

2011

Annual Letter *from* Bill Gates

BILL & MELINDA
GATES *foundation*



Vaccinators being trained at the Kabuga Health Centre for the upcoming polio campaign (Kano, Nigeria, 2010).

As I sit down to work on my third annual letter, governments in every corner of the world are facing tough decisions about how to reduce spending. Although foreign aid accounts for less than 1 percent of governments' total budgets, it is one place being considered for cuts. As a result, health and agricultural assistance that saves lives and puts poor countries on a track for self-sufficiency is at risk.

The world's poorest will not be visiting government leaders to make their case, unlike other constituencies, so I want to help make their case by describing the progress and the potential I see in key areas of health and development. Perhaps it is ironic for someone who has been so lucky to talk about the needs of those who have not.

I believe it is in the rich world's enlightened self-interest to continue investing in foreign aid. If societies can't provide for people's basic health, if they can't feed and educate people, then their populations and problems will grow and the world will be a less stable place.

Whether you believe it a moral imperative or in the rich world's enlightened self-interest, securing the conditions that will lead to a healthy, prosperous future for everyone is a goal I believe we all share.

Many people don't have a clear image of the benefits aid actually provides. That's not surprising, because aid covers many different areas. Also, in the past some aid was sent to countries to buy friendship without real regard for its impact. However, today a significant portion of foreign aid is spent on hugely beneficial programs that improve people's lives in both the near and long term.

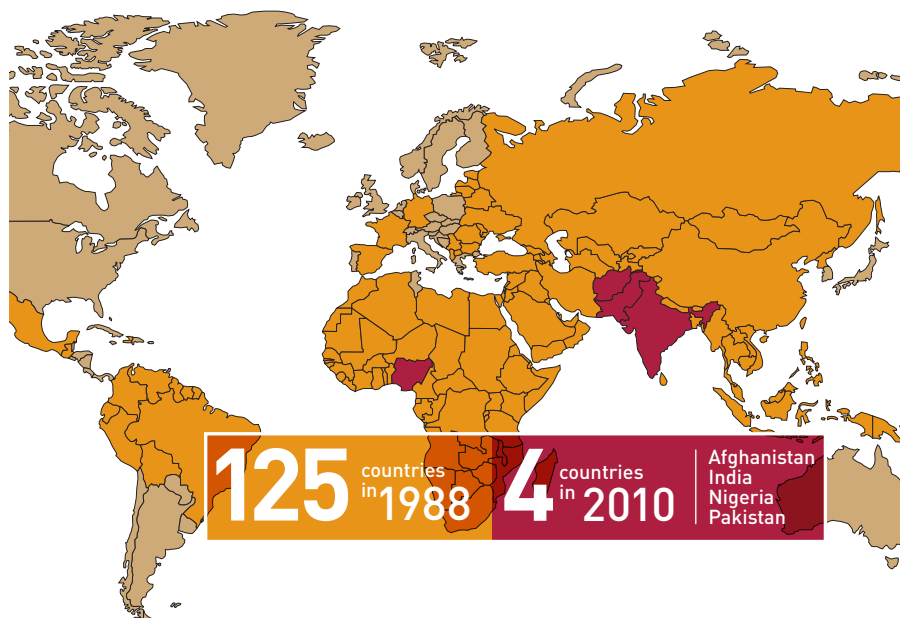
Despite the threat to aid budgets, one thing that makes me optimistic about the future is the courage of leaders who are finding ways to make the welfare of poor people a priority. Under David Cameron's leadership, the United Kingdom set a great example by keeping its promise to grow aid spending despite the cuts it had to make. It is inspiring to see a leader stand up for what he believes is right, even when it isn't easy.

Ending Polio

Aid for the poorest has already achieved a lot. For example, because of donors' generosity, we are on the threshold of ending polio once and for all.

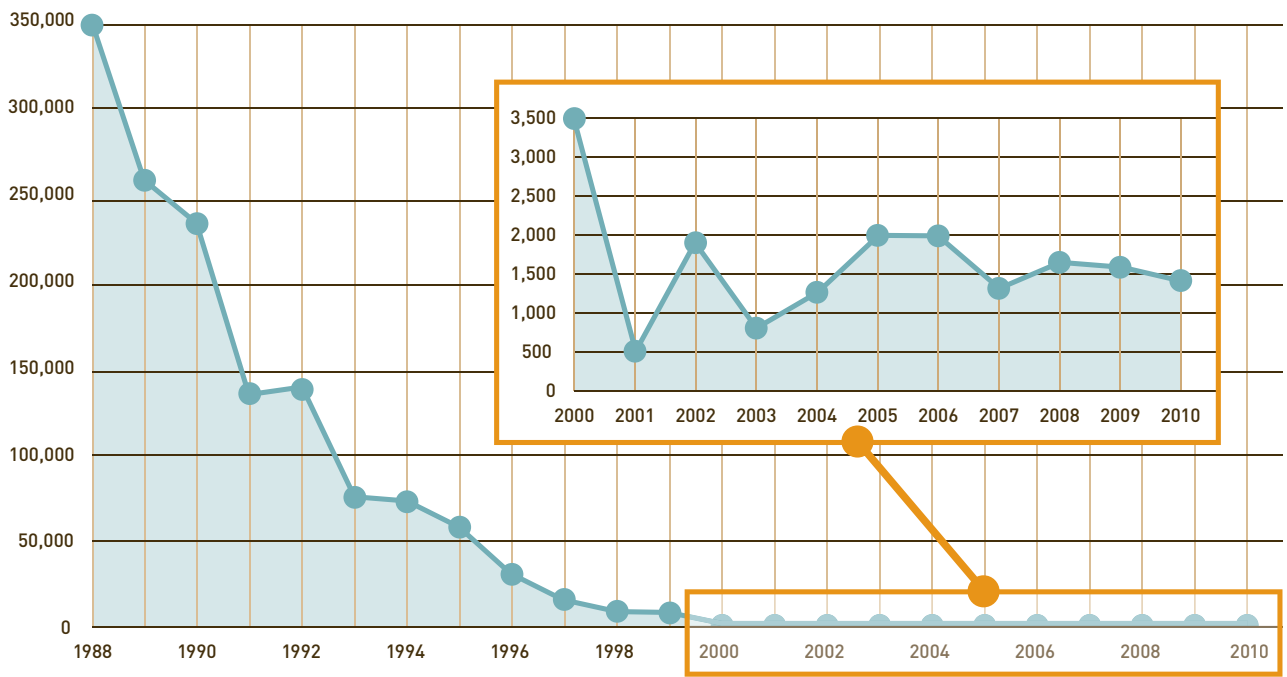
Polio is a terrible disease that kills many and paralyzes others. Fifty years ago it was widespread around the world. When you talk to people who remember polio in the United States, they'll tell you about the fear and panic during an outbreak and describe grim hospital wards full of children in iron lungs that maintained their breathing. At its peak in the United States in 1952, polio paralyzed or killed more than 24,000 people.

Reduction in countries with sustained transmission of polio, 1988-2010



Child suffering from polio reads a comic book attached to the rim of an iron lung (ca. 1955).

Estimated number of polio cases per year



Source: WHO/Polio database



Crowded polio ward at Hynes Memorial Hospital (Boston, 1955).

As a result of mass mobilizations to administer the polio vaccine, polio was eliminated in the United States and most developed nations decades ago. Most people who live in rich countries assume the disease is long gone and that it doesn't kill or paralyze children anymore. But it is still a frightening presence in a number of places around the world.

In 1988 the global community adopted the goal of ending polio altogether. At that time more than 350,000 children a year worldwide were killed or paralyzed by the disease. Since then, vaccination coverage has increased significantly and the number of cases has gone down by 99 percent, to fewer than 1,500 last year. There are now just four countries where polio transmission has never been stopped: India, Nigeria, Pakistan, and Afghanistan.

That's incredible progress, but the last 1 percent remains a true danger. Eradication is not guaranteed. It requires campaigns to give polio vaccine to all children under 5 in poor countries, at a cost of almost \$1 billion per year. We have to be aggressive about continuing these campaigns until we succeed in eradicating that last 1 percent.

Therefore, funding is critical to success. Organizations such as Rotary International and the governments of India, the United States, the United Kingdom, and Japan are all major contributors to the polio campaign. Our foundation gives about \$200 million each year. But the campaign still faces a 2011-12 funding gap of \$720 million. If eradication fails because of a lack of generosity on the part of donor countries it would be tragic. We are so close, but we have to finish the last leg of the journey. We need to bring the cases down to zero, maintain careful surveillance to ensure the virus is truly gone, and keep defenses up with polio vaccines until we've confirmed success.



Why is it so important to end polio? Eradication will have three huge benefits.

The first is that getting rid of polio will mean that no child will die or be paralyzed by the disease in the future. One thing most people don't realize is that if we don't finish the job on eradication, we will lose a lot of the ground we've gained over the past two decades. The disease will not stay at its current low level. If we don't get rid of it, it will spread back into countries where it's been eliminated, and it will kill and paralyze children who used to be safe. Only eradication will guarantee that all children are safe.

The second benefit is that the money that will be saved by eradicating polio far exceeds what we are spending on eradication efforts now. The long-term benefits of the last couple of billion dollars spent on eradication will be truly phenomenal. A recent estimate added up the cost of treatment that won't be necessary and the enhanced economic contribution of adults who won't get polio. Eradication could save the world up to \$50 billion over the next 25 years.

The third benefit is that success will energize the field of global health by showing that investments in health lead to amazing victories. The eradication effort illustrates so well how a major advance in the human condition requires resolve and courageous leadership. To win these big important fights, partnerships, money, science, politics, and delivery in developing countries have to come together on a global scale.

The history of polio and polio eradication is fascinating. (One of the best books I've read on the subject is David Oshinsky's *Polio: An American Story*.) Polio was the first disease that raised significant money from the broad public. The March of Dimes was created to combat the disease. Although President Roosevelt and lots of Hollywood stars helped the campaign, its huge success came from neighborhood-based fundraising. I remember March of Dimes volunteers ringing our doorbell when I was growing up and asking for a donation. By any measure, the public's generosity in supporting that charity made it one of the most successful health-related fundraising campaigns ever.

The March of Dimes funded research into the first polio vaccine, which was invented by Dr. Jonas Salk and introduced in 1955. It was such an important priority to get the polio vaccine out widely that the U.S. government sponsored the campaign, which it had never done before. The campaigns of the late-1950s were wildly successful, and by 1961 the number of cases in the United States was down to just 161.

A second polio vaccine—this one in the form of liquid drops that children swallow instead of an injection in the arm—was invented by Dr. Albert Sabin and licensed in 1963. By 1979 there was no more poliovirus in circulation in the United States. Dr. Salk's and Dr. Sabin's vaccines are still the key tools used for eradication today.

Polio timeline

3000 BC

Egyptian paintings and carvings depict people with withered limbs and walking with canes

1952

Worst polio outbreak in United States history, with 58,000 reported cases

1963

Albert Sabin's oral polio vaccine licensed

1979

Last case of naturally occurring polio in the United States

2007

The World Health Organization declares polio eradicated in the Americas, Europe, and the Western Pacific

1928

First iron lung used at Children's Hospital in Boston

1955

Jonas Salk's injected polio vaccine introduced

1970s

National immunization programs launched, leading to control of the disease in many developing countries

1988

Polio still exists in 125 countries and paralyzes an estimated 350,000 children; Global Polio Eradication Initiative created

2010

Sustained transmission of polio in four countries, but outbreaks in 16 countries are reminders that polio anywhere is a threat everywhere



Clockwise, from top: Rotary vaccination teams pick up vaccines and other supplies at the Patna Junction railway station (Bihar, India, 2010). World Health Organization workers unpack polio vaccine from boxes designed to keep it cold (Bihar, India, 2010). Billboard advertises the ongoing polio campaigns in Patna (Bihar, India, 2010).

To this day, the smallpox campaign is the only successful human disease eradication campaign in history. At its peak, smallpox killed over 2 million people every year and also blinded and disabled large numbers. The eradication campaign started in 1967, the last naturally acquired case of smallpox was in 1977, and the world was certified as being free of smallpox in 1979. (Two excellent books on the smallpox eradication are Dr. D.A. Henderson's *Smallpox: The Death of a Disease* and the forthcoming *House on Fire* by another key smallpox warrior, Dr. Bill Foege.)

Smallpox had a number of characteristics that made it easier to eradicate than polio. Almost everyone who got smallpox developed a distinct rash. In contrast most polio infections are not noticed because less than one in 100 people infected are paralyzed, even though all those infected can transmit the virus. This means by the time a paralytic case is found, the poliovirus has probably spread.

Also, the vaccines against polio are not as effective as the smallpox vaccine, which was so powerful that a single vaccination protected almost everyone. In the case of the most common polio vaccine, at least three doses are required to get 85 percent of children fully protected. In many countries of the developing world, even more doses are needed to reach the immunity levels needed to stop transmission of the virus.

But the polio campaign also has some huge advantages that the smallpox campaign did not have. The advanced science we have today lets us sequence the DNA of the polio virus and develop an understanding of the history of transmission, which guides our work. We also have far better communications and modeling tools than were available in the 1970s, and those are being used in smart ways to respond rapidly to every outbreak.



Girl winces as she gets vaccinated against smallpox (Nigeria, 1969).

In 2003 I would have said we were just a couple of years away from ending polio, and I would have been wrong. That year there were false rumors in Nigeria that the polio vaccine caused women to become sterile. This allowed the disease to have a resurgence and to spread to many other countries. The experience of 2003 serves as a reminder to be humble as we move forward. But humility does not mean fatalism.

Fortunately those false rumors have been almost completely eliminated through the leadership of key political and religious figures. In 2009 when I visited Northern Nigeria to meet with the most important traditional leader, the Sultan of Sokoto, he committed to the campaign. It was fantastic to see him publicly giving his support. (He also gave me a horse to thank me but I told him I couldn't take it.)

Last year both India and Nigeria had substantially fewer cases than ever before. In India the number of cases went down from 741 in 2009 to just 41 in 2010. In Nigeria, thanks in large part to the renewed leadership in the northern part of the country, the number went down from 388 to just 18. But alongside the phenomenal progress was another reminder that gains can be lost without sustained action.

The majority of cases in 2010 were in countries that had been polio-free until the virus travelled back across borders and caused outbreaks in areas where people had gotten lax about vaccination. There was a large outbreak in Tajikistan in the first half of 2010 and another in Congo in the second half. In both regions there were a number of immunization campaigns organized as a response. Today the outbreaks appear to be under control.

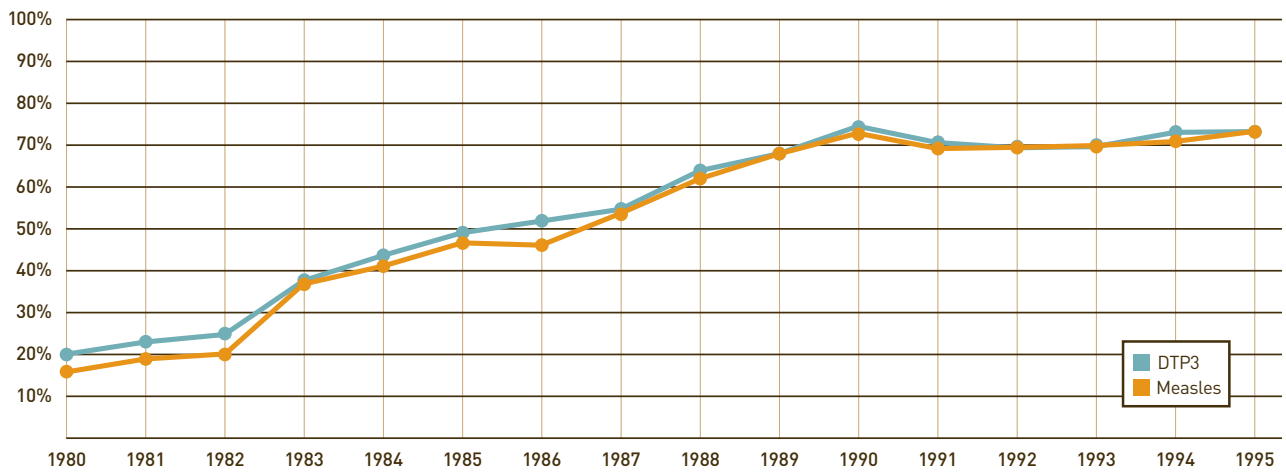
What those outbreaks in formerly polio-free countries prove is that eradication is a global project requiring every country to do its part. Very few projects demand global participation. In most areas each country can pursue its own approach, and countries can compare outcomes to see which approach is the most successful.

Philosopher and historian Will Durant once observed that the only thing that could get countries to join forces would be an alien invasion. To my mind, terrible diseases are surrogates for an alien invasion. If we are to succeed, the world needs leadership from a global institution and significant, coordinated resources from rich countries to fund activities in the poorest countries.



Clockwise, from top left: Health worker vaccinates a woman against tetanus (Freetown, Sierra Leone, 2009). Child receives oral polio vaccine from house-to-house vaccination team (Kano, Nigeria, 2010). Mother has her baby vaccinated against rotavirus (Corozal, Nicaragua, 2009).

Rise in measles vaccine coverage and diphtheria, tetanus, and pertussis (DTP3) vaccine coverage, 1980-1995



Source: UNICEF

For polio, the World Health Organization (WHO) has played the central role with Rotary International, the Centers for Disease Control, and UNICEF as key partners. Polio eradication has benefited immensely from having Rotary's support. Rotary had the vision to get involved in 1985 and has kept polio eradication as its top priority. Everywhere I go to learn about polio, I see Rotary members helping out with the hard work.

I feel sure that with continued support we will be able to show significant progress building on this year's work. The site www.polioeradication.org tracks the key parts of the campaign including fundraising and the latest cases. I will make a number of trips focused on polio this year, including additional trips to India and Nigeria, and will write a report for the foundation website. For anyone who wants to support the polio campaign, which would be fantastic, visit www.rotary.org and click on the EndPolioNow logo.



The Miracle of Vaccines

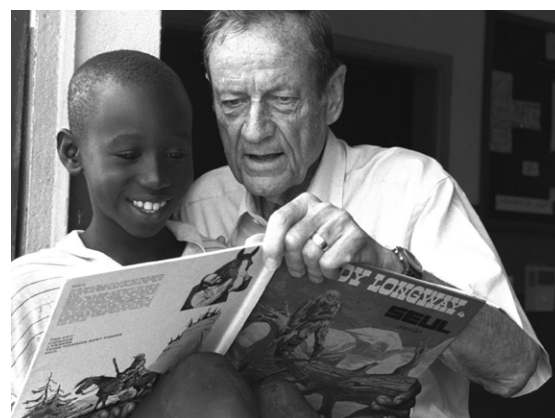
In the same way that during my Microsoft career I talked about the magic of software, I now spend my time talking about the magic of vaccines. Vaccines have taken us to the threshold of eradicating polio. They are the most effective and cost-effective health tool ever invented. I like to say vaccines are a miracle. Just a few doses of vaccine can protect a child from debilitating and deadly diseases for a lifetime. And most vaccines are extremely inexpensive. For example, the polio vaccine costs 13 cents a dose.

This year 1.4 million children will die from diseases for which there are already vaccines—diseases like measles, pneumonia, and tetanus. Those lives can be saved if we can reduce the costs of vaccines and raise enough money to buy and distribute them. If we simply scale up existing vaccines in the five countries with the highest number of child deaths, we could save 3 million lives (and more than \$2.9 billion in treatment costs alone) over the next decade. In addition, researchers are inventing new vaccines for malaria, AIDS, and tuberculosis, and these would save millions more lives. But generous aid is required to realize the true lifesaving potential of vaccines. The most direct way of saying this is that every \$2,000 cut in the most effective aid spending causes a child to die.

A few years ago I was looking into the history of vaccination coverage. In 1980 less than 20 percent of children worldwide received the vaccinations for diseases including measles, diphtheria, tetanus, and whooping cough (pertussis) that children in rich countries were receiving. Less than 15 years later, in 1995, vaccination rates had been raised to over 70 percent. Just this year I finally got around to learning why there was such a huge increase. The head of UNICEF at the time, Jim Grant, led the way. The book *Jim Grant—UNICEF Visionary* tells his amazing story. Since there are only a few used copies of this in circulation UNICEF recently made a free version available at www.unicef.org/publications/index_4402.html.

I'm surprised by how little attention his story gets and how long it took me to find out about it. I was inspired by reading how he drove global progress even during the tough economic decade of the 1980s. We can draw lessons from his leadership now, in our own tough economic times.

As is often the case with courageous efforts, many people resisted Jim Grant's push, viewing it as too top-down. However, he managed to enlist a number of countries to lead the way, and as the number of deaths in those countries dropped dramatically he was able to persuade almost every country to run strong vaccination campaigns. It is especially amazing that he did this in an age when there was no Internet and no email. Jim Grant's achievement is the greatest miracle of saving children's lives ever.



Jim Grant reads with a child at a community center (Abidjan, Cote d'Ivoire, 1994).

© UNICEF



Infant being immunized at a district hospital (Dowa, Malawi, 2010).

The benefits of widespread vaccination are mostly explained in terms of the lives vaccines save, and based on that measure alone, vaccines are the best investment to improve the human condition. However, there are two other equally important benefits that are not as widely known partly because they are harder to quantify.

The first is the reduction in sickness. I don't mean just the acute sickness where a child is clearly suffering from the disease, but also the permanent disabilities caused by the disease. This is most noticeable when the disability presents with a clear symptom such as being paralyzed by polio or going deaf because of a pneumococcal infection. However, the largest disability is the effect on mental development. For example, severe cerebral malaria damages your brain even if you survive. When children have lots of diarrheal episodes or parasites in their intestines, they don't get enough nutrition for their brains to develop fully.

The huge infectious disease burden in poor countries means that a substantial part of their human potential is lost by the time children are 5 years old. A group of researchers at the University of New Mexico conducted a study, covered in *The Economist*, showing the correlation between lower IQ and a high level of disease in a country. Although an IQ test is not a perfect measure, the dramatic effect you see is a huge injustice. It helps explain why countries with high disease burdens have a hard time developing their economies as easily as countries with less disease.

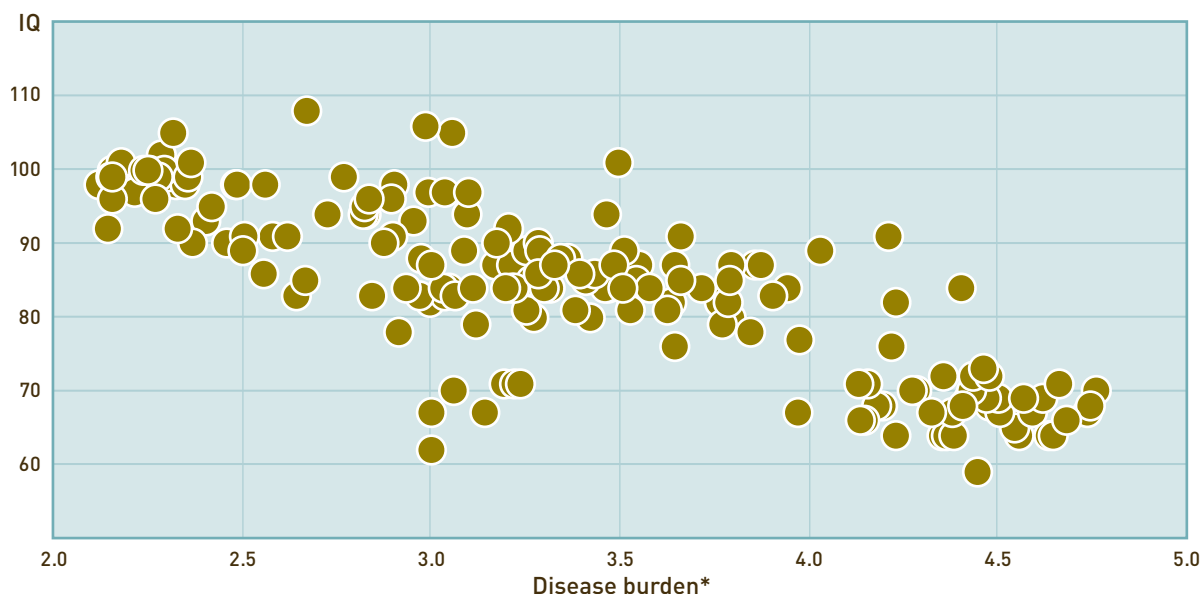
The second great benefit of vaccination is that as the childhood death rate is reduced, within 10 to 20 years this reduction is strongly associated with families choosing to have fewer children. While it might seem logical that saving children's lives will cause overpopulation, the opposite is true.

I mention this amazing connection often, since I remember how I had to hear it multiple times before the full implications of it became clear. It is the reason why childhood health issues are key to so many other issues, including having resources for education, providing enough jobs, and not destroying the environment. Only when Melinda and I understood this connection did we make the full commitment to health issues, especially vaccination.

The connection of health to education, jobs, and the environment points back to the tremendous value of high-quality international aid—and why it's essential that donor nations not cut their spending on it. Melinda and I have committed \$10 billion from the foundation over the next 10 years to help make this the Decade of Vaccines. However, this will fall well short of what is needed.

The group which helps poor countries purchase vaccines and increase vaccine coverage is the GAVI Alliance and like the polio campaign its success will depend on donor generosity.

Correlation between IQ and disease burden in 184 selected countries



*The logarithm of disability-adjusted life years (DALYs) lost to 28 representative and important human infectious diseases.

Source: Christopher Eppig, University of New Mexico



Bed nets to protect against malaria being manufactured at the A to Z Textile Mills (Arusha, Tanzania, 2009).

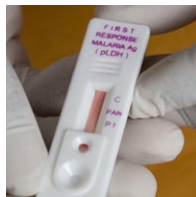


Shanti Devi holds her newborn daughter (Koelikhhera Village, India, 2004).



Melinda observes newborn babies at Bwaila Hospital (Lilongwe, Malawi, 2010).

The foundation's website does a great job of outlining all of our strategies, but in the remainder of my letter I want to highlight a few specific areas. The world has made some crucial breakthroughs, and with bold leadership I think we can do even more.



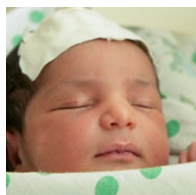
Malaria: Progress on Multiple Fronts

The fight against malaria is making very good progress. The death toll, overwhelmingly of young children in Africa, went down from 985,000 in 2000 to 781,000 in 2009. Of the 99 countries with malaria, 43 have decreased cases of the disease by more than 50 percent. Turkmenistan and Morocco were recently declared malaria-free. For these communities the reduction in both death and sickness makes a huge difference. And it is possible only because of increased donor spending, which reached \$1.5 billion in 2009.

The Roll Back Malaria group, with strong support from the WHO and our foundation, has set an aggressive goal to provide bed nets to almost every household that needs them in the next few years. As coverage goes up from its current level of 42 percent, it will have a dramatic impact. In Senegal, where 80 percent of households own a bed net, the number of malaria cases went down 41 percent in a single year. Many amazing grassroots groups are helping with the delivery of bed nets. The Nothing But Nets campaign, for example, has gotten hundreds of thousands of individual citizens and organizations like the United Methodist Church and the National Basketball Association involved in the fight against malaria.

We are also working on lowering the cost of the anti-malaria drugs containing artemisinin, which are expensive enough that people are still using less effective drugs instead. The approaches range from breeding the plant that provides artemisinin to have a higher yield, to using very advanced synthetic chemistry that can make artemisinin starting with simple sugars.

As is the case with all infectious diseases, the ultimate tool against malaria would be a low cost, highly effective vaccine. The RTS,S vaccine, developed in partnership with the pharmaceutical manufacturer GSK, is in its final phase-3 trial stage. Interim data will be available later this year, and we should have final results by 2015. A number of other vaccine candidates that might be even more effective or might be combined with RTS,S are also making progress, and several will start human trials this year.



Saving the Youngest Children

Of the 8.1 million deaths per year of children under the age of 5, over 40 percent happen in the first 28 days of life, or the neonatal period. The good news is that we are headed in the right direction. In 1995 there were an estimated 5.6 million neonatal deaths. The most recent estimates show the number down to around 3.6 million.

Unlike the deaths that take place after a child is 28 days old, almost all of which can be prevented by inventing and delivering vaccines, reducing these early deaths requires a range of approaches. Some require new tools such as an ointment for the baby's skin that prevents infection and an antibiotic solution for cleaning the cut umbilical cord. However, many of the key interventions involve social and behavioral change. You can have a huge impact (on both newborn and maternal health) by increasing the number of births done by a skilled provider in a clinic. It's also important to teach mothers to wash their hands before handling a baby, to have frequent skin-to-skin contact with their babies, and to breastfeed exclusively for the baby's first six months. (Mother's milk contains not only key nutrition but also antibodies that block infection until the baby's immune system is ready to operate on its own.) Where all of these elements come together, neonatal deaths can be reduced by 50 percent or more, so it's critical that we learn more about how to teach and motivate mothers effectively, especially at a large scale.

Melinda has been a strong leader on maternal and child health issues. She gave an especially powerful speech last year to the Women Deliver conference (www.gatesfoundation.org/womendeliver). The plight of mothers and their babies is something she feels deeply, and it's something we talk about a lot.

When she came home from a trip to Malawi she shared the experience of seeing two babies in a hospital in the town of Lilongwe, lying side-by-side in the same incubator. They were born within hours of each other. Each had suffered



Clockwise, from top left: Pregnant mother gets tested for HIV at the NDA Health Center (Dimbokro, Cote d'Ivoire, 2010). Transgender sex workers at a drop-in center (Chennai, India, 2008). Female sex workers are trained how to use condoms at a mobile clinic (Mumbai, 2009). Sign advertises the use of condoms to prevent HIV infection (Andhra Pradesh, India, 2009). Physician examines a six-year-old girl (Siem Reap Province, Cambodia, 2010).

the same condition—they were unable to breathe at birth. Sadly, it was clear that only one would survive. That baby's mother had made it to the donor-funded hospital in time for her delivery and was able to get the care she needed. Her baby was immediately resuscitated, which saved his life. The other was not so fortunate. He was born on the way to the clinic, on the side of road, and was not resuscitated soon enough. I wish everyone had a chance to experience what Melinda did, so they could see how things are improving but also understand the urgent need to do more.



HIV/AIDS and the Need for Leadership

Progress continues in fighting the AIDS epidemic, but the pace is slow. The rate of HIV infection has been reduced by almost 20 percent over the last 10 years, to fewer than 2.7 million infections per year. The number of people dying from AIDS has gone down by more than 20 percent in the last five years, to fewer than 2 million annually. Given all the lives that are at stake, I am impatient enough about this that I am willing to be viewed as a troublemaker by people who are

happy with the status quo.

The war against AIDS is being waged on two fronts—treating those who are already infected and preventing new infections. Treatment continues to be scaled up, with more than 5 million people receiving HIV drugs. This is a great success story. Rich country generosity has been crucial and the execution in poor countries has been strong. However, there will not be enough money to treat everyone who will become infected if we don't halt the progress of HIV. Because we don't have a cure for AIDS, treatment has to continue for a patient's entire life. That means costs continue to increase as you put more and more people on treatment.

Even without including people who will become infected in the future, the cost of treating the 33 million people living with AIDS today would be over \$40 billion per year at current costs—over four times as much as is provided in aid today. To minimize the funding gap we need to reduce per patient costs of treatment. Drug costs have already been reduced to less than 20 percent of treatment costs. Most of the future savings will have to come from treatment models that reduce personnel, laboratory, and overhead costs. The difficulty of funding treatment makes it clear how important it is to prevent new cases. The sooner we make progress the better. There needs to be a sense of urgency that doesn't exist yet.

Prevention breaks down into several different areas. The easiest should be preventing mother-to-child transmission since it simply involves giving a mother drugs to prevent transmission to her child. There is a lot of focus on getting from the current number of over 300,000 infections per year to zero. Another prevention approach is counseling people to change their behavior, including avoiding risky acts and using condoms.

Then we have prevention approaches that rely on new tools. We now have three tools that have shown significant impact. The first is male circumcision, which I discussed last year. Amazingly, teenagers in communities with high HIV incidence show a high willingness to be circumcised. Kenya is leading the way with over 200,000 circumcisions performed. However, there are over 10 million men in high-risk settings in Africa who would benefit from male circumcision, and we should be scaling up 10 times faster than we are.

Another new tool is a vaginal microbicide gel that a woman can use to protect herself. A recent trial showed a gel containing tenofovir protected women against infection. Now the question is how long it will take before the gel is rolled out on a large scale. As someone outside the field, I am surprised at the number of steps it takes. First the product has to be licensed, which requires approvals from regulatory groups in both the country where the product will be used and donor countries. Many of these approval steps happen serially rather than in parallel, and it is only when the entire approval process is complete that the product can be rolled out. Even then the process isn't complete because a whole system for delivering the product needs to be put together, and again a lot of these steps proceed in a slow serial fashion.

Another new prevention tool, PrEP (Pre-Exposure Prophylaxis), involves someone without HIV taking an anti-HIV drug on a regular



Talking to reporters at the XVII International AIDS Conference (Vienna, Austria, 2010).

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Lab technicians at the Diamond AIDS Research Center (New York City, 2008).



Farmer prepares dried maize (corn) for sale (Monopo, Mozambique, 2010). Farmer separates maize from stalks (Malawi, 2010).

© Charlie Barnwell, World Food Programme

basis to block infection. A PrEP trial showed a strong prevention benefit for the participants who consistently used the drugs and a weaker impact when all the participants were included. With both microbicides and PrEP I think countries with large epidemics should figure out how to do large community trials as soon as possible. This would shorten the time before all patients have these lifesaving tools by many years.

If the United States had an epidemic where almost half the girls in large neighborhoods contracted a terrible disease, we would find a way to cut through all the complexity. With HIV it is more difficult since there are many countries involved. But we need to work creatively to shorten these delays.

The best tool would be a vaccine for HIV. The scientific progress on this has gone well. The positive results of the trial in Thailand were a turning point for the field, and blood samples from the volunteers are being studied in depth for lessons about why that vaccine worked but only to a limited degree.

There has also been an explosion in the discovery of antibodies that block HIV infection. Scientists don't yet know how to make a vaccine that will cause patients to generate lots of these antibodies, but there are several approaches that look promising and will be ready to go to trials in the next few years.

In order to get a fully effective HIV vaccine we will almost certainly need several rounds of trials where we learn and improve the candidate vaccines. So to get a vaccine as soon as possible we need to minimize the length of the trials and the time between trials. So far each cycle has taken over five years. The field needs to look into how to shorten this so that progress matches the urgency of the problem.



Agriculture's Great Promise

Outside of health the area where we invest the most to help poor people is agriculture. There is so much potential in agricultural development because most poor people in the world feed their families and earn their income from farming. When farmers increase their productivity, nutrition is improved and hunger and poverty are reduced. In countries like Rwanda, Ethiopia, and Tanzania, investments in seeds, training, access to markets, and innovative agricultural policy are making a real difference.

Ghana made agriculture a priority and cut hunger by 75 percent between 1990 and 2004. The increase in food production has led to economic development in other areas.

But the growth in other countries has been slower. These are complex issues, and it's going to take strong leadership to make sure farmers have the opportunity to seize their potential. Kofi Annan, who chairs the Alliance for a Green Revolution in Africa, is leading the way by helping to drive a new agriculture agenda for the continent.

One program I'm especially enthusiastic about is a partnership launched in 2008 with the World Food Programme (WFP), the world's largest humanitarian agency for fighting hunger. What I like about it is that it takes a new approach to something the world has been doing for a long time, food aid.

In the past most small farmers were not able to sell their produce to WFP to be used as food aid. They had trouble meeting WFP's complicated requirements and delivering food in bulk quantities that met WFP's quality standards. Our partnership works with farmers and others to resolve these issues, making it possible for them to sell to lots of additional buyers including WFP. When the West African country of Niger experienced a famine last summer, WFP bought 1,000 metric tons of rice from a farmers' organization in Mali. When small farmers in Mali are earning extra income by feeding hungry families in Niger, it's a clear win-win.

The near-term rise in food prices and the long-term increased demand for food will create opportunities for small farmers even in the poorest countries. In fact, increasing production in Africa will be critical for the world to have enough food. It's encouraging that foreign aid for agriculture has now increased from its historic low of just \$2.8 billion in 2003 to \$5.9 billion in 2009, and it's critical that nations don't cut back again.

One of the most important new developments came in April when I joined the finance ministers of the United States, Spain, Canada, and South Korea to launch the Global Agriculture and Food Security Program with initial commitments of nearly \$1 billion over three years. This program provides support to developing countries with strong domestic agricultural development plans that they are already investing in themselves but cannot fully fund. It has generated amazing demand, demonstrating how committed poor nations are to their own agricultural development.

Selected countries' performance in mathematics, reading, and science, 2009

Mathematics	Reading	Science
Shanghai-China 600	Shanghai-China 556	Shanghai-China 556
Singapore 562	Korea 539	Finland 539
Hong Kong-China 555	Finland 536	Hong Kong-China 536
Korea 546	Hong Kong-China 533	Singapore 533
Chinese Taipei 543	Singapore 526	Japan 526
Finland 541	Canada 524	Korea 524
Liechtenstein 536	New Zealand 521	New Zealand 521
Switzerland 534	Japan 520	Canada 520
Japan 529	Australia 515	Estonia 515
Canada 527	Netherlands 508	Australia 508
Netherlands 526	Belgium 506	Netherlands 506
Macao-China 525	Norway 503	Chinese Taipei 503
New Zealand 519	Estonia 501	Germany 501
Belgium 515	Switzerland 501	Liechtenstein 501
Australia 514	Poland 500	Switzerland 500
Germany 513	Iceland 500	United Kingdom 500
Estonia 512	United States 500	Slovenia 500
Iceland 507	Liechtenstein 499	Macao-China 499
Denmark 503	Sweden 497	Poland 497
Slovenia 501	Germany 497	Ireland 497
Norway 498	Ireland 496	Belgium 496
France 497	France 496	Hungary 496
Slovak Republic 497	Chinese Taipei 495	United States 495
Austria 496	Denmark 495	Czech Republic 495
Poland 495	United Kingdom 494	Norway 494
Sweden 494	Hungary 494	Denmark 494
Czech Republic 493	Portugal 489	France 489
United Kingdom 492	Macao-China 487	Iceland 487
Hungary 490	Italy 486	Sweden 486
Luxembourg 489	Latvia 484	Austria 484
United States 487	Slovenia 483	Latvia 483
Ireland 487	Greece 483	Portugal 483
Portugal 487	Spain 481	Lithuania 481

Significantly above the OECD average

OECD average

Significantly below the OECD average

PISA focuses on young people's ability to use their knowledge and skills to meet real-life challenges. This orientation reflects a change in the goals and objectives of curricula themselves, which are increasingly concerned with what students can do with what they learn at school and not merely with whether they have mastered specific curricular content.

Source: OECD PISA 2009 database



Geoffrey Canada talks with students at Harlem Children's Zone, in a scene from *Waiting for "Superman"* (New York City, 2009).

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Excellence in Teaching

In the United States, the foundation's biggest investments are in education. Only a third of students are graduating from high school prepared to succeed at college-level work, and even fewer are going on to get a degree that will help them compete for a good job. No one should feel comfortable with those results.

Davis Guggenheim's amazing and popular movie *Waiting for "Superman"* made a powerful argument against the status quo. It showed a broad audience that schools with the right approach can succeed, even with inner city students that typical schools do not educate well. As more people understand the gap between what is possible and what is actually happening in most schools, I believe the momentum for reform will grow.

Since 1980 U.S. government spending per K-12 student increased by 73 percent, which is 20 percent faster than the rest of the economy. Over that time our achievement levels were basically flat, while other countries caught up. A recent analysis by the Programme for International Student Assessment (PISA) showed the United States is about average (compared to 35 developed countries) in science and reading and below average in math. Many Americans have a hard time believing this data, since we are so used to being the global leader in educational achievement and since we spend a lot more money on education than many other countries.

PISA measured educational achievement in the Shanghai area of China, and even allowing for the fact that Shanghai is one of the most advanced parts of China, the scores relative to the United States and other countries were quite stunning. China did better in math, science, and reading than any of the 65 countries it was compared to, and it achieved these results with an average class size of more than 35 students. One of the impressive things about the Chinese system is how teachers are measured according to their ability. There are four levels of proficiency in the Chinese system, and to move up a level, teachers have to demonstrate their excellence in front of a panel of reviewers.

According to the PISA analysis (available at www.pisa.oecd.org), two key things differentiate the U.S. education system from most other countries' systems. The first is that non-U.S. students are in school for more hours, and the second is that U.S. school systems do very little to measure, invest in, and reward teacher excellence.

Most people who become teachers do so because they're passionate about kids. It's astonishing what great teachers can do for their students. But the remarkable thing about great teachers today is that in most cases nobody taught them how to be great. They figured it out on their own. That's why our foundation is investing to help devise measurement and support systems to help good teachers become great teachers.

Our project to learn what the best teachers do—and how to share this information with other teachers—is making significant progress. With the help of local union affiliates, we have learned a lot already. We're learning that listening to students can be an important element in the feedback system. In classes where students agree that "Our class stays busy and doesn't waste time" or that "In this class, we learn a lot almost every day," there tend to be bigger achievement gains.

Another great tool is taking a video showing both the teacher and the students and asking evaluators to provide feedback. Melinda and I spent several days visiting schools in Tennessee this fall and sat with teachers who were watching videos of themselves teaching. We heard from a number of them how they had already improved by seeing when students were losing interest and analyzing the reasons.

Ultimately, the goal is to gather high-quality feedback from multiple sources—test scores, student surveys, videos, principals, and fellow teachers—so that teachers know how to improve. I think it is clear that a system can be designed that teachers agree is fair, has modest overhead, and rewards the teachers who are doing the most for their students.

State budgets, the biggest part of K-12 funding, will be challenged in the years ahead because of the economic downturn, the liabilities from early retirement and pension commitments, and increasing medical costs. I recently gave a speech to the chief states school officers



Visiting the Ridgeway Middle School with Melinda to learn about the Measures of Effective Teaching project (Memphis, Tennessee, 2010).



Welding student Jaurie Vaughn at the Tennessee Technology Center (Nashville, Tennessee, 2010).

(www.gatesfoundation.org/ccsso) about how they might need to find money to reward excellent teaching by shifting some away from things like payment for seniority or advanced degrees that do not correlate with improved teaching.

I am very enthusiastic about the potential of innovation to help solve many of the problems with our education system. Melinda and I were impressed when we visited the Tennessee Technology Center in Nashville, an institution that provides young adults with technical training and certificates. It gets significantly better results than its peer institutions—graduating 71 percent of its students—because it focuses on teaching job skills that are in high demand and is oriented around meeting the needs of students who are juggling school with work and family. Sometimes something as simple as rethinking the times when classes are scheduled makes a huge difference for students.

The foundation is funding the development of online tools to help both K-12 and college students learn. Pioneers like Sal Khan are already showing how effective online tools can be. His website www.khanacademy.org continues to grow its library of 2,000 short instructional videos on topics from basic arithmetic to complicated subjects like biology and physics. The videos are a tremendous resource for students of any age.

Sal's vision for how technology can improve learning is broader than just videos. With support from the foundation, he's been able to expand his site to include online exercises that diagnose weak spots, pointing you to additional material to fill the gaps in your knowledge. Also, Khan Academy is creating an online "dashboard" to help teachers use the site as part of their curriculum. The dashboard tells the teacher how each student is doing, pinpoints where they're having trouble, and suggests explanations and exercises to help.

Although it is clear that online learning works for strongly motivated students, we need to learn how to blend classroom learning and online learning, particularly for younger and less-prepared students. As these projects develop and we start to answer many of these questions, I believe technology will let us dramatically improve education despite the budget constraints.



The Giving Pledge

Warren Buffett is a remarkable friend and mentor to both Melinda and me, and we have learned so much from spending time with him and working with him on foundation projects. A few years ago Warren suggested that he, Melinda, and I should get together with some of the most generous givers in the country and see what we could learn from them. We started out by having dinners where everyone talked about why they give, what they are passionate about, and what they wish they could do better. The dinners evolved into discussions of the challenges of giving effectively. It became clear that there was a lot of collective knowledge and that we could inspire each other and in some cases work together. There was a strong sense we should broaden the discussion to a larger group including people who were earlier in their giving career.

This led to the idea of the Giving Pledge. It is simply a commitment to give the majority of your wealth away during your lifetime or through your will. We hope that over the long term it will encourage people to start earlier, collaborate more, and make their giving even more impactful.

We are excited that 58 people have already joined the Giving Pledge. You can see the letters describing their thinking about giving at www.givingpledge.org. The United States is the most generous country in the world. More than 15 percent of the large estates go to charity. That is significant, but there is room for that to increase. Warren has said, "We want the general level of giving to step up. We want the Pledge to help society become even more generous. We hope the norm will change towards even greater and smarter philanthropy."

Although this effort is focused on those people in the United States with the greatest wealth, we are encouraged by and support similar efforts that focus on other groups. For example, some of the top business people in China and India asked if we would meet with them to stimulate discussion about giving in their country. Warren and I had the meeting in China in November and we were very happy with how many people came and how the conversation turned out. All three of us will be attending a similar meeting in India in the first half of the year.



Clockwise, from top left: Geetanjali in her bakery with her son and daughter (New Delhi, 2010). Woman carries maize to market (Kunsu, Ghana, 2010). Kamla Devi at her roadside flower shop (New Delhi, 2010). Child receives oral polio vaccine (Kano, Nigeria, 2010). Students learn about biotech in Dr. Kinchington's 10th grade class at the Science and Technology Academy (Pittsburgh, Pennsylvania, 2010).



Continuing the Conversation

Last year I launched www.gatesnotes.com and started a Twitter feed (@BillGates) to share my thoughts on the work we're doing and what I'm learning from leaders and innovators. One great benefit of these tools is that they allow me to hear back from people. Over the next year I'll be trying some new ways of adding interactivity to the site so I can get even more feedback.

Melinda is also very interested in spurring a broader conversation about the issues she's focused on at the foundation. Last year she started posting regularly to the foundation's blog. She also hosted a terrific TEDx event (www.tedxchange.org) in New York that brought together interesting speakers on global health and development. Next year, building on her relationship with TED, she'll be hosting a series of "TEDxChange" events in communities around the world—in places like Kenya and India. The goal of these TEDxChange events is to give people a chance to hear about health and development from people who live in the places where the work is happening.

Despite government budget difficulties and the complexity of solving the key problems the foundation's work addresses, Melinda and I remain optimistic. We meet so many remarkable leaders whose work is making the world a better place.

My father, our co-chair, set the foundation's direction from the start and he always helps us keep in mind what is important. Jeff Raikes, our CEO, continues to add great people and improve the way we do our work. Not everyone can go to the field, or even donate. But every one of us can be an advocate for people whose voices are often not heard. I encourage everyone to get involved in working for solutions to the challenges those people face. It will draw you in for life.

Bill Gates
Co-Chair, Bill & Melinda Gates Foundation
January 2011

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GATES *foundation*

Guided by the belief that every life has equal value, the Bill & Melinda Gates Foundation works to help all people lead healthy, productive lives. In developing countries, it focuses on improving people's health and giving them the chance to lift themselves out of hunger and extreme poverty. In the United States, it seeks to ensure that all people—especially those with the fewest resources—have access to the opportunities they need to succeed in school and life. Based in Seattle, Washington, the foundation is led by CEO Jeff Raikes and Co-chair William H. Gates Sr., under the direction of Bill and Melinda Gates and Warren Buffett. Learn more at www.gatesfoundation.org.

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