

Preventing Maternal and Newborn Deaths Globally

Using Innovation and Science to Address Challenges in Implementing Life-Saving Interventions

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We have made important progress toward achieving Millennium Development Goals 4 and 5, with an estimated 47% decrease in maternal deaths and 28% decrease in newborn deaths globally since 1990. However, rapidly accelerating this progress is vital because far too many maternal and newborn deaths still occur each day. Fortunately, there are major initiatives underway to enhance global efforts in preventing these deaths, including the United Nations Secretary General's Global Strategy for Women's and Children's Health. We know why maternal and newborn deaths occur, where they occur, and how they occur, and we have highly effective interventions for preventing them. Nearly all (99%) maternal and newborn deaths occur in developing countries

See related editorial on page 509.

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where the implementation of life-saving interventions has been a major challenge. Determining how best to meet this challenge will require more intensive interrelated efforts that include not only science-driven guidance on effective interventions, but also strategies and plans for implementing these interventions. Implementation science, defined as "the study of methods to promote the integration of research findings and evidence into healthcare policy and practice," will be key as will innovations in both technologies and implementation processes. We will need to develop conceptual and operational frameworks that link innovation and implementation science to implementation challenges for the Global Strategy. Likewise, we will need to expand and strengthen close cooperation between those with responsibilities for implementation and those with responsibilities for developing and supporting science-driven interventions. Realizing the potential for the Global Strategy will require commitment, coordination, collaboration, and communication—and the women and newborns we serve deserve no less.

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In referring to the smallpox eradication campaign, one of the greatest triumphs in global health history, Dr. William Foege said, "In retrospect, the belief that it could be done seems like the most important factor in the global eradication effort."¹ Many now believe that we can dramatically accelerate progress in preventing maternal and newborn deaths globally, and this belief, in turn, is helping to create an important window of opportunity for another public health triumph. That some progress has already been made in this regard is undeniable with evidence that



maternal deaths have decreased by nearly half (47%) from 1990 to 2010 with an absolute decrease from 543,000 to 287,000 deaths.² We have also made major progress in decreasing the neonatal mortality rate with a 28% reduction from 1990 to 2009.³ That additional progress is needed is equally clear because far too many women and newborns continue to die each day as a result of complications of pregnancy and childbirth.

The challenges faced by Dr. Foege and other leaders of the smallpox eradication program were monumental, requiring not only a safe and highly effective vaccine, but also hundreds of thousands of well-trained personnel with adequate equipment and supplies. As daunting as these challenges were, many of those we face in preventing maternal and newborn deaths are, in important respects, even greater.

We have much going for us as we move forward. After decades of research, we now know why maternal and newborn deaths occur, where they occur, and how they occur, and we have highly effective interventions for preventing these deaths.⁴ Worldwide, most maternal deaths are the result of hemorrhage, hypertensive disorders, sepsis, and unsafe abortion, with obstructed labor, anemia, and human immunodeficiency virus (HIV) and acquired immunodeficiency syndrome (AIDS) being major contributing factors.⁵ Of these, hemorrhage is the leading cause of death in sub-Saharan Africa and southern Asia, where an estimated 85% of all maternal deaths occurred in 2010²; hypertensive disorders are the leading cause of deaths in Latin America and the Caribbean, where abortion deaths were also a major cause (as high as 30% of all maternal deaths in some countries in the region).⁵ Nearly 90% of newborn deaths (an estimated 3.3 million total neonatal deaths in 2009)³ are the result of infections, complications of preterm birth, and intrapartum-related deaths with more than two thirds of all newborn deaths occurring in sub-Saharan Africa and South Asia.⁶

Developed countries have been successful in preventing maternal and newborn deaths from these causes through implementation of science-driven, highly effective, life-saving interventions and through the progressive development of the health systems needed to support them. Thus, 99% of such deaths now occur in developing countries^{2,7} where the challenges of implementing these interventions are substantially greater. Clearly, dramatic progress in preventing maternal and newborn deaths will require a strong commitment to understanding and addressing these challenges.

Fortunately, with the launch in September 2010 of the United Nations Secretary General's Global

Strategy for Women's and Children's Health, we have such a commitment. The leading United Nations agencies targeting health issues (Health 4+)—the United Nations Children's Fund, the United Nations Population Fund, the World Health Organization (WHO), the World Bank and the Joint United Nations Programme on HIV/AIDS—are spearheading this effort and they are supported by governmental and nongovernmental partners from around the world. The aforementioned progress in preventing maternal and newborn deaths cannot be accelerated, or even sustained, without strong financial support from governments and their development partners.^{8,9} The Global Strategy's vision is to dramatically accelerate progress in achieving Millennium Development Goals 4 (a two-thirds reduction in under-5-years child mortality by 2015) and 5 (a three-fourths reduction in maternal mortality and universal access to reproductive health by 2015) with a focus on the 49 countries of the world with the lowest income. Achieving this vision could prevent 33 million unwanted pregnancies, 570,000 deaths to women from pregnancy and child birth, and 15 million deaths to children younger than 5 years of age, including 3 million newborns. Key components of the Global Strategy include: 1) country-led health plans; 2) a comprehensive, integrated package of essential interventions and services; 3) integrated care; 4) health systems strengthening; 5) health workforce capacity building; and 6) coordinated research and innovation. One guiding approach for this effort is the "Global Consensus for Maternal, Newborn and Child Health." This approach highlights the importance of aligning efforts around a cohesive set of priority interventions across the continuum of care, which includes not only continuity of individual care for women and children, but also among places of caregiving such as households, communities, and clinical care settings.¹⁰

THE CHALLENGES OF IMPLEMENTING LIFE-SAVING INTERVENTIONS

In an earlier commentary regarding our framework for accelerating science-driven solutions to challenges in global reproductive health, we noted the importance of "meeting the needs of the field" for implementation of life-saving interventions.¹¹ Meeting these needs in the low-resource countries in which the vast majority of maternal and newborn deaths occur will require addressing the problems presented by weak health systems, including constraints in infrastructure, personnel, and equipment and supplies. Doing so will involve not only evidence-based guidance on life-saving interventions, but also strategies and plans for the processes of implementing these interventions as



well as the science needed to inform and facilitate these processes.^{12,13} These efforts will support the building of the environment required to enable successful implementation of the recommended interventions and thereby contribute to strengthening the health systems that will have to deliver them.¹⁴

It will be essential that we improve equitable availability and access to emergency obstetric care services. Our recommended standard for these services is having at least five emergency obstetric care facilities, including at least one comprehensive facility, for every 500,000 population.¹⁵ These facilities should be able to provide, day and night, the following basic emergency obstetric and neonatal care services: 1) administration of parenteral antibiotics for sepsis; 2) administration of uterotonic drugs for hemorrhage; 3) administration of parenteral anticonvulsants for preeclampsia and eclampsia; 4) manual removal of the placenta; 5) removal of retained products (eg, manual vacuum extraction, dilation and curettage); 6) performance of assisted vaginal delivery; and 7) performance of basic neonatal resuscitation. In addition, the comprehensive facility should be able to perform surgery (including cesarean delivery), provide blood transfusions, and be the core of an effective referral mechanism for transporting women and newborns with complications. The challenges of meeting these requirements in settings with weak health systems are readily apparent and are related not only to the immediate organizational contexts in which clinical services are provided, but also to their larger contexts, including social, cultural, political, and economic factors.

We will also need to assure that high-quality antenatal care services are provided. Although a WHO randomized trial found that effective interventions can be packaged into a small number of antenatal care visits (median=5),¹⁶ neither the required number of visits nor the recommended services to be included are in place in many low-resource settings. Furthermore, new evidence has shown that testing women early in pregnancy for HIV infection and treating those who are positive with a triple-drug antiretroviral regimen will markedly reduce the likelihood of maternal-to-child transmission and, continuing this treatment, will clearly improve a woman's own survival as well.¹⁷ The difficulties of providing quality antenatal care services will be exacerbated by the need to integrate them with HIV counseling, testing, and treatment services,¹⁸ yet meeting this challenge will be essential if we are going to realize the potential for this breakthrough in HIV prevention and treatment. Uncertainties remain regarding how best to integrate antenatal care and HIV services as well as other

interventions across the continuum of care for reproductive, maternal, newborn, and child health.¹⁹

MEETING THE CHALLENGES WITH INNOVATION AND SCIENCE

Two common statements about the prevention of maternal and newborn deaths are that "We know what to do ... we just need to do it" and "We know what to do ... but we don't know how to do it." Both statements contain some elements of truth but neither accurately describes the full picture. Regarding the former, we now have many life-saving interventions that can be readily implemented even in low-resource settings given sufficient political will and priority and related resources. Fortunately, the countries in which most maternal and newborn deaths occur are increasingly making commitments to prevent them. The focus of the latter statement on "how to do it" properly highlights the importance of understanding barriers to implementation of interventions and encourages efforts to use innovations and our best science to address them. In this regard, historically we have placed the overwhelming majority of our scientific emphasis and funding on the "what to do," ie, the development of highly effective interventions for preventing maternal and newborn deaths, and not on the "how to do it." As a consequence, we now have a strong evidence base from multicenter studies led by the United Nations Development Programme, United Nations Population Fund, WHO, World Bank Special Programme of Research, Development and Research Training in Human Reproduction and others to support our current package of recommended interventions, eg, our guidelines on the treatment of postpartum hemorrhage and retained placenta,²⁰ and on prevention and treatment of preeclampsia and eclampsia.²¹ By contrast, in part because the field of implementation science is relatively new, we have far less science to support the implementation of these evidence-based, highly effective interventions with implementation being defined as "a specified set of activities designed to put into practice an activity or program of known dimensions."²² In general, the more complex the interventions and the contexts in which they are being implemented, the more important the science to support the implementation process becomes. Our interventions and contexts are complicated enough that we will need innovations and strong scientific and technical support, including implementation science, to succeed. Although such support is essential, it is not, however, sufficient, because weak health systems will continue to constrain our efforts unless we simultaneously address



underlying fundamental problems such as insufficient numbers of trained personnel and inadequate facilities, equipment, and supplies. Implementing cost-effective interventions and strengthening the health systems that support them are complementary efforts and both are required.

IMPLEMENTATION SCIENCE AND RELATED DISCIPLINES

Implementation science is an emerging field defined by the National Institutes of Health (www.nlm.nih.gov/hsrinfo/implementation_science.html) as “the study of methods to promote the integration of research findings and evidence into healthcare policy and practice.” Studies in the field of implementation science are designed to answer the questions “What is happening?” “Is it what is expected or desired?” and “Why is it happening as it is?”²³ They are conducted before and during the process of putting an intervention into practice. The related field of “impact evaluation” answers the questions “What works?” and “What doesn’t work?” and is of particular help to policymakers because it measures the effect of interventions after they are implemented and enables determinations of cost-effectiveness.²⁴ Another closely related multidisciplinary field is health policy and systems research, which addresses a broad range of questions concerning international, national, and local health systems and the policies made and implemented within them.²⁵ WHO serves as the Secretariat for the Alliance for Health Policy and Systems Research, which was created in 1999 to support this work. The Alliance hosts the Implementation Research Platform, which includes a focus on maternal, newborn, and child health and works across programs within WHO in support of research to identify common implementation problems, develop and test solutions to these problems, and determine how best to introduce these solutions into health systems. Implementation science also has many similarities to operations research; scientists at the Fogarty International Institute of the National Institutes of Health have drawn a useful distinction between the two in stating, “Unlike routine applied (or operations) research, which may identify and address barriers related to performance of specific projects, implementation science creates generalizable knowledge that can be applied across settings and contexts to answer central questions.”²⁶ Although the role of implementation science in creating generalizable knowledge will be key to our success, so will the contribution of implementation science in addressing country-specific concerns by answering the “how to” question,

in particular cultural, institutional, and health systems contexts.

INNOVATIONS

Innovations in the processes for implementing existing interventions to address “implementation bottlenecks” will be required and new methodologies, approaches, and tools to help in this regard need to be developed and tested. Technologic innovations to ameliorate the constraints of the contexts in which we are operating will be particularly helpful in developing interventions that are highly effective yet easier to implement in low-resource settings than those currently recommended. Two such innovations under study are a device for assisted vaginal delivery intended to be an alternative to vacuum extractors and cesarean delivery for obstructed labor and a nonpneumatic antishock garment intended to enable women with obstetric hemorrhage in low-resource settings to be stabilized until they can be transported for more definitive care. Innovative interventions using mobile technologies to promote and strengthen delivery of health services also hold promise.

As we develop innovative approaches to implementing interventions in districts within countries, we will need to do so with an eye toward sustaining and scaling up these approaches more broadly. In this regard, WHO is working closely with ExpandNet, a network that includes representatives from international organizations, nongovernmental organizations, academic and research institutions, ministries of health, and donor agencies that defines scaling up as “deliberate efforts to increase the impact of health innovations tested in pilot or experimental projects so as to benefit more people and to foster policy and program development on a lasting basis.” The ExpandNet secretariat has produced a number of tools for supporting the process of scaling up health innovations, including guidance documents on planning pilot projects and programmatic research for scaling up success as well as guidance on developing strategies for scaling up and strategically managing the process.²⁷ ExpandNet grew out of the implementation of the WHO-sponsored Strategic Approach to Strengthening Sexual and Reproductive Health Policies and Programmes, a planning and implementation process on which we expect to draw heavily.²⁸

MOVING FORWARD

The central questions we face in achieving the mission of the Global Strategy will be determined as we frame out the implementation challenges in each of the 49 countries in collaboration with their Ministries of Health



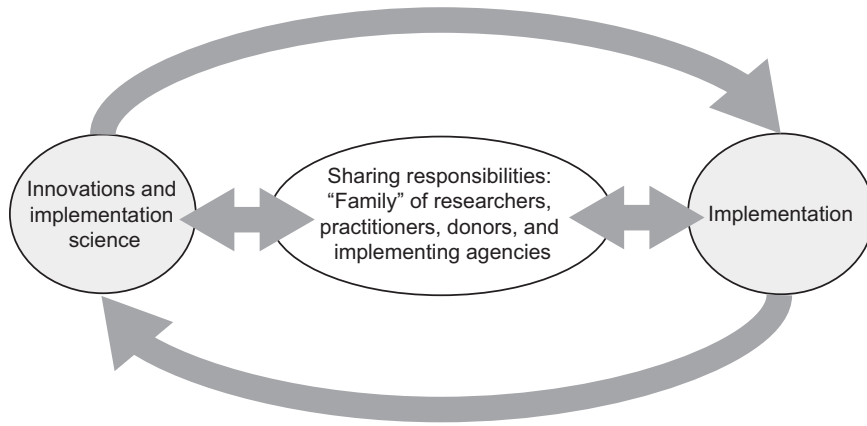


Fig. 1. Using innovations and science to address challenges in implementing life-saving interventions for maternal and newborn health. This figure shares a common box with Peterson HB, d’Arcangues C, Haidar J, Curtis KM, Meriardi M, Gülmezoglu AM, et al. Accelerating science-driven solutions to challenges in global reproductive health: a new framework for moving forward. *Obstet Gynecol* 2011;117:720–6.

Peterson. *Implementing Science-Driven Interventions*. *Obstet Gynecol* 2012.

and as we determine common challenges across countries. The challenges identified, in turn, will dictate the scientific and technical approaches needed to solve them.

The scientific and technical underpinnings of the Global Strategy will be transdisciplinary, multidisciplinary, and interdisciplinary and, for addressing implementation challenges, will include implementation science, operations research, and health policy and systems research. Our success in creating and using a strong science base to put life-saving interventions into practice will depend on multiple factors including our ability to bring together scientists from relevant disciplines to build a body of knowledge that improves the process of implementing interventions, supports technologic innovations, and facilitates the transfer of these innovations across varied contexts. Translational science has created a link from bench science to clinical practice and we likewise will need to develop conceptual and operational frameworks that link innovations and implementation science to implementation challenges in the field with the former influencing the latter and vice versa (Fig. 1). Because the use of the science base for implementing interventions is so interconnected with the challenges faced by implementers in the field—who, in turn, provide perspectives on what works and what does not work—we will need to continue to enhance current efforts that link those with responsibilities for implementation, including the United Nations Population Fund, the United Nations Children’s Fund, and their respective partners and those with responsibilities for developing and supporting science-driven interventions, including WHO and its partners. As we noted previously in our description of the framework to accelerate science-driven solutions to challenges in global reproductive health, these linkages will be a shared responsibility of a “family” of

researchers, practitioners, donors, and implementing agencies.¹¹ The family will include partners from governmental and nongovernmental organizations, academe, professional societies, and the private sector. For effectively addressing implementation challenges, it will be essential that it also includes local partners and those responsible for program implementation in the countries in which the challenges exist.

The interdependent relationship between implementers and scientists includes a common space that must be organized and operationalized to support efforts to address scientific and technical challenges as well as management challenges, including coordination, collaboration, and communication. Work in this “common space” requires bringing together interdisciplinary scientists, policymakers, program managers, service providers, funders, and the private sector. Accordingly, the WHO Implementation Research Platform and its partners will convene a global task force on innovation and implementation science for maternal and newborn health whose charge will include the following: 1) assessing the potential effect of implementation science on the field of maternal and newborn health; 2) developing standards for designing and conducting the implementation research needed to realize this potential; 3) prioritizing and investigating the most pressing implementation challenges and developing models and mechanisms for determining how best to link the solutions identified to actions in the field; 4) creating a forum to focus on innovations by bringing together those who can develop the technologies, those who can implement them, and those who can ensure their sustainability; and 5) creating effective synergies between the public and private sector for improving maternal and newborn health in the low- and middle-income countries. This new initiative will build on and support existing



initiatives and will be linked to ongoing efforts, including the Global Research Network to support the United Nations Global Strategy for Women's and Children's Health. The Global Research Network is a commitment made by the World Bank Special Programme of Research, Development and Research Training in Human Reproduction to facilitate the role of academic and research institutions described within the Global Strategy, including elements related to development and delivery of a prioritized research agenda, capacity strengthening in research in low-income countries, and enhancing dialogue between research entities and policymakers to enhance translation of research findings and ensure that research questions address program needs. The Global Research Network builds on the World Bank Special Programme of Research, Development and Research Training in Human Reproduction's network of centers of excellence for multicenter studies (as part of its research capacity strengthening program in low-income and middle-income countries) as well as other relevant networks.

In conclusion, we intend to rapidly accelerate progress in preventing maternal and newborn deaths by using innovations and our best science not only to develop highly effective interventions, but also to assure that these interventions are implemented successfully in challenging contexts. De Cock et al in describing the success of the US President's Emergency Plan for AIDS Relief, which is using an implementation science framework to improve programs at all levels,²⁹ characterized game changers as "radical innovations that fundamentally change how something is done, thought about, or approached."³⁰ We will need "game changers" to fully realize the vision of the Global Strategy and achieving them will take a collective effort that includes close cooperation between implementers and scientists on both a conceptual and an operational level. This, in turn, will require commitment, coordination, collaboration, and communication. Great public health triumphs have been up to this task and the women and newborns we serve deserve no less.

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