

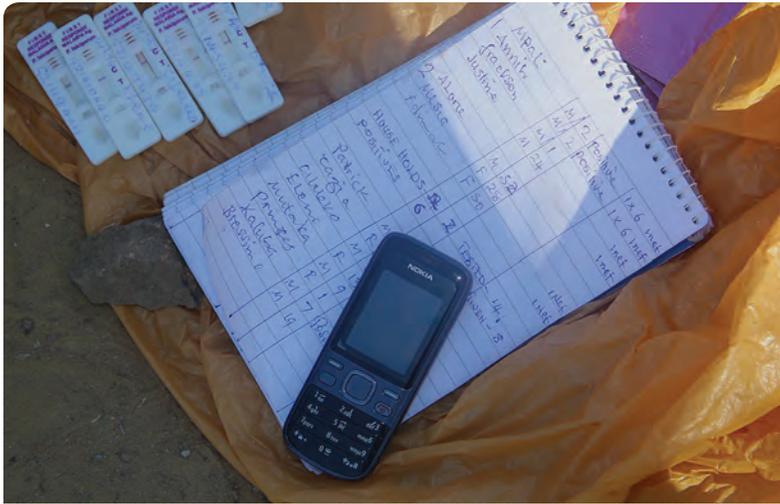
# Innovation matters

**PIONEERING  
INNOVATION TODAY  
FOR HEALTH  
IMPACT TOMORROW**

Amie Batson  
Seth Berkley  
Balram Bhargava  
Agnes Binagwaho  
Børge Brende  
Steve Davis  
Haitham El-noush  
Anthony Fauci  
Craig Friderichs  
Tore Godal  
Glenda Gray  
Felix Olale  
Allan Pamba  
Rajiv Shah  
Peter Singer  
Gavin Yamey

With a message  
from UN Secretary-  
General Ban Ki-moon

INNOVATION  
COUNT  
DOWN 2030



Smart phone-readable and standardized QR codes to track medicines?

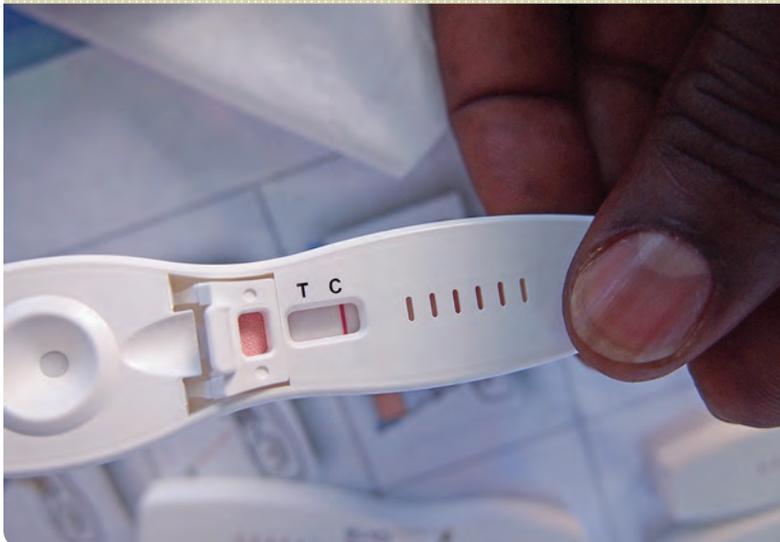


A field-based test for water safety that quantifies risk?

Simulation programs to help health workers manage emergency obstetric and neonatal care?



**A highly efficacious HIV vaccine?**



Diagnostic and screening tools for malaria and TB, tailored specifically for low-resource settings?

## MESSAGE FROM THE UN SECRETARY-GENERAL

By **Ban Ki-moon**  
Secretary-General  
of the United Nations

Since the launch of the Every Woman Every Child movement in 2010, leaders from government, civil society, multilateral organizations, and the private sector have worked hand-in-hand to improve health and save lives around the world. Building on earlier work, our collective efforts have achieved much progress: Maternal and child deaths have been cut by almost half since 1990. Remarkable technological advances in recent years, such as low-cost vaccines, new drugs, diagnostic tools, and innovative health policies, have driven this unprecedented reduction in maternal and child mortality.

The innovative Every Woman Every Child partnership model has proven to be a game-changer for women's and children's health, demonstrating the immense value of bringing all relevant actors to the table. Many other innovations, including more efficient distribution networks, the use of mobile technologies to reach women in rural areas, and local vaccine production, have also played an important role in generating new progress for women's and children's health.

As we acknowledge these achievements, we must recognize that much more needs to be done to meet the Millennium Development Goals (MDGs) focused on health. Each year, 289,000 women die while giving life, and each day, almost 18,000 children die, mostly from preventable causes.

As we accelerate efforts to achieve the MDGs by the 2015 deadline and create the best possible foundation for implementing the post-2015 development agenda, innovation will be critical. These innovations may be technological, social, business, or financial. Many lifesaving innovations already exist, and an increasing number are coming from low- and middle-income countries. We need to determine which have the greatest potential and how to take them to scale.

The Innovation Countdown 2030 initiative seeks to help the world meet this challenge. By working across sectors to identify and analyze promising innovations, the initiative will highlight new pathways for ensuring that every woman and every child have the opportunity for a healthier, happier life. Together, with new innovations at the forefront, we can reach our shared goal of ending all preventable maternal and child deaths within a generation.

## INTRODUCTION

We are pleased to welcome you to Innovation Matters, the first product of the Innovation Countdown 2030 initiative.

By **Amie Batson**  
Chief Strategy Officer  
PATH

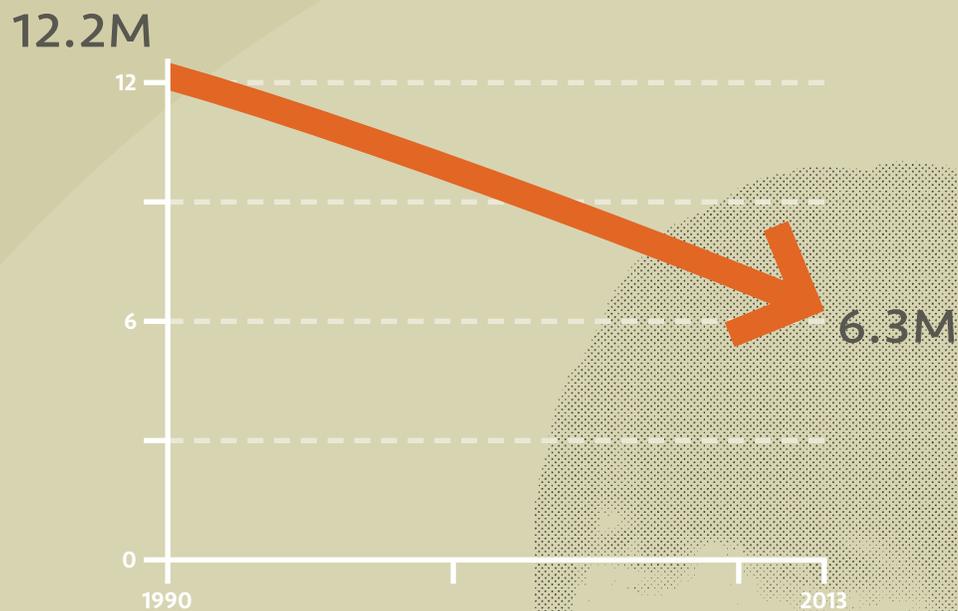
and **Tore Godal**  
Special Adviser on  
Global Health  
Ministry of Foreign Affairs  
Norway

As sponsors of the initiative, PATH and the Government of Norway are deeply motivated by the impact that innovation has had on global health in the past 15 years. From 2002 to 2012, for example, innovations in child survival—including immunization as well as malaria prevention and control, improved nutrition, access to clean water and sanitation, and education—have reduced the number of deaths among children under age five by 3 million per year. When we see remarkable results like this, we know that we can do much, much more to improve the effectiveness, safety, accessibility, and cost of today’s health interventions.

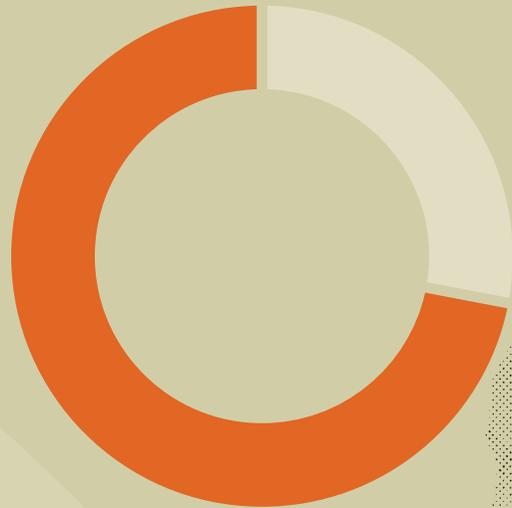
As we set our sights on harnessing the potential of innovation for the next 15 years, we acknowledge a few key insights. First, we recognize that many innovations that have contributed to progress toward the Millennium Development Goals were already in the pipeline when the goals were launched in 2000. Second, we see that innovation is no longer the sole purview of white-coated scientists working in well-funded labs. Increasingly, innovation happens at the intersections of disciplines, sectors, and countries. Third, we recognize that taking bright ideas to scaled-up reality is a long, hard road with many pitfalls. Development, large-scale production, introduction, and use are seldom linear or sequential.

We conclude that if we can be more deliberate about identifying high-potential innovations, we can strategically focus resources for the greatest possible impact. We can enlist governments and new investors who seek to channel their resources most effectively. And we can develop new ways to surface and accelerate the ideas that will one day—within our lifetimes—achieve game-changing impact.

We live in a dynamic world, and we know that the innovation landscape will change. New innovations will emerge, and existing innovations will advance or drop off. Innovation Countdown 2030 therefore seeks to not only create a formal process for identifying innovations but to track those innovations over time—capturing new ideas, sharing provocative insights, and creating an environment that drives change. And it seeks to foster the “cross-talk” that can provide the essential ingredient—whether that’s knowledge, resources, or partnerships—in a formula that has the power to improve millions of lives around the world.



Child deaths dropped 48% between 1990 and 2013, from 12.2 million to 6.3 million.



72% of the drop in  
child deaths was due  
to health innovations  
and better systems  
for delivering them.

# A window of opportunity to transform the future of global health

By **Børge Brende**

**SINCE THE MILLENNIUM DEVELOPMENT GOALS (MDGS)** were adopted in 2000, a growing global health community, spanning researchers and innovators on the one hand to politicians on the other, has proven effective in working for health and development. This successful cooperation now needs to be widened both in scope and depth as we look toward 2030.

Bending the curve of child mortality—lowering it from 12.6 million in 1990 to fewer than 6.6 million in 2012—was only partly due to new vaccines, drugs, diagnostics, health devices, and digital tools. Politicians were also called to action, as the very nature of the MDGs forced them to think more smartly about how states should address child mortality.

The MDGs acted as a scorecard for measuring development, an empirical basis for drawing up policy. Systematic measurement and accountability were no longer requirements for the technical community alone, but for politicians worldwide. They needed to ensure that breakthroughs in the field of health actually trickled down to the people who needed them.

There are various ways of doing this, such as creating market-shaping mechanisms, establishing public-private partnerships, or the successful conclusion of regional and global trade negotiations.

We must make use of the lessons learned from the MDGs as we draw up the new agenda. The new Sustainable Development Goals (SDGs) should be limited in number, clearly understandable, and measurable, but at the same time achievable. If they are not, they will not win political support. Purse strings will be tightened, and the vision will be harder to sell. This is why simplicity is paramount. The simplicity of the MDGs is one of the reasons they were effective.

At the same time, the new agenda needs to be broadened in two important ways.

First, health needs to be seen in the context of other areas, such as nutrition, education, climate, and governance.

We therefore need to ask ourselves how we can develop a trans-sectoral and sustainable approach that is effective on the ground. The Norwegian government is looking closely at the links between education and health. There is strong evidence that education improves the chances of a healthy life, just as good health is a key factor in education and for subsequent employment. This is particularly true for girls. Educated girls make educated choices. They become pregnant later, and they are thus more likely to be able to feed their children properly and support them through school. Educated girls are less likely to be infected by HIV and less likely to infect others. The list goes on.

Norway intends to work with various partners to identify and promote innovative approaches that create synergies between health and girls' education at all levels.

Second, the SDGs need to be universal. This means that they will apply just as much to Norway as to the rest of the world. We are already developing plans to reduce our greatest health burden: noncommunicable diseases, including mental health problems. At the same time, we can see interesting links between global and national development agendas.

For example, we believe that homegrown solutions can often be applied elsewhere. We are convinced that high-quality medical care and preventive medicine need not only be for the rich. Prices can be drastically reduced if we find smart solutions. It has been done many times and can of course be done again.

It is not easy to predict what innovations will be developed in the period up to 2030. But there are already good ideas out there. This is why we have launched Innovation Countdown 2030, which will systematically identify and assess curve-bending innovations, engage and inspire stakeholders, raise awareness about opportunities for the global health community, and—most importantly—bring investments on board in support of the SDGs.

We now have a window of opportunity to transform the future of global health through the new development framework—if we put our minds together.



**Børge Brende** is the Minister of Foreign Affairs of Norway.

# Innovation is crucial to achieving a “grand convergence” in global health

By Gavin Yamey and Agnes Binagwaho

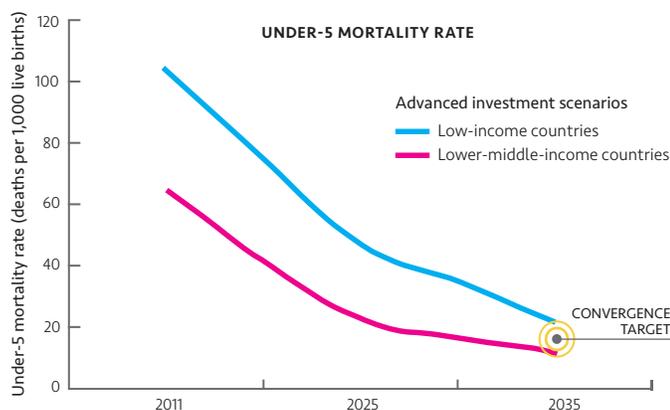
**A REMARKABLE OPPORTUNITY FOR GLOBAL HEALTH** transformation is now at our fingertips.

If we make the right health investments—to scale up existing health interventions and delivery systems and to develop and deliver new tools—we could see a “grand convergence” in global health within our lifetimes. Within one generation, we could reduce the rates of infectious, maternal, and child deaths in nearly all low- and lower-middle-income countries down to the low levels seen today in richer countries like Turkey, Chile, and Costa Rica (Figure 1).

One in ten children in poor countries dies before his or her fifth birthday; by 2035, we could reduce that rate down to one in fifty. We could prevent 10 million maternal, child, and adult deaths each year from 2035 onward. But this grand convergence cannot be achieved without innovation to discover tomorrow’s disease control tools.

We had the privilege of serving as members of The Lancet Commission on Investing in Health, chaired by Lawrence Summers and Dean Jamison. The commission published an ambitious yet feasible road map for achieving convergence, called *Global Health 2035* ([www.globalhealth2035.org](http://www.globalhealth2035.org)). The road map has three key components.

**FIGURE 1. Estimated decline in child mortality rates from enhanced health-sector investments.** The “convergence target” is 20 deaths per 1,000 live births, similar to the current child mortality rates in high-performing middle-income countries.



The first is **mobilizing financing**. The “price tag” for low- and lower-middle-income countries to achieve convergence is an additional \$70 billion per year from now to 2035. Fortunately, these countries are on course to add \$10 trillion per year to their GDP over that time period. Public investment of less than 1% of this GDP growth could therefore fund the grand convergence. Some countries, of course, will still need external assistance to finance their health programs.

The second is **targeting this financing toward the most cost-effective health interventions**. Early investment in scaling up modern methods of family planning, antiretroviral medication, and childhood vaccinations would have a particularly large and rapid payoff.

The third is **increasing funding for R&D**. Our modeling found that even with aggressive scale-up of today’s tools to 90% coverage levels, convergence would not be achieved. Low-income countries would get only about two-thirds of the way. To close the gap, new technologies will be needed. Countries that adopt new tools experience an additional 2% per year decline in their child mortality rate over countries that do not—an “acceleration” that is crucial for reaching convergence.

The most important way that the international community can support the grand convergence is by funding the discovery, development, and delivery of the next generation of medicines, vaccines, diagnostics, and devices. International funding for R&D targeted at diseases that disproportionately affect poor countries should be doubled from current levels (US\$3 billion per year) to \$6 billion per year by 2020. Game-changing technologies that could help achieve convergence include a single-dose radical cure for *vivax* and *falciparum* malaria and highly efficacious malaria, tuberculosis, and HIV vaccines.

The public health and economic benefits of achieving convergence would be profound. Every \$1 invested from 2015 to 2035 would return \$9 to \$20, an extraordinary return on investment.

We have at our fingertips one of the greatest opportunities available to improve human welfare. The question is: Will we seize it?



**Gavin Yamey, MD, MPH, MA, MRCP**, is a physician and Associate Professor of Epidemiology and Biostatistics in the School of Medicine at the University of California, San Francisco (UCSF), where he teaches global health policy. He leads the Evidence to Policy Initiative (<http://e2pi.org>) in the UCSF Global Health Group.



**Agnes Binagwaho, MD, MPed, PhD**, is a pediatrician and the Minister of Health of Rwanda. She was previously Permanent Secretary of the Ministry of Health and Executive Secretary of Rwanda’s National AIDS Control Commission. She co-chaired the MDG Project Task Force on HIV/AIDS and Access to Essential Medicines.

# The changing world of global health innovations

## New approaches to accelerating impact

By **Rajiv Shah**

**IN ETHIOPIA, A COMMUNITY HEALTH WORKER TICKLES** a newborn before administering immunizations against pneumonia and diarrhea. In Haiti, a skilled birth attendant uses a simple bag and mask to save an infant who is struggling to take her first breath. In India, a Ministry of Health official reviews scorecards with district-level data to evaluate nationwide progress.

Today, we are pioneering a child survival revolution driven by the power of innovation to realize a world where all children survive and thrive. By equipping community health workers with simple, affordable technologies, we can deliver essential health services right to the doorstep of vulnerable families—enabling countries to leapfrog slower, more traditional paths to improving the health of their children. This approach has helped cut child mortality in half in two decades. Each day this year, 17,000 more children will live, laugh, play, and learn compared to 20 years ago.

New technologies, however, still take too long to reach those who need them most. Health facilities remain underfunded and understaffed. And poor monitoring and evaluation means we do not often know what is and is not working. This year, in fact, more than 6 million children will die before their fifth birthday from causes we know how to prevent.

That is why, two years ago, we helped host a global call to action to rally the world behind a new approach and a single, comprehensive goal: ending preventable child deaths by 2035. Together, we agreed to prioritize evidence-based solutions and redirect resources to reach the poorest of the poor, who are the most likely to die from preventable causes.

This past year, we reconvened the global community at Acting on the Call: Ending Preventable Child and Maternal Deaths to take stock of our progress. With a greater emphasis on science, business, and innovation, developing countries themselves have stepped forward to lead with energy and focus. Sixteen countries have launched their own calls to action, set national targets, and created evidence-based report cards and action plans to

focus resources and lifesaving interventions in the most vulnerable regions.

These leaps forward are catalyzing new solutions along the continuum of care—from reproductive and maternal health to newborn and child health. In Zambia, a public-private partnership called Saving Mothers, Giving Life is using geospatial technology to map travel time to clinics and establishing a fleet of motorcycle ambulances to reach women in an emergency. In just one year, maternal mortality declined by roughly one-third in the districts covered by the partnership.

In Nepal, we supported randomized control trials and feasibility studies demonstrating that the antiseptic chlorhexidine cuts infant mortality by 23% for pennies per dose. We also partnered with a local company to take this solution to scale. Through Saving Lives at Birth: A Grand Challenge for Development, we are investing in at least 59 global health game-changing innovations just like chlorhexidine.

With a smart, focused, innovative approach, we know we can save millions of lives.

In the past two State of the Union addresses, President Obama called upon the US to join the world in ending extreme poverty and its most devastating consequences—child hunger and child death—in the next two decades. We know we can get this done, and we know the impact it will have. Ending child death is the first step in ensuring more children learn, get good jobs, and grow their economies. While accomplishing this mission would be a great moral victory, it is also critical to our own nation's stability, security, and prosperity. With a smart, focused, innovative approach, we know we can save millions of lives—and create ripples of change that transform the future of families and countries.



**Dr. Rajiv Shah** serves as the Administrator of the US Agency for International Development (USAID) and leads more than 9,600 professionals in 80 missions around the world.

# Let's reinvent the wheel

## A homegrown approach to transforming health care innovation in Africa

By Felix Olale

**SIXTEEN KILOMETERS WEST OF DOWNTOWN NAIROBI LIES** a university campus housing one of the most advanced research facilities in the world. Launched in November 2013, this facility is the location for IBM's 12th global research and innovation lab dedicated to solving Africa's biggest challenges. It is the result of a partnership with the Kenyan government, with IBM committed to investing US\$10 million in the first two years and the Kenyan government contributing a similar amount over the next five years.

The principal way to transform Africa's health systems is to deliberately invest in and partner with African institutions in order to build local capacity focused on local African problems.

With these funds, IBM is building one of Africa's most advanced cloud-enabled computing hubs with the ability to collect and analyze large amounts of data to build sustainable solutions for Africa's most pressing challenges. The ambitious and highly localized research agenda includes areas such as agriculture, energy, financial inclusion, health care, public safety, transportation, and water.

To tackle these challenges, IBM has hired a research staff that is somewhat unique in its composition. IBM pairs seasoned researchers with more than 20 young Africans, many holding PhDs from universities abroad. These young African scientists are part of the large diaspora beginning to return home to participate in Africa's newfound economic growth. I should know. I am one of them.

The UN's Department of Economic and Social Affairs estimates that there are 3 million tertiary-educated

migrants from sub-Saharan Africa living in member countries of the Organisation for Economic Co-operation and Development. Africa's highly educated diaspora is a vastly underutilized resource in the quest to build homegrown innovation that is fundamental to solving Africa's health care challenges.

As the global health community moves toward the post-2015 agenda, Africa's health care challenges remain formidable. Despite recent improvements, the health of the vast majority of Africans is still at risk. Sub-Saharan Africa has 11% of the global population but carries 24% of the world's disease burden. On the basic indicators of health, the continent compares poorly with other developing regions. One in six children born in the region today will die before age five. African women face more than 100 times the risk of maternal mortality than women in the developed world. The average life expectancy in sub-Saharan Africa is a mere 52 years. And sadly, most of the countries will not meet the UN's Millennium Development Goals for health by 2015, let alone address the significant threat of noncommunicable diseases now on the horizon.

This can change. I believe that the principal way to transform Africa's health systems is to deliberately invest in and partner with African institutions in order to build local capacity focused on local African problems. The ingredients for success already exist. What remains is for the global community to reinvent its approach.

We must ask the right questions in order to better utilize the window of opportunity that exists today: How can we entice more Africans in the diaspora to return home? How can we take advantage of ubiquitous data and technology? How do we better partner with local enterprise and governments to create innovation hubs and ecosystems? How do we move from today's siloed approaches toward a holistic approach that builds more sustainable African health systems?

Africa's health systems are at an inflection point. As we move toward the post-2015 agenda and the UN's agenda for the Sustainable Development Goals, the global health community has a rare opportunity to reinvent its approach to innovation and transform the health of Africa.



**Felix A. Olale, MD, PhD**, is the CEO of Wellness Group, a medical diagnostics and imaging company focused on delivering high-quality and affordable health care across Africa. He also sits as Chairman of the Board for the Excelsior Group and is on the board of directors for PATH.

# Reaching every child through immunization innovation

By Seth Berkley

**MORE THAN 200 YEARS SINCE EDWARD JENNER'S FIRST** pioneering work, vaccines continue to be one of the most innovative and cost-effective health interventions the world has ever seen. They have already paved the way for dramatic reductions in life-threatening and debilitating diseases in wealthy and many developing countries. But now, thanks to the accelerated development of new vaccines and new ways of improving access to immunization, we have the opportunity to reach every child, no matter where they live.

Innovation can enable countries to leapfrog into much higher-performing health systems and dramatically increase access to vaccines.

This is critical because, despite the great strides that have been made in increasing immunization rates, global coverage is still much lower than most people realize. At first glance, coverage has been on the rise, with the number of children receiving all doses of diphtheria-tetanus-pertussis-containing (DTP) vaccines (the traditional yardstick of immunization coverage) increasing from 73% to 83% in the last decade. However, a look at the number of children receiving all 11 vaccines recommended by the World Health Organization for universal usage—diphtheria, pertussis, tetanus, polio, *Haemophilus influenzae* type b, hepatitis B, measles, rubella, BCG (against tuberculosis), pneumococcal, and rotavirus—reveals a very different picture, with just 5% of the world's children fully immunized. It's little wonder that 1.5 million children still die from vaccine-preventable diseases every year.

Increasing the number of children who are fully immunized could make a huge impact on this figure, not least because some of these new, powerful vaccines target major killers. Rotavirus and pneumococcal vaccines, for example, protect against some of the main causes of diarrhea and pneumonia, the two biggest causes of death among children under age five.

Innovative efforts by Gavi, the Vaccine Alliance, have helped accelerate access to new and powerful vaccines. This year, we will support the introduction of one new vaccine in a Gavi-eligible country every week on average. However, introducing these vaccines is just the first step. The bigger challenge is ensuring they reach every single child, including the most remote and marginalized. This will require new tools such as digital and geographical information systems so we know where those children are and who is being missed, innovative supply chain equipment and practices so we can get vaccines everywhere they are needed, and better human resource management. Together, these can enable countries to leapfrog into much higher-performing health systems and dramatically increase access to vaccines as well as other vital health interventions.

Newer vaccines have also moved us from prevention of traditional infectious diseases to infectious causes of chronic diseases, such as cancer. Today we already have vaccines to protect against two common cancers: liver cancer (hepatitis B) and cervical cancer (human papillomavirus), and there are others in the pipeline. Given that today more than 30% of cancers in Africa have known infectious antecedents, as opposed to less than 10% in industrialized countries, this kind of innovation will prove vital.

In the long term, the trend of innovation in R&D can also lead to vaccines for many more pathogens, such as HIV, hepatitis C, malaria, and tuberculosis, all of which have thus far challenged traditional vaccinology. In the meantime, if we continue to invest in immunization innovation, by 2020 we should be able to dramatically increase the number of children who are fully immunized and come significantly closer to reaching every child.



**Seth Berkley, MD**, is the CEO of Gavi, the Vaccine Alliance.

# Ending AIDS

## Toward an HIV vaccine and cure

By Anthony Fauci

**MORE THAN THREE DECADES HAVE PASSED SINCE AIDS** was recognized and its etiologic agent, HIV, was discovered. Extraordinary scientific progress has been made in understanding, diagnosing, treating, and preventing HIV/AIDS. Globally, new HIV infections and deaths from AIDS fell by more than one-third over the past decade.

While continued scale-up of existing HIV treatment and prevention tools will likely continue to reduce new HIV infections and AIDS deaths, further innovation is needed if we are to realize the goal of a world without AIDS and sustain that landmark success. In this regard, two areas loom large: developing a vaccine to prevent HIV infection, and finding a therapeutic regimen that induces permanent or at least prolonged suppression of viremia, thereby sparing HIV-infected individuals a lifetime of antiretroviral therapy (ART).

Recent advances give cause for hope that both an HIV vaccine and a cure can be achieved with further innovation.

The history of HIV vaccine development has been marked by disappointments, but recent research advances have provided reason for optimism. Notably, candidate vaccines have proven protective in various animal models of HIV infection, and modest efficacy was seen in a large human HIV vaccine trial conducted in Thailand. Ongoing analyses of the data from the Thai trial have identified possible leads for improved vaccines, and clinical trials are planned to build on the results. Furthermore, a growing array of potent, broadly neutralizing monoclonal antibodies targeting at least five structures on the HIV envelope protein have been identified. Alone or in combination, these antibodies can neutralize most HIV strains circulating globally. Scientists are working to characterize these antibodies and the viral structures to which they bind and to trace antibody development in the bodies of HIV-infected individuals, with an eye to

eliciting such broadly neutralizing antibodies in uninfected individuals.

A second key area of innovation in HIV science is finding a cure for AIDS. The stunning successes achieved with ART for HIV-infected individuals is tempered by the fact that these lifesaving drugs are not curative; the virus persists in a latent form in cellular reservoirs even when a patient responds well to treatment. Although medicines can suppress HIV to very low levels in the blood, the virus in these reservoirs of latently infected cells resurges if treatment is stopped.

Two strategies emerge when the concept of a cure is considered: viral eradication, in which HIV is no longer present in the body, and sustained virologic remission, in which viral replication is completely suppressed or kept at very low levels in the absence of daily ART. The latter approach is likely the more feasible of the two. The extended virologic remission seen in an HIV-infected infant called the “Mississippi child” treated very soon after birth suggests that therapy, if initiated early enough in HIV infection, can perhaps preempt formation of a sustained viral reservoir. Furthermore, a cohort of patients in France was identified who started treatment early in the course of infection and later discontinued ART without viral rebound. Since very early therapeutic intervention is not always feasible, other approaches are being pursued in the quest for a cure, including activating and eliminating latently infected cells, immunotoxic therapy directed at the HIV reservoir, gene therapy, and other novel strategies including a therapeutic vaccine.

In summary, although both an HIV vaccine and a cure remain within the uncertain realm of discovery, recent advances give cause for hope that both can be achieved with further innovation. Added to our existing HIV treatment and prevention tools, an HIV vaccine and cure would help bring us closer to our goal of ending AIDS.



**Anthony S. Fauci, MD**, is Director of the National Institute of Allergy and Infectious Diseases (NIAID) at the US National Institutes of Health. Dr. Fauci also is Chief of the NIAID Laboratory of Immunoregulation and was one of the principal architects of the US President’s Emergency Plan for AIDS Relief (PEPFAR).

# Nurturing innovators and innovations

A new model for frugal innovation today for impact tomorrow

By Balram Bhargava

**INDIA IS A MIDDLE-INCOME COUNTRY WHOSE HEALTH CARE** landscape ranges from needs reminiscent of developed countries to infectious diseases prevalent in low-income countries. The vast majority of Indians cannot access or afford the medical technologies they need. More than 80% of the medical technology in India is imported, making it prohibitively expensive. Of course, India's challenges are not unique; the vast majority of low- and middle-income countries face them.

The key is need-appropriate innovation that leapfrogs significant constraints.

India's aspiration to become an advanced nation is predicated upon the nation's ability to provide high-quality health care to its people at an affordable cost. Need-appropriate innovation that leapfrogs significant constraints is the key to solving this urgent challenge. What is required is a new paradigm in innovation that leverages the deep understanding of India's needs and context by local innovators who are steeped in a frugal mind-set.

The Stanford-India Biodesign program and the new School of International Biodesign (SIB) are rooted in this new paradigm. The SIB program is a Department of Biotechnology, Government of India-funded program managed by Biotech Consortium India Limited at the All India Institute of Medical Sciences and the Indian Institute of Technology Delhi, with Stanford University as an international partner. The program brings together an interdisciplinary team of physicians, engineers, doctors, and researchers in its fellowship program. SIB fellows go through experiential learning and hands-on training in medicine, design, engineering, and business development. They identify unmet clinical needs through direct

observation and intensive research of disease processes that are screened based on parameters such as potential impact. Potential solutions for high-impact needs are screened based on technical feasibility, competitive landscape, and stakeholder analysis.

Training innovation leaders today who will create technologies to heal humanity tomorrow has been at the core of SIB's mission. Over the past seven years, the program has trained more than 100 innovators who have become the anchors of the medical technology ecosystem in the country. These innovators have invented more than ten technologies that are in active development and clinical evaluation. These three are representative of the range of SIB's innovations:

- Consure is a novel fecal catheter that solves challenges associated with a serious and underestimated problem—fecal incontinence. The start-up founded by innovators has completed product development, established scalable operations, successfully completed safety and efficacy studies, obtained patent grants in key jurisdictions, and recently received US Food and Drug Administration clearance for commercialization. Consure is a wonderful example of frugal innovation that will not only address a serious health problem in India but also bring down the costs of managing fecal incontinence in the developed world.
- HiCARE LIMO is an affordable, cardboard-based, environmentally friendly immobilizer for lower-limb fractures. Similar in performance and superior in usability to more expensive metal immobilizers, it has been licensed to public-sector manufacturing and distribution company HLL Lifecare Limited, which is now introducing the technology to health care systems in India and internationally.
- BRUN is an electronic fetomaternal wellness monitoring system in development that simplifies monitoring during labor and helps in objective decision-making, improving fetomaternal outcomes in resource-limited settings. The innovation has the potential to serve pregnant women in much of the developing world.

Collectively, the innovations from the SIB program will likely help tens of millions of people worldwide. Even more critically, the program has become a model for a country that produces an abundance of high-caliber physicians, engineers, designers, and researchers, leading to a multitude of SIB-inspired incubators across India.



**Balram Bhargava, MBBS, MD, DM, FRCP(Glasg), FRCP(Edin), FACC, FAHA, FIACS, FAMS, FNASc,** is Professor at the Department of Cardiology, Cardiothoracic Sciences Centre, and Executive Director, Stanford-India Biodesign at the All India Institute of Medical Sciences. Professor Bhargava is decorated with Padma Shri, one of India's highest civilian honors.

# Taking a bold step forward: innovation in Africa

By Glenda Gray

**AFRICA IS OFTEN SEEN AS A REGION WHERE INNOVATION** is lacking. How wrong this view is! Africa is the land of opportunity, and innovation is a key factor driving this. Whether countries are pioneering mobile health or health systems research, Africa can often be seen on the forefront of innovation. Our challenge is translating such innovation to scale and impact.

Africa can often be seen on the forefront of innovation. Our challenge is translating such innovation to scale and impact.

Nowhere is innovation in Africa more critical than in the field of health care. Whether it equips us to diagnose a patient at the most remote clinic, or whether it ensures the quality and integrity of medicines, innovation is central to driving better patient care toward 2030.

The first thing to realize about Africa is that we are different from the rest of the world. Compared to other regions, we have unique needs, a genetically diverse population, different diets, and a very different disease burden profile. Taking these differences into account, one soon learns that innovation and impact are measured quite differently here than they are in the northern hemisphere. Impact factors and citation rates are important to us. But saving lives and impact are most important.

At the Medical Research Council in South Africa, we seek to focus on the impact of innovation to save lives. We are approaching this goal in partnership and with a focus on the key disease burdens of our continent. One such example is our exciting partnership with PATH to develop critical interventions focusing on maternal and child health by taking projects to scale. These interventions include a

low-cost Doppler device to measure umbilical function in the last trimester of pregnancy, which could reduce infant mortality in an environment where an ultrasound is a three-hour drive away.

We're rethinking the possibilities in light of Africa's unique needs and capabilities.

In Africa, waiting times at rural clinics can often be more than 12 hours. As a result, many sick people are sent home untreated, even though many can't afford the fare to return to clinic the following day. These individuals are lost to the system. To overcome this challenge, we are focusing on developing an electronic triage device that seeks to radically reduce patient waiting times and help those in greatest need first. Our first study in this domain showed a radical improvement of triage times, a vast reduction of errors, and improved patient outcomes. Building on this momentum, we will next seek to address the challenge of developing electronic records of patients.

None of these examples required the latest technology—this is not always Africa's need in health care. Rather, they involved a new way of approaching enduring problems, rethinking the possibilities in light of Africa's unique needs as well as our unique capabilities.



**Glenda Gray, MBBCH, FCPaeds (SA), DSc (honoris causa)**, a National Research Foundation A-rated scientist, is President of the Medical Research Council of South Africa.

# Scaling innovations to save lives of women and children pre- and post-2015

By Haitham El-noush, Allan Pamba, and Peter A. Singer

**IN 2010, UN SECRETARY-GENERAL BAN KI-MOON LAUNCHED** the Every Woman Every Child (EWEC) initiative to mobilize and intensify global action to improve the health of women and children around the world. The EWEC initiative hosted the Accountability Commission, the independent Expert Review Group, the UN Commission on Life-Saving Commodities for Women's and Children's Health, and the Innovation Working Group (IWG).

The IWG was established to advocate for, identify, and support innovations to accelerate progress on the health targets included in the Millennium Development Goals. Through its flexible structure and extensive network of more than 180 members representing more than 80 institutions, the IWG has made the case for innovation as game-changer for maternal, newborn, and child health (MNCH), whether science and technology, social, business, financial, or some combination of these.

In addition, the IWG has produced useful reports on sustainable business models for delivering health care, engagement guides for companies, and checklists for improved health care, the deployment of innovative medical devices in low-resource settings, nutrition for adolescent girls, mHealth and telemedicine, and innovative financial models. Importantly, the IWG is the primary platform for private-sector engagement in the EWEC initiative. Thanks are due to the support of the Government of Norway and the visionary leadership of Tore Godal.

Meanwhile, global partners were developing a pipeline of innovations in MNCH that did not previously exist. For example, the Bill & Melinda Gates Foundation, Grand Challenges Canada, the US Agency for International Development, the Norwegian Agency for Development Cooperation, and UK Aid partnered on Saving Lives at Birth, which has supported 91 innovations, including 77 at the proof-of-concept stage and 14 transitioning to scale. These partners and others have supported hundreds of MNCH innovations.

While most of these innovations are still at the proof-of-concept stage, there are some examples of innovations already transitioning to scale, such as the Odon device (innovation in assisted vaginal delivery) being scaled by BD

and the Linda Jamii program (health care micro-insurance) developed by Changamka, Safaricom, and Britam.

The challenge now is to turn up the tap on this robust pipeline of MNCH innovations, unleash the social capital and expertise needed for scaling, and turn the trickle of innovations transitioning to scale into a torrent.

There are strong links and exciting complementarities between the IWG and the Innovation Countdown 2030 initiative, which will help to identify these promising MNCH innovations. While the IWG follows the EWEC initiative's timeframe and focuses on MNCH, Innovation Countdown 2030 targets additional health domains including reproductive health and infectious and noncommunicable diseases, as well as MNCH. The outcomes of the Innovation Countdown 2030 initiative will greatly benefit efforts to scale innovation as the project looks to provide insights into which innovations will have the highest impact and to develop an innovation assessment framework.

A key strategy of the IWG going forward will be to contribute to a global marketplace for MNCH innovations, where innovations meet investors to help them transition to scale in a sustainable manner and achieve widespread impact. The IWG is uniquely positioned to contribute to such a platform. Its comparative advantage is the ability to bring its member network to invest in the most promising innovations in the MNCH pipeline. This will prove crucial in achieving the target set in the IWG strategy of demonstrating several scaling and scaled MNCH innovations within the coming two years.



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**Allan Pamba, MD, MSc**, is Vice President of Pharmaceuticals, East Africa and Government Affairs, Africa, for GlaxoSmithKline, and co-chair of the Innovation Working Group.



**Peter A. Singer, OC, MD, MPH, FRSC**, is CEO of Grand Challenges Canada.

# The next frontier

## Digital health for scaled impact

By Craig Friderichs

**THE POTENTIAL OF MOBILE AND INFORMATION AND** communications technology to support behavior change, supply chain improvements, health financing, health worker enablement, and other critical health services has been well-documented. However, mHealth has yet to demonstrate significant scale and integration into the health system. Mobile is dependent on volume to drive economies of scale, but fragmentation, inadequate partnership brokerage, and an inability to access business-to-business (B2B) payment mechanisms have largely prevented mHealth services from reaching significant scale.

Realizing the potential of mHealth will depend on creating sustainable, low-margin, high-volume business models.

With more than 85% of total health care expenditures existing in a B2B or reimbursive payment environment, mHealth stakeholders have to be able to demonstrate strong economic evidence of mHealth's cost impact on specific health interventions.

We have been tracking the growth in mHealth since 2010, looking for evidence to support the sustainable B2B integration of mobile into the fiscal budgets of national or regional health providers. Our first literature review helped us understand that out of more than 800 peer-reviewed publications, less than 1% demonstrated a cost implication to the health intervention and/or health system.

Four years later, we are now tracking more than 1,300 mHealth services being deployed across emerging markets. The phenomenal growth in the number of new services has not, unfortunately, seen a parallel growth in the evidence base of these services, particularly economic or cost proof points. Some 90% of services rely on donor funding and/or a consumer payment model, both of which we would argue are unsustainable given the short-term nature of funding and the inability of consumers at the bottom of the pyramid to contribute significantly to out-of-pocket health expenses.

Building toward scale and sustainability, we need to be conscious of the fact that mobile services are built around a high-volume, low-margin business model. Most of the mHealth services we analyze are not able to achieve this tipping point of active users that allows for economies of scale.

The vast majority of sustainability models are designed for thousands or tens of thousands of users. When we presented an opportunity from one of our GSMA members, Samsung, to pre-embed health services onto 80 million mobile devices across Africa over the next two years, only a handful of service providers were able to adjust their offering to take advantage of this opportunity to support up to 80 million potential users across Africa.

We also have to consider how to better leverage the mobile ecosystem to drive scale and sustainability. Internet.org was able to secure zero-rated connectivity agreements with Airtel in Zambia recently with a strong brand value and product offering. MTN and Airtel Group have committed to similar offerings across their portfolio of operations if mHealth stakeholders can demonstrate a win-win value proposition.

Gemalto, the largest SIM card manufacturer, has about 350 million SIMs in circulation across sub-Saharan Africa and has committed to distribute health content and enable civil registration. Samsung, in addition to pre-embedding Smart Health onto 80 million devices, has committed to make its Samsung ecosystem available. It is hoped that financial and nonfinancial incentives will drive demand for health services. For example, users might receive a week's free access to the Samsung music store for completing an immunization schedule.

Realizing the potential of mHealth will depend on creating sustainable, low-margin, high-volume business models. This volume is dependent on strong demand from end users. Demand can be catalyzed through an ecosystem of delivery partners aiming to drive down the prohibitive cost of handsets and connectivity; leverage strong marketing, distribution, and public relations campaigns; and aggregate the multitude of mHealth services onto a single user interface.



Craig Friderichs, MD, MBA, is Director of Health at GSMA and has pioneered the GSMA ecosystem partnership and the Pan-African mHealth Initiative.

# Why innovation matters

By Steve Davis

**INNOVATION IS TRANSFORMING GLOBAL EFFORTS TO SAVE** lives and improve health, including in the world's most vulnerable communities. By harnessing the power of new ideas and channeling the expertise of a diverse ecosystem of partners, networks, and systems, innovation is fueling health solutions that are more effective, more accessible, and less expensive than ever before.

Researchers have started to quantify just how profound the impact of innovation can be. The Institute for Health Metrics and Evaluation, for example, determined that new vaccines, drugs, diagnostics, public health campaigns, and related innovations resulted in 4.2 million fewer child deaths in 2013, compared to 1990.<sup>1</sup> Progress like this is fundamentally changing the landscape of human health and opportunity.

Yet the truth is we have only begun to tap innovation's radical potential.

The nature of innovation itself is changing in ways that could exponentially accelerate our progress.

Today, game-changing breakthroughs are coming from every corner of the globe. Innovation comes from scrappy start-ups in India and entrepreneurs in South Africa inspired by firsthand knowledge of their communities' needs. It comes from cross-sector partnerships and enterprising, underfunded inventors. Sometimes, it comes from the most unlikely of sources. Right now, the World Health Organization and BD, a medical technology company, are testing and developing a prototype device that could help babies make their way through the birth canal—an idea conceived by a car mechanic in Argentina inspired by an online video on how to extract a cork from an empty wine bottle.

The nature of innovation itself is changing in ways that could exponentially accelerate our progress. As a global community, we must break down the barriers and silos that choke the flow of innovation through the development pipeline. We must create new ways to connect our brightest

minds, greatest ideas, and common aspirations across sectors, disciplines, and borders.

At PATH, we know that finding creative ways to connect innovation and impact can drive massive improvements in health. For example, our work with partners in China turned an effective vaccine that was virtually unknown outside the country into an internationally approved tool to fight Japanese encephalitis, a disease that kills three in ten people it infects. We used an innovative systems approach to make it happen—strengthening disease surveillance, negotiating affordable pricing, and providing technical expertise to help the manufacturer in China meet international regulatory standards. The vaccine is now being rolled out to millions of children across Asia.

Greater investments in research and development are critical to accelerating progress. The Lancet Commission on Investing in Health has called for the doubling by 2020 of funding for international R&D that targets diseases disproportionately affecting low- and middle-income countries.<sup>2</sup> Focusing our efforts on the most promising innovations will yield tremendous returns on investment in both lives and resources saved.

Now is the time to reach higher and bring together the world's leading innovators—from experts in the global health community to social and impact investors, entrepreneurs, technology and business leaders, policymakers, and partners from the Global South. How much more could we do together by harnessing our collective expertise, resources, networks, and commitment? How dramatically could we accelerate innovation and reach the millions of women and children still waiting to share in the gains?

## References

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- 2 Jamison DT, Summers LH, Alleyne G, et al. Global health 2035: a world converging within a generation. *The Lancet*. 2013;382(9908):1898–1955.



**Steve Davis** is President and CEO of PATH, an international nonprofit organization driving transformative innovation to save lives and improve health, especially among women and children.

## ABOUT INNOVATION COUNTDOWN 2030

The logo for Innovation Countdown 2030 is displayed on an orange rectangular background. The text "INNOVATION" is at the top in a bold, sans-serif font. Below it, "COUNTDOWN" is written in a smaller, spaced-out font. The year "2030" is the largest element, positioned to the right of "COUNTDOWN".

Innovation Countdown 2030 is reimagining what's possible in global health. Led by PATH, the initiative is identifying and showcasing technologies and interventions with great promise to accelerate progress

toward solving the world's most urgent health issues. The initiative is supported by the Government of Norway.

By engaging entrepreneurs, investors, innovators, and experts across sectors and around the world, the Innovation Countdown 2030 initiative aims to accelerate high-potential innovations, catalyzing investment and increasing awareness of and support for transformative ideas to improve health and save lives.

### **Our approach**

To identify innovations with great potential for global health impact by 2030, PATH is conducting a survey to gather innovations identified by a broad range of multidisciplinary experts in global health, technology, investment, the nonprofit sector, academia, and government from around the world.

The survey is available at: [www.ic2030.org/engage/](http://www.ic2030.org/engage/)

Survey responses received by October 10, 2014, will be evaluated using an assessment methodology developed with the input and guidance of an independent expert advisory group. An independent panel of experts will rank selected innovations, taking into account their potential for impact based on their affordability, accessibility, effectiveness, and other factors.

### **The Innovation Countdown 2030 report**

The final set of selected health technologies and interventions will be featured in the *Innovation Countdown 2030* report planned for release in 2015.

Financing mechanisms for smallholder farmers to improve food security?



A mosquito-repellent patch?

Therapeutic regimens that induce prolonged suppression of viremia in HIV-positive patients?



**Geospatial technology to map travel times to clinics?**

# Join the conversation

## What's your idea for transforming global health?

Which technologies and interventions do you believe will drive dramatic improvements in health over the next 15 years and beyond?

## Take the Innovation Countdown 2030 survey

Nominate the innovations you believe have great potential for health impact by taking our short survey, available at: [www.ic2030.org/engage/](http://www.ic2030.org/engage/)

Survey responses received by October 10, 2014, will be evaluated using an assessment methodology developed with input from an independent expert advisory group. An independent panel of experts will rank selected innovations, with high-potential innovations to be showcased in the *Innovation Countdown 2030* report planned for release in 2015.

Survey responses received after October 10, 2014, will be part of a pool of innovations considered for future editions of the report.

### DISCOVER

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