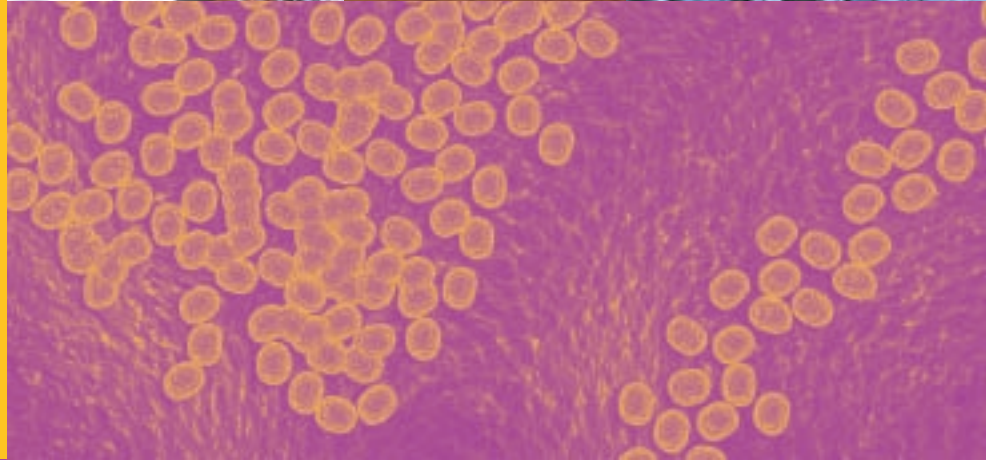


# PATHWAYS TO GLOBAL HEALTH RESEARCH STRATEGIC PLAN 2008-2012

THE JOHN E. FOGARTY INTERNATIONAL CENTER  
ADVANCING SCIENCE FOR GLOBAL HEALTH



## **Vision**

The Fogarty International Center's vision is a world in which the frontiers of health research extend across the globe and advances in science are implemented to reduce the burden of disease, promote health, and extend longevity for all people.

## **Mission**

The Fogarty International Center is dedicated to advancing the mission of the National Institutes of Health by supporting and facilitating global health research conducted by U.S. and international investigators, building partnerships between health research institutions in the U.S. and abroad, and training the next generation of scientists to address global health needs.



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## 1. WELCOME FROM THE DIRECTOR

As we enter our 5th decade, and as global health has become a worldwide priority, it is time to reflect on the new connectivity of the global community and consider a new Strategic Plan for the Fogarty International Center. We encourage you to read through the new Strategic Plan that is presented in this document and reflects the input of hundreds of stakeholders and experts from abroad and the U.S.

As you will see, Fogarty has a long history of investment in low- and middle-income countries working with NIH colleagues to support research, train health researchers, and promote collaboration. As we go forward with this plan, we hope to build on our past successes and bring new dimensions and a new vision to our programs in the next five years and for the century ahead.

Thank you for joining us as a partner in this effort.

Sincerely,



Roger I. Glass, M.D., Ph.D.  
Director, Fogarty International Center and  
Associate Director for International Research,  
National Institutes of Health



## What is Global Health?

The term *global health* has been defined by the Institute of Medicine of the National Academies to refer to “health problems, issues, and concerns that transcend national boundaries, may be influenced by circumstances or experiences in other countries, and are best addressed by cooperative actions and solutions.” Such a concept goes beyond the notion of global health as a simple “absence of disease” and beyond a focus on exotic tropical diseases that galvanized much of international health research in early days. Addressing global health challenges today means marshalling experts in many fields of behavioral and biomedical research, from anthropology to zoonotic infections, along with studies of the impact of economics, ecology, healthcare systems, and public health policies on health and disease.

There is also a more idealized concept of global health that sees global health as a state that would be achieved when individuals everywhere are free to develop to their full physical and mental capacity in a safe, unpolluted environment, with access to clean water, adequate nutrition, and health care services appropriate to maintain health and prevent and treat diseases. It is an ideal and, like all ideals, is the inspiration for the actions of many global health leaders, both in research and in philanthropy. Indeed, it is the inspiration that drives the commitment that the Fogarty Center’s staff brings to their work.



## 2. EXECUTIVE SUMMARY

### The Fogarty International Center Strategic Plan: 2008-2012

The Fogarty International Center enters its fifth decade with a new strategic plan—Pathways to Global Health Research. Inspired by the desire of all humankind to live a long and healthy life, Fogarty sees opportunities for addressing and resolving major global health problems by conducting research at places where those diseases are especially problematic, because of genetic, environmental or other causes. Such a strategy in our increasingly connected world stands to benefit people everywhere, whether they live in developed or low- and middle-income countries (LMICs). This strategy is embodied in Fogarty's vision.

Crucial to this ideal of “taking science where the problems are” is having the people and resources in place around the globe to do the work. This new strategic plan proposes ways to build upon decades of Fogarty research and research training programs focused in LMICs that have resulted in the growth of a worldwide community of global health scientists who have made remarkable advances and discoveries and become leaders in the research enterprise. It describes strategies to address global health disparities through the development of new tools to apply evidence-based knowledge. Ultimately what is learned abroad from these research and training activities will come home to help all Americans as well.

**Changing patterns of disease.** Today, thanks to public health measures and biomedical advances worldwide, life expectancy and prosperity are generally increasing across the developing world with the exception of sub-Saharan Africa, which continues to be heavily impacted by AIDS, malaria, tuberculosis and childhood diarrheal and respiratory diseases.

But along with getting older, people become vulnerable to noncommunicable, chronic diseases including cancer, diabetes, heart disease and the risk factors that cause them. Social and economic changes such as migration to cities, adoption of more sedentary lifestyles and rich diets, and smoking and addictions add further risk factors to a healthy life. The result is that the biomedical and behavioral research agendas of LMICs and developed countries are merging. Fogarty's new strategic plan takes these epidemiologic facts to heart in a set of five goals and strategic priorities, beginning with the need to focus on chronic, noncommunicable diseases, while remaining committed to the still unfinished agenda of infectious diseases.



## FOGARTY GOALS: EXTEND THE NIH RESEARCH MISSION GLOBALLY

### **GOAL I: Mobilize the scientific community to address the shifting global burden of disease and disability.**

#### **STRATEGIC PRIORITIES**

- Expand Fogarty's investment in noncommunicable diseases research and research training.
- Continue to invest in infectious diseases research and research training.

### **GOAL II: Bridge the training gap in implementation research.**

#### **STRATEGIC PRIORITIES**

- Support and expand the development of research training programs for implementation research.
- Support the application of implementation research to the recommendations from the Disease Control Priorities Project.

### **GOAL III: Develop human capital to meet global health challenges.**

#### **STRATEGIC PRIORITIES**

- Expand programs to provide early global health research experiences for U.S. health science students and junior faculty.
- Sustain research training for future generations of foreign health scientists.
- Expand research support for foreign researchers to promote pathways to independence.

### **GOAL IV: Foster a sustainable research environment in low- and middle-income countries.**

#### **STRATEGIC PRIORITIES**

- Support the development of research hubs in low- and middle-income countries.
- Bolster the development of expertise and use of information and communication technologies (ICT) in support of research and research training programs.
- Sponsor the development of Fogarty alumni networks.

### **GOAL V: Build strategic alliances and partnerships in global health research and training.**

#### **STRATEGIC PRIORITY**

- Forge partnerships based on mutual interest and complementary strengths.

\* \* \*

**Acknowledgement.** The Strategic Plan reflects the collective wisdom of the Fogarty staff, the Fogarty Advisory Board, and the hundreds of stakeholders who provided advice and comments at national and international meetings or through the Fogarty Web site. A full copy of the Strategic Plan is available at: [www.fic.nih.gov/about/plan/strategicplan\\_o8-12.htm](http://www.fic.nih.gov/about/plan/strategicplan_o8-12.htm)





**Implementation Science.** To assure that the results of research do not languish in the lab, but reach the public for whom they are intended, Fogarty has formulated a goal to support research training in the field of “implementation science.” This research training will help scientists to create generalizable knowledge that can be applied broadly to address central questions about health-care scale-up and determine the strategies that will work in the field. Local practitioners and the public need access to the deployment of the best of scientifically tested interventions. This goal also strongly supports research in relation to recommendations in the updated World Bank publication, *Disease Control Priorities in Developing Countries (DCP2)*, which is focused on cost-effectiveness of health interventions and identified a series of “best buys” in a variety of settings.

**Research capacity and training.** Two strategic goals are designed to maintain and augment activities where Fogarty programs have had a strong impact. One relates to building and sustaining the research environment in LMICs so that scientists will have the support necessary to conduct their research. Key strategic priorities here are to establish linkages or hubs where resources and knowledge can be shared across sites, and to exploit more advanced information and communication technology platforms.

The other area where Fogarty’s impact has been significant is in capacity building, developing the pipeline of U.S. and foreign research talent. Fogarty will provide increased opportunities for early career U.S. health science professionals, both predoctoral and postdoctoral students, fellows, and new faculty, to work at research sites abroad to help launch careers in global health research. Fogarty will also continue its research training partnerships between U.S. and foreign institutions and enhance opportunities of foreign scientists to further their careers when they return home.

**Promoting partnerships.** Fogarty’s final goal is to capitalize on the rising tide of private and public funding devoted to advancing global health and help provide vision and leadership for the future. Fogarty will work to maintain and forge new partnerships to support the Plan’s agenda, in particular with its NIH partners, as well as seeking common cause with other U.S. government agencies and the many new private sector donors in global health.





### 3. INTRODUCTION: A GLOBAL IMPERATIVE

The fundamental aspiration of all humankind is to live a long and healthy life. The last half century has shown marked progress toward that end with dramatic increases in life expectancy in many countries. These gains are largely due to improvements in public health and advances in biomedical research that have furthered investigators' understanding of disease processes and led to new treatments and means of prevention. For many countries including the United States, the trend towards increased life expectancy has not peaked.

We foresee a further lengthening of human life free of disabilities through advances in biomedical research. Fueling this hope are new discoveries in genomics, molecular biology, nanotechnology, bioengineering and imaging—discoveries that are providing powerful tools and techniques that promise an accelerating pace of new innovations in diagnosis, treatment and prevention.

Nevertheless, in many low- and middle-income countries (LMICs), serious challenges to health remain where access to care and availability of advances are sorely lacking and where inequalities in the delivery of care persist. Research is needed to understand how to disseminate, adapt and apply relevant knowledge effectively to ensure the implementation of health care systems and delivery to achieve maximum impact. Fogarty will invest in research training in implementation research to address this challenge.

In contrast to sub-Saharan Africa, countries undergoing rapid development like China, India, and Brazil have seen life expectancies grow every decade for the past forty years (Fig 1). With the aging of their populations, however, these countries now must cope with the dual burden of the infectious diseases of childhood and the chronic diseases of aging. Consider that life expectancy in China was 37 years in 1960. People died before developing diabetes, cancer, heart disease or dementia. By 2004, with life expectancy reaching 72 years, and with unhealthy lifestyle choices, those conditions and others, especially tobacco-related diseases, stroke and trauma and injuries are now increasing in tandem with industrialized countries. Depression, substance abuse and other behavioral and mental health problems increase in response to stressful and disordering effects of increasingly rapid global change. International collaborations to study these diseases makes sense and could well speed knowledge on how to treat and prevent them around the world.

FIG 1

Gapminder Life Expectancy Chart

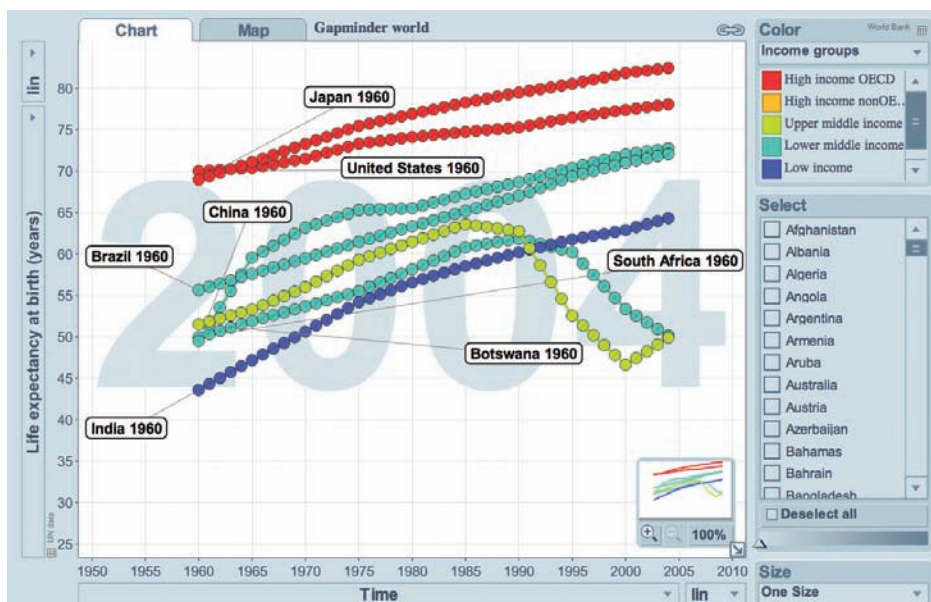


Chart created at [www.gapminder.org](http://www.gapminder.org).



BOX 1

**The Benefits of Investment in Global Health Include:**

- Advancing biomedical discoveries by taking research where the problems are (to high-risk communities or populations).
- Improving the economy in developing countries.
- Extending security of the U.S. by the early identification of new threats from infectious disease, environmental hazards and lifestyle changes.
- Promoting health diplomacy, extending a positive, humanitarian image of America to those in greatest need.
- Increasing competitiveness of U.S. biomedical science.

To address this common agenda, Fogarty will increase investments in noncommunicable diseases research and training, while continuing to support programs in infectious diseases.

The idea that the U.S. could benefit from international collaborative research was central to the creation of the Fogarty International Center in 1968 (Box 1). John Fogarty, the Rhode Island Congressman for whom the Center is named, foresaw that international studies in the health sciences would pay double dividends: The research would help build healthier, more politically and economically stable societies overseas and U.S. citizens would reap the benefits of international discoveries.

**Our Nation of Immigrants.** International research is particularly relevant in the U.S., which is made up of immigrants from every continent. Much can be gained by understanding the genes and predilection for diseases that these groups brought from their ancestral populations abroad. The health of all Americans has benefited greatly from discoveries made outside the U.S. and will continue to do so in the future (Chart 1).

Today, Fogarty funds some 400 projects awarded to both foreign and U.S. institutions (Fig 2). Approximately 20% of Fogarty awards are made directly to highly capable research institutions in LMICs. In many of the Fogarty programs, scientists in the U.S. collaborate with colleagues in foreign institutions, mostly in LMICs (Box 2). About one-third of Fogarty grants focus on scientific discovery; the remaining two-thirds provide support to train research scientists in global health. Fogarty programs actively promote long-term collaborative efforts.

FIG 2

**Fogarty International Center, Major Research and Training Sites**



CHART 1

Worldwide Discoveries Help People Everywhere

Disease	Discovery	Implication for Global Health & the American Public
Huntington's Disease	<b>Venezuela</b> —Gene for Huntington's Disease (HD) identified in an extended family, all descended from a single woman immigrant from Europe in early 1800s.	Prenatal diagnosis now possible for more than 30,000 Americans with HD and over 200,000 who carry the gene.
Diarrheal Diseases	<b>Bangladesh/India</b> —U.S. and local scientists pioneered development of oral rehydration therapy (ORT) for treatment of cholera.	ORT prevents over a million deaths per year, is the first line treatment for childhood dehydration worldwide, and is recommended for treatment of every American child with diarrhea.
Breast Cancer	<b>Nigeria</b> —High fatality rates and ineffectiveness of treatment of African women with breast cancer, compared with Caucasian women in the United States, was linked to 3 genes.	In addition to several other factors such as poor access to care, genes play a key role in the poor prognosis of breast cancer and the lower success rates of treatment of the disease in African American women. Knowledge of genetic markers can facilitate personalization of treatment.
Hepatitis B	<b>Australia</b> —Hepatitis B antigen discovered in blood samples of Australian aboriginals led to discovery of the virus, development of a vaccine, and the prevention of related liver cancer.	All American children and many children in the developing world are currently immunized against hepatitis B. First cancer vaccine—a model for other viral associated cancers (e.g., cervical cancer and papilloma virus).
Malaria	<b>China</b> —A traditional medicine made from wormwood, <i>Artemisia annua</i> , is found to be highly effective for treatment of malaria.	More than 1 million Africans, mostly children < 5 years, die from malaria. More than 1,000 American travelers infected annually and hundreds of thousands at risk. Artemisinin-derived medicines are the treatment of choice for saving lives.
Tuberculosis Treatment	<b>India</b> —Adherence of patients to long-term treatment for tuberculosis enhanced by a program of directly observed therapy (DOT), a strategy that also reduces the emergence of drug-resistance.	Success of this program abroad has led to adoption of DOT TB treatment in the U.S., where close to 14,000 new cases were reported in 2006.



## Sustaining International Research Partnerships

In 1993, to foster long-lasting transnational research teams, the Center created the **Fogarty International Research Collaboration Award (FIRCA)**, an innovative small grants program. FIRCA funds collaborations between U.S. scientists holding NIH research awards and partners in LMICs. NIH partners collaborating in FIRCA include NIEHS, NIDCR, NCCAM, NEI, NIA, NIAAA, NIBIB, NIDCD, NIDA, NINDS, and OBSSR.

An independent evaluation found that the program fills a unique and underserved niche, noting:

**Productivity:** In just over a decade since 1992, more than 460 grants were awarded, generating more than 1,500 peer-reviewed publications.

**Sustainability:** The majority of researchers' collaborations continue after the grant ends; more than 30 percent continue to publish together.

**Long-term career commitment:** Developing country investigators report that the program launched their careers and helped them gain recognition and credibility in the global research community.

**Diffusion of training and technology:** New tools and techniques acquired by foreign partners through the program have diffused to other laboratories in LMIC institutions. In addition, grantees have reported “second generation” effects, with the majority of foreign partners now using some of their grant funds to support travel, education and research training for their students.

**“FIRCA allows us to maintain strong links with outstanding groups in the U.S. This has improved our research strength.”**

— FIRCA Collaborator, Brazil, 2006.





Fogarty is not alone in its investments in global health. International research funding by NIH has increased significantly from roughly \$50 million in 1997 to over \$500 million in 2005. Improving global health has also become the rallying cry on U.S. college campuses and at medical schools and spawned increased investment by donors throughout the world—so much so that a commitment to global health appears to have reached a tipping point (Box 3). Fogarty will harness this energy by broadening its sponsored training of the next generation of U.S. global health research leaders.

Donors and philanthropists are making huge investments in global health programs and the need for research to guide these initiatives has never been more critical. Equally important is the need to leverage these investments, to ensure their sustainability. Fogarty, working with new and current partners, will fund research training of LMIC health scientists and institutional leaders to address this challenge.



### BOX 3

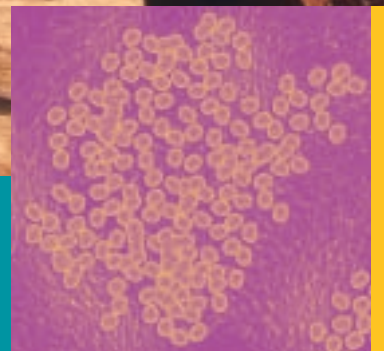
#### Global Health Has Reached the Tipping Point

In his book, *The Tipping Point*, Malcolm Gladwell describes a moment in time when a new idea or innovation catches on with the general public so that overnight it becomes commonplace, accepted, if not adopted. Has that point been reached with global health? The evidence suggests it has:

- The last decade has seen phenomenal growth in private funding and advocacy for global health featuring some of the world's most visible personalities—Bill Gates, Warren Buffett, Ted Turner, Presidents Clinton, Carter, and Mandela, and rock stars like Bono.
- New partnerships and public sector efforts have emerged, such as the Global Fund to Fight AIDS, Tuberculosis, and Malaria, the President's Malaria Initiative, and the President's Emergency Plan for AIDS Relief. Global health is also a G8 priority.

- Governments in countries such as India and China have increased investments in research, recognizing the importance to their own economic development to join a global health work force.
- Funds for global health are no longer considered merely a humanitarian charity but recognized as important in creating economic growth and political stability, producing scientific advances, providing security against emerging disease threats, and enhancing the competitiveness of the U.S. biomedical enterprise.

The critical next step is to move global health research and research training to the tipping point.





## 4. TRENDS IN CONDUCTING GLOBAL HEALTH RESEARCH

**Team Science.** Health research in the 21st century is increasingly a team effort. Just as scientists have come to understand the relationship between health and the environment as a result of the joint research of medical specialists, epidemiologists, mathematicians, ecologists, microbiologists, and geneticists, so must the same kind of interdisciplinary approach be brought to bear on complex global health problems (Box 4).

Interdisciplinary research teams have been prime movers in the development of low-cost diagnostics and cost-efficient ways to prevent or treat disease. Such teams are best suited to address global health issues when the investigators are multi-national and sensitive to culture and context. Building such teams in local institutions across the world is **precisely the strategy Fogarty has employed for decades in its research and research training programs.**

Program graduates have gone on to distinguished careers in public health and health research. Others have continued as independent investigators, heads of departments, and directors of medical schools and clinics. Graduates have assumed high-ranking positions in their governments' health agencies. Many are engaged in the President's Emergency Program for AIDS Relief, the Global Fund to Fight AIDS, TB and Malaria, WHO, and UNAIDS. Several alumni have been recognized by the Elizabeth Glaser Pediatric AIDS Foundation for outstanding leadership in AIDS prevention (Box 5).

**From Cell to Society.** Over the last decade, biomedical research has been evolving from reductionism, an approach which remains enormously useful in understanding how living organisms function at the molecular level of genes and proteins, toward a *systems* approach where the interactions of these components are addressed together— i.e. as a system. This can range from analyzing the behavior of a single cell and its surroundings to understanding how behavior is integrated at the level of tissues, organs, the individual, and collectives of individuals in populations in their environments. It is an interdisciplinary approach that can exploit advances in informatics and computer science to collect, analyze, model and integrate masses of data.

### BOX 4

#### Understanding the nexus between ecological disturbance and infection

Major ecological and environmental change resulting from rapid industrialization, clearing of lands for agriculture, and the growth and migration of populations, have at times created ideal living conditions for rodents, insects, and other disease-carrying organisms. To focus research on these issues and their effects on human health, Fogarty created the **Ecology of Infectious Diseases (EID)** program. It is jointly administered by NIH and the National Science Foundation and supported by NIH partners including NIEHS, NIGMS, and NIAID. Interdisciplinary by design, this program draws upon experts in fields such as ecology, hydrology, microbiology, entomology, demography, modeling, epidemiology, and genetics. Most awards have involved international collaboration, exploring issues such as the environmental determinants of schistosomiasis in Kenya and the causes of an emergent new threat such as Nipah Virus in Malaysia.



In terms of global health, a systems approach may include ecological, socio-behavioral, economic, and policy influences and *extend beyond national boundaries*. In studying malaria, for example, local climate variations and previous control methods can influence mosquito density, feeding behavior, and population dynamics, so that proposed interventions to control malaria must be tailored to take these and other contextual variables into consideration (Box 6).

Similarly, due to the increasing life expectancy of populations in LMICs, tobacco-associated diseases have become a serious health issue. To counter potential epidemics of lung cancer and other diseases, researchers must not only understand the neurobiology of nicotine addiction, but also the dynamics of personal behavior, social norms, the availability of smoking cessation and patient education programs, and the impact of taxation policies to discourage smoking in young adults. This means that behavioral and social science research is important to the kind of biosocial understanding of global health problems that supports the implementation and evaluation of interventions among local populations.

To address the major global health challenges Fogarty foresees, the Center's Strategic Plan establishes five goals, each with a set of strategic priorities, to be pursued over the next five years. Goal I highlights the demographic shift towards increased aging populations, and the need for more chronic diseases research, in addition to studies of ever-present infectious disease threats. Goal II calls for the training of scientists who can study evidence-based interventions that can be transferred and scaled-up in communities in an area called "implementation science." Goals III and IV describe strategies to build a cadre of U.S. and foreign researchers and strengthen the research capacity of institutions overseas. Goal V focuses on the importance of both maintaining and forging new partnerships to promote the research agenda. Fogarty will rely on internal working groups and consultations with stakeholders to flesh out details and develop strategies for implementing the Plan's goals and strategic priorities.

#### BOX 5

##### **A vision to create world leaders in AIDS research**

Twenty years ago Fogarty launched the **AIDS International Training and Research Program (AITRP)** to build epidemiology expertise in LMICs devastated by HIV. The program unites U.S. and foreign research institutions and has become the model for building and sustaining research capacity in low- and middle-income countries. AITRP supports training in research institutions in over 50 countries. The program has funded over 1,300 recipients of doctoral and master's degrees and is supported by NIH partners including NCI, NIAID, NIDCR, NIDA, NIMH, NHLBI, NINR, OAR and ORWH.

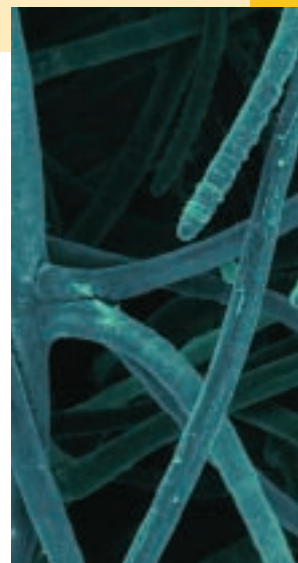


Program graduates have gone on to distinguished careers in public health and health research. Others have continued as independent investigators, heads of departments, and directors of medical schools and clinics.

#### BOX 6

##### **A Systems Approach: Pioneering Computer Models of Epidemics**

Fogarty researchers use mathematical models and computer simulations to study disease epidemics of global import. Since 2000 these scientists, with collaborators in more than 24 countries, have developed dynamic models to explain how outbreaks of malaria, cyclical epidemics of influenza, and other vector-borne disease epidemics occur. The models have also been used to predict the effects of future epidemics on people in the U.S. and abroad and to guide domestic and international policy. The group recently developed a model to explore the role of international transportation networks in the potential spread of influenza.



**Guiding Principles.** Governing those implementation strategies will be a set of core operating principles, which have served Fogarty well in the past. They have enabled Fogarty to invest in new or neglected areas of global health research, provided successful models for international collaborations, and helped to build global health research capacity at home and abroad.

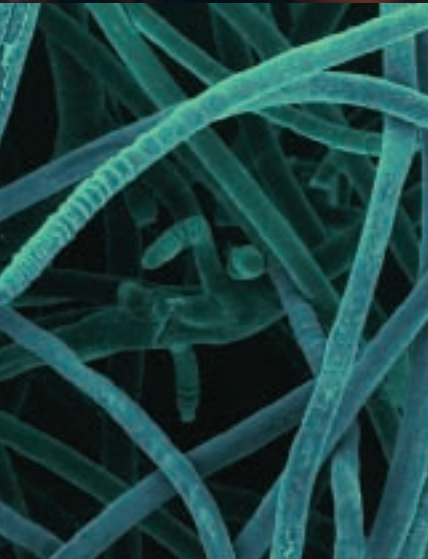
### Fogarty's Core Operating Principles

**Pioneering Discovery and Filling Gaps.** Fogarty pioneers new fields in global health, stimulating research and research training programs in new areas of science as well as filling gaps in the global health research workforce and enterprise (such as current Fogarty research and research training programs in tobacco, trauma, stigma, and ethics). Many initiatives are interdisciplinary and conducted with partners in other agencies as well as NIH Institutes and Centers.

**Promoting International Research Training and Collaboration.** Fogarty funds training of the next generation of researchers in global health—both foreign and U.S. scientists—including new investigators on the cutting edge of a career in discovery. Fogarty programs to build the research pipeline are anchored to peer-reviewed research grants and designed to be collaborative, long-term, and flexible, meeting the research priorities of both the U.S. and foreign collaborators. Newly trained foreign scientists are encouraged to return home with the skills that allow them to conduct research on their own.

**Advancing Global Health Research at NIH.** Fogarty serves as the global health focus at the NIH, advising the NIH Director on issues and concerns and alerting other NIH components to opportunities to advance global health science. Fogarty also co-funds global health research programs initiated by other NIH Institutes and Centers.

**Encouraging Science for Diplomacy.** Years of experience and unique geographic expertise have established Fogarty as a key player in the international health arena. Fogarty engages directly with national or international funding agencies on health science issues and has a long history of helping to develop bilateral or multilateral agreements on global health. In the context of advancing science and health, Fogarty seeks opportunities to bridge differences between countries that might otherwise not engage and build trust by having scientists and institutions from different countries work in collaboration to address common health research concerns.





## 5. THE FOGARTY GOALS: EXTEND THE NIH RESEARCH MISSION GLOBALLY

The mission of the NIH is “*science in pursuit of fundamental knowledge about the nature and behavior of living systems and the application of that knowledge to extend healthy life and reduce the burden of illness and disability.*” Fogarty incorporates and extends this mission to reduce global burdens of disease and disability. Fogarty brings science and scientists to places in the world where specific diseases and disorders are concentrated, whether due to the environment, socioeconomics, genetics, infectious agents or any combination of these. Collaborations with these communities can accelerate the pace of progress, help build the local science base, and ultimately reduce the burden of illness and disability. The plan will be realized through Fogarty’s investments in investigator-led training and research programs, creating partnerships between U.S. scientists and institutions and counterparts in low- and middle-income countries. Central to Fogarty’s investment in both chronic, noncommunicable and infectious diseases is the underlying research support that the Center’s partners provide.

### **GOAL I: Mobilize the scientific community to address the shifting global burden of disease and disability.**

The dramatic gains in life expectancy in many low- and middle-income countries dictate the need for increased research on chronic, noncommunicable diseases related to age and lifestyle. These increases, particularly among middle-aged and older adults, are mainly due to declines in childhood mortality, more effective public health measures and improvements in economic and social welfare (e.g., increased per capita income). Population forecasters now predict that by 2030, one out of eight people in the world will be 65 or over—1 billion adults. The most significant growth in older-aged groups is expected to occur in rapidly growing LMICs such as India, China, and Brazil. One result of these gains in aging is an increase in the length of time adults are exposed to or will live with known risk factors for noncommunicable diseases, such as smoking, hypertension, diabetes or obesity.

At the same time, many people in these countries are now suffering from the dual burden of the chronic, noncommunicable diseases of aging and infectious diseases. Infectious diseases account for one-third of all deaths worldwide. More than 10% of children die before the age of 5 years in LMICs versus only 0.6% in high-income countries. Even when diseases are controlled, scientists need to be ever vigilant due to the rapid rate at which microbial agents evolve, adapt, and develop resistance to antibiotics. As well, global travel and trade facilitate the rapid spread of infection and toxins in the food supply.

Global climate change adds yet another potential threat, as it may enable infectious pathogens and vectors to move to new environmental niches to infect new hosts.



While lifestyle factors and risky behaviors, such as alcohol and drug disorders, contribute to the growing magnitude of chronic, noncommunicable diseases, recent discoveries suggest that infectious disease agents may also play a role. For example:

- Cervical cancer is associated with infection by a type of human papillomavirus, a finding that led to the development of a vaccine.
- Epilepsy and seizure disorders in parts of Peru are associated with the pig parasite that causes the disease, cysticercosis. Treatment with a drug can cure this condition, which is also found in Hispanic populations in the U.S.
- *H. pylori* infection of the stomach, known to be the cause of stomach ulcers, is confirmed to be a risk factor in some types of stomach cancer.
- Liver cancer is often causally associated with hepatitis B and C virus infections.

As a result of these associations, understanding the nexus between infectious diseases and chronic, noncommunicable diseases are emerging as a cutting-edge area of biomedical research. This field of investigation is especially relevant to countries experiencing a disproportionate burden of infectious diseases.



## STRATEGIC PRIORITIES

- Expand Fogarty’s investment in noncommunicable diseases research and research training.

Fogarty will enhance its portfolio to include more research and training in noncommunicable diseases and their risk factors such as diet and lifestyle. Current investments in chronic, noncommunicable diseases include Fogarty programs in tobacco, trauma and injury, bioethics and environmental and occupational health. Fogarty will promote the exploration of the relationship of infectious diseases to chronic, noncommunicable disorders in some of these programs.

- Continue to invest in infectious diseases research and research training.

Fogarty will maintain its investments in research and research training programs in HIV (such as the AIDS International Research and Training Programs) and other infectious diseases (such as the Global Infectious Disease Research and Training Program) tailoring them to meet current and future needs.

## GOAL II. Bridge the training gap in implementation research.

There is a formidable knowledge gap between innovations in health (including vaccines, drugs and strategies for care) and their delivery to communities, which allow disparities to persist and prevent the reduction or elimination of problems. As a result, nearly 14,000 people in sub-Saharan Africa and South Asia die each day from HIV, malaria and diarrheal disease, even though scientific advances have enabled prevention, treatment and in some cases elimination of some of these diseases in developed countries.

Implementation science is a field of research that addresses these issues by seeking ways to optimize scientific advances and use evaluation to facilitate adoption in the real world through health care systems and health policy. Research has shown the risk of transmission of HIV can be reduced with condom use and male circumcision, for example, but infection rates continue to rise and further research is needed to develop safe, culturally

acceptable and accessible methods for surgery and care. Implementation research identifies barriers to the use of proven interventions and develops locally relevant strategies to overcome them for scale-up. It is interdisciplinary in nature, involving collaborations between behavioral and social scientists and clinicians, epidemiologists, mathematical modelers, operations engineers, business analysts and importantly policy makers.

## STRATEGIC PRIORITIES

- Support and expand the development of research training programs for implementation research.

Fogarty will identify the tools, methods, and training needed to build a research workforce able to advance implementation research. Fogarty will encourage the use of complex systems analysis and predictive modeling as research tools, using its in-house expertise to advance this approach. New grants and enhancements of existing programs, such as Fogarty’s programs to support clinical, operational, and health services research, will also be used to build Fogarty’s portfolio for implementation science.



- Support the application of implementation research to the recommendations from the Disease Control Priorities Project.

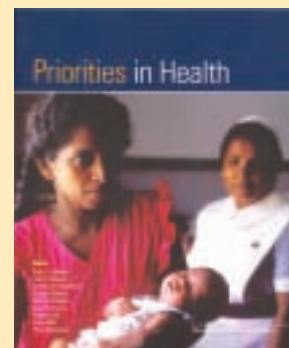
Over a four-year period starting in 2002 Fogarty partnered with the World Bank, the World Health Organization, the Population Reference Bureau, the National Library of Medicine, National Institutes of Health, and the Bill & Melinda Gates Foundation to publish the 2nd edition of the 1993 World Bank publication, *Disease Control Priorities in Developing Countries* (DCP2), its companion volume *Global Burden of Disease and Risk Factors*, and a summary of the DCP2 volume, *Priorities in Health*. (<http://www.dcp2.org/pubs/DCP>). These volumes provide detailed data on health in low- and middle-income countries, and, in DCP2, list ten “Best Buys” for improving global health (Box 7). Fogarty will work with NIH colleagues to address the research agenda associated with DCP2 and the Best Buys. The next challenge will be to work with researchers to assess the impact of key strategies and to extend knowledge so that the findings of the DCP2 can be updated.



#### BOX 7

#### Disease Control Priorities Project 10 Best Health Buys

1. Vaccinate children against major childhood killers, including measles, polio, tetanus, whooping cough and diphtheria.
2. Monitor children's health to prevent and treat childhood pneumonia, diarrhea and malaria.
3. Tax tobacco products to increase consumers' costs by at least one one-third, to curb smoking and reduce the prevalence of cardiovascular disease, cancer and respiratory disease.
4. Attack the spread of HIV through a coordinated approach that includes: promoting 100% condom use among populations at risk; treating other sexually transmitted infections; providing antiretroviral medications, especially for pregnant women; and offering voluntary HIV counseling and testing.
5. Give children and pregnant women essential nutrients, including Vitamin A, iron and iodine, to prevent maternal anemia, infant deaths and long-term health problems.
6. Provide insecticide-treated bed nets in malaria-endemic areas to drastically reduce malaria.
7. Enforce traffic regulations and install speed bumps at dangerous intersections to reduce traffic-related injuries.
8. Treat TB patients with short-course chemotherapy to cure infected people and prevent new infections.
9. Teach mothers and train birth attendants to keep newborns warm and clean to reduce illness and death.
10. Promote use of aspirin and other inexpensive drugs to treat and prevent heart attack and stroke.



\* \* \*

There are researchable implementation questions related to each of these 10 Best Buys. For example, How can resistance to vaccination programs be overcome? What are the most cost-effective and reliable ways to monitor children's health? How can acceptance and regular use of condoms be encouraged?

These “best buys” were calculated based on DALYs—Disability-Adjusted Life Years—a unit measuring the amount of health lost due to a particular disease or condition. DALYs are useful for policymakers because they are a more comprehensive measure of population health than merely counting deaths and because they allow comparisons among a wide range of health interventions. The publication, *Global Burden of Disease and Risk Factors*, provides comprehensive DALY information.

Source: Disease Control Priorities Project ([www.dcp2.org](http://www.dcp2.org))



### GOAL III: Develop human capital to meet global health challenges.

The most important resources in global health are people. U.S. engagement in global health, represented by a cadre of global health experts, was instrumental to historic achievements such as the eradication of smallpox and the establishment of oral rehydration therapy. This critical resource must be renewed and diversified within U.S. universities and research institutions to meet contemporary global health problems. While the 20th Century saw most emphasis in training Americans around key infectious diseases, the 21st Century will see the rapid expansion of opportunities in other medical specialties of noncommunicable diseases.

Fogarty will extend the reach of its training of investigators in low- and middle-income countries to meet strategic needs through pre- and post-doctoral research awards to conduct studies in disease-endemic countries, among other initiatives. The robust demand for research training and career development related to global health is exemplified by what is now a prevalent trend among U.S. academic institutions: the establishment of global health curricula as well as interdisciplinary centers focusing on research, training and service in LMICs.



#### STRATEGIC PRIORITIES

- Expand programs to provide early global health research experiences for U.S. health science students and junior faculty.

Fogarty's program for clinical research scholars allows health science students to work with scientists abroad, developing the skills, cultural sensitivities, and collaborations they need to build future careers. Fogarty will expand eligibility for the

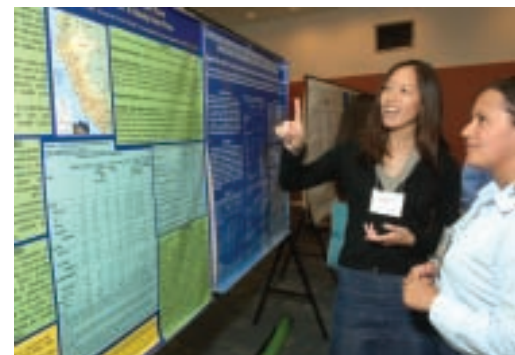
program to include support for advanced students, medical residents and fellows, graduate students in health-related fields, junior faculty and postdoctoral fellows.

- Sustain research training for future generations of foreign health scientists.

Research training of foreign scientists has been and will remain a high priority and Fogarty will continue to employ the well-established strategies and models used in many existing research training programs. Over the years these programs have generated thousands of investigators currently active in health research and medical education and priority-setting for health care around the world.

- Expand research support for foreign researchers to promote pathways to independence.

Foreign institutions suffer a loss of talent when investigators, faced with limited resources and opportunities, leave their countries for greater rewards and scientific opportunities elsewhere. The problem may be especially acute when U.S.-trained researchers return home and want to continue their research yet have limited opportunities. To facilitate this transition, Fogarty will expand its competitive re-entry global research grant awards. This program enables foreign investigators trained at the NIH or through Fogarty-funded training programs to continue their research at home, providing the stability of support they need on their path to independence.







## GOAL IV: Foster a sustainable research environment in low- and middle-income countries.

The development of priority interventions for global health requires a sustainable base of research sites in LMICs. Establishment of highly capable research institutions in these countries will be critical to achieving solutions to current disease burdens, and to training the research workforce of the future.

Fogarty is committed to help build a sustainable research environment through centers of research excellence in low- and middle-income countries. Past Fogarty investments have multiplied the number of foreign investigators working at research institutions abroad—scientists at the forefront of global health research who will benefit from the support of increased resources and facilities. Fogarty will foster the evolution of their local institutions into centers of excellence by promoting

research “hubs,” advancing the use of sophisticated information and communication technologies (ICT), and encouraging the formation of Fogarty alumni networks.

### STRATEGIC PRIORITIES

- Support the development of research hubs in low- and middle-income countries.

Fogarty envisions research “hubs” as a way to enrich and sustain the research capacity of any single institution by linking that institution with other sites, or nodes, within a country or across a region. The institutes linked to a hub will constitute a network to provide a variety of opportunities. Depending on the varying individual strengths of network members, a hub or its nodes will provide a resource for training in areas such as bioinformatics, bioethics, clinical trials, research management and administration. A hub also might promote interdisciplinary approaches to address research problems. For example, an institution with a strong infectious disease focus might link through a hub to an institution providing curricula and resources to support the exploration of the relationship between infections and chronic, noncommunicable diseases. Individual hubs themselves could also in turn be networked to each other and other centers of research in a region or country.

- Bolster the development of expertise and use of information and communication technologies (ICT) in support of research and research training programs.

The past two decades have seen explosive expansion of cell phone technology and global access to broadband internet connections that has changed the panorama of communication and information exchange. This has afforded researchers new opportunities for training, access to the medical literature and collaboration. ICT usage ranges from simply enabling colleagues to keep in touch and access the scientific literature to sophisticated systems for long distance learning, experimental design, and data management and analysis. As Fogarty moves towards developing global health research hubs, strengthening appropriate ICT core capability among researchers and between institutions will be a key element that will ultimately benefit all areas of Fogarty and NIH international investment. It will allow physicians and health scientists and their staff in the most remote areas to access state-of-the-art information and consultations in their own languages and in real time.

Fogarty will work to extend some successful global health research initiatives with ICT resources in LMICs, by Fogarty grantees and others, and explore current and future needs and opportunities in this area. There are clearly some challenges to existing ICT tools and networks, such as cost and limitations of bandwidth. This effort will be undertaken to enable the research environment in the hubs to be as effective as possible in supporting and sustaining research collaborations and training programs.

Efforts to increase ICT infrastructure are underway worldwide, but research-relevant training to creatively address the challenges of managing information and extracting new data remains an underserved need. Since 1998, Fogarty has supported a dedicated program in informatics research training to produce master's and doctoral level experts. Fogarty also provides ICT training relevant to specific research programs. Expanded ICT initiatives linked with research hubs will translate into informatics cores able to supply ICT training for all research teams at an institution.

- Sponsor the development of Fogarty alumni networks.

To advance the careers of scientists who have completed Fogarty research training, Fogarty will support the creation of alumni networks linking the newest generations with established leaders in global health science. Alumni networks can promote the exchange of information and advice, address queries, and publicize research opportunities in LMICs. The existence of alumni organizations will enable Fogarty to capitalize on the resources of over 2,700 former trainees and cultivate relationships between recent graduates, their mentors, and other senior scientists.



## **GOAL V: Build strategic alliances and partnerships and in global health research and training.**

Over the past decade a transformation has occurred in the diversified and integral role that foundations and corporate entities have taken in the arena of global health ranging from the delivery of childhood vaccines to the development of therapeutic innovations for diseases of poverty. Strategic partnerships will be an essential component of each of the priorities outlined in the Fogarty plan, with the overarching goal to seed research and related training as integral components of disease control and prevention activities. Collaborative arrangements with external organizations will incorporate the working principles of Fogarty: co-sponsored programs will be based on objective assessments of medical and public health needs, the state of scientific knowledge in a given field, application of the best evidence-based practices, and technical advances that make new approaches feasible.

Fogarty will continue to work closely with the State Department and other federal agencies, NIH partners, the National Academies of Sciences, Non-Government Organizations, philanthropies, private and not-for-profit groups and other national and international agencies to promote greater scientific collaboration across nations, by building bridges and partnerships between scientists and institutions. Since its establishment, the Fogarty Center has served as the NIH nexus for international research by informing, initiating, and coordinating international health and research activities for the agency. With the growth of global health investments by the U.S. government and other donors, as well as the development of new national health systems and public health policies in low- and middle-income countries, the partnership opportunities for Fogarty to promote international research collaboration can be expected to grow.





## STRATEGIC PRIORITY

- Forge partnerships based on mutual interest and complementary strengths.

As the premier medical research funding agency in the world, the NIH represents a rich store of intellectual capital that can be mobilized to support global health research. To address the goal of research on noncommunicable and infectious diseases, Fogarty will work with NIH colleagues committed to research in these areas and identify ways to support their mission through international research opportunities. Fogarty will also enhance NIH overseas investments by continuing to build a critical mass of scientists abroad who can collaborate and partner with U.S. colleagues.

As the economies of LMICs strengthen, many recognize the value of health research and scientific infrastructure and are expanding their investments. For example, in 2007, the African Union established a wide-reaching research agenda for Africa, accompanied by pledges from African leaders to increase government funding of research and development. Countries like China, India and Brazil realize that scientific innovation can pave the way to growth and prosperity, and are building major research institutions and attracting the best and brightest scientists from around the world. In response, Fogarty will foster new relationships with these scientific agencies and professional bodies in these nations, working with these groups as partners in supporting health research and research training. Where new challenges to global health arise, such as that posed by climate change, Fogarty will work with these and other partners to take advantage of existing and new programs to advance priority research and research training.



## 6. FOGARTY ADAPTS TO SERVE CHANGING NEEDS IN GLOBAL HEALTH RESEARCH

International trade, travel and the Internet have created a world that is connected as never before. Opportunities to advance science for global health, promote transnational research collaborations, and apply life-saving and life-extending medical advances abound, paving the way for a world of healthy societies and sound economies tomorrow.

Already distinctions between developed countries and LMICs are blurring so that the emerging global health agenda is truly global—addressing diseases, risk factors and lifestyles common to all countries. At the same time, experience has taught us that the solutions to many genetic diseases, cancers, infections, and environmental problems can be developed faster by enabling science in settings where diseases are concentrated and by promoting collaborations with local investigators.

Congressman John E. Fogarty was visionary in arguing the needs and rewards of global health research a half century ago. This Strategic Plan extends the Congressman's foresight, setting an ambitious course for the years ahead, taking Fogarty's programs in fresh directions, embracing new partnerships, and helping to build the global health research enterprise in the U.S. and around the world. It is dedicated to moving us closer to the ideal of global health, one that reflects the aspiration of every human being on the planet to live a long and healthy life.





## 7. APPENDIX

### Development and Implementation of the Strategic Plan

**An inclusive process.** The development of the Fogarty Strategic Plan began with the arrival of Dr. Roger I. Glass as the new director in the summer of 2006. The goal was to create a transparent and inclusive priority-setting process. So it was that Fogarty held staff retreats, consulted its advisory board, conducted analyses of current activities and programs, and, most importantly, listened to what stakeholders around the world had to say in person (holding stakeholder meetings in Maryland and Cairo) and via the Web. Throughout the planning process, Dr. Glass engaged in a “listening tour,” in which he conferred with fellow NIH Institute and Center Directors, leaders of non-governmental organizations and others prominent in global health research. A final draft of the plan was posted on the Fogarty Web site for comments in January 2008 and with further changes went to press in June 2008.

### Implementation and Evaluation

For each of the five strategic plan goals, one or more Fogarty inter-divisional working groups have been formed. These groups will develop implementation plans and performance targets to document progress under each goal, facilitated by consultations with outside experts in specific areas. Fogarty programs are evaluated every five years using outside experts and consultation and follow the Fogarty Framework for Evaluation [http://www.fic.nih.gov/about/plan/eval\\_framework.pdf](http://www.fic.nih.gov/about/plan/eval_framework.pdf).



## Photo Captions and Credits

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Children living in resource-poor countries, such as these in Nepal, are particularly vulnerable to health issues. *Stock Connection RM Rights Managed Photograph*

Fogarty's training programs are designed to build local research capacity in low-and middle-income countries. Here an Ethiopian scientist works in a laboratory in Addis Ababa. *Copyright: WHO/P. Viot*

Mosquitoes transmit a number of infectious diseases. *Stockbyte Royalty Free Photograph*

Smoking contributes to the growing epidemic of chronic, non-communicable diseases throughout the world, a focus of the new strategic plan and Fogarty's International Tobacco and Health Research and Capacity Building Program. This Lebanese smoker is at increased risk of cancer and heart disease. *Curt Carnemark/The World Bank*

Many infectious diseases are caused by viruses, such as this one rendered in 3D. *Copyright: Alexander Kozachok*

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Fogarty's new strategic plan promotes healthy lives from childhood into old age. *Copyright: Getty Images*

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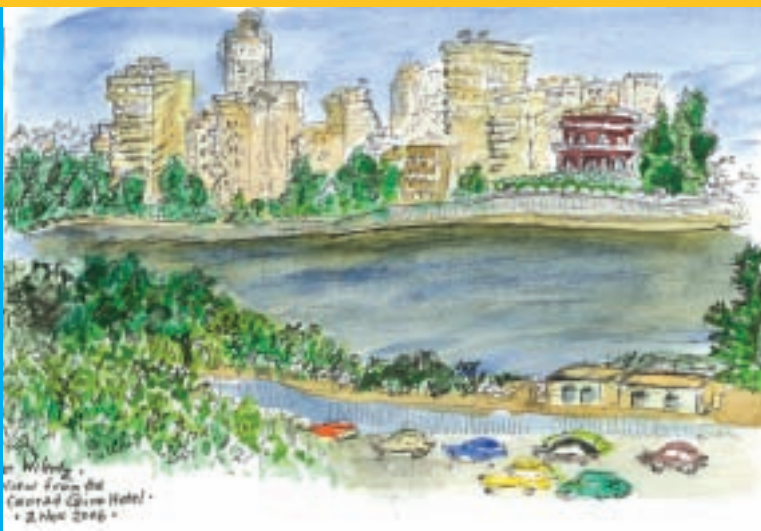
#### Page 2

Having the people and resources in place to do the work is central to Fogarty's ideal of taking science to places where health problems exist, such as this flooded area of Nigeria. *Yosef Hadar/The World Bank*

Fogarty's training programs are designed to build local research capacity in low-and middle-income countries. Here an Ethiopian scientist works in a laboratory in Addis Ababa. *Copyright: WHO/P. Viot*

#### Page 3

Fogarty Director Dr. Roger I. Glass accompanied HHS Secretary Mike Leavitt to Africa in August 2007 to observe U.S. government-supported programs in action. *Photo courtesy of Dr. Roger I. Glass*



#### Page 4

Increased urbanization can often lead to a rise in both infectious and chronic diseases. Here a densely populated section of Ankara, Turkey is shown. *Copyright: Getty Images*

In September 2007, Fogarty and the National Institute of Allergy and Infectious Diseases sponsored a polio symposium examining eradication efforts. Here a child receives oral polio vaccine in Angola. *Copyright: WHO*

#### Page 5

Countries experiencing rapid economic growth like China have also seen major increases in life expectancy. *Copyright: Getty Images*

Fogarty is a major proponent of implementation science. Here a doctor visits a patient through Progesa, Mexico's incentive-based development program that targets the very poor. *Copyright: InterAmerican Development Bank*

Mosquitoes transmit a number of infectious diseases. *Stockbyte Royalty Free Photograph*

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Fogarty Scholar Paul Drain checks blood pressure at a rural clinic in Tanzania as part of his year-long global health research project. *Photo courtesy of Paul Drain*

#### Page 7

These women laborers carrying mud in Bangladesh exemplify the conditions in which many people in low-and middle-income countries exist. *Scott Wallace/The World Bank*

Scholars supported by Fogarty's International Cooperative Biodiversity Groups program conduct research in Papa New Guinea. *Photo courtesy of Dr. Joshua Rosenthal*

Fogarty's Clinical Scholar program offers an opportunity for highly motivated individuals to experience mentored research training at top-ranked NIH-funded research centers in developing countries throughout Africa, Asia and the Americas. *Photo courtesy of Dr. Aron Primack*

Children living in resource-poor countries, such as these in Nepal, are particularly vulnerable to health issues. *Stock Connection RM Rights Managed Photograph*

#### Page 8

As life expectancy increases, people like this Indian boy will be more susceptible to chronic, non-communicable diseases such as diabetes, heart diseases and cancer. *Ray Witlin/The World Bank*

Fogarty grantee Dr. Nirbhay Kumar and colleagues at Johns Hopkins are working to develop a human malaria transmission-blocking vaccine that would interfere with the development of sexual stages in mosquitoes and could significantly reduce malaria transmission. *Photo courtesy of Dr. Nirbhay Kumar*

#### Page 9

Both infectious and chronic non-communicable diseases pose health problems for slums such as this favela, rising on the outskirts of Salvador de Bahia, Brazil. *Scott Wallace/The World Bank*

#### Page 10

Representative John Fogarty in front of the U.S. Capitol.

Fogarty's AIDS International Training and Research Program supports training of local scientists to help them address the HIV/AIDS epidemic affecting so many, including this widow in Kenya. *Copyright: 2005 Felix Masi/Voiceless Children, Courtesy of Photoshare*

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Fogarty grantee Dr. Chris Plowe tests a new malaria vaccine in Bandiagara, Mali. *Photo courtesy of Chris Plowe*

Fogarty develops local research capacity to improve the care provided in the developing world, including in hospitals such as this one in Ethiopia. *Copyright: WHO/P. Viot*

#### Page 12

Fogarty's Ecology of Infectious Diseases program supports research to examine how environmental events—such as habitat destruction, biological invasions and pollution—alter the risks of emerging diseases in humans and animals. Recent studies suggest a correlation between rice farms, such as this one in Vietnam, and the spread of bird flu by infected ducks drawn to the paddies. *iStockphoto/Copyright: Ashley Whitworth*

President and Mrs. Carter give a long-lasting insecticidal bed net, which prevents malaria, to Mrs. Hlmenlike, who hosted the Carters in her home during their tour of the Center's health work in the remote village of Afeta in southwest Ethiopia. *Copyright: Louise Gubb/The Carter Center*

In 2002, President Clinton established the Clinton HIV/AIDS Initiative (CHAI) to reorganize markets and work with governments to make treatment more accessible in the developing world. Now, more than 1.4 million people living with HIV/AIDS have access to lifesaving antiretroviral treatments purchased under CHAI pricing agreements. *Photo and caption courtesy The Clinton Foundation; Copyright: Ralph Alswang/The Clinton Foundation*

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Fogarty-supported researchers from the University of Papua New Guinea and the Forestry Research Institute study native plant and marine sources of therapeutic molecules as part of the International Cooperative Biodiversity Groups program. *Photo courtesy of Dr. Joshua Rosenthal*

Bill and Melinda Gates visit a children's ward inside the ICDDR,B (International Centre For Diarrhoeal Disease Research, Bangladesh clinic and Research Center and BRAC (Bangladesh Rural Advancement Committee) Center in Dhaka, Bangladesh. *Photo and caption courtesy of the Bill & Melinda Gates Foundation*

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Deforestation poses a number of public health concerns, including increases in malaria and other vector-borne diseases. *Copyright: istock*

Many infectious diseases are caused by viruses, such as this one rendered in 3d. *Copyright: Alexander Kozachok*

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Fogarty's ecology of infectious diseases program focuses on major ecological and environmental changes resulting from the growth and migration of populations, rapid industrialization and clearing of lands for agriculture. *Copyright: Getty Images*

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Though Fogarty's new strategic plan addressed the growing prominence of chronic diseases, the huge toll taken by HIV/AIDS cannot be ignored. Here, an Indian woman with AIDS convalesces in a hospital. *John Isaac/The World Bank*

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Fogarty's strategic plan seeks to both create new partnerships and to strengthen existing international alliances. Here Fogarty's director Dr. Roger Glass looks on while NIH Director Dr. Elias Zerhouni signs an agreement with Dr. Raj Bhan, India's Secretary to the Department of Biotechnology. *Photo: NIH*

Fogarty's International Cooperative Biodiversity Groups program supports efforts to examine the medicinal potential of the earth's plants, animals and microorganisms—such as the algae shown here. *Copyright: Dennis Kunkel Microscopy*

Fogarty's International Training and Research Program in Environmental and Occupational Health program was established to train researchers in the developing world to investigate occupational and environmental problems, such as exposures to toxic chemicals and pollutants. China's air pollution is a health concern for these women who commute by bicycle. *Curt Carnemark/The World Bank*

**Page 18**

People such as this Nigerian man have become more susceptible to non-communicable chronic diseases as their life spans have increased. *Curt Carnemark/The World Bank*

**Page 19**

Smoking contributes to the growing epidemic of chronic, non-communicable diseases throughout the world, a focus of the new strategic plan and Fogarty's International Tobacco and Health Research and Capacity Building Program. This Lebanese smoker is at increased risk of cancer and heart disease. *Curt Carnemark/The World Bank*

Access to safe drinking water in countries such as India is a major health concern. *Copyright: WHO/P. Viot*

More than 10 percent of children die before the age of 5 in low- and middle-income countries such as Peru. *Scott Wallace/The World Bank*

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Improving environmental health continues to be one of Fogarty's strategic priorities. Urban areas such as this one in China are exposed to a wide range of environmental health hazards. *Curt Carnemark/The World Bank*

Reducing the prevalence of childhood diseases in low-and middle-income countries through vaccinations is a continuing mission for Fogarty. *Photo courtesy of Dr. Roger Glass*

**Page 21**

Fogarty's strategic plan emphasizes the use of implementation science to address the gap between health innovations and their delivery to communities in need such as this village in Africa. *Photo courtesy of Dr. Roger Glass*

Infectious diseases may play a role in chronic diseases. Women across the world are at risk from cervical cancer associated with a type of human papillomavirus. *Curt Carnemark/The World Bank*

**Page 22**

One of the "10 Best Health Buys" of the Disease Control Priorities Project is to monitor the health of children such as this young Bangladeshi child. *Shehzad Noorani/The World Bank*

**Page 23**

Fogarty's Stigma and Global Health Research Program was designed to stimulate interdisciplinary research on the role of stigma in health, and on how to mitigate its negative effects on the health of individuals and societies worldwide. Here Fogarty grantee Gretchen Birbeck works with Zambian children who suffer from epilepsy. *Photo courtesy of Gretchen Birbeck*

Chris Plowe, principal investigator on a Fogarty Global Infectious Disease Research Training program, and his Malian colleague, Abdoulaye Djimde, conduct malaria research. *Photo courtesy of Chris Plowe*

Fogarty is building the next generation of global health innovators through its program for clinical research scholars. The program allows health science students to work with scientists abroad, developing the skills, cultural sensitivities, and collaborations they need to build future careers. *Photo courtesy of Dr. Aron Primack.*

**Page 24**

Waterborne diseases pose a serious health threat in many countries. *Thomas Sennett/The World Bank*

Fogarty is committed to building centers of research excellence throughout the world. Here a researcher from Papua New Guinea conducts work in a laboratory supported by Fogarty's International Cooperative Biodiversity Groups program. *Photo courtesy of Dr. Joshua Rosenthal*

**Page 25**

The establishment of a sustainable base of research expertise throughout low- and middle-income countries will be essential to improving global health. Here scientists work at the Joint Clinical Research Center in Kampala, Uganda. *Photo courtesy of Dr. Linda Kupfer*

The expansion of broadband internet and other communications technologies have transformed global health research and research training. Here a researcher funded by Fogarty's International Cooperative Biodiversity Groups program utilizes an internet connection in Papua New Guinea. *Photo courtesy of Dr. Joshua Rosenthal*

**Page 26**

Fogarty's Global Infectious Disease program supports research training on communicable diseases. Here an Ethiopian child receives poliomyelitis vaccination and immunization. *Copyright: WHO/P. Viot*

Researchers in Uganda, including former Fogarty trainees, attend a journal club talk sponsored by the Uganda Society for Health Scientists at Makerere University Medical School in Uganda. This group has received supplemental funding to form a Fogarty alumni association through an AITRP grant. *Photo courtesy of Dr. Jeanne McDermott*

Dr. Akira Masaïke discusses US-Japanese cooperation with Fogarty director Dr. Roger I. Glass and Dr. Michael Gottesman, Deputy Director of Intramural Research at NIH during a reception to honor the new Japan Society for the Promotion of Science fellows. *Photo: NIH*

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Fogarty's International Clinical, Operational and Health Services Research and Training Award supports training for researchers in low- to middle-income countries, such as these in the Ukraine. *Photo courtesy of Alexis McLean*

**Page 28**

High concentrations of arsenic in drinking water pose a health risk in India and other countries. *Copyright: Curt Carnemark/The World Bank*

In October 2007, Fogarty sponsored an event to launch the Council of Science Editors' 2007 Global Theme Issue. More than 230 journals throughout the world simultaneously published articles devoted to the topic of poverty and human development. *Photo: NIH*

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Rhode Island Representative John Fogarty (1913-1967) was a lifelong advocate of international biomedical research, claiming "disease knows no national boundaries."

Lack of clean water and unsanitary living conditions pose health challenges in many parts of the world including this shantytown in Rio De Janeiro, Brazil. *iStockphoto/ Copyright: Joseph Luoman*

**Page 30**

As life expectancy increases, this African man shares many of same health concerns of a man of the same age in the developed world. *Copyright: Getty Images*

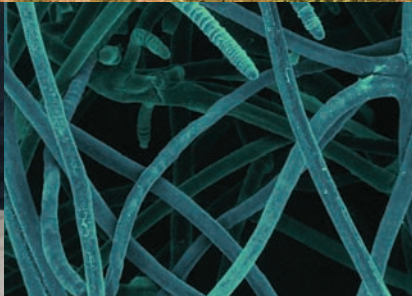
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Cairo was the site of one of many consultations to elicit input from Fogarty's stakeholders as the new strategic plan was developed. *Watercolor painted by and courtesy of Joan Wilentz*

**Page 33**

Despite numerous advances in global health, problems still exist in many low- and middle-income countries. This elderly Indian woman who fled hardship in the Andes now lives in a Lima shantytown. *Scott Wallace/The World Bank*





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NIH Publication No. 08-6261  
May 2008

