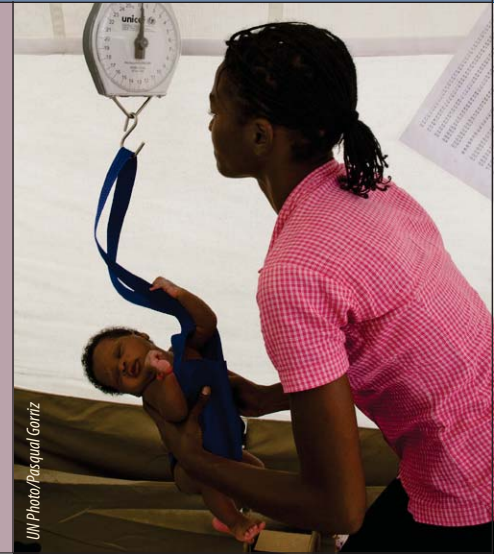


The Potential of Technology to Transform Maternal and Newborn Health

Reflections from a Gathering of Unlike Minds



A newborn child is weighed at an Internally Displaced Persons (IDP) camp in Place de la Paix, Port-au-Prince, Haiti.

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INTRODUCTION

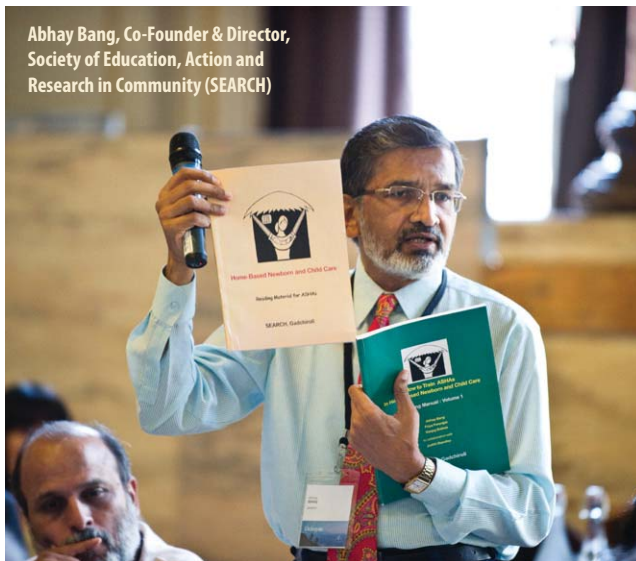
How can technology potentially transform the field of maternal and newborn health (MNH)? A 2010 Pacific Health Summit plenary session, “Technologies for MNH: Innovation, Creation, and Delivery,” proved an exceptionally rich discussion about the creativity of, and potential for, modern technologies to transform maternal and newborn healthcare in developing countries. The session explored ideas and challenges from the wide variety of perspectives found among a diverse group of high-level stakeholders. Participants hailed from science, industry, policy, academia, and medicine, sectors that do not often coalesce around the theme of maternal and newborn health.

Key questions addressed in this session included: What do we mean by “creative technologies” for MNH? What innovations already exist, and what innovations do we still need? What business models can deliver these technologies, and what lessons can be learned from other consumer-driven sectors? What special design issues should be considered in developing new products so that they reach those at the edges of health systems?

The discussion catalyzed fresh thinking about the scalability of existing technologies, health worker capacity and training, and the role of telecommunications and user-oriented systems in affecting behavioral change in a variety of settings. It also emphasized the need for the healthcare industry to demonstrate how they will make their skills and technology relevant to everyone in the world—not only for emerging markets, but also for those at the peripheries of the poorest countries.

The Question & Answer format on the following pages presents excerpts from this unique gathering.

¹ Dr. Ishrak’s comments were made when he was President & CEO of GE Healthcare Systems.



INNOVATION IN TECHNOLOGY: NEW MARKETS, CREATIVE PROTOTYPES

Q In what areas of the MNH field are new tools and technologies most needed? What is the framework for thinking about technology for these markets?

Christopher Elias – *Shifting how we think about technology*

As we innovate and create new solutions, we have to think not just about new tools for prevention, diagnosis, and treatment, but of new tools for reducing distance, whether that refers to the physical distance from a health facility and a trained health worker, or the social distance. We need new technologies, as well as new ways to reduce distances and create better informed individuals, families, and communities.

Gary Darmstadt – *Creative application of highly technical interventions*

If you're born very preterm in London, lifesaving interventions can be provided; however, they're highly technical and very costly. Typically, we have regarded this kind of intervention as completely outside the reach of low- and middle-income countries, and as a result, hundreds of thousands of babies [in those countries] die of respiratory distress syndrome every year.

But what if we were to radically modify those interventions and equipment and make them more available peripherally? For example, could we put these technologies in the hands of

physicians in a frontline clinic or a community health center? Several interventions could come into play. One would be the surfactant that these newborns get; currently the surfactant is endotracheal-administered for severe respiratory distress syndrome. Could we instead administer it via the oropharynx and have it inhaled in the process of ventilating a baby? Could we simplify ventilation equipment and incubator technology?

Abhay Bang – *Liberating technologies, liberating communities*

We need to ask ourselves: Are these technologies liberating or dependence-producing? We know that technology shapes our lives...but technologies can also produce disempowerment—they can produce dependence, which is a political disease. What we really need are technologies that will empower individuals, families, women, and communities for self-care, self-diagnosis, home management, and community-based management. Then technologies, apart from their intended health effects, will also be politically liberating.

Omar Ishrak – *Technologies that span the entire birth continuum*

[GE]'s focus in maternal and newborn care is in three areas. First is the area of early detection in pregnancy and antenatal care. Through early detection, we can triage pregnant women or mothers who are at highest risk and manage them differently. At the same time, we want to create an efficient system of care so healthy mothers will not clog up an already stretched healthcare system. Second, we focus on the area of labor and delivery, creating clinics where we have advanced equipment for efficient and safe delivery of infants. Finally, there is often a need to provide various technical interventions after the infant is delivered, such as warmers, phototherapy treatment, and oxygen capability.

“Don't forget the maintenance part. Equipment will not function for months and years if a small piece is broken and nobody is there to fix it.”

Vinod Paul, Professor & Head, Department of Pediatrics, All India Institute of Medical Sciences



Tina Sharkey, Chairman & Global President, BabyCenter

Q What considerations should be foremost when developing tools and technologies for underserved communities?

Vinod Paul – *Frameworks for testing and maintenance*

When you come to developing countries to evaluate new products, please set up an ethical framework for how these are to be tested on local patients. ... Second, when you decide how marketing is to be done, don't forget the maintenance part. Equipment will not function for months and years if a small piece is broken and nobody is there to fix it.

Martha Newsome – *Technologies for the household consumer*

We need to make sure that we're creating technologies that really make the most sense for the consumers—households and parents. We need to make sure that those technologies are appropriate for this context, that they're addressing the key forms of child mortality and maternal mortality, and that they're durable. They need to be able to exist in those very difficult hot, dusty, and remote environments.

Gary Darmstadt – *Equipping frontline workers*

It's critical to push technologies out into communities, but also to pull people into health facilities through technologies, and to view that action as an important way of rapidly increasing coverage of lifesaving interventions. Frontline

workers play an essential role in that process. They're the first point of contact; they're out in, and are familiar with, the community, so they provide a ready means of transmitting interventions, including information and technologies. What kinds of technologies do they need? Certainly effective and quite simple ones—in many cases, these workers are illiterate. The tools need to be low-cost and very durable, as the workers will be hauling this stuff all over the place, under a wide variety of environmental conditions.

Tore Laerdal – *Simplifying health education*

Training health workers in basic medical techniques can make a significant difference in developing countries. In the area of neonatal health, fundamental education about indicators of breathing abnormalities and methods for infant resuscitation has the potential to transform a country's healthcare for newborns and thus its infant mortality rate. For example, one common error is not checking the umbilical heart rate to determine whether the newborn's breathing is compromised. Qualified instruction and training in these areas can be done at relatively low-cost, such as by using the training kit in the "Helping Babies Breathe" program that includes a bulb that simulates infant heart rates. These kits cost only US\$50 each, whereas simulators for the Western world can cost up to US\$20,000.

CREATIVE PARTNERSHIPS AND SCALABILITY: INTEGRATING TECHNOLOGIES INTO HEALTH SYSTEMS

Q To what extent does the success of innovative technologies in MNH depend on functioning health systems? Conversely, how can technologies help strengthen health systems and improve MNH outcomes?

Christopher Elias – *Integration is critical for success*

At the Summit Opening Dinner, we talked about how technologies only have an impact if they can be integrated into health systems. Those systems need to be sustained by strong institutions, and leadership at all levels is quite critical. As I've listened to conversations over the last day, it has become even clearer to me that in the area of maternal and newborn health, these points are truer than with any other technology. With a vaccine, you may have to reach a child three times in infancy, maybe one or two times with a booster. That's challenging enough. But with maternal and newborn health, you essentially need to be ready 24-7 to respond, often in an emergency situation. It's an even more important integration of technologies and systems.

“We need to make sure that we're creating technologies that really make the most sense for the consumers—households and parents. . . [These technologies] need to be able to exist in those very hot, dusty, and remote environments.”

Martha Newsome, Senior Director, Global Health & HIV & AIDS Hope Initiative, World Vision International

Q How do we move beyond pilot studies and integrate interventions into systems? Who within the systems are these technologies targeting?

Martha Newsome – *Scaling technologies through creative partnerships*

How do we go to scale with the simple technologies that already exist? For instance, we know that long-lasting insecticide-treated nets are effective in preventing malaria, so how do we go to scale with that? How can we partner? In Zambia, I was involved in designing RAPIDS, an HIV program with integrated treatment care and prevention. What was exciting about that five-year program, which involved six different partners, is that it was predominantly an HIV program, but we used it as a platform to partner with the Global Business Coalition and then 16 different private sector partners, many of whom are here at the Summit. This powerful partnership was able to distribute 500,000 insecticide-treated nets in Zambia, which led to a 66% reduction in malaria in 2009 when you compare it to the year 2000 figures. So it may not be quite as sexy and quite as interesting, but we need to get these very simple technologies to scale and that's going to require those kinds of creative partnerships.

Gary Darmstadt – *Targeting the full range of providers*

We have some very good examples of working at scale: in Ethiopia for example, over the last few years, we've seen frontline workers go to scale across the entire country. We've got ANMs [Auxiliary Nurse Midwives] in India and Health Surveillance Assistants in Malawi that have been in place for decades, but it's just in the last few years that these workers are being equipped to address maternal and newborn health. There is a variety of types of community health workers—a drug seller, a community-based health worker, a midwife, a nurse, or even a doctor in a frontline clinic—any of these workers can be a mother's first point of contact. This is the range of providers that we're thinking of in terms of targeting our technologies.



Peter Singer, CEO, Grand Challenges Canada

INNOVATION IN TRAINING AND COMMUNICATIONS: EMPOWERMENT THROUGH EDUCATION AND CELL PHONES

Q For optimal impact, technologies must be applied effectively. How can we ensure that targeted consumers at all levels—from providers to the mothers themselves—are able to use the technologies?

Abhay Bang – *A holistic approach: pairing training and technology*

There is another aspect of technology. We need training and education so that individuals will be able to learn and master those technologies. We need simultaneous development of biomedical and educational technologies. Together, these will be empowering, and thus liberating, technologies.

Let me use this example. In 1999, we published our findings on home-based newborn care, but the next question has been, so what? How do you move from 39 villages to maybe one million villages, two million villages? With this new training system that we have developed—a manual, which a trainer can use, and reading material which the community healthcare worker can use—any literate woman who desires can learn basic home-based newborn care, including some home-based management of illnesses. This training system is now being adapted by UNICEF for use in Africa. What is further needed is the introduction of digital technologies so that these education technologies can reach far beyond where people cannot physically go.

William Castell – *Training physicians and nurses*

One key message for industry and those outside the health system is that PMTCT [Preventing Mother-to-Child Transmission of HIV] is a gateway for opportunities. It doesn't need to create anything new. Many answers already exist; they just need better implementation.

Q What role does information and communications technologies (ICT) now play in improving MNH outcomes, and what future role do you see?

Tina Sharkey – *Improving health literacy through SMS*

In the developing world, you find a US\$20 handset that we call a feature phone. It can barely text message. We thought, “Well, how do we adopt our messages to 160 characters and do so in areas of low literacy and potentially uncorrected vision, with many different languages to engage with?” We started by creating and sending out a daily SMS message which then triggered a voice call in which the expecting mother could actually call and hear information about what was happening in her body that particular week. Once we make that connection through the SMS, she can go back and read the messages again and share with her mother-in-law, family, and partner. She can listen to that voice message and then push a button for nutritional information, which is personalized to fit each of our targeted regions; another to find out about the size of the baby and what's happening in her body; and one more for pertinent exercise and fitness information. It's the kind of personalized engagement that we're trying to invent on a basic mobile phone that has limited features.

Zulfiqar Bhutta – Capitalizing on the growing use of cell phones

An important question to consider is the rapid increase in the cadre of community health workers in many parts of the world. While many are lay workers who have low levels of education, we also have growing populations of people who are able to use modern technologies. Thus I think a substantial part of the work that's going into the use of cell phone technologies needs to capitalize on reasonably edu-

cated women with eighth to tenth grade educations, such as the Lady Health Workers program in Pakistan, which numbers nearly 100,000 alone in my country [Pakistan]. . . We recently undertook a survey and found that cell phone ownership by the women in the Lady Health Workers program was 87%. These cell phones are personally owned and not supplied by the government. So already the world is moving in this direction.



Zulfiqar Bhutta, Founding Chair, Division of Women & Child Health, The Aga Khan University

SUSTAINABLE BUSINESS MODELS: MARKETS, COSTS, AND CONSUMERS

Q What business models can deliver these technologies, and how can we learn from other consumer-driven sectors?

William Castell – Differing contexts, differing models

We've heard about the preference for sustainable business models as the goal, rather than philanthropy. If we can make a product work in India where healthcare is paid for out of pocket, then using a business model is the only way that we will succeed in delivering healthcare in India. In China, it's a totally different model. You need to go to Beijing and get a state order, and the state takes the cost. So when we're looking at the emerging markets, we're dealing with very different models as we work to achieve our goal of delivering improved healthcare.

Andrew Thompson – Consumerization as a key strategy

It would be a really, really good idea for us to study and learn from industries that have already built large, global, sustain-

able businesses. There are some criteria we should study—these businesses need to be already reaching people in low-resource settings; they need to be investing at least 10% of their sales in R&D, because we're a research-driven industry and it would be very foolish to say we can do this without having a pipeline to new products; and finally, they need to be making a profit. . .

For example, the wireless Internet is the most important utility on the planet. Wireless connectivity is more available than water or electricity. It's really profound. Four and a half billion people on this planet use a mobile phone, which is a very sophisticated piece of computing technology. Vastly more computing today is owned by individuals than by corporations or governments—that fact is astonishing. Most of the people who own one of these devices make less than US\$10 a day, and most of them have never seen a doctor, nor will they. It's a profound shift. The global information technology industry can teach us an enormous amount about how we might build sustainable business models.

Q • What challenges does industry face when entering these lower-resource markets? How do pricing and affordability come into play?

William Castell – *Market growth and pricing challenges*

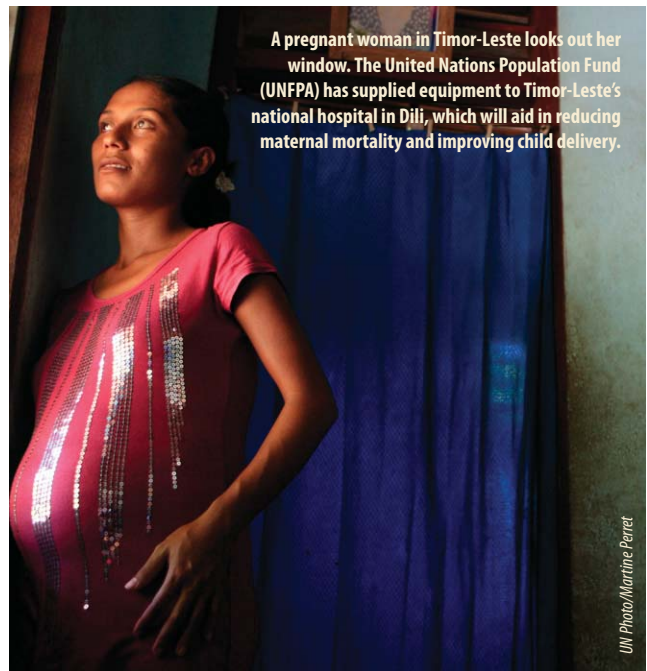
When you look at the situation from an industrial perspective, the growth markets of the world are in the developing world. For these emerging markets, you need not just a product, but very often also a system to change health-care. In terms of pricing, you have two options: Either you have a product for every price point in the market or you have tiered pricing. Tiered pricing for small molecules is a very difficult thing because the developed world does not always accept that you would price-tier into the developing world at a substantially different price. So one of the challenges for our industrial colleagues is how they can deliver products to the world without cannibalizing the developed world prices because of the way they've been priced to the developing market.

Omar Ishrak – *Ballparking costs and price-tiering products*

I know people are worried about price. Price is obviously an issue. Our philosophy [At GE] is to price these technologies so they are generally in the ballpark, and then we'll work out the final pricing that is right for each market. Our cost is a function of volume output. If you get too hung up on price at the outset, we won't get anywhere in reaching these underserved markets. I'm confident that we have the technology and the business capability to appropriately price-tier these products and approach the market with them. We can get the price down, but keep in mind that if we get too hung up on price at the beginning, we won't make any progress.

“The global information technology industry can teach us an enormous amount about how we might build sustainable business models.”

Andrew Thompson, CEO, Proteus Biomedical



PUBLIC-PRIVATE PARTNERSHIPS: CREATIVE BUSINESS ALLIANCES

Q • Which partnerships are most needed, and why and how should industry be engaged in them? How can policy and civil society incentivize further engagement from business in the development and delivery of innovative, robust, and affordable technologies for MNH?

Christopher Elias – *Sustainable partnerships for delivery*

The benefits of a given innovation must reach everyone, and there's not much that the industry can do on its own about delivery. The industry could theoretically come up with a very new and even an inexpensive gizmo that could have some benefit for MNH, but it's really going to require partnership with governments, local communities, and non-profit organizations to make sure that those innovations reach the people who need them most. While there is a nascent and growing private sector for delivery in many countries, in most poor countries, essential MNH services are still delivered via government and civil society organizations. So in fact, I think we are in a bit of danger at this conference in that if we generate this much enthusiasm in the private sector industry to help us solve these problems, and then we in the public sector don't follow through with the delivery, we're going to lose our credibility as partners.

Tina Sharkey – Partnering with governments and civil society

We need to remember that governments have a real role in terms of creating standards and regulations, making sure that they are protecting families and technologies are appropriate. We need to continue to think about how to bring these creative partnerships together with government and the private sector and civil society. Why is civil society important? Because a lot of these technologies require behavioral change, which often requires face-to-face engagement. There are so many CBOs [community-based organizations], civil society groups, and mothers' groups that can partner with the private sector to engage in the behavioral change needed to enable parents to use those new technologies.

There are ways to think about collaborating across the spectrum of providers, from carriers to handset makers, to implementation partners like us, as well as healthcare providers and other types of interventions. Together, we can create a portfolio approach that really surrounds a woman, that empowers her, lifts her up, and helps her understand that she can actually be in the center of her journey. We can give her

the support, the advice, the wisdom, and the information that helps her—not only with her own body, but also enables her to teach the other women and families in her community how they can also have better outcomes and better journeys.

Jonathan Klein – Clinical leadership in partnerships

As people go forward with some of these very high-level public-private partnerships, I'd encourage them to make sure to include the clinical leadership as a key part of civil society. ... I think the lesson learned from our newborn resuscitation program is that clinical leaders are essential to helping child survival programs become localized and institutionalized in many countries around the world. Our program is not always called "neonatal resuscitation"—it has taken on different names in many countries because it has become culturally integrated. This example can serve as a model for how to take some other public health priorities forward. The involvement of pediatric organizations helps ensure program sustainability. I think it's a powerful way to look at training the master trainers, disseminating information through the educational and public health systems, and making those actions part of ongoing policies.



Judith Helzner, Director of Population and Reproductive Health, John D. and Catherine T. MacArthur Foundation

“If we generate this much enthusiasm in the private sector industry to help us solve these problems, and then we in the public sector don't follow through with the delivery, we're going to lose our credibility as partners.”

Christopher Elias, President & CEO, PATH

THE IMPACT OF INNOVATION: EVIDENCE AND ACCOUNTABILITY FOR SUCCESS

Q What evidence do we have that these innovations are having their intended impact, and who is accountable for success? Are we focusing attention and resources on technologies that are appropriate and proving results, and how can we be more strategic in doing so?

Craig Rubens – *Accountability for results, generating evidence*

We must generate the evidence for whether a technology really works, because it obviously takes a lot to get any technology out, and obviously, each needs to be appropriate for the context. But if they don't work, then they either need to be refined or stopped. One of the most difficult things to do is stop interventions that suck up resources and don't work, and can also actually cause harm. One such example is the routine episiotomy of women during labor and delivery, a procedure that although not always necessary, is still being regularly performed today. While we're doing the implementation and scale-up of a technology, I really want to make a plea to generate the evidence for whether an intervention is working and having the kind of impact that was intended.

Paul Meyer – *Feedback from consumers as a driver for accountability*

I would love to see 15 million women in five years' time receiving information on their cell phones, but more importantly, providing feedback and telling us—do they have ac-



cess to prenatal care, do they have bed nets, did they get their kids immunized? ... That for me will be the most revolutionary thing that we can do to actually drive accountability in global health and serve women.

William Castell – *Accountability for success*

Measurement is critical. It tells us whether we're succeeding and, importantly, it also increases everyone's accountability. I want to add measurement back to the [Pacific Health Summit] agenda so we understand how we succeed. We have an outstanding new generation of healthcare leaders that understand that their corporations will only be accepted in the world if they demonstrate the relevance of their skills to the global citizen—no longer just the wealthy, no longer just the West.

“Measurement is critical. It tells us whether we’re succeeding and, importantly, it also increases everyone’s accountability. . . . We have an outstanding new generation of healthcare leaders that understand that their corporations will only be accepted in the world if they demonstrate the relevance of their skills to the global citizen.”

William Castell, Chairman, Wellcome Trust