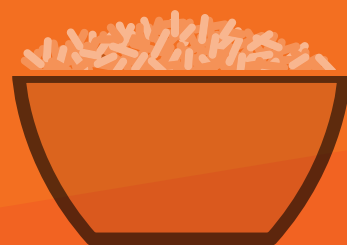
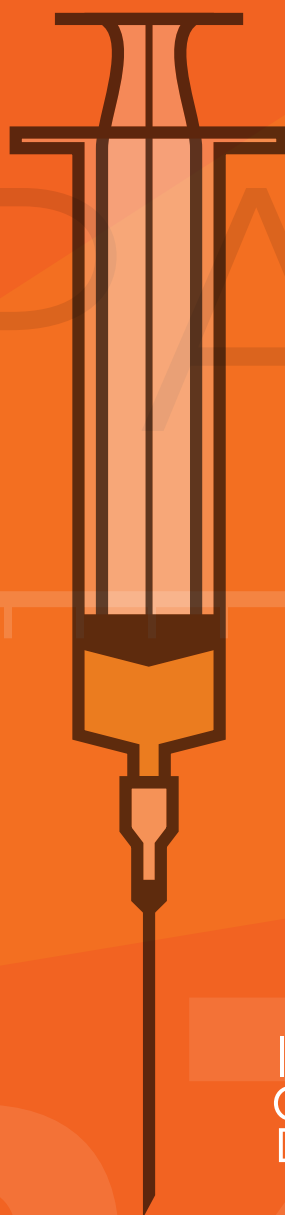
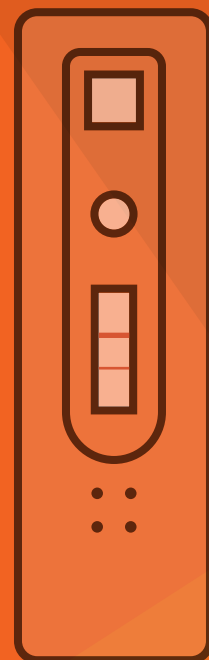


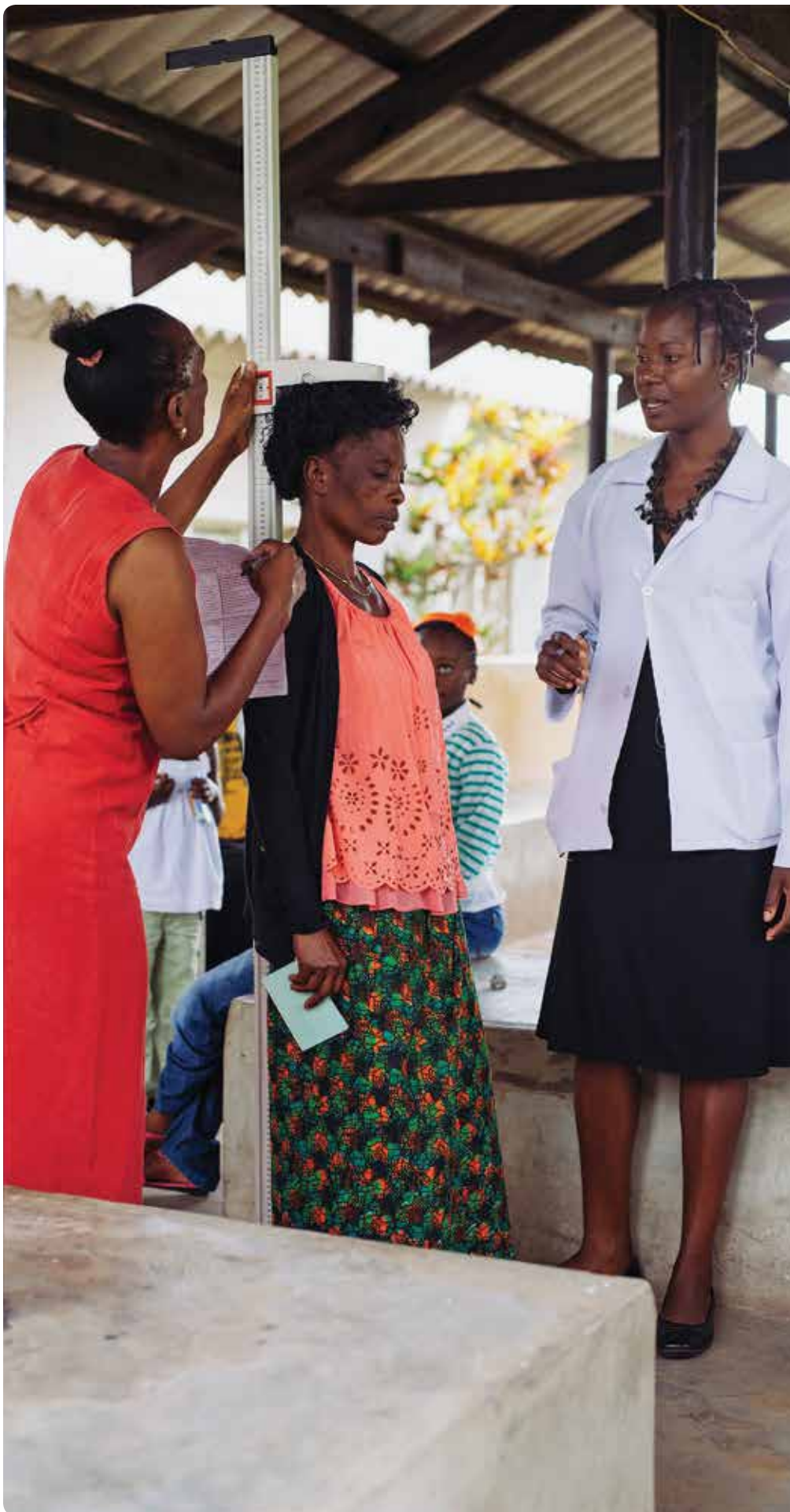
THE IC2030 REPORT

Reimagining global health

**30 high-impact innovations
to save lives**



INNOVATION
COUNT
DOWN 2030

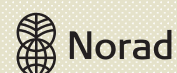


INNOVATION COUNTDOWN 2030

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 Norwegian Agency for Development Cooperation, the Bill & Melinda Gates Foundation, and the US Agency for International Development.

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.

www.ic2030.org



BILL & MELINDA
GATES foundation



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July 2015

INTRODUCTION

We stand on the cusp of an unprecedented opportunity—the chance to transform health through the power of innovation, ensuring a brighter future for people in every corner of the globe.

Advances in science, technology, and health care delivery are already opening the doors of possibility in ways that were previously unimaginable. The United Nations (UN) Millennium Development Goals catalyzed a new global focus on ending preventable maternal and child deaths, goals that have driven unparalleled progress since 2000.

Reimagining Global Health, the inaugural report of the Innovation Countdown 2030 initiative, highlights 30 lifesaving innovations with great promise to accelerate that progress over the next 15 years to reach the proposed health targets of the UN Sustainable Development Goals (SDGs).

The report also features commentaries by leading health, business, and technology experts on the essential role of innovation in driving health impact.

The report is the result of a yearlong effort to identify, evaluate, and showcase game-changing health technologies and ideas. We sought innovations from across sectors, disciplines, and borders, crowdsourcing hundreds of ideas from developers, entrepreneurs, and experts. Dozens of independent health experts then evaluated and ranked them, selecting the 30 innovations featured here.

On the eve of launching the SDGs, the global community now knows what we can accomplish by coming together around a common set of goals and throwing our collective weight behind health solutions with the most potential for impact.

As world leaders consider how to finance and scale up those solutions, we know that coordinated investment and financing will be essential in our efforts to reach the 2030 health targets—and to ensure we can financially sustain those gains into the future.

We can accelerate our progress by prioritizing promising new vaccines, diagnostics, and other innovations and by expanding access to existing interventions and tools that have already proven themselves effective and affordable.

Many of the solutions we need to tackle the world's greatest health challenges are poised for impact. Will we grasp the opportunity to reimagine global health?

Steve Davis
President and CEO
PATH

Tore Godal
Special Advisor on Global Health
Ministry of Foreign Affairs, Norway

Christopher Elias
President, Global Development Program
Bill & Melinda Gates Foundation

Ariel Pablos-Méndez
Assistant Administrator for Global Health
US Agency for International Development

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The way forward

Frugal innovation: the engine of sustainable development

How to achieve better health care for more people at lower cost

By Navi Radjou



Navi Radjou is a Fellow at Cambridge Judge Business School. He is co-author of *Jugaad Innovation* and *Frugal Innovation*. He won the 2013 Thinkers50 Innovation Award and spoke at TED/Global 2014. An Indian-born French national, he lives in California.

Development goes hand in hand with innovation. Western countries became “developed” economies by investing heavily in research and development (R&D) to create new technologies and processes.

Yet today, the R&D-driven innovation model is running out of steam because it is too costly, elitist, and rigid and fails to address even basic socioeconomic needs. More Americans are getting sicker—45 percent have at least one chronic disease—even as health care spending skyrockets.

The West’s “more with more” innovation model uses ever more financial and natural resources to produce ever more costly and sophisticated products and services. Low-income countries don’t stand to gain much by importing this model.

Inclusive and sustainable development in both emerging and advanced economies requires *frugal innovation*—a disruptive approach that strives to deliver more economic and social value to more people using fewer financial and natural resources.

By delivering “more (and better) with less,” frugal innovation enables socially and environmentally responsible economic development through products and services that combine four qualities: affordability, accessibility, sustainability, and quality.

Based on my in-depth study of pioneers of frugal innovation in the global health care sector, I identified three core principles that public, private, and nonprofit organizations can use to create and deliver health solutions at lower cost to more people.

Favor simplicity over sophistication.

Easier-to-use medical solutions are less expensive to develop and maintain and more accessible. For instance, to address China’s shortage of qualified doctors, Siemens’ Chinese engineers created a CT scanner that can be used by health professionals who are not doctors.

This scanner, which processes images more quickly and uses less energy, cuts the cost of treatment by 30 percent and curbs radiation by up to 60 percent. It is now successfully commercialized in the United States.

Use what is abundant to address what is scarce. Health care providers should use resources that already exist widely—like abundant mobile and satellite connectivity—to deliver care faster, better, and cheaper.

For example, Dr. Mohan, a world-renowned diabetologist, operates a mobile clinic in India housed in a satellite-enabled van that links low-income patients in remote villages to urban doctors. Dr. Mohan teamed up with the Indian space agency to get free satellite communication for his telemedicine service.

Collaborate across sectors for greater impact. Private-sector health providers should team up with public and nonprofit entities and integrate their knowledge and networks to boost their reach.

For instance, to help reduce infant and maternal mortality in Bangladesh, General Electric partnered with Grameen Kalyan (a sister company of Grameen Bank) to train paramedics in rural clinics in the use of ultrasound devices, making this solution more widely available. The nonprofit ColaLife “piggybacks” on the cold-chain process of soft drink distributors as an inexpensive way to preserve lifesaving medicines and distribute them to African villages.

Ultimately, frugal innovation could boost collaboration between emerging and advanced economies, enabling them to cocreate affordable and sustainable health solutions that benefit everyone. ■

The astonishing returns of investing in global health R&D

How to reach a “grand convergence” by 2035

By Lawrence Summers and Gavin Yamey



Lawrence Summers is President Emeritus and Charles W. Eliot University Professor of Harvard University and a former US Treasury Secretary. He chaired *The Lancet* Commission on Investing in Health (CIH) and co-chaired the Center for American Progress's Inclusive Prosperity Commission.



Gavin Yamey is Associate Professor of Epidemiology and Biostatistics in the Global Health Group (GHG) at the University of California, San Francisco. He directs the GHG's Evidence to Policy Initiative. He is a member of the CIH and *The Lancet* Commission on Global Surgery.

We have a once-in-human-history opportunity to achieve a “grand convergence” in global health—a reduction in infectious, maternal, and child deaths down to universally low levels everywhere on the planet.

The *Global Health 2035* report that we co-authored with 23 other economists and health experts came to a startling conclusion: With the right investments, we could reach grand convergence in just one generation, averting 10 million deaths every year by 2035.

But today's health tools alone won't get us there. We'll need tomorrow's tools as well, including new medicines, vaccines, diagnostics, and other innovations.

Investing in global health R&D won't just save millions of lives. It will also reap astonishing economic returns.

Take the polio vaccine. In the 1950s, the March of Dimes invested about US\$26 million in developing the vaccine. Since routine vaccination was introduced in the United States, more than 160,000 polio deaths and about 1.1 million cases of paralytic polio have been prevented. Treatment cost savings have generated a net benefit of around \$180 billion. It's hard to think of a better \$26 million investment in human history.

Today's scientists are focusing on equally game-changing innovations, like an HIV vaccine. Our colleagues Dean Jamison and Rob Hecht have shown that every \$1 invested in this vaccine would return between \$2 and \$67, assuming a vaccine of 50 percent efficacy becomes available by 2030 and R&D costs of about \$900 million annually. Other game-changers—like a single-dose malaria cure or inhaled oxytocin to treat life-threatening maternal bleeding—are likely to bring similar economic returns.

Discussions about global health R&D often lead to concerns about whether countries

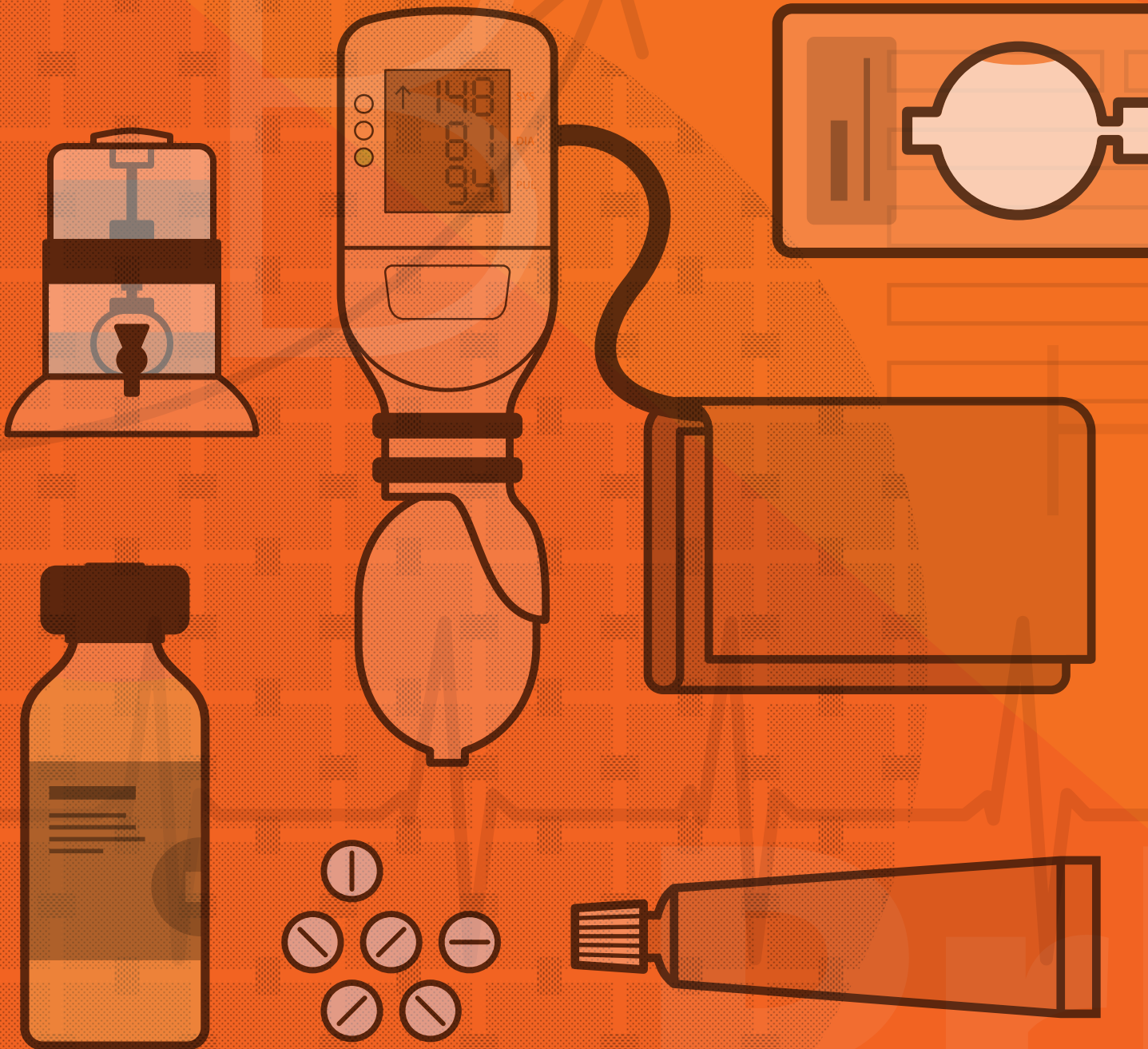
have the institutional capacity to deliver new tools. One of the striking features of health innovations is that they can be “capacity-conserving.” Our main tool for preventing malaria is arranging regular mass distributions of bednets and teaching households how to use them properly, a hugely resource-intensive intervention. When we develop a highly effective malaria vaccine, we will be conserving such resources. Bednets will come to be seen as a cumbersome relic, akin to the iron lung in the era before polio vaccines.

In *Global Health 2035*, we called on donors to step up their R&D investments. Public, private, and philanthropic investors are now on the lookout for high-impact R&D opportunities to catalyze global change. Today, 129 billionaires have pledged to give at least half of their wealth to charity through The Giving Pledge. Health is their number one interest.

But investors want more guidance on how to achieve maximum impact. We believe a new “health investors' platform” could provide this kind of strategic knowledge about the greatest health challenges facing poor populations, the most promising candidates in the R&D pipeline, and the likely health and economic impacts of developing these into health tools that will reach the poor.

Global Health 2035 challenged all of us to reach higher and faster. But we will fail unless we find creative ways to bring new health tools to those with the greatest health needs. ■

30 high-impact innovations to save lives



How to accelerate innovation to solve the world's most urgent health issues

By Amie Batson

What if the solutions to the greatest health challenges of our time were within reach? Imagine if the world came together around those solutions and worked to accelerate the ones with the most potential to transform health.

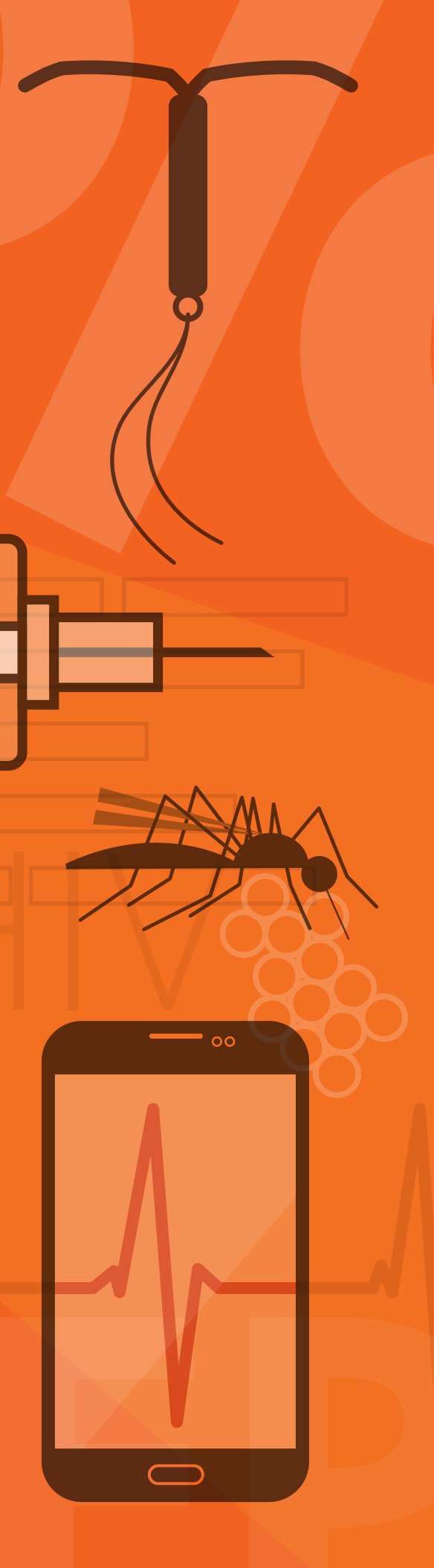
How might the world source, assess, finance, and coordinate investment in the highest-impact innovations and dismantle the barriers that keep them from reaching the very people who need them most?

This is the intriguing premise behind the PATH-led Innovation Countdown 2030 (IC2030) initiative. With support from the Norwegian Agency for Development Cooperation, the Bill & Melinda Gates Foundation, and the US Agency for International Development, we set out to identify, evaluate, and showcase health technologies and interventions with great promise to accelerate progress toward solving the world's most urgent health issues.

We turned to experts and innovators all over the globe, crowdsourcing transformative ideas and innovations that could dramatically increase the affordability, accessibility, or effectiveness of health care compared to the current standard of care.

Reimagining Global Health, the inaugural report of the IC2030 initiative, features 30 innovations that experts believe could quicken the pace of progress toward the health targets in the proposed UN Sustainable Development Goals (SDGs), along with commentaries from health, technology, and business leaders.

These 30 innovations are presented in four categories mapped to the proposed health targets: maternal, newborn, and child health (MNCH); infectious diseases, including malaria, HIV/AIDS, and tuberculosis (TB); reproductive health; and noncommunicable diseases (NCDs), including diabetes, cancer, and chronic respiratory and cardiovascular disease.





Amie Batson, MBA, is PATH's Chief Strategy Officer. Her 20-year career in global health includes positions with the World Health Organization, the World Bank, UNICEF, and most recently, the US Agency for International Development, where she served as Senior Deputy Assistant Administrator for Global Health.

We cast a wide net in our search because innovation is truly diverse and global. Our call for nominations brought in more than 500 ideas submitted by people in nearly 50 countries across five platforms: devices; diagnostics; drugs and therapeutics; systems and services, including digital health; and vaccines.

We then tapped more than 60 health experts to evaluate and rank those innovations, selecting the final set featured here. For a detailed look at our methodology, please see pages 37–41.

FOUR STRATEGIES TO ACCELERATE THE IMPACT OF INNOVATION

Our list of 30 promising innovations and our dialogue with experts and innovators around the world offer important insights into what it will take to harness the power of innovation to save lives.

1. Tap and support innovation wherever it occurs.

Innovators are everywhere, not just in well-funded labs and technology companies in wealthy nations. Today's innovation ecosystem is diffuse, with smart ideas coming from every corner of the globe and across every sector and discipline.

The world increasingly sees the importance of user-centric solutions that are demand-

driven, relevant, and affordable. The opportunities for accelerating innovation—wherever it comes from—have never been greater, empowered by digital platforms where new ideas, data, and approaches can be shared, developed, and deployed.

Our crowdsourcing approach for gathering innovations is one example of the new tools that are redefining health innovation. Nearly 30 percent of the 500-plus submissions received by IC2030 came from people in low- and middle-income countries, giving voice to their growing role in health innovation.

There were many more promising ideas than we could feature in this report. More innovation submissions we received will be available on our website over the coming months: www.ic2030.org.

Strengthening the capacity of low- and middle-income countries to identify, develop, adapt, produce, regulate, assess, and share innovations is critical for a robust innovation pipeline. Investments in countries' innovation ecosystems will catalyze better overall global health while ensuring that innovations are appropriate for low-resource markets and local contexts and cultures. Innovators with direct experience working with limited resources may be the best source for frugal innovations—cost-effective solutions to address the needs of the poor, wherever they live.

By accelerating innovations, including vaccines and other high-impact health solutions, we can transform health, save lives, and open the doors of opportunity to new generations.



PAT/Case Biencycki



Proposed SDG 3: Key health targets

Ensure healthy lives and promote well-being for all at all ages.

By 2030:

Reduce the global maternal mortality ratio to less than 70 per 100,000 live births and end preventable deaths of newborns and children under five years old.

End the epidemics of AIDS, TB, malaria, and neglected tropical diseases and combat other infectious diseases.

Reduce by one-third premature mortality from NCDs.

Ensure universal access to sexual and reproductive health care services.

2. Assess and advance innovations that deliver the most health for the money.

Rigorous and transparent assessment of an innovation's health impact, market size, and technological feasibility compared to alternatives in the pipeline is important for informing decisions about where to invest precious health resources. Low- and middle-income country governments are requesting assistance in evaluating the potential health and economic value of introducing one innovation versus another amid a burgeoning supply of new tools and interventions. Investors are also demanding more and better data on which to base investment decisions.

However, comparing innovations across diseases and conditions is a challenge. Health experts frequently focus on specific conditions and make decisions with a single health outcome in mind.

A key feature of IC2030 is the health and cost impact modeling process we developed to quantify lives saved, cases of disease averted, and costs for a subset of MNCH innovations. This model could provide a common framework to assess innovations with the greatest potential to address the SDG health targets.

Our impact modeling results for select maternal, newborn, and child health innovations are featured on pages 13–19. The data provide new insights into prioritizing global health investments for greatest impact.

For example, we found that new tools for community-level water treatment to prevent diarrheal disease and the scale-up of a low-cost drug to prevent newborn infections could save more lives over the next 15 years compared to other innovations we modeled.

Measuring the impact of crosscutting innovations is equally important. These health systems and platform innovations, including digital tools and broad diagnostics, have the potential to address multiple SDG health targets simultaneously. About one in five of the innovations submitted to IC2030 was crosscutting in nature.

Yet assessing their impact is particularly challenging because of the complexity of linking multiple health outcomes to the

foundational structure of the health system that supports them. In this first year of IC2030, we did not systematically evaluate crosscutting innovations, but they will be a focus going forward.

New assessment tools and more comparable, comprehensive, and reliable financial and technical data are critical to help spotlight and advance innovations with particular promise that might otherwise be overlooked.

A clear and rigorous framework to gauge the best value for money in a range of low- and middle-income settings is needed to inform national and subnational purchasing decisions and the decisions of those purchasing on behalf of countries. This will also help innovation investors more accurately assess potential impact, markets, and revenue flows.

Zeroing in on health solutions that offer the greatest value for money is the essential next step in reaching the millions of people still waiting to share in the gains of our progress.

3. Develop new financing mechanisms for global health innovation.

The pool of public and private funds to invest in health innovations is large and evolving. Funds from traditional R&D and development donors—typically dedicated public funds from wealthy countries—are being augmented by resources from philanthropies, social impact investors, private-sector mechanisms, and domestic sources. This new mix of innovation funding creates both opportunities and challenges.

Domestic funding to introduce and scale up health innovations is becoming central to innovation funding. As low- and middle-income economies grow and countries graduate from aid, they are expected to finance their own health expenditures, creating new markets for affordable health tools and interventions.

Sustainable financing of innovation will depend on the decisions of domestic stakeholders, including governments, insurance entities, corporations, and individuals. As more viable markets emerge, we will see a rebalancing of innovation from being primarily supply-side driven by donors and the R&D community to being more demand-side driven by countries

and markets. Supporting country decision-makers to buy or, in the case of insurance mechanisms, cover or reimburse cost-effective health innovations must be at the heart of a new and improved financing model.

Global funding mechanisms, including the Global Fund to Fight AIDS, Tuberculosis and Malaria and the new Global Financing Facility at the World Bank, may be well-positioned to act as intermediaries, as Gavi, the Vaccine Alliance, currently does for vaccines. These mechanisms can increase the certainty that funds will be readily available to purchase high-priority innovations if countries demand them. To play this role, they will need a window into the innovation pipeline and a means of engaging with eligible governments to identify high-impact innovations.

The next generation of health financing mechanisms must also be responsive to the increasing requirements of social impact and private investors who base their investment decisions on not only the potential health impact of an innovation

but also its probable market in low- and middle-income countries. While traditional funders have always understood the importance of having a clear “line-of-sight” to the market, it was often discounted. The

assumption has been that if an innovation demonstrated significant public health value, a donor would eventually support it.

New financing mechanisms must spotlight and bridge the critical links between R&D decisions, market uptake, and health impact. Innovators will respond to incentives that encourage them to maintain a focus on the market from the beginning of the development process to ensure the creation of sustainable and affordable innovations.

New financing mechanisms must also provide more efficient and effective models for making and executing investment decisions. Over the past decade, the evolving spectrum of innovation funders has led to

increasing fragmentation of investment decisions and growing transaction costs.

Each investor—whether a public agency representative, a social impact investor, or a minister of health—brings a unique mix of risk tolerance, due diligence processes, data sources, expected returns, and interest in specific platforms, geographies, or health areas. For any investor, the difficulty and risk of investing alone is high, but today, the transaction cost of coordinating decisions and investment can be even higher. Global health investment funds try to address this challenge but require all investors to align on risk/reward preferences.

The growing diversity of funders, while currently a challenge, has the potential to be a benefit if investors can leverage their different interests and risk tolerance. If actively coordinated, mixed sources of funding can be structured to finance different stages in the innovation cycle with a focus on the market.

This means recognizing the growing role of purchasers in establishing a market, as well as finding new ways to align the decisions of investors and purchasers. All parties would make better decisions if they knew, and could count on, what others were doing.

4. Coordinate investments to ensure a strategic approach to health innovation.

Coordinated investments in innovations across the continuum of care, including prevention, diagnosis, treatment, and disease management, have the potential to ensure a comprehensive suite of health tools and services designed for the greatest possible impact. The proposed SDGs provide the opportunity for investors to work toward shared health targets and better coordination in how they source, assess, and invest in innovations that achieve those targets.

Yet we found potential inefficiencies in investment approaches that may underscore the current lack of coordination. In certain health areas, for example, we received nominations for multiple devices all taking a similar approach to address the same health condition. While competition might result in better tools at better prices, it also raises the question of whether donors are aware of what others are investing in and

Coordinated investments in innovations across the continuum of care have the potential to ensure a comprehensive suite of health tools and services designed for the greatest possible impact.



Expert advisory panels

We thank the more than 60 independent experts who contributed their time and insights to the IC2030 innovation selection process. For our list of experts, please see pages 42–43.

whether scarce resources could be more strategically targeted.

In maternal health, we received many submissions for diagnostics to predict and detect preeclampsia/eclampsia—the second leading cause of maternal mortality—but few innovations for the treatment of these life-threatening conditions. In many low-resource settings, the existing treatment, magnesium sulfate, is underused, incorrectly administered, or unavailable. Diagnostics will have limited value unless innovations in new treatments and delivery systems are developed in parallel.

A broader understanding of where investments in innovation are high—or very low—is also warranted. NCDs now account for about two-thirds of global deaths, yet we received very few innovation nominations. Donors may assume others are funding NCD innovations while they focus on infectious diseases.

Will they be surprised when they pivot to NCDs and discover the lack of appropriate innovations for people in low-resource settings? Could investments in preventive innovations today allow countries to effectively leapfrog developed nations and avoid creating the huge treatment burdens associated with NCDs?

CONCLUSION

The robust and growing innovation pipeline presents an exciting opportunity to accelerate high-impact solutions that can create better health and opportunity for all.

Ensuring the best ideas are surfaced—wherever they come from—is the first critical step we must take to deliver on the promise of the SDG health targets. This should include investing in the innovation ecosystem in low-resource countries to enable local entrepreneurs to develop, produce, and share their ideas. It also means using new crowdsourcing tools to gather ideas and data visualization to make the comprehensive pipeline more visible to national and global investors, policymakers, and innovators.

Developing and adopting assessment methodologies that provide common, consistent, and comparable evaluations of

innovations is the second step. Countries are in great need of health technology assessment tools that allow governments and insurance entities to decide which of the many innovations available today and in the future should be procured, covered, and reimbursed. These tools also will improve the quality of market estimates, one of the most critical and yet weakest components of innovation assessment for all investors.

The third step is to develop innovative financing mechanisms that both recognize the growing importance of domestic finance in determining markets in low- and middle-income countries and benefit from the growing diversity of investors. Financiers have the potential to leverage their investments by aligning with other funders while maintaining a strategic focus on the market. Aligned investment across the different stages of the innovation cycle, from development to production, commercialization, purchase, and wide-scale use, has the potential to dramatically accelerate our progress.

The fourth step may be the most essential—coordinating the resources and attention of investors, innovators, and policymakers on innovations with the greatest potential value for money. Our progress depends on decision-makers sharing information to ensure that collectively, the world is investing in the portfolio of innovations that will allow us to achieve our shared goals embodied in the SDGs.

Innovation is the key to sustainable health impact. But innovation isn't a random set of ideas and inventions. High-impact innovation is more likely to result from the kind of sourcing, assessment, financing, and coordination described above.

It is our hope that one or more of the innovations highlighted in this report will become a game-changer for global health over the next 15 years.

But beyond the success of any single innovation, we hope IC2030 will be a platform to catalyze discussion, collaboration, investment, and momentum toward the day when everyone has an equal chance for a healthy life. ■

Featured innovations

The 30 health innovations showcased on the following pages are the result of a yearlong process to find technologies and interventions with great potential to accelerate progress toward the proposed SDG health targets.

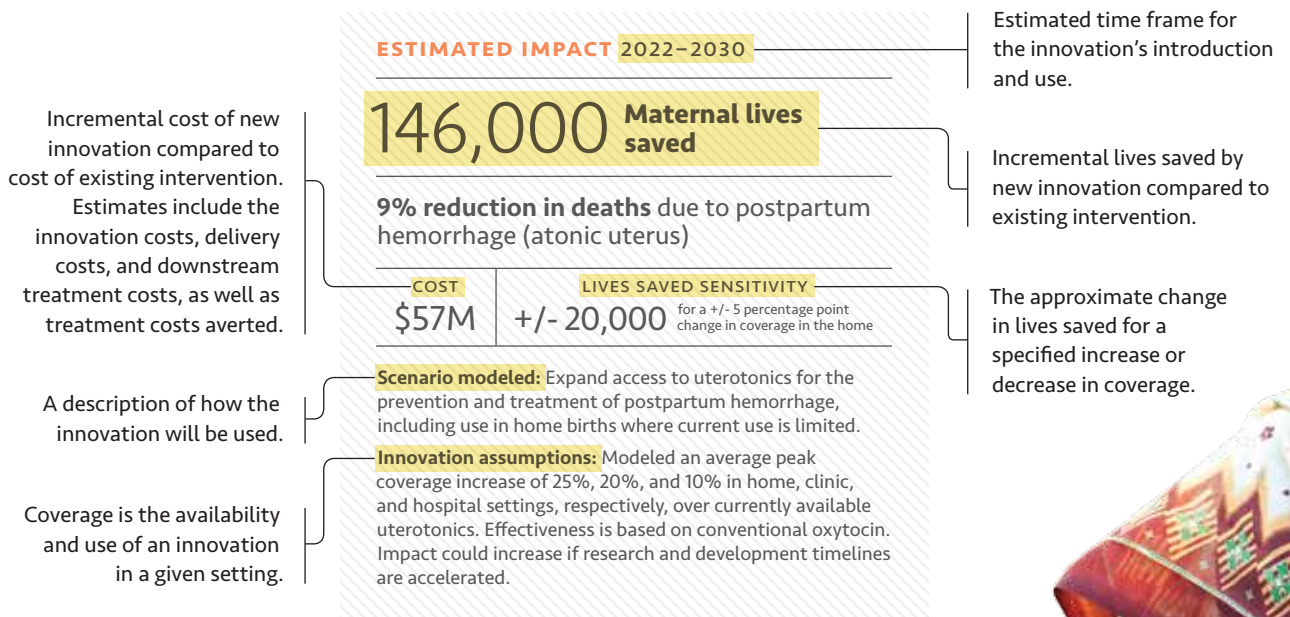
From the more than 500 ideas submitted to IC2030, independent experts assessed and selected the 30 innovations they believe show the most promise to improve global health by contributing to a significant reduction in the burden of disease by 2030.

IMPACT MODELING

For select MNCH innovations, IC2030 modeled introduction scenarios based on assumptions about availability and use in various settings to assess the potential lives saved, innovation and delivery costs, and downstream treatment costs (Figure 1). The results should be viewed as estimates.

Time and resource constraints limited the number of innovations modeled. Going forward, we intend to apply the model across all highlighted innovations with the goal of informing decision-making on health investments and policies.

FIGURE 1. Reading the impact modeling data for MNCH innovations.



Cost figures are presented in US dollars. M=million.

We received many more promising innovations than could be featured in this report. Please visit www.ic2030.org, where more innovation submissions we received will be available over the coming months.

Innovation platforms

The innovations submitted to IC2030 fall into five platforms:

DEVICES

DIAGNOSTICS

DRUGS/THERAPEUTICS

SYSTEMS & SERVICES

VACCINES

INNOVATIONS FOR MATERNAL, NEWBORN, AND CHILD HEALTH

The world has made significant strides in reducing maternal and child mortality, gains that have increased during the past 15 years. Yet too many mothers and children still die every year from entirely preventable causes. The 12 innovations featured in this section show promise for accelerating our progress.

They include new water treatment tools, a drug to prevent newborn infection, and better respiratory rate monitors to improve diagnosis and treatment of pneumonia—innovations that could each save approximately 1 million lives by 2030.



DRUGS

New formulations of oxytocin

Improving access to drugs to control bleeding after childbirth

Severe bleeding after childbirth kills many women in low-resource settings. Although oxytocin can effectively control postpartum hemorrhage, this drug is not available to many women, especially in remote areas. It currently comes only in liquid form and needs to be injected. It also must be transported and stored under refrigeration.

Alternative formulations are needed to improve access. Products under development include a fast-dissolving tablet placed under the tongue and a dry powder that can be administered with a simple, disposable inhaler. Unlike conventional oxytocin, these formulations do not require refrigeration during transport and storage or require injection, making them especially suitable for use in outlying areas by lower-level health workers.



ESTIMATED IMPACT 2022–2030

146,000 Maternal lives saved

9% reduction in deaths due to postpartum hemorrhage (atonic uterus)

COST	LIVES SAVED SENSITIVITY
\$57M	+/- 20,000 for a +/- 5 percentage point change in coverage in the home

Scenario modeled: Expand access to uterotonics for the prevention and treatment of postpartum hemorrhage, including use in home births where current use is limited.

Innovation assumptions: Modeled an average peak coverage increase of 25%, 20%, and 10% in home, clinic, and hospital settings, respectively, over currently available uterotonics. Effectiveness is based on conventional oxytocin. Impact could increase if research and development timelines are accelerated.

DEVICES

Uterine balloon tamponade

Low-cost kit to manage postpartum hemorrhage

Postpartum hemorrhage is a leading cause of maternal death. When first-line treatments such as oxytocin don't control bleeding, one option is to insert a balloon tamponade into the uterus. Health care professionals in wealthy countries have used uterine balloon tamponades for years, but cost and lack of access to equipment and training have limited their use in low-resource settings.

One promising product is the Every Second Matters for Mothers and Babies uterine balloon tamponade. This simple, low-cost kit consists of a condom that is tied to a Foley catheter and then inflated with clean water through a syringe and one-way valve. Using readily available materials, it is especially suitable for use in remote settings.

ESTIMATED IMPACT 2015–2030

169,000 Maternal lives saved

11% reduction in deaths due to postpartum hemorrhage (atonic uterus)

COST	LIVES SAVED SENSITIVITY
\$27M	+/- 15,000 for a +/- 5 percentage point change in coverage in the clinic

Scenario modeled: Introduce uterine balloon tamponades in clinics and hospitals for use when women fail to respond to uterotonic therapy.

Innovation assumptions: Modeled an average peak coverage of 0%, 50%, and 75% in home, clinic, and hospital settings, respectively. Effectiveness is based on existing products. Impact could increase if the product is used in all birth settings.

DEVICES

Handheld device to measure blood pressure

Improving early detection of pregnancy complications

Preeclampsia is a condition that affects more than 1 in 20 pregnant women and is associated with dangerously high blood pressure. Some women have few symptoms until it is too late. Undetected and untreated, preeclampsia can lead to eclampsia, or seizures. Together, these hypertensive disorders are a leading cause of maternal death, especially in settings with inadequate prenatal care.



Photo courtesy of Dawid De Greeff and King's College London

Better methods to check blood pressure during pregnancy are needed. One promising technology is the Microlife Vital Signs Alert, an easy-to-use, low-cost handheld device that measures both blood pressure and shock index (a reliable predictor of adverse clinical outcomes). Widespread use may enable earlier detection of a key symptom of preeclampsia, as well as other hypertensive disorders.

SUMMARY

- Some pregnant women develop preeclampsia, which is associated with dangerously high blood pressure.
- Health workers in low-resource settings need better methods to check blood pressure during pregnancy.
- Widespread use of new low-cost, handheld devices may improve detection of preeclampsia, leading to prompt treatment to save lives.

DEVICES



Simple, safe device for assisted delivery

Protecting mother and baby at birth

Complications during prolonged labor can be fatal to both mother and baby. Although a cesarean section or operative vaginal delivery is an option for some women, simple, low-cost alternatives are needed. Ideally, these alternatives could be used by mid-level health workers in remote locations and would be safer and easier to use than a forceps or vacuum extractor.

One solution is the BD Odon Device™, which features a polyethylene film that is wrapped around the baby's head, allowing a health worker to assist with delivery. If proven safe and effective, the device could become an important innovation for reducing the risk of infection and injury for mother and baby.

The BD Odon Device is a trademark of BD.

ESTIMATED IMPACT 2015–2030

249,000 Maternal and fetal lives saved

2% reduction in deaths due to prolonged and obstructed labor

COST	LIVES SAVED SENSITIVITY
\$189M	+/- 35,000 for a +/- 5 percentage point change in coverage in the clinic

Scenario modeled: Expand access to assisted vaginal delivery devices in clinics and hospitals to treat prolonged and obstructed labor.

Innovation assumptions: Modeled an average peak coverage of 40% in the clinic. Assumes that the Odon Device can be used for prolonged labor and approximately 30% of obstructed labor cases. Effectiveness is based on existing vacuum devices. Impact could increase if the Odon Device shows improved effectiveness or reduced cost over existing tools.

DRUGS

Chlorhexidine for umbilical cord care

Low-cost antiseptic prevents infections

Photo courtesy of CNCP/ISI Research and Training Institute, Inc.



Hundreds of thousands of newborns in low-resource settings die each year from infections. Unsanitary conditions during childbirth and a lack of antiseptics in the first week of life increase the risk of life-threatening disease, including serious infections. Affordable, feasible, and efficacious interventions to reduce neonatal infections are needed.

Chlorhexidine liquid or gel substantially reduces the risk of infection when applied to the umbilical cord stump soon after birth. It delivers chlorhexidine at a safe and effective 7.1 percent concentration, appropriate for use at home by low-level health workers or family members.

ESTIMATED IMPACT 2015–2030

1,004,000 Neonatal lives saved

9% reduction in deaths due to sepsis

COST	LIVES SAVED SENSITIVITY
\$81M	+/- 95,000 for a +/- 5 percentage point change in coverage in the home

Scenario modeled: Introduce chlorhexidine in the home setting for umbilical cord care.

Innovation assumptions: Modeled an average peak coverage of 55% in the home setting. A 23% reduction in neonatal mortality for chlorhexidine was modeled. Impact could increase if chlorhexidine is used in all birth settings.

Innovating to improve the health of women, children, and adolescents

We have come a long way in a short time. Since 1990, maternal and child mortality have dropped by nearly half. In 2015, nearly 240,000 maternal and 1.9 million newborn deaths will be averted compared to 1990. But on the eve of the 2015 deadline to achieve the Millennium Development Goals, we know that the maternal and child health targets will not be met. There are still far too many women and children dying from preventable conditions. We can and must do even better. Innovation will be critical to our continued progress.

The task ahead is for countries and their partners to focus on the most promising innovations to save the lives of vulnerable women, children, and adolescents—and for all of us to help ensure these innovations reach scale and can be sustainably financed. Our experience with the Every Woman Every Child (EWEC) movement shows what is possible when we come together around a common strategy.

In only five years, the global EWEC movement has rallied unprecedented energy and financial support for women and children to put into action the Global Strategy for Women's and Children's Health. We estimate that more than US\$255 million in investments have been made to support more than 1,000 maternal and child health innovations in various R&D pipelines.

The World Health Organization has a long history with R&D to address public health needs, especially in developing countries. We are committed to working with our partners in country governments, multilateral organizations, the private sector, and civil society to address the major health challenges facing women, adolescents, and children.

By ensuring that the new Global Strategy is a cornerstone of the United Nations Sustainable Development Goals—and with the help of promising innovations like those in this report—we will continue to improve the lives of women, children, and adolescents worldwide.

Flavia Bustreo, MD, MSc, is Assistant Director-General for Family, Women's, and Children's Health at the World Health Organization.



SYSTEMS & SERVICES

Kangaroo mother care

Using skin-to-skin contact to improve survival

Kangaroo mother care involves prolonged skin-to-skin (chest-to-chest) contact between the newborn and mother immediately after birth. Studies have found that this intimate physical contact improves thermal regulation of newborns and promotes exclusive breastfeeding, which is especially important for survival in low-resource settings. It also creates a strong psychological bond between the newborn and parent.

Kangaroo mother care was originally developed to improve newborn survival for low-birthweight or preterm babies in areas where incubators are either unavailable or unreliable. Based on the observed benefits and simplicity, the method has been recommended for widespread use, especially in developing countries with high newborn death rates.

SUMMARY

- Prolonged skin-to-skin contact between mother and newborn has previously shown many benefits for low-birthweight or preterm babies in low-resource settings.
- Expanded use of this kangaroo mother care will improve newborn survival and well-being, especially in developing countries.



DEVICES

Photo courtesy of Laerdal Global Health



New neonatal resuscitators

Addressing cost issues and other challenges

As many as one in ten newborns needs help breathing at birth; many of these babies will die without proper care. Most deaths occur in developing countries, where health centers and birth attendants often lack the equipment to help babies breathe. Although neonatal resuscitation devices can help save lives, health workers often face roadblocks, including costs, lack of training, and limited access to devices suitable for use in low-resource settings.

New low-cost, reusable, and easy-to-use resuscitators can help to prevent deaths among newborns in low-resource settings. One product with potential is the Laerdal Upright Resuscitator, which is designed to improve the mask-mouth seal and features easy assembly and cleaning.

SUMMARY

- Many newborns need help breathing at birth.
- Health care workers in low-resource settings often lack access to suitable neonatal resuscitation devices.
- New low-cost, easy-to-use resuscitators will better meet needs in low-income countries, saving many newborn lives.

THERAPEUTICS

New treatments for severe diarrhea

Combating a major cause of child deaths

Diarrheal disease is a leading cause of death among young children. Most of these deaths occur in areas with poor sanitary conditions, contaminated drinking water, and limited access to lifesaving treatment and prevention tools.

Several new treatments promise to reduce the burden of severe diarrhea. One, called Qwell, aims to rehydrate the child, reduce stool output, and restore intestinal function, helping to improve nutrition. Another, called DiaResQ, supplements use of oral rehydration solution and provides nutrients for intestinal repair. It has the advantage of being given orally only once each day. These new treatments and others used in conjunction with oral rehydration solution will help children with life-threatening diarrhea in developing countries have a better chance at recovery.

Overall costs are relatively high due to the frequent bouts of diarrhea young children experience in developing countries. Evaluating related nutritional benefits and other health outcomes of new treatments could improve understanding of their value.

ESTIMATED IMPACT 2018–2030

251,000 Child lives saved

3% reduction in deaths due to diarrhea

COST	LIVES SAVED SENSITIVITY
\$3.5B	+/- 59,000 for a +/- 5 percentage point change in diarrhea treatment coverage

Scenario modeled: A new diarrhea treatment used in conjunction with oral rehydration solution (ORS) to reduce stool output and restore intestinal function expands the number of children receiving diarrhea treatments.

Innovation assumptions: Modeled an average peak coverage of 80% for diarrhea treatments (ORS + new therapy). Effectiveness is based on existing ORS therapy. New therapy improves ORS adherence by 25%.

DEVICES

Rice fortification

Using technology to improve nutrition

Micronutrient deficiencies threaten the health and development of millions of children. Key problems include deficiencies in iron, which can reduce cognitive function, and vitamin A and zinc, which can reduce immune function, leaving children vulnerable to disease. Enriching the foods children regularly eat with needed vitamins and minerals can help to avoid these problems.

For children who live in areas where rice is a staple food, rice fortification is a cost-effective, wide-reaching, and sustainable way to boost nutrition. Rice fortification technologies can match added micronutrients with local dietary needs and ensure ingredients are consistently mixed and then blended with milled rice at the correct proportions. The result is nearly identical to unfortified rice in aroma, taste, and texture. Expanding use of this innovation may improve child nutrition in many countries.



SUMMARY

- Many children suffer from micronutrient deficiencies, which threaten their health and development.
- New rice fortification technologies can add micronutrients to meet specific local dietary needs.
- Expanded use of rice fortification is a cost-effective, sustainable way to improve child nutrition and health in many countries.

DEVICES



Photo courtesy of Zimba

New tools for small-scale water treatment

Helping to prevent diarrheal disease

Many households in developing countries lack access to clean water. Large-scale public water systems are often inadequate, and households may lack the resources to buy treated water. Use of contaminated water at home can cause severe diarrheal disease.

New technologies are making the use of chlorine for disinfecting water at small-scale community water sources both feasible and economical with the potential for significant savings in diarrhea treatment costs. The Zimba automated batch chlorinator, for example, is a rugged device fitted directly to a hand pump or community tap that automatically chlorinates water to a safe concentration without electricity or moving parts. It treats up to 8,000 liters of water between refills of the chlorine dispenser.

ESTIMATED IMPACT 2015–2030

1,515,000 Child lives saved

16% reduction in deaths due to diarrhea

SAVINGS	LIVES SAVED SENSITIVITY
\$1.2B	+/- 337,000 for a +/- 5 percentage point change in coverage

Scenario modeled: Equip community water sources with a device that automatically mixes chlorine in the water at the correct proportions.

Innovation assumptions: Modeled an average coverage of 23% for individuals who receive water through a community water source. An 84% reduction in diarrhea incidence was modeled. Cost savings occur by reducing diarrhea incidence and downstream treatment costs.

DEVICES

Portable pulse oximeters to measure oxygen

Improving detection of pneumonia

Measurement of blood oxygen levels could be used to detect pneumonia, the leading cause of death among children under age five years. Methods to measure oxygen levels in the body include testing blood samples in a laboratory and the use of pulse oximeters. These small devices are typically placed on fingertips to measure light transmission through the body to determine the blood oxygen level.

A new type of oximeter uses a mobile phone attachment to accurately measure oxygen levels without touching the body.

ESTIMATED IMPACT 2015–2030

772,000 Child lives saved

6% reduction in deaths due to pneumonia

COST	LIVES SAVED SENSITIVITY
\$101M	+/- 24,000 for a +/- 5 percentage point change in coverage in the clinic

Scenario modeled: Expand access to pulse oximeters in clinics and hospitals to more accurately identify children with hypoxic pneumonia and increase percentage of children diagnosed and treated.

Innovation assumptions: Modeled an average peak coverage of 0%, 72%, and 81% in home, clinic, and hospital settings, respectively. Assumes availability of pulse oximeters increases the accuracy of diagnosing hypoxic pneumonia by 15 percentage points to 85% and increases the fraction of children under age five with pneumonia screened for infection by 9 percentage points to an average of 50% across countries in scope. Impact could increase if bundled with other diagnostic tools.

DEVICES

Better respiratory rate monitors

Improving diagnosis and treatment of pneumonia

Pneumonia is often difficult to diagnose, leading to treatment delays and increased risk of death. Health workers in low-resource settings visually count the number of breaths each minute to help determine diagnosis and treatment—a crude method prone to error.

New respiratory rate monitoring tools will improve the diagnosis and timely treatment of infants and children with pneumonia. The INSPIRE sensor, for example, is a robust, low-cost device that monitors respiratory rate as well as body temperature. It is also more reliable and easier to use than existing tools and transmits data to nearby devices. Other new automated monitors use smart sensing technology.

ESTIMATED IMPACT 2015–2030

908,000 Child lives saved

7% reduction in deaths due to pneumonia

COST	LIVES SAVED SENSITIVITY
\$182M	+/- 61,000 for a +/- 5 percentage point change in coverage in the clinic

Scenario modeled: Expand access to respiratory rate counters in clinics and hospitals to increase the percentage of children with pneumonia who are diagnosed and treated.

Innovation assumptions: Modeled an average coverage of 0%, 50%, and 60% in home, clinic, and hospital settings, respectively. The availability of respiratory rate counters increases the fraction of children under age five with pneumonia who are screened for pneumonia from an average of 41% today to an average of 54% across the countries in scope.

INNOVATIONS FOR COMBATING INFECTIOUS DISEASES

Infectious diseases such as malaria, HIV/AIDS, and TB kill millions of people each year, mostly in low- and middle-income countries. Despite advances in science, technology, and health care, these diseases continue to take a heavy toll on children and on adults in their most productive years.

The innovations featured in this section hold special promise for reducing the global burden of infectious diseases, collectively addressing the spectrum of prevention, detection, and treatment. Further development, introduction, and scale-up of these creative solutions will improve health, save lives, and contribute to economic prosperity.

VACCINES

Protective malaria vaccine candidates

Preventing deaths from malaria among young children

Malaria affects more than 200 million people each year and kills about 600,000, mostly young children in sub-Saharan Africa. It is caused by microscopic parasites transmitted to people through the bite of a mosquito. Efforts to control malaria have included indoor spraying to kill mosquitoes, use of bednets to keep them from biting at night, and broader use of drug treatments.

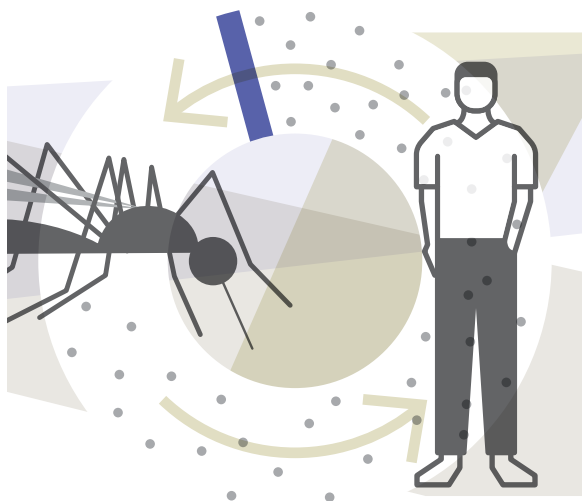
Vaccination against malaria could be a low-cost, effective way to prevent disease and save lives. Advanced clinical trials have shown that a vaccine candidate known as RTS,S can safely reduce the incidence of clinical and severe malaria in young children. Other vaccine candidates include genetically attenuated-parasite vaccines in early stages of development. It will be important to determine how vaccines can best be applied in concert with other interventions.

SUMMARY

- Vaccination to prevent malaria could provide a low-cost, effective way to avoid many deaths.
- Several vaccine candidates are now being developed.
- Vaccination could be used in conjunction with other interventions to eliminate disease.



VACCINES



Malaria transmission-blocking vaccine

Helping to facilitate disease eradication

Malaria vaccine candidates target various stages in the life cycle of the parasite that causes the disease. Some aim to protect against the early stage of infection, and others target the parasite during its rapid replication in red blood cells. Yet others aim to interrupt the parasite's life cycle by inducing antibodies to keep it from maturing in the mosquito after the mosquito bites a vaccinated person, limiting the spread of infection.

This innovation is a malaria transmission-blocking vaccine candidate based on a parasite antigen. The candidate is designed to block transmission of the *Plasmodium falciparum* parasite from humans to mosquitoes. If successful, the vaccine's impact would be at the population level because the candidate does not directly protect vaccinated individuals.

SUMMARY

- One type of malaria vaccine candidate aims to block transmission of disease-causing parasites from people to mosquitoes, interrupting the parasite's life cycle.
- This type of vaccine has the potential to block the spread of infection, though it would not prevent malaria among those who are vaccinated.

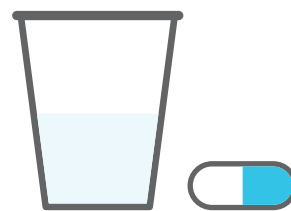
DRUGS

Potent, single-dose antimalarial drug

A simple treatment that avoids drug resistance

Malaria treatment aims to rapidly and completely eliminate the *Plasmodium* parasite from the patient's blood to prevent the progression of uncomplicated malaria to severe disease or death and to prevent chronic infection that leads to serious anemia. Artemisinin is a key ingredient of the gold-standard treatment for uncomplicated malaria caused by the *P. falciparum* parasite. In some regions, however, the parasite is developing resistance to artemisinin-based combination therapies.

This innovation is a potent synthetic antimalarial drug candidate known as OZ439 that may also be effective against artemisinin-resistant strains of malaria. A complete cure for malaria could be completed with a single oral dose. This drug may also be useful for malaria prevention.



SUMMARY

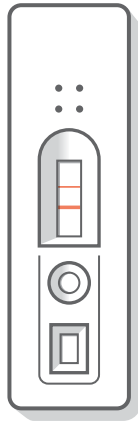
- Malaria parasites are developing resistance to existing drug treatments.
- A new drug candidate may enable single-dose treatment that is effective even against resistant strains.

DIAGNOSTICS

Expanded use of rapid malaria tests

Enabling faster, more effective treatment

Patients with suspected malaria should be tested to confirm the presence of malaria parasites before beginning treatment. Parasites can be detected by either microscopy or rapid diagnostic tests (RDTs). Early, accurate diagnosis is important because malaria treatment should begin within 24 hours of fever onset to prevent life-threatening complications, and misdiagnosis can result in serious illness or death.



This innovation consists of improving on malaria RDTs and improving access to them for better disease management, especially in areas with limited access to microscopy. Also, novel tests such as the Rapid Assessment for Malaria (RAM) prototype could provide more accurate results than conventional RDTs. The RAM is a reusable, low-cost, point-of-care device that uses magnetic fields and light to detect malaria parasites without the need for temperature-sensitive reagents.

SUMMARY

- Malaria needs to be diagnosed and treated quickly to get the best results.
- Expanded use of malaria rapid diagnostic tests could help to speed treatment.
- Several novel tests promise to make rapid diagnosis even more widely available.

VACCINES

Broadly neutralizing antibodies in HIV vaccines

Efficient, effective prevention of HIV infection

About 35 million people worldwide are infected with HIV. Although treatment with antiretroviral drugs is effective, only one-third of those eligible for treatment in low- and middle-income countries actually receive the medication, and treatment is relatively expensive and lifelong.

Because vaccines are typically the most effective, affordable, and practical way to eliminate an infectious disease, many researchers have worked to develop an HIV vaccine. The AAV-PG9, VRC01, VRC07-523LS, and 3BNC117 vaccine candidates, and several others in the pipeline, hold special promise. These candidates aim to harness the potential of broadly neutralizing antibodies to render HIV variants harmless. It may be possible to induce production of these antibodies in most or all people.

SUMMARY

- Many people with HIV infection do not receive treatment, which is expensive and lifelong.
- Vaccines are effective and affordable for prevention of infectious diseases.
- Candidate vaccines that use broadly neutralizing antibodies may prove effective for protecting against HIV infection.



Transforming the fight against AIDS, TB, and malaria

Innovative approaches by partners in global health have achieved tremendous progress against AIDS, TB, and malaria since 2000. For example:

- The number of children dying of malaria has been reduced by half, accelerated by innovations such as insecticide-treated bednets and logistical advances that delivered more than half a billion nets.
- Innovation that reduced the price of antiretroviral drugs from US\$10,000 to \$125 a year has contributed to saving the lives of millions of people.
- An innovative tool called GeneXpert dramatically improved TB diagnosis.

Local governments and community organizations have pioneered creative solutions to effectively deliver technological advances. The partnership model itself is a great innovation, by aligning governments, civil society, the private sector, and people affected by the diseases in common cause.

As many aspects of global health transform from emergency response to sustainable solutions, innovation will save even more lives. To end HIV, TB, and malaria as epidemics, we have to accelerate progress, and that requires finding, using, and catalyzing innovative approaches. Technical and programmatic innovation will play a role, and so will innovations in business models.

The Global Fund partnership has created an innovation hub that is advancing work in procurement and supply chain management, financial and risk management, and program quality. We're already seeing gains.

Pooling the procurement of medicines and health products has saved nearly \$500 million in a two-year period. New approaches to accounting training and services are improving financial management. Creating an e-marketplace, where medicines and health products are bought and sold on an online platform, will accelerate delivery of high-quality goods at reasonable prices.

As the global health landscape changes, we must adapt with sustainable solutions and new partnerships.

Mark Dybul is the Executive Director of the Global Fund to Fight AIDS, Tuberculosis and Malaria.



DRUGS

Long-acting injectable antiretrovirals

Improving adherence to treatment regimens

Taking an oral antiretroviral medication every day can effectively treat HIV infection and slow or stop progression to AIDS. Studies have shown, however, that many people have difficulty adhering to a daily pill regimen. Researchers have pursued long-acting formulations of antiretroviral drugs that can be given less frequently, with the hope of improving treatment adherence.

Two current candidates are GSK1265744 and TMC278-LA, which could be injected once every two months to suppress HIV infection. Long-acting drugs such as these could improve treatment adherence and outcomes in HIV patients and reduce transmission. They may also be an attractive alternative to a daily pill for prevention of infection among individuals at high risk.

SUMMARY

- Oral medication to treat HIV infection must be taken daily, which reduces treatment adherence.
- New long-acting drug formulations could be injected once every two months.
 - These formulations could also be useful for preventing HIV among high-risk groups.



DRUGS

Oral preexposure prophylaxis

Taking a daily pill to prevent HIV infection

Groups at high risk of HIV infection include young women in sub-Saharan Africa, men who have sex with men, injection drug users, and female sex workers. Although routine use of condoms can reduce risk, condoms are not always available, and ongoing, consistent use can be challenging.

Preexposure prophylaxis (PrEP) is the use of oral formulations of antiretrovirals, such as tenofovir or emtricitabine-tenofovir, to prevent HIV infection. PrEP is an important addition to existing methods of HIV prevention, and access should be expanded.

Treatment adherence has been challenging in some populations, and PrEP is not widely available. PrEP is intended for use with condoms to ensure complete protection. Long-acting, injectable PrEP candidates may offer new options to improve adherence.

SUMMARY

- Taking oral formulations of antiretroviral drugs can help to prevent HIV infection.
- Many people at risk of HIV cannot access these drugs.
- Expanding access to these oral drugs as well as long-acting, injectable forms under development could help to reduce HIV infections in high-risk groups.

DRUGS



Novel multidrug treatment regimen for TB

Shortening treatment to improve patient outcomes

Despite the availability of effective antibiotic treatments for tuberculosis, more than a million people die from TB each year, mostly in low-resource settings. TB treatment is difficult for several reasons, including the unusual chemical composition of the bacterial cell wall, which hinders the effectiveness of many antibiotics. Especially for patients with drug-resistant TB, treatment may require use of multiple drugs over prolonged periods.

A novel multidrug treatment regimen known as BPaZ includes two new, promising drugs for TB and one established drug. It has potential to safely treat TB and some forms of multidrug-resistant TB in as little as three months without injections and at low cost. The shorter course may improve adherence, enhancing health outcomes and reducing the evolution of drug resistance.

SUMMARY

- Current treatments for TB are often lengthy and difficult.
- A novel multidrug treatment regimen has the potential to safely and more rapidly treat TB, including drug-resistant forms.

VACCINES

New vaccines to prevent TB

Potential new protection for adults at risk

TB prevention and control efforts rely primarily on infant vaccination and the detection and appropriate treatment of active cases. The only available vaccine is the bacillus Calmette-Guérin (BCG) vaccine, which decreases a child's risk of TB disease by nearly 60 percent. Most children worldwide are vaccinated, but immunity decreases after about ten years.

Several new vaccines are under development. One is vaccine candidate Ad35/MVA85A, which is a combination of two novel vaccine candidates given in sequence to boost immune response. Available data indicate that this combination is highly immunogenic in adults. A highly effective vaccine is essential for achieving global targets for TB prevention and control.



SUMMARY

- The only available vaccine to protect against TB has serious limitations.
- Several new vaccines may overcome some of these shortcomings.
- Better vaccines are essential to improve TB prevention and control.

DIAGNOSTICS

Nucleic acid amplification tests

Improving TB diagnosis

Pulmonary tuberculosis is difficult to diagnose based on signs and symptoms. A definitive diagnosis is made by culturing a clinical sample, such as sputum, to identify the bacterium that causes TB, but this process can take many weeks. Initial diagnosis is often done by microscopy, which is slow, requires extra patient visits, and misses many cases.



New nucleic acid amplification tests allow more sensitive and rapid diagnosis, facilitating prompt treatment. For example, the Xpert MTB/RIF is an automated assay for detection of TB and drug resistance that gives results in two hours and can be used in district-level facilities. The automated Alere Q prototype assays for diagnosis and resistance typing could give fast, accurate results when run on a test platform designed for lower-level laboratories and clinics.

SUMMARY

- Tuberculosis is often difficult to diagnose.
- For the best results, treatment needs to begin promptly.
- New nucleic acid amplification tests allow rapid diagnosis in more remote locations, enabling prompt treatment.

INNOVATIONS FOR REPRODUCTIVE HEALTH

Many women around the world lack access to modern contraceptive methods or rely on methods controlled by men, such as male condoms. More than 200 million women have an unmet need for family planning, and the absence of options for preventing pregnancy leads to many maternal and infant deaths.

The innovations described here range from scaling up use of proven methods to development and introduction of new options for woman-controlled contraception. Providing women with more choices will help to save lives and enable more young women to complete school and contribute to local economic development.

DEVICES DRUGS

Expanded access to implants and intrauterine devices

Saving lives by increasing options for family planning

Increased use of contraception to delay motherhood, space births, prevent unintended pregnancy, and avoid unsafely performed abortions could substantially reduce maternal and infant deaths. More than 200 million women have an unmet need for family planning, and meeting this need could save an estimated 80,000 women and 1.1 million infants each year.

Long-acting reversible contraceptive methods such as implants and intrauterine devices are an appealing option for many women. They are highly effective, easy to use, and readily reversible if a woman wants to become pregnant.

This intervention consists of scaling up counseling and provision of long-acting reversible methods. Efforts may focus on women who are currently irregular users or nonusers of contraception.

SUMMARY

- Meeting the unmet need for family planning could prevent many maternal and infant deaths each year.
- Long-acting reversible contraceptive methods such as implants and intrauterine devices, are an attractive option for many women.



Innovation in reproductive health is key to prosperity

Innovation in reproductive health has given women more control over family planning and more power over their lives. We are now seeing the benefits, including better health for women and children and improved economic conditions for families and communities.

Increased access to injectable contraceptives, for example, has given women a more convenient, discreet option for preventing or delaying pregnancy. The introduction of the female condom has enabled some women to prevent both pregnancy and HIV infection. Mobile phones have increased women's access to health information and services.

Innovative partnerships are reaching more women with needed services. Through new total market approaches, the public and private sectors have joined forces to increase coverage of affordable family planning options. Community health insurance has leveraged resources to improve the public- and private-sector health systems in some countries.

Other innovations have improved service delivery. These include results-based financing, where health workers are paid based on verified results, and innovations that improve the quality of care, especially for poor women.

Additional innovation in health financing will be essential for further improvements. The Discovery Health insurance plan in South Africa is one example of how financing systems can contribute to health and well-being.

To build more support for advancing reproductive health, we need to focus on the links between family planning, employment, and economic development. Delaying pregnancy and spacing births enables more young women to complete school, prevents death and disability among many young women and their children, and contributes to economic development. Economic gains, in turn, provide more resources for improving health.

Innovation in reproductive health is a key to future health and prosperity for all. Expanding access through creative funding models will accelerate the gains we are already seeing.

Joy Phumaphi is Executive Secretary of the African Leaders Malaria Alliance and Co-chair of the independent expert review group for Every Woman Every Child.



DEVICES DRUGS

Injectable contraceptives

Improving access to an effective method of family planning

Injectable contraceptives are among the world's most popular methods for preventing pregnancy. They offer women safe and effective protection, convenience, and privacy. Until now, however, they have not been widely available outside of clinic settings.



Sayana® Press promises to make injectable contraception more widely available to women in low-resource settings, especially in remote areas. This product is a lower-dose formulation and presentation of the injectable contraceptive Depo-Provera® packaged in the single-use Uniject™ injection system. One subcutaneous injection provides protection for three months. The product is small, lightweight, and easy to use, and it requires minimal training. It is especially suitable for community-based distribution—potentially enabling women to administer it themselves at home.

Sayana Press and Depo-Provera are registered trademarks of Pfizer, Inc. Uniject is a trademark of BD.

SUMMARY

- Although injectable contraceptives are a good option for many women, their use has largely been restricted to clinic settings.
- Because Sayana Press is easy to administer and requires minimal training, it is ideal for community-based use, making it accessible to more women.
- The product may potentially enable women to self-administer injectable contraceptives at home.

DEVICES DRUGS

One-year contraceptive vaginal ring

Giving women more options and control



For many women, pregnancy prevention is largely out of their control. They may lack access to any type of contraception, or their access may be limited to methods controlled by men, such as male condoms.

A one-year contraceptive vaginal ring may be a good option for many women. The ring can be inserted by a woman at home and provides long-acting, reversible protection through the slow, sustained release of Nestorone® and ethinyl estradiol. The ring is left in place for 21 days and removed for 7 days, for up to 13 cycles.

Nestorone is a registered trademark of the Population Council.

SUMMARY

- Many women lack control over pregnancy prevention.
- A one-year contraceptive vaginal ring that women can insert at home may provide a convenient, reversible option for women who want more control over family planning.

INNOVATIONS ADDRESSING NONCOMMUNICABLE DISEASES

NCDs have overtaken infectious diseases as the primary cause of illness and death around the world. Changes in diet and lifestyle have contributed to a surge in diabetes, cardiovascular disease, cancers, and chronic lung disease, which together now account for about two-thirds of all mortality.

NCDs present special challenges for low- and middle-income countries still struggling to overcome infectious diseases, such as malaria, as well as challenges related to maternal, newborn, and child health. They typically have too few health professionals and other resources to provide high-quality care for NCDs, which are placing enormous health and economic burdens on families and communities.

The innovations described here hold potential for improving access to low-cost solutions to address NCDs.



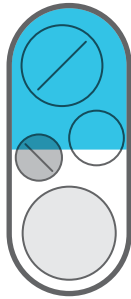
DRUGS

Polypill

Low-cost prevention of cardiovascular disease

By 2020, heart disease and stroke will be the leading causes of death and disability worldwide, with the vast majority of these deaths occurring in low- and middle-income countries. A key strategy for reducing deaths from cardiovascular disease is addressing modifiable risk factors, including hypertension.

The polypill contains a combination of well-known, inexpensive medications that can reduce the risk of cardiovascular disease or help to control progression. It is intended to be taken daily by a broad segment of the population at high risk for disease or with recognized disease. The need for only one pill a day makes it easier for patients to adhere to their treatment regimens.



SUMMARY

- Heart disease and stroke will soon become the leading cause of death in low- and middle-income countries.
- Readily available medications, such as blood pressure drugs, can reduce risk.
- A polypill containing a combination of low-cost medications can simplify preventive care for people at high risk.

VACCINES

Broader use of HPV vaccine

Protecting more women from cervical cancer

Cervical cancer kills about 266,000 women each year, with more than 85 percent of deaths occurring in low- and middle-income countries. Most cases are caused by infection with human papillomavirus (HPV). Currently available vaccines can prevent infection with two common types of HPV that cause cancer and are targeted to girls and young women who are not yet sexually active. Broader use within these groups will accelerate the decline of cervical cancer mortality.



Studies suggest that these vaccines may be almost as useful in adult women who test negative for HPV as in girls and young women. This innovation consists of broadening the eligibility for vaccination to include women in their late 20s, and possibly older groups, assuming cost-effectiveness can be demonstrated. Reducing vaccine costs will facilitate wider use.

SUMMARY

- Cervical cancer is mainly caused by infection with certain types of HPV.
- Vaccines that can prevent HPV infection and cervical cancer have previously been targeted to girls and young women before they are sexually active.
- Expanding vaccination to older women may further reduce deaths from cervical cancer.

Measuring the true impact of NCDs

When the Ebola virus reemerged, the world's public health community called for better tracking of infections and deaths from the disease. The same urgency could be applied to a range of NCDs that cause widespread suffering and death.

Take chronic obstructive pulmonary disorder (COPD). It causes more than 70 million years of healthy life lost, making it the fifth leading driver of disease burden globally. In Sri Lanka, COPD, diabetes, ischemic heart disease, and low back pain make up four of the top five leading causes of premature death and disability.

These diseases rob people of health over decades while a swift-moving virus like Ebola can kill in a matter of days. Can we finish the unfinished agenda of childhood, maternal, and infectious diseases, especially vaccine-preventable diseases, while bringing more focus to the chronic conditions that cause massive health loss worldwide? We can and must.

Outside of sub-Saharan Africa, chronic illnesses devour health resources, even in financially stable countries. In low-resource settings in Africa and elsewhere, as NCDs become more prominent, they could challenge the ability of health systems to adequately address disease outbreaks like Ebola. Currently, development assistance for health is rightly focused on lessening the toll exacted by nutritional disorders and infectious diseases. We have not truly assessed how a rising NCD burden would change the financial needs of countries.

To do that, we must rethink how we gather information about levels and trends in musculoskeletal disorders, cardiovascular diseases, mental health conditions, and other NCDs. We need true surveillance through surveys, biological sampling, and disease registries. Rapid diagnostics for cancers and other diseases are available to be deployed with smart investments and could radically transform the health landscape.

To meet a challenge, you must take its full measure. We should measure the health loss from NCDs and use those measurements to guide investment and innovation.

Christopher J.L. Murray, MD, DPhil, is a Professor of Global Health at the University of Washington and Director of the Institute for Health Metrics and Evaluation.



SYSTEMS & SERVICES

Task-shifting for diabetes care

Increasing access to services and reducing costs

Because of changes in diet and lifestyle, the number of people with diabetes has surged to nearly 400 million. Many are unaware they have diabetes, and more than 80 percent live in low- and middle-income countries. Health systems in many countries, however, have too few physicians and other health professionals to manage diabetes diagnosis, treatment, and monitoring.

Task-shifting is a health system innovation with potential to improve access to care for diabetes and related conditions. It focuses on training lower-level health workers to provide many components of diabetes care, providing them with decision-support tools, and then giving them more responsibility. The result is increased access to lower-cost services. Task-shifting will require additional innovation in diagnostics, devices, and digital tools to broaden the scope of practice for lower-level health workers.

SUMMARY

- The number of people with diabetes is growing rapidly.
- Low- and middle-income countries have too few physicians and other highly skilled health professionals to provide diabetes care.
- Task-shifting to enable lower-level health workers to provide diabetes care can increase access to services.



mHealth innovations

Using mobile devices to address NCDs

Although the prevalence of NCDs is growing rapidly in low- and middle-income countries, these diseases are unfamiliar to many patients and health care workers. Also, proper management of diabetes, cardiovascular disease, and other long-term conditions requires sustained behavior change by patients, support for decision-making by health professionals and patients, and ongoing engagement of patients and health care providers—all of whom will benefit from increased use of technology to share information.

Mobile devices and communications networks have growing potential for implementation of NCD management strategies, data collection, encouragement of healthy behaviors, and decision-making support for providers and patients. Increased use of these tools will also pave the way for other, more specific innovations.

SUMMARY

- Growth in the prevalence of NCDs, such as diabetes, has paralleled expansion in the use of smart phones and other information and communications technology in low- and middle-income countries.
- Mobile devices and communications networks can be used to improve information exchange, modify behaviors, and enhance services to reduce the burden of NCDs.



Portable, affordable screening for eye problems

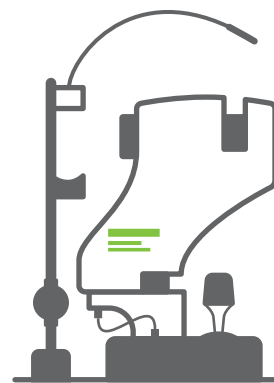
Preventing vision impairment in low-resource settings

About 40 million people worldwide are blind, and another 250 million have moderate to severe visual impairment. Most live in low- and middle-income countries, especially in Asia. The prevalence of vision problems is expected to grow with aging populations around the world.

Although 80 percent of visual impairment is avoidable with proper eye care, many countries have a shortage of ophthalmologists and other eye care professionals.

New portable, affordable

devices screen for early signs of diabetic retinopathy, cataract, glaucoma, and other eye conditions that may signal a serious health condition. One example is the 3nethra Classic, which can be operated by a minimally trained technician and uses web-based storage of results so programs can leverage the expertise of eye doctors in distant locations.



SUMMARY

- Nearly 300 million people suffer from significant vision loss or blindness.
- Although proper eye care can prevent most visual problems, many people in low- and middle-income countries lack access to eye doctors.
- New portable, affordable devices can be used by low-level technicians to check for eye problems, and web-based storage of results enables consultation by eye care professionals in distant locations.

CROSSCUTTING SOLUTIONS TO CATALYZE HEALTH IMPACT

These health innovations could address two or more SDG health targets simultaneously by strengthening the underlying foundation of innovation platforms and health systems.

Nearly 20 percent of the innovations submitted to IC2030 were crosscutting in nature—broad systems solutions and platform innovations that can create the foundation to successfully introduce and scale up specific health interventions.

Innovative processes and tools have the potential to create a ripple effect of health impact that reaches beyond a single disease area, accelerating the world's ability to reach the proposed SDG health targets by 2030.

The systems solutions we received are emblematic of an emerging consensus that achieving a “grand convergence” in global health—with lower-income countries achieving health outcomes similar to those of wealthier countries—requires moving beyond the health and funding siloes that have historically defined the global health and development sector to strengthen systems overall.

Among the systems innovations nominated for inclusion in the IC2030 report, those using digital technology—software applications, mobile phones, and related tools—were by far the most

common. We classified the nominations according to three broad themes: behavior change communications (BCC) and demand generation; health care workforce and capacity-building; and data collection, management, and use.

BCC and demand generation innovations aim to influence health behaviors and increase demand for a health service or product. One nomination featured a digital tool that serves as a virtual health center with a toll-free hotline and an SMS service to increase access to timely, appropriate information and care for mothers, infants, and children. While the goal is to reduce maternal, neonatal, and child mortality rates, this intervention also holds promise for improving outcomes related to reproductive health and other areas.





Health care workforce and capacity-building tools provide job aids, diagnostic and treatment protocols, and more to health service providers. For example, an open-source software application provides a multilingual and multimedia tool for community health workers to improve their technical skills and quality of care. Health workers receive mobile phones preloaded with the application, enabling them to register and track patients, provide referrals, and access information to guide counseling messages.

Data collection, management, and use innovations aim to create or improve existing data systems and generate high-quality, timely information to inform decision-making. One submission featured a mobile device to guide health workers through clinical work flows while automating data capture. The innovation provides real-time data to health care decision-makers and other stakeholders.

Despite their promise, digital health innovations used in the context of health systems have not yet proven their ability to create broad impact. Short-term funding models, a proliferation of pilot approaches, and low levels of investment in crosscutting platforms and national-level infrastructure have so far kept digital health solutions from achieving broad systemic change.

The global community must prioritize long-term investments in strengthening platforms and health systems, including comprehensive digital health solutions. There is no shortage of innovation in this space. Investments in national infrastructure and back-end platform innovations will create the launching pad we need to quicken the pace of progress toward health equity, financial sustainability, and impact on a global scale.

Petabytes for pennies

Mobile, digital, and wired development and health

By Ramez Naam



Ramez Naam is a computer scientist and the award-winning author of five books, including the *Nexus* series of science fiction novels and *The Infinite Resource*, a book about innovating to beat climate change and other environmental and natural resource challenges.

Between 2015 and 2030, the costs of computation, storage, and bandwidth will drop by roughly a factor of 1,000, with enormous implications for economic development, poverty, and global health.

By 2030, we can expect Internet access that is effectively ubiquitous around the globe through handheld or worn devices that are at least 100 times more capable than what we have today. Here are five ways that may affect development and health.

Education: The ability to deliver text, images, and video at gigabit speeds and tailor that delivery to the person's responses, knowledge, and skill level opens up incredible new possibilities. Education drives income and development, which in turn increases health.

Democracy, corruption, and good

governance: Informed populaces demand better governance and less corruption, one of the thorns in the side of development. Corruption thrives in the shadows created by power and information asymmetries. Ubiquitous devices armed with cameras erase those shadows.

Health education and information:

Worldreader, a charity that delivers digital books in Africa, reports that their most-read book of 2014 was *Ebola: Practical Info*. The third most-read book: *Male Condom Instruction* (read primarily by girls, apparently). Ubiquitous, high-bandwidth mobile devices can deliver health information to more people and leverage the power of celebrities and authority figures to convey a message.

Remote health and diagnostics: The rapid dissemination of smart devices will make them universal health care terminals. For example, an ultrasound probe connected to a smartphone can transmit images to a physician in a far-away city for diagnosis. By 2030, algorithms will make many such diagnoses, transforming health in the most remote and least developed areas with few health care providers.

Health monitoring and reporting:

Ubiquitous connectivity will increase intentional and incidental self-reporting of health data and the ability of individuals and health care practitioners to report on infectious disease outbreaks or other events.

The greatest benefit may be the innovations that take place *atop* this expanded digital platform. Health innovators should ask themselves the question that Google reportedly asks its engineers: What would you do if computational cost, bandwidth, and storage were no limit?

Yet the dissemination of hyper-connected supercomputers into the pockets of 7 or 8 billion people will not automatically cure all ills.

Today, more people around the world have mobile phones than toilets. Our best hope is that widespread mobile Internet access will accelerate economic development and thus increase access to clean water, sufficient food, and other underpinnings of global health.

There will also be challenges as billions come online. How do we direct people to accurate information instead of myths or rumors? How do we build trust in legitimate institutions? In the developed world, we often fail at this. Can we do better with the billions to come?

Even with the many challenges, in the next 15 years, the exponential price decline of digital technology will put more power and information in the hands of the poorest people than ever before, catalyzing a surge of global economic development and health innovation.

The future has never looked brighter. ■

Innovation for global health: tackling chronic diseases

Personalized technology and behavioral economics to advance health

By Derek Yach



Derek Yach, MBChB, MPH, is Senior Vice President (SVP) of the Vitality Group, part of Discovery Holdings Ltd., where he leads the Vitality Institute for Health Promotion. Previously, he was SVP for Global Health and Agriculture Policy at PepsiCo and Executive Director, Noncommunicable Diseases, at the World Health Organization.

Chronic diseases—diabetes, cardiovascular disease, and various cancers—threaten the stability of societies worldwide. They account for 38 million deaths annually, with 28 million occurring in low- and middle-income countries.

Tobacco use, unhealthy diets, physical inactivity, poor mental health, and nonadherence to prescribed medications contribute to chronic diseases but are areas that have not benefited from advances in innovation.

Personalized health technologies activate users, measure steps and sleep, support better medication adherence, guide healthy food choices, and quantify biological measures that are predictive of chronic diseases. A Technology Catalysts Map developed by the Vitality Institute and the Institute for the Future outlines emerging innovations and their potential for impact on chronic diseases and related risks.

Wearables, adhesives, and ingestible sensors are already encouraging healthy behavior change. Inexpensive stick-on sensors help to manage risks by providing personalized feedback through aggregating and analyzing health data. Artificial intelligence-based coaches incorporate

advice and encouragement to promote healthy activities.

In the future, eye tracking and brain games will facilitate better understanding and management of stress and sleep levels. Miniature sensors will track physiological functions and environmental changes. Sensors that detect gestures, assess body functions, and track facial movements will be embedded in individualized devices and physical spaces.

A variety of stakeholders—entrepreneurs and policymakers, researchers and health providers, large and small employers and their communities—are pioneering investment in new technologies to catalyze better health and well-being. Affordable, sustainable, and high-quality technological innovations are emerging in low- and middle-income countries, which may lead the world in cost-effectively addressing the prevention and control of chronic diseases.

Mobile money transfers through M-Pesa in Kenya, electrocardiogram machines by General Electric in China and India, and intuitive point-of-care diagnostic devices by PATH are transformative examples with immediate applications to chronic diseases. The lack of legacy infrastructure, regulations, and mindsets that impede progress in high-income countries could spur advancement in low- and middle-income countries.

Combining personalized health technology with behavioral economics has emerged as a powerful mechanism to encourage sustained uptake of and engagement with technology. This combination holds potential for promoting health and preventing chronic diseases more effectively to yield reductions in health care costs over the long term. ■

FIVE FUTURE FORCES WORKING TO ALIGN PRIVATE AND SOCIAL STAKEHOLDERS

Connected science: Stakeholders contribute data and connections to the art and science of health promotion and chronic disease prevention.

Rise of networks: Bottom-up solutions address health promotion and disease prevention.

Quantified generations: Data-driven self-knowledge ignites intergenerational health engagement and promotion.

New business models: Business and social interests align for upstream interventions.

Entrepreneurial ecosystems: Lean iteration creates vital human and economic systems.

Creating a new source of capital for global health

A collaboration of governments, industry, foundations, and individuals for health

By Christopher Egerton-Warburton



Christopher Egerton-Warburton, MA Oxon Biochemistry, is Founding Partner of Lion's Head Global Partners, a London-based investment firm focused on sustainable development. Previously, Christopher spent 14 years at Goldman Sachs. Lion's Head serves as fund manager for the Global Health Investment Fund.

Global health is traditionally linked with the concept of philanthropy, not investment. From the generous gifts of individuals, foundations, and corporations (primarily in the pharmaceutical industry) to government donor grants, philanthropy has changed the health prospects of billions of people. For example, basic vaccination is now the norm in all countries, while millions are being treated with HIV, TB, and malaria drugs.

But philanthropy alone cannot meet the challenges of the next 15 years. We have successfully reduced the number of child deaths by nearly half since 1990. But sustaining the pace of progress going forward will be harder yet. The goal to bring all countries to the same low levels of child mortality as those in Europe and the United States by 2030 represents one of the most audacious challenges ever attempted.

At its core, this is about efficiency. Achieving the health targets outlined in the Sustainable Development Goals will ensure better health for millions of vulnerable women and children. Our challenge is to ensure these health gains can be sustained financially. This requires a cauldron of innovation to literally boil over, spilling new solutions to the corners of our world.

But what is the fire that can provide the energy to achieve this goal? Fortunately, a new sector is emerging: impact capital.

Two years ago, a new investment fund was launched. The Global Health Investment Fund (GHIF) sought to provide a new type of capital for global health, with a focus on late-stage development of new technologies, drugs, and vaccines and the explicit target of shrinking the burden of infectious disease and improving maternal health in the poorest countries of the world.

The project's first investors were true pioneers. They were offered a safety cushion from the Bill & Melinda Gates Foundation and the Government of Sweden in the

form of a partial capital guarantee. This structure attracted a group of both new and long-time investors who had never previously come together.

Governments (Grand Challenges Canada, the International Finance Corporation, and KfW Development Bank), foundations (Children's Investment Fund Foundation), and corporations (AXA, GlaxoSmithKline, JP Morgan, Merck, Pfizer, and Storebrand) joined together with a number of individuals seeking to invest with purpose. The objective was not only to make an investment return but also to have a significant global health impact.

The GHIF has built a pipeline of opportunities and is now in the process of completing its investment program. Transactions to date include:

- A new TB diagnostic test that can operate outside a laboratory.
- A cholera vaccine that is lower cost and has the potential to be heat-stable to protect adults and children alike from this Victorian-era disease.
- The registration of a drug for the treatment of onchocerciasis (river blindness), a disease spread by flies, particularly in West Africa.

The GHIF's pipeline includes additional new vaccines, improved diagnostics, and tools to improve the cold chain. Taken together, we believe this will be the start of a significant pool of investment into this historically overlooked sector. ■

OUR METHODOLOGY: SELECTING THE FINAL 30 INNOVATIONS

The 30 promising global health innovations featured in this report are the culmination of a yearlong process that sought ideas and input from thousands of people around the world.

Our methodology involved a three-step process:

- Crowdsourcing more than 500 innovations from developers, innovators, private-sector leaders, and experts across the globe.
- Assessing submitted innovations using a novel qualitative methodology.
- Ranking 175 of the most promising innovations through a two-step selection process that involved dozens of independent health experts.

Separately, we also worked with Applied Strategies, a life sciences and global health consulting firm, to develop and apply a quantitative methodology to evaluate the potential cost and health impact of a select list of specific MNCH innovations.

CROWDSOURCING INNOVATIONS

In May 2014, PATH launched a survey to gather global health innovations from multidisciplinary experts in technology, investment, the nonprofit sector, academia, and government.

“The innovations submitted to IC2030 included health solutions with exciting potential. They are tangible examples of the kinds of new tools that we need.”

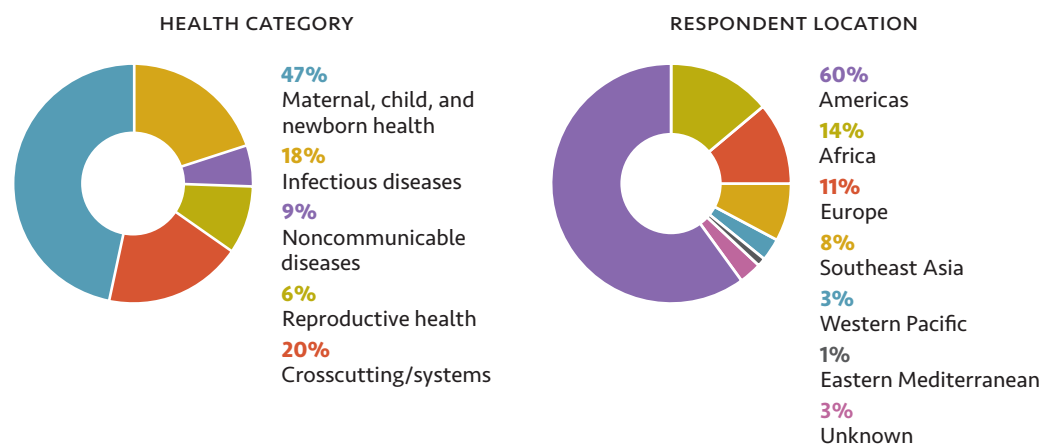
— Lucy Chen, MD, MPH
Final interdisciplinary panel

The survey was sent to thousands of people in more than 150 countries, including health experts from nearly 100 professional associations, conferences, and networks; the World Health Organization and the US National Institutes of Health; and PATH’s global network of collaborators and partners.

The public was also invited to participate in the survey, which was promoted through social media, blog posts, electronic newsletters, and electronic mailing lists for 40 international universities and research institutes.

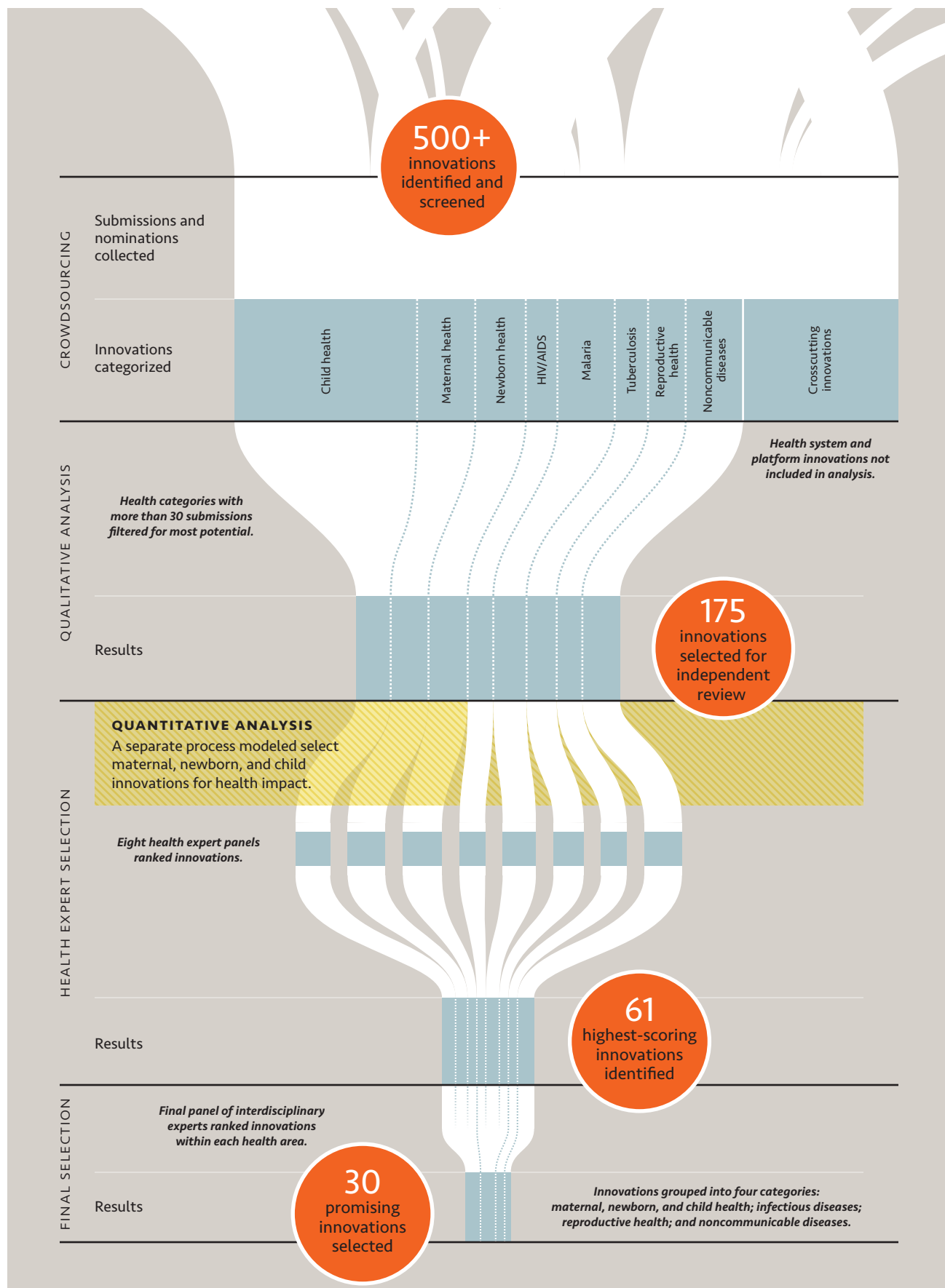
By the time the survey closed in October 2014, we had received 380 nominations from experts in 33 countries, including technology developers, health leaders, academics, industry experts, investors, donors, and representatives from nongovernmental organizations. About 30 percent of respondents were people in low- and middle-income countries (Figure 2).

FIGURE 2. Innovation nominations* by health category and respondent location.



*Some innovations were not classified due to lack of information.

FIGURE 3. Innovation selection methodology.





SDG health categories

More than 500 innovations were assigned to eight SDG health categories:

Maternal health

Newborn health

Child health

HIV/AIDS

Tuberculosis

Malaria

Reproductive health

Noncommunicable diseases

We also added more than 120 additional innovations separately identified through the Saving Lives at Birth initiative and Grand Challenges Canada. Saving Lives at Birth seeks groundbreaking prevention and treatment approaches for pregnant women and newborns around the time of delivery. Grand Challenges Canada seeks ideas that integrate science and technology with social and business innovation to impact global health.

We assigned these 500-plus innovations to eight health categories aligned with health targets included in the proposed SDGs: maternal, newborn, and child health; HIV/AIDS; TB; malaria; reproductive health; and noncommunicable diseases, including diabetes, cancer, cardiovascular disease, and chronic respiratory disease (Figure 3).

CROSSCUTTING INNOVATIONS

There was one additional health category that received a substantial number of submissions—crosscutting systems solutions and platform innovations that could accelerate progress toward two or more SDG health targets simultaneously.

Nominations included innovations targeting behavior change communication and demand generation (such as a workplace-based intervention with peer educators providing information and access to women's health services), health care workforce capacity-building (such as diagnostic and treatment protocols), and data collection and management tools (such as electronic medical record systems). We have highlighted these crosscutting innovations on pages 32–33.

Systems and platform innovations are essential for the global community's efforts to achieve the SDGs by 2030. Our evaluation framework focused specifically on an innovation's potential to meet individual SDG targets; thus, we did not evaluate the crosscutting innovations this year. In future years, we plan to develop a new assessment tool that will allow us to evaluate these solutions.

ASSESSING THE INNOVATIONS: QUALITATIVE ANALYSIS

We narrowed the list of submitted innovations using an innovative qualitative assessment methodology developed with input from a panel of nine public- and private-sector experts.

We created an assessment tool (Figure 4) to narrow the field of submissions in health areas where we received more than 30 nominations. This allowed us to select innovations with the most potential to accelerate progress toward the SDGs.

We categorized these innovations by health area and type of innovation. We then assessed the innovations based on their:

- Accessibility, affordability, and scalability.
- Stage of development.
- Expected performance compared to existing solutions.
- Potential health impact.
- Number of nominations.

For health areas with fewer than 30 nominations, we performed a basic assessment to ensure that they were credible and met our standards for inclusion. For more on our assessment criteria, please see www.ic2030.org.

RANKING THE INNOVATIONS: HEALTH EXPERT SELECTION PROCESS

Our next step involved eight independent panels of health area experts ranking the innovations. Before the selection process began, the experts were invited to submit additional innovations in certain health areas to address gaps. In all, 175 innovations made it to this next round of evaluation. The panelists then rank-ordered the innovations from

FIGURE 4. Sample innovation scorecard.

IC2030 assessment criteria		<div> <div></div> High <div></div> Medium <div></div> Low </div>
	Sample response (malaria vaccine)	Scoring (low, medium, high)
Characteristics of the innovation		
Innovation description	Participant response	Not scored
Innovation type	Vaccine	Not scored
Challenge the innovation addresses		
Health area	Malaria	Not scored
Target disease area	Malaria	Not scored
Current standard of care (comparative solution)		
Comparative solution	Bed nets	Not scored
Innovation improvement type*	Effectiveness	Not scored
Level of performance improvement	Significant	See definition
Probability of success (regulatory approval)*		
Stage of development†	Phase 3	Concept & PC, PI & PII, PIII+
Potential health impact (deaths averted)		
Global burden of disease (deaths)	6.18k	See definition; will vary by health area
Expected effectiveness	16%	<60%, 60%-80%, >80%
Dependency on other innovations	0	See definition
Accessibility, affordability and scalability		
Target health care provider/administrator	Nurse	Self or family, community health worker, or nurse, MD
Anticipated cost relative to comparative solution	Higher cost	Lower cost, similar, higher cost
Frequency of delivery/use	3 interactions or less	See definition
Other		
Number of survey mentions	2 (insert number)	1, 2, 3+
Key risks and opportunities mentioned by respondents:		

*Innovation improvement types include effectiveness, safety, ease of use, and cost reduction; †stage of development will be different for devices and diagnostics; stage of development will also be related to the time and cost to complete development.

This sample scorecard for a fictional malaria vaccine candidate illustrates the criteria we used to assess an innovation's potential to accelerate progress toward the SDG health targets.

one to ten in each health area. The 61 highest-scoring innovations from this round of voting were selected to move on for a final assessment by a separate independent expert panel.

This final interdisciplinary panel reviewed the list but was not invited to submit additional innovations for consideration. Panelists followed the Delphi process, a widely used approach to facilitate consensus among experts, by ranking innovations within each health area in two rounds of voting. Their rankings were based on what they believed had potential to accelerate progress toward the SDG health targets based on the innovation descriptions provided by nominators and their broader contextual knowledge of global health.

For consideration in the second round of voting, panelists were provided with aggregated results from the first round of voting and anonymous comments from fellow panelists on the rationales for their top choices. The second vote determined the final list of 30 innovations.

Throughout the process, experts were reminded that innovations were independently nominated, the innovation descriptions relied primarily on information provided with the nominations, and inclusion in the list of innovations did not imply endorsement by either PATH or the expert panelists. Innovations developed or supported by PATH were also independently assessed by the experts following the process described here.

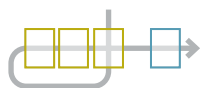
IMPACT MODELING: QUANTITATIVE ANALYSIS

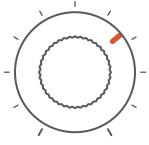
To assess the potential cost and health impact of these innovations, PATH also modeled introduction scenarios for select MNCH innovations to provide insights on the innovation's potential to accelerate progress toward the SDG health targets. Estimated lives saved and costs are provided for eight MNCH innovations in this report. In the future, we plan to expand our impact modeling to include innovations that address additional SDG health targets.

Working with Applied Strategies, we developed a quantitative methodology that models the uptake and cost associated with procuring and delivering a new innovation, including the impact on downstream costs and treatment costs that may be averted compared to the current standard of care. We then estimated the potential incremental lives saved and

Delphi process

This method invites a group of experts to each rank options and comment on their choices anonymously, review the group's comments and initial ranking, and then each rank the options again to give a final result that reflects something closer to expert consensus.





Coverage estimates

Adjusting assumptions about the peak coverage rate for each innovation in home, clinic, and hospital settings has a significant impact on the potential number of lives saved.

additional life-years gained from introducing the innovation. The model methodology and approach, as well as the outputs, were vetted with external advisors.

Health impact and cost estimates are based on a number of assumptions and should be viewed as estimates that contain a level of uncertainty. The incremental impact of each innovation was modeled between the years 2015 and 2030 based on assumptions of care-seeking behavior, innovation launch timing, and uptake to peak coverage by treatment setting (home, clinic, or hospital). Cost and effectiveness were generated based on publicly available literature and consultation with PATH experts. Sensitivity and scenario analyses were performed where there was a high level of uncertainty in the assessment or available data.

The analyses assumed that innovations would successfully meet technical milestones and launch, but recognized that some innovations are still in early development and their arrival on the market is uncertain. Costs for R&D, innovation training, and patient transport were not included.

This model methodology could be expanded to include other health and economic value measures, providing a common framework to assess the potential impact of innovations in other SDG health areas. For more information on reading the impact modeling data, see page 12.

LIMITATIONS

In our first year of the IC2030 initiative, PATH's scope of work was defined by the time and resources available. There were necessarily certain limitations in our approach.

We assessed innovations based on their potential impact on mortality, not morbidity, tracking the SDG health targets. We received innovations that addressed areas such as chronic pain management, but these were not included in our analysis. We did not systematically evaluate the crosscutting innovations submitted.

While we sought to create the broadest possible list of high-impact health innovations, we know that there are many promising technologies and products in development that were not among the submissions we received.

ACCELERATING PROGRESS TOWARD THE SDGS

In addition to the expert panels described above, a senior advisory committee of 14 experts and thought leaders from nine countries provided input and guidance throughout this yearlong process. They represented academia, research, foundations, global health, social impact investing, and the private sector.

In all, 61 experts on 11 different panels provided important contributions that informed the selection of the final 30 innovations highlighted in this report. PATH is grateful to each of our distinguished panelists. We thank them for their time and valuable insights.

ADVISORY AND EVALUATION PANELS

More than 60 international experts contributed their insights and knowledge to guide the selection of the 30 innovations highlighted in this report. We are grateful for their time and valuable contributions. We also thank Applied Strategies for its role in the impact modeling work.

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THE WAY FORWARD

Imagine the world in 2030 if even a fraction of the promising innovations featured here are introduced, scaled up, and accessible to the people who need them most.

How many more lives could we save over the next 15 years by focusing our brightest minds, collective resources, and shared aspirations on accelerating health innovations with transformative potential?

In this first year of the Innovation Countdown 2030 initiative:

- We saw how crowdsourcing can tap into an innovation ecosystem and amplify lifesaving solutions from all corners of the globe.
- We found gaps in the pipeline of innovation to address key health challenges, especially NCDs.
- We were inspired by the potential for crosscutting innovations to drive global progress toward health equity.

We aim to continue IC2030 as a multiyear initiative, building on our findings and a database that contains hundreds of compelling health solutions.

By focusing the world's attention and resources on promising health innovations, we can ensure that the 2030 health targets are met. Together, we can source innovation from around the world, build the evidence base for high-impact innovations, catalyze attention and investment, and advance policies to support and sustain those innovations.

WHAT YOU CAN DO

Imagine the possibilities

We received many more intriguing ideas than we could feature in this report. Here are three more to fire your imagination:

- Promotion and farming of insects as an inexpensive and sustainable food source to reduce malnutrition.
- A point-of-care diagnostic test combined with a mobile device interface and GPS to identify spikes in disease cases, enabling faster disease outbreak response.
- A \$1 folding paper microscope that could help bring diagnostics to researchers and clinics in remote areas.

Join the conversation

Share your ideas and thoughts with us:

- Email the team at ic2030@path.org.
- Engage in the ongoing discussion about financing and accelerating high-potential health innovations at events and meetings that include the Third International Conference on Financing for Development and the United Nations General Assembly in 2015.

Learn more

Engage with us online to find out more:

- Visit ic2030.org, where more innovation submissions we received will be available over the coming months.
- Read our blog posts on accelerating and financing innovation by leading cross-sector experts on ic2030.org.
- Follow us on Twitter: [#ic2030](https://twitter.com/ic2030).

**Innovation
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