and childbirth. The 20th anniversary of the Safe Motherhood Initiative therefore gave an opportunity to recognise the inextricable links between maternal and newborn health, and revitalise action for both, in the context of the continuum of maternal, newborn, and child health, as discussed by Kate Kerber and colleagues in The Lancet today.

Recent global developments offer an unprecedented opportunity to refocus on maternal health, to change the terms of the discussion and debate, and to convert goodwill into resources and focused action. These developments include: the adoption of the MDGs in 2000, with a specific MDG on maternal health; the launching of...
Comment

As Kirrin Gill and co-workers7 show in today’s women deserve it, but also because societies need it. role to be recognised and supported, not only because are the backbone of society—and a vigorous call for that acknowledgment of the many ways in which women The Women Deliver conference is a celebration and energy, creativity, and inspiration for their communities. The conference carries, quite deliberately, multiple mean-
ings—women deliver babies, certainly, and that is a central theme of the conference. But women also deliver in many other ways: food, goods, and income for their families; education, affection, and care for their children; and energy, creativity, and inspiration for their communities. The Women Deliver conference is a celebration and acknowledgment of the many ways in which women are the backbone of society—and a rigorous call for that role to be recognised and supported, not only because women deserve it, but also because societies need it. As Kirrin Gill and co-workers’ show in today’s Lancet, the economic and social cost of maternal and newborn mortality is enormous, at around US$15 billion a year in lost productivity. Preventing these deaths would cost only about a third of this amount: estimates vary, but are in the range of $4–6 billion a year for a basic package of maternal and neonatal interventions in the 75 countries with highest mortality. We need more research and data to document the costs of both inaction and action, but the core message is clear, and is articulated in the conference theme: invest in women—it pays. The Women Deliver conference, and this special issue of The Lancet, aims to achieve four major outcomes.

First, as outlined above, we need to establish maternal health as an essential contributor to economic and social development. The 1500 participants at the conference therefore include not just health policymakers, medical professionals, and public-health experts, but also those working on education, human rights, micro-enterprise, HIV, child health, and a range of other development sectors. Featured speakers include not only the heads of WHO and UNFPA, agencies with longstanding commitment to maternal health, but also the heads of the International Labour Organization and UNAIDS, the President of the Global Fund for Women, the UN Special Rapporteur for Human Rights, and of course, the conference co-chairs, the Deputy Secretary-General of the UN and the former UN Commissioner for Human Rights. This broad participation is intended to forge and strengthen programmatic and advocacy links to other sectors that are crucial for improvement of women’s status and women’s health.

Second, we need to get both donor and developing country governments to allocate sufficient resources, financial and otherwise, to achieve MDG 5, as well as the related MDGs for poverty eradication (MDG 1), education (MDG 2), gender equality (MDG 3), child survival (MDG 4), and HIV (MDG 6). At the country level, we need to reach out not only to ministers and ministries of health, but also to ministers and ministries of planning, finance, and local government. And we also need to ensure that the maternal health community, especially at local and national levels, understands how and when budgeting decisions are made, and has the evidence and the arguments it needs to show how improved maternal health affects national development. As noted by Lynn Freedman and others in The Lancet today,8 for maternal death to be prevented, health systems must meet a minimum level of functionality in terms of human resources, infrastructure, supplies, and management. As such, monitoring indicators of maternal health is a highly effective way for countries to monitor the basic capacity of their health systems.

Third, we need to activate and re-energise civil society, both to challenge donors and governments to invest in maternal health, and to hold them accountable for the promises they have made or implied. Women deliver, but they must demand too; and unfortunately women’s groups and women’s rights activists have historically not made the issue of maternal health a priority. By recognising the links between maternal health and other aspects of women’s status and roles, Women Deliver aims
to redress this gap. The term safe motherhood served an important political purpose 20 years ago, allowing sensitive issues relating to reproduction to be raised at high-level policymaking. But by implying that women’s value was based on their maternal roles only, the term was also a liability. It is time to put it to rest, to talk instead about maternal health, and to focus on the more positive vision inherent in the phrase women deliver.

Fourth, the maternal health community needs to overcome the perception that there is no agreement on effective interventions for reducing maternal mortality. As outlined above, a broad consensus has emerged. Specific elements of these strategies, such as how much to focus on facility-level versus community-based interventions, can and should still be discussed, and will of course vary depending on the national context. But we can no longer allow the excuse “we don’t know what to do” to be used as a way to avoid action—and the maternal-health community itself needs to coalesce behind the three core strategies of comprehensive reproductive health services, skilled care, and emergency obstetric care. Since the human race began, women have delivered for society. It is time now for the world to deliver for women.

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I declare that I have no conflict of interest.

No woman should die giving life

Of all health indicators, maternal mortality reveals the greatest gap between rich and poor women, both between and within countries. Each year, 536 000 women die from complications of pregnancy and childbirth—99% in the developing world—and another 10–20 million women have severe health problems, including obstetric fistula. In 2005, women in developed countries had a one in 7300 lifetime risk of dying from pregnancy-related causes, compared with a one in 75 risk in developing countries.1 In Africa, the lifetime risk is one in 26.2 Little change has been seen in the hardest hit areas and the gap is widening.

At the midpoint in the timeline to achieve the Millennium Development Goals (MDG), the absence of progress in reduction of maternal mortality and morbidity is unacceptable. The urgent and life-threatening circumstances of millions of women call for quick, concerted, and decisive actions to be taken now and sustained through 2015 and beyond. The new MDG 5 target to achieve universal access to reproductive health,3 in line with the International Conference on Population and Development,4 paves the way for faster progress.

After decades of experience, we know what works. We can irreversibly and significantly reduce maternal mortality by simply making sure that all women everywhere have access to essential reproductive health

The printed journal includes an image merely for illustration
services before, during, and after pregnancy. Voluntary family planning alone could reduce maternal death by a third and child deaths by as much as 35%. Ensuring skilled attendance at all births, backed by emergency obstetric care, could reduce maternal deaths by about 75%. The challenge is to bring resources together so that services can be provided to the people who need them most. The countries with the lowest proportions of skilled health attendants at birth, lowest use of contraceptives, and the weakest health systems have the highest numbers of maternal deaths.

Improvements in maternal health need interventions to: improve adolescent sexual and reproductive health; prevent early pregnancy; prevent unwanted pregnancy through access to contraceptive services; prevent the transmission of HIV and other sexually transmitted infections; prevent unsafe abortion and provide comprehensive care for the management of complications; improve prenatal care, delivery, and postpartum care, including skilled birth attendance and emergency obstetric care; and provide postnatal care, including counselling for family planning.

The United Nations Population Fund is one of several organisations that are working to bring cohesion in local, regional, and worldwide efforts to reduce maternal mortality and morbidity through integrated reproductive health services. Our vision for future efforts in maternal health encompasses four strategic foci. First, we must ensure that maternal health is a political priority in countries, regionally and worldwide. This focus needs strengthened advocacy, policy dialogue, integration of sexual and reproductive health in national development programmes, and mobilisation of resources in national budgets. Second, the international community needs to come together with national stakeholders and provide technical and financial support for country-driven national health plans, and for strengthened health systems and workforces to deliver reliably available, high-quality, and integrated health services. Third, community education and participation are paramount. The focus has to be on getting communities informed, educated, and involved, especially those that are poor and marginalised. Fourth, maternal health must be seen as part of the continuum of care. This continuum is both horizontal throughout the life-cycle from pre-pregnancy through birth to motherhood and multilayered throughout the health system from its base in the community to the district and, when appropriate, referral hospitals.

The future efforts will not materialise unless the leaders of the world commit to substantial increases in funding for maternal health in the context of health-system strengthening. The estimation is that, up to 2015, $US5·5–6·1 billion per year in additional funding will be needed from domestic and international sources to accomplish MDG 5 to improve maternal health. Additional funding will be needed to achieve the new target of universal access to reproductive health.

There is so much that can be accomplished if partners combine efforts and work together. Such collaboration is the only way to achieve MDG 5 and promote the vision that no woman should die giving life.

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I declare that I have no conflict of interest.


Women’s health and political will

This year the world marks the 20th anniversary of the global Safe Motherhood Initiative. Although there are reasons to celebrate, there is also reason to pause, and perhaps to worry. The reality is that maternal health (along with newborn and child health) is not a political priority in many countries today, whereas HIV and AIDS are. There is an urgent need to accelerate progress, step up efforts, and move from intentions to actions. For real progress to be achieved in maternal health, there are five fundamental transformations that must take place.

First, we need to change the mindset in countries—we must convince political leaders that to let women die is
a scandal. A broad and inclusive constituency base for maternal, newborn, and child health is essential. With the establishment of the Partnership for Maternal, Newborn & Child Health,2 there has been much progress in this area at the global level. This progress must now be echoed at the country level. Civil society groups have a central part to play in building this constituency base, and they need to be supported and strengthened to speak up, loudly and often. It is striking indeed that in Mozambique the ratio of non-governmental organisations engaged in HIV compared with those engaged in maternal and child health is 100:1. This must change.

Second, maternal, newborn, and child health must be integrated in the broader context of primary health care. We need to avoid the trap of verticalisation, which can lead to situations in which equipment purchased for one programme or disease cannot be used for other important health needs, or in which health workers are taken away from their workstations repeatedly for separate training workshops on different but linked health interventions (from breastfeeding to prevention of mother-to-child transmission of HIV to family planning). Integration is crucial to ensure the efficiency and sustainability of health-service improvements.

Third, we need to allocate greater resources for maternal health, or even better, for integrated sexual and reproductive health. The reality in many countries is that funds are not needed specifically for AIDS, tuberculosis, or malaria. Funds are firstly and mostly needed to strengthen national health systems so that a range of diseases and health conditions can be managed effectively. The key priorities are: to accelerate the training of health workers and address the enormous human resource crisis in Africa; to expand coverage by building new infrastructure, especially in rural areas, so that poor and marginalised people can have reasonable access to services; to ensure a sustainable supply of essential commodities, including drugs and other consumables; and to promote community involvement so that health services and health workers are responsive to local needs.

Fourth, sustainability must be addressed. Every programme or grant, at its inception, must plan and prepare for how activities will be sustained once that programme is finished. Strengthening national and local capacity, both of governmental partners and non-governmental organisations, must be central to every externally funded initiative.

Fifth, the contributions of global funding agencies and partners must be harmonised in support of national health plans, with adequate attention to maternal, newborn, and child health. The new International Health Partnership3 and other initiatives announced in September, 2007, under the umbrella of the Global Campaign for the Health Millennium Development Goals,4 outline a set of laudable principles: respecting and supporting national priorities, strengthening health systems, minimising the administrative burden on countries, linking allocation of funds to results, strengthening health systems, and promoting transparency. The agreement signed by a range of donors and governments to adhere to these principles is a huge step in the right direction. But the momentum must be sustained, and the commitment must be genuine.

The world cannot afford to continue to lose more than a 1000 women every day, women whose only aim is to celebrate life. United and working together we can and we must do better.

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I declare that I have no conflict of interest.

The Women Deliver conference (Oct 18–20, London, UK) provides a long overdue opportunity to examine maternal health within the context of the AIDS pandemic. About half of people living with HIV are women, 63% of them in sub-Saharan Africa. The associations between maternal mortality and HIV are troubling: HIV-positive women are at 1.5–2 times greater risk of maternal mortality than HIV-negative women, and in the high-prevalence setting of southern Africa, AIDS has become the leading cause of maternal mortality. Evidence from Uganda shows that HIV-negative women are at greater risk of HIV infection during pregnancy. And yet, neither the field of maternal health nor that of HIV has paid adequate attention to the association between maternal mortality and HIV, and especially the rights and needs of HIV-positive pregnant women, despite repeated calls to do so.

The Prevention of Mother-to-Child Transmission strategy has been the framework under which maternal health care is addressed within HIV prevention efforts. To date, such programmes reach less than 10% of the women who need them. Although comprehensive in theory, in practice these programmes have tended to focus on the third component of the strategy: prevention of HIV transmission from an HIV-positive woman to her infant. One notable exception is Columbia University’s Mother-to-Child Transmission Plus initiative, which seeks to address the broader needs of pregnant women. However, this effort only reaches 13 health facilities in eight African countries and Thailand.

Recent years have seen increasing efforts to strengthen links between HIV programmes and those promoting sexual and reproductive health, but these efforts have yet to extend to maternal health. The maternal health community has much knowledge about strengthening maternal care that should be used to improve efforts to reduce transmission of HIV from mother to child, such as improvement of quality of care, management of services, and behaviour-changing strategies, to encourage women to seek health care during pregnancy. At the same time, the experience from the AIDS pandemic in terms of prevention and treatment of HIV can bring much to bear in improving maternal health outcomes in countries with high maternal mortality and high HIV prevalence. In the immediate future, the maternal health community and those in the AIDS field must work together to ensure that HIV-positive pregnant women have access to highly active antiretroviral therapy for prevention of HIV transmission from mother to child, rather than the single-dose nevirapine that potentially jeopardises their treatment options.

The AIDS pandemic makes the goal of reduction of maternal mortality elusive—in fact, unachievable—unless the maternal health and AIDS communities devise and implement joint strategies and solutions that build on each other’s strengths. Reaching the Millennium Development Goals of reduction of both maternal mortality and HIV infection cannot be achieved if the two communities do not work in concert. To achieve these aims, bolder leadership is needed to address the twin epidemics of maternal mortality and HIV, especially in sub-Saharan Africa. I vow to provide such leadership in my capacity as the UN Special Envoy on HIV/AIDS for Africa, and I call on governments and international agencies to do the same.

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Challenges in measuring maternal mortality

In today’s Lancet, Kenneth Hill and colleagues from the Maternal Mortality Working Group present new estimates of maternal mortality for 2005, and examine trends in such mortality since 1990. The authors estimate that there were nearly 536 000 maternal deaths in 2005, mostly in sub-Saharan Africa and Asia.

In an environment that demands results-based approaches to development assistance, and which uses the Millennium Development Goals (MDGs) to motivate donor assistance and global action, it is hard to argue against Hill and colleagues’ efforts in their calculations of global and country estimates for maternal mortality. But even without the relatively recent renewed focus on impact and outcomes at the global level, country-level estimates of outcome measures, such as maternal mortality, child mortality, fertility rates, and nutritional status, are crucial for understanding the nature of problems in the health sector, for planning and prioritising interventions or policy directions, and for setting targets. To the extent that the global community and national actions require such efforts in measurement, the Maternal Mortality Working Group is to be commended for tackling what is arguably the most difficult of the MDG health indicators to measure, maternal mortality.

What stands out beyond Hill and colleagues’ main findings, however, is that years after the launch of the MDG agenda, a crucial indicator such as maternal mortality remains so difficult to measure. The honesty of the authors, about the difficult methodologies used and the guesswork that continues to play too large a role, points to the continued challenges faced by countries and the global health community in measuring this important outcome. This failure comes from the inability of national health programmes to measure and explain the causes of maternal mortality, and the limited success of the donor and development community in helping countries strengthen national health-information systems.

To be fair, a large part of the problem here is the nature of the outcome measure in question. Even in countries with high mortality and in demographic transition, maternal mortality is a rare event from a statistical point of view, which makes it hard to measure in surveys. This fact argues for the need to build better national information systems. But, as Hill and colleagues imply, such systems remain weak even in countries that are developing at a fast pace (eg, India and China).

We find ourselves in a situation in which a global effort, defined mainly by measuring outcomes and outputs (the MDGs), is unable to measure a crucial outcome and not likely to do so with any confidence at the national level for the foreseeable future. It is highly likely that, 5 years from now, the agencies that sponsored Hill and
Rethinking interventions for women’s health

Since its birth in 1971, Bangladesh has made impressive progress, especially in the social sector. The population has doubled, but fortunately the trebling of food production has contained the food shortages and famines that previously characterised this land. Net enrolment in primary schools has exceeded 85%, and the gender gap has disappeared. Both infant mortality and total fertility rates have more than halved. Life expectancy has risen by 50%, with women now living longer than men. Such gains have only because they document an absolute decrease but described in the Poverty Reduction Strategy Papers and other documents. Actions that favour marginalised groups, such as a stipend for girls in schools and a food incentive to attend school for pupils from poorer families, have also contributed to a reduction of inequity. The independence war defeated religious dogmatists, effectively ending their resistance to new ideas such as family planning and emancipation of women. Then came the rise of non-governmental organisations that promoted progressive values and that scaled up their interventions for women’s empowerment, education, health, and family planning to reach the whole nation. The country has also seen decreased maternal mortality. In today’s Lancet, Mahbub Chowdhury and colleagues’ report on the reduction in maternal mortality describes that the new environment of collaboration is real. But the difficulty in coming up with the estimates of maternal mortality shows how far we are in many countries from having national health systems that can measure problems, much less solve them.

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also for the reasons for this decline. They pointed out the positive role of new obstetric facilities, but questioned any substantial role for community-based midwives. This view challenges the current wisdom of promoting skilled birth attendants for all deliveries. In Bangladesh, for example, over the past few years the government has trained about 2500 such birth attendants. Unfortunately not many of them function effectively. In a country of 140 million people and 84 000 villages, how many years will it take to train skilled birth attendants for all deliveries? The other issue is the role of non-obstetric interventions, such as education and microcredit, in the reduction of maternal mortality.

Over the past 15 years, researchers have examined the effect of development interventions, such as primary education, microcredit, and women’s empowerment, by BRAC, a non-governmental organisation, on health in Matlab. BRAC also trained thousands of community-health volunteers who provide a variety of services to women and children in Bangladesh. Such studies attributed a 22% improvement in child survival to BRAC’s interventions alone. Positive effects of BRAC’s interventions in reduction of violence against women, increasing family-planning practice, improving children’s nutritional status, provision of better quality education, and improving livelihood were also documented.

Unfortunately, Chowdhury and colleagues did not analyse maternal mortality by comparing women who did and did not receive inputs from non-governmental organisations, which could have helped to better elucidate attribution. Improved economic opportunities plausibly resulted from access to microcredit, and the enhanced status and value of women in families might have provided the motivation to take extra care during pregnancy and seek emergency attention during and after delivery. BRAC’s inputs might have affected mortality in many ways (figure).

BRAC has recently started a programme for maternal, neonatal, and child health in Bangladesh through community involvement and strengthening of existing emergency obstetric facilities. An early lesson from this programme is that the socioeconomic status of a woman largely determines whether she survives a medical emergency. A woman with greater socioeconomic status has higher chances of being rushed to a facility in time, and also being looked after well. Each year, more than 12 000 women die during labour and up to 42 days postpartum in Bangladesh, and the factors affecting such deaths are many and complex. Reduction of maternal deaths thus requires a multipronged attack from all conceivable fronts—obstetric and non-obstetric. Interventions based on both are likely to have maximum and sustained effects.

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Contraception, safe abortion, and maternal morbidity

In today’s Lancet, Véronique Filippi and colleagues use longitudinal data from Burkina Faso with a year of follow-up to quantify the effect of severe obstetric complications. Maternal mortality, which is estimated at 529 000 deaths worldwide each year, is just the tip of the iceberg—an estimated 50 million women have morbidity related to pregnancy and childbirth annually.

Filippi and colleagues showed that, for up to 12 months postpartum, women who had had a severe obstetric complication (a so-called near miss) were more likely to report suicidal ideation and that the pregnancy had a negative effect on their lives than women with uncomplicated deliveries. Women who had had severe obstetric complications were also more likely to die or for their infant to die. The researchers recorded a surprisingly high rate of pregnancies in the near-miss women. Within 6 months of their near miss, 12.5% of women with early pregnancy loss, 10.9% of women with a perinatal death, and 1.3% of women with a livebirth had a subsequent pregnancy, compared with 0.2% of women with uncomplicated deliveries. The short interval between a near miss and subsequent pregnancy might result in adverse pregnancy and birth outcomes and poorer maternal outcomes.

One must exercise caution in generalising the results of this study to other developing nations. 88% of urban births in Burkina Faso occurred in an appropriate facility—ranking among the highest in sub-Saharan Africa. Whilst most populations in Burkina Faso, and other African countries, live in rural areas, Filippi and colleagues’ study focused on urban areas, which have higher than average rates of facility-based births. Without more information about the health of the women in this study before their hospital stay, it is difficult to elucidate whether the poorer health of women who had a near miss came before or after the severe obstetric complications. Some of the findings probably represent the consequences of a near miss and others might have been factors that predisposed women to have complications. Even with its limitations, Filippi’s study points to the need to prevent maternal morbidity in conjunction with efforts to reduce maternal mortality.

Nearly half of all maternal mortality is thought to be preventable; however, substantial obstacles remain. First, data and systems of data collection remain inadequate to assess national progress in many countries. Second, the complex set of cultural and social issues that impede implementation of interventions can be substantial. These barriers are greater for maternal morbidity, which is often undocumented and is often misclassified as a separate outcome from maternal mortality. Recent successful safe-motherhood interventions have focused on the provision of emergency obstetric care, intrapartum care in appropriate facilities, and trained birth attendants.

In Burkina Faso, only 10% of women of reproductive age use modern contraception, and another 23% report an unmet need for contraception. For women who want to limit or space births, the provision of modern contraception is sensible for health and the economy. The US$7 billion dollars in annual expenditure on contraception is estimated to provide 500 million women in developing countries the ability to prevent 187 million unintended pregnancies, 60 million unplanned births, 105 million induced abortions, 2.7 million infant deaths, and 215 000 pregnancy-related deaths (including 79 000 related to unsafe abortion). Additionally, if unmet need for contraception was met in developing nations, 52 million unintended pregnancies would be avoided, and 25–40% of maternal deaths would be averted. Although the availability of contraception to prevent unwanted pregnancies is important for maternal health, at a more basic level, the ability of women to decide how many children to have and when is a fundamental human right. But the promotion of family planning seems to have steadily declined as a global priority, as evidenced...
by the conspicuous absence of family planning from the Millennium Development Goals.\textsuperscript{12} Unsafe abortion is a major cause of maternal mortality,\textsuperscript{14} and every year, 5 million disability-adjusted life-years are lost by women of reproductive age as a result of unsafe abortion.\textsuperscript{15} Abortion is illegal in Burkina Faso, except to save the mother’s life or in cases of rape or incest, which suggests that nearly all abortions are unsafe. In Filippi and colleagues’ study, 4.7% of women who had had severe obstetric complications and 25% of women who had had an early pregnancy loss were suspected or confirmed to have undergone an induced abortion. Women who died before arriving at hospital or during their hospital stay were not included, which prevents inferences about abortion-related maternal mortality. In this context, unsafe abortion and its maternal consequences are probably under-reported or misclassified. Provision of safe abortions can have a substantial effect on the primary prevention of maternal morbidity and mortality. A broad focus on the prevention of maternal morbidity and its short-term and long-term physical and mental health consequences is needed. Better health care during pregnancy and at delivery should go hand-in-hand with efforts to prevent unwanted pregnancies.

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Eliminating unsafe abortion worldwide

In today’s \textit{Lancet}, Gilda Sedgh and colleagues report new findings about abortion that are both good and bad news.\textsuperscript{1} The absolute number and rate of abortions globally have slightly declined since 1995. Yet these findings mask increases in much of the developing world and virtually no change in the rate of unsafe abortion. Each year, millions of women and girls risk their lives, health, and dignity to terminate their pregnancy where abortion is not safe and legal. Governments, donors, health practitioners, and civil society have the capacity to substantially reduce maternal mortality and morbidity related to unsafe abortion.

The continuing high incidence of unsafe abortion in developing countries represents a public-health crisis and a human-rights atrocity. In such places, the need for contraceptive services and supplies to prevent unwanted pregnancies is far from being met\textsuperscript{2} and abortions are done in dangerous conditions—even where legal. This year, tens of thousands of women will die, more than 5 million will be admitted to hospital, and a substantial number will become infertile as a result of unsafe abortion. Preliminary estimates suggest that more than US$1 billion yearly could be needed to treat complications from abortion.\textsuperscript{3}

In 1994, governments declared for the first time that addressing unsafe abortion was a public-health imperative.\textsuperscript{4} Since then, many countries have broadened the circumstances under which abortion is legal,\textsuperscript{5}

I declare that I have no conflict of interest.

Comment

and medical care for postabortion complications has improved. Only last year, African governments set a bold plan of action to address unsafe abortion explicitly among a comprehensive set of goals to promote and protect sexual and reproductive rights and health. The path to progress is clear.

Legal and policy reform is required. The legal status of abortion has never dissuaded women and couples who, for whatever reason, seek to end pregnancy, and research shows that the more restrictive a country’s abortion law, the higher are the rates of unsafe abortions and related mortality. Conversely, Guyana saw a 41% reduction in hospital admissions for septic and incomplete abortion in the first 6 months after making abortion legally available in 1995. Governments should also consider following the example of Nepal, which banned child marriage and polygamy, and granted women some property rights, at the same time as abortion was legalised.

Donor governments, such as that of the USA, exacerbate legal restrictions on abortion with policies like the global gag rule, which mandates that foreign organisations receiving US governmental assistance for family planning must deny information to women about the option of legal abortion or where safe services can be obtained. This policy has very real detrimental effects on public health and should be unanimously rejected. Repealing harmful policies is not sufficient; however—donors and national governments must also ensure access to reproductive health services, including contraception.

Reform must also be supplemented by technical assistance to health systems and health-care providers, which is especially important in settings such as Colombia, Portugal, and Mexico City, where laws that allow increased access to abortion have recently been enacted. Examples such as Guyana, India, South Africa, and even the USA prove that legalisation is not sufficient to ensure women’s access to safe services. In each setting, players must carefully consider women’s preferences and ensure access to services accordingly, including through mid-level providers and an appropriate mix of medical and surgical technologies (eg, manual vacuum aspiration). Outreach and support to providers in countries where abortion remains highly restricted is also necessary to ensure access to family-planning services and postabortion care, as well as provision of abortion to the full extent allowed by law. WHO’s technical guidance, available in several languages, is key to designing effective policies and programmes.

Investment in developing and sustaining robust advocacy for access to safe abortion is the final priority. Broad coalitions of advocates at local and national levels can help to change, implement, and protect laws. They can also document and expose consequences of unsafe abortion, reach women with crucial information, and work to address the additional and underlying challenge of gender and socioeconomic inequality that can compromise women’s right to make decisions about their health, even after abortion is legalised.

In all the available data, one fact stands out: safe and legal abortion saves women’s lives and protects their health. There is no acceptable reason to allow women to die, fall ill, or become infertile as a result of unsafe abortion when the world community has both the knowledge and the means to prevent these deaths.

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A better future for women and children

Over the past century, the risk of maternal and infant death and of injury associated with childbirth has decreased substantially in developed countries.3 Sadly, the benefits of these advances are not accessible to all throughout the world.

Why does one woman die every minute from complications related to pregnancy and childbirth? 99% of such deaths occur in developing countries, and the reasons are basic. Women haemorrhage to death; they do not have access to antibiotics to prevent infection; or they do not have the option of a caesarean section.2,3 Why do nearly 10 million children die each year before their fifth birthday (more than the number of adults who die from AIDS, malaria, and tuberculosis combined), if most of these deaths are preventable?2,4,5

Why, when contraception is cheap and effective, do 200 million women still have an unmet need for family planning?26

The answers are known: poverty and poor health go hand-in-hand. Poor health is closely related to inequities in resources and power. The health status of individuals and communities is linked to lack of access to clean water, nutritious food, secure shelter, economic opportunity, education, and health care. These determinants of wellbeing are mostly denied to poor people, and women and girls typically have least access to resources and power. That nine out of ten women in sub-Saharan Africa will lose a child during their lifetimes,7 or that the highest mortality rates for children aged under 5 years are concentrated in countries in or emerging from conflict is no coincidence.7

With effort and resources, large-scale improvements in public health are achievable. Sri Lanka’s long-term commitment to safe motherhood services has, over four decades, decreased maternal mortality from 486 deaths per 100 000 livebirths to 24 per 100 000.8 In Egypt, a national campaign promoting oral rehydration therapy helped to reduce infant diarrhoeal deaths by 82% between 1982 and 1987.3 China’s national tuberculosis programme helped to reduce prevalence of that disease by 40% between 1990 and 2000, and translated directly into social and economic benefits: for each US dollar invested in the Chinese programme, $60 was generated in savings from treatment costs and the increased earning power of healthy people.8

But, too often funding for health interventions flows inefficiently through independent and issue-specific channels. Today’s health threats almost never occur in isolation. The same communities in which individuals live with AIDS are also those in which women are at very high risk of dying during childbirth from lack of family planning and basic obstetric care. The same young children who sleep under bednets to guard against malaria are no less likely to die from diarrhoea or pneumonia. The laudable objective of fighting specific diseases has become confused with the fundamental goal of saving and bettering lives, and crucial investments are undermined by an excessively narrow perspective.
In Bangladesh, where CARE implemented a safe motherhood initiative, fieldworkers concluded that domestic violence was one of the greatest risks that women faced during pregnancy. Even the best prenatal, obstetric, and postpartum care could not fully serve a woman’s best interest unless the widespread violence against women was also addressed. CARE’s modified approach incorporated efforts to prevent and respond to violence against women in its safe motherhood programming. The new model holds promise—not only for helping women have healthier pregnancies but also for safer healthier societies.

Ultimately, the experience of organisations like CARE and the Global Health Council strongly supports the need for both increased investment of resources, and better use of those resources. Resources must be invested comprehensively to address issues such as maternal mortality and child survival within a broader context. Although innovations, such as the Global Fund to Fight AIDS, Tuberculosis and Malaria and the United States President’s Emergency Plan for AIDS Relief, are encouraging and groundbreaking, they must be accompanied by investments that promote community-led development, strengthen health-care systems and build workforce capacity. If all parties do not work together, hard-won gains could be undermined.

Despite the scale of global need, substantial gains could be achieved with concerted investment. An additional $7 billion could save the lives of at least 6-6 million more newborn babies and children every year. $6.1 billion more would provide essential obstetric care to 75% of women in 75 countries. An extra $3.9 billion would provide 200 million more women with family-planning services. Simple inexpensive interventions, and a global commitment to the fight against poverty and preventable disease, can save millions of lives and give individuals and communities throughout the world the tools to build a brighter future for themselves. It is time to act.
Afghanistan’s midwives tackle maternal and infant health

Decades of conflict have left Afghanistan’s maternal health services woefully under equipped and understaffed. But a movement is underway to boost the number of trained midwives in the country, and amid the insecurity there are already signs of success. Declan Walsh reports.

The Afghani people have much to fear this year. Taliban insurgents are on the march, engaging western forces in battle, and the death toll is soaring—over 5000 deaths so far due to suicide bombings, beheadings, airstrikes, and roadside bombs, up 25% on 2006. But for Afghan women, the greatest peril is not bombs or bullets—it is the act of giving birth. On average one Afghan woman dies every 30 minutes from pregnancy-related causes. The national maternal mortality rate is 1600 per 100 000 livebirths, second only to Sierra Leone.

An expectant mother faces colossal problems in seeking professional help. The road to a hospital or clinic may be rutted, snow-filled, or crawling with armed insurgents. Her family might be too poor to afford a car or a taxi fare; a 4 hour donkey ride could be too painful. Male relatives may discourage her from going to hospital, fearing the comments of sneering neighbours. The local mullah may be even sterner.

Hannah Gibson of JHPIEGO, an aid agency affiliated with Johns Hopkins University in Baltimore, remembered one pregnant woman with high blood pressure who had been taken to the local mullah in search of a cure. The mullah beat her to banish the evil spirits inside her. “By the time she got to hospital she had been beaten black and blue and the baby was dead.”

There are stark regional variations in the level of care for women. Hospitals in major towns are often well resourced but swamped with clients. Kabul’s Malalai Hospital delivers 18 000 babies a year. In the distant provinces, the situation is more dire. In Badakhshan, a mountainous province on the northern border, some 6500 mothers die for every 100 000 livebirths—the highest ever recorded rate.

Cultural barriers and ingrained superstitions exacerbate the problems. Some Afghans, for example, believe that all running water is clean, or that liquids should be withheld from children with diarrhoea. In some places girls receive little medical care because of the privacy worries of domineering male relatives.

But there is hope. Since 2001, Afghan and western health workers have concentrated their efforts on this gargantuan problem, and progress is being made. A sharp fall in infant mortality is saving the lives of up to 40 000 children every year, according to a recent study by Johns Hopkins researchers. The investigators also note that the number of births assisted by a skilled health worker rose from 50 000 in 2002, to 190 000 in 2006.

A midwife training scheme has been key to that success. The British medical aid agency Merlin has trained 44 new midwives in Takhar, a northern province on the border with Tajikistan, since 2004, as part of a community-based programme. “In the beginning it was not easy”, said country director Paul Sender. “We had just 20 applicants for 20 places. It was considered a strange idea for a woman to go and live in a training compound, away from her family. They were being dissuaded from coming, not through direct intimidation, but in a gossipy way at village level.”

Merlin overcame the suspicion with educational messages on local radio and television stations, and an exhaustive round of consultations with local religious leaders. It worked—in its last intake Merlin had 200 applicants for the same number of places.

Good wages help. A community midwife in a rural area can earn up to US$350 per month, a huge salary by local standards. But the need remains acute. Across the country there are only 2200 midwives against an estimated need of between 6000 and 8000.

“The amount of money you could pour into the health system is limitless”, admits Sender. “But things are changing. We have newly constructed clinics, working midwives, and mothers delivering babies. It is moving in the right direction.”

Declan Walsh

The printed journal includes an image merely for illustration

Afghanistan’s midwives often have to tackle superstitions surrounding pregnancy and newborn care
Rwanda makes health-facility deliveries more feasible

Rwanda, one of the poorest countries in the world, where a genocide in 1994 destroyed health infrastructure and drove hundreds of medical workers into exile, is emerging as one of the nations with the best maternal health-care systems in Africa. Wairagala Wakabi reports.

Rwanda has seen a substantial improvement in maternal health recently. This success has partly hinged on a medical insurance scheme known as Mutuelles de Santé, through which women can access medical facilities at nominal costs, and a government policy under which women deliver at no cost if they have completed four standard antenatal visits.

The results have been impressive, say donor bodies and humanitarian agencies, which are actively supporting initiatives to improve maternal health in this small central African country. Nevertheless, the country has one of the worst maternal mortality rates in the world at 750 per 100,000 livebirths—down from 1071 early this decade. Female adult mortality rates shot up dramatically in the aftermath of the 1994 genocide, which killed an estimated 80,000 people. Solange Hakiba, head of maternal health at the Ministry of Health, says even during 1995–2000, it was 1.8 times higher than pregenocide levels.

Mutuelles—a prepayment health-insurance scheme—is run by community representatives and local health-care providers. A subscriber receives a membership card, which they produce at a health centre and receive treatment. Promoted by the health ministry and supported by international non-governmental organisations and donor agencies, Mutuelles is designed to enhance the performance of primary health-care providers while reversing the low usage of services, especially family planning and reproductive health care, a trend largely attributed to widespread poverty.

With a gross domestic product per head of US$330, few can afford to pay for medical services in Rwanda. Before the advent of Mutuelles, hospitals routinely detained women who failed to clear delivery-related bills. Some were forced to sell property such as land to leave hospital.

The Mutuelles adherence fee per person per year is about $1.83, whereas the cost of a delivery for a non-adherent woman averages $370. With membership, women receive maternity care at 10% of the usual cost. At Muhima Hospital in the capital Kigali, children born before term spend on average 45 days in the hospital. Clarisse Utamuliza, neonatology head at Muhima, says the medical bill can reach $370, which Mutuelles members do not need to pay. Currently, between 100 and 150 of the 200 patients Muhima cares for daily are members.

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Last year, skilled birth attendance in Rwanda increased to 49.5% from 31% 6 years earlier. This, Hakiba says, is due to increasing adherence to Mutuelles by the population and to an increase in funding for maternal health. Rwanda has set up health centres in remote areas to deliver insecticide-treated mosquito nets, contraceptives, condoms, and immunisation. Agencies such as USAID are also supporting Mutuelles in part because they have realised a Mutuelle member is five times more likely to seek modern health care than is a non-member.

Although experts say Mutuelles is an essential innovation, they believe that it must be supported by other measures if it is going to succeed. Melissa Gillooly, a country manager for non-governmental organisation Partners In Health (PIH), says removing user fees for pregnant women attending prenatal clinics is not enough on its own. “Hence, working in six sites in the Eastern Province, PIH sought to improve delivery of maternal health care by improving the capacity of health facilities and staff to handle obstetrical complications and by training community health workers in maternal health.”

Being able to provide obstetric surgery could save hundreds of lives in an area where maternal mortality rates are high and transportation to hospitals in other districts is not readily available. The 2005 Maternal, Neonatal and Child Health Assessment in Rwanda, showed that just 7.2% of births in Rwanda took place in facilities capable of emergency obstetrical care.

At Rwinkwavu Hospital, PIH has worked with the health ministry to renovate an abandoned district hospital including a surgical suite. Before the opening of this operating room, women arriving with life-threatening complications, such as obstructed labour or haemorrhaging, had to be transferred to the closest district hospital, a 40 minute ambulance ride. Since opening its delivery room and operating suite, the hospital now has over 100 deliveries a month, compared with less than five a month in 2005.

Wairagala Wakabi
Maternal mortality falls in Nepal but inequalities exist

Although a recent survey has indicated a sharp fall in the maternal mortality ratio in Nepal, the decline is not evenly spread across the country. In poor communities and in rural regions, the maternal health situation has not improved. Sanjaya Dhakal reports from Kathmandu.

When officials and activists were busy celebrating a sharp fall in maternal mortality in Nepal, an impoverished woman from an underdeveloped region in the far west of the country was making a heart-rending request to a social worker. Parvati wanted poison. Unable to bear the constant pain and discomfort due to severe uterine prolapse, Parvati had expressed her wish to die at the first opportunity she had to express her misery.

36-year-old Parvati comes from a marginalised Dalit (so-called untouchables) community. She was married at age 10 years to a man 20 years older. She had ten children—six of whom survived. 2 years ago, she gave birth to her last child but that delivery proved too much for her frail, weary, and undernourished body.

Uterine prolapse is often the result of difficult labour, frequent pregnancies, lack of antenatal care, and a rigorous working schedule. In less severe cases, the womb can be stabilised by inserting a rubber ring or pessary, but surgery is required in severe cases. 600 000 women all over Nepal need urgent medical care for uterine prolapse, according to the UN Population Fund.

Although Parvati lives in a fairly accessible place, each time she gave birth she was alone. She used rusty sickles to cut off the umbilical cord. The latest Demographic Health Survey (DHS) shows that 81% of births still take place in homes and the remainder in a health facility.

Against such a backdrop, the news of a sharp drop in maternal mortality ratio (MMR) over 10 years—which was marked by extreme instability, violent conflict, and a reduction of the state’s presence from various rural areas—has been received with much scepticism.

Even senior government officials have expressed “pleasant surprise” over the dramatic fall in MMR. “Various reasons like increased awareness, expansion of health-care facilities, immunisation, and antenatal care may be behind this fall. As the fall has been very substantial, we are currently engaged in further analysis to find out the truth”, said Ram Hari Aryal, a joint secretary at the Ministry of Health and Population and chief of Population Division at the Ministry.

Bhogendra Dotel, senior officer at Family Health Division of the Ministry, added that improvement in family planning awareness, which is evident by the increase in the contraceptive prevalence rate from 39% to 48% in past 5 years, is largely responsible for the fall in MMR. “The average family size has decreased from 4.6 children (for every parent) in 1996, to 4.1 in 2001, to 3.1 in 2006. This means there have been fewer pregnancies and, by that extension, fewer deaths”, he said. However, he conceded that the prevalence of contraceptives and family planning awareness has increased much more in urban areas than in rural areas.

Former minister and a Member of Parliament representing the Doti district, Bhakta Bahadur Balayar, says, “The situation not only in Doti but also in other poor districts is similar. The improvement is coming very slowly in rural regions. The dramatic fall in MMR is possibly because of huge improvement in urban areas.”

The DHS shows considerable differences in maternal health indicators for women living in different parts of the country. It shows that although 85% of urban women received antenatal care from a skilled birth attendant, only 38% of rural women did so. Almost half (48%) of children in urban areas are born in a health facility, compared with 14% in rural areas.

It seems that Nepal will need to redouble its efforts in rural areas and among marginalised communities, such as Parvati’s, to reduce the country’s MMR further.

Sanjaya Dhakal
Ecuador addresses cultural issues for pregnant women

At the policy-level, Ecuador’s government has recognised that intercultural approaches to maternal and child health are needed. But, says Susana Camacho Vivar, only with the effective participation of indigenous communities will there be a sustainable effect on the lives of women and children.

Last year, the founders of Intercultural Maternity—a private clinic in the Amazonian province of Sucumbíos, Ecuador—faced a dilemma. They had found a donor for their much needed operating room but had no space for it. They had to choose between rejecting the money and adapting their delivery room to accommodate both. They chose the latter.

Faced with criticism over their perceived choice of modern medical care over traditional models of care, Intercultural Maternity’s president Darly Quiñónez said: “There is no reason why we cannot have both: if our client needs an emergency operation, she can have one; if she wants to give birth according to her cultural needs and preferences, she can do so.”

This, like other initiatives in Ecuador, responds to a pressing need to consider cultural differences in a small but ethnically and culturally diverse country. Afro-Ecuadorians, several indigenous nationalities (mainly Kichwa, but also Cofán, Siona, and ten other nationalities), and non-indigenous people coexist in the equally varied geography of the highlands, coast, Galapagos, and Amazon region.

Coexistence, however, does not translate into equity, particularly with regard to maternal and child health. According to the 2004 Demographic and Maternal and Child Health Survey only 30% of indigenous women receive skilled care during delivery, compared with 80% of non-indigenous women. Some Kichwa women think that their cultural preferences, such as their desire to be in a vertical position during childbirth, are behind this difference. “But mostly, we feel discriminated [against] and mistreated”, says Juana Andi from the Yana Kucha community.

To address this problem, the constitutional and legal framework of Ecuador guarantees the integration of intercultural approaches in sexual and reproductive health services, including maternal health. In August, 2006, Ecuador’s Ministry of Health developed its first National Sexual and Reproductive Health Rights Plan that integrates an intercultural perspective into sexual and reproductive health services. It follows on from the Maternal and Child Health Law passed in 1994, which guarantees free reproductive health services for all women and establishes mechanisms for community monitoring and the promotion of intercultural models of care.

The legal framework may be clear and innovative, but the exact definition of interculturalism is not. Initiatives targeting cultural barriers to maternal health in Ecuador are as diverse as its people and geography. The Sucumbíos maternity clinic, for example, complements professional medical staff and modern medicine with traditional birth attendants and medicine.

According to Lily Rodríguez, the UN Population Fund’s deputy representative in Ecuador, the aim is to achieve more equitable relationships between the vision of modern medicine and that of traditional care, for the benefit of users.

Maritza Segura, Family Care International’s Ecuador coordinator, agrees and sees interculturalism as a process in construction, where dialogue among stakeholders should allow health services to meet the differentiated needs and preferences of users.

To this end, in 2005 Family Care International-Ecuador, the Quality Assurance Project, and the Tungurahua Health District implemented a process to humanise and culturally adapt childbirth through dialogue between traditional and modern medicine health providers and their clients. After identifying the freedom to choose the position for childbirth, quality of care, and adequate information as common valued cultural components of care, Tungurahua’s public-health services are mainstreaming them in their delivery services.

In another intercultural approach, the Kichwa Women’s Association in Sucumbíos, prioritises the social organisation of indigenous communities. “Only through the effective participation of indigenous women and men can maternal and child health improve; we work in a strategy of community outreach and mobilisation”, says Marcela Ayluardo from RIOS-Swiss Red Cross who technically assists the association.

Clearly in Ecuador, the process of integrating intercultural models of care into maternal health services is underway, and, for now, the outlook is positive.
Ever since the departure of Robert McNamara as its president in 1981, the World Bank has been ambivalent on the issue of population. McNamara was a convinced neoMalthusian, believing as he once stated that, after the threat of thermonuclear war, rapid population growth was perhaps the greatest threat to mankind. But not long after McNamara’s departure, the World Bank’s attitudes and thinking about population began to shift, in two ways.

First, many in the World Bank, especially the economists who dominate the institution’s intellectual core, have been sceptical that rapid population growth is a key factor in the economic performance of countries, or in efforts to reduce the incidence of poverty within countries. Like many trained in the neoclassical tradition, they have seen rapid population growth as a marginal factor that might, in some circumstances, diminish the economic performance of nations and the wellbeing of families, but a factor that can be neutralised or even overcome by sound economic policies.

Second, the World Bank has long been divided between those who favoured aggressive lending for family planning programmes and those who doubted the efficacy of family planning in reducing high fertility. This debate revolved around the question of the demand for children and whether families, especially those living in rural poverty, would voluntarily reduce the number of children they bore. Again, economists tended towards the view that parents who had large families were acting rationally, bearing many children as a hedge against high infant mortality and as a source of household labour and old-age security.

Both of these debates explain the World Bank’s lack of internal consensus and, therefore, the weakness of its policy dialogue and fairly low level of lending for population programmes in developing countries. To be sure, the Bank has provided financial assistance to family planning programmes for many years, often in the context of broader health lending, but population has figured prominently neither in its macroeconomic policy advice to governments nor in its own stated lending priorities.

The decline in priority for population is by no means unique to the World Bank. Indeed, ever since the 1994 International Conference on Population and Development (ICPD), in Cairo, the issue of population growth has been more or less absent from the international development agenda. The ICPD definitively shifted the focus of programmes away from demographic considerations and towards individual reproductive rights. Many women’s health and human rights advocates successfully argued at Cairo that demographically driven family planning led to human rights abuses and that they should be replaced by programmes to protect individual reproductive rights and health. It was also becoming clear by 1994 that population growth rates in many regions had fallen to the point that population growth was no longer high on the agenda for global collective action.

In the years since Cairo, population has rarely been mentioned in any international setting where pressing global issues were discussed. Indeed, universal access to reproductive health, Cairo’s reframing of the family planning approach, was excluded from the UN’s Millennium Development Goals (MDG) in 2000/2001, thus becoming the only international conference goal of the 1990s that failed to become an MDG. This is of great importance because the MDGs themselves are today the defining priority list for development strategy and investment. As a result, funding for population, family planning, and reproductive health has declined since the mid-1990s, especially if HIV/AIDS money is excluded.

Against this background, it is particularly noteworthy that World Bank staff have now produced a Discussion Paper entitled Population Issues in the 21st Century: The Role of the World Bank. This report seeks to take the Bank back to McNamara’s original view that rapid population growth presents substantial obstacles to economic growth and poverty reduction. Recognising that much has changed in global demography since McNamara declared population growth to be a focus of intensive Bank effort, the report, nonetheless, challenges directly the prevailing views of orthodox World Bank economists about the importance of population as a macroeconomic factor, the demand for children, and the efficacy of family planning programmes in reducing fertility.

While recognising that the world is far more differentiated demographically today than it was 50, or even 35, years ago, Population Issues in the 21st Century focuses primarily on the 35 countries in the world with total fertility rates over 5·0, nearly all of which (31 of the 35) are in sub-Saharan Africa. The paper calls on the Bank first to undertake intensive analytical work to understand the determinants and the consequences of rapid population growth in individual countries. Perhaps most crucial is to understand the reasons...
that desired fertility remains high, particularly in central and west Africa—higher than in countries such as Indonesia and Bangladesh where strong family planning programmes stimulated rapid declines in fertility a generation ago. Also of great importance in many African states is understanding the interplay of HIV/AIDS and human reproduction and to design interventions that address both the risk factors that contribute to the spread of the pandemic and the unmet need for contraception that exists despite high desired fertility in many of these countries.

The World Bank is then urged to place population high on the agenda of its overall development dialogue with these clients and to emphasise in these discussions the multipronged strategy required to reduce population growth rates, including measures to reduce infant and young child mortality, educate young women, promote gender equity and women’s employment, and improve women’s health, particularly the provision of family planning services.

Population Issues in the 21st Century joins a growing list of publications urging a return to concern about rapid population growth, especially in Africa. But one should not be overly sanguine that the World Bank is about to sound a clarion call for intensified action on population. After all, this report is a discussion paper, not a policy document. Indeed, it’s not clear that World Bank economists are convinced of the arguments put forth by the report. Some in senior Bank management may continue to oppose any involvement in policy advice or programme lending for population, family planning, or reproductive health. It was only a few months ago that a top Bank executive sought to expunge virtually all mention of these subjects from the aforementioned Health, Nutrition, and Population strategy paper and it was only after non-governmental organisations and a few member governments objected, and the Bank’s president intervened, that population and reproductive health were restored to a position of some prominence in the strategy. Even with its commitment to hard evidence and solid analysis, the World Bank appears not to be immune to the ideological struggles that continue to bedevil this field.

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In brief

Exhibition Mothers lost

Stories of Mothers Lost: A Promise of Healthy Pregnancy and Safe Childbirth for All is an impressive and moving multimedia exhibition created by men and women who have lost a mother, sister, partner, or friend in pregnancy or childbirth. The quilted panels dedicated to a testimony of maternal death come from 19 countries and reflect the work of more than 40 organisations that fight to keep mothers and children alive. The exhibition marks the launch of a year-long, global initiative to ignite action and mobilise people to raise awareness and improve policies on maternal health. These art works are a powerful representation of lost lives and the positive action being taken by so many individuals to tackle maternal mortality.

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Book

Abortion stories

I recently realised the importance of the cover of a book when, in reviewing three books on abortion, I carried them to various public places to read. Immediately, it was clear that I had lost the privileged professional security of dealing with controversial and intimate topics as a matter of course. In a café, when I extracted my reading material with the bold word “Abortion” on the cover, I wondered if I would be asked by other patrons to put it away—in the same way my colleagues and I had recently been asked by fellow diners to change our conversation in a restaurant. What a pity that I have learned to think that way by hard experience.

These three volumes on abortion each tell such a different story—and yet all contribute to filling out the picture of what makes abortion such a divisive political issue and an urgent health matter at the same time. Eyal Press’ book, Absolute Convictions: My Father, a City, and the Conflict That Divided America, doesn’t even mention the word abortion in its title. Press has written a loving tribute to his father—a brave and unassuming abortion provider in an antiabortion community—and also an examination of the politics, passions, and misunderstandings that divide the actors on both sides of the US abortion wars. In every chapter, he seeks to understand the motivations and feelings of all the players, never trivialising the differences among them but always preserving the essential humanity of people whatever their points of view.

Abortion Under Attack: Women on the Challenges Facing Choice, edited by Krista Jacob, is a collection of essays that places the struggles about abortion into a much wider social context, dealing with individual women’s needs as well as the challenges faced by marginalised groups, including poor women, non-white women, and women with non-traditional lifestyles and sexual orientations. The volume contains personal descriptions of difficult experiences and epiphanies in having, and providing, abortions. The essayists discuss the connection between other social policies and abortion, changes in medical technology, fetal pain, ideas about the value of the fetus, and the creation of the notion of “reproductive justice”, among much else.

The Human Drama of Abortion: A Global Search for Consensus by Anibal Faúndes and the late José Barzelatto, has a serious cover that does not shrink from its subject matter: the font size of “abortion” is huge and striking. In this unusual book, two very senior Latin American physicians describe their reasons for having arrived at a prochoice position during the course of their clinical and international health careers. They use this reasoning as the basis for an advocated consensus on the subject. Their volume is filled with clear descriptions of all the considerations that form attitudes towards abortion: reflections in the various sections cover epidemiological, ethical, legal, religious, public health, and clinical perspectives, as well as stories about women seeking abortions and the attitudes of health-care professionals towards the procedure. The thesis of the book is that it is possible to arrive at an agreement about abortion that involves accepting it as sometimes the best of bad choices, with clear guidance about limits on abortion based on gestational age.

These books are as much reflections of their creators as they are mirrors of the reality of abortion and the debates surrounding it. A son tries to understand his father’s quiet resolve even as he puts himself and his family possibly in harm’s way; women respond with fervour, and sometimes anger, to the injustices they have seen or experienced; respected members of the medical establishment raised in traditional Catholic societies explain their ability to take socially and potentially career-threatening stances by using sober, highly intellectual arguments.

In the diverse discussions about abortion, there are all too many arguments that contain false distinctions or that fail to make clear distinctions that really do matter. For false dichotomies, there’s the implied concept that there are two kinds of women: those who have abortions and those who are mothers. Yet in many societies, most women who have abortions are already mothers—and most of the others will become mothers eventually. For a critical failure to make important distinctions, there is the antiabortion argument that all abortions are morally the same because they end the life of a person. Yet, it is clear that, even if by some definitional gymnastics we agreed to call a blastocyst a “person”, it would be a very different kind of person from you or me.

Finally, there is in the abortion dialogue, a surprising lack of consistency in the application of logical reasoning. The influential, and life-saving, public-health argument is rarely taken to its natural conclusion:
since it is demonstrably more dangerous for a woman to carry a pregnancy to term than to have a medically supervised early abortion, should we require informed consent for prenatal care? And again, if the concept of viability implies a probability of survival, not an absolute guarantee, how can we know if any fetus is viable? Surely not solely by gestational age. Is the only test to deliver it and see if it lives? If the woman is not the best agent to decide on the fate of her fetus, who is better? Will doctors make fewer errors in judgment about the private life of a woman than the woman herself? Will judges? Or legislators who create blanket rules and leave no room for individual circumstances?

Is it paradoxical or predictable that the countries with the least encumbrances to safe abortion generally have the best profile of maternal and child health and frequently the lowest rates of abortion? Should we be surprised or simply saddened that the burden of restrictive abortion laws and practices falls most heavily on the poor and disadvantaged—both within countries and between them? Of the 67000 yearly deaths from unsafe abortion in the world, almost all occur in developing countries. What kind of international justice or equity is that?

The striking response to the last question is that there is simply no justice for deaths from unsafe abortion in the 21st century. Such deaths have virtually disappeared from countries that have safe and legal services. Deaths from unsafe abortion are arguably the most preventable kind of maternal mortality in the world, and the international health community has been sitting on its collective hands too long on this issue. Fortunately, there is movement in some unexpected places as popular opinion, as well as legislative and judicial systems, have begun to recognise the essential unfairness of denying women safe abortion services. Recent events creating the conditions for safe legal services in Portugal, Colombia, and Mexico may be the start of a new wave of consciousness on this matter. Despite difficulties, and sometimes even dangers, the need for safe abortion services may be becoming more widely recognised. International collaboration on research, training, dissemination of information, and advocacy may be able to bring the subject out from under its covers at last.

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Profile

Pius Okong: saving mothers’ lives in Uganda and worldwide

At the age of 21 years, Pius Okong entered a city for the first time. Born in 1952, the second child in a family of 12, he was brought up in a village in northeastern Uganda, and as a boy had little reason to travel. But as an intelligent child, he was encouraged to follow in his uncle’s professional footsteps and, in 1975, travelled to the capital city Kampala to study medicine at Makerere University. 30 years later, Okong is a leading international figure in the Save the Mothers Initiative and is President of the Association of Obstetricians and Gynaecologists of Uganda. His career has taken him all over the world; training in Ireland and Germany, studying for his PhD at the Karolinska Institute in Sweden, and serving as a consultant for many international organisations, including WHO, UNFPA, and UNICEF. But despite the international lifestyle offered to him, Okong remains committed to Uganda, where he lives and works. Indeed, he describes being able to work in Uganda as one of the most satisfying things about his job.

After training abroad, Okong returned to Uganda, in 1987, to specialise in obstetrics and gynaecology, and found himself at the centre of the emerging HIV/AIDS epidemic. As one of the main architects of the first HIV/AIDS clinic in the country, he recalls how “lots of different doctors from all different specialties of medicine chipped in to help with the HIV/AIDS patients”. This experience not only provided expertise in mother-to-child transmission of HIV, but also reaffirmed his love for working in missionary hospitals where he discovered his passion for community work. It was at this time that he met Sister Miriam Duggan, an Irish nun and practising gynaecologist, whom Okong regards as one of his most influential mentors: her “gentle nature” and “the way she conducted herself with patients, regardless of their status” inspired him to follow in her work.

This inspiration has helped Okong forge an impressive career. Alongside his presidency of the Association of Obstetricians and Gynaecologists of Uganda, Okong is Head of the Obstetrics and Gynaecology Department at St Francis Hospital in Nsambya. As a member of the International Federation of Gynecology and Obstetrics (FIGO) Committee on Safe Motherhood and Newborn Health, he was a linchpin in the foundation of the Save the Mothers Initiative. This project was established by FIGO in 1997, with the aim of getting high-income and low-income countries to work in partnership to reduce maternal mortality in the developing world. For some time, Okong had been concerned for the women who were unable to attend hospitals for care because of location, illness, or poverty, and says that he “wanted to find a way to reach out to them”. The Save the Mothers Initiative offered him a chance to improve care not only for women in Uganda, but for those in other developing countries.

According to Jean Chamberlain, assistant professor of obstetrics and gynaecology at Canada’s McMaster University, who works closely with Okong on the Save the Mothers Initiative, he is “a man I would never doubt; someone of great personal integrity, and undaunting dedication”. Not only does he provide crucial care to vulnerable women, but he also gives them an international voice. Chamberlain says that Okong has used his skills as a “great networker” to engage politicians, policymakers, and the media in the global fight to reduce maternal mortality.

These skills are put to use tackling what Okong describes as the biggest challenge to those working in maternal health: “capturing the commitment of political leaders”. He believes that the situation cannot improve until maternal health is established on the political agenda of developing countries. He explains that “if it’s not on their agenda then they won’t speak about it, and the communities won’t know about it” so nothing will change. Okong believes that only with such political commitment will Millennium Development Goal 5 be achieved: “Governments must sign up to a plan. A 5-to-7-year commitment to give them some sort of ownership over reaching their own targets. And the governments’ plans must involve politicians, health-care workers, public-health workers, and the community”. For Okong, community involvement from the outset is vital so that people feel included rather than dictated to—such an approach can make a real difference to improving public health he says.

As leaders in maternal health gather in London this week to celebrate the 20th anniversary of the Safe Motherhood Initiative, Okong says that he “hopes that the Women Deliver meeting will not just be a time for reflection and looking back, but that each person can leave the conference thinking ‘this is how I am going to reassess and strengthen my plans to reduce maternal mortality in my country’”. He wants to see a new level of commitment from politicians and global agencies to “inspire people to return to their countries energised by realistic action plans”. Okong has only one wish: that “by 2015 every woman in Uganda and sub-Saharan Africa is empowered to demand her right to health”.

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Jane Godsland
Profile

Jill Sheffield: nurturing safe motherhood

One day when Jill Sheffield was working as a volunteer for a family planning clinic at the Pumwani Maternity Hospital in Kenya, a woman walked into the clinic carrying a newborn baby on her front, and an older baby on her back. She had had 11 pregnancies, had six living children, and was just 27 years old. It was the mid-1960s and Kenya was one of only two African countries that had a national family planning programme, but to get contraceptives a woman had to have her husband’s signature. This woman had not sought her husband’s permission. Sheffield still remembers her response to this woman’s plight: “I was the same age and had no children; I thought holy smoke, stuff the rules. I made sure she got contraceptives, and thought: I have to change this. From that day on I wanted to make sure that women everywhere had as much choice as they could because if you can’t plan your fertility, you can’t plan your life.”

Sheffield went on to become the co-founder and President of Family Care International (FCI), a non-profit organisation that has made impressive contributions to maternal health and adolescent sexual and reproductive health. This year is the 20th anniversary of FCI and the Safe Motherhood Initiative—a global campaign to reduce maternal mortality that Sheffield has championed since its inception.

Sheffield had gone out to work in Kenya with her husband as a teacher and after 3 years they returned to the USA where she continued in education and also began working to help women like those she had met in Kenya. After serving as an Executive Officer for the International Programme of Carnegie Corporation of New York, she joined the Board of Directors of the International Planned Parenthood Federation/Western Hemisphere Region. Sheffield and others began to galvanise support to tackle issues that surround reproductive health choices. In 1985, at the conference to mark the end of the UN Decade for Women, a representative from WHO got up and said: “We think that about one woman dies every minute in childbirth around the world. Is anyone going to do anything about it?”

Sheffield knew that was her cue. FCI was created in response to this crisis, but faced many challenges. “There were so many governments, including my own, who were insensitive about contraception, unsafe abortion (or safe services), or adolescent pregnancy. We figured we could tuck all these issues under the skirts of the term ‘Safe Motherhood.’ It was a bit sneaky but it got us in the door.” It was, however, difficult to convince governments and elected policymakers to care about this issue and it was “only when we started to bang on about the economic arguments, we began to get more traction”, Sheffield explains. In 1987 with her colleague, Ann Starrs, Sheffield organised the first international Safe Motherhood meeting in Nairobi, Kenya, which brought attention to the high number of maternal deaths and challenged the world to do something.

Today, Sheffield thinks Safe Motherhood is too narrow a term for what the field has become. “It needs refurbishment. It’s not broad enough. Some women, especially young women, don’t want to be mothers at all...and they die trying to avoid it. Women will always want choices”, she says. Sheffield feels her own government is letting women and families down all over the world. “The US government doesn’t see—can’t see—won’t see that abortion only really isn’t a winning strategy. It is an ideological strategy and the data tell us it’s not working. But still they make huge investments in abstinence only education...for HIV/AIDS, for family planning, and population programmes.” Sheffield admits to having a clock on her desk that tells her how much longer the Bush Administration has left. “488 days, 6 hours, and 31 seconds”, she sighs.

The major challenge for achieving the Millennium Development Goals (MDGs), according to Sheffield, is deciding to have the will to invest in them and just “do it”. “For maternal health and morbidity it is deciding those lives are worth saving. Without a win on MDG5, the others are in grave danger”, she warns. “If there’s a silver bullet, it’s educating girls, and then gender equity and empowerment of women”, she adds. At the upcoming Women Deliver conference, she hopes to change the attitudes of those who can make a difference and persuade donors and finance ministers they can deliver for women and by doing so have far-reaching effects on economies and communities that will enable the ultimate goal of poverty reduction to be tackled.

Fred Sai, Chairman of FCI and a close friend, says: “If I were to characterise Jill in one phrase, I would say she is truly ‘a pilgrim of the impossible’. There is nothing that she considers not worth doing. Jill is ambitious in the best possible sense, ambitious to succeed in achieving an objective of service to a group or to mankind as a whole. Over the past 20 years Jill has shown such enthusiasm, leadership, dedication, and personal sacrifice to the cause of the Safe Motherhood Initiative that no-one else can match. It is no exaggeration to say that but for her, the initiative would have been consigned to history as another of those international fads that come and go.”

Sheffield’s one wish is that women are able to plan the number and spacing of their children and for pregnancy to be safe: “Fred Sai often says: we honour our soldiers who die but we don’t honour the women who die trying to be mothers, and they are heroes of our world too.”

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Legal, safe, and rare?

Your July 28 Editorial (p 291) follows the call of Bill Clinton to make abortion “legal, safe, and rare”. This is not a clarion call that my journal, which has been in the forefront of publishing on the need for safe, legal abortion, nor the international women’s health movement, has ever supported. We campaign for abortion to be safe and legal, but we also recognise and accept that it will continue to be common.

All the evidence shows that even when contraceptive prevalence is as high as it can go (eg, in the Netherlands and Australia, about 70% of women of reproductive age), abortion is less prevalent but not rare. Abortion could only become rare in a world in which contraceptives never failed, women and men having sex together never failed to use them, and sex between them was only ever preplanned and consensual. None of that is realistic, and there seems little point in calling for something that is totally unfeasible.

The implication of “make abortion rare”, moreover, is that contraception is good but abortion is “bad”. If family planning is valid behaviour, then abortion is as valid when an unwanted pregnancy occurs. I believe Clinton bought into that phraseology because he wanted to appease the anti-abortion movement in the USA. Now you join forces with the World Bank in seeking to have family planning raised higher on the political agenda. You even seek inspiration from Bill Clinton, but do not mention that he was a key champion of the barbaric practice of ‘partial birth abortion’.

Back in 1995, your Editorial questioned in a very effective way the one-dimensional manner of defining health in a reproductive context only, thus distorting it beyond recognition. You argued that the UN’s determination to “coerce women into adopting fertility control must surely give way to a broader campaign to provide multiple freedoms” (such as freedom from hunger, access to clean water, primary care, housing, etc).

India’s first woman president, Pratibha Patil, is arguing for such an approach, announcing in her inaugural speech: “We must banish malnutrition, social evils, infant mortality and female feticide.” The Lancet published research in 2006, estimating that as many as 10 million female fetuses could have been aborted in India during the past 20 years.

It is a great disappointment to see The Lancet drifting towards what it criticised in 1995 as ”the new colonialism of the international women’s health agenda”.

I declare that I have no conflict of interest.

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In your Editorial of July 28, you refer back to the 1994 International Conference on Population and Development in Cairo, Egypt. What a different tack you adopt now compared with July 22, 1995, your Editorial of which date also deconstructed the Cairo conference.

Now you join forces with the World Bank in seeking to have family planning raised higher on the political agenda. You even seek inspiration from Bill Clinton, but do not mention that he was a key champion of the barbaric practice of ‘partial birth abortion’.

Abortion debate in Latin America and beyond

Jill Replogle’s observations on the dispute between Latin American activists, the interference of the Catholic Church in legal changes, and the high numbers of abortions (July 28, p 305) are also pertinent to Argentina.

Abortion is the main cause of maternal mortality in Argentina, accounting for almost a third of maternal deaths. A survey showed that there are between 560 000 and 615 000 induced abortions per year, a figure close to the 700 000 deliveries per year in Argentina. Such figures suggest a mean of two induced abortions per woman of reproductive age.

In Argentina, induced abortion is illegal except in cases in which the mother’s life is threatened and in cases of violations on women with mental retardation. Despite this legal concession, women in these exception categories often do not have access to abortion in practice. For example, earlier this year a young mother with severe cancer requiring treatment became pregnant before the cancer treatment started. Her parents requested an abortion in order for her to receive the cancer treatment, but the public hospital authorities refused. The 20-year-old woman gave birth to a premature baby who died, and subsequently died of the cancer herself. The hospital authorities and doctors acted under the Catholic Church’s pressure and their own ideology.

In Argentina, women still need protection and must be allowed the right to decide on the basis of their beliefs, not those of doctors or anyone else.

We declare that we have no conflict of interest.

Mabel Bianco, José M Belizán,
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The current UN emergency obstetric care process indicators do not address the quality of care from the perspective of the fetus or the neonate. We know that most interventions to ensure maternal survival in case of obstetric complications also have a beneficial effect on the neonate, and we would like to monitor progress in that direction. A new indicator with a different perspective—the intrapartum case fatality rate—has been proposed and will be included in the revised WHO guidelines on monitoring the availability and use of obstetric services. I would like to bring this new indicator to the attention of those concerned with improving the quality of obstetric services, and to point out some difficulties that might arise in practice.

The intrapartum case fatality rate is defined as the proportion of deliveries that result in late stillbirths and early neonatal deaths (deaths during the first 24 h) in a given obstetric facility. In practice, three main difficulties affect the collection of the data.

First, the identification, reporting, and recording of very early neonatal deaths can be difficult. In some areas, the practice might be that women only stay in the facility for an average of 6 h or 12 h after birth, so it might be better to restrict the definition of early neonatal deaths to those occurring within the first 6 h (or 12 h).

Second, so as to measure the quality of obstetric care and not the risks attached to a very small size at birth (caused by prematurity or intrauterine growth retardation) it would be preferable to restrict the data to babies whose birthweight exceeds 2500 g (or 2000 g in areas where most babies are small).

Third, identification of late stillbirths involves examination of the individual admission records for the presence of audible fetal heartbeats at the onset of labour. A more feasible alternative would be the examination of stillborn fetuses for indications of freshness, by absence of signs of maceration.

Many programme managers and advisers have expressed interest in using this new indicator in facilities with large numbers of births, either starting data collection from scratch, or using the data available in existing monitoring systems. This letter aims to increase awareness and stimulate collaboration among those interested in testing the new indicator, those willing to share experience, and those having access to data of reasonable quality and quantity. It will also be useful to set up standard values; to exchange lessons learnt, caveats, and results; and to compare data across settings and over time, specially before and after implementation of interventions to improve obstetric care.

I declare that I have no conflict of interest.

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I declare that I have no conflict of interest.

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Estimates of maternal mortality worldwide between 1990 and 2005: an assessment of available data

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Summary

Background Maternal mortality, as a largely avoidable cause of death, is an important focus of international development efforts, and a target for Millennium Development Goal (MDG) 5. However, data weaknesses have made monitoring progress problematic. In 2006, a new maternal mortality working group was established to develop improved estimation methods and make new estimates of maternal mortality for 2005, and to analyse trends in maternal mortality since 1990.

Methods We developed and used a range of methods, depending on the type of data available, to produce comparable country, regional, and global estimates of maternal mortality ratios for 2005 and to assess trends between 1990 and 2005.

Findings We estimate that there were 535 900 maternal deaths in 2005, corresponding to a maternal mortality ratio of 402 (uncertainty bounds 216–654) deaths per 100 000 livebirths. Most maternal deaths in 2005 were concentrated in sub-Saharan Africa (270 500, 50%) and Asia (240 600, 45%). For all countries with data, there was a decrease of 2·5% per year in the maternal mortality ratio between 1990 and 2005 (p<0·0001); however, there was no evidence of a significant reduction in maternal mortality ratios in sub-Saharan Africa in the same period.

Interpretation Although some regions have shown some progress since 1990 in reducing maternal deaths, maternal mortality ratios in sub-Saharan Africa have remained very high, with little evidence of improvement in the past 15 years. To achieve MDG5 targets by 2015 will require sustained and urgent emphasis on improved pregnancy and delivery care throughout the developing world.
Countries and territories with populations under 250 000 were excluded.

**Estimation of maternal mortality ratios**

The challenge in producing comparable country estimates of maternal mortality ratios is to make maximum use of the strengths of recent (post-1995) empirical data while minimising the effects of the data weaknesses identified in previous global estimates.2–4 A modelling strategy was required for countries without any reliable national level data for maternal mortality. We identified eight broad types of data availability (panel), and used different strategies to estimate or adjust reported maternal mortality ratios for each; we also estimated uncertainty bounds, intended to give a sense not of formal statistical significance but of plausible range. In most settings the magnitude of uncertainty is unclear; our approach to establishing uncertainty bounds was largely arbitrary. Studies in countries with high-quality data have revealed a widespread tendency to under-record maternal deaths in civil registration, on average by a third (webtable 1).10–19 We assumed that in less good data collection settings the errors were likely to be at least as large, so we used an upward adjustment of maternal mortality ratios by 50% in many settings. Throughout we used UN Population Division estimates of 2005 births (the denominator of the maternal mortality ratio) for consistency. For countries in groups C, F, and H, we made use of the proportion of deaths of all women of reproductive age due to maternal causes (PMDF) because we believe it to be more accurately recorded than maternal mortality per se. However, the PMDF is affected by the HIV/AIDS epidemic: where adult female deaths have increased sharply, the PMDF has fallen. In many cases, the PMDF is observed for a year

**Methods**

Our unit of analysis was the country. Countries have used a range of different data collection approaches to generate estimates of maternal mortality. Our analysis was restricted to nationally representative sources of data. Sources were identified in collaboration with countries through WHO, UNICEF, and UNFPA country representatives as well as from internationally coordinated survey programmes; our cutoff for the review of data sources was March, 2007. Different data sources require different analytical strategies to enhance comparability across countries and over time. As a result, we used different methods to obtain comparable country, regional, and global estimates of maternal mortality ratios for 2005 and for the analysis of trends between 1990 and 2005.

<table>
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<tr>
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**Panel: Country groups, categorised by type of available data**

- Group A: Countries with satisfactory civil registration data
- Group B: Countries with complete registration of deaths but excessive proportions of ill-defined causes
- Group C: Countries with direct sisterhood surveys
- Group D: Countries with reproductive age mortality surveys
- Group E: Countries with sample registration estimates
- Group F: Countries with population census based estimates
- Group G: Countries with other empirical bases
- Group H: Countries lacking appropriate empirical data

**Methods**

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**Estimation of maternal mortality ratios**

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**Methods**

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</tbody>
</table>

**Figure: Distribution of country estimates of maternal mortality ratios for 2005 by MDG regions**

Boxes represent 25th and 75th percentiles of the observations, with the middle bar representing the median, and the whiskers marking the upper and lower adjacent values. Dots represent extreme outliers.
other than 2005. To avoid bias due to excess HIV-related deaths, we calculated the proportion of deaths due to maternal causes among deaths of all causes except HIV, a proportion that we refer to as PMDF\textsuperscript{non-HIV}. One should note that expressing the proportion relative to non-HIV deaths does not mean that maternal deaths of women as a result of HIV are excluded.

In group A countries (n=59, 13% of global births in 2005), WHO estimates that at least 90% of deaths are registered, and there is medical certification of cause of death using International Statistical Classification of Diseases and Related Health Problems (ICD) standards, and where ill-defined cause of death codes appear on less than 20% of certificates.\textsuperscript{39} For these countries, we calculated maternal mortality ratios by dividing the average number of maternal deaths for the three most recent years available (we averaged over 3 years to smooth out volatility resulting from small numbers; for countries with population size below half a million we averaged over 6 years) by the estimated number of births in 2005. On average about two-thirds of all true maternal deaths were identified as such in complete civil registration systems (webtable 1). However, national registration procedures vary, and a single adjustment factor (of around 1·5) cannot be generalised. Therefore, national estimates were used both as the lower limit of the country-specific uncertainty bound and as the point estimate; the upper uncertainty bound was obtained by multiplying the estimated maternal mortality ratio by two to account for uncertainty in the under-reporting of deaths due to maternal causes. Maternal mortality was so low in group A countries that any adjustments to their estimates would make essentially no difference to regional or global estimates.

In group B countries (n=6, 1% of global births), civil registration systems are judged by WHO to record at least 90% of deaths, but ill-defined cause of death codes appear on 20–30% of certificates.\textsuperscript{21} Initial estimates of maternal mortality ratios for these countries were arrived at by proportionately redistributing female deaths of ill-defined causes among known causes. The adjusted estimates of maternal deaths averaged over the three most recent years available and estimated number of births in 2005 were used to estimate maternal mortality ratios for 2005. In view of the additional uncertainty of these estimates relative to group A, the point estimate was obtained by multiplying the initial estimate of the maternal mortality ratio by 1·5. The initial estimate was used as the lower uncertainty bound, and twice the initial estimate as the upper bound.

Group C countries (n=28, 16% of global births) have used direct sisterhood modules in nationally representative household surveys.\textsuperscript{22} These modules collect information concerning all siblings born of the same mother: sex and age for living siblings; sex, age at death, and year of death for dead siblings. Additionally, for sisters who died at ages 15–49 years, information was collected as to whether the sister was pregnant or within 2 months of delivery when she died. Estimates of maternal mortality derived from sisterhood methods are usually calculated for a reference period of 0–6 years before the survey. Previous analyses have suggested that sisterhood data tend to underestimate overall female

<table>
<thead>
<tr>
<th>Group A*</th>
<th>Reference period of latest data or estimate*</th>
<th>Estimated maternal mortality ratio 2005 (deaths per 100 000 livebirths)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Australia</td>
<td>2003</td>
<td>4 (4–9)</td>
</tr>
<tr>
<td>Austria</td>
<td>2005</td>
<td>4 (4–7)</td>
</tr>
<tr>
<td>Bahamas</td>
<td>2000</td>
<td>16 (16–33)</td>
</tr>
<tr>
<td>Barbados</td>
<td>2000</td>
<td>16 (16–31)</td>
</tr>
<tr>
<td>Belarus</td>
<td>2003</td>
<td>18 (18–35)</td>
</tr>
<tr>
<td>Belgium</td>
<td>1997</td>
<td>8 (8–16)</td>
</tr>
<tr>
<td>Belize</td>
<td>2001</td>
<td>57 (52–100)</td>
</tr>
<tr>
<td>Bosnia and Herzegovina</td>
<td>2004</td>
<td>3 (3–6)</td>
</tr>
<tr>
<td>Bulgaria</td>
<td>2004</td>
<td>11 (11–22)</td>
</tr>
<tr>
<td>Canada</td>
<td>2003</td>
<td>7 (7–13)</td>
</tr>
<tr>
<td>Chile</td>
<td>2003</td>
<td>16 (16–32)</td>
</tr>
<tr>
<td>Costa Rica</td>
<td>2004</td>
<td>30 (30–60)</td>
</tr>
<tr>
<td>Croatia</td>
<td>2005</td>
<td>7 (7–15)</td>
</tr>
<tr>
<td>Cuba</td>
<td>2004</td>
<td>45 (45–90)</td>
</tr>
<tr>
<td>Cyprus</td>
<td>2005</td>
<td>10 (10–20)</td>
</tr>
<tr>
<td>Czech Republic</td>
<td>2005</td>
<td>4 (4–9)</td>
</tr>
<tr>
<td>Denmark</td>
<td>2001</td>
<td>3 (3–6)</td>
</tr>
<tr>
<td>Estonia</td>
<td>2005</td>
<td>25 (25–50)</td>
</tr>
<tr>
<td>Finland</td>
<td>2005</td>
<td>7 (7–15)</td>
</tr>
<tr>
<td>France</td>
<td>2003</td>
<td>8 (8–16)</td>
</tr>
<tr>
<td>Germany</td>
<td>2004</td>
<td>4 (4–9)</td>
</tr>
<tr>
<td>Hungary</td>
<td>2005</td>
<td>6 (6–11)</td>
</tr>
<tr>
<td>Iceland</td>
<td>2004</td>
<td>4 (4–8)</td>
</tr>
<tr>
<td>Ireland</td>
<td>2005</td>
<td>1 (1–2)</td>
</tr>
<tr>
<td>Israel</td>
<td>2003</td>
<td>4 (4–9)</td>
</tr>
<tr>
<td>Italy</td>
<td>2002</td>
<td>3 (3–6)</td>
</tr>
<tr>
<td>Japan</td>
<td>2004</td>
<td>6 (6–12)</td>
</tr>
<tr>
<td>Kuwait</td>
<td>2002</td>
<td>4 (4–8)</td>
</tr>
<tr>
<td>Latvia</td>
<td>2004</td>
<td>10 (10–19)</td>
</tr>
<tr>
<td>Lithuania</td>
<td>2005</td>
<td>11 (11–22)</td>
</tr>
<tr>
<td>Luxembourg</td>
<td>2005</td>
<td>12 (12–23)</td>
</tr>
<tr>
<td>Macedonia, Former Yugoslav Republic of</td>
<td>2005</td>
<td>10 (10–20)</td>
</tr>
<tr>
<td>Malta</td>
<td>2005</td>
<td>8 (8–12)</td>
</tr>
<tr>
<td>Mauritius</td>
<td>2003</td>
<td>15 (15–30)</td>
</tr>
<tr>
<td>Mexico</td>
<td>2003</td>
<td>60 (60–120)</td>
</tr>
<tr>
<td>Moldova</td>
<td>2004</td>
<td>22 (22–44)</td>
</tr>
<tr>
<td>Mongolia</td>
<td>2003</td>
<td>46 (46–93)</td>
</tr>
<tr>
<td>Netherlands</td>
<td>2005</td>
<td>6 (6–12)</td>
</tr>
<tr>
<td>New Zealand</td>
<td>2003</td>
<td>9 (9–18)</td>
</tr>
<tr>
<td>Norway</td>
<td>2003</td>
<td>7 (7–15)</td>
</tr>
<tr>
<td>Puerto Rico</td>
<td>2001</td>
<td>18 (18–36)</td>
</tr>
<tr>
<td>Romania</td>
<td>2005</td>
<td>24 (24–49)</td>
</tr>
<tr>
<td>Russia</td>
<td>2004</td>
<td>28 (28–55)</td>
</tr>
</tbody>
</table>

(Continues on next page)
mortality.22–24 The webfigure compares a summary measure of female mortality (the probability of dying between the ages of 15 and 50 years) estimated from sister histories with independent estimates made by WHO based on careful assessments of all available data;25,26 although there is a strong relation, in all but two cases the sister-based estimate is below the WHO estimate. The same studies have also suggested that the proportion of sister deaths reported as occurring during pregnancy or the immediate post-partum period (pregnancy-related deaths) provides a reasonable estimate of the true PMDF; theoretically, pregnancy-related deaths exceed true maternal deaths because of the inclusion of deaths from causes incidental to the pregnancy, but in practice this excess could be roughly balanced by a failure to report some deaths (eg, abortion-related deaths), as occurring during pregnancy.27–29 Thus, for group C countries we based our estimate of maternal mortality ratios on WHO estimates of the number of deaths of women of reproductive age in 2005 combined with the survey estimates of PMDF. For each survey, we standardised our estimates of PMDF onto the age distribution of women in the survey population, because the age distribution of sisters is not the same as that of the female population itself. A further adjustment is required as a result of the dynamics of national HIV epidemics. The survey estimates of PMDF represent averages over the 7 years before the survey; thus for a survey taken at the end of 2002, the PMDF represents an average over the period 1996–2002. Since PDMF can change rapidly over time in a population with an HIV/AIDS epidemic, we calculated PMDF_{non-HIV} over the period and then estimated maternal deaths for 2005 by applying this PMDF_{non-HIV} to estimated non-HIV deaths of women of reproductive age in 2005. This estimate was then divided by the estimated number of births in 2005 to obtain the point estimate of the maternal mortality ratio. Lower and upper bounds for the estimates were calculated from a model that related published SE on 7-year sisterhood estimates22 to the square root of the number of sister years of observation.

Group D countries (n=4, 5% of global births) are those that have done reproductive age mortality surveys. A true reproductive age mortality survey uses several sources of data on deaths of women of reproductive age to ensure that all such deaths are identified (triangulation) and are usually regarded as the gold standard for the estimation of maternal mortality ratios. However, some surveys are not nationally representative, and others fail to report their procedures clearly. We therefore took a conservative approach to estimates from such surveys. We used only those surveys that were nationally representative or had been adjusted for geographic selection, and used this estimate as the lower bound of the uncertainty range. The point estimate was obtained by multiplying the observed value by 1·5, and the upper bound by doubling it.

### Table 1. Estimated Numbers of Maternal Deaths in 2005 (95% CI)

<table>
<thead>
<tr>
<th>Country</th>
<th>Year</th>
<th>Estimate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Serbia and Montenegro</td>
<td>1997</td>
<td>14 (14–27)</td>
</tr>
<tr>
<td>Singapore</td>
<td>2003</td>
<td>14 (14–27)</td>
</tr>
<tr>
<td>Slovakia</td>
<td>2004</td>
<td>6 (6–12)</td>
</tr>
<tr>
<td>Slovenia</td>
<td>2005</td>
<td>6 (6–12)</td>
</tr>
<tr>
<td>South Korea</td>
<td>2004</td>
<td>14 (14–27)</td>
</tr>
<tr>
<td>Spain</td>
<td>2005</td>
<td>4 (4–9)</td>
</tr>
<tr>
<td>Suriname</td>
<td>2000</td>
<td>72 (72–140)</td>
</tr>
<tr>
<td>Sweden</td>
<td>2002</td>
<td>3 (3–7)</td>
</tr>
<tr>
<td>Switzerland</td>
<td>2004</td>
<td>5 (5–11)</td>
</tr>
<tr>
<td>Trinidad and Tobago</td>
<td>2000</td>
<td>45 (45–89)</td>
</tr>
<tr>
<td>Ukraine</td>
<td>2004</td>
<td>18 (18–36)</td>
</tr>
<tr>
<td>UK</td>
<td>2004</td>
<td>8 (8–15)</td>
</tr>
<tr>
<td>USA</td>
<td>2003</td>
<td>11 (11–21)</td>
</tr>
<tr>
<td>Uruguay</td>
<td>2001</td>
<td>20 (20–40)</td>
</tr>
<tr>
<td>Uzbekistan</td>
<td>2004</td>
<td>24 (24–49)</td>
</tr>
<tr>
<td>Venezuela</td>
<td>2002</td>
<td>57 (57–110)</td>
</tr>
<tr>
<td><strong>Group B</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Argentina</td>
<td>2003</td>
<td>77 (51–100)</td>
</tr>
<tr>
<td>Bahrain</td>
<td>2003</td>
<td>32 (21–42)</td>
</tr>
<tr>
<td>Greece</td>
<td>2004</td>
<td>3 (2–4)</td>
</tr>
<tr>
<td>Poland</td>
<td>2004</td>
<td>8 (5–10)</td>
</tr>
<tr>
<td>Portugal</td>
<td>2003</td>
<td>11 (7–14)</td>
</tr>
<tr>
<td>Qatar</td>
<td>2004</td>
<td>12 (8–16)</td>
</tr>
<tr>
<td><strong>Group C</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Burkina Faso</td>
<td>1994–98</td>
<td>700 (390–1000)</td>
</tr>
<tr>
<td>Cameroon</td>
<td>1998–2004</td>
<td>1000 (670–1400)</td>
</tr>
<tr>
<td>Chad</td>
<td>1998–2004</td>
<td>1500 (930–2000)</td>
</tr>
<tr>
<td>Congo</td>
<td>1999–2005</td>
<td>740 (450–1100)</td>
</tr>
<tr>
<td>Dominican Republic</td>
<td>1993–2002</td>
<td>150 (90–210)</td>
</tr>
<tr>
<td>Ethiopia</td>
<td>1999–2005</td>
<td>720 (460–980)</td>
</tr>
<tr>
<td>Gabon</td>
<td>1994–2000</td>
<td>520 (290–750)</td>
</tr>
<tr>
<td>Indonesia</td>
<td>1998–2003</td>
<td>420 (240–600)</td>
</tr>
<tr>
<td>Lesotho</td>
<td>1995–2004</td>
<td>960 (570–1400)</td>
</tr>
<tr>
<td>Madagascar</td>
<td>1999–2003</td>
<td>510 (290–740)</td>
</tr>
<tr>
<td>Malawi</td>
<td>1998–2004</td>
<td>1100 (720–1500)</td>
</tr>
<tr>
<td>Mali</td>
<td>1995–2001</td>
<td>970 (620–1300)</td>
</tr>
<tr>
<td>Mauritania</td>
<td>1995–2001</td>
<td>820 (480–1200)</td>
</tr>
<tr>
<td>Peru</td>
<td>1994–2000</td>
<td>240 (120–310)</td>
</tr>
<tr>
<td>Rwanda</td>
<td>2000–2004</td>
<td>1300 (770–1800)</td>
</tr>
<tr>
<td>Senegal</td>
<td>1999–2005</td>
<td>980 (590–1400)</td>
</tr>
<tr>
<td>Tanzania</td>
<td>1995–2005</td>
<td>950 (620–1300)</td>
</tr>
<tr>
<td>Togo</td>
<td>1993–98</td>
<td>510 (290–750)</td>
</tr>
<tr>
<td>Zambia</td>
<td>1995–2001</td>
<td>830 (520–1200)</td>
</tr>
</tbody>
</table>

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Group E countries (China and India, 32% of global births) have data from disease surveillance or sample registration systems. We assumed that these estimates at best were as uncertain and faced the same biases as group B countries; this could be a liberal assumption in view of possible issues related to number of deaths covered and how representative the systems were for the country as a whole. Accordingly, the observed value was accepted as the lower uncertainty bound, the point estimate was obtained by multiplying the observed value by 1·5, and the upper bound by doubling it.

Group F countries (n=5, 2% of global births) have population census data on household deaths with identification of pregnancy-related deaths. We treated these data in much the same way as sisterhood data: we multiplied the observed PMDF by the WHO estimate of deaths for the respective census year to estimate the number of maternal deaths, and then expressed this as a percentage of WHO non-HIV deaths. This adjusted PMDF was then applied to WHO-estimated non-HIV deaths in 2005. This number of maternal deaths, divided by estimated births in 2005, was used as the lower uncertainty bound; the point estimate was obtained by multiplying the observed value by 1·5, and the upper bound by doubling it.

Group G countries (n=6, 5% of global births) have estimates for maternal mortality ratios from special studies about which little information is available. For these countries, the observed value was taken to be the lower uncertainty bound; the point estimate was obtained by multiplying the observed value by 1·5, and the upper bound by doubling it.

Group H countries (n=61, 25% of global births) are those with no empirically based data sets or estimates for maternal mortality ratios in 1995 or more recently produced according to established methods. For these countries, it was not possible to develop correction factors; instead we had to predict maternal mortality values on the basis of statistical modelling. We adopted a strategy similar to that used for the 2000 estimates, involving a four-stage procedure. First, we developed a statistical model to estimate PMDFs for non-HIV/AIDS deaths (webappendix and webtable 2), using data from all countries with empirical data (ie, groups A to G, with the exception of group B). We used this model to estimate the PMDF for each country in group H. We then multiplied the estimated PMDF by the number of non-HIV/AIDS deaths of women aged 15–49 years, as estimated by WHO for 2005, to establish the number maternal deaths. Lastly, we derived estimates of the maternal mortality ratio by dividing the estimated maternal deaths by estimated 2005 livebirths. Lower and upper bounds were estimated from the SE of out-of-sample estimates from the PMDF model.

Estimation of trends in maternal mortality ratios
Few developing countries, especially low-income ones, have more than one national estimate of maternal

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<table>
<thead>
<tr>
<th>Group D</th>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>Brazil</td>
<td>2005</td>
<td>110 (74-150)</td>
</tr>
<tr>
<td>Egypt</td>
<td>2000</td>
<td>130 (84-170)</td>
</tr>
<tr>
<td>Jordan</td>
<td>1996</td>
<td>62 (41-82)</td>
</tr>
<tr>
<td>Turkey</td>
<td>2005</td>
<td>44 (29-58)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Group E</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>China</td>
<td>2005</td>
<td>45 (30-60)</td>
</tr>
<tr>
<td>India</td>
<td>2001-2003</td>
<td>450 (300-600)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Group F</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Honduras</td>
<td>2001</td>
<td>280 (190-380)</td>
</tr>
<tr>
<td>Iran</td>
<td>1995-96</td>
<td>140 (95-190)</td>
</tr>
<tr>
<td>Nicaragua</td>
<td>2005</td>
<td>170 (120-230)</td>
</tr>
<tr>
<td>Paraguay</td>
<td>2002</td>
<td>150 (99-200)</td>
</tr>
<tr>
<td>South Africa</td>
<td>2001</td>
<td>400 (270-530)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Group G</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Bangladesh</td>
<td>2000</td>
<td>570 (380-760)</td>
</tr>
<tr>
<td>Burma</td>
<td>1999</td>
<td>380 (260-510)</td>
</tr>
<tr>
<td>Malaysia</td>
<td>1996</td>
<td>62 (41-82)</td>
</tr>
<tr>
<td>Saudi Arabia</td>
<td>2000</td>
<td>18 (12-24)</td>
</tr>
<tr>
<td>Sri Lanka</td>
<td>2004</td>
<td>58 (39-77)</td>
</tr>
<tr>
<td>Thailand</td>
<td>2005</td>
<td>110 (70-140)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Group H</th>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>Afghanistan</td>
<td>2005</td>
<td>1800 (730-2100)</td>
</tr>
<tr>
<td>Albania</td>
<td>2005</td>
<td>92 (26-300)</td>
</tr>
<tr>
<td>Algeria</td>
<td>2005</td>
<td>180 (55-520)</td>
</tr>
<tr>
<td>Angola</td>
<td>2005</td>
<td>1400 (560-2500)</td>
</tr>
<tr>
<td>Armenia</td>
<td>2005</td>
<td>76 (23-250)</td>
</tr>
<tr>
<td>Azerbaijan</td>
<td>2005</td>
<td>82 (21-290)</td>
</tr>
<tr>
<td>Benin</td>
<td>2005</td>
<td>840 (330-1600)</td>
</tr>
<tr>
<td>Bhutan</td>
<td>2005</td>
<td>440 (160-970)</td>
</tr>
<tr>
<td>Botswana</td>
<td>2005</td>
<td>380 (120-1000)</td>
</tr>
<tr>
<td>Brunei</td>
<td>2005</td>
<td>13 (3-47)</td>
</tr>
<tr>
<td>Colombia</td>
<td>2005</td>
<td>130 (35-370)</td>
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<tr>
<td>Burundi</td>
<td>2005</td>
<td>1100 (480-1900)</td>
</tr>
<tr>
<td>Cape Verde</td>
<td>2005</td>
<td>210 (68-530)</td>
</tr>
<tr>
<td>Central African Republic</td>
<td>2005</td>
<td>980 (380-1900)</td>
</tr>
<tr>
<td>Comoros</td>
<td>2005</td>
<td>400 (150-840)</td>
</tr>
<tr>
<td>Côte d'Ivoire</td>
<td>2005</td>
<td>810 (310-1600)</td>
</tr>
<tr>
<td>Democratic Republic of the Congo</td>
<td>2005</td>
<td>1100 (480-1900)</td>
</tr>
<tr>
<td>Djibouti</td>
<td>2005</td>
<td>650 (240-1400)</td>
</tr>
<tr>
<td>Ecuador</td>
<td>2005</td>
<td>210 (65-560)</td>
</tr>
<tr>
<td>El Salvador</td>
<td>2005</td>
<td>170 (55-460)</td>
</tr>
<tr>
<td>Equatorial Guinea</td>
<td>2005</td>
<td>680 (210-1600)</td>
</tr>
<tr>
<td>Eritrea</td>
<td>2005</td>
<td>450 (180-850)</td>
</tr>
<tr>
<td>Fiji</td>
<td>2005</td>
<td>210 (55-720)</td>
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<tr>
<td>Gambia</td>
<td>2005</td>
<td>690 (250-1500)</td>
</tr>
<tr>
<td>Georgia</td>
<td>2005</td>
<td>66 (18-230)</td>
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<tr>
<td>Ghana</td>
<td>2005</td>
<td>560 (200-1300)</td>
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<tr>
<td>Guatemala</td>
<td>2005</td>
<td>290 (100-650)</td>
</tr>
<tr>
<td>Guinea Bissau</td>
<td>2005</td>
<td>1100 (500-1800)</td>
</tr>
<tr>
<td>Guyana</td>
<td>2005</td>
<td>470 (140-1600)</td>
</tr>
<tr>
<td>Iraq</td>
<td>2005</td>
<td>300 (110-600)</td>
</tr>
<tr>
<td>Jamaica</td>
<td>2005</td>
<td>170 (51-510)</td>
</tr>
</tbody>
</table>

(Continues on next page)
See Table 2: registration.

groups A and B, year refers to the most recent year for which maternal deaths are available to WHO from civil nearest unit, estimates between 100 and 1000 to 10 units, and estimates above 1000 to the nearest 100 units. *For Data are maternal mortality ratio (uncertainty bounds). Because of the very large uncertainty bounds around country

<table>
<thead>
<tr>
<th>Country</th>
<th>Year</th>
<th>Estimate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zimbabwe</td>
<td>2005</td>
<td>380 (150–700)</td>
</tr>
<tr>
<td>Yemen</td>
<td>2005</td>
<td>430 (150–900)</td>
</tr>
<tr>
<td>Zambia</td>
<td>2005</td>
<td>880 (300–2000)</td>
</tr>
</tbody>
</table>

Data are maternal mortality ratio (uncertainty bounds). Because of the very large uncertainty bounds around country point estimates, we have rounded estimates of maternal mortality ratios below 100 per 100 000 livebirths to the nearest unit, estimates between 100 and 1000 to 10 units, and estimates above 1000 to the nearest 100 units. *For groups A and B, year refers to the most recent year for which maternal deaths are available to WHO from civil registration.

Table 2: Country estimates of maternal mortality ratios for 2005

mortality. We therefore used two different approaches to explore trends in maternal mortality ratios.

The first approach was a random-effects time-series regression model of empirically based estimates of maternal mortality ratios compiled (and adjusted if necessary with the methods described above) by this and earlier WHO, UNICEF, and UNFPA exercises covering the period 1985 to the present, including estimates for high-income countries that had been excluded from the modelling exercise for group H countries. All estimates that were based on the models of PMDF (the equivalent in earlier exercises of the group H countries in 2005) were excluded from the analysis. The distribution by data source of the estimates included in the analysis is shown in webtable 3. The time-series regression model related the outcome variable (the estimated maternal mortality ratio) to the reference date of the estimate. Random-effects regression models were used because they are more appropriate to the structure of our data (multiple observations at irregular time points for some countries, single observations for others) than were standard time-series methods. The random effects model uses not only multiple observations within countries but also the patterns of change across countries; it therefore makes use of single country observations, but could provide biased results if countries are selected into the database differentially over time. To test for possible bias we re-estimated the models by use of fixed-effects models, which produced almost identical results (webtable 3).

The specific form of the random-effects regression model was as follows: $\ln(\text{MMR}_i) = \beta_0 + \beta_1(t_{time}) + \nu_i + \epsilon_i,$ where $\text{MMR}_i$ is the maternal mortality ratio for country $i$ at time $t$, $t_{time}$ is the reference year to which the estimate applies, $\nu_i$ is a country-specific normally distributed term, and $\epsilon_i$ is a random residual term. The coefficient $\beta$ on time can be interpreted as an estimate of secular trend in maternal mortality ratios. This regression equation was used for all 858 empirically based estimates of maternal mortality ratios, but we also examined differences in the estimated model parameters across MDG regions, level of income as determined by the World Bank, and the initial maternal mortality ratio.

Our second approach was to re-estimate maternal mortality for all countries of the world for around 1990, by use of the same methods used for the 2005 estimates. For countries with some empirical basis for estimates of maternal mortality ratios around 1990, we replicated the methods used to estimate maternal mortality ratios for 2005 with data from the late 1980s and early 1990s. For countries lacking an acceptable basis for estimates around 1990, a model of the PMDF is used, the model having the same form as the 2005 model, but with coefficients re-estimated with data available for 1985–95. Webtable 4 compares the coefficients of the 1990 and 2005 models. Trends were then explored by examining the regional changes in maternal mortality ratios and numbers of maternal deaths between the 1990 and 2005 estimates.

Role of the funding source

Representatives of UNICEF and the World Bank-Netherlands Partnership Program participated in the Maternal Mortality Working Group and in data compilation, and made suggestions about our analysis. All participants in the working group had access to all the data. The corresponding author had final responsibility for the decision to submit for publication.

Results

We estimate that there were about 535 900 maternal deaths worldwide in 2005, and the maternal mortality ratio was about 402 maternal deaths per 100 000 livebirths (table 1). Most maternal deaths were concentrated in
sub-Saharan Africa (270 500, 50% of deaths worldwide) and Asia (240 600, 45% of deaths worldwide); almost half (48%) of maternal deaths worldwide in 2005 was concentrated in just five countries: India (117 100), Nigeria (58 800), the Democratic Republic of Congo (32 300), Afghanistan (26 000), and Ethiopia (22 200).

Variation in the maternal mortality ratio at the regional level was very large, from nine per 100 000 livebirths for developed countries to 905 per 100 000 livebirths in sub-Saharan Africa (table 1 and figure). Even within developing regions, the range is substantial—eg, the estimate for Latin America and the Caribbean is about a seventh of that for sub-Saharan Africa (table 1). Variation at the country level is even more dramatic than for regions, from a low of one per 100 000 livebirths in Ireland to 2100 per 100 000 livebirths in Sierra Leone (table 2).

Overall, the random-effects regression model was fitted to 858 observations from the late 1980s to 2005 for a total of 125 countries. Coefficients of the regression model fitted to all 858 observations from the late 1980s to 2005 are shown in table 3. The coefficient β, on reference date measures trends in maternal mortality ratios, and can be interpreted as the average annual rate of change in the ratio per year over the time period. For all countries, the coefficient for β, is –0·025 (p<0·0001) indicating that, over the period of observation, there was a 2·5% decline per year in the maternal mortality ratio in all countries with empirically based estimates of the ratio; the fixed effects results in webtable 5 show an almost identical rate of change across those countries with two or more observations.

Table 3 also shows results of the random-effects model fitted to observations for different World Bank income categories, countries classified by type of maternal mortality data source, and initial levels of maternal mortality ratios. The downward trend in maternal mortality ratios with time is only significant in lower-middle and upper-middle income countries. Decreases in the maternal mortality ratios are significant across all data source types except for those obtained from sisterhood studies; the decrease was largest for estimates of maternal mortality ratios from studies with complete registration of deaths but excessive proportions of ill-defined causes, which represent about 2% of the sample. An additional analysis of the trends in sisterhood-based estimates of maternal mortality ratios as reported by Demographic and Health Surveys, without adjustment for the WHO estimated numbers of deaths, produced similarly non-significant results (data not shown), confirming that the results in table 3 are not an artifact of our adjustment procedure. Countries with initial maternal mortality ratios below 200 deaths per 100 000 livebirths experienced declines of about 2·4% per year (p<0·0001), whereas countries with initial ratios of

<table>
<thead>
<tr>
<th>Year</th>
<th>Maternal mortality ratio (deaths per 100 000 livebirths)</th>
<th>Maternal deaths</th>
</tr>
</thead>
<tbody>
<tr>
<td>1990</td>
<td>425</td>
<td>576 300</td>
</tr>
<tr>
<td>2005</td>
<td>402</td>
<td>535 900</td>
</tr>
<tr>
<td>Change in maternal mortality ratio (%)</td>
<td>-5.4%</td>
<td></td>
</tr>
</tbody>
</table>

Table 4: Comparison of 1990 and 2005 regional and global estimates of maternal mortality ratios
200 or more deaths per 100,000 livebirths experienced no significant decline between 1990 and 2005 (table 3).

Table 4 shows our re-estimation of maternal mortality ratios by MDG region around 1990, and compares them with those from 2005. These estimates indicate that the worldwide maternal mortality ratio fell by only 5–4% between 1990 to 2005, which equates with an average decrease of about 0.4% a year. In the same period, there was a 7% decrease in the number of maternal deaths worldwide. Decreases in maternal mortality ratios exceeded 20% in northern Africa, Latin America and the Caribbean, Oceania, and in developed countries, but were negligible in sub-Saharan Africa. Sub-Saharan Africa was the only MDG region in which the number of maternal deaths increased between 1990 and 2005, driven by increasing numbers of births and a negligible decline in maternal mortality ratios.

Discussion
Our results indicate that the worldwide maternal mortality ratio for 2005 is about 402 deaths per 100,000 livebirths, which represents about 535,900 maternal deaths in 2005. At the national level, estimated maternal mortality ratios range from below 10 deaths per 100,000 livebirths in most developed countries to as high as 2000 deaths per 100,000 livebirths in some developing countries. This huge difference in risk dwarfs differences for other commonly used health indicators, such as the infant mortality rate, and makes it likely that effective interventions to reduce maternal mortality exist but are not being widely implemented.

Reports of maternal mortality ratios in 1995 and 2000 strongly cautioned users against comparing the new country, regional, and global estimates with those from earlier exercises in terms of trends. Changes in data availability, data collection, and analysis methods rendered the results non-comparable. Here, we made an explicit attempt to estimate trends. Both methods we used indicated some decline in maternal mortality ratios between 1990 and 2005. The time-series analysis indicated an average decline of about 2.5% per year, but also indicated that such a decrease is largely restricted to middle-income countries and those countries with initial ratios below 200 deaths per 100,000 livebirths (table 3). Our re-estimation analysis showed a much smaller decline, of less than 1% a year, also restricted to countries in northern Africa, Asia, and Latin America; there is little evidence of any improvement for those countries in sub-Saharan Africa with high maternal mortality ratios (table 4). The substantial difference between the results of the two approaches is the result of differences in the composition of the country data sets included and of the methods of calculation. The time-series analysis used countries as the unit of analysis, irrespective of the number of births, whereas the re-estimation analysis weighted changes by numbers of births; births have increased in areas with high maternal mortality ratios such as sub-Saharan Africa where little progress has been made, but have declined in middle-income countries where progress has been made. The time-series random-effects model was only fitted to countries with empirical data, whereas the re-estimation analysis includes all countries. Since the countries with empirical data might plausibly have done better than those without, the time-series estimates should be viewed as upper bounds on the true trends. One should also note that the available data permit analysis for regional and global aggregates only and not for individual countries.

We estimated national maternal mortality ratios for 2005 by use of a broadly similar strategy to that used by the previous WHO, UNICEF, and UNFPA exercises for 1995 and 2000. After an internationally coordinated exercise to identify and compile all available sources of nationally representative data concerning maternal mortality, we classified countries according to the type of data available. For most countries, the observed information is adjusted or recalculated in some way to address issues of non-comparability of data from different sources both over time and across countries. Only for countries representing about an eighth of global births were births and deaths completely recorded with generally good cause of death recording, and even in these supposedly ideal cases there was considerable uncertainty about the true maternal mortality ratio because of failure to identify maternal deaths as such on death certificates, or coding errors. Despite our efforts at data compilation, no suitable recent data were found for a third of the countries of the world. For these countries, a statistical model was used to predict the proportion of women of reproductive age who died because of maternal causes. Indeed, the maternal mortality database remains very weak, especially for those countries with the highest levels of risk; national estimates of maternal mortality ratios continue to have very wide uncertainty bounds. Major investment by the international community is needed to measure maternal mortality and to build country capacity so that we can assess and interpret such data more accurately.

In the context of MDG5, progress is slow. The yearly rate of decline required to achieve the MDG5 target of reducing national maternal mortality ratios by three-quarters between 1990 and 2015 is 5.5%, far faster than the 2.5% decrease per year estimated for the countries with data or even the 4.6% fall estimated for upper-middle income countries. Of great concern is that, although some regions have shown some progress since 1990 in reducing maternal deaths, maternal mortality ratios in sub-Saharan Africa have remained very high, with little evidence of improvement in the past 15 years. To achieve MDG5 targets by 2015 will need a huge and urgent emphasis on improved pregnancy and delivery care throughout the developing world. Identifying progress by 2015 will also require a major investment in data availability and data quality; advantage must be taken...
of all possible sources of relevant information, such as including the necessary questions—eg, recent household deaths by age and sex with follow-up questions for death of women at ages 15–49 years about the timing of death relative to pregnancy—in forthcoming national population censuses.13

Contributors
KH oversaw the technical analysis, co-wrote the first draft, and edited subsequent drafts. KT contributed to compilation of data, did the statistical analysis and co-wrote the first draft. CAZ contributed to compilation of maternal mortality data, and advised on methodology and interpretation. NW contributed to methodological development and editing of revisions. LS contributed to the conception and planning of the study, identification and assessments of the primary data sources and maintenance of the database. MI contributed to the collection, compilation of data and estimation for countries with civil registration systems, carried out a literature review on the situation of reporting of maternal deaths in such systems and produced a summary table. ES contributed to methodology development, database maintenance, editing of revisions, and production of summary tables.

The Maternal Mortality Working Group

Conflict of interest statement
We declare that we have no conflict of interest.

Acknowledgments
We thank Carine Ronsumans, Cynthia Berg, Cynthia Stanton, and Budi Utomo for helpful comments on early drafts of this paper, and Annet W R Mahanani for help with the references. Kenneth Hill and Kevin Thomas were partly supported for this work by UNICEF and by the World Bank-Netherlands Partnership Program. The funding sources have no responsibility for the views expressed. The views in this article are those of the individual authors and do not represent the views of their institutions.

References
Determinants of reduction in maternal mortality in Matlab, Bangladesh: a 30-year cohort study

Mahbub Elahi Chowdhury, Roslin Botlero, Marge Koblinsky, Sajal Kumar Saha, Greet Dieltiens, Carine Ronsmans

Summary

Background Research on the effectiveness of strategies to reduce maternal mortality is scarce. We aimed to assess the contribution of intervention strategies, such as skilled attendance at birth, to the recorded reduction in maternal mortality in Matlab, Bangladesh. We examined and compared trends in maternal mortality in two adjacent areas over 30 years, by separate analyses of causes of death, underlying sociodemographic determinants, and areas and time periods in which interventions differed.

Methods We analysed survey data that was routinely collected between 1976 and 2005 for about 200 000 inhabitants of Matlab, in Bangladesh, in adjacent areas served by either the International Centre for Diarrhoeal Disease Research, Bangladesh (ICDDR,B) or by the government. We used logistic regression to assess time trends in maternal mortality. We separately analysed deaths due to direct obstetric causes, abortion-related causes, and other causes.

Findings Maternal mortality fell by 68% in the ICDDR,B service area and by 54% in the government service area over 30 years. Maternal mortality remained stable between 1976 and 1989 (crude annual OR 1·00 [0·98–1·01]) but decreased substantially after 1989 (OR 0·95 [0·93–0·97]). The speed of decline was faster after the skilled-attendance strategy was introduced in the ICDDR,B service area in 1990 (p=0·09). Abortion-related mortality fell sharply from 1990 onwards (OR 0·91 [0·86–0·95]). Educational differentials for mortality were substantial; the OR for more than 8 years of schooling compared with no schooling was 0·30 (0·21–0·44) for maternal mortality and 0·09 (0·02–0·37) for abortion mortality.

Interpretation The fall in maternal mortality over 30 years occurred despite a low uptake of skilled attendance at birth. Part of the decline was due to a fall in abortion-related deaths and better access to emergency obstetric care; midwives might also have contributed by facilitating access to emergency care. Investment in midwives, emergency obstetric care, and safe pregnancy termination by manual vacuum aspiration have clearly been important. However, additional policies, such as those that bring about expansion of female education, better financial access for the poor, and poverty reduction, are essential to sustain the successes achieved to date.

Introduction

The fifth Millennium Development Goal (MDG) is to reduce maternal mortality by 75% between 1990 and 2015.1 An intrapartum care strategy, preferably delivered in health centres and supported by referral-level facilities, is the key to achievement of MDG-5.2 This strategy would fit well within a district-health-system approach, and most interventions that make up the package of intrapartum care could be delivered by a skilled attendant. However, research to quantify the effectiveness of such a strategy for maternal mortality is scarce: with no randomised controlled trials to compare an intrapartum care strategy with alternative strategies, and only a few time-series studies from resource-poor countries to inform the scale of effect.3

Many poor countries, especially those in South Asia, are undergoing rapid economic growth, with associated improvements in women’s education and empowerment. Economic growth clearly contributes to a reduction in maternal mortality, but does not fully explain variations between countries.4 Inequalities within poor countries, both in access to obstetric care and in maternal survival, persist.4 However, the effect of overall improvements in social and economic indicators on access to care and maternal health outcomes is not yet known.

Because women’s education and other social indicators have improved substantially in Matlab, in rural Bangladesh, we chose this location to examine trends in maternal mortality against a background of social and economic change. One half of the area has been served by the International Centre for Diarrhoeal Disease Research, Bangladesh (ICDDR,B); maternal and child health and family-planning services were introduced in this area in the late 1970s, followed by a skilled-attendance strategy in 1987.5 We used an adjacent area, which has received routine government health services, as a useful comparison for understanding how scaling up interventions within the wider health system might affect maternal mortality. We aimed to assess the contribution of intervention strategies, such as skilled attendance at birth, to the recorded reduction in maternal mortality in Matlab. We examined and compared trends in maternal mortality in the two areas over 30 years, and separated causes of death and underlying sociodemographic determinants.

Methods

Study population This cohort study took place in two adjacent areas in Matlab, Bangladesh, that had a combined population of...
about 220000 in 2002. Matlab is a rural subdistrict southeast of Bangladesh’s capital, Dhaka. The population is predominantly Muslim, and the main sources of income are farming and fishing. Tradition restricts women from seeking care outside their homes, especially during pregnancy.

The ICDDR,B and government service areas are generally similar in terms of socioeconomic environment, but differ widely in the services that are available to women. The ICDDR,B service area, community-health research workers have visited women monthly in their homes, since 1977, to provide a range of services.4 In the early years of the programme, the focus was almost entirely on the provision of contraceptives (table 1).5–11

In 1982, the role of Maternal and Child Health (MCH) services in half of the ICDDR,B service area was expanded to include delivery of tetanus-toxoid vaccination to all women of reproductive age, simple antenatal screening, training of traditional birth attendants, and measles vaccination to children. In 1986, MCH services were expanded to the full ICDDR,B area to include full child immunisation, treatment of acute respiratory infections, vitamin A supplementation to children, nutrition rehabilitation, and control of dysentery in the community.

In 1987, a safe-motherhood programme was piloted in part of the ICDDR,B service area (table 1).12 The programme aimed to increase coverage of home births that were attended by a health professional by posting two trained midwives in each of two health centres; by establishing a basic obstetric clinic in Matlab town; and by providing transport to the clinic or a referral hospital when necessary. This intervention was extended to two more health centres in 1990, to cover the entire ICDDR,B service area. In 1996, the programme was redesigned to promote facility-based birthing. Between 1996 and 2001, all four health centres were upgraded and equipped for basic obstetric care; home births with midwives in attendance were no longer offered.12 Until 2005, skilled attendance at birth remained below 50%, whereas the rate of caesarean sections has increased steadily, from 0·2% in 199013 to 6·8% in 2005 (table 1).11,14 (figure 1). The total fertility rate declined from 5·5 in 1978 to 4·2% in 2005.11,13 Between 1990 and 2001, the proportion of births that were attended by a health professional by posting two trained midwives in each of two health centres; by

### Table 1: Interventions for maternal health in Matlab between 1976 and 2005

<table>
<thead>
<tr>
<th>Provision of contraceptives</th>
<th>Government service area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduced in 1978 by ICDDR,B, and intensified over time. The total fertility rate was reduced from 5·5 children per woman in 1978 to 2·7 in 2005 (figure 1)</td>
<td>Introduced in late 1970s by government, and intensified over time. The total fertility rate declined from 5·5 in 1978 to 2·8 in 2005 (figure 1)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Manual vacuum aspiration</th>
<th>Government service area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduced in the late 1970s in both the ICDDR,B and government service areas</td>
<td>Not available</td>
</tr>
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<table>
<thead>
<tr>
<th>Antenatal screening</th>
<th>Government service area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Simple screening tool introduced in 1982 (community health workers); continues today</td>
<td>Not available</td>
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</table>

<table>
<thead>
<tr>
<th>Training of traditional birth attendants (TBAs)</th>
<th>Government service area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Both ICDDR,B and the government trained TBAs between 1982 and 1999, and stopped in 2000</td>
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</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Access to skilled attendant</th>
<th>Government service area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Four midwives posted in part of area in 1987, expanded to full area in 1990, continues today. Between 1987 and 2005, the proportion of births with a skilled attendant increased from 5% to 53% (1976) to 6% in 2005.11 Between 1990 and 2001, the proportion of births with a skilled attendant increased from 3% to 9% (1976) to 14% (2005)</td>
<td>No midwives are practising in the area. Between 1987 and 2005, the proportion of births with a skilled attendant increased from 2% (1976) to 14% (2005)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Access to emergency obstetric care</th>
<th>Government service area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Most women go to Chandpur town. Between 1976 and 1990, Chandpur had two hospitals for emergency obstetric care; many private clinics began to offer such care in the 1990s. From 1987 onwards, the ICDDR,B offered extra transport for women to go to Chandpur. The caesarean rate increased from 0·2% in 1990 to 6·8% in 2005.11 Between 1990 and 2001, the proportion of births with a caesarean to save the mother’s life rose from 0·3% to 0·9%</td>
<td>Most women go to Chandpur town. Between 1976 and 1990, Chandpur had two hospitals for emergency obstetric care; many private clinics began to offer such care in the 1990s. Rates of caesarean sections increased from 0·1% in 1990 to 4·2% in 2005.11 Between 1990 and 2001, the proportion of births in which a caesarean was used to save the mother’s life rose from 0·1% to 0·3%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Availability of antibiotics</th>
<th>Government service area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Widely available in villages in both the ICDDR,B and government service areas since mid-1980s</td>
<td>Not available</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Microcredit programmes</th>
<th>Government service area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduced in both ICDDR,B and the government service areas in mid-1980s, and ongoing</td>
<td>Not available</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Women’s education</th>
<th>Government service area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Proportion of pregnant women without formal schooling decreased from 69% in 1976–80 to 27% in 2001–05</td>
<td>Proportion of pregnant women without formal schooling decreased from 73% in 1976–80 to 28% in 2001–05</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Socioeconomic development</th>
<th>Government service area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Major changes over full period. Proportion of pregnant women classed as poor decreased from 31% in 1976–80 to 1% in 2001–05</td>
<td>Major changes over full period. Proportion of pregnant women classed as poor decreased from 34% in 1976–80 to 1% in 2001–05</td>
</tr>
</tbody>
</table>

### Articles

Data collection

Since 1966 all births, deaths, migrations, and marriages in the study areas have been recorded in monthly...
Figure 1: Total fertility rate in ICDDR,B and government service areas in Matlab between 1978 and 2005

Articles

A maternal death was defined as the death of a woman while pregnant or within 90 days of pregnancy termination, irrespective of pregnancy duration or termination method, and excluding deaths from intentional and unintentional injuries. Deaths were further classified into deaths from direct obstetric causes (including antepartum, intrapartum, and postpartum haemorrhage; hypertensive diseases of pregnancy, dystocia; and sepsis), deaths from abortion, and other causes. We pooled all abortion deaths into one group, because the distinction between spontaneous and induced abortion was not always clear from verbal autopsies. Similarly, we did not distinguish indirect obstetric deaths from deaths from incidental causes, since verbal autopsies failed to make that distinction.

Statistical analysis
We calculated asset quintiles of all families with pregnancies between 1976 and 2005 using principal-components analysis (SPSS version 10.0). To allow for changes in asset ownership with each pregnancy, we used pregnancies as the unit of analysis, and assessed the most recently available census for each pregnancy. We included asset variables that were common to the 1974, 1982, 1996, and 2005 censuses in Matlab: source of drinking water; type of latrine; principal material of floor, wall, and roof; electricity supply; and ownership of quilt, hurricane lamp, watch, radio, television, bicycle, boat, cow, telephone, or remittance. The asset quintiles were derived from the first principal component.

We investigated trends and determinants associated with maternal mortality from all causes, from direct obstetric causes (excluding abortion), from abortion, and from other causes. Denominators were all recorded pregnancies, including spontaneous and induced abortions, stillbirths and livebirths, with multiple births treated as single pregnancies. We estimated crude and adjusted odds ratios by logistic regression, adjusting for time, area, asset quintile, maternal education, religion, maternal age, and parity. Because maternal mortality is a rare event, the odds ratio was deemed to approximate the relative risk. Trends in mortality over time or within ordered categorical variables were tested with the Wald test. We did not use data analysis methods suitable for the analysis of correlated data, despite the fact that some women had more than one pregnancy during follow-up, because the outcome of interest (death) could not be clustered for each woman.

We modelled time as a linear variable (assuming a constant change per year), allowing for changes in the trend in 1990 when the Safe Motherhood programme was underway in the ICDDR,B service area. We chose 1990 rather than 1987 as the cut-off because the midwives only operated in half of the ICDDR,B service area between 1987 and 1989. We also tested whether the slope was similar in the ICDDR,B and government service areas after 1989 by introducing an interaction between time and area after this date. We used Stata software (version 8.0) for all analyses.

Role of the funding source
The sponsor of this study had no role in study design, data collection, data analysis, data interpretation, or writing of the report. The corresponding author had full access to all the data in the study and had final responsibility for the decision to submit for publication.

Results
The demographic and socioeconomic profile of the population changed noticeably between 1976 and 2005 (table 2). The proportion of pregnant women who had no formal education was reduced to less than half from 1976–80 to 2001–05. In 1976–80, nearly a third of pregnant women lived in households in the lowest asset quintile, compared with fewer than 1% in 2001–05. The
The demographic composition of births also changed: in 1976–80, more than a quarter of pregnancies were of order six or more, whereas in 2001–05, only about a tenth were in this category. The proportion of first pregnancies increased from a fifth to nearly a third during this period, and pregnancies in women younger than 20 years were halved.

The sample consisted of 215 779 pregnancies and 769 maternal deaths. Trends in maternal mortality by cause and area are shown in figure 2. In the ICDDR,B service area, maternal mortality was 412 per 100 000 pregnancies in 1976–80, and only 131 per 100 000 in 2001–05. In the government service area, maternal mortality fell from 451 per 100 000 pregnancies in 1976–80 to 189 per 100 000 pregnancies in 2001–05.

Table 2: Sociodemographic characteristics and pregnancies in Matlab between 1976 and 2005

<table>
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<td>4 837 (12%)</td>
<td>4 472 (11%)</td>
<td>3 845 (12%)</td>
<td>3 925 (13%)</td>
<td>4 126 (12%)</td>
<td>26 072 (12%)</td>
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<tr>
<td>5–7</td>
<td>5 195 (13%)</td>
<td>5 687 (14%)</td>
<td>5 804 (15%)</td>
<td>6 140 (19%)</td>
<td>7 412 (24%)</td>
<td>9 016 (27%)</td>
<td>39 254 (18%)</td>
</tr>
<tr>
<td>≥8</td>
<td>10 272 (27%)</td>
<td>13 313 (33%)</td>
<td>19 577 (50%)</td>
<td>3 187 (10%)</td>
<td>5 318 (17%)</td>
<td>10 323 (31%)</td>
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<td>2 014 (5%)</td>
<td>2 395 (6%)</td>
<td>1 297 (4%)</td>
<td>7 07 (2%)</td>
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<td>13 109 (33%)</td>
<td>11 427 (28%)</td>
<td>9 699 (25%)</td>
<td>6 315 (16%)</td>
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<tr>
<td>1981–85</td>
<td>10 016 (25%)</td>
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<td>9 548 (25%)</td>
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<td>1986–90</td>
<td>8 318 (21%)</td>
<td>7 821 (19%)</td>
<td>6 938 (18%)</td>
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<td>5 475 (18%)</td>
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<td>1991–95</td>
<td>5 776 (14%)</td>
<td>6 977 (17%)</td>
<td>6 774 (18%)</td>
<td>6 462 (20%)</td>
<td>6 691 (21%)</td>
<td>7 426 (22%)</td>
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<td>1996–20</td>
<td>1 437 (4%)</td>
<td>2 671 (7%)</td>
<td>2 906 (7%)</td>
<td>3 621 (10%)</td>
<td>9 282 (32%)</td>
<td>16 853 (51%)</td>
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<td>2001–05</td>
<td>1 325 (3%)</td>
<td>1 304 (3%)</td>
<td>2 393 (8%)</td>
<td>2 560 (8%)</td>
<td>3 640 (12%)</td>
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<td>1981–85</td>
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<td>33 985 (88%)</td>
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<tr>
<td>1986–90</td>
<td>28 974 (88%)</td>
<td>27 848 (89%)</td>
<td>29 528 (89%)</td>
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<tr>
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<td>29 528 (89%)</td>
<td>29 528 (89%)</td>
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<td>26 072 (12%)</td>
<td>23 220 (11%)</td>
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<tr>
<td>2001–05</td>
<td>23 220 (11%)</td>
<td>26 072 (12%)</td>
<td>23 220 (11%)</td>
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<td>1981–85</td>
<td>18 728 (47%)</td>
<td>21 974 (56%)</td>
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<td>1986–90</td>
<td>10 860 (27%)</td>
<td>9 227 (23%)</td>
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<tr>
<td>1991–95</td>
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<td>1 388 (3%)</td>
<td>1 437 (4%)</td>
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<td>1996–20</td>
<td>2 164 (2%)</td>
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<td>1976–80</td>
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<tr>
<td>1981–85</td>
<td>12 253 (31%)</td>
<td>12 062 (31%)</td>
<td>11 407 (31%)</td>
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<td>1986–90</td>
<td>8 558 (22%)</td>
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<tr>
<td>1991–95</td>
<td>10 284 (26%)</td>
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</tr>
<tr>
<td>1996–20</td>
<td>9 216 (24%)</td>
<td>5 878 (16%)</td>
<td>4 218 (12%)</td>
<td></td>
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<tr>
<td>2001–05</td>
<td>3 517 (10%)</td>
<td>4 357 (10%)</td>
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Figure 2: Maternal mortality by cause in ICDDR,B (A) and government service areas (B) in Matlab, between 1976 and 2005
Table 3: Sociodemographic characteristics and maternal mortality in Matlab between 1976 and 2005

<table>
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<tr>
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<td>-----------</td>
<td>-----------</td>
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<td>Annual trend</td>
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<td>Service area</td>
<td>0.95 (0.93-0.97)</td>
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<tr>
<td>Completed years of formal education of mother</td>
<td>0.82 (0.71-0.94)</td>
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<tr>
<td>Household asset quintile</td>
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<td>Poor area</td>
<td>0.48 (0.45-0.52)</td>
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<td>0.53 (0.50-0.57)</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Leastest poor area</td>
<td>0.61 (0.58-0.64)</td>
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<td>Government</td>
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<td>1.0</td>
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<td>Completed years of formal education of mother</td>
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<td>Maternal age</td>
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<td>1.0</td>
</tr>
<tr>
<td>Religion</td>
<td>1.0</td>
<td>1.0</td>
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<tr>
<td>Poorer area</td>
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<tr>
<td>Poor area</td>
<td>0.99 (0.94-1.04)</td>
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<td>Least poor area</td>
<td>0.99 (0.94-1.04)</td>
<td>0.001</td>
</tr>
<tr>
<td>Leastest poor area</td>
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</tr>
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<td>0.99 (0.94-1.04)</td>
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<tr>
<td>Education</td>
<td>0.99 (0.94-1.04)</td>
<td>0.001</td>
</tr>
<tr>
<td>Government</td>
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<td>1.0</td>
</tr>
<tr>
<td>Government</td>
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<td>1.0</td>
</tr>
<tr>
<td>Completed years of formal education of mother</td>
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<td>1.0</td>
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<tr>
<td>Maternal age</td>
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<tr>
<td>Religion</td>
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<td>Poorer area</td>
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<td>Poor area</td>
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<td>Leastest poor area</td>
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<tr>
<td>Education</td>
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<td>Government</td>
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<td>Government</td>
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Table 3: Sociodemographic characteristics and maternal mortality in Matlab between 1976 and 2005

See Online for webtable

to 206 per 100,000 in 2001–05. In proportional terms this represents a 68% and 54% decline in all-cause maternal mortality in the ICDDR,B and government service areas, respectively, over 30 years. Table 3 shows that maternal mortality remained stable between 1976 and 1989 (crude annual OR 1·00 [0·98–1·01]) but decreased substantially after 1989 (crude annual OR 0·95 [0·93–0·97]). The change in slope before and after 1989 was significant (p=0·003). Maternal mortality in the ICDDR,B service area was substantially lower than that in the government area (crude OR 0·82 [0·71–0·94]), and the speed at which mortality was reduced after 1989 was faster in the ICDDR,B than in the government service area (p=0·09). From 1990 onwards, maternal mortality declined by 7% per year in the ICDDR,B service area (crude OR 0·93 [0·89–0·99]) compared to 4% per year in the government service area (crude OR 0·96 [0·92–1·00]).

Mortality was three times lower in women who had 8 or more years of education compared with women who had no formal education (table 3). The gap between poor and rich in maternal mortality was also substantial: the crude OR between women in the richest and poorest quintiles was 0·49 (0·38–0·63). Mortality was highest for women during their first pregnancies, those of higher pregnancy order, and those who were pregnant at very young and older ages. Adjustment for socioeconomic or demographic factors did not substantially alter the time or area differentials (table 3). The educational differential persisted whereas differentials by asset quintile disappeared. Maternal mortality remained higher for first pregnancies, and those who were pregnant at older ages.

More than half of maternal deaths were because of direct obstetric causes (57·5% and 61·9% in the ICDDR,B and government service areas, respectively). Haemorrhage was the most common cause of direct obstetric mortality (excluding abortion) in both the ICDDR,B (44·8%) and government (36·2%) service areas, followed by hypertensive diseases (22·4% and 29·4%, respectively). Deaths from infection were not common (9·8% and 12·2%, respectively). The reduction in all-cause direct obstetric mortality was steady between 1976 and 1989, and continued after 1989 (table 4); the change in slope before and after 1990 was not significant (p=0·78). Although the ICDDR,B service area had substantially lower direct obstetric mortality than the government area (crude OR 0·76 [0·63–0·92]), the speed of decline after 1989 was not faster in the ICDDR,B than in the government service areas (p=0·10). Despite the large sociodemographic differentials, adjustment for these factors only marginally changed the time trends. Pooling all years between 1976 and 2005, the crude annual trend changed from 3% (crude annual OR 0·97 [0·96–0·98] to 2% after adjustment (adjusted annual OR 0·98 [0·97–0·99]). The reduction in maternal mortality did not accelerate after the shift from homebirths to facility-based births from 1996 onwards (webtable).

Between 1976 and 2005, 143 deaths were related to abortion, resulting in an overall mortality ratio of 66·3 per 100,000 pregnancies. Most abortion-related deaths (81·8%) were reported to be the result of induced abortion. Abortion-related mortality was stable between 1976 and 1989 (crude annual OR 1·00 [0·96–1·04]) declining sharply thereafter (crude annual OR 0·91 [0·86–0·95]) (table 5). The change in slope before and after 1990 was significant (p=0·014). Abortion-related mortality was not significantly lower in the ICDDR,B than in the government service area (OR 0·86 [0·62–1·20]). Educational differentials were
huge: women with 8 or more years of education were 11 times less likely to die as a consequence of abortion than women without any formal education (crude OR 0.09 [0.02–0.37]). Trends over time persisted after adjustment for sociodemographic variables. About a fifth of maternal deaths were attributed to causes other than abortion or direct obstetric causes (23·3% and 20·0% in the ICDDR,B and government service areas, respectively). Mortality from these causes increased between 1976 and 1989 (adjusted annual OR before 1990 1·05 [1·01–1·11]), declining thereafter (adjusted annual OR from 1990 onwards 0·92 [0·89–0·96]; data not shown). There was no difference between the two areas (adjusted OR 1·00 [0·74–1·38]).

Discussion

These data show that maternal mortality has declined noticeably in Matlab. All-cause mortality fell by nearly two-thirds over 30 years, which is as high as the 75% target specified within MDG-5. Part of this reduction is attributable to fewer deaths from abortion, although other causes of death were also reduced. The decline in maternal mortality occurred in the context of poor uptake of skilled care at birth, although uptake of emergency obstetric care increased substantially over the past decade.11,13

The fall in maternal mortality was especially pronounced in the past 15 years. However, evidence that this decline accelerated after the introduction of the safe motherhood programme in the area where midwives were posted was not significant at the 5% level. Neither could we identify an accelerated decline after the shift from home births to facility-based births from 1996 onwards (webtable). Uptake of midwifery care was initially slow in the ICDDR,B service area, but increased afterwards (webtable). Uptake of midwifery care was posted was not significant at the 5% level. Neither motherhood programme in the area where midwives were posted was not significant at the 5% level. Neither.13

Table 4: Sociodemographic characteristics and direct obstetric mortality in Matlab between 1976 and 2005

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<thead>
<tr>
<th>Maternal age (years)</th>
<th>Number of pregnancies per 100,000</th>
<th>Direct obstetric deaths per 100,000 pregnancies</th>
<th>Crude</th>
<th>Adjusted</th>
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<td>1</td>
<td>50,436</td>
<td>304.7</td>
<td>2.19</td>
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<td>2-3</td>
<td>75,807</td>
<td>139.8</td>
<td>1.0</td>
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<tr>
<td>4-5</td>
<td>46,179</td>
<td>182.2</td>
<td>1.30</td>
<td>1.04 (0.77–1.40)</td>
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<tr>
<td>≥6</td>
<td>43,257</td>
<td>272.8</td>
<td>1.96</td>
<td>1.29 (1.50–2.54)</td>
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</table>

Rates were lower in the ICDDR,B than the Government service area, which was partly because of better family-planning services provided by the ICDDR,B.14 Although data on illegal abortions were not available, improved access to family planning and safe abortion has almost certainly affected abortion-related mortality. Why this effect was only seen after 1990 is not clear. Abortion mortality was surprisingly low in the late 1970s in the government service area, and some misreporting of abortion mortality cannot be excluded.

We focused on the role of the formal health sector (midwives and emergency referral care) in the reduction of maternal mortality. Traditional birth attendants were trained between 1982 and 1999, but their training was...
Table 5: Sociodemographic characteristics and mortality from abortion in Matlab between 1976 and 2005

<p>| Table 5: Sociodemographic characteristics and mortality from abortion in Matlab between 1976 and 2005 |</p>
<table>
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<th>Number of pregnancies</th>
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</tr>
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<td>1976–1989</td>
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<td>1990–2005</td>
<td></td>
<td>0.91 (0.86–0.95)</td>
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<td>39 254</td>
<td>30.6</td>
<td>0.32 (0.18–0.59)</td>
</tr>
<tr>
<td>≥8</td>
<td>23 220</td>
<td>8.6</td>
<td>0.09 (0.02–0.37)</td>
</tr>
<tr>
<td>Unknown</td>
<td>7284</td>
<td>2.7</td>
<td>0.29 (0.07–1.18)</td>
</tr>
<tr>
<td>Household asset quintile</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Poorest</td>
<td>39 867</td>
<td>92.8</td>
<td>1</td>
</tr>
<tr>
<td>Poorer</td>
<td>42 460</td>
<td>87.1</td>
<td>0.94 (0.59–1.48)</td>
</tr>
<tr>
<td>Poor</td>
<td>38 170</td>
<td>73.4</td>
<td>0.79 (0.48–1.39)</td>
</tr>
<tr>
<td>Less poor</td>
<td>40 106</td>
<td>47.4</td>
<td>0.51 (0.29–0.89)</td>
</tr>
<tr>
<td>Least poor</td>
<td>40 116</td>
<td>37.4</td>
<td>0.40 (0.22–0.73)</td>
</tr>
<tr>
<td>Unknown</td>
<td>15 060</td>
<td>46.5</td>
<td>0.50 (0.22–0.92)</td>
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<td>Religion</td>
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<tr>
<td>Islam</td>
<td>188 454</td>
<td>66.3</td>
<td>1</td>
</tr>
<tr>
<td>Hinduism</td>
<td>26 442</td>
<td>64.3</td>
<td>0.97 (0.58–1.61)</td>
</tr>
<tr>
<td>Unknown</td>
<td>883</td>
<td>113.2</td>
<td>1.72 (0.24–12.29)</td>
</tr>
<tr>
<td>Material age</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>≤19</td>
<td>32 559</td>
<td>82.9</td>
<td>1.05 (1.22–3.10)</td>
</tr>
<tr>
<td>20–29</td>
<td>121 952</td>
<td>42.6</td>
<td>1</td>
</tr>
<tr>
<td>30–39</td>
<td>54 597</td>
<td>39.7</td>
<td>2.11 (1.43–3.11)</td>
</tr>
<tr>
<td>≥40</td>
<td>6671</td>
<td>224.8</td>
<td>5.30 (2.98–9.42)</td>
</tr>
<tr>
<td>Pregnancy order</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>50 436</td>
<td>102.9</td>
<td>2.79 (1.76–4.42)</td>
</tr>
<tr>
<td>2–3</td>
<td>75 807</td>
<td>36.9</td>
<td>1</td>
</tr>
<tr>
<td>4–5</td>
<td>46 179</td>
<td>39.0</td>
<td>1.06 (0.58–1.91)</td>
</tr>
<tr>
<td>≥6</td>
<td>43 257</td>
<td>104.0</td>
<td>2.82 (1.76–4.52)</td>
</tr>
</tbody>
</table>

very short (2 days) and focused mostly on safe cutting and dressing of the umbilical cord, and thus on prevention of neonatal mortality rather than maternal mortality. Traditional birth attendants were also trained in clean delivery practices, but this would not necessarily have prevented postpartum infection. The data did not support the hypothesis that the fall in mortality was related to the expansion in availability of antibiotics. Infection was a rare cause of maternal death in Matlab, which was nearly three times lower than that in women without any formal education. Abortion mortality was 11 times lower in highly educated women than in those without education. Induced abortions were more common among educated women, though they suffered fewer abortion complications, suggesting they might have better access to safer abortion or post-abortion care than other women.

Although household assets have increased in the Matlab population, evidence that these changes are associated with the decline in maternal mortality is scarce. Asset ownership cannot, of course, be equated with wealth. One possible limitation of our results was that construction of a pooled asset score over a 30-year period, ignoring the possibly changing value of assets over time, might have led to misclassification of socioeconomic status. Many families now own assets that were unavailable 30 years ago, and they might still be poor in relation to others. Whether ranking of households is robust to the asset items included has been disputed. We repeated our analysis with census-specific asset scores rather than a pooled asset score, but our findings did not change (data not shown). Our distribution of asset quintiles was relative—ie, the distribution for that period, but the distribution relative to the average over 30 years. However, this distribution did allow us to assess changes over time in asset ownership. More importantly, changes in the distribution of asset groups over time were consistent with the rapid economic growth in Bangladesh during this time.
on religion for 0.4% of women. However, since exclusion of the pregnancies with missing information did not alter the findings, we do not think that this introduced bias. Second, we relied on interviews with families to ascertain deaths related to pregnancy and their medical cause, and caution is required in interpretation of trends in cause-specific mortality. We are confident that the study identified most pregnancy-related deaths, since pregnancies were ascertained prospectively in Matlab and families of all deceased women of reproductive age were reinterviewed to ensure that no pregnancy was missed.\textsuperscript{3,5} (eg, deaths from abortion in women whose pregnancy was not recorded in the surveillance system). However, identification of other medical causes might be less accurate, which could allow misclassification of causes of death.\textsuperscript{3,5} Higher education and better access to obstetric care might have affected reporting of the circumstances leading to death, and ascertainment of medical causes could plausibly have improved over time. Therefore, we urge caution in the interpretation of cause-specific patterns, especially in distinguishing direct from indirect causes.

Evidence-based public health must draw on studies with designs other than randomised controlled trials, especially when the intervention and causal chain between the intervention and outcome are complex.\textsuperscript{29} In our assessment we ruled out alternative explanations by use of a comparison group, by examining causes of death and time trends in relation to specific interventions, and by addressing confounding variables. Victora and colleagues\textsuperscript{29} propose three prerequisites for valid causal inferences from intervention studies without random allocation: (1) the causal pathway must be short and simple; (2) the expected effect must be large and consistent with the temporal sequence of the intervention; and (3) confounding must be unlikely. Our study fulfils these criteria for attributing the fall in abortion mortality to increased access to family planning and menstrual regulation. The study also fulfils the criteria for attributing a large part of the decline in maternal mortality to increased access to caesarean sections: (1) caesarean sections for maternal indications save lives without delay; (2) the timings of the mortality decline in both areas (from 1990 onwards) and the lower mortality in the ICDDR,B compared with the government service area were consistent with the steep rise in caesarean deliveries after 1990 in both areas, with a somewhat slower rise in the government area; and (3) we took account of a large number of confounders. We are much more cautious about attributing the decline in mortality to the presence of midwives, since the causal pathway is complex, midwives were not present in the government service area, and the accelerated decline in the ICDDR,B service area was not significant at the 5% level.

The fall in maternal mortality in Matlab might have also occurred at the national level. Between 1998 and 2001, the maternal mortality ratio in Bangladesh has been estimated at 322 deaths per 100,000 livebirths,\textsuperscript{10} which is similar to that in the government service area in Matlab at the same time. The fall cannot be fully explained by uptake of skilled attendance at birth, since this remains low, both in Matlab and nationally.\textsuperscript{2} Increased access to emergency obstetric care—a cornerstone of the Bangladesh safe motherhood strategy\textsuperscript{19}—has probably contributed, together with increased access to menstrual regulation.

This study has shown that achievement of MDG-5 is not an impossible dream for Bangladesh. Although investment in midwives, emergency obstetric care and safe abortion are clearly important, additional policies that bring about expansion of female education, better financial access for the poor, and poverty reduction are essential to sustain the successes achieved to date.

Contributors
CR designed the study and analysis plan. RB and GD participated in data collection, and SS in data management. MEH did data analysis, and participated in interpretation of results with RB, MK, GD, and CR. All authors collaborated to write the manuscript and have seen and approved the final version.

Conflict of interest statement
We declare that we have no conflict of interest.

Acknowledgments
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Health of women after severe obstetric complications in Burkina Faso: a longitudinal study

Véronique Filippi, Rasmané Ganaba, Rebecca F Baggaley, Tom Marshall, Katerini T Storeng, Issiaka Sombié, Fatoumata Ouvattara, Thomas Ouedraogo, Mélanie Akoum, Nicolas Meda

Background Little is known about the health of women who survive obstetric complications in poor countries. Our aim was to determine how severe obstetric complications in Burkina Faso affect a range of health, social, and economic indicators in the first year post partum.

Methods We did a prospective cohort study of women with severe obstetric complications recruited in hospitals when their pregnancy ended with a livebirth (n=199), perinatal death (74), or a lost pregnancy (64). For every woman with severe obstetric complications, two unmatched control women with uncomplicated delivery were sampled in the same hospital (677). All women were followed up for 1 year.

Findings Women with severe obstetric complications were poorer and less educated at baseline than were women with uncomplicated delivery. Women with severe obstetric complications, and their babies, were significantly more likely to die after discharge: six (2%) of the 337 women with severe obstetric complications died within 1 year, compared with none of the women with uncomplicated delivery (unadjusted p=0·001); 17 babies of women with severe obstetric complications died within 1 year, compared with 18 of those born by uncomplicated delivery (hazard ratio for mortality 4·67, 95% CI 1·68–13·04, adjusted for loss to follow-up and confounders; p=0·003). Women with severe obstetric complications were significantly more likely to have experienced depression and anxiety at 3 months (odds ratio 1·82, 95% CI 1·18–2·80), to have experienced suicidal thoughts within the past year at all time points (1·54, 1·04–2·30 at 3 months; 2·30, 1·56–3·39 at 6 months; 2·26, 1·30–3·95 at 12 months), and to report the pregnancy having had a negative effect on their lives at all time points (1·54, 1·04–2·30 at 3 months; 2·30, 1·56–3·39 at 6 months; 2·44, 1·63–3·65 at 12 months) than were women with uncomplicated delivery.

Interpretation Women who give birth with severe obstetric complications are at greater risk of death and mental-health problems than are women with uncomplicated delivery. Greater resources are needed to ensure that these women receive adequate care before and after discharge from hospital.

Introduction Improvements in maternal health in developing countries are most often described in terms of maternal mortality rather than health. More than 500 000 women die in pregnancy and childbirth every year, but many more—perhaps as many as 9 million—survive obstetric complications.1 Post-partum morbidity can reach high levels in poor countries,2–5 but the post-partum experiences of women with severe obstetric complications, followed long enough to trace the full implications of their morbidity, have not been studied. Although maternal mortality is widely used as an indicator of development, the many pathways that link maternal health and illness to long-term economic and developmental indicators are under-explored.

We investigated how severe obstetric complications affect a range of health and other outcomes in the year after the end of pregnancy in hospitals in Burkina Faso, comparing the health experiences of women whose pregnancies ended in severe obstetric complications with those of women with uncomplicated childbirth.

Methods This prospective cohort study was done between November, 2004, and March, 2006, in Burkina Faso, a francophone country in west Africa with high levels of maternal mortality and widespread poverty.6 The proportion of women giving birth in facilities is high in towns (88%) and low in rural settings (32%).7

Patients Because of the difficulty in identifying women with direct obstetric complications in the community when they do not seek medical help,8,9 we selected seven public urban and rural hospitals, at which all women who presented to medical care with severe obstetric complications, and who lived within 30 km of these hospitals, were eligible for recruitment.

We identified women with severe obstetric complications on the basis of clinical signs and symptoms of complications as well as case management procedures.10 Such complications, often described as near miss because women faced a particularly high risk of death in the absence of acute care, included: uterine rupture and Bandl’s ring for dystocia; eclampsia and severe pre-eclampsia; bleeding with hysterectomy, caesarean section, shock, or blood transfusion; haemoglobin level below 40 g/L or between 40 and 70 g/L with signs of shock or blood transfusion; and infections leading to hypothermia or hyperthermia, with clear source of infection and signs of infection.
of shock. Induced abortion is illegal in Burkina Faso, so the probability of an abortion having been induced was assessed only from the medical records, at two levels of certainty.13

We also recruited two unmatched controls for every woman with severe obstetric complications in each hospital. Each control individual had an uncomplicated vaginal delivery and livebirth, and were sampled among normal births concurrently as the cases with severe obstetric complications were recruited.

The ethical committees at Centre Muraz, Bobo-Dioulasso, Burkina Faso, and the London School of Hygiene and Tropical Medicine, London, UK, approved the study. Informed consent—written for literate women, oral for illiterate women—was obtained from all participants when pregnancy ended.

Procedures

After obtaining consent, trained female interviewers accompanied each woman home. 3 days later, the same interviewer returned to collect baseline data on the woman's health and socioeconomic status during the pregnancy in a structured interview. Interviews were also done at 3, 6, and 12 months after pregnancy ended to capture both short-term and longer-lived effects.

Our questionnaire was devised on the basis of a preliminary ethnographic study and maternal health literature, combined with standardised items in comprehensive survey instruments. Reproductive and marital history and asset index were extracted from the Demographic and Health Survey questionnaire.9 Risk of depression and anxiety was assessed with the K10 scale.14 Items in the scale were translated semantically into French, with adaptation to ensure cultural relevance. A score of 14 or more was used to denote an individual at moderate risk of depression, with or without anxiety, following a local validation study.15 We summarised specific symptoms and reported difficulty in doing specified tasks at home or elsewhere if reported at least once by a respondent.

Medical examinations were done at 6 and 12 months to identify fever, incontinence, fistula, urinary infections,
prolapse, anaemia, hypertension, low body-mass index (BMI), and orthopaedic problems. Haemoglobin was measured with haemocues.16 Urinary infections were assessed with the Oxoid dip slide system. A 45-min pad test to quantify urine loss was also done on all women at 6 months post partum.17

Clinical information on the pregnancy loss or delivery was extracted from hospital records and registers by maternity unit staff before women left the hospital, to ensure completeness. Verbal autopsies were done at the end of data collection for women who had died, by use of a standardised tool.18 An ethnographic study was done with 82 women from the cohort, consisting of observations and repeated in-depth interviews with the women and, whenever possible, their husbands and other household members, the results of which are published elsewhere.19

Statistical analysis

Because we were not interested in any particular individual outcome, and since there is little data regarding the frequencies of the several morbidities and other outcomes of interest, the sample size was set in more general terms as adequate to detect an approximate 10% risk difference between complicated and uncomplicated cases for outcomes with prevalence between 25% and 75%, and power between 80% and 90%. We did not power the study to detect differences in mortality because this was not the primary objective and the sample size would have been too large.

We divided our sample of women with severe obstetric complications into those with a livebirth, those with perinatal death (stillbirth or a neonatal death before discharge), and those with early pregnancy loss (abortion, miscarriage, and ectopic pregnancy). We used Stata version 9.2 to derive percentages, means, significance levels, and unadjusted and adjusted odd ratios, comparing women in these categories with those with uncomplicated deliveries. Adjustment was for hospital (associated with socioeconomic status), age, gravidity, education, marital status, and wealth quintile. Wealth quintiles were derived from a score calculated from the asset ownership of each woman’s household (eg, a radio or bicycle, housing, and roof type), by use of principal components analysis.20

We used Fisher’s exact test to compare death rates between women with severe obstetric complications and those with uncomplicated childbirth. The hazard ratio for mortality of babies born of women with severe obstetric complications compared with those with uncomplicated delivery was calculated with Cox regression (with Efron’s method for tied failures; exact dates of death were not recorded). Tests by Schoenfeld residuals confirmed the proportional hazards assumption was valid. Confounders were as above, plus multiple births and Apgar score at 1 min after delivery.

Table 1: Characteristics of participants at discharge from hospital

<table>
<thead>
<tr>
<th></th>
<th>Early pregnancy loss (n=64)</th>
<th>Perinatal death (n=74)</th>
<th>Livebirth (n=199)</th>
<th>Women with uncomplicated delivery (n=677)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diagnosis of severe obstetric complication*</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Anaemia</td>
<td>22 (34·4%, 22·9–47·3)</td>
<td>30 (40·5%, 29·3–52·6)</td>
<td>55 (27·6%, 21·5–34·4)</td>
<td>NA</td>
</tr>
<tr>
<td>Hypertension</td>
<td>2 (3·1%, 0·3–10·8)</td>
<td>15 (20·3%, 11·8–31·2)</td>
<td>70 (35·2%, 28·6–42·2)</td>
<td>NA</td>
</tr>
<tr>
<td>Haemorrhage</td>
<td>48 (75·0%, 62·6–85·0)</td>
<td>28 (37·8%, 26·8–49·9)</td>
<td>60 (30·2%, 23·9–37·0)</td>
<td>NA</td>
</tr>
<tr>
<td>Dystocia</td>
<td>NA</td>
<td>12 (16·2%, 8·7–26·6)</td>
<td>38 (19·1%, 13·9–25·3)</td>
<td>NA</td>
</tr>
<tr>
<td>Infection</td>
<td>26 (40·6%, 28·5–53·6)</td>
<td>29 (39·2%, 28·0–51·2)</td>
<td>54 (27·1%, 21·1–33·9)</td>
<td>NA</td>
</tr>
<tr>
<td>Age (years)</td>
<td>26·1 (24·3–27·9)</td>
<td>25·8 (24·2–27·4)</td>
<td>25·3 (24·3–26·2)</td>
<td>25·6 (25·1–26·1)</td>
</tr>
<tr>
<td>Gravity</td>
<td>3·4 (2·8–4·0)</td>
<td>3·4 (2·8–4·1)</td>
<td>2·9 (2·5–3·2)</td>
<td>2·9 (2·8–3·1)</td>
</tr>
<tr>
<td>Any formal education</td>
<td></td>
<td></td>
<td></td>
<td>23 (35·9%, 24·3–48·9)†</td>
</tr>
<tr>
<td>Marital status‡</td>
<td></td>
<td></td>
<td></td>
<td>18 (37·8%, 26·8–49·9)†</td>
</tr>
<tr>
<td>Monogamous</td>
<td>26 (40·6%, 28·5–53·6)</td>
<td>50 (67·6%, 55·7–78·0)</td>
<td>145 (72·9%, 66·1–78·9)</td>
<td>505 (74·7%, 71·2–77·9)</td>
</tr>
<tr>
<td>Polygamous</td>
<td>25 (39·1%, 27·1–52·1)</td>
<td>17 (23·0%, 14·0–19·7)</td>
<td>28 (14·1%, 9·6–19·7)</td>
<td>113 (16·7%, 14·0–19·7)</td>
</tr>
<tr>
<td>Single</td>
<td>13 (20·3%, 11·3–32·2)†</td>
<td>7 (9·5%, 3·9–18·5)</td>
<td>26 (13·1%, 8·7–18·6)</td>
<td>58 (8·6%, 6·6–11·0)</td>
</tr>
<tr>
<td>Wealth quintiles¶</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Most poor</td>
<td>23 (36·5%, 24·7–49·6)</td>
<td>26 (36·6%, 25·5–48·9)</td>
<td>46 (23·8%, 18·0–30·5)</td>
<td>102 (15·7%, 13·0–18·7)</td>
</tr>
<tr>
<td>Second</td>
<td>15 (23·8%, 14·0–36·2)</td>
<td>19 (26·8%, 16·9–38·6)</td>
<td>44 (22·8%, 17·1–29·4)</td>
<td>117 (18·0%, 15·1–21·1)</td>
</tr>
<tr>
<td>Third</td>
<td>10 (15·9%, 7·9–27·3)</td>
<td>12 (16·9%, 9·0–27·7)</td>
<td>35 (18·1%, 13·0–24·3)</td>
<td>141 (21·7%, 18·6–25·0)</td>
</tr>
<tr>
<td>Fourth</td>
<td>5 (7·9%, 2·6–17·6)</td>
<td>10 (14·1%, 7·0–24·4)</td>
<td>34 (17·6%, 12·5–23·7)</td>
<td>144 (22·1%, 19·0–25·5)</td>
</tr>
<tr>
<td>Least poor</td>
<td>10 (15·9%, 7·9–27·3)§</td>
<td>4 (5·6%, 1·6–13·8§)</td>
<td>34 (17·6%, 12·5–23·7)</td>
<td>147 (22·6%, 19·4–26·0)</td>
</tr>
</tbody>
</table>

Data are number (%), 95% CI) or mean (95% CI). *Women could have several diagnoses so column percentages add to >100%. †p<0·001 vs uncomplicated delivery. ‡n=676 for uncomplicated delivery group. †p<0·01 vs uncomplicated delivery group. ¶Number of responders was 63 in early pregnancy loss, 71 in perinatal death, 193 in livebirth, and 651 in uncomplicated delivery group. ||p<0·05 vs uncomplicated delivery.
Articles

Role of the funding source

The sponsors of the study had no role in the study design, data collection, analysis, interpretation, or writing of the report. All authors had full access to all the data. VF had the final responsibility for the decision to submit for publication.

Results

1042 women were eligible for recruitment; of these, 1014 agreed to participate (figure 1). There were 337 women with severe obstetric complication: 199 with livebirth, 64 with early pregnancy loss, and 74 with perinatal death. 677 controls with uncomplicated delivery were recruited. Of those with early pregnancy loss, 16 (25%) were certain or probable cases of induced abortion, 28 (44%) were recorded as spontaneous abortion, 17 (27%) were ectopic pregnancies, and three (5%) had no information. 90% of those recruited completed the 12-month interview or examination (figure 1), although some women (100 [11%] at 6 months, 115 [13%] at 12 months) only attended one of these. The proportions recruited who were followed up to 12 months (responders) varied by group: 93% (n=630) for uncomplicated delivery, 92% (59) for early pregnancy loss, 86% (64) for perinatal death, and 80% (160) for livebirth with severe obstetric complications. Non-responders were younger, more often single, and less likely to have received any formal education than were responders, but these patterns varied by group and should be interpreted with caution because of the small numbers (data not shown).

The four groups were of similar age and gravidity, but those with uncomplicated delivery were wealthier, more likely to be married, and more likely to have had more formal education than were women with severe obstetric complications, especially those with pregnancy loss or perinatal death (table 1). The nature of severe obstetric complications varied with pregnancy outcome (table 1). According to medical records, 17% (58/332) of all women with severe obstetric complications with available data were not fully recovered at discharge, although there were no clear differences when stratified by birth outcome.

Women with severe obstetric complications were significantly less likely to survive after hospital discharge than were women with uncomplicated deliveries (figure 2). No women with uncomplicated childbirth died, whereas six women with complications died during the follow-up period (three by 3 months, two more by 6 months, and another one by 12 months). This difference in mortality was significant both for all enrolled women (p=0·001, Fisher’s exact test) and for those seen at 12 months (p=0·001, Fisher’s exact test). Verbal autopsies suggest that cause of death in all cases was directly related to a severe obstetric complication (three infections, two caused by anaemia, one by hypertension). The hospital notes of two of the women who died from infection suggest that they were HIV positive. Three (50%) of the six women who died had been discharged when not fully recovered. By contrast, of the 332 women for whom we had information on this variable, only 58 (17%) were not fully recovered at discharge, although there were no clear differences when stratified by discharge.

Babies alive at hospital discharge after their mother’s severe obstetric complication were more likely to die in their first year than were babies born from uncomplicated delivery (figure 2). 17 of the babies born to women with severe obstetric complications died within 1 year, compared with 18 of those born by uncomplicated delivery.

Figure 2: Survival over 12 months since discharge from hospital
(A) Women with severe obstetric complications compared with normal delivery women and (B) their infants. Error bars are 95% CI.
There were notable differences between women with severe obstetric complications and those with uncomplicated delivery in terms of physical morbidity diagnosed at follow-up (table 2). There was a significant difference in the proportion of women reporting a serious illness between women with severe obstetric complications and those with uncomplicated delivery (table 3). At 12 months after pregnancy, there was a significant difference in the proportion of women reporting one or more symptoms between all women with severe obstetric complications and those with uncomplicated delivery (table 4). Women with severe obstetric complications who lost their pregnancy were significantly more likely to report at least one symptom (ie, a disease causing suffering and interfering with daily activities) in the first year post partum (table 3); however, the difference in reporting a serious illness between women with severe obstetric complications and those with uncomplicated deliveries was significant only at 3 months (table 4). At 12 months after pregnancy, there was a significant difference in the proportion of women reporting one or more symptoms between all women with severe obstetric complications and those with uncomplicated delivery (table 4).

Table 2: Findings from clinical examinations at 6 and 12 months after end of pregnancy

<table>
<thead>
<tr>
<th>Women with severe obstetric complications</th>
<th>Women with uncomplicated delivery</th>
</tr>
</thead>
<tbody>
<tr>
<td>Early loss</td>
<td>Perinatal death</td>
</tr>
<tr>
<td>Severe anaemia*</td>
<td></td>
</tr>
<tr>
<td>Underweight</td>
<td>26/60 (4.3%, 2.9–6.0) 2/57 (0.2%, 0.0–6.0)</td>
</tr>
<tr>
<td>Hypertension</td>
<td>55/60 (9.2%, 7.0–12.0) 15/60 (2.5%, 1.0–6.0)</td>
</tr>
<tr>
<td>Subsequent pregnancy</td>
<td>17/60 (2.8%, 1.6–6.0) 2/57 (0.2%, 0.0–6.0)</td>
</tr>
<tr>
<td>Haemorrhoids</td>
<td>15/60 (2.5%, 1.2–5.0) 2/57 (0.2%, 0.0–6.0)</td>
</tr>
<tr>
<td>Urinary incontinence</td>
<td>17/60 (2.8%, 1.6–6.0) 2/57 (0.2%, 0.0–6.0)</td>
</tr>
<tr>
<td>Urinary infections</td>
<td>35/60 (5.8%, 4.2–8.0) 15/60 (2.5%, 1.2–5.0)</td>
</tr>
<tr>
<td>Prolapse</td>
<td>NA</td>
</tr>
<tr>
<td>Rectal incontinence</td>
<td>15/60 (2.5%, 1.2–5.0) 2/57 (0.2%, 0.0–6.0)</td>
</tr>
<tr>
<td>Fever**</td>
<td>35/60 (5.8%, 4.2–8.0) 15/60 (2.5%, 1.2–5.0)</td>
</tr>
<tr>
<td>Back/orthopaedic problems</td>
<td>17/60 (2.8%, 1.6–6.0) 2/57 (0.2%, 0.0–6.0)</td>
</tr>
<tr>
<td>Pains or problems with walking</td>
<td>15/60 (2.5%, 1.2–5.0) 2/57 (0.2%, 0.0–6.0)</td>
</tr>
</tbody>
</table>

Data are n/N (%), CI. *Haemoglobin ≤70 g/L. †BMI<18·5 kg/m². ‡Systolic blood pressure over 140 mm Hg and diastolic over 90 mm Hg. §Physical examination at 6 months; pregnancy test at 12 months.

Women with severe obstetric complications reported negative physical health outcomes more frequently than did women with uncomplicated delivery (table 3), although the differences were not always significant (table 4). Self-reported morbidity remained high at all points for all participants: for example, 14–29% of women reported having had a serious illness (ie, a disease causing suffering and interfering with daily activities) in the first year post partum (table 3); however, the difference in reporting a serious illness between women with severe obstetric complications and those with uncomplicated deliveries was significant only at 3 months (table 4). At 12 months after pregnancy, there was a significant difference in the proportion of women reporting one or more symptoms between all women with severe obstetric complications and those with uncomplicated delivery (table 4). Women with severe obstetric complications who lost their pregnancy were significantly more likely to report at least one symptom or sign of illness at 6 and 12 months than were women who had uncomplicated deliveries (table 4). There was no difference in reporting difficulty with one or more
### Table 3: Findings from interviews at 3, 6, and 12 months after end of pregnancy

<table>
<thead>
<tr>
<th></th>
<th>3 months</th>
<th>6 months</th>
<th>12 months</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Women with severe obstetric</td>
<td>Women with severe obstetric</td>
<td>Women with severe obstetric</td>
</tr>
<tr>
<td></td>
<td>complications</td>
<td>complications</td>
<td>complications</td>
</tr>
<tr>
<td></td>
<td>Early loss</td>
<td>Perinatal death</td>
<td>Livebirth</td>
</tr>
<tr>
<td>Physical health</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Feeling average/not</td>
<td>11/62 (12%)</td>
<td>13/70 (16%)</td>
<td>23/279 (12%)</td>
</tr>
<tr>
<td>good at all today</td>
<td>(17.7%)</td>
<td>(18.6%)</td>
<td>(12.9%)</td>
</tr>
<tr>
<td>Serious illness since</td>
<td>9/62 (14%)</td>
<td>19/70 (27.1%)</td>
<td>38/179 (21.2%)</td>
</tr>
<tr>
<td>last interview</td>
<td>(19.5%)</td>
<td>(27.1%)</td>
<td>(21.2%)</td>
</tr>
<tr>
<td>Proportion reporting</td>
<td>27/62 (43.6%)</td>
<td>35/70 (50.0%)</td>
<td>84/179 (46.9%)</td>
</tr>
<tr>
<td>one or more symptoms*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Proportion reporting</td>
<td>9/62 (14.5%)</td>
<td>18/70 (25.7%)</td>
<td>38/179 (21.5%)</td>
</tr>
<tr>
<td>one or more</td>
<td>(30.9%)</td>
<td>(27.8%)</td>
<td>(21.5%)</td>
</tr>
<tr>
<td>difficulties in</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mental health</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Depression: K10 score</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Suicidal thoughts</td>
<td>11/61 (18.0%)</td>
<td>18/69 (26.1%)</td>
<td>22/277 (12.4%)</td>
</tr>
<tr>
<td>within past year</td>
<td>(18.0%)</td>
<td>(26.1%)</td>
<td>(12.4%)</td>
</tr>
<tr>
<td>Pregnancy has a</td>
<td>9/61 (14.8%)</td>
<td>10/70 (14.3%)</td>
<td>15/179 (8.4%)</td>
</tr>
<tr>
<td>negative effect</td>
<td>(14.8%)</td>
<td>(14.3%)</td>
<td>(8.4%)</td>
</tr>
<tr>
<td>on the woman’s life</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Data are n/N (%). *Fever in past 7 days, exhausted or extremely tired within past 24 h, pain within past 24 h, serious illness since last interview. †Difficulty with any of the following tasks: work other than housework (eg, office work, in the fields); fetching wood or water; preparing meals; cleaning; washing clothes; going to market.

### Discussion

This study is an important step in understanding how maternal complications affect the survival and health—both physical and mental—of women in poor countries. Women who had severe obstetric complications were generally poorer and less educated than women with uncomplicated hospital delivery, and experienced significantly higher mortality and infant mortality. There were few differences in excess diagnosed morbidities in the year after birth between women with complications and those with uncomplicated delivery. However, women who had experienced severe obstetric complications seem to have had poorer mental-health outcomes and self-reported health.

Our study found that almost 2% of women with severe obstetric complications died during 1 year of follow-up, compared with none of those with uncomplicated deliveries, equivalent to a post-partum maternal death ratio of 1800 deaths per 100,000.2 These women seem to have died as a result of the complications that they initially survived, and a greater proportion of these women were discharged from hospital before they had fully recovered, compared with women with complications who survived. Ethnographic work has shown that the inability to pay for follow-up care is a major impediment to care-seeking in the period after a severe obstetric complication. These women could be an easily identifiable group to target with additional health and financial resources.

About 10% of babies of women with severe obstetric complications died within a year, compared with about
Our data suggest that there are larger differences between women with severe obstetric complications and those with uncomplicated deliveries in reporting difficulty with one or more household tasks, possibly the result of women doing these tasks irrespective of whether they perceived difficulties, or because they do not complain of having to do them, rather than real differences.

Our data suggest that the occurrence of a complication—itself a complex clinical and financial shock—and not just socioeconomic background has a long-term effect on infant survival, although we cannot exclude the possibility of residual confounding.

The overall level of diagnosed morbidity among all women in the cohort was high, but is in line with findings from other developing countries.21 There were some, but not many, differences in diagnosed morbidity between women with complications and those with uncomplicated delivery, including significantly higher levels of anaemia in women with severe obstetric complications who lost their pregnancy than in the other groups of women, possibly because of the high frequency of haemorrhage diagnosed as the severe obstetric complication in this group of women. Previous studies have found that perceived excessive bleeding during or after delivery was an important risk factor for post-partum anaemia.22,23

In general, women with severe obstetric complications reported feeling worse than did women with uncomplicated deliveries. For some of the self-reported health outcomes, this difference persisted over time, but not always consistently between groups. Women with early pregnancy loss reported higher levels of perceived health problems at 6 and 12 months, suggesting either that the onset of some health problems might have been delayed, that the accumulation of health and social problems led these women to label them as serious at a later stage, or that the other women recovered more quickly. There were no differences between women with complicated deliveries and those with uncomplicated deliveries in reporting difficulty with one or more household tasks, possibly the result of women doing these tasks irrespective of whether they perceived difficulties, or because they do not complain of having to do them, rather than real differences.

Our data suggest that there are larger differences between women with severe obstetric complications and those with uncomplicated delivery for self-reported health at 3, 6, and 12 months.

### Table 4: Odds ratios for adjusted comparisons of each group of women with severe obstetric complications with the group with uncomplicated deliveries for self-reported health at 3, 6, and 12 months

<table>
<thead>
<tr>
<th>Mental health</th>
<th>3 months</th>
<th>6 months</th>
<th>12 months</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Depression</strong></td>
<td>Overall Early loss Perinatal death Livebirth Overall Early loss Perinatal death Livebirth Overall Early loss Perinatal death Livebirth</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Depression</td>
<td>1.82 (1.18–2.80) 1.71 (1.01–3.63) 3.39 (1.75–6.56) 1.36 (0.78–2.38)</td>
<td>1.71 (1.08–2.89) 1.32 (0.48–4.36) 1.64 (0.63–4.29) 1.92 (0.99–3.74)</td>
<td>1.52 (0.83–2.76) 1.01 (0.37–2.80) 1.55 (0.55–4.37) 1.86 (0.89–3.88)</td>
</tr>
<tr>
<td>Suicidal thoughts within past year</td>
<td>2.27 (1.33–3.98) 2.63 (1.10–6.30) 3.09 (1.36–7.02) 1.82 (0.93–3.58)</td>
<td>2.30 (1.17–4.50) 4.79 (1.82–12.65) 2.30 (0.71–7.49) 1.50 (0.63–3.61)</td>
<td>2.26 (1.30–3.95) 2.25 (1.42–3.68) 2.81 (1.49–5.38) 2.81 (1.49–5.38)</td>
</tr>
<tr>
<td>Pregnancy has had a negative effect on the woman’s life</td>
<td>1.54 (1.04–2.30) 1.30 (0.61–2.78) 2.61 (1.37–4.99) 1.32 (0.81–2.15)</td>
<td>2.30 (1.50–3.39) 2.84 (1.43–5.65) 3.44 (1.83–6.46) 1.80 (1.12–2.89)</td>
<td>2.44 (1.36–3.65) 2.53 (1.17–5.47) 1.88 (0.89–4.01) 1.90 (0.86–3.96)</td>
</tr>
</tbody>
</table>

Data are odds ratio (95% CI). *Fever in past 7 days, exhausted or extremely tired within past 24 h, pain within past 24 hours, serious illness since last interview. †Difficulty with any of the following tasks: work other than housework (eg, office work, in the fields); fetching wood or water; preparing meals; cleaning; washing clothes; going to market. ‡K10 score ≥14.

3% of those born by uncomplicated delivery. The increased risk of infant death in the group born to women with complications persisted at 1 year post partum, and so cannot be explained solely by the neonatal complications and death associated with severe obstetric complications.22 Our data suggest that the occurrence of a complication—itself a complex clinical and financial shock—and not just socioeconomic background has a long-term effect on infant survival, although we cannot exclude the possibility of residual confounding.

The overall level of diagnosed morbidity among all women in the cohort was high, but is in line with findings from other developing countries.21 There were some, but not many, differences in diagnosed morbidity between women with complications and those with uncomplicated delivery, including significantly higher levels of anaemia in women with severe obstetric complications who lost their pregnancy than in the other groups of women, possibly because of the high frequency of haemorrhage diagnosed as the severe obstetric complication in this group of women. Previous studies have found that perceived excessive bleeding during or after delivery was an important risk factor for post-partum anaemia.22,23

In general, women with severe obstetric complications reported feeling worse than did women with uncomplicated deliveries. For some of the self-reported health outcomes, this difference persisted over time, but not always consistently between groups. Women with early pregnancy loss reported higher levels of perceived health problems at 6 and 12 months, suggesting either that the onset of some health problems might have been delayed, that the accumulation of health and social problems led these women to label them as serious at a later stage, or that the other women recovered more quickly. There were no differences between women with complicated deliveries and those with uncomplicated deliveries in reporting difficulty with one or more household tasks, possibly the result of women doing these tasks irrespective of whether they perceived difficulties, or because they do not complain of having to do them, rather than real differences.

Our data suggest that there are larger differences between women with severe obstetric complications and those with uncomplicated delivery for self-reported health at 3, 6, and 12 months.
They were also more likely to report that the pregnancy had a negative effect on their lives at all interviews. Women who lost their babies through stillbirth or perinatal death were more likely to indicate signs of non-specific psychiatric distress, as assessed by the K10 score, at 3 months after discharge than were women in the uncomplicated delivery group, and had the highest odds ratios for suicide ideation. These differences persist after adjustment for confounders, suggesting that factors associated with the complication itself could affect the manifestation of symptoms of mental distress. Ethnographic data from a subset of our cohort suggest that mental-health problems could result from the complex interaction of several factors, including individual or familial disappointment with the pregnancy outcome and fears about future reproductive uncertainties, increased social tensions as a result of the practical, financial, and emotional difficulties of managing a medical emergency, compromised physical or emotional wellbeing, and sustained difficulties managing everyday poverty.

Health conditions peaked at different times and in different groups of women. Previous studies that focus on morbidity have tended to show a consistent decline, whereas other studies have shown delayed onset and increase in symptoms longitudinally. Because we considered a range of different outcomes, we postulate that complex pathways involving social and economic factors could account for these observations, and it is conceivable that different constellations of health problems will affect women at different times after a severe obstetric complication.

Although women who had severe obstetric complications sought post-partum care more often than did women with uncomplicated deliveries, their need for care might not have been adequately met. Women participating in the ethnographic study often reported they could not afford to seek care when they felt that they needed it. In some cases, women who had severe obstetric complications were able to consult a health-care provider but were unable to buy the prescribed medicine.

One limitation of this study is that it was hospital based. However, this factor is difficult to avoid because women with complications cannot be identified in the community with sufficient accuracy. A very large sample size would be required to capture enough complications in a prospective population-based cohort study starting in pregnancy because of the low prevalence of severe obstetric complications. We defined such events so that it would be unlikely that these women could survive without hospital care, thereby hoping to ensure a representative sample of severe obstetric complications. A further limitation is that the women with uncomplicated delivery who served as controls were also selected from hospitals, and so differed in socioeconomic terms from women with complications; however, we selected them in hospitals to make sure that these women had a clinically confirmed uncomplicated delivery. Additionally, the sample sizes for the pregnancy loss and perinatal death groups were small. A radius of 30 km was applied to secure good access to women’s homes and to reduce socioeconomic differences between the groups, although this meant that some of the poorest women in very remote areas were not included. We had limited information on the health, social, and economic status of women before the end of pregnancy, and although we can say that women who had complications were already economically vulnerable at baseline, it is more difficult to assert this from health and social perspectives.

The strengths of the study include its cohort design and its broad conceptualisation of health. We developed our questionnaires on the basis of ethnographic fieldwork with standardised methods where appropriate, which we adapted for cultural and linguistic relevance. We achieved high participation and follow-up rates, probably because of the intensive contacts with women and the reimbursement of their transport costs to the medical examinations.

Future methodological research could consider whether a more generalised health measure might be better able to detect differences between women with severe obstetric complications and those with uncomplicated delivery. A focus on self-reported health and its relation to the excess mortality risks we have identified is also warranted. Future studies could also consider in more detail the consequences that are specific to different types of severe obstetric complications, the extent to which certain types of health problems precede such events and their sequelae, the reasons for early discharge or hospital departure of women judged not to be recovered, and the longer-term effects of severe obstetric complications on mortality and morbidity, including on child health outcomes.

Women with severe obstetric complications are a high-risk group and resources need to be devoted to ensure that these women who—unlike many women in developing countries—have actually entered the health system receive adequate care before and after discharge from hospital. The fact that their risk of mortality remains high even after they have survived a life-threatening complication suggests that they are a group in great need. This need is further reinforced by the very high mortality of their children in the first year of life. Efforts to reduce maternal mortality and improve maternal health could begin by targeting women with severe obstetric complications for social and financial interventions.

Contributors
VF was the lead investigator for this study. She developed the proposal with NM, TM, and KTS. All authors (except RFB) participated in the design of the data collection methods and the fieldwork, which was coordinated by RG and IS. RFB analysed the quantitative data with specific inputs from RG, TM, and VF. VF wrote the first draft of the paper, and revised subsequent drafts with RFB, KTS, and TM and specific inputs from the other authors. All authors contributed to the interpretation of findings and comments and writing of drafts.
Conflict of interest statement
We declare that we have no conflict of interest.

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Induced abortion: estimated rates and trends worldwide

Gilda Sedgh, Stanley Henshaw, Susheela Singh, Elisabeth Åhman, Iqbal H Shah

Summary

Background Information on incidence of induced abortion is crucial for identifying policy and programmatic needs aimed at reducing unintended pregnancy. Because unsafe abortion is a cause of maternal morbidity and mortality, measures of its incidence are also important for monitoring progress towards Millennium Development Goal 5. We present new worldwide estimates of abortion rates and trends and discuss their implications for policies and programmes to reduce unintended pregnancy and unsafe abortion and to increase access to safe abortion.

Methods The worldwide and regional incidences of safe abortions in 2003 were calculated by use of reports from official national reporting systems, nationally representative surveys, and published studies. Unsafe abortion rates in 2003 were estimated from hospital data, surveys, and other published studies. Demographic techniques were applied to estimate numbers of abortions and to calculate rates and ratios for 2003. UN estimates of female populations and livebirths were the source for denominators for rates and ratios, respectively. Regions are defined according to UN classifications. Trends in abortion rates and incidences between 1995 and 2003 are presented.

Findings An estimated 42 million abortions were induced in 2003, compared with 46 million in 1995. The induced abortion rate in 2003 was 29 per 1000 women aged 15–44 years, down from 35 in 1995. Abortion rates were lowest in western Europe (12 per 1000 women). Rates were 17 per 1000 women in northern Europe, 18 per 1000 women in southern Europe, and 21 per 1000 women in northern America (USA and Canada). In 2003, 48% of all abortions worldwide were unsafe, and more than 97% of all unsafe abortions were in developing countries. There were 31 abortions for every 100 livebirths worldwide in 2003, and this ratio was highest in eastern Europe (105 for every 100 livebirths).

Interpretation Overall abortion rates are similar in the developing and developed world, but unsafe abortion is concentrated in developing countries. Ensuring that the need for contraception is met and that all abortions are safe will reduce maternal mortality substantially and protect maternal health.

Introduction Induced abortion is one of the greatest human rights dilemmas of our time. The need for scientific and objective information on the matter is therefore imperative. However, because of the sensitive nature of the topic, data sources are limited and accurate information on the occurrence of induced abortion is difficult to obtain.

The distinction between safe and unsafe abortion is crucial because each has different public-health implications. Safe abortion has few health consequences, whereas unsafe abortions are a threat to women’s health and survival.1–3 WHO is involved in efforts to improve maternal health and reduce maternal mortality in 63 priority countries.1 The UN Millennium Development Goals, adopted by 189 nations, include the goal of improving maternal health and the specific target of reducing the maternal mortality ratio by three-quarters between 1990 and 2015.5 Unsafe abortion is a major cause of maternal mortality, and measuring its incidence is important for monitoring progress on this goal. Unsafe abortion also has other consequences, including economic costs to health systems and families, stigmatisation, and psychosocial effects on women.

All abortions, whether safe or unsafe, are a compelling indicator of the incidence of unintended pregnancies, and information on abortion rates can affect the allocation of resources by national authorities, donor nations, and international agencies for contraceptive services and supplies.

This Article presents new estimates of the incidence of induced abortion worldwide, by region, and according to the safety of the procedure, for 2003, the most recent year for which worldwide estimates could be made. We define safe and unsafe abortion and indicate how these definitions intersect with abortion laws and regulations. This work is the product of a comprehensive review of the evidence and systematic methods of estimation, and represents the first known worldwide assessment of abortion incidence since 1995, when estimates were originally developed. It used methods similar to those used in 1995, and we assessed trends in safe and unsafe abortion since that time.

Methods Data sources For estimation purposes, safe abortions were defined as those that meet legal requirements in countries in which abortion is legally permitted under a broad range of criteria. Unsafe abortion is defined by WHO as any procedure to terminate an unintended pregnancy done either by people lacking the necessary skills or in an environment that does not conform to minimum medical standards, or both (panel I).6 These include abortions in countries with restrictive abortion laws, as well as abortions that do not meet legal requirements in countries with less restrictive laws. Although there is not a perfect correlation between the legal status of abortion
Panel 1: Definitions of safe and unsafe abortion

Safe abortions
Abortions (a) in countries where abortion law is not restrictive,* and (b) that meet legal requirements in countries where the law is restrictive.†

Unsafe abortions
Abortions done either by people lacking the necessary skills or in an environment that does not conform to minimum medical standards, or both. These include (a) abortions in countries where the law is restrictive and (b) abortions that do not meet legal requirements in countries where the law is not restrictive.

*Defined as countries in which abortion is legally permitted for social or economic reasons or without specification as to reason, and a few countries and territories with more restrictive formal laws in which safe abortion is nevertheless broadly available.
†Such abortions are currently too few to be included in these estimates.

and its safety, there is substantial evidence that most abortions are safe in countries where the procedure is legally permitted under a broad range of criteria. By contrast, in countries where the procedure is highly restricted by law, abortions are frequently done by unqualified providers, are self-induced, or are done by medical professionals under unhygienic conditions. Even when done by a trained practitioner, the clandestine and illegal nature of abortion in these countries usually means that medical back-up is not immediately available in an emergency, the woman might not receive appropriate post-abortion care, and if complications occur the woman might delay seeking care.

The most current statistics available on safe abortion for many countries at the time of data collection were for 2003. Although some statistics were available for more recent years, having comparable data for all countries was important in order to produce regional and worldwide estimates. Estimates of unsafe abortions are based on data and studies that cover various years, the rough average of which is 2003. Estimates for years other than 2003 were projected forward or backward to 2003 if data for trends were available. Where there was no evidence of changes in rates over time, rates from other years were applied to UN population data for 2003.

Most countries in which abortion is legally available on request or under a range of circumstances have a mechanism for collecting statistics on procedures. We obtained this information from published reports, websites of or special requests to relevant government agencies, or databases compiled by WHO Regional Office for Europe or the Council of Europe.

We examined reports for information on the completeness of abortion records, and with every data request we included an inquiry about the completeness of statistics. Additionally, we consulted available studies and several national and international experts on the quality of abortion statistics. These experts included researchers, officials from government agencies involved in abortion data collection, and administrators of abortion and family planning programmes who were familiar with reporting practices. Where statistics were deemed complete or nearly complete, as was the case in several northern and western European countries, no adjustments were made. In other countries, we corrected the reported numbers for under-reporting, as indicated by experts. We used the same correction factor as was used in our previous study when we did not have sufficient evidence of a change in completeness of reporting.¹

For two-thirds of countries for which official reports were available, and in which abortion is considered safe, the reports were deemed complete and the data were not adjusted. In the remaining countries, the average correction factor was 1.4 (which corresponds to an inflation of the official estimate by 40%). The correction factors ranged from 1.05 (USA) to 3.0 (Bangladesh). The inflation factor was high for Bangladesh because official statistics in that country include only menstrual regulation procedures (the only legally permissible procedure), most of which are unreported.

In several countries where abortion is usually legally permissible, accurate abortion reporting systems are not in place; however, women’s reports on abortion are available from national surveys. In these cases, we used the number of induced abortions estimated by the surveys. Because structured surveys, at best, achieve around 80–85% completeness in reporting on abortion, we increased the survey-based numbers by 20%, a conservative estimate of the extent of under-reporting in surveys.²

For a few Asian and eastern European countries, abortion data were available from two sources: household surveys for periods close to 2003 and government statistics for the intervening years between the surveys and 2003. In countries for which surveys showed more abortions than were counted in the official statistics, we deemed the survey estimates to be more complete, since even they are known to undercount abortions.³ We used the trend line from official statistics to project estimates forward from the survey year to 2003.

For countries with statistics or survey data for a year within 4 years of 2003 (ie, 1999–2003) and with no information on changes in abortion levels over time, we applied the rate for the available year to the population in 2003 to estimate the number of abortions in 2003. For a few countries that lacked sufficient data, either from official statistics or surveys, we applied a low, medium, or high-variant abortion rate, on the basis of contraceptive prevalence and fertility rates.

Two countries merit special discussion of the methods underlying their estimates, because of their large populations and the difficulty of estimating numbers of safe abortions. In India, although official statistics on
legal abortion were known to have omitted many safe abortions done by physicians, there was little basis for estimating the incidence of safe abortion in 1995. A 2002 study provided national abortion estimates based on a survey of facilities in six states. The study indicated there were 6.4 million abortions in India, of which 2.4 million were safe. The total was similar to our 1995 estimate, but the estimated number of safe abortions in 2003 was much greater than our 1995 estimate (1.1 million). In Vietnam, official data show a sharp decline in the number of abortions since the mid 1990s. However, nationally representative Demographic and Health Surveys done in 1996 and 2003 indicate that the abortion rate has been steady or has increased slightly, and experts indicate that there has been an increase in private abortions and in those done in public hospitals but not recorded. These numbers are not captured by official statistics. We applied the yearly survey-based rate of change to our 1995 estimate, which was based on government statistics, to obtain an estimate for 2003. More detailed information on data sources used for safe abortion estimates is available.

WHO periodically estimates the incidence of unsafe abortion for each region and subregion of the world and has done so for the past 20 years. Unsafe abortion can only be estimated with indirect techniques that draw on all available evidence, including information on complications treated in hospitals, studies on conditions of unsafe abortion, and women’s reports in surveys. These estimates are further corroborated with data for fertility rates, in relation to contraceptive prevalence and trends, and unmet need for family planning, where available. Because there are gaps in the evidence base, there is a degree of uncertainty and imprecision in country-specific estimates, which are, therefore, used solely for the purpose of aggregation to the regional and subregional levels. For countries that have data for numbers of women hospitalised for abortion complications, unsafe abortion incidence was estimated by use of an existing and widely used technique that adjusts these numbers for the estimated percentage of women having abortions who do not need or do not receive treatment.

Reports on household surveys of women sometimes provide abortion rates, from which the national number of abortions can be estimated. Some household surveys report the percentage of women of reproductive age who have ever had an unsafe abortion, and these percentages were converted into yearly rates. When data were taken from a subnational hospital or community-based study, results were weighted to the country’s population to adjust for rural and urban distributions in the sample compared with the country as a whole. A small number of countries for which no information was available were assumed to have the same rate as other countries in the same region, or as other countries with similar abortion laws and rates of fertility and contraceptive use. A more detailed description of methods for estimating unsafe abortion rates is also available.

Demographic data
To calculate the total, safe, and unsafe abortion rates, we used estimates of the numbers of women of reproductive age (15–44 years) as the denominator; for calculation of the corresponding ratios, the denominator was the number of births in 2003. To calculate the proportion of pregnancies that end in abortion, we estimated the number of pregnancies as the sum of all livebirths, induced abortions, and spontaneous pregnancy losses (miscarriages and stillbirths). We estimated the numbers of spontaneous pregnancy losses using a model-based approach derived from clinical studies of pregnancy loss by gestational age, which indicated that spontaneous pregnancy loss is equal

Panel 2: UN listing of countries by geographical region

**Africa**

**Middle Africa**
- Angola, Cameroon, Central African Republic, Chad, Congo, Democratic Republic of the Congo, Equatorial Guinea, Gabon, Sao Tome and Principe

**Northern Africa**
- Algeria, Egypt, Libya, Morocco, Sudan, Tunisia, Western Sahara

**Southern Africa**
- Botswana, Lesotho, Namibia, South Africa, Swaziland

**Western Africa**
- Benin, Burkina Faso, Cape Verde, Côte d’Ivoire, Gambia, Ghana, Guinea, Guinea-Bissau, Liberia, Mali, Mauritania, Niger, Nigeria, Senegal, Sierra Leone, Togo

**Asia**
- Eastern Asia: China, Hong Kong Special Administrative Region of China, Macau Special Administrative Region of China, North Korea, Japan, Mongolia, South Korea

**South-central Asia**
- Afghanistan, Bangladesh, Bhutan, India, Iran, Kazakhstan, Kyrgyzstan, Maldives, Nepal, Pakistan, Sri Lanka, Tajikistan, Turkmenistan, Uzbekistan

**Southeastern Asia**
- Brunei, Burma, Cambodia, East Timor, Indonesia, Laos, Malaysia, Philippines, Singapore, Thailand, Vietnam

**Western Asia**
- Armenia, Azerbaijan, Bahrain, Cyprus, Georgia, Iraq, Israel, Jordan, Kuwait, Lebanon, Occupied Palestinian Territory, Oman, Qatar, Saudi Arabia, Syrian Arab Republic, Turkey, United Arab Emirates, Yemen

(Continues on next page)
to 20% of the number of births plus 10% of the number of induced abortions. Abortion numbers, rates, and ratios were calculated for regions as defined by the UN (panel 2), which follow familiar geographical divisions.

Role of the funding source
The funding source had no role in study design, data collection, data analysis, data interpretation, or writing of the report. The corresponding author had full access to all the data in the study and had final responsibility for the decision to submit for publication.

Results
An estimated 42 million induced abortions occurred in 2003, compared with the 1995 estimate of 46 million (table 1). The abortion rate (yearly number of induced abortions per 1000 women aged 15–44 years) worldwide was 29 in 2003, down from 35 in 1995. The total abortion rate, which can be interpreted as the number of abortions a woman will have if current rates prevail throughout her reproductive lifetime, was 1·1 in 1995 and 0·9 in 2003. An assessment of trends between 1995 and 2003 should take into account the fact that figures for both years are estimates and are not precise values. Additionally, improvements in data availability and estimation methods might have contributed to the higher estimates in Africa for 2003 than for 1995. However, declines in abortion rates in some regions are substantial and likely real.

The observed decline was greater in developed regions (panel 2) than in developing countries. Within the developed regions, the sharpest decline in abortion rates was in eastern Europe, where it was estimated to be 90 per 1000 women in 1995 and 44 in 2003. This decline had already begun before 1995. Elsewhere in the developed regions, the abortion rate declined modestly in Oceania (which consisted mainly of Australia and New Zealand), and negligibly in northern America (Canada and the USA).

In the developing world, the total number of abortions changed very little (from 35·5 million to 35·0 million),

<table>
<thead>
<tr>
<th>Region</th>
<th>Number of abortions (millions)</th>
<th>Abortion rate*</th>
</tr>
</thead>
<tbody>
<tr>
<td>World</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Developed countries</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Excluding eastern Europe</td>
<td>3.8</td>
<td>3.5</td>
</tr>
<tr>
<td>Developing countries</td>
<td>35.5</td>
<td>35.0</td>
</tr>
<tr>
<td>Excluding China</td>
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<td>26.4</td>
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<tr>
<td>Estimates by region</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Africa</td>
<td>5.0</td>
<td>5.6</td>
</tr>
<tr>
<td>Asia</td>
<td>26.8</td>
<td>25.9</td>
</tr>
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<td>Europe</td>
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<td>4.3</td>
</tr>
<tr>
<td>Latin America and the Caribbean</td>
<td>4.2</td>
<td>4.1</td>
</tr>
<tr>
<td>Northern America</td>
<td>1.5</td>
<td>1.5</td>
</tr>
<tr>
<td>Oceania</td>
<td>0.1</td>
<td>0.1</td>
</tr>
</tbody>
</table>

* Abortions per 1000 women aged 15–44 years.

Table 1: Global and regional estimated numbers of induced abortion and abortion rates, 2003 and 1995
but the rate fell from 34 to 29 per 1000 women (about 15%). In China, which accounts for a fifth of all abortions worldwide, the rate seemed to have declined by a little over 20%. When China was excluded, the total number of abortions in developing countries actually increased by 1·5 million, and the rate fell by only 9%.

The estimated absolute number of abortions was greater in 2003 than in 1995 in Africa, but was lower in 2003 in Asia, and Latin America and the Caribbean. However, the abortion rate seemed to have decreased in Africa, Asia, and Latin America and the Caribbean. Contrasting trends in the numbers of abortions and abortion rates were explained by population growth during this time. Because of the concentration of the world’s population in Asia, more than half of the world’s abortions in 2003 (26·4 million) took place there, and a substantial proportion of these (8·6 million) were in China.

Almost half of all abortions in 2003 were unsafe (table 2). In developed regions, most abortions (92%) were safe, but in developing countries, more than half (55%) were unsafe, including 38% of abortions in Asia, 94% in Latin America and the Caribbean, and 98% in Africa. Overall, 97% of all unsafe abortions in 2003 were in developing countries.

The abortion rate per 1000 women was lowest in western Europe (12), and was also quite low in northern America and Oceania.
and southern Europe (17–18) and Oceania (17). In these geographic areas, most abortions were legal and abortion incidence had been low for decades.20 Northern America also had a low abortion rate of 21. Of the subregions in which most abortions were legal, two showed continued high rates of abortion: eastern Europe at 44, and to a lesser extent, eastern Asia at 28. Although the rate in the eastern European region has fallen substantially in recent years, it remains higher than in any other region.

The abortion ratio (the number of abortions for every 100 livebirths) was about 31 worldwide in 2003 (table 3). Safe and unsafe abortion ratios were similar to each other (16 and 15, respectively). The abortion ratios in developing countries tended to be lower than those in developed countries, even though the rates were comparable or higher in developing countries, largely because birth rates were higher in developing countries.

The abortion ratio was highest in eastern Europe (105 per 100 livebirths) as a result of both a high incidence of abortion and low fertility rates. There were slightly more abortions than births on average in this region. Abortion rates were also high in eastern Asia (which is dominated by China), southeastern Asia, and the Caribbean.

There were an estimated 205 million pregnancies (livebirths, spontaneous miscarriages, stillbirths, and induced abortions) worldwide in 2003, of which about 20% ended in induced abortion. In eastern Europe, almost half of all pregnancies ended in induced abortion, whereas in northern America, one in five pregnancies ended in abortion. Even in regions where small proportions of pregnancies end in induced abortion, such as middle and western Africa, about one in ten pregnancies were terminated.

Discussion

The findings presented here provide new estimates of abortion incidence at the worldwide and regional levels, which had not been updated since 1995. In the face of a dearth of information for many countries, particularly those in which abortion laws are highly restrictive, this study drew on all available sources of information and used systematic and consistent methods to estimate abortion incidence. Information on abortion rates and trends has important implications for stakeholders in many fields, including public health, public policy, the law, and reproductive rights.

The estimates presented here indicate that the incidence of induced abortion worldwide has declined since 1995, but trends have been variable across regions. The change in developing regions (excluding China) has been modest. However, a definite and much larger decrease in the incidence of abortion was seen in the developed regions as a whole. The most pronounced change was in countries of the former Soviet Union (principally consisting of eastern Europe, but also including a few countries in northern Europe, south-central Asia, and western Asia).21 Although the magnitude of this decline might be overestimated because abortions were increasingly being done in the private sector and the incidence of such procedures might be underestimated, the reduction in abortion rates did coincide with substantial increases in contraceptive use in the region.22,23 With respect to family planning, the Soviet era was characterised by restricted access to contraceptive services, combined with the availability of abortion services at little or no cost to the woman.24 Since that time, the efforts of international donors and governmental agencies have resulted in improved access to contraceptive information and supplies,25 whereas the cost of abortion has increased in many settings.26

Although abortion rates and ratios in the countries of the former Soviet Union have fallen substantially in recent years, the rates in eastern Europe remain higher than in any other region. This finding suggests the need for continued improvements in and expansion of contraceptive service provision. The widespread preference for small families in this region indicates a high level of need for effective contraception.27

Abortion incidence in 2003 was moderate to high in the African region. The estimated number of unsafe abortions in 2003 was higher than that for 1995, partly because studies in the intervening period revealed high levels of unsafe abortion, and partly because the population had grown. High abortion rates in sub-Saharan Africa coexist with high levels of unmet need for contraception,28 and the higher rates in eastern Africa than in western Africa are consistent with higher overall demand for family planning in eastern Africa.29

Unsafe and safe abortions correspond in large part with illegal and legal abortions, respectively (panel 1). The findings presented here indicate that unrestricted abortion laws do not predict a high incidence of abortion, and by the same token, highly restrictive abortion laws are not associated with low abortion incidence. Indeed, both the highest and lowest abortion rates were seen in regions where abortion is almost uniformly legal under a wide range of circumstances.

Results of previous studies have shown a strong correlation between abortion and contraception use such that, in settings with steady fertility rates over time, abortion incidence declines as contraceptive use increases.26 An analysis of trends in eastern Europe and western and south-central Asia indicates that this pattern is evident in those regions.27

Although abortion is likely to be safe in countries where it is legally available under a wide range of circumstances, unsafe abortions still take place in some of these areas because of poor information or access to safe medical services. In eastern Europe and central Asia, 8–16 per 100 procedures lead to post-abortion complications and 15–50% of maternal deaths are related to abortion.27 Some of the high-risk abortions are illegal, whereas others are legal but done under poor conditions or using inappropriate methods. More often,
however, legal abortions are safe. In the USA, fewer than 0·3% of women undergoing abortions have a complication that necessitates admission to hospital,^{57} and abortions (both spontaneous and induced) account for 4% of maternal deaths.^{28}

Similarly, some abortions in restricted settings are done by trained providers, but most abortions in these settings have high risks to a woman’s life and health. In Africa, where abortion is highly restricted by law in nearly all countries, there are 650 deaths for every 100,000 procedures, compared with fewer than 10 per 100,000 procedures in developed regions.^{18} Worldwide, an estimated 5 million women are hospitalised every year for treatment of complications related to unsafe abortion.^{39} Moreover, illegal procedures are harmful even when they do not lead to these consequences, because they require women to take actions in violation of the law and often without the knowledge or support of their partners or family.

We should also note that the level of risk associated with unsafe abortion varies according to circumstances and can change over time. In Peru and the Philippines the rate of hospitalisation for abortion-related complications has declined, even as abortion law remained restrictive and the abortion rate remained constant.^{30–32} Access to safer abortion methods (particularly misoprostol-only abortions) and to better-trained providers has made abortions safer to some degree in these countries.^{30,31} Legalisation of abortion can have a substantial effect on the safety of the procedure: in South Africa, the incidence of infection from abortion decreased by 52% after a more liberal abortion law went into effect in 1997.^{11}

Worldwide, the rate of unsafe abortion declined slightly between 1995 and 2003, but the proportion of all abortions that were unsafe increased from 44% to 48% in the same interval. These findings reinforce the need to ensure that existing resources for reducing the rates of unsafe abortions are used as fully as possible. WHO has issued technical and policy guidance to assist countries in making safe abortion accessible to the full extent permitted by the law,^{38} which include: using the safe methods now available for first-trimester abortions, in particular manual and electric vacuum aspiration and medical abortion; training providers on safe and aseptic abortion practice; training mid-level health professionals to do these procedures to the extent allowed by law; ensuring that the needed equipment and supplies are available for safe and appropriate procedures; and providing high quality post-abortion care that includes contraceptive counselling and services.

At the root cause of induced abortion is unintended pregnancy. An estimated 108 million married women in developing countries have an unmet need for contraception,^{36} and 51 million unintended pregnancies in developing countries occur every year to women not using a contraceptive method. Another 25 million happen as a result of incorrect or inconsistent use of contraception or method failure.^{36} Meeting the need for contraception and improving the effectiveness of use among women and couples who are already using contraception are crucial steps toward reducing the incidence of unintended pregnancy.

Estimates of abortion incidence and trends are necessary means of monitoring and responding to its causes, including unmet need for contraception, and, in the case of unsafe abortion, consequences such as maternal morbidity and mortality. In our research, we have been able to estimate abortion rates and trends by geographic region and according to the safety of the procedure. Additional research examining variations within and between regions and over time in the incidence of unintended pregnancy, the types of abortion procedures used, and the severity of consequences of unsafe abortion, would help establish where service improvements are most needed and whether the health risks associated with unsafe abortion are declining. In light of the recent mandates of intergovernmental bodies, the contraceptive and abortion technologies now available, and the estimates presented here, prevention of unsafe abortion is an imperative public-health goal.

**Contributors**

GS participated in data collection and estimation of safe abortion incidence, writing portions of the paper, editing the paper, and preparation of tables. SH, SS, and IHS participated in providing technical assistance during data collection and analysis, writing portions of the paper, and editing the paper. EA participated in data collection and estimation of unsafe abortion incidence, writing portions of the paper, and editing of the paper.

**Conflict of interest statement**

We declare that we have no conflict of interest.

**Acknowledgments**

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**References**

29 Singh S. Hospital admissions resulting from unsafe abortion: estimates from 13 developing countries. Lancet 2006; 368: 1887–92.
Minutes after being born at full term, a baby was referred to our unit for severe cyanosis, refractory to oxygen administration. The baby was not in respiratory distress. A transposition of the great arteries was diagnosed by echocardiography; we did a balloon atrial septostomy via the umbilical vein, to allow oxygenated blood to reach the systemic circulation. 3 days after birth, we observed abdominal distension. Abdominal percussion was tympanic. Transillumination indicated that the baby was likely to have a pneumoperitoneum (figure)—which was confirmed by abdominal radiography. Emergency surgical exploration showed a localised necrotising enterocolitis, with several gut perforations: the baby required an ileocaecal resection, and a distal ileostomy. The necrotising enterocolitis may have been caused by emboli released from the atrial septum or the umbilical vein, during the septostomy, or by the hypoxaemia caused by the transposition of the great arteries. Transillumination is widely used by pediatricians to detect pneumothoraces, particularly when rapid aspiration must be done, or radiography is unavailable. As demonstrated here, transillumination can also assist in the diagnosis of pneumoperitoneum.
Women deliver for development

Kirrin Gill, Rohini Pande, Anju Malhotra

There is a large amount of research into maternal health as a health issue, but maternal health as a development issue has been less explored. This Review analyses the evidence from the past 20 years on the links between maternal health and development to examine maternal health within a development framework. We note that although existing evidence suggests that these links are strong, further research is needed to definitively substantiate how and to what extent maternal health and development affect each other. Further, we find that progress and investment in maternal health have lagged far behind estimates of what is needed to achieve the Millennium Development Goals.

Introduction

The reproductive years for women are of central importance to their lives, their families and communities, and the next generation. During these years women not only bear and raise children, but are active members of society in many ways—as workers, leaders, and key actors in social change and development—and have the greatest potential to deliver not only for their own lives, but also for broader development. Since childbearing is a key part of the lives of most women in developing countries, maternal health probably has an important effect on their ability to fulfill this potential. However, although much public-health research has examined maternal health itself, there has been less focus on the assessment of evidence about how maternal health may interact with economic and social development at family (micro) and national (macro) levels. The Millennium Development Goals (MDGs) have identified maternal health as a key development outcome, and thus assessment of the importance of improving maternal health as a development goal is essential.

We examine the evidence so far on the links between maternal health and three of the several important aspects of development: women’s own status and empowerment; economic and social development at the family level; and economic and social development at a national level. Studies up until now have tended to focus on specific aspects of development, and few, if any, have specifically examined the links between maternal health and several outcomes of women’s status and empowerment. Our Review addresses these gaps and examines many aspects of development together to provide a holistic analysis.

Figure 1 shows our framework. As most research up until now has shown, maternal health most directly affects a woman’s own health and survival and that of her newborn child. However, maternal health is linked to women’s lives not only as a health issue. A woman’s maternal health is affected by, and could influence, her status and empowerment as an individual. As a member of a family, maternal health affects the health and education of a woman’s children and the finances and welfare of her household, whereas in her role in a community, maternal health affects a woman’s and her nation’s productivity. This framework shows how maternal health is not only central to women’s potential, but also has telescopic, ripple effects for broader economic opportunity, occupation, and microcredit. Searches for links of maternal health to maternal health, we added: “employment”, “wages”, “enterprise”, “savings”, “assets”, “economic opportunity”, “occupation”, and “microcredit”. Searches for links of maternal health with development outcomes used search terms such as: “disability-adjusted life years (DALYs)”, “burden of disease”, “cost-effectiveness”, “child education”, “household finances”, “family”, “individual effects”, “household-level effects”, and “adult mortality consequences”.

Key findings

- Progress in maternal health has been uneven, inequitable, and unsatisfactory, but successes in several countries show that change is possible
- Women’s status and empowerment, in spheres such as education, employment, decisionmaking, intimate partner violence, and reproductive health, affect their maternal health including access to and use of services during pregnancy and childbirth
- Maternal health has profound effects on neonatal and child survival and morbidity and grave implications for the long term wellbeing of children—particularly girls—through its effect on their education, growth, and care
- Maternal death and illness is costly for families because of high direct health costs, loss of income, loss of other economic contributions, disturbed family relationships, and social stresses
- Maternal health affects economic productivity and overall health service delivery
- The investment needed for improved maternal health is a minor fraction of global spending and makes financial sense since maternal health interventions are cost effective

Search strategy and selection criteria

All searches were done with literature databases such as POPLINE, PubMed, Proquest, Social Science Citation Index, and the websites of international organisations and universities such as WHO, the World Bank, UNICEF, the UN, UNFPA, the US Agency for International Development, Population Reference Bureau, the Global Health Council, the London School of Economics, the London School of Hygiene and Tropical Medicine, Oxfam International, and the Immpact Initiative. Searches were limited to published work produced in the past 10 years, with the exception of key articles in the discipline. Searches on maternal health included the following key terms: “maternal mortality”, “maternal morbidity”, “obstetric morbidity”, and “maternal health services utilization” (antenatal, delivery, and postnatal care). Key terms used for investments in maternal health included: “investments”, “(donor) funding”, and “millennium development goals”. For the relations of economic opportunities to maternal health, we added: “employment”, “wages”, “enterprise”, “savings”, “assets”, “economic opportunity”, “occupation”, and “microcredit”. Searches for links of maternal health with development outcomes used search terms such as: “disability-adjusted life years (DALYs)”, “burden of disease”, “cost-effectiveness”, “child education”, “household finances”, “family”, “individual effects”, “household-level effects”, and “adult mortality consequences”.

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Correspondence to: Rohini Pande, International Center for Research on Women, 1120 20th Street NW, Suite 500N, Washington, DC 20036, USA rpande@icrw.org
Maternal morbidity is also a serious problem in developing countries, but research is scarce compared with analyses of maternal mortality. Estimates are poor but suggest that 10–20 million women have physical or mental disabilities every year because of complications of birth or its management.\(^5\)\(^,\)\(^6\) One in four women is estimated to have acute or chronic symptoms related to pregnancy.\(^3\)\(^,\)\(^4\)\(^,\)\(^10\)–\(^13\) 4–8% of women who deliver in hospitals have severe acute morbidity or severe obstetric complications\(^7\)–\(^11\) making comparisons across time very difficult for neonatal mortality. Nonetheless, neonatal mortality remains an important concern. Between 1980 and 2000, although child mortality after the first month of life fell by a third, neonatal mortality rates fell only by about a quarter. Thus, whereas in 1980, 23% of child deaths occurred in the first week of life, by 2000 this figure rose to an estimated 28%.\(^3\) Like maternal mortality, most neonatal deaths and stillbirths happen in west Africa and south-central Asia,\(^3\) since disorders that cause these deaths are often the same as those that result in maternal morbidity and mortality—eg, obstetric complications\(^3\)–\(^11\) and inadequate care during pregnancy, delivery, or in the immediate postpartum period.\(^3\) As with maternal mortality, most stillbirths and deaths to newborns and infants are preventable.\(^3\)\(^,\)\(^3\)\(^1\)–\(^11\)

Maternal morbidity is also a serious problem in developing countries, but research is scarce compared with analyses of maternal mortality. Estimates are poor but suggest that 10–20 million women have physical or mental disabilities every year because of complications of birth or its management.\(^5\)\(^,\)\(^6\) One in four women is estimated to have acute or chronic symptoms related to pregnancy.\(^3\)\(^,\)\(^4\)\(^,\)\(^10\)–\(^13\) 4–8% of women who deliver in hospitals have severe acute morbidity or severe obstetric complications (so-called near miss).\(^3\) The morbidity associated with births without a skilled attendant—which consist of almost

Table 1: Maternal mortality ratios,\(^*\) 1983–2005

<table>
<thead>
<tr>
<th>Region</th>
<th>1983†</th>
<th>1990</th>
<th>1995‡</th>
<th>2000‡</th>
<th>2005‡</th>
</tr>
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<td>400</td>
<td>400</td>
<td>403</td>
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<tr>
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<td>21</td>
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<td>640</td>
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<td>830</td>
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<td>Northern(^$)</td>
<td>246</td>
<td>200</td>
<td>130</td>
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<td>Eastern(^&amp;)</td>
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<td>55</td>
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<tr>
<td>Southern</td>
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<td>520</td>
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<td>Southeastern</td>
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<td>Western</td>
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<td>170</td>
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<tr>
<td>Latin America and Caribbean</td>
<td>270</td>
<td>179</td>
<td>190</td>
<td>190</td>
<td></td>
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<tr>
<td>Oceania(^&amp;)</td>
<td>NA</td>
<td>548</td>
<td>260</td>
<td>240</td>
<td>430</td>
</tr>
</tbody>
</table>

Data from references 1–4. NA=no available data, or no data according to the regional breakdown used here. CIS=Commonwealth of Independent States. *Maternal deaths per 100,000 live births. 1983 estimates result from a UN regional classification of countries as opposed to UN MDG regional groupings for 1990–2005. †Includes North America, Europe, Japan, Australia, and New Zealand, which are excluded from regional averages. ‡Includes Sudan which is included in sub-Saharan Africa. ¶The countries included in maternal mortality ratios in Oceania for 1995 and 2000 differ from those included in 1990 and 2005, and thus the changes in estimates across these two sets of periods should be interpreted with caution.
50% of births in developing countries—can be much higher than this finding. However, further research is needed to improve understanding of the nature, extent, and consequences of maternal morbidity in various regions of the developing world.

**Use of maternal-health services and inequities in access**

Why has maternal mortality not improved in many developing regions? At least part of the reason is uneven and inequitable improvement in the use of maternal-health services. Furthermore, the low status and empowerment of women affects their access to and use of these services.

The largest increase in the use of maternal-health services between 1990 and 2000 has been in antenatal care (table 2), with an average increase of more than 20% across all regions of the world. The increase was especially large in Asia, where service use rose by 31%. However, women in Asia continue to have the lowest levels of antenatal-care use in the developing world. By contrast, although the increase was only 4% in sub-Saharan Africa, almost three-quarters of pregnant women were using antenatal care by 2000. However, the high level of maternal mortality accompanying these high levels of antenatal care in Africa suggest that there are difficulties with quality of care, such as the absence of adequately trained staff, which emphasises the importance of such quality and institutional factors in lowering maternal mortality.

The proportion of births attended by skilled health care personnel also rose in all regions of the developing world between 1990 and 2004, although this increase was uneven. The use of skilled birth attendants increased by almost 80% in southeastern Asia and northern Africa, but more than half the women in sub-Saharan Africa and two-thirds in south Asia still deliver their children without a skilled attendant. Since almost half the world’s maternal deaths occur in these two regions, the low rates of skilled attendance have serious implications for maternal health. These successes underscore the importance of effective health inputs to improving maternal health and suggest that MDG5, which calls for a 75% reduction in the maternal mortality ratio between 1990 and 2015, is achievable.

Poor maternal health is of serious concern beyond its importance as a health issue, because women’s health as mothers can be linked with other aspects of women’s lives and development more broadly. We assess what evidence exists to support these links.

**Women as individuals: maternal health and women’s status and empowerment**

Research suggests that the MDGs will not be reached without addressing poverty and gender inequality. As WHO noted, “Maternal mortality is an indicator of disparity and inequity between men and women and its

There are also strong inequalities in the distribution of services for maternal health. The poorest women in the poorest regions of the world have the lowest service coverage. A study in over 50 countries (figure 2) showed that on average more than 80% of births were attended for the richest women, compared with only 34% for the poorest women. This gap between the rich and poor is large in all regions of the world, except Europe and central Asia, and is especially wide in South Asia. Despite this severe situation, there are success stories when poor maternal health has been substantially improved. Egypt, Honduras (panel 1), Malaysia, Sri Lanka (panel 2), Thailand, and parts of Bangladesh have all halved their maternal mortality ratios over the past few decades. These successes underscore the importance of effective health inputs to improving maternal health and suggest that MDG5, which calls for a 75% reduction in the maternal mortality ratio between 1990 and 2015, is achievable.

Poor maternal health is of serious concern beyond its importance as a health issue, because women’s health as mothers can be linked with other aspects of women’s lives and development more broadly. We assess what evidence exists to support these links.

**Table 2: Antenatal care use, 1990–2000**

<table>
<thead>
<tr>
<th>Region</th>
<th>1990</th>
<th>2000</th>
<th>% increase</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sub-Saharan Africa</td>
<td>68</td>
<td>71</td>
<td>4%</td>
</tr>
<tr>
<td>Middle east/north Africa</td>
<td>52</td>
<td>57</td>
<td>10%</td>
</tr>
<tr>
<td>Latin America/Caribbean</td>
<td>77</td>
<td>88</td>
<td>14%</td>
</tr>
<tr>
<td>Asia*</td>
<td>45</td>
<td>53</td>
<td>31%</td>
</tr>
<tr>
<td>Developing countries*</td>
<td>53</td>
<td>64</td>
<td>21%</td>
</tr>
</tbody>
</table>


**Figure 2: Attended delivery by a medically trained person (1990–2005)**

The Richest quintile had the highest coverage of attended deliveries, with 94.3% in Europe, central Asia, and 99.7% in East Asia, Pacific. The Poorest quintile had the lowest coverage, with 30.5% in East Asia, Pacific, and 40.2% in Latin America, Caribbean. The gap between the richest and poorest quintiles is evident in all regions, with the highest gap in South Asia. The figure highlights the need for targeted interventions to improve access to maternal health services.
extent a sign of women’s place in society and their access to social, health, and nutrition services and to economic opportunities”. The evidence reviewed below shows that women’s status and empowerment—measured by education, employment, intimate partner violence, and reproductive health—affects women’s capacity to access and use services during pregnancy and childbirth or otherwise maintain good maternal health. In some cases, the evidence also suggests that maternal health affects women’s status and empowerment as well.

Enablers for improved women’s status: education and employment
Education and employment are termed enabling factors since they can be instrumental in enabling women to gain the knowledge, confidence, skills, and opportunities that they need to increase their social and economic status and power in the household and in society. Some studies have examined the links of both these enablers with maternal health.

Perhaps the clearest and best documented example of the link between women’s status and maternal health is the effect of women’s education on maternal health. Educational attainment is measured by years of schooling, levels of education, and leaving school before secondary school completion. Extensive reports show that women’s education increases the use of maternal-health services, and is independent of related factors such as urban or rural residence or socioeconomic status, and across the range of services and stages of maternal care. Educated women are more likely than are uneducated women to use antenatal care, to use it early and frequently, and to use trained providers and medical institutions. Similarly, education is positively associated with safe delivery and an increased use of postnatal care. Education results in substantial improvements in a woman’s own health as a mother, and also has positive intergenerational effects on the health and nutrition of her daughters and their households. Female education, along with trained delivery assistance, is also a strong predictor of maternal mortality, independent of income per head.

Women’s economic opportunity (measured in terms of involvement in gainful or paid employment, wages, type of occupation, status at work, sector of activity, work effort, and potential wage rate) also has the potential to affect maternal health. Employment can pose physical burdens, hazards, or stress on women, which could result in negative outcomes for maternal health. Conversely, experiences and roles as economic providers might empower women through increased control over income which, in turn, may increase their power in decision-making about health care and their ability to access and pay for the services that they need when they are pregnant. The evidence suggests that women’s employment positively affects maternal health, although the research is scarce compared with that for the link between maternal health and education.

Existing research shows that employment is associated with reduced maternal mortality and morbidity and increased use of maternal-health services, even after considering other factors such as education, age, household assets, and neighbourhood characteristics. Studies in several countries have shown that unemployed women had over four times the chance of maternal death compared with employed women, and a substantially higher likelihood of episodes of illness in the 2 years after childbirth. Employment and participation in credit programmes were positively correlated with seeking antenatal and postnatal care services in China and the Philippines, respectively, and with women demanding formal health care in the event of an illness in Bangladesh.

These studies suggest that women’s participation in economic activities and control of own income is more important to improvement of maternal health than is household socioeconomic status per se, perhaps because economic control increases women’s ability to access the resources that they need during pregnancy. Other research emphasises how economic disadvantage more generally affects maternal health negatively, through factors such as residence in a poor neighbourhood and absence of
toilet facilities and potable water.

Women's empowerment: household decisionmaking and intimate partner violence

Several studies suggest that although education and employment might be enabling factors, decisionmaking in the household and experience of intimate partner violence are more direct measures of women’s ability to make crucial life choices. These factors indicate the power dynamics women face in terms of other family members in their efforts to secure their own welfare and frequently, that of their children. They also show women’s value in the household and the effort and resources that will probably be spent in ensuring their wellbeing. Although research into these links is scarcer than it is for education and employment, it does show some consistent findings.

Almost all the studies that connected decisionmaking with maternal health reported that, independent of other factors, women’s involvement in decisionmaking on key aspects of life is associated with an increased use of maternal-health services. Moreover, the stronger the woman’s decisionmaking power, the greater the effect on maternal health. Women with strong decisionmaking power were more than twice as likely to deliver their child at a health facility compared with women with little decisionmaking power. Similarily, women from households with a female head and those who alone had the final say on decisions were substantially more likely to use health services and deliver at a health facility than were other women. Finally, the association between women’s decisionmaking and health service use was two to three times larger when both the husband and wife agreed that the wife had power in decisionmaking.

Evidence for intimate partner violence from around the world shows that violence during pregnancy can be common.

However, the relation of violence with pregnancy varies by location. Some studies report that pregnant women are more likely to experience violence than are women who are not pregnant. Surveys from several countries show that intimate partner violence during pregnancy in developing countries ranges from 1·3% of pregnant women in Cambodia to 27·6% in a province in Peru. However, these studies also suggest that there is no consistent pattern of change in violence during pregnancy; although in some countries the level of violence during pregnancy is higher than it is when a woman is not pregnant, in other areas the reverse may be true.

Although the extent of violence during pregnancy varies, studies consistently show that violence is associated with many negative outcomes for maternal and fetal health, including premature and low birthweight babies, low maternal weight gain, infections, anemia, smoking, alcohol and drug use, and depressive symptoms. Analyses across several developing countries show that women who experienced violence were substantially more likely to have a terminated pregnancy or non-livebirth than were women who did not experience violence. They are also likely to have poorer maternal health because they are less likely to access antenatal, delivery, and postnatal care.

Violence can also indirectly contribute to women’s isolation during pregnancy through its control over their lives and access to resources.

Reproductive health: contraception, abortion, and HIV/AIDS

Options and constraints that women face regarding other reproductive health issues such as contraception, abortion, and risks of HIV can affect their health as mothers. Because of gender-based power dynamics with regard to sexuality in many cultures, women often do not

Panel 2: Reduction of maternal mortality in Sri Lanka

Context

The maternal mortality ratio in Sri Lanka in the 1940s was over 1600 per 100 000 livebirths. As of 2000, this number has been reduced to 92 per 100 000 livebirths.

Interventions/programmes

Key actions contributing to the country’s success included strong public investments in the overall health system, while taking special care to include crucial elements of maternal health care. Fundamental to their progress was sustained commitment for maternal-health care priorities with financial, managerial, and political support. Additionally, special attention was given to specific, sustained strategies in health, education, and nutrition, including equitable access to these services early in the development stage. Specific steps taken by the country for maternal health care included:

- Ensuring access through the expansion and provision of a free synergistic package of basic comprehensive health and social services, including maternal health care that reached poor people, even in rural areas
- Use of a judicious mix of health personnel to deliver services. Midwives were certified and provided an integral link between the women and the health units
- Effective management and use of health information to serve as a foundation, guiding decisionmaking and identifying problems
- Use of information for quality improvements, especially in identified vulnerable groups
- Empowering clients to provide information and to use services effectively

Cost and cost-effectiveness

In the late 1950s, Sri Lanka’s gross national product per head was US$270 (1995 US equivalent), and about half the households were below the poverty line. The country was able to reduce maternal mortality despite a decreasing budget. Between 1950 and 1999, expenditures for maternal-health services decreased from an average of 0·28% of gross domestic product in the 1950s to 0·16% in the 1990s, with an average of 0·23% over the five decades from 1950–99.

Effect

The country has shown the capacity to reduce maternal mortality ratio by 50% every 6–12 years.
have the power to negotiate safe sex or to prevent or safely abort unwanted pregnancy. As a result, women can be vulnerable to increased risks of maternal morbidity and mortality, especially in the context of HIV, because of risky sexual experiences as well as pregnancies that arise under difficult circumstances.

Extensive research shows that contraceptive use contributes to improved maternal health and lower maternal mortality, by contributing to fewer births, fewer unwanted pregnancies, and a lower proportion of births that are high risk. There is little research into the effect of maternal health on contraception, but a few studies show that women who use maternal-health services are more likely to use contraception than are women who do not use maternal care.77-84

The negative effect of unsafe abortion on maternal health is also well documented. Unsafe abortions increase both maternal mortality and morbidity—eg, through haemorrhage and infection, severe pain, secondary infertility, and death.6 WHO estimates that about 68 000 maternal deaths—mostly in developing countries—are due to abortion every year, which is probably a large underestimate because of widespread problems with reported abortion rates.70 Maternal deaths related to abortion are highest in Latin America and the Caribbean, where abortion is largely illegal. Unsafe abortion is one of the major direct causes of maternal mortality and morbidity in developing countries, and it accounts for 13% of maternal deaths.70

Conversely, safe or legal abortion poses little risk; in developing countries, the mortality risk is only four to six per 100 000 cases for legal abortion compared with 100–1000 per 100 000 cases for illegal abortions.73 Thus women’s options for safe abortion services are an important determinant of maternal-health outcomes.

HIV is becoming an increasingly important cause of maternal morbidity and mortality. Women are especially at risk of HIV, over 17 million women are infected with HIV, and every year two million pregnancies occur in women who are HIV positive.71,72 AIDS is now the leading cause of maternal deaths in some areas of Africa.73 HIV directly increases the risk of complications of pregnancy, delivery, and induced abortion such as anaemia, haemorrhage, and sepsis, thereby causing a high number of maternal deaths and complications.71-74 HIV indirectly increases susceptibility to episodes of moderate to severe maternal morbidity75 and the chance of a maternal death due to opportunistic infections such as pneumonia, tuberculosis, and malaria.72-75

Maternal health is also thought to affect HIV because pregnancy can accelerate disease progression in women who are HIV positive, although the supporting evidence has produced varying conclusions. Research results from developed countries show no effect of pregnancy on HIV disease progression, immunodeficiency, or AIDS.76-83 However, evidence from developing countries, where HIV is accompanied by a greater degree of symptomatology than it is in developed countries, suggests that there could be a link.73,84-87

Thus there is strong evidence that indicators of women’s status and empowerment such as education, decisionmaking, contraception, unsafe abortion, intimate partner violence, and HIV status affect outcomes for maternal health. However, research is scarce for the effect of employment on maternal health. Evidence on the reverse links—ie, the effect of maternal health on women’s status and empowerment—is even scarcer. Yet poor maternal health could plausibly affect women’s ability to exercise power or improve other dimensions of their lives such as employment opportunities. Further research is needed to verify these links, and to investigate how maternal health affects overall development through its effect on factors related to women’s status and empowerment.

Women as family members: effects of maternal health on children and families

That maternal health and mortality are of fundamental importance to the survival and wellbeing of children is well-documented. However, the evidence of the costs of maternal death and illness on families is scarce.

Many studies have shown that a child’s risk of dying increases substantially after the mother’s death.84-85

Moreover, maternal death seems to be one mechanism for perpetuating gender inequality in the next generation: the child’s risk of death when the mother dies is higher for girls than for boys.84-85 Children whose mothers die are also more likely to be stunted and less likely to attend school.85-88 When a mother dies or is severely ill, children are more likely to be sent to foster care, where they might have an increased chance of death, disability, and poor nutrition and of receiving less education and health care.85 Studies on orphanhood are exploring these negative effects, as well as potential benefits, of foster care.86-89

Poor maternal health perpetuates the cycle of ill-health across generations. Women who do not gain enough weight during pregnancy increase the chance that their newborn children are of low birthweight. Girls who are born underweight are more likely to be stunted, underweight adults and to have obstructed labour, which endangers their lives and that of their newborn child.90 Birth asphyxia can cause brain damage and impede cognitive development, and poor health at birth can affect adult wellbeing—eg, through increased chance of death from cardiovascular and cerebrovascular diseases.9

An increasing amount of evidence draws attention to the costs of a maternal death or illness to a household.90-94 These costs can drain family resources and savings, change patterns of consumption, and reduce households to debt and poverty.95-97 For instance, in Indonesia, a hospital delivery with complications cost 14% of an average yearly income.92 In Ghana and Benin, families could spend US$115 or $256, respectively, to treat...
near-miss complications. In 2000, these costs represented 8% of average annual cash expenditures for Ghanian families and 34% in Benin. When women are important economic contributors within their families, maternal illness means fewer hours of paid work, less income, and reduced resources for a family, exacerbating economic insecurity. Research in Ghana shows that women lost an average of 26 days of work because of reduced productivity during pregnancy and 23 days during postpartum. A review of US studies linked the poor health of mothers with reduced wages and labour-market participation, and increased welfare dependency. Poor maternal health also restricts women’s important non-paid economic contributions such as food production, water collection, health care, and caring for children, those who are ill, and elderly people.

The psychological and social consequences of poor maternal health and mortality are less extensively documented than are the economic costs, but existing published work suggests these factors are important. Rahman and co-workers’ study showed that one in four women in Pakistan had antenatal or postpartum depression, which is a disorder that has been linked to disturbed relationships with children, marital discord, and poor performance of household tasks, but which can be ameliorated with good health care. In many societies, men are not raised, taught, or expected to manage household affairs and they are poorly equipped to care for children and families. When maternal illness or death occurs, there is evidence of increased depression and psychological problems in the family, and increased numbers of children leaving school because they are compelled to help earn income.

Despite these negative results of maternal morbidity and mortality, women’s low status in a household typically means that women’s health-care needs are ignored and given low priority. Further, childbearing is regarded as an expected part of a woman’s role. Thus, families are reluctant to invest in maternal care and women may be unable to negotiate better care; thus, the risks and costs of maternal morbidity and mortality persist.

### Women as citizens: maternal health benefits for national productivity and health service delivery

In view of the costs and negative consequences associated with poor maternal health for women and their families, the cumulative effect of maternal mortality and morbidity probably affects national and global development outcomes. Of all the three aspects of development that we have presented in this Review, research is most scarce for the relation between maternal health and national development. However, existing published work does point to a negative effect of poor maternal health on development.

Cost estimates in recent years have tried to quantify the effects of maternal deaths and illnesses on national budgets and productivity, on the basis of various assumptions. The US Agency for International Development (USAID) estimated global maternal mortality costs of over US$15 billion every year because of diminished potential productivity caused by the death of women and neonates. Estimates for four countries suggest that costs of total productivity losses per year associated with poor maternal, newborn, and infant health range from US$8 million in Mauritania to $95 million in Ethiopia, on the basis of figures for 2001. Annual productivity losses per head range from $1·5 in Ethiopia to over $3 in Uganda and Mauritania, and almost $5 in Senegal. With somewhat different assumptions, and household and health centre costs added to such estimates, the annual cost for lost productivity in Uganda is closer to $102 million per year or $4·25 per head per year.

Further evidence shows that maternal morbidity and mortality represent an important burden of disease in the developing world. In women of reproductive age, maternal ill health is one of the leading single causes of death and disability, accounting for 13% of deaths and 13% of DALY’s (disability-adjusted life years). Furthermore, maternal health and the quality of obstetric and newborn care are directly associated with perinatal disorders (birth asphyxia, trauma, and low birthweight), which are the second leading cause of premature death and disability in children younger than 5 years and which account for about 20% of the burden of disease in that age group.

Although research has not explicitly explored the effect of poor maternal health on economic growth, evidence suggests a positive relation between health overall and economic growth. Since estimates for the burden of disease show that maternal mortality and morbidity is one of the largest single causes of ill-health for women, it can reasonably be assumed to account for an important portion of the effect of overall adult health on economic growth. Studies for the economic effect of AIDS support such an assumption. Since individuals are affected in the prime of their productive lives, AIDS substantially alters economic growth, productivity, investment, domestic savings, poverty, and inequity. Like AIDS, maternal morbidity and mortality also affects women at the prime of their lives when they have the greatest ability to contribute to society and the economy, and it has severe economic repercussions for families and represents a large burden of disease. National economic outcomes are similarly affected. However, further research is needed specifically on the consequences of maternal death and disability to provide the empirical evidence to support these theoretical links.

Evidence suggests that investment of resources in maternal health can at least partly address these issues through its positive effect on overall health service delivery and use. Maternal health indicators are so closely associated with key service delivery issues such as equity and efficiency that they have been used to

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assess the functioning of health systems and proposed as a measure of the performance of a country’s overall health system. Investments in key maternal-health facilities—e.g., essential obstetric care—can be used for other types of services such as operations and blood transfusions for accidents. Prevention of maternal morbidity avoids the large costs of treating maternal-health problems. Finally, research shows that women who use maternal-health services are more likely to use other reproductive-health services than are those who do not use such services, thus creating a multiplier benefit for several reproductive-health outcomes.

Investments in maternal health: shortfalls and potential

Investments in maternal health continue to fall below what the development community knows is necessary to achieve the benefits of maternal health and the MDG goal for safer maternity. Although there are many other important barriers to improving maternal health—such as access, quality of care, and cost—adequate investment in maternal health is an essential first step to addressing them all.

There are several estimates of what it would cost countries to try and reach MDG5, ranging from as low as US$1 billion in 2006 to as high as $6 billion in 2015. Cost estimates per head range from $0.22 to $1.40. Estimates of costs and investments make different assumptions and are not strictly comparable, but available evidence shows a wide gap between present investments and what is needed to meet MDG5. International development assistance for maternal and neonatal health was estimated to be $664 million in 2003 and $530 million in 2004. Analyses of the outlook for future overseas development funding are mixed, but they suggest that donor funding will need to increase over 11 times its 2004 level to achieve the $6–1 billion that WHO estimates is needed for 2015.

The good news is that the gap between present and needed investment for maternal health represents only a small fraction of donor gross national product and of total development aid. Even the much larger $5 billion shortfall in estimated funds that is needed by 2015 to meet both maternal health and child health MDGs consists of only 0.016% of global gross national product and 2% of aid. The investment that is needed to improve maternal health is a small fraction of world spending, and it makes financial sense because maternal health interventions are cost effective.

A World Bank study noted that antenatal and delivery care and family planning were two of the six most cost-effective interventions selected for the essential package of clinical services for low-income and middle-income countries. A recent study showed that primary care interventions for mothers and neonates, and preventive community-level interventions for newborn children, were highly cost effective for settings in sub-Saharan Africa and southeast Asia where the rates of adult and child mortality are high. Hospital-based interventions were also reported to be cost effective and essential to efforts to substantially reduce maternal and newborn mortality.

Conclusions

The continued scarcity of progress in maternal health over the past two or more decades in several parts of the world is disturbing. The little progress is especially of concern for south Asia and sub-Saharan Africa, which have consistently presented the worst maternal health in the world. Our Review suggests that the fact that these regions also lag in progress on a range of broader development outcomes, including poverty reduction and the status of women, is no coincidence; even the little research so far points to the likelihood of a strong link between maternal health and other women’s status and development outcomes. Similarly, that many countries in southeast Asia have made great progress is also no coincidence; in many of these countries, investments in improving the availability and quality of maternal care services have gone hand-in-hand with investments in education and employment for women, and in the provision of a range of reproductive health services. Thus, the examples of countries like Thailand and Malaysia suggest that MDG5 is achievable with appropriate financial and political commitment.

Our Review emphasises some key limitations in the published work. Most notably, additional research is needed on how poor maternal health affects women’s status; the many ways in which it affects women’s productivity, household wellbeing, and national economic growth; and on how women’s status and broader development, in turn, change the patterns and extent of improvements in maternal health. However, additional evidence alone will not be enough to ensure future progress. Concerted efforts also are needed to change public perceptions about the severity of the problem and the solutions that are available, and to create a coalition of stakeholders committed to improving maternal health.

The convergence of such actions, along with a growing understanding of the links between maternal health, women’s status and broader development, and adequate investment in maternal health and in women will enable women to fulfil their potential to deliver as mothers, individuals, members of families, and citizens.

Conflict of interest statement

We declare that we have no conflict of interest.

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Continuum of care for maternal, newborn, and child health: from slogan to service delivery

Kate J Kerber, Joseph E de Graft-Johnson, Zulfiqar A Bhutta, Pius Okong, Ann Starrs, Joy E Lawn

The continuum of care has become a rallying call to reduce the yearly toll of half a million maternal deaths, 4 million neonatal deaths, and 6 million child deaths. The continuum for maternal, newborn, and child health usually refers to continuity of care necessary throughout the lifecycle (adolescence, pregnancy, childbirth, the postnatal period, and childhood) and also between places of caregiving (including households and communities, outpatient and outreach services, and clinical-care settings). We define a population-level or public-health framework based on integrated service delivery throughout the lifecycle, and propose eight packages to promote health for mothers, babies, and children. These packages can be used to deliver more than 190 separate interventions, which would be difficult to scale up one by one. The packages encompass three which are delivered through clinical care (reproductive health, obstetric care, and care of sick newborn babies and children); four through outpatient and outreach services (reproductive health, antenatal care, postnatal care and child health services); and one through integrated family and community care throughout the lifecycle. Mothers and babies are at high risk in the first days after birth, and the lack of a defined postnatal care package is an important gap, which also contributes to discontinuity between maternal and child health programmes. Similarly, because the family and community package tends not to be regarded as part of the health system, few countries have made systematic efforts to scale it up or integrate it with other levels of care. Building the continuum of care for maternal, newborn, and child health with these packages will need effectiveness trials in various settings; policy support for integration; investment to strengthen health systems; and results-based operational management, especially at district level.

Introduction

The continuum of care has recently been highlighted as a core principle of programmes for maternal, newborn, and child health, and as a means to reduce the burden of half a million maternal deaths, 4 million neonatal deaths, and 6 million children who die between the ages of 1 month and 5 years.1–3 The continuum of care is a recurrent theme in the World Health Report 20054 and The Lancet Neonatal Survival Series.5 The continuum also provides the foundation for the conceptual framework of the Partnership for Maternal, Newborn and Child Health (PMNCH)6 and Opportunities for Africa’s Newborns.7 The Global Business Plan for Millennium Development Goals 4 and 5, which was called for at the World Health Assembly 2007, also emphasises the continuum of care.4

The goal of this approach is to avoid dichotomies, between either mothers and children, places of service delivery, or single health issues (table 1).7,8 Within the continuum, all women should have access to reproductive health choices and care during pregnancy and childbirth, and all babies should be able to grow into children who survive and thrive.9

The continuum-of-care approach has been used as a rallying call for integration of programmes for maternal, neonatal, and child health, but often without a clear

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<th>Policy conflicts</th>
<th>Win-win strategies</th>
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<tr>
<td>Competing voices of advocates for health of women and children, with those for newborn babies not heard</td>
<td>Mothers, neonates, and children all benefit from essential packages in a continuum of care</td>
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<td>MDG 4 and 5, for child survival and maternal health, respectively, are both intimately linked with health of neonates</td>
<td>Global health-policy shift, organisations with disparate agendas formed the Partnership for Maternal, Newborn and Child Health in 2005</td>
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<td>Facility-based vs community care</td>
<td>Systematic, phased strengthening of health systems (including community-based care) with emphasis on universal coverage of essential packages for health of mothers, neonates, and children</td>
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<td>Vertical vs horizontal programming</td>
<td>Integration between essential packages for health of mothers, neonates, and children and of these packages with other programmes, such as those for HIV, malaria, and vaccine-preventable diseases</td>
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<td>Community-based approaches to promote healthy behaviours and demand for skilled care; to deliver selected essential interventions to under-serviced populations; and to improve supply and quality of clinical care</td>
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<tr>
<td>Global tracking vs national and district needs</td>
<td>Tracking of MDGs, including deaths, funding for health, and the coverage and equitable distribution of essential interventions</td>
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<tr>
<td>Promotion of accountability of governments and partners, with a focus on results</td>
<td>National stewardship with decentralisation and district management</td>
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<td>Competing interests of many partners, donors, and governments</td>
<td>Country-led action with support from donors harmonised to accelerate progress, and broader partner inputs such as professional and non-governmental organisations, in the spirit of the Paris Declaration</td>
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Table 1: Paradigm shifts towards a continuum of care for mothers, neonates, and children

MDG=Millennium Development Goal. Adapted from reference 7 with permission.
application. Rapid escalations in investment, related to MDG 4 for child health and MDG 5 for maternal health, have increased the need for a solid framework for implementation and assessment. Who is the continuum of care for, and what are the essential service-delivery packages within it? What coverage does such care have? What are the challenges to building and tracking results for an effective continuum of care within existing health systems?

Defining the continuum of care

The term was initially applied in the 1970s to the integration of research and practice for provision of a continuum of care for elderly people.10 In subsequent decades, use of the term has broadened, although it most commonly refers to individual patient care and case management, and to promotion of appropriately directed care with a series of linkages to ensure that no patient is lost to follow-up. A systematic review11 showed that most of the 638 papers on the continuum-of-care approach between 1995 and 2002 focused on health systems for nursing, palliative care (58%), and mental health (19%). Others assessed the continuum within biomedical care (11%) and health-service administration (8%). Fewer than 1% of the identified papers related to public health or health promotion. These papers emphasised the connections between components along a continuum of care—including people, places, and times.11

We aimed to define a framework for the continuum of care for maternal, neonatal, and child health, in the context of developing countries. We searched with the terms “continuum of care”, “continuum”, and “continuity”. These searches identified 412 articles of relevance to international public health, of which eight referred to integrated care for health of mothers, newborns, and children but did not define this in practical terms. Therefore, the policies, programmes, and information systems that are needed to guide an effective, integrated, population-level continuum of care have not been addressed in published work.

The health of mothers, newborn babies, and children consists of sequential stages and transitions throughout the lifecycle. Women need services to help them to plan and space their pregnancies and to avoid or treat sexually transmitted infections. Pregnant women need antenatal care that is linked to safe childbirth care provided by skilled attendants. Both mothers and babies need postnatal care during the crucial 6 weeks after birth; postnatal care should also link the mother to family-planning services and the baby to child health care. Adolescents need education and services for nutritional, sexual, and reproductive health. If women, babies, children, or adolescents experience complications or illness at any point, continuity of care from household to hospital, with referral and timely emergency management, is crucial.

To add to the complexity, patients are often targeted simultaneously by cross-cutting programmes (eg, those that promote nutrition) and programmes with separate funding and management streams (eg, those for immunisations, malaria, and HIV). Lack of integration between such programmes can result in fragmented service delivery, affect quality and continuity of care, and cause dissatisfaction for both clients and providers.15 Each contact with the health system is an opportunity not only to provide promotional, preventive, or curative care, but also to amplify the effect of the subsequent contact. However, the challenges are apparent even in strong health systems, since each transition requires connections between care providers, programmes, and levels of care to ensure that a mother, baby, or child does not fall through the cracks of a weak continuum.

During the brief history of international interest in the continuum of care for maternal, newborn, and child health, a range of definitions have been proposed, mainly during the past 2 years (panel 1).12,13–15 These definitions differ in scope, and address various levels and aspects of care for mothers, newborn babies, and children. Few, if any, of these definitions focus on reproductive health, and none incorporate the dimension of coverage of care. We propose a new definition that builds on this previous work:

“The continuum of care for maternal, neonatal, and child health requires access to care provided by families and communities, by outpatient and outreach services, and by clinical services throughout the lifecycle, including adolescence, pregnancy, childbirth, the postnatal period, and childhood. Saving lives depends on high coverage and quality of integrated service-delivery packages throughout the continuum, with functional linkages between levels of care in the health system and between service-delivery packages, so that the care provided at each time and place contributes to the effectiveness of all the linked packages.”

Figure 1 shows that the continuum can be defined over the dimension of time (throughout the lifecycle), and over the dimension of place or level of care.53 The continuum of care over time includes care before pregnancy (including family-planning services, education, and empowerment for adolescent girls) and during pregnancy. During childbirth and the days immediately afterwards, mothers and babies are at highest risk of death; over half of all maternal and neonatal deaths occur during this period.54 Of the estimated 3·2 million stillbirths every year,55 30% occur during childbirth, yet even now, every year 50 million women deliver at home.56 An effective postnatal care package for mothers and babies would facilitate the transition between maternal care and preventive and curative care to improve child survival.

The continuum of care over the dimension of place or level includes the home, the first-level facility, and the hospital. An effective continuum would ensure that appropriate care was available wherever it was needed, and linked, where necessary, to other levels of care (figure 1). In many developing countries, most deaths of
babies and children, and many maternal deaths occur at home, commonly because of delays in reaching care. Mothers and babies are especially vulnerable to death: a woman with postpartum haemorrhage or a baby with birth asphyxia, sepsis, or complications of preterm birth can die within hours or even minutes if appropriate care is not provided. Delayed attention to complications during labour leads not only to deaths but also to poor outcomes such as intrapartum stillbirths, neonatal illness and disability, obstetric fistula, and other long-term obstetric complications.

The place dimension of the continuum can be defined as the physical location where care is provided. The operational levels of different health systems vary widely, but three distinct approaches can be differentiated on the basis of the skill and intensity of service delivery and the obstacles to care. The first approach—clinical care—consists of individual-oriented case management of mothers, babies, and children with illness or complications, which is typically provided through facility-based care at primary and referral sites. These

Panel 1: Definitions of the MNCH continuum of care

“Programs succeed best when they provide a package of services, including community-based family planning, health and nutrition services. Substantial—and sustained—reduction of the risk of dying once pregnant, however, requires an effective continuum of care from the community to the first-referral level, supported by a public education program.”

World Bank, 1993

“The right person, at the right time, in the right place, providing the right care.”

Centers for Disease Control/CARE International, 2001

“The core principle underlying the strategies to develop MNCH programmes is the ‘continuum of care’. This expression has two meanings. First it means care has to be provided as a continuum throughout the lifecycle, including adolescence, pregnancy, childbirth and childhood. Second it indicates that care has to be provided in a seamless continuum that spans the home, the community, the health center and the hospital.”

World Health Report 2005

“The time has come for these health interventions for newborn babies to be integrated into maternal and child health programmes... The continuum-of-care approach promotes care for mothers and children from pregnancy to delivery, the immediate postnatal period, and childhood, recognising that safe childbirth is critical to the health of both the woman and the newborn child—and that a healthy start in life is an essential step towards a sound childhood and a productive life. Another related continuum is required to link households to hospitals by improving home-based practices, mobilising families to seek the care they need, and increasing access to and quality of care at health facilities.”

The Lancet Neonatal Survival Series, 2005

“The household to hospital continuum of care approach provides pragmatic steps to ensure the availability of and access to quality maternal and newborn services at peripheral health facilities and district hospitals, while strengthening linkages in between.”

Save the Children, 2005

“The continuum of care that follows the life-cycle is part of a high impact program delivery, supported by enabling environment, encompassing strong political commitment and strengthened comprehensive health system, from community level to clinical services.”

Mangiaterra and colleagues, 2006

“This encompasses a continuum of essential interventions that should be accessible to mothers, newborns and children at household, community, district and national levels, as well as continuum that follows through the lifecycle of maternal, newborn and child health.”

PMNCH, 2006

Figure 1: Continuum of care

Connecting care during the lifecycle (A) and at places of caregiving (B). Adapted from Partnership for Maternal, Newborn and Child Health, with permission.
services, such as emergency obstetric care, are the most challenging and costly to provide, but also have the highest potential to save lives. Clinical care should therefore be available for 24 h per day, and providers must be adequately trained, equipped, and supervised. Normal childbirth also demands skilled clinical case management and continuous availability of health-care professionals.

The second approach—outpatient and outreach services—consists of population-oriented services, delivered on a routine scheduled basis, either through static clinics (for example routine antenatal or postnatal care) or through mobile services (for example immunisation campaigns or child-health days). These services are commonly standardised, in that clients receive the same care, and therefore the skills needed by providers are easier to learn than those for clinical case management.

The third—family and community care—consists of home-based care practices. Programmes to improve family and community care, by promoting adoption of healthy behaviours and empowering individuals and families to demand quality services, should be tailored to specific social and cultural environments through formative research. Community healthworkers need negotiation skills (eg, to promote breastfeeding or use of oral rehydration salts) and skills to address basic health needs across the lifecycle. In some health systems, provision of clinical case management to communities might be the most feasible way to increase access to essential interventions, at least in the short term. However, synergistic connections between the three delivery approaches are necessary; none of them is sufficient on its own.

Building the continuum of care with health-service packages
Studies suggest that high coverage and quality of essential packages could avert about 67% of neonatal and child deaths in 60 priority countries worldwide. These analyses have included packages for maternal and child health, basic and emergency obstetric care, and postnatal care. A functional continuum can increase client and provider satisfaction. At the public-health level, linkages between integrated packages can maximise the efficiency with which the scarce human and financial resources available for health care are used.

The continuum of care is the basis of health care in many wealthy countries, especially those with government-funded health-care systems with near-universal coverage. The countries ranked as the ten best for maternal health all have an effective continuum of care for the health of mothers, neonates, and children, both in policy and in reality. In many low-income countries, which have shortages in human and financial resources and inadequate health-system infrastructure, care is neither continuous nor integrated, although some, such as Sri Lanka, have reduced maternal, neonatal, and child mortality by bringing care close to families. An effective continuum is especially important for maternal survival, since timely linkage to referral-level obstetric care is necessary to reduce maternal mortality. Monitoring implementation of the continuum of care for health of mothers, neonates, and children will also track the performance of health systems, since a functional continuum depends on public-health planning and strengthening of health systems.

Packages of interventions for delivery within the continuum of care
Several *Lancet* Series have dealt with periods along the continuum of care, such as sexual and reproductive health and maternal, neonatal, and child survival. Other Series will focus or have focused on nutrition and the links between early-life events, poverty, and the environment of long-term development. These Series have increased attention on the goals of universal coverage of effective interventions for health of mothers, newborn babies, and children and of reduction of preventable mortality. However, each Series seems to call for a different focus and a different solution. Countries could not possibly scale up all of the interventions listed in these *Lancet* series with a vertical approach. The continuum of care for health of mothers, neonates, and children provides a framework whereby single evidence-based interventions can be combined and delivered in packages in accordance with local needs and capacity.

A health package can refer to an entire national health package; to specific interventions designed to address a particular outcome (such as a child-survival package); or to a very specific package such as immunisation. A review of packaged services reported that interventions tended to be combined because of logistical convenience, donor directives, organisational expertise, or specific lines of scientific inquiry, rather than because of a specific service-delivery approach, biological or behavioural synergies, or cost-effectiveness.

We propose service-delivery packages according to both common service-delivery strategies and common target populations throughout the lifecycle for health of mothers, newborn babies, and children (figure 2). We reviewed more than 190 interventions that were described in the four relevant *Lancet* Series (webtable 1). Both the Maternal Survival and Neonatal Survival Series suggested packages along the continuum of care, although with some differences in approach. We grouped these interventions into eight service-delivery packages which should be feasible in low-income and middle-income countries, and which are already provided by health systems in most countries (webtable 2). Figure 2 sets out these eight distinct packages, which include an integrated family and community package; four outpatient and outreach packages (reproductive health care, antenatal care, postnatal care, and child health services); and three clinical-care packages (reproductive health care, childbirth care, and care of sick...
These packages tend to be weakly implemented or integrated, especially during childbirth and the postnatal period, or might be missing some especially effective interventions. The family and community package tends not to be effectively linked with the health system, despite the fact that countries such as Nepal have achieved higher, sustained coverage by systematic efforts to define teams of healthworkers in the community and to link them to the formal health system.\textsuperscript{23}

The content of the packages will probably vary by country and context. Some interventions will be necessary and appropriate everywhere; for example, during labour all women should be monitored with use of a partograph. Other interventions might be situational; for example, malaria prevention and treatment is necessary only in endemic regions. Each package can increase in complexity over time, with phased introduction of additional interventions; some interventions within a package might have a small marginal effect, and might therefore not be cost-effective until mortality has been reduced and health systems strengthened. For example, evidence shows that screening for bacteriuria in pregnancy is effective but is costly to implement; therefore, it could be

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### Figure 2: Integrated packages for health of mothers, newborn babies, and children, with evidence-based interventions along the continuum of care, organised by lifecycles and place of service-delivery

Adapted from references 5, 32, and 33, with permission.
added to the antenatal package once coverage of basic interventions has been achieved and the capacity of health systems improved.\textsuperscript{12,13} This phased selection of interventions, from more simple to more complex, is similar to the so-called diagonal approach implemented in Mexico.\textsuperscript{16}

1. Reproductive health clinical-care package
Women of reproductive age might need clinical case management, especially for complications of sexually transmitted infections or HIV, other gynaecological emergencies, safe abortion, or post-abortion care (figure 2). Unsafe abortion is the fifth most common cause of maternal death globally, and accounts for 30% of all deaths in some Latin American countries.\textsuperscript{17}

2. Childbirth clinical-care package
This package consists of skilled attendance for normal childbirth and availability of emergency obstetric care. Skilled care at birth and immediately after birth can determine the survival and health of both mothers and babies (figure 2). Rates of skilled attendance increased from 43% to 56% for developing countries between 1990 and 2004; however, in south Asia the improvement was small, and rates did not change in sub-Saharan Africa.\textsuperscript{18} Women with complications during childbirth need access to facilities that provide instrumental delivery and caesarean sections. Surveys in more than 20 African countries showed that less than a third of pregnant women who suffered a life-threatening complication (haemorrhage, eclampsia, obstructed labour, sepsis, or unsafe abortion) received the necessary emergency obstetric care.\textsuperscript{1} In some cases, however, women who lived within reach of a health facility went there for antenatal care but not for childbirth, indicating that geographical access is not the only factor that affects use of obstetric care.\textsuperscript{1} Cultural beliefs or perceptions of service quality might reduce the acceptability of a facility-based birth, and the cost to families can be high for emergency obstetric services.\textsuperscript{19} Clinical care should be made more accessible and culturally appropriate; necessary human resources and supplies for 24-h care should be made available; quality should be improved; emergency transport schemes should be promoted; and financial barriers for the poor should be removed.

3. Newborn baby and child clinical-care package
Primary-level clinical care should be readily accessible, most commonly through the programme Integrated Management of Childhood Illness, with communication and links to the referral level (figure 2). Continuous care must be available to manage acute child and neonatal illnesses including severe malnutrition. The case-management skills of healthworkers should be improved, and health system strengthened; for example, to provide drugs and equipment. For many of the world’s 4 million neonatal deaths, the immediate cause is an illness that presents as an emergency, either soon after birth (such as complications of preterm birth and asphyxia) or later (because of neonatal tetanus or community-acquired infections).\textsuperscript{19} Despite this, most low-income countries do not provide care for sick neonates, even in referral centres. Most clinical care will take place at a health facility, but if access is difficult, some case management of sick children and newborn babies can be delegated to other healthworkers (eg, management of pneumonia at community level).\textsuperscript{19}

4. Reproductive health package delivered through outpatient and outreach services
Outpatient or outreach services can be used to deliver many interventions, including health education and

Panel 2: Implementing and testing the integrated continuum of care in Asia and Africa
Implementation of a community package for maternal, neonatal, and child health, in combination with strengthening of the health system, can create demand for care, and thereby improve health outcomes. In rural Nepal, almost all women give birth at home, and maternal and neonatal mortality rates are high. A randomised trial of a community-based intervention sought local solutions for health of mothers and babies by working with existing women’s groups.\textsuperscript{19} Female facilitators met women’s groups about once a month for ten sessions over the course of a year to identify problems for local mothers and neonates. They used a participatory process, with games and interactive materials, to formulate solutions to these problems. Overall, the interventions brought care closer to home and improved linkages to the health system through structural renovations and in-service training at the local clinic and referral centre. More women in the intervention group received antenatal care, gave birth in a facility, and used a trained attendant and hygienic care than did women in the control group.\textsuperscript{19} Neonatal mortality decreased by 30% over 4 years.\textsuperscript{19} Though the study was not designed to reduce maternal mortality, and the numbers of maternal deaths were small, the intervention group had significantly fewer maternal deaths (69 per 100 000 livebirths) than the control group (341 per 100 000 livebirths). These results showed that birth outcomes and healthy behaviours in a poor rural population can be greatly improved through a low-cost, potentially sustainable participatory community intervention that empowers women to improve care and use available services.

Since much of the evidence for community interventions for maternal, neonatal, and child health has come from Asia, African studies are needed. A similar approach to that implemented in Nepal is being tested in Malawi.\textsuperscript{19} This randomised controlled study, in a population of almost 150 000 women, will assess two community-based health-promotion interventions that empower women’s groups to solve problems related to their own health and create demand for care.\textsuperscript{19} The interventions also aim to improve service delivery at facility level.
promotion for adolescent girls and women (figure 2). Contraception and family planning make up a cost-effective and life-saving intervention that can improve both child and maternal health.35 In countries where termination of pregnancy by manual vacuum aspiration is legal, this could also possibly be delivered as an outpatient procedure. Prevention, early detection, and management of sexually transmitted infections are crucial throughout the lifecycle, for both men and women.

Reproductive health is closely tied to the education, nutrition, and health services that girls and women receive throughout their lives. Many girls in low-income countries are underfed and undereducated, and experience gender-based violence and genital mutilation from a young age.3 Many of these girls marry young, and they have little power to make decisions such as the timing of their first pregnancies or planning for the number and spacing of their children. Even when reproductive health interventions are delivered, whether through a static facility or outreach visits, poor quality of services can hinder their use. Most women who present at family-planning clinics have already decided which contraceptive method to use; failure to obtain that method can deter adoption and sustained use.40 In many developing countries, social marketing has made contraceptives more available, but these schemes have tended to be vertically implemented, instead of linked to the broader health system.42

5. Antenatal care package delivered through outpatient or outreach service:
For antenatal care to be effective, all pregnant women need a minimum of four visits, at specific times and with evidence-based content (figure 2).41 Care for women during pregnancy improves health by preventive measures, and by prompt detection and management of complications. Essential components of a focused antenatal-care package include screening for and treatment of disorders (such as anaemia, abnormal lie, hypertension, diabetes, syphilis, tuberculosis, and malaria); provision of preventive interventions (such as tetanus immunisation and insecticide-treated bednets); and counselling about diet, hygiene, HIV status, birth, emergency preparedness, and care and feeding of babies.31,33,41 Since antenatal care has good coverage, it provides a platform to increase the interventions provided during antenatal visits, including HIV care for the mother, prevention of maternal to child transmission of HIV, and support for feeding choices. However, this opportunity must be weighed against the risk of overloading services that are already stretched.45

6. Postnatal care package delivered through outpatient or outreach services
Postnatal care is needed to reduce deaths of mothers and neonates, and to support adoption of healthy behaviours (figure 2). By comparison with the large trials and detailed guides for implementation of antenatal care, postnatal care has been neglected, or fragmented into postpartum care for the mother and newborn care for the baby. However, new evidence is shaping the development of the postnatal package.30,31,41 The postnatal package for mothers and babies should include routine visits in the first days after birth, when risk is high, to promote healthy behaviours, to identify complications, and to facilitate referral. Some mothers or babies will need extra support, especially for preterm babies or HIV-positive mothers.

Delivery strategies for postnatal care should be context-specific. If a woman gives birth in a facility, she and her baby should receive a predischarge postnatal visit, with an early follow-up visit at home and return visits to the facility.45 Even in settings where most births happen in a facility, most mothers and babies go home within a few hours and are unlikely to return in the first few days because of transport, costs, and cultural constraints.37 If a woman gives birth at home, as is the case for 50 million women every year, a trip to the health facility on the first or second day after childbirth is even less likely. We need to investigate, test, and adapt integrated postnatal home visit packages in various settings, with appropriate healthworkers and linking referral care.37

7. Child health package delivered through outpatient or outreach services
High coverage of preventive child health care, such as immunisation, has advanced global progress for child survival (figure 2). However, nutrition in particular continues to be a major risk factor for child death. Some nutritional interventions have been integrated into child outreach packages, notably vitamin A supplementation; others, such as zinc supplementation, still have little or no coverage.37 The effectiveness of breastfeeding has been well known for decades, but rates of early and exclusive breastfeeding are still low, at 44% and 30% coverage, respectively, in 46 sub-Saharan African countries.42 Promotion of breastfeeding depends on interpersonal interaction in the immediate and early postnatal period—at childbirth, during postnatal home visits, and through peer-group support.42 However, since countries cannot justify creation of separate teams of healthworkers for promotion of breastfeeding, this is an example of the need for integrated care.

Routine immunisations in the first year of life generally reach high coverage with low inequity.37 Immunisation coverage has continued to improve since funding has increased. Similarly, investment in malaria programmes has enabled key interventions, such as provision of insecticide-treated bednets, to be scaled up in the past few years. Routine intermittent preventive treatment of malaria for infants is being assessed.37 The UNICEF Accelerated Child Survival and Development Program has successfully used a child-health outreach package to increase coverage, especially for commodity-based interventions in Africa.

Traditionally, integrated management of childhood illness has focused on case management in an outpatient
setting, although community level care for integrated management of childhood illness and referral care are growing in importance. Until recently, integrated management of childhood illness did not include newborn care, but additional algorithms now include care of sick young infants. Care of children with HIV is also being incorporated into training for integrated management of illness in neonates and children.5

8. Family and community care package
This package aims primarily to improve healthy home behaviours and to increase demand for outreach and clinical services (figure 2).14 Effective behavioural and preventive interventions that can be delivered through this package include promotion of hygiene; immediate and exclusive breastfeeding; reduced workload in pregnancy; demand for use of skilled childbirth care; recognition of danger signs for maternal, neonatal, and child illnesses; and care-seeking for those illnesses. This package can also deliver selected complex interventions such as community-based case management of malaria, pneumonia, preterm birth, and in some settings, neonatal sepsis.21 Oral misoprostol has been shown to reduce the need for more complex interventions for postpartum haemorrhage, but the exact dose and treatment regimen have yet to be established.48

Specific strategies for delivery of the family and community care package include media and behaviour change strategies; mothers’ groups (panel 2);14 community mobilisation (eg, for emergency transport); and commodity distribution (eg, of contraceptives, oral-rehydration salts, and insecticide-treated bednets). Implementation of a more complex family and community package, including home visits and case management, will depend on availability of community or extension healthworkers, and their remuneration, supervision, and connection to the health system with referral back-up.23,50 Sustainability has not been assessed or promoted (other than at a small scale) with systematic planning, human resource management, or supervision

Figure 3: Coverage along the continuum of care in sub-Saharan Africa* (A) and South Asia† (B) between 2000 and 2006
Adapted from reference 5, which used data from Demographic and Health Surveys (DHS), 2000–2006;11 with permission. *Sub-Saharan Africa includes Benin, Burkina Faso, Cameroon, Chad, Congo, Eritrea, Ethiopia, Gabon, Ghana, Guinea, Kenya, Lesotho, Madagascar, Malawi, Mali, Mauritania, Mozambique, Namibia, Niger, Nigeria, Rwanda, Senegal, Tanzania, Uganda, and Zambia; these countries have 74% of the region’s annual births. †South Asia includes Bangladesh, India, and Nepal; these countries have 82% of the region’s annual births. DPT3=three doses of diphtheria, pertussis, and tetanus. ‡DHS have assumed that all women who had a facility-based birth received postnatal care; therefore, only women whose most recent birth was outside a health facility were asked about a postnatal visit within 2 days.
and assessment of community interventions. Community workers have often been employed for special interests or projects, rather than integrated as a part of a wider team with a range of skills for caregiving over a long period, or linked to the formal health system. The evidence base for integration of primary-care service and community-delivery strategies is under investigation (personal communication, ZA Bhutta, Aga Khan University, Karachi, Pakistan and A Costello, Institute of Child Health, London, UK, June 2007).

### Operational strategies to strengthen care and linkages between levels of care

Both supply of services and demand for care need to increase. At the clinical-care level the predominant challenge is human resources. Table 2 outlines key barriers and operational solutions according to service-delivery approaches. Community mobilisation can increase demand for care and improve access through communication (eg, radios and mobile phones) and community referral solutions (eg, stretcher teams, transport cooperatives, and maternity waiting homes) to better connect households and health facilities (table 2).110 Local accountability for delays in seeking care and for sharing successes can be promoted through audits of both facilities and communities. Underlying causes are wider than the health sector; for example education and empowerment (especially for women) and improved transport systems substantially benefit the health of mothers, neonates, and children.

**Table 2: Obstacles to essential health services according to delivery approach**

<table>
<thead>
<tr>
<th>Underlying causes</th>
<th>Operational strategies</th>
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<tbody>
<tr>
<td><strong>Clinical care</strong></td>
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<tr>
<td>Scarcity of trained staff</td>
<td>Inadequate human resource policies</td>
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<td></td>
<td>High attrition, low pay, and disincentives to work in rural areas</td>
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<tr>
<td>Poor quality of care in public and private sectors</td>
<td>Inadequate standards of care, including for emergencies</td>
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<td></td>
<td>Non-skills-based training</td>
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<td></td>
<td>Lack of accountability or motivation</td>
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<td>Delayed use of services and poor compliance with treatment</td>
<td>Insufficient basic supplies and drugs</td>
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<td>Affordability barriers</td>
<td>Delays in recognition of illness, slow decisionmaking, and inadequate transportation</td>
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<td></td>
<td>Low income and resources</td>
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<td>Insufficient social security systems</td>
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<td>Corrupt practices by public sector providers</td>
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<td>High user fees (public and private sector)</td>
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<td><strong>Outpatient/outreach</strong></td>
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<tr>
<td>Low quality of care</td>
<td>Lack of standards for care</td>
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<td>Failure to disseminate, adapt, or promote existing global guidelines</td>
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<td>Erratic supply of essential drugs and supplies</td>
<td>Poor supervision and accountability</td>
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<td>Poor management of supply chain</td>
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<td>Transport and cold-chain failures</td>
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<td>Low demand for care, late use, and poor compliance</td>
<td>Insufficient information</td>
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<td>Negative experiences with health system</td>
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<td>Family/community</td>
<td>Distant location of facilities</td>
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<td></td>
<td>Cost</td>
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<td>Inadequate information about healthy behaviours and care-seeking</td>
<td>Scarcity of mechanisms for community participation</td>
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<td>Irrelevant or inappropriate messages</td>
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<td>Lack of legal framework for gender equality and status of women</td>
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<td>Inadequate supply of affordable household commodities for health</td>
<td>Insufficient access and transport to communities</td>
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<td>Cost of commodities</td>
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<td>Deficient markets</td>
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<tr>
<td>Scarcity of community workers, ineffective linkages to the health system, or both</td>
<td>Inconsistent policies for primary health care</td>
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<td>Poorly defined roles and training, and lack of supervision</td>
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<td>Reliance on volunteerism</td>
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<td>Insufficient remuneration or other rewards</td>
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Adapted from references 3 and 50, with permission.

**Tracking and accelerating coverage along the continuum of care**

Figure 3 shows coverage indicators for selected packages for the health of mothers, neonates, and children along the continuum of care for sub-Saharan Africa and south

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Asia. Even in the world’s worst-off regions, population-based outreach packages of antenatal care and immunisation had good coverage (figure 3). Compliance with immunisation was reasonable, as shown by high coverage of immunisation for diphtheria, pertussis, and tetanus, which ranged from 83% at the first dose to 65% for the third in south Asia, and from 77% to 66% in sub-Saharan Africa.39 However, existing programmes have missed opportunities for coverage of effective interventions which can be provided through antenatal care is often low; for example, programmes for prevention of maternal to child transmission of HIV reach an average of only 11% of those who need them, despite antenatal-care coverage of 69% in sub-Saharan Africa.32 A policy and programme shift is needed to provide care for the mother in her own right, and to prevent transmission to her baby.33

Moving along the continuum of care, coverage drops off strikingly during childbirth and the postnatal period, which coincides with the highest risk for mothers and babies. Postnatal care in the crucial first hours and days after childbirth is poor or missing entirely, even for women who give birth in a health facility, since the predischarge check is often superficial. This gap indicates women who give birth in a health facility, since the after childbirth is poor or missing entirely, even for tracking mechanisms,54 but available data do not packages are compatible with the “Countdown to 2015” delivery. The higher coverage reached through outreach antenatal care and immunisation services can be used as a contact point to increase demand for skilled care at birth and postnatal care.

The indicators used to represent continuum-of-care packages are compatible with the “Countdown to 2015” tracking mechanisms;4 but available data do not adequately measure the entire continuum, in particular the community package. Moreover, existing data could be used more effectively. Indicators for integrated management of childhood illness tend to focus on process (eg, districts with a trained staff member) rather than coverage, in terms of use of services. Even indicators that do measure use of services do not test quality or level of integration; for example, whether antenatal visits include management of sexually transmitted infections and counselling on birth preparedness, or whether postnatal care includes family planning. To strengthen the continuum of care, global attention must focus on tracking relevant data (eg, through the Countdowd to 2015 process) and on country-level capacity to use such data to design and improve integrated services, especially at district level. Most data come from household surveys that are released every 5 years. Increased frequency of key coverage indicators and, ideally, mortality data, would help to accelerate action. The indicators also need to measure differing access to care between or within countries, to identify and target populations to reduce inequity.

We have selected interventions on the basis of evidence in the various Lancet Series; evidence of effectiveness was also available for several service-delivery packages (eg, antenatal care). Priority research questions should centre on how to adapt, deliver, and integrate these packages in different health systems. We need to assess the effectiveness of these packages against a range of outcomes, and the cost of implementing packages in different settings. Such studies should inform action and increase impetus for investment. We especially need evidence to guide design of community-based programmes in African contexts; however, lessons learned in Asia can be adapted and tested in Africa (panel 2).36 Cluster randomised trials to test the effectiveness of various locally adapted packages for health of mothers, neonates, and children are starting in five African countries.1

Towards scaling up an effective continuum of care

Elements that affect the functionality of health systems—human-resource capacity, health-facility infrastructure, supply systems, financial resources, government stewardship, district-level management, and monitoring—will also impinge on efforts to scale up packages for health of mothers, neonates, and children within the continuum.53,55 Systematic identification of local challenges; attention to underlying causes of ill health; and adaptation of package complexity in terms of healthworker skills will be necessary to accelerate scale-up of sustainable programmes (table 2). The artificial divide between vertical approaches, which focus on specific disease priorities and interventions, and horizontal approaches, which aim to strengthen the overall structure and functions of the health system, can be bridged. For example, health authorities in Mexico, one of the few countries on track to reach MDG 4 to reduce child mortality, used a so-called diagonal approach in the 1990s to implement a defined set of cost-effective outreach preventive interventions and to sustain high coverage.36 Mexico then created increasingly comprehensive packages within the continuum of care to address maternal, neonatal, and child health with other interventions that have been shown to be cost-effective. As part of continuing health-sector reform, Mexico legislated access to maternal and child health services, and mobilised the necessary resources. Mexico has now approved use of emergency contraceptives, and legalised first-trimester abortion—both promising signs of commitment to MDG 5.

From slogan to saving lives

The continuum of care for maternal, neonatal, and child health is much more than a slogan. If the eight proposed packages could be implemented to reach most families worldwide, then every year the lives of up to two-thirds of
10 million babies and children could be saved, and many of the half million maternal deaths and 3–2 million stillbirths prevented. This would accelerate progress towards MDGs 1, 4, 5, and 6: to improve maternal health; reduce child mortality; combat infectious disease; and improve nutrition. Many of the proposed clinical-care packages have very low coverage. Even for packages with greater coverage, some effective interventions have not yet been implemented; quality can be improved; and care can be better integrated. One gap is postnatal care, which especially affects the connection between programmes for maternal and child health. Reproductive health services are at risk of dropping off the continuum of care; they will need continuing focus. Supply of services must be increased; at the same time, demand for care and support for adoption of healthy behaviours should be systematically promoted.

The main barrier to increased coverage of integrated packages for health of mothers, neonates, and children in most countries is not insufficient knowledge, or even unsupportive policy, but inadequate operational management, especially at the district level. Successful implementation of integrated continuum-of-care packages within health systems will depend on systematic efforts to address this constraint, especially to improve human resources for integrated delivery of all packages, and to ensure planning for increased complexity within packages over time.

The Declaration of Alma Ata, the seminal statement on primary health care, which nears its 30-year anniversary, incorporated many of these integrated concepts; ironically, international health policy and financing for maternal, neonatal, and child health is more fragmented now than it was in 1978. Competing investment demands mean that countries often fund the health of mothers, newborn babies, and children with leftovers from vertical programmes. More investment in packages and integration for health of mothers, neonates, and children along the continuum of care should increase efficiency of scale-up for all effective interventions, including traditionally vertical programmes.

Contributors
JEL had the idea for the paper and developed the first draft with KJK. All the other authors contributed substantially to the content, writing, and finalisation of the paper.

Conflict of interest statement
We declare that we have no conflict of interest.

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Generation of political priority for global health initiatives: a framework and case study of maternal mortality

Jeremy Shiffman, Stephanie Smith

Why do some global health initiatives receive priority from international and national political leaders whereas others receive little attention? To analyse this question we propose a framework consisting of four categories: the strength of the actors involved in the initiative, the power of the ideas they use to portray the issue, the nature of the political contexts in which they operate, and characteristics of the issue itself. We apply this framework to the case of a global initiative to reduce maternal mortality, which was launched in 1987. We undertook archival research and interviewed people connected with the initiative, using a process-tracing method that is commonly employed in qualitative research. We report that despite two decades of effort the initiative remains in an early phase of development, hampered by difficulties in all these categories. However, the initiative’s 20th year, 2007, presents opportunities to build political momentum. To generate political priority, advocates will need to address several challenges, including the creation of effective institutions to guide the initiative and the development of a public positioning of the issue to convince political leaders to act. We use the framework and case study to suggest areas for future research on the determinants of political priority for global health initiatives, which is a subject that has attracted much speculation but little scholarship.

Introduction

Global health initiatives vary in the amount of political priority they receive from international and national leaders. Child immunisation, family planning, and HIV/AIDS, for instance, at some points have attracted great resources, whereas malnutrition and pneumonia have received little attention despite also addressing high-burden disorders. We know little about the sources of variance in priority levels afforded to global health initiatives, since there is an absence of systematic research into this subject.

We propose an initial framework for analysing the determinants of political priority for global health initiatives, and we hope future researchers will modify and improve this framework. It consists of four categories: the power of actors involved, the ideas they use to portray the issue, the nature of the political contexts in which they operate, and characteristics of the issue itself. We apply this framework to the global safe motherhood initiative, which was launched in 1987 to reduce levels of maternal mortality. This initiative reached its 20th anniversary in 2007, but despite determined efforts by advocates, it has yet to attract the level of political attention its founders hoped it would receive. A recent study on political priority for maternal mortality reduction took the country as the unit of analysis and developed a framework that sought to explain variance in levels of national priority for safe motherhood in Guatemala, Honduras, India, Indonesia, and Nigeria.1 Our study asks a similar question about variance in political priority levels, but the unit of analysis is the global health initiative. It deepens and expands the first framework by grounding it in the extensive research on collective action.

A global initiative is an organised effort linking people and organisations across national borders to address an issue of international concern, such as climate change or human rights. Global political priority is the degree to which international and national political leaders actively give attention to an issue, and back up that attention with the provision of financial, technical, and human resources that are commensurate with the severity of the issue. We know that global political priority is present when: (1) international and national political leaders publicly and privately express sustained concern for the issue; (2) the organisations and political systems they lead enact policies to address the problem; and (3) these organisations and political systems provide levels of resources to the problem that are commensurate with its severity. These three factors include not only international but also national components, since global initiatives rarely aim to generate priority only among international organisations—they also seek political support from national political systems.

Global political priority alone is not sufficient to address an international problem successfully. Effective policies, technology, and implementation systems, among other elements, are also crucial. However, global political priority aids success, and therefore is essential to investigate.

In this paper we present the framework, examine determinants of global political priority for safe motherhood with reference to this framework, point to challenges that the initiative might face in gaining priority over the coming decade, and identify questions for future research into sources of political priority for global health initiatives.

Framework for determinants of political priority for global initiatives

Researchers have sought to understand why initiatives pursuing social and political change succeed or fail in attracting political support. They have investigated several types of collective action efforts, including international networks for issues such as climate change,2–6 social movements for causes such as civil rights,7–9 and policy
communities that aim to place particular issues on national agendas. A central concern in collective action research is the role of power: the power of actors connected with the issue; the power of the ideas used to define and describe the issue; the power of political contexts to inhibit or enhance political support; and the power of some characteristics of the issue, such as the number of deaths a particular disease causes, to inspire action.

These four elements form the foundation of our framework for the determinants of political priority for global initiatives (table). Initiatives are more likely to attract political support if they share specific features in all categories.

The first element is the power of the actors involved in the initiative. Initiatives differ in the strength of those who participate in them, in the quality of linkages between these actors, and in their collective capacity to confront opponents. Among those who influence initiative acquisition of political support are policy communities (factor 1)—the network of individuals and organisations who operate globally and who are linked by a central concern for the issue. These communities include prominent leaders of non-governmental organisations, government officials, bilateral donors, members of UN agencies, other international organisations, and academics. Policy communities that agree on basic issues such as how the problem should be solved are more likely to acquire political support than are those that are divided by such issues, since politicians will be more likely to listen to those in agreement as authoritative sources of knowledge.

The emergence of respected leaders who are embraced by the community (factor 2) helps with coalescence and provides direction to the initiative. For example, the former director of the UN Children’s Fund (UNICEF), James Grant, is often cited as an example of such a leader. Strong guiding institutions (factor 3)—ie, organisations or coordinating mechanisms with a mandate to lead the initiative—are also crucial. Initiatives might start through informal associations or as projects inside formal organisations, but they must build their own enduring institutions if they are to survive. Continual competition among concerned organisations to control the issue could hamper the creation of these structures. The Task Force for Child Survival and Development (formerly led by Grant) has been noted as a guiding institution that is particularly effective for the cause of child health. Finally, initiatives are more likely to generate political support if they link with grassroots organisations in civil society that are pushing for global attention to the issue (factor 4), rather than remaining confined to select members of a global policy community. Pressure from grassroots AIDS activists on national governments and international organisations, for instance, has helped to increase donor aid to address the disease in developing countries.

Ideas also shape political support for initiatives. The role of ideas in politics has inspired much research, which is grounded in recognition that material influences alone cannot explain all political behaviour and that people interpret the world around them very differently. The central ideational variable in collective action research is the frame—ie, the way in which an issue is understood and portrayed publicly. Any issue can be framed in several ways. For example, HIV/AIDS has been framed as a public-health problem, a development issue, a humanitarian crisis, and a threat to security. Some frames resonate more than others, and

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<td>11 Effective interventions: the extent to which proposed means of addressing the problem are clearly explained, cost effective, backed by scientific evidence, simple to implement, and inexpensive</td>
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Table: The four categories for the framework on determinants of political priority for global initiatives.
different frames appeal to different audiences. Finance ministers, for instance, might be more likely to respond to frames that emphasise the economic costs of a health problem than are health ministers, who might pay more attention to frames that focus on public-health benefits and losses. Frames that resonate internally (factor 5) unify policy communities by providing a common understanding of the definition of, causes of, and solutions to the problem. Frames that resonate externally (factor 6) move essential individuals and organisations to action, especially the political leaders who control the resources that initiatives need.

The political contexts in which actors operate also exert substantial influence over political support levels. Those involved in the initiative might have little control over these contextual factors, but they should take them into account if they wish to develop effective strategies. Many elements of political context matter, but two are essential. First are policy windows (factor 7), which are moments in time when worldwide conditions align favourably for an issue, presenting advocates with especially strong opportunities to reach international and national political leaders. Policy windows often open after major disasters (such as a tsunami), discoveries (a new vaccine), or forums (global UN conferences). For example, the Millennium Development Goals (MDGs) have helped with the opening of policy windows for some of the causes included. A second crucial element of context is the global governance structure for the sector (factor 8)—i.e., the set of norms (shared beliefs on appropriate behaviour) and the institutions that negotiate and enforce these norms. International treaties, laws, and declarations exist for many sectors, including trade, the environment, and health, usually with an international organisation or set of organisations in charge of their enforcement. In some sectors, these structures work well; in others, they are dysfunctional. Several studies have expressed concern about the increasingly fragmented structure of global governance for health, with many organisations competing for power, constantly shifting priorities, and no one organisation or set of organisations with the power to coordinate.

Finally, the nature of the issue itself shapes political priority. Some issues are intrinsically easier to promote than others. Problems that are easily measured are more likely to gain political support than are those that are not, since policymakers and advocates will have information to confirm the severity and monitor progress (factor 9). For instance, studies providing credible evidence of high population growth and fertility rates interacted with other factors in the 1970s and 1980s to convince political leaders in many developing countries that they had population problems that needed attention. Problems that cause substantial harm, as indicated by objective measures such as numbers of deaths, are more likely to attract resources than are those that do not, since policymakers will perceive harmful problems as more serious (factor 10). Problems with fairly simple, inexpensive, evidence-based solutions will be easier to promote than will those without these features, since policymakers prefer to devote resources to issues that they think they can address effectively and cheaply (factor 11). Cheap and effective vaccines, for example, have helped to generate political attention for child immunisation policies.

No one factor is necessary or sufficient for political support: some initiatives that have not attracted political support possess several of these characteristics and some initiatives that have received political attention are without several. For example, HIV/AIDS presently attracts great political support despite extensive contention within its global policy community, and polio eradication continues to receive substantial resources despite the disease’s small global burden compared with many other disorders. Conversely, chronic diseases such as cardiovascular disorders, cancer and diabetes, some communicable diseases such as pneumonia, and a number of risk factors such as malnutrition attract few worldwide resources despite causing high morbidity and mortality. These cases suggest the need for continual research into the determinants of political priority for global health initiatives, including assessment of the relative causal weights of the factors, their interactive effects, and whether different combinations of factors could raise the issue in global health.

However, existing research into collective action provides evidence that, other things being equal, every factor enhances the likelihood that an initiative will receive priority. A global policy community is more likely to generate political support for its concern if it is cohesive, well-led, guided by strong institutions, and backed by mobilised civil societies; if it agrees on solutions to the problem and has developed frames for the issue that resonate with political leaders; if it takes advantage of policy windows and is situated in a sector with a strong global governance structure; and if it addresses an issue that is easily measured, is high in severity, and has effective interventions available. In such a situation, the power of those involved with the initiative, ideas, political contexts, and issue characteristics all work in favour of the initiative.

Methods used to apply framework
To examine the global safe motherhood initiative we used process-tracing, which is a method that is commonly used in qualitative social science inquiry and involves analysis of several sources of information to uncover social processes and assess causality. In 2005–07, we conducted 23 interviews, lasting on average 1-5 h, with individuals centrally involved in the development of the global initiative, including most of its founders. All individuals had worked on safe motherhood with a UN agency, multilateral financial
institution, university, or international non-governmental organisation. We also analysed data from a complementary study on political priority for maternal mortality reduction in five developing countries, which included interviews with bilateral donors, national political officials, and national non-governmental organisation leaders. Additionally, we undertook archival research on the history of the initiative, collecting and reviewing more than 70 documents from coordinating organisations for the initiative, donors, UN agencies, non-governmental organisations, and other actors. Furthermore, we consulted published work on maternal mortality and the safe motherhood initiative. Once we had collected the information, we reviewed the interview transcripts, documents, and published work to analyse factors that shaped political priority for the initiative. One of our aims was to capture the perspectives of global safe motherhood actors themselves on the state of political priority for the initiative. We therefore draw heavily on excerpts from the interviews in presentation of our data. We provided a draft of the paper to many of the interviewees, and incorporated feedback that they provided. We also distributed and presented the paper at a consultation organised by the MacArthur Foundation in May, 2007, on global safe motherhood strategy, which was attended by 24 individuals connected to initiative. We revised the draft on the basis of feedback from several participants who attended the meeting.

We do not take a position on the technical debates surrounding appropriate intervention and measurement strategies that have emerged in the initiative. Instead, our aim was to examine the content of these debates and how they were understood by the participants themselves to assess the effect the debates had on political support for the initiative. Our focus is on the initiative’s global level rather than national or grassroots level actors and debates, except in instances when national and grassroots organisations have affected or been affected by the global safe motherhood initiative. National and community experiences, and the perspectives and voices of actors from developing countries, are crucial to the history of safe motherhood and deserve research attention. This case study, however, limits itself to examining developments surrounding the global safe motherhood initiative.

A limitation of the method of our case study was the difficulty in controlling for confounding variables of influence, and in assessment of the relative causal weight of factors that we identified as shaping political priority. As we note above, this study should be taken as an initial exploration of the complex question of issue ascendance and neglect in global health. Substantially more research, ideally comparing global health initiatives varying in political support levels, will be necessary to establish which factors are most and least influential in shaping political priority.

The case of safe motherhood

In 1987, the World Bank, WHO, and the UN Population Fund (UNFPA) sponsored a conference in Nairobi, Kenya, which launched the Global Safe Motherhood Initiative. Its aims were to raise awareness of the roughly half a million yearly maternal deaths worldwide, nearly all of which occurred in developing countries, to spark efforts to address this problem, and to reduce maternal mortality levels by half by the year 2000. After the conference, an Inter-Agency Group for Safe Motherhood (IAG) formed to focus global attention on the issue, bringing together several international agencies and non-governmental organisations associated with the launch. Since this conference two decades ago, safe motherhood advocates have engaged in a sustained effort to convince international organisations and national political leaders to prioritise maternal mortality reduction.

Nearly all respondents perceive the initiative’s results in terms of production of political support to have been disappointing. Many published accounts on the initiative also reached this same conclusion. However, several respondents believe that the 20th anniversary year of the initiative will offer an opportunity to generate political momentum for safe motherhood.

Actor power

Since the start of the initiative, the policy community has been divided over intervention strategy, which has affected its credibility with international and national political leaders (interview [I] 3 [May, 2006]; 19 [June, 2006]; 115 [June, 2006]). Throughout the 1970–80s antenatal risk screening and the training of traditional birth attendants formed the core strategies for maternal survival. An influential article in The Lancet in 1985 expressed concern about these strategies, arguing that most maternal deaths could not be prevented and that women needed access to emergency obstetric care in the event of complications at childbirth. Although they do not deny the need for emergency obstetric care, other advocates emphasised that its importance had been exaggerated and that community-level and preventative activities had crucial roles in the prevention of maternal deaths. Some advocates supported what has been termed the skilled attendance approach. Its core message, expressed at safe motherhood’s tenth anniversary conference in 1997, in Sri Lanka, was to ensure skilled attendance at delivery, defined as “having a health worker with midwifery skills present at childbirth, backed up by transport in case emergency referral is required.”

Participants in the debates suggest that the disagreements were more than technical; they took on a personal quality. One respondent commented:

“[People] were extremely defensive about their ideas... If you didn’t agree with the idea you were bad and wrong...It was kind of like President Bush. If you are against this idea then you are a traitor”

I2 [June, 2005]
Another participant described the whole history of the initiative to be “one of competing camps” (I3 [May, 2006]). A third participant believed that positions became deeply entrenched and nearly immutable:

“We always know the answer. First traditional birth attendants and antenatal care, then that doesn’t work so skilled attendants and emergency obstetric care... There is view bias. [You must] take the company line” 16 [May, 2006]

A 2006 Lancet series on maternal survival called for deliveries to be attended by midwives in health centres, with other medical professionals present and higher levels of care available if needed. The series indicated a consensus that had been building gradually among some members of the policy community about the need to have both skilled attendants at birth and emergency obstetric care if needed. Many respondents noted a substantial decrease in tension in the policy community, partly because of this emerging consensus (I4 [May, 2006]; 15 [May, 2006]; 16 [May, 2006]; 17 [June, 2006]; 18 [June, 2006]; 115 [June, 2006]). However, this agreement did not encompass all members of the policy community. Some expressed strong concern about what to do in the interim, before such facilities could be established, in view of resource scarcity and the difficulty that poor countries faced in expanding care.

Weak guiding institutions hindered the acquisition of political support. The IAG grouped effective individual advocates for safe motherhood and well-respected researchers. However, it included technical officials in the represented agencies rather than their senior leaders, hampering its ability to develop global political support for maternal mortality reduction.” Furthermore, controversy surrounded membership—IAG members made a deliberate decision initially to remain small. One founding member explained the rationale for this:

“A lot of groups wanted to be in and the IAG was not perfect but worked well together...The group felt strongly that smaller was better. It was easier when dealing with difficult issues [such as] abortion” 121 [August, 2006]

Another initial IAG member commented that this decision created difficulties, noting that, “we were accused, rightly so, of being a small inside group” (I23 [September, 2006]). A non-member articulated one of the consequences of this decision:

“The IAG was not and never was perceived as a strong mouthpiece for safe motherhood until much later” 19 [June, 2006]

Another issue for guiding institutions, one that the IAG was not able to resolve, concerned relations between UN agencies. For other health issues such as child survival, family planning, and technical advice, a clear UN agency took the lead (UNICEF, UNFPA, and WHO, respectively). However, such agency leadership in the UN system never developed for safe motherhood.” UNICEF, UNFPA, WHO, and the UN Development Program (UNDP) all developed safe motherhood activities, which were often run independently of one another. At some points, the agencies were antagonistic, differing on intervention approach and competing for scarce safe motherhood resources (I7 [June, 2006]; I10 [June, 2006]; I11 [June, 2006]; I17 [July, 2006]). One respondent from the UN involved in safe motherhood believed that the core problem was an absence of UN agency ownership:

“UNICEF was involved but children are its bread and butter...UNFPA was neither here nor there...It had advocacy and policy but not programs. The WHO balances between norms and standards and implementation—back and forth—it deals with many things. So safe motherhood doesn’t have a home in the United Nations and that’s a big problem” 110 [June, 2006]

Between 2002 and 2005, pressured by donors who did not want to fund separate efforts (I7 [June, 2006]), the Safe Motherhood Initiative and the IAG gradually merged with other initiatives to become a broader partnership for maternal, newborn, and child health. The idea of continuum of care was intuitively appealing to some organisations and actors involved, since it sought to ensure that the health of newborns, children, and mothers would be promoted in a synergistic way (118 [July, 2006]; 123 [September, 2006]). The idea and birth of the partnership were contentious, however; its leaders have had to manage tensions between its members since its launch (I3 [May, 2006]; 15 [May, 2006]; 17 [June, 2006]; 19 [June, 2006]; 115 [June, 2006]; 118 [July, 2006]; 123 [September, 2006]). The alliance between safe motherhood and newborn survival has been uneasy, and that between safe motherhood and child survival even more so. One point of contention concerns different perspectives on facility versus community or home-based delivery. Additionally, many advocates of child survival have been wary of politically contentious discussions surrounding unsafe abortion, which is a leading cause of maternal mortality. Underlying these tensions has been a concern over the division and control of scarce resources. Commenting on the place of safe motherhood amidst these partnership tensions, one respondent said:

“There are three siblings. Child survival is older, richer, more resourceful. The newborn is weak, small, but got a new grant from Gates for US$60 million. It is the small child in the family that everyone looks to. Safe motherhood is the middle child; it doesn’t know exactly where to be. We need a good parent to take care of the three equally, or unequally—safe motherhood needs more vigorous opportunities” 110 [June 2006]

Supporters of the partnership argue that the cause of maternal survival rightly belongs under its fold, integrated

with child and newborn health (I23 [September, 2006]). However, several safe motherhood advocates are suspicious, wondering whether the partnership ultimately will serve the cause of maternal survival (I13 [May, 2006]; I19 [June, 2006]; I116 [June, 2006]; I117 [July, 2006]). One advocate notes that with the emergence of the partnership, many members of the safe motherhood community are no longer sure if an initiative for safe motherhood still exists. Weak mobilisation of civil society organisations has also hindered the acquisition of political support. In 1999, the White Ribbon Alliance formed with the aim of promoting cross-national advocacy for safe motherhood, linking civil society institutions with donor and other organisations. However, few grassroots organisations concerned with the global dimensions of the issue have emerged. One reason could be the absence of access to the political process on the part of those most directly affected by this issue—ie, poor women with little education, who face substantial gender discrimination in many poor countries. Several respondents note also the initiative’s detachment from grassroots activities that do exist (I9 [June, 2006]; I110 [June, 2006]; I115 [June, 2006]). One respondent, commenting on how far removed policy community debates were from local realities, said:

“There’s a huge disjuncture. 35000 feet discussions. And I’m worried the gap is getting bigger. International discussions are devoid of reality on the ground”

I15 [June 2006]

A widely embraced leader could have helped surmount historical difficulties of policy community fragmentation, weak guiding institutions, and little civil society mobilisation. However, no such figure emerged (I15 [May, 2006]; I115 [June, 2006]). Several individuals associated with the initiative at particular junctures were perceived potentially to have this capacity, but they did not take up the opportunity. Referring to child survival’s best-known leader, one respondent surmised:

“Safe motherhood doesn’t have a Jim Grant. Where’s the ambassador?”

I15 [June, 2006]

Ideas

Finding a resonating set of ideas—ie, positioning the issue publicly in ways that attract political support—has been a persistent challenge for the initiative. Since the initiative’s launch, several political leaders in developing countries have come to perceive maternal mortality as an issue that is deserving of attention and resources.24,35,44 However, few leaders have prioritised maternal mortality, especially compared with the many national leaders that have prioritised issues such as child survival and HIV/AIDS.

Safe motherhood advocates have made concerted efforts to develop frames for the issue that might resonate. They have emphasised the severity of the issue, made rights-based arguments, connected the issue to economic outcomes, and noted the effects on children.25,46 Despite these efforts, no frame has convinced many political leaders, which is a situation that continues to puzzle several members of the policy community. As one respondent states:

“Why is it like this? Why have we not seen the flow of resources to do something about it? The issue has all the emotional appeal on so many different levels. The case can be made economically, in terms of household productivity, the next generation of children. What more do you need to capture the imagination? I don’t understand it”

I15 [June, 2006]

The initiative’s initial positioning could have contributed to difficulties in attracting political support from one group that might otherwise have lent powerful backing to the cause: the women’s movement. When World Bank officials first came up with the idea for an international conference for maternal mortality in 1985, they were conscious of the unwillingness of the US administration to support family planning internationally. Sensitive to the US administration’s conservatism regarding reproductive issues, Bank officials wanted to find, in the words of one of the organisers, “a concept that is politically unassailable, a name that brings in money, that makes a lot of people heroes, something the American administration cannot oppose” (I22 [August, 2006]). From these deliberations, the term safe motherhood was born. The organisers coalesced surrounding the term, partly because they thought that it was unlikely to incite active opposition from the administration. However, as one respondent put it:

“The feminists didn’t like the term ‘safe motherhood’ so [the issue] was never picked up by women’s groups”

I7 [June, 2006]

The same respondent notes that many men, too, may have been reluctant to engage the issue, but for a different reason, arguing:

“The neglect of women’s issues…does reflect some level of unconscious bias against women at every level, from the community to high-level decisionmakers…While we may ignore it, maternal health does involve sex and sexuality; it is bloody and messy; and I think many men (not all, of course) have a visceral antipathy for dealing with it”

The framing of the issue inside the policy community also has posed difficulties. Fundamentally, the community has united with a shared belief that maternal mortality is a neglected tragedy that demands redress. This idea was the source for an article that helped bring international attention to the issue. The 1985 piece in The Lancet by Allan Rosenfield, regarded by many to be the cause’s most effective champion, and Deborah Maine, emphasised the neglect of maternal survival in favour of child health. However, beyond this core point of agreement, the policy community until recently has had difficulty identifying common ideas. An internally resonating frame would need clear answers to several
issues, none of which the policy community has yet to resolve in full. These issues include whether maternal mortality or maternal health more broadly is the focal concern; how progress should be measured; whether the continuum of care idea is embraced as the core positioning of the issue; the precise strategies to address the problem; and the relation of the initiative to other health concerns, including family planning, the broader reproductive health agenda, and health systems development.

Political contexts
Advocates have sought to build a favourable global political environment for safe motherhood by organising international meetings and events for maternal mortality reduction, seeking inclusion of the issue in other global meetings, and aiming to take advantage of policy windows such as those associated with the MDGs (I7 [June, 2006]; I18 [July, 2006]; I19 [August, 2006]; I21 [August, 2006]; I22 [August, 2006]; I23 [September, 2006]). The effect of their efforts is uncertain. AbouZahr has argued in a review of the history of the initiative that “these efforts have lacked conviction”, noting that, “safe motherhood meetings tend not to attract the most senior decisionmakers.”39

The first efforts to promote maternal mortality reduction took place in 1985, before the launch of the initiative, at the end of the UN Decade for Women, when advocates for women’s rights identified maternal mortality reduction as one of several issues that might sustain the women’s agenda (I21 [August, 2006]). The 1987 Nairobi conference was the first major international event for safe motherhood. Safe motherhood also made the agenda of the Third International Conference on Population and Development in Cairo in 1994, and the Fourth World Conference on Women in Beijing in 1995.47 In 1997, a conference in Colombo, Sri Lanka, marked the tenth anniversary of the initiative, and in 1999, new initiatives and programmes formed for maternal mortality reduction, including Columbia University’s Averting Maternal Death and Disability Program. This programme received US$50 million from the Gates Foundation, which is the largest grant so far for safe motherhood.

A policy window—i.e., a favourable confluence of events providing an opportunity for advocates to press political leaders—opened for safe motherhood in 2000. In that year, UN member states announced the MDGs, a set of poverty alleviation objectives for the year 2015. Maternal health was one of a select group of health goals to make the MDGs, with goal number five being the reduction of the global maternal mortality ratio by 75% over 1990 levels by the year 2015.

Whether the maternal health MDG, efforts by advocates to take advantage of the MDG, and continual efforts by global safe motherhood advocates have had substantial effect on political support and resources is uncertain. A weak global governance structure for health (including absence of leadership on the issue of safe motherhood within the UN system) has hampered the capacity of the initiative to create and take advantage of opportunities. On the positive side, the UK Department for International Development (DFID), influenced by the MDGs, has increased maternal and newborn health funding from GB£0·9 million in 2001–02 to £16·2 million in 2005–06.48 Other donors also increased funding for maternal survival during this time.49 Furthermore, the MDG commitment stood behind several substantial global calls for action, including a declaration in 2005 in New Delhi, India, from UN agency heads and many developing country governments calling for global progress on maternal, newborn, and child health.50 Additionally, the leaders of the countries that rank number one and two in terms of numbers of maternal death, India’s Prime Minister Manmohan Singh and Nigeria’s former President Olusegun Obasanjo, commented publicly on the maternal health MDG. They expressed concern about their countries’ high levels of maternal death, and demanded that their governments act to address the issue.51–56

Conversely, several studies show continuing large gaps in global resources for maternal health.57–59 One study estimated that an additional US$1 billion was needed to meet maternal and newborn health needs in 2006,60 and another identified a need for a minimum yearly average increase of $3·9 billion over 10 years to meet combined maternal and newborn health needs.55 Furthermore, only a few developing countries have made maternal mortality reduction a political priority since the initiative’s launch.1

The initiative’s 20th anniversary year, 2007, could present new opportunities for generation of political priority for safe motherhood. In February, 2007, IMMPACT (a maternal mortality research initiative) disseminated results from several years of studies on measurement strategies and programme assessment. In September, 2007, an initiative led by the Norwegian government to accelerate progress towards the achievement of the child and maternal survival MDGs was launched. The culminating event is the Women Deliver conference, which will be held in October, 2007. Heads of state, ministers of planning and finance, and other senior political officials have made commitments to attend this event, creating the potential for the meeting to bring about the high-level political support for the issue which has previously been lacking.

Issue characteristics
Three characteristics of the issue itself have made attracting political support for maternal mortality difficult. First, maternal deaths are not as common as are those caused by several other high-burden disorders (eg, HIV/AIDS, malaria); second, accurate measurement of maternal mortality is technically difficult; and third, the interventions to avert maternal death are not as simple as are those for some other disorders (such as several children’s diseases that are preventable by vaccine).
The most recent estimate of the number of annual maternal deaths globally is 529 000 for the year 2000.64 Although this figure is high, it is much smaller than the annual number of deaths from HIV/AIDS (2·9 million), tuberculosis (1·6 million), and malaria (1 million), as well as the number of deaths to children younger than 5 years (10·6 million), and neonates (4 million).63,64 Many advocates for safe motherhood are acutely aware of these figures (I5 [May, 2006]; I15 [June, 2006]) and have debated whether maternal health advocacy should instead emphasise other indicators of severity, such as morbidity, lifetime risk of death, or combined maternal and newborn deaths (which total 4·5 million).

Additionally, maternal mortality is more difficult to measure than are other health outcomes such as infant mortality, child mortality, and fertility.66 The fairly low numbers of maternal deaths in any specific geographic locality mean that confidence intervals for estimates from most survey methodologies are large, making actual levels difficult to ascertain and whether change occurred across time difficult to establish. These challenges have led some researchers and programmers to turn to process indicators to assess effect and measure progress. Other researchers, although not denying the utility of such indicators, emphasise other indicators of severity, such as morbidity, lifetime risk of death, or combined maternal and newborn deaths (which total 4·5 million).

Another difficulty is that the interventions necessary to prevent maternal death are not as simple as are those for other disorders, such as specific diseases that are preventable by vaccine. Few of the leading maternal health epidemiologists believe that a simple solution is available, and most argue that functioning health systems are crucial.42,62 Disagreement exists about the actual degree of complexity of the necessary interventions, the strength of the evidence base for these interventions, and their cost (I2 [June, 2005]; I3 [May, 2006]; I6 [May, 2006]; I7 [June, 2006]; I11 [June, 2006]; I15 [June, 2006]).61

Several respondents suggest that the sometimes contentious public discussions surrounding measurement and evidence have had adverse effects on the initiative’s ability to acquire political support and resources, and have contributed to policy community fragmentation:

“We hang out our dirty washing. Other people are more discreet”
I15 [June, 2006]

“We don’t know what’s effective. We can’t measure outcomes very well”
I3 [May, 2006]

“We focus on uncertainties. That is the truth but it will not convince the Minister of Finance”
I15 [June, 2006]

“I would go with my ideas [to a donor] and [X] would go with hers and who was to say who was correct”
I9 [June, 2006]

These problems notwithstanding, safe motherhood advocates have used estimates, however imprecise, to generate attention for the cause. For example, in the mid-1980s, Robert Cook from WHO sponsored studies that produced the first estimate of global maternal mortality levels: half a million maternal deaths annually.65 This figure drew the attention of international agency heads and others key to the initiative’s inception.30,39 Revised estimates from UN agencies in the mid-1990s provoked discussion between national leaders and UN agencies surrounding the issue, which might have increased maternal mortality’s profile with donor institutions.39

Conclusions

Factors shaping global political priority for safe motherhood

If we consider all the four categories of factors that affect the acquisition of global political support, we see that the safe motherhood initiative has had many difficulties. With respect to actors, the global policy community has been fragmented, no powerful institutions have emerged to guide the initiative, and organisational rivalries have persisted throughout its history. Additionally, although the initiative included highly capable individuals, it never found a recognised leader. Furthermore, the primary victims of maternal mortality (poor women in the developing world) have little political power and are disadvantaged by gender inequalities, and civil society mobilisation to make this cause a global priority has been weak.

With regard to ideas, the global policy community has not yet established an internally resonating frame, and still struggles to find external frames that will move political leaders to action. With respect to political context, global policy windows have opened, but how well the policy community has taken advantage of these opportunities is unclear. The fragmented global structure of governance for health has made an institutional home for safe motherhood difficult to find. With respect to issue characteristics, the severity of the problem is low compared with other conditions if indicated by mortality levels, hampering resource acquisition and mobilisation efforts. Measurement is a continuing problem, and no widely accepted and simple way to monitor progress has emerged. Interventions are not simple, the evidence base for these interventions is weaker than it is for some other issues, and the policy community has had trouble developing consensus on which interventions should be prioritised. Because of these difficulties caused by both the nature of the issue and the decisions of actors, the safe motherhood initiative remains in a state of infancy even after 20 years.

Building global political priority for safe motherhood

2007 could present a window of opportunity to generate political support for the cause. Cohesion is building in
the policy community as proponents of skilled attendance and emergency obstetric care bridge their differences. A major policy window has opened, prompted by the MDGs and the 20th anniversary of the initiative. Additionally, the Partnership for Maternal, Newborn and Child Health could provide a new coordinating mechanism for global leadership on the issue.

Creation of political momentum will need four connected political challenges to be addressed, in addition to continuing technical challenges surrounding intervention and measurement. First is building on the growing cohesion in the policy community so that it can speak with authority and unity to international and national political leaders. Second is the creation of enduring guiding institutions to sustain the initiative. The partnership might provide a platform, but in view of its recent creation and tensions in the policy communities that compose it, assessment cannot yet be made. Third is finding external frames that resonate and will convince political leaders that they should be concerned about the issue. Policy community members have offered several ideas on framing, but none has taken hold widely. Fourth is building stronger links with national initiatives and mobilising country-level civil society organisations. The weakness of such links and minimal social mobilisation for the cause in countries with high maternal mortality has hampered the acquisition of global political support.

Future research on political priority for global health initiatives

The main question is why do some global health initiatives attract political priority whereas others remain neglected? Our investigation, grounded in a synthesis of research on collective action and one case study, represents only a start in examination of this complex issue. Further study and refinement of the framework is needed, ideally through comparisons across global health initiatives that vary in levels of political support. Such studies would have great value both for theory development and for practice. Empirically-grounded explanations on issue ascendance and neglect would advance our knowledge of dynamics for agenda setting in global health. Equally importantly, they would offer guidance to struggling global health initiatives such as safe motherhood on how to generate much needed political support.

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Detours and shortcuts on the road to maternal mortality reduction

Deborah Maine

Since the beginning of the Safe Motherhood Initiative in the mid-1980s, progress has been slower than expected.1–3 Some observers attribute this delay to insufficient commitment on the part of donors and governments; in fact, little funding has been devoted to maternal mortality programmes compared with programmes for child health, for example. Nevertheless, much more could be accomplished if resources were focused on the most effective interventions, and implemented in such a way as to strengthen health systems.

Although progress has been slower than we hoped at the official founding of the Safe Motherhood Initiative in Nairobi, Kenya, in 1987, many accomplishments have also been achieved, which are set forth in other articles in this Series. However, some worrying developments in programme strategies have occurred during the past few years. Some of these strategies are advertised as shortcuts on the road to safer motherhood. They often have intuitive appeal, and they satisfy the real sense of urgency to make progress. Unfortunately, they might not lead us to substantial long-term gains, and could, in fact, be detours rather than shortcuts. Detours are not necessarily dangerous, but they can waste time and resources (financial, human, intellectual, and even emotional) that could be used more effectively. Moreover, people could think that maternal mortality is being addressed in a substantial way when this is not the case.4 These strategies are often promoted by international agencies and donors, and governments are pressured to adopt them.

Ten examples of shortcuts or detours are discussed in this Viewpoint. The first four items seem plausible, but do not have solid evidence showing that they actually work. The next five items focus on the dangers of fragmentation and the need for a systems approach. The last item emphasises the problem of keeping focused on the goal of reducing maternal deaths. Of course, there are other important goals, such as reducing infant mortality, but reducing maternal mortality is the core of the Safe Motherhood Initiative.

(1) Safe births kits
Safe (or clean) births kits are small packets that are given or sold to pregnant women in developing countries. They usually include a piece of soap, a new razor to cut the umbilical cord, and a piece of plastic sheeting on which the woman can give birth. The intention is to prevent infection in both mothers and newborn babies. Although a clean razor blade (if used properly and only once) could help reduce neonatal tetanus, no evidence suggests that this reduces maternal sepsis. Moreover, a study5 in Matlab, Bangladesh, in which traditional birth attendants were trained in clean birth practices by the non-governmental organisation Building Resources Across Communities (BRAC), showed that occurrence of maternal sepsis was not reduced even though the attendants used the procedures they were taught. Although each kit is inexpensive, the assembly and distribution of millions of kits (one for each birth) is not. Furthermore, something that is not effective can never be cost-effective.

(2) Birth planning
Another popular activity is to promote birth planning, in which women and other community members are given information about the complications of pregnancy, and advice about where to deliver and what to do in the event of complications. Again, nothing is overtly harmful here, but this approach has been promoted without evidence that it actually helps. In fact, some evidence now suggests that birth planning does not change behaviour.6 Although the kind of families who plan for upcoming events are more likely to make use of available services, the question is whether the promotion of birth planning through prenatal visits or community education makes a difference. One flaw in this strategy is that it assumes that people do not use health facilities because they lack information or planning skills, whereas the major deterrents are usually the high cost and poor quality of services, and the fact that nearby facilities are not functioning.

(3) Advocacy
Although advocacy—eg, to raise resources—is an important component of an initiative such as the Safe Motherhood Initiative, it is often undertaken without a clear connection to actions that can actually help to reduce maternal deaths, such as to improve the retention and functioning of staff at rural health facilities. Surely, after 20 years of the Initiative, there is no further need for raising awareness about the general problem of maternal mortality. What we need is advocacy directly aimed at crucial interventions, and at monitoring the implementation and outcome of programmes.

(4) Semi-skilled attendants
Strong evidence shows that programmes to reduce maternal mortality will be effective only if providers are skilled in treating obstetric disorders.7,8 And yet, in many countries, the notion of skilled attendants at birth
is being watered down, and workers with relatively little training are now known as skilled birth attendants, even though they do not meet the WHO/FIGO (International Federation of Gynaecology and Obstetrics)/ICM (International Confederation of Midwives) definition.7 Although this measure is claimed to be temporary, it could delay effective measures (such as the training of real midwives) by diverting attention and resources and confusing programme strategies.

(5) One-complication programmes
In the past few years, several new programmes have been launched to address one complication—e.g., post-partum haemorrhage. Use of oxytocic drugs after delivery and active management of the third stage of labour have been shown to reduce post-partum haemorrhage. Moreover, they can be incorporated into household-level programmes aimed at neonatal and child health programmes.

Despite these advantages, community programmes to reduce post-partum haemorrhage address only part of a single obstetric complication. Estimates vary as to how big a contribution such an intervention could make. Haemorrhage (ante-partum and post-partum) accounts for an estimated 25% of maternal deaths.10 Furthermore, a substantial proportion of women who have post-partum haemorrhage will still need care at a health centre or hospital. A programme that improves the ability of the health system to treat women with various complications will have a much larger effect on maternal mortality.

(6) One-component programmes
These programmes stress a particular aspect without addressing related components that are actually crucial for success. The most common example is when training is the only, or predominant, activity in the programme. Even the best-trained providers cannot effectively use their skills in a setting where equipment, lighting, supplies, and infection control are inadequate. In fact, poor management practices often undermine the potential of many other activities, including training, upgrading of equipment, renovation, and community mobilisation.11

(7) One-cadre programmes
Programmes that focus exclusively on a particular type of worker can have similar problems as one-component programmes. A more systemic approach to maternal mortality reduction is urgently needed. At the start of the initiative to promote skilled birth attendants, the emphasis was mostly on the worker. In recent years, the emphasis has changed to include the need for not only the skilled birth attendants, but also the so-called enabling environment, which allows attendants to apply their skills (collectively known as skilled care). This change is a welcome clarification.

(8) Institutional deliveries
Several programmes are now using institutional deliveries as an indicator of progress, perhaps because they are easier to measure than deliveries with a skilled attendant. Although in many settings there is a substantial overlap between births attended by a skilled provider and institutional deliveries, there are many places where this is not the case. By focusing on institutional deliveries, programmes could meet their targets, but miss the goal of reducing deaths and long-term disability for women.

(9) Private-sector deliveries
In many countries, a growing proportion of deliveries are done in private facilities, and donors and governments are experimenting with funding the private sector to improve obstetric care. Although the private sector certainly has an important role, crucial questions need to be answered before this approach is widely adopted. Private, for-profit clinics and hospitals are usually concentrated in urban or periurban areas. Will the support for private services (through vouchers or other means) increase care for underserved populations? Will such initiatives overcome financial and cultural barriers, and increase equity? Do private facilities actually provide good-quality care?

Finally, we need to question whether strengthening private-sector care will be less expensive than strengthening government health services. Since no one is seriously proposing that governments dismantle their health systems, funds for private sector services will be additional funds. Also, resources for the public sector might well be reduced, leading to further deterioration of government health systems. Thus, apparent cost savings could actually be false economies.

(10) We still need to ask about the M in MCH
In 2005, the Safe Motherhood Initiative merged into the Partnership on Maternal, Newborn, and Child Health. This combined initiative presents us with the opportunity to work along a continuum of care—from the community-based activities (in which much can be done for neonatal and infant health) to health centres and district hospitals (which are crucial for saving the lives of women). However, we still need to keep a clear focus on maternal mortality, not exclusively, or as a vertical programme, but we need to ensure that the key interventions for women’s survival do not get lost. A colleague recently showed me the delivery form in a brand new national register from an East African country. It has five columns related to HIV and mother-to-child transmission, and five columns related to newborn health, but for maternal health, the form merely asks for the mode of delivery and whether the mother lived or died—no column is designated for information about obstetric complications. Thus, we must still ask, “Where is the M in MCH?” 11
The way forward

There is growing awareness in international health groups that weak national health systems limit the gains that can be made in many areas of health. True, some progress can be made through sharply targeted interventions, such as community-based prevention of post-partum haemorrhage. But these interventions can only take us so far, and they are not inexpensive. However, the strengthening of district health systems will have many benefits—not only for pregnant women, but also for children and men. For example, WHO recently reported that road accidents are the leading cause of death in people aged 10–24 years worldwide.13 Accident victims often need blood transfusions and surgery during the night or on weekends, as do women with obstetric complications. Thus, ensuring that district hospitals are functioning properly at all times will bring broad benefits.

Furthermore, a systems approach to reduce maternal mortality does not necessarily delay progress. A World Bank study showed how in the second half of the 20th century, the coverage, quality, and use of maternity services in Malaysia and Sri Lanka were systematically improved.14 The report concluded that maternal mortality could be halved in developing countries every 7–10 years with this approach. Contemporary examples also include the substantial reduction in maternal mortality due to health systems strengthening in Honduras.15 These experiences show us a clear road to success, if we have the perseverance to follow it, and resist the temptation of shortcuts.

Conflict of interest statement

I declare that I have no conflict of interest.

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Practical lessons from global safe motherhood initiatives: time for a new focus on implementation

Lynn P Freedman, Wendy J Graham, Ellen Brazier, Jeffrey M Smith, Tim Enser, Vincent Fauveau, Ellen Themmen, Sheena Currie, Koki Agarwal

The time is right to shift the focus of the global maternal health community to the challenges of effective implementation of services within districts. 20 years after the launch of the Safe Motherhood Initiative, the community has reached a broad consensus about priority interventions, incorporated these interventions into national policy documents, and organised globally in coalition with the newborn and child health communities. With changes in policy processes to emphasise country ownership, funding harmonisation, and results-based financing, the capacity of countries to implement services urgently needs to be strengthened. In this article, four global maternal health initiatives draw on their complementary experiences to identify a set of the central lessons on which to build a new, collaborative effort to implement equitable, sustainable maternal health services at scale. This implementation effort should focus on specific steps for strengthening the capacity of the district health system to convert inputs into functioning services that are accessible to and used by all segments of the population.

Introduction

The safe motherhood movement reaches its 20th anniversary as the global health field embarks on ambitious new efforts to transform its practice. With the Millennium Development Goals (MDGs), the Paris Declaration on Aid Effectiveness, and the launch of the Global Campaign for the Health MDGs,1 the principles of country ownership, aid coordination, and results-based financing will create a new approach to national policymaking and financing. The success of these initiatives depends on the ability of countries to steadily expand their capacity to implement integrated programmes for service delivery while progressively advancing coverage and equity.

Four major global safe motherhood implementation and evaluation initiatives of the past decade—Averting Maternal Death and Disability (AMDD), Immpact, the Skilled Care Initiative (SCI), and ACCESS (panel 1)—call for a renewed and intensified focus on implementation. In this paper we use our complementary experiences in the field to offer a set of central lessons on which to build a new, collaborative effort to initiate change on the ground, where women live and die.

The time is ripe for a shift in focus

For much of its history, the Safe Motherhood Initiative focused largely on global debates about strategies and priorities. Little attention was devoted to expanding the capacity of countries with high mortality rates to implement and sustain any such strategies or to learning from the few local-level initiatives that did exist. New attention to implementation is now needed.

Panel 1: Global Maternal Health Initiatives

Global initiatives can generate and synthesise evidence, develop instruments, create links for learning across countries, and provide technical guidance and support.

The Averting Maternal Death and Disability (AMDD) Program at the Mailman School of Public Health, Columbia University, is a global programme of research, advocacy, policy analysis, and programme support that is dedicated to the reduction of maternal mortality and morbidity. AMDD and its UN, non-governmental, and governmental partners have worked in some 50 countries in Asia, Africa, and Latin America with a focus on expanding availability, quality, and use of emergency obstetric care and addressing health systems factors that constrain or facilitate equitable access at scale.

Immpact is a global research initiative to strengthen the evidence-base on the effectiveness and cost effectiveness of intervention strategies for safe motherhood, and is coordinated by the University of Aberdeen, UK. It consists of a collaborative network of scientists spread across seven research institutions, and has developed measurement methods for robust evaluation of strategies, which were used to undertake major assessments in its first phase (2002–06) in Burkina Faso, Ghana, and Indonesia.

The Skilled Care Initiative (SCI) is a 5-year programme of Family Care International that aimed to increase the availability, quality, and accessibility of skilled maternity care in four rural, underserved districts in Burkina Faso, Kenya, and Tanzania through a multifaceted approach of health facility and community interventions.

The ACCESS Program works to expand coverage, access, and use of key maternal and neonatal health services across a continuum of care from the household to the hospital. The 5-year global programme is sponsored by the US Agency for International Development (USAID) and works with USAID missions, governments, non-governmental organisations, local communities, and partner agencies in developing countries.

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For more on the AMDD Program see http://www.amddprogram.org/

For more on the Immpact initiative see http://www.immpactinternational.org

For more on the SCI programme see http://www.familycareintl.org/

For more on the ACCESS Program see http://www.accesstohealth.org/
Several factors are already in place. First, the safe motherhood community has coalesced around three key elements that are crucial for reduction of maternal mortality—family planning, skilled care for all deliveries, and access to emergency obstetric care for all women with life-threatening complications—all of which are firmly grounded in a sustainable health systems approach that engages communities and facilities.

Second, in many countries, national plans to accelerate progress on maternal and neonatal health have set overall priorities for implementation and monitoring and, in the process, generated political will and national ownership.

Third, virtually every country has committed to the MDGs, and leading donor and recipient countries have endorsed the new global initiatives being brought together under the Global Campaign for the Health MDGs to accelerate progress in reaching these goals. Lastly, promising mechanisms have been created for carrying advocacy messages, maintaining the public profile of maternal health, and strengthening coordination and collaboration in the discipline of maternal, newborn, and child health overall, in particular the Partnership for Maternal, Newborn and Child Health.

With these factors in place, we call for renewed energy, attention, and resources for implementation at the district or local level. However, the importance of generating political will, increasing funding, or launching advocacy campaigns that keep the issue in the public eye should not be discounted nor dismissed. Of course, national policy work should continue. But implementation of maternal health services on the ground has been woefully neglected in the global safe motherhood community. We believe that the time is right to change the balance and provide new priority to implementation.

Global initiatives and local actors: lessons for implementation

Although each of the four initiatives focuses primarily on a different aspect of maternal health efforts, on the basis of these varied experiences we believe that implementation efforts aimed at service delivery at scale, and thus achievement of MDG5, should be firmly embedded in a health systems approach. Ultimately, this tenet means that the following needs to be addressed: both the supply and demand side; both home and community dynamics and facility-based services in a home-to-hospital continuum of care; and both obstetric emergencies and routine deliveries.

But a health systems approach does not mean that every district in every country has to do everything all at once or use exactly the same strategy. Instead, countries or the relevant subnational planning and implementation units (usually states or districts), or both, should start where they find themselves, and proceed through a process of assessment, planning, progressive implementation, and monitoring, while keeping in steady focus the operational result they seek: equitable use of functioning, good quality services, and measurable health improvements.

To plan for implementation at scale needs prioritisation and vision. Selected elements of a plan might be put into operation immediately, whereas other elements need a longer timeline but demand immediate investment to set into motion progress along that timeline. Of course, plans need to be financially realistic and sound, but the approach of simply postponing serious attention to any crucial elements of a maternal mortality reduction plan, until a time when poor countries are prosperous, is not acceptable. Maternal mortality reduction is a global responsibility that is codified in international law and endorsed repeatedly in policy statements.

For MDG5 to be achieved, support has to be available to responsibly implement all the essential elements of an evidence-based strategy to reduce maternal mortality.

In this paper we focus on interventions that are designed to avert deaths and injuries to women around the time of delivery and in the immediate postpartum period, when the risk to mother and baby is greatest. The number of maternal deaths can and should also be reduced through access to family planning, which enables women to control the number of times they become pregnant and thus risk maternal death. Furthermore, the risk of dying when pregnant can also be reduced through safe abortion services when legal, and treatment of abortion complications. Good intrapartum care has other important health effects. For example, it can reduce the risk of chronic morbidities, such as fistulas or uterine prolapse. Interventions for the mother at the time of delivery also have a substantial effect on perinatal mortality—an estimated 30–45% of newborn deaths and 25–62% of intrapartum stillbirths could be averted through good obstetric care.

Equally importantly, maternal health programmes that are well implemented strengthen the broader health system with collateral benefits for many other health disorders. For example, referral systems help victims of road accidents reach emergency care; blood transfusion services supply blood for all surgeries; improvement in facility management benefits the whole site; and community engagement can change accountability dynamics across all health services.

Needs assessments and the importance of contextual variation

We are not advocating a single universal approach to implementation, but neither are we suggesting that every situation is so unique that it has to start from scratch. In short, we know what to do, but how to do it varies by context. Understanding context entails an appreciation of the relation between supply and demand within the district level health system—ie, the continuum from home or community, up through health posts and health centres, to the first referral level facility.

In many
give birth and under what circumstances (ie, what proportion receives skilled care)? Where is basic and comprehensive emergency obstetric care now available and which signal functions (panel 3) are missing? What is the profile of human resources—both clinicians and managers—that is now available compared with what is needed? What is the present pattern of and capacity for referral (ie, emergency transport, patterns of bypassing, etc)? Who is and who is not accessing care—ie, what is the equity profile? What are the demand-side barriers to use and what is their relative importance? This information will be expanded through the health management information system and through operations research as implementation and scale-up proceed.

Instruments already exist for many aspects of needs assessments for both supply-side and demand-side. For example, information about place of delivery and present status of skilled care can usually be identified in population-based data sets such as the Demographic and Health Surveys and in facility surveys such as the Service Provision Assessments. Instruments for needs assessments for emergency obstetric care have been developed by AMDD in partnership with UNICEF, UNFPA, and WHO, and have been used in some 48 countries (panel 4).

On the demand side, research undertaken by Family Care International (FCI), Immpact, and others confirms that there is substantial variation in the relative importance of different barriers, such as financial and geographical obstacles. This work also shows great variation in the relative importance of different cost elements—such as user fees, transport costs, and countries where political and bureaucratic decentralisation has taken place, the district is also the level at which budgets are decided and authority over the direct functioning of the health system is lodged.

The ultimate goal is to ensure that every birth is attended by a skilled health professional (panel 2) and that every woman who has an obstetric complication receives care either in a basic emergency obstetric care facility (typically a health centre) or in a comprehensive emergency obstetric care facility (typically a district or subdistrict hospital; panel 3). Although there is not just one right strategy for attaining this goal, a strategy is crucial to guide implementation. This strategy should be based on evidence and on relevant information about the local context. For example, the recent Lancet series on maternal survival\(^9\) presented evidence to suggest that, if maternal survival is the outcome sought, then the best strategy for delivering intrapartum care at scale is one that enables women to routinely give birth in health centres, private clinics, or maternity homes that can assist with healthy births but which also include basic emergency obstetric care for managing complications and which provide ready access to well-functioning referral level care. Health centres would be staffed by fully qualified midwives as principal providers working in teams with midwife assistants or their equivalents, who can safely handle routine deliveries.

To develop and then plan for implementation of this strategy or any other evidence-based one, the following questions are crucial for every district: where do women

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**Panel 2: WHO, International Confederation of Midwives, and International Federation of Gynaecology and Obstetrics definition of a skilled birth attendant**

“A skilled 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”.\(^9\)

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**Panel 3: Signal functions for basic and comprehensive emergency obstetric care**\(^8\)

**Basic emergency obstetric care**

1. Parenteral antibiotics
2. Parenteral oxytocic drugs
3. Parenteral anticonvulsants
5. Removal of retained products
6. Assisted vaginal delivery

**Comprehensive emergency obstetric care**

All of the above plus:
7. Surgery (eg, caesarean delivery)
8. Blood transfusion

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**Panel 4: Needs assessments with the UN process indicators for emergency obstetric care**\(^8\)

Over the past decade, the UN process indicators for emergency obstetric care have been used in over 48 countries to assess the status and to monitor progress in the provision of emergency obstetric services. Findings from needs assessments with the UN process indicators have shown:

- Per population, most countries have enough comprehensive facilities for emergency obstetric care but very few basic facilities.\(^11\) Quality of care, however, needs to be improved at all levels
- Geographic distribution of facilities for emergency obstetric care is a challenge, especially in rural areas\(^12\)
- Met need for emergency obstetric care is low. National needs assessments in nine countries in sub-Saharan Africa showed that met need was on average 28% (ranging from 12% in Mali to 48% in Benin), suggesting that too many women in these countries are not receiving treatment for their obstetric complications\(^12\)
- Caesarean delivery rates in surveyed African and Asian countries were less than 3% and therefore below the UN recommended range of 5–15%\(^12\)
Panel 5: Contextual variation in barriers to financial access

Conventional strategies to reduce financial barriers tend to focus largely on the costs of services at the facility by abolishment or reduction of user charges. Yet in some contexts, the costs that households incur outside the facility—eg, drugs and supplies purchased as well as payments for transport to reach care—might represent a more important barrier than formal payments for the care itself. The size of these costs varies enormously by context. In Nepal, demand-side costs represent at least 60% of the costs of a healthy delivery. In Ghana, spending on non-facility cost accounted for almost half the cost of a routine delivery. In contrast, in the Immpact study districts in West Java, Indonesia, which are densely populated, without topographical barriers, and with good roads, transport and other demand side costs represented less than 10% of the total costs of a routine delivery. Demand side costs are an especially important issue in countries where distances or topography make facilities physically difficult to access.

Panel 6: Targeting

The research of Immpact and other studies suggest that targeting services to poor groups is of little use since identification of poor individuals is usually inadequate, targeting stigmatises, and providers frequently prefer to deliver services largely to those who are able to pay high fees. Furthermore, and of great importance for emergency obstetric care, many more households than those defined as poor are at risk of impoverishment from the high costs of care. For example, the selective insurance for the poor people in Indonesia has almost been abandoned at a public hospital level for these reasons, where most women now receive highly subsidised emergency obstetric care. Geographical targeting can be beneficial in extending access to services in the poorest areas first. Such services include access to skilled delivery care, basic emergency obstetric care, and transport or transport subsidies to get to hospitals. This idea receives extensive support in published work, which reports that geographic targeting, especially if focused on fairly small areas (eg, district, subdistrict), is a cheap and effective way of reaching the poorest groups.

Finally, an often neglected area for needs assessment relates to equity across several dimensions of social disadvantage, including wealth, locality, religion, and ethnic origin. Techniques exist for showing the magnitude of inequity in the maternal mortality ratio with use of data from the Demographic and Health Surveys. Other indicators focus on specific services such as Unmet Obstetric Need, which provides an equity-sensitive measure of access to caesarean sections. New methods are being developed to assess equity in service use at the facility level. In maternal health, both the barriers to skilled care for routine deliveries and those to access emergency obstetric care in the event of life-threatening complications are especially important. Not only is the amount of the costs incurred for these services and the effect that these costs have on households very different, but the distinction between a planned event, such as routine delivery, and an unpredictable emergency has implications for the effectiveness of different financing mechanisms and policy initiatives such as targeting (panel 6).

From the bottom-up approach that begins with this type of needs assessment at the district level, issues will emerge that should be addressed at a centralised level of the health system, such as overall financing, procurement systems, and human resource strategies including employee posting and transfer policies. But implementation efforts at the district level should not wait until all such central issues are resolved. Implementation efforts—the transformation of existing and new inputs into functioning equitable services—can and have to begin immediately in the periphery and feed information and experience back up to the centre where, simultaneously, health systems structure and financing are being addressed.

In practice, the interplay between change at the service provision level and policymaking at the central level is rarely so straightforward. Incentives created by specific centralised decisions (eg, about compensation or career paths) or by the structure and financing of the system itself (eg, privatisation, decentralisation) can either ease or undermine local efforts to improve service delivery. Conversely, in the process of implementation, service providers and local managers can subvert even the best-intentioned policies created at the central level. Competent, committed managers at the district level—skills often absent in newly decentralised or weak health systems—are needed to ensure that policy change initiated from the top down and information generated in needs assessments from the bottom up do indeed come together to help produce equitable services of good quality.

Thus the new focus on implementation that we call for here is as much about management as it is about clinical care.

From inputs to functioning

Arguments about the effectiveness and theoretical impact of specific clinical interventions, such as misoprostol or active management of third stage of labour for postpartum haemorrhage, often mask the fact that none of the interventions in question, whether community-based or facility-based, will actually reach people in an equitable and sustained way without the infrastructural support of the health system. The field of maternal health has many examples of projects in which an intervention that is enthusiastically pursued ultimately has little effect on health outcomes because of failure to address the necessary health system support.

Inputs alone are not enough. The mere presence of health workers, drugs, supplies, and physical infrastructure does not necessarily produce functioning, responsive services. The results—ie, functionality and use—are what matter, not just the existence of the inputs. But understanding and tracking the relation between inputs,
processes, and results will ultimately be an essential part of managing for results.

For example, within AMDD, a simple method—the emergency obstetric care building blocks—has effectively helped planners and managers break down the task of implementation for results into manageable pieces (figure 1). With this type of step-by-step approach, hundreds of facilities over the course of 3 to 4 years were able to more than double the met need for emergency obstetric care and substantially reduce case fatality rates, often by 50% or more.21

Additional instruments exist for almost every block in the pyramid. Adaptations of EngenderHealth’s COPE method were used to improve management in both FCI’s Skilled Care Initiative in facilities managing routine deliveries22 and in the AMDD programme in facilities providing emergency obstetric care.23 Other methods such as criterion based audits,26–28 verbal autopsies,29 forms of confidential enquiry,30 and appreciative inquiry31,32 have also been successful in assessment and maintenance of quality and functionality in facilities.

Such management instruments emphasise perhaps the most challenging area of implementation: human resources. Implementation at scale needs a sound human resource plan: a health workforce framework that considers planning, recruitment, education, deployment, and performance support of health workers.31

As in other areas of implementation, no universal solution for human resources exists. For example, in Nepal, a new skilled birth attendant policy focused on upgrading existing workers. On the basis of an analysis of all cadres of health workers involved in maternal health care, policymakers assigned resources and attention to selected groups for standardisation and upgrading to become skilled attendants. Conversely, in Afghanistan the situation clearly needed immediate production of new workers, since less than 500 midwives existed in the country in 2002. Therefore, a massive national effort to train and appropriately make use of midwives was launched in 2003.34 A national policy to expand skilled attendance, especially in rural areas, strong donor support, and clear technical leadership and resources led to a rise in the number of midwifery schools from six in 2003, to 23 in 2006, and the production of more than 1100 new competent midwives in 3 years. Skilled birth attendant coverage in the Herat province increased from 4% in 2003, to 43% in 2006.

Maternal mortality reduction also needs appropriate skilled human resources to treat life-threatening complications when women with obstetric emergencies are referred. Studies have shown that scale-up for results often requires fundamental changes in both inservice and preservice curricula to emphasise competency (rather than simply knowledge) in a core set of essential skills and to ensure that training fits the infrastructural realities of high-mortality, low-resource settings.30,31,32 But no one right combination of professional credentials exists. In many countries, delegation to lower cadres of workers—usually midlevel providers such as clinical officers or surgical technicians—has become a crucial strategy for health system functioning.37 In Mozambique, for example, non-physician surgical technicians posted to rural areas had an 88% retention rate after 7 years compared with 0% retention of physicians, resulting in 92% of all major obstetric surgeries being done at district hospitals in Mozambique by surgical technicians.38

None of these training approaches can be effective without careful planning for the deployment and support of trainees. For example, in the Afghanistan midwifery system supported by ACCESS and JHPIEGO, the focus of these new schools was on the midwifery service to the community, not simply on midwifery education. Recruitment of students was connected with planned deployment, with the student, their family, and local authorities committed to a 3–5 year rural work contract. Initial deployment success in provincially-based community midwifery schools was more than 80%, whereas government schools whose recruitment policies were less tied to planned employment had deployment rates lower than 50% on average.

Immpact’s research has explored the effects that health financing schemes39 can have on health worker performance, sometimes with substantial consequences for equity. For example, its assessment in Indonesia showed that although the government had trained and placed a sufficient number of midwives in the study districts, midwives’ reliance on incomes from private practice means that women not able to pay for services are still disadvantaged in accessing them.40 Similarly in Burkina Faso, the absence of career progression including salary increase is probably an important factor behind the challenge of retaining experienced staff.41 The Ghana assessment showed that when user fees were eliminated,
the willingness of staff to shoulder increased workloads was partly linked to a general rise in public sector pay and allowances, even though most staff did not receive direct incentives to provide free delivery care.42

Such findings help to emphasise the important links between micro dynamics at the level of service delivery and macro dynamics at the level of health system structure and financing. Furthermore, they remind us that the health system is a core social institution made up of many different sets of social relations—ie, among health system staff, between health providers and the communities they serve, and within communities themselves. Implementation efforts cannot avoid addressing these relations and the power dynamics, including culturally specific gender and class or caste hierarchies, on which they are frequently based.

Accountability is the notion that has in recent years been regarded as the key to ensuring that this system of relations yields an equitable and efficiently functioning health system.40 Although accountability is often approached strictly as top-down enforcement of laws and regulations, experience in our initiatives support a so-called constructive accountability approach45 that encourages accountability to clients and other members of the full team who are associated with delivery care within the district health system, rather than solely to distant managers and supervisors.

Building constructive accountability into implementation programmes often means integration of community members or community-based institutions into the management of health services. Many techniques are able to achieve this effect. For example, in FCI’s work in Kenya, initially there was friction and mistrust between facility staff and community health committee members. A training programme helped to clarify the roles and responsibilities of the management committee and to strengthen members’ awareness about maternal health issues, their ability to serve as health ambassadors to and from the community, and their skills in key areas such as community mobilisation and fundraising.

In Burkina Faso, FCI worked extensively with local chiefs and traditional leaders in the Ouargaye district to heighten their awareness of and concern about maternal mortality. In one community, the local chief began to regularly attend antenatal clinics to urge women to return to the facility for delivery care. The use of skilled care increased from 25% to 56% between 2003 and 2006, partly because of the positive social atmosphere created by the local chiefs and partly because quality services were made available at health centres that were closest to where women lived.44

Although formal legal and regulatory mechanisms should, of course, be used to enforce some types of accountability (such as financial corruption), rights-based approaches have also been used effectively in implementation of programmes to create a responsive dynamic that is focused on teamwork for best possible client care. For example, the organisation CARE used an explicitly rights-based approach in its AMDD-supported programme in Ayacucho, Peru, to tackle a failing referral system in which poor clinical decisionmaking and slow action were reinforced by mistrust and condescension across different levels of providers. The introduction of a referral/counter-referral system, as well as training, clear protocols, two-way radios, and ambulances helped improve the situation, ensuring that staff at all levels saw themselves as part of a team which was working to improve maternal-health outcomes. With improvements in performance at both health centres and the referral hospital, and in their interactions with the community, met need for emergency obstetric care rose from 30% to 84% in 4 years.46,47

Monitoring and evaluation
Monitoring and evaluation is a fundamental part of a well-functioning health system, and thus it is an essential element of any implementation initiative. At a programmatic level, the rationale for tracking inputs, processes, and outcomes is clear: to improve performance, enhance effectiveness, and achieve results.48 Over the past 20 years, a large amount of experience has accumulated on many aspects of the monitoring and evaluation of programmes for maternal health.49–53 As the interdependence between health systems strengthening and initiatives for the reduction of maternal mortality has
become increasingly apparent, so has the overlap in their monitoring needs.

Indeed, as global health policy and development aid move increasingly toward results-based financing as a means for improvement of overall management of the health system and service delivery at the operational level, monitoring and evaluation have become very important. The challenge is to define a small number of indicators that will not overwhelm fragile reporting systems, but that capture district level programme inputs and management appropriately, which is necessary for both health system strengthening and maternal health specifically. One of the lessons learned in our and others’ initiatives, is the importance of linking coverage indicators to quality and equity. In Ghana, for example, Government removal of user fees was associated with an increase in the proportion of deliveries with health professionals, but the reduction in out-of-pocket payments for care was only 14% for the poorest women compared with 22% for the richest.

These developments in global health policy and financing mechanisms imply an increased commitment to strengthening district level reporting and data collection systems, and commitment to analysis, interpretation, and use of data. In the maternal health field, many measurement methods and techniques are now available, although further improvement is still needed. Some of these methods rely on the routine information system, like the UN process indicators for emergency obstetric care and quality of care audits, whereas others use secondary analysis of data from major survey programmes—eg, the Demographic and Health Surveys, and some need specific data collection activities such as key informant interviews. Measurement of health outcomes, such as maternal mortality, continues to present challenges for weak routine information systems, but several novel methods have emerged from AMDD and Immpact. Experience with the measurement of non-fatal outcomes, such as obstetric fistulae and psychological morbidities, is slowly increasing, and efforts are underway to improve analysis of perinatal outcomes.

Remaining challenges

The inputs needed for maternal mortality reduction are within the reach of all countries over the next decade if the necessary rises in aid and budget allocations are forthcoming. Recognition of the deficits in human resources and infrastructure that hamper maternal health programmes has been growing. But attention to the poor capacity of the overall organisational system to convert these inputs into functioning, equitable services is now urgently needed. Efforts to strengthen capacity should focus on the organisational system that “is composed of a network of programmes of services, staff, facilities, structures (forums for discussion and collective decisionmaking such as management boards, committees, etc), and processes of supervision, decisionmaking, information passing, financial flows, and so forth.” When systems capacity is ignored, inputs are often wasted and results scarce (figures 2 and 3). The challenge will be to address these elements of systems capacity not as mechanical cogs in a wheel, but as human interactions. Effective management of these interactions needs a continual, open-minded search to understand what incentives from inside or outside any particular health system drive people—eg, providers, patients, managers—to act as they do. The work of our four initiatives has shown the feasibility of eliciting context-specific information about the motivating factors that drive service quality and use, which can then help adapt policies and practices to address these factors directly.

Clearly these many dimensions of health-system functioning do not exist in isolation from the wider political economy that prevails in high-mortality countries and in the global system. Our call is not to ignore such issues. We recognise that maternal health is linked in profound ways to poverty and wider issues of socioeconomic development. Yet social and economic dynamics are not only questions for contributors to global policy. They also have tangible consequences in the actual functioning and use of these most basic services to which the lives of millions of women and neonates depend. Our call is to bring the fight for these services to the local level, and to support the efforts of those inside and outside the health system at that level who are able to initiate real and lasting change.

This leaves the question of what will it cost to implement this aim at scale? Here there are some known and unknown factors. Known factors encompass the various global costs on scaling-up maternal and newborn services. Although these costs vary according to model assumptions, the additional budget needed is clearly substantial—in the range of US$5·5–6·1 billion per year by 2015, for the 75 priority countries. Present investment at a global level is insufficient, and donors will greatly need to increase financial contributions. The Global Campaign for the Health MDGs is hoped and expected to be the catalyst and mechanism for achieving this increase. Projections suggest that such funding requirements could be met if countries invested 15% of their national budgets in health (the Abuja target set by and for Africa), and if official development assistance rose further towards 0–7% of gross national income for countries in the Organisation for Economic and Co-operative Development.

The unknown factors in the scale-up costs lie at a country level. The global estimates are too crude for national planning, and there is an urgent need for context-specific budgets to be produced—ie, budgets which also need to cover improved resource tracking, so that both country and donor commitments are held accountable. Crucial information gaps exist on the costs of health sector reforms, and costs of recruiting, training,
and retaining sufficient numbers of skilled health personnel, who are vital to saving women’s lives. Strong evidence exists in support of major reform in the financing of maternal health services, and specifically the removal of user fees, which disadvantage the poorest women and exaggerate the poor-rich gap in terms of use and outcomes.39,69 For this bold move to succeed, governments have to replenish the income lost from the abolition of user fees, and should ensure rather than assume that the benefits reach disadvantaged groups and regions.

Conclusions

The focus of the global maternal health community needs to shift. Instead of energy spent on the fine points of precisely which effective interventions theoretically fit best into generic packages, we now need to address the health system that must deliver them. Yet virtually nothing in the maternal health field has been prepared or set up to address the type of systems capacity-building for scale that is the over-riding lesson of the diverse experiences of our four initiatives. To change this pattern will take creativity and courage. Creativity is needed to build political commitment and forge strong coalitions across programmes, sectors, professions, and countries, and to tap the expertise and local knowledge—so often hidden from the global view—to design and implement the new initiatives, incorporating the best of what is already known. Courage is needed not to confront what is wrong in health systems that do not function for people, especially those who are poorest, despite huge infusions of cash and development aid, and to demand and support a transformation.

Conflict of interest statement

We declare that we have no conflict of interest.

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In May, 2007, a 33-year-old woman presented to our clinic with a violet, painless lump on her navel (figure). The lump had first appeared 3 years earlier: initially, the patient had not been worried by the lump, but it had grown steadily and reached a size that worried her—although she said she had no idea what it was. The lump bled irregularly. The patient had pale skin and a tendency to burn rather than tan (Fitzpatrick skin type II); however, she was not a habitual sunbather and had only been sunburnt twice. There was no family history of cancer or of skin disease. The woman had no other symptoms. Her medical history was unremarkable, except for sarcoidosis, which had manifested with coughing and shortness of breath, and had been diagnosed in December, 2006. When the patient saw us, she was taking prednisolone, and had no respiratory symptoms. She took no other medications.

Examination revealed a lobulated, nodular mass, which measured 3×2×2 cm, and was hard, non-tender, and irreducible. Ultrasonography showed that the mass was well-defined and solid. An excision biopsy was done. On removal, the mass was found to be irregular in shape and of rubbery texture. Histopathological examination showed that the mass consisted of endometrial tissue. When last seen, in July, 2007, the woman had no gynaecological symptoms or skin lesions.

Endometriosis is the growth of endometrial tissue outside the uterine cavity. Around 15% of women of reproductive age, and 50% of infertile women, have endometriosis. The disorder is thought to be caused in many cases by retrograde menstruation, in which menstrual blood flows down the fallopian tubes; endometrial tissue in the fluid lands on tissues in the pelvic cavity and starts to grow. However, up to 12% of women with endometriosis have endometrial tissue outside the pelvis; cutaneous endometriosis is found in 0·5–1·0% of women with extragenital endometriosis. Rarely, as with our patient, a lump on the skin can be the only symptom of endometriosis. Cutaneous and, in particular, umbilical endometriosis mimics melanoma, classically presenting as a dark mass, with cyclical pain and bleeding. Our patient’s mass was slightly atypical in that it was painless, and bled irregularly rather than cyclically. Cutaneous endometriosis can be caused by the transfer of endometrial tissue during gynaecological surgery. Other possible causes include metaplasia and the transport of endometrial tissue in lymph or blood vessels. Cutaneous endometriosis is surgically removed; the patient might also need to take oral contraceptive tablets, containing progestagens and analogues of gonadotropin-releasing hormone, to prevent menstruation and reduce the size of the endometrial tissue. If melanoma is suspected, an excision biopsy should be done. Rarely, ectopic endometrial tissue becomes cancerous.

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