

Strategic U.S. Leadership— Essential to Address the Global Tuberculosis Pandemic



AUTHORS

J. Stephen Morrison
Phillip Nieburg

PART OF THE CSIS SERIES ON TUBERCULOSIS

A Report of the CSIS Global Health Policy Center

JUNE 2014

CSIS | CENTER FOR STRATEGIC &
INTERNATIONAL STUDIES

Strategic U.S. Leadership— Essential to Address the Global Tuberculosis Pandemic

Authors

J. Stephen Morrison
Phillip Nieburg

A Report of the CSIS Global Health Policy Center

June 2014

CSIS | CENTER FOR STRATEGIC &
INTERNATIONAL STUDIES

About CSIS

For over 50 years, the Center for Strategic and International Studies (CSIS) has worked to develop solutions to the world's greatest policy challenges. Today, CSIS scholars are providing strategic insights and bipartisan policy solutions to help decisionmakers chart a course toward a better world.

CSIS is a nonprofit organization headquartered in Washington, D.C. The Center's 220 full-time staff and large network of affiliated scholars conduct research and analysis and develop policy initiatives that look into the future and anticipate change.

Founded at the height of the Cold War by David M. Abshire and Admiral Arleigh Burke, CSIS was dedicated to finding ways to sustain American prominence and prosperity as a force for good in the world. Since 1962, CSIS has become one of the world's preeminent international institutions focused on defense and security; regional stability; and transnational challenges ranging from energy and climate to global health and economic integration.

Former U.S. senator Sam Nunn has chaired the CSIS Board of Trustees since 1999. Former deputy secretary of defense John J. Hamre became the Center's president and chief executive officer in 2000.

CSIS does not take specific policy positions; accordingly, all views expressed herein should be understood to be solely those of the author(s).

© 2014 by the Center for Strategic and International Studies. All rights reserved.

Center for Strategic & International Studies
1616 Rhode Island Avenue, NW
Washington, DC 20036
202-887-0200 | www.csis.org

Contents

Acronyms and Abbreviations	iv
Preface	v
Years of Progress, Rising Threats	1
U.S. Progress in Eliminating Domestic TB	7
The Current U.S. Approach to Global TB	8
U.S. TB Resources and Strategy	9
U.S. Government Collaboration with International Organizations	13
The “Big Three” Challenges	16
What Now? Recommendations for U.S. Policy	20
Closing Comment	23
Companion Analyses	25
Further Readings on Global TB	25

Acronyms and Abbreviations

AIDS: Acquired Immunodeficiency Syndrome, caused by HIV

CDC: Centers for Disease Control and Prevention, an agency of the U.S. Department of Health and Human Services

GTB: Global TB Programme, the TB office within the World Health Organization

HIV: Human Immunodeficiency Virus, the cause of AIDS

IDSA: The Infectious Diseases Society of America, a national organization of infectious disease experts

MDR-TB: Multidrug-resistant tuberculosis, a strain that is resistant to the most commonly used anti-TB drugs

NIH: The National Institutes of Health, the medical research arm of the Department of Health and Human Services

OGAC: Office of the Global AIDS Coordinator, an office in the Department of State that oversees the President's Emergency Plan for AIDS Relief (PEPFAR)

PEPFAR: The President's Emergency Plan for AIDS Relief, which works to provide HIV prevention and AIDS treatments to millions of people infected by HIV

PLHIV: People Living with HIV, that is, those infected with HIV

PMI: The President's Malaria Initiative, an office within USAID that oversees all U.S. malaria control programs in other countries

R&D: Research and development, the process of discovering/inventing and developing new methods of preventing, diagnosing, or treating diseases; R&D may also refer to research (e.g., operational research, implementation research) on how to improve disease control programs that are already in place

TB: Tuberculosis, the disease caused by various strains of the bacteria called *Mycobacterium tuberculosis*

USAID: The U.S. Agency for International Development, the lead U.S. agency that works with—and in—developing countries, providing resources to support numerous health and development programs

WHO: The World Health Organization, the United Nations' primary health agency whose members include nearly all of the world's nations

XDR-TB: Extensively drug-resistant tuberculosis, a strain of TB that is resistant to all, or nearly all, anti-TB drugs

Preface

This summary report, which we coauthored, grew out of a far larger enterprise that commenced in March 2013, when we called together the small tribe of dedicated TB experts, inside and outside government, and asked for their help. We felt the time was ripe to take a close look at U.S. approaches to global TB and to ask whether we might do things differently to better address the complex challenges emerging. The response we received to our request exceeded all expectations in the generosity, commitment, and insights these many friends extended to us. At that moment in early 2013 we asked several experts to author policy analyses on six vital subjects. The resulting papers are companion building blocks that inform the summary analysis of findings and conclusions contained here. We are issuing these six papers on June 9, 2014, simultaneous with this summary report.

From the CDC ranks, Brittany Moore, Drew Posey, Susan Maloney, Martin Cetron, and Ken Castro examined the interface between TB at home and TB outside U.S. borders. Peter Small, of the Bill & Melinda Gates Foundation, took the lead on TB research and development, joined by J. Stephen Morrison and Seth Gannon, of CSIS. Amanda Glassman and Victoria Fan of the Center for Global Development turned to questions of investment allocations in global TB in the midst of scarcity. Katherine Bliss turned to the calculations and interests of the heavily TB-burdened BRICS (Brazil, Russia, India, China, South Africa) countries. Nellie Bristol of CSIS examined the patterns of collaboration among international organizations, heavy-burden countries, donors, partnerships, foundations, and advocates. Finally, Phil Nieburg, Sharon Stash, and Alisha Kramer looked at the complex biological, clinical, and disease control interactions of TB and HIV/AIDS.

We also had careful help throughout this process from Alisha Kramer, and more recently Lindsey Hammergren, talented and dedicated young CSIS program managers. We are grateful to Sharon Stash, formerly of CSIS, for her many important contributions in initiating and supporting this process, to Gail Cassell of Harvard for her insights into the emerging challenge of TB drug resistance, and to Talia Dubovi of CSIS for keeping us on track.

Most fundamental, many notable TB experts gave generously of their time in our extended meetings and in reviewing the multiple written products we generated over many months. Special gratitude is due to Susan Maloney, CDC; Cheri Vincent and Amy Bloom, USAID; Bill Coggin, Office of the Global AIDS Coordinator; Lisa Carty, UNAIDS; Erika Arthun, Bill & Melinda Gates Foundation; Richard Chaisson, Johns Hopkins University; Heidi Ross, Office of Representative Eliot Engel (D-NY); Christine Lubinski, Infectious Disease Society of America; David Bryden and John Fawcett, RESULTS; Jennifer Kates, Kaiser Family Foundation; and Chris Collins, formerly of AmFAR, now UNAIDS. Seth Gannon and Vinca LaFleur were invaluable in helping shape and reshape the summary report.

Mario Raviglione and Diana Weil, leaders of the World Health Organization's TB work, came to CSIS, engaged us on the telephone on multiple occasions, and taught us much that we had not adequately understood.

To all of these friends and colleagues, we remain grateful. For the final report, of course, only the two of us are ultimately responsible.

Strategic U.S. Leadership—Essential to Address the Global Tuberculosis Pandemic

J. Stephen Morrison and Phillip Nieburg¹

Tuberculosis (TB) is an ancient disease that has plagued societies for centuries.^{2, 3} The TB burden is estimated to have been most severe between 1750 and 1850,⁴ when the disease was so pervasive that it became prominent in the writing and thought of the Romantic period. However, TB is anything but “the romantic disease.” Untreated TB causes gradual wasting of the body, chronic cough, difficulty breathing, and weakness, resulting in extended suffering and a painful death. TB was the leading cause of adult death in the United States in the late nineteenth century and remained a terribly destructive, fatal contagious disease in this country well into the twentieth century. Not until 1943 did scientists discover the first anti-TB drug effective against the bacteria that cause the disease.⁵ Over the next three decades, additional anti-TB drugs were identified, preventing death, hastening recovery times, and reducing the transmission of TB to new victims. Since 1995, 56 million patients have been cured of their TB and an estimated 22 million TB deaths have been avoided. Yet, despite the perception among many U.S. and other policymakers that tuberculosis is a disease of the past or a disease of other countries, it remains a major global public health challenge that carries significant global and domestic disease burdens and risks.

Years of Progress, Rising Threats

The last two decades have seen consistent progress in addressing many aspects of global TB. Between 1990 and 2012, global TB cases dropped 37 percent. Over that same period, the global TB mortality rate fell by 45 percent, suggesting that the interim global goal of a 50 percent reduction from 1990 numbers by 2015 is well within reach. Over the past decade and a half, public health officials, practitioners,

¹ J. Stephen Morrison is senior vice president and director of the Global Health Policy Center at the Center for Strategic and International Studies (CSIS). Phillip Nieburg, MD, is a senior associate with the CSIS Global Health Policy Center.

² *Mycobacterium tuberculosis* was detected in human bones from a 9,000-year-old Neolithic settlement. Israel Hershkovitz et al., “Detection and Molecular Characterization of 9,000-Year-Old *Mycobacterium tuberculosis* from a Neolithic Settlement in the Eastern Mediterranean,” *PLoS One* 3, no. 10 (2008): e3426, <http://www.plosone.org/article/fetchObject.action?uri=info%3Adoi%2F10.1371%2Fjournal.pone.0003426&representation=PDF>.

³ Tuberculosis (TB) is an infection caused by *Mycobacterium tuberculosis* (*M. tb.*) that is spread by aerosol droplets (e.g., by coughing). The immune systems of most people who become infected can control the initial infection, which then remains latent (inactive) and noncontagious. However, some infected people, especially those whose immune systems are weakened by disease (e.g., HIV/AIDS, malnutrition, diabetes) are prone to have their TB become an active disease, most often in their lungs.

⁴ John F. Murray, “A Century of Tuberculosis,” *American Journal of Respiratory and Critical Care Medicine* 169, no. 11 (2004): 1181–86, <http://www.atsjournals.org/doi/full/10.1164/rccm.200402-1400E#Uyn8PfldWSo>.

⁵ Medical Research Council, “Tuberculosis,” <http://www.mrc.ac.uk/Achievementsimpact/Storiesofimpact/Tuberculosis/index.htm>.

and researchers in the United States and partner countries—as well as at the World Health Organization (WHO), the Stop TB Partnership, the Global Fund to Fight AIDS, Tuberculosis, and Malaria (Global Fund), and other international organizations—have generated a range of new policies, programs, and technologies to address changing global TB control needs and priorities, including improving access to those populations that are the most difficult to reach. In May 2014, the World Health Assembly approved a promising new post-2015 global strategy, with wide support from the United States, emerging powers, other donors, and heavy-burden countries (Table 1).⁶

Table 1. Key Points of the New Global Strategy and Targets for TB Prevention, Care, and Control after 2015

Post-2015 Global Tuberculosis Strategy Framework	
Vision	A world free of tuberculosis
Milestones for 2025	75 percent reduction in tuberculosis deaths (compared to 2015) 50 percent reduction in new tuberculosis cases (compared to 2015) No affected families facing catastrophic costs due to tuberculosis
Targets for 2035	95 percent reduction in tuberculosis deaths (compared to 2015) 90 percent reduction in new tuberculosis cases (compared to 2015) No affected families facing catastrophic costs due to tuberculosis
Principles	Government stewardship and accountability, with monitoring & evaluation Coalition with communities and civil society organizations Protection and promotion of human rights, ethics and equity Adaptation of strategy and targets at country level
Pillars	Integrated patient-centered care and prevention Bold policies and supportive systems Intensified research and innovation

Source: adapted from World Health Organization, “Global Strategy and Targets for Tuberculosis Prevention, Care and Control after 2015,” 2013, http://www.who.int/tb/post2015_tbstrategy.pdf?ua=1.

Programs addressing various aspects of global TB have existed at the U.S. Agency for International Development (USAID) and the Centers for Disease Control and Prevention (CDC) at least since the 1980s. USAID’s program began expanding in 2001. In addition, two institutions that the United States had helped establish within the past 12 years—the Office of the U.S. Global AIDS Coordinator (OGAC), responsible for managing the President’s Emergency Plan for AIDS Relief (PEPFAR), and the Global Fund—have each highlighted global TB as an important public health problem. U.S. resources provided through USAID for addressing various aspects of global TB and through PEPFAR for addressing TB/HIV increased substantially from FY 2005 to FY 2009, although there has been little change in the annual amount of either since FY 2009–2010. Research has advanced over this same period, raising hopes that scientific and technical challenges of outdated TB control technologies can be surmounted, step by step.⁷ New diagnostic, treatment, and prevention tools now in the field and others

⁶ World Health Organization, “Global Strategy and Targets for Tuberculosis Prevention, Care and Control after 2015,” 2013, http://www.who.int/tb/post2015_tbstrategy.pdf?ua=1.

⁷ Both public and private U.S. participation in TB R&D has been impressive, accounting for almost 60 percent of the global total of \$627 million in 2012.

in the research and development (R&D) pipeline hold considerable promise of significantly strengthening TB care and control, as high-burden countries themselves take additional measures to improve their own health systems.

For all these reasons, it appears that optimism about continued progress is in order. Yet, it is too early to declare victory in regard to TB and turn attention and resources to other global health issues. Serious societal challenges remain, including extreme poverty, inequity, and disproportionate TB burdens borne by women and children. In 2012 an estimated 8.6 million people developed TB disease, of whom 3 million went undetected or unreported; 1.3 million TB patients died.⁸ In addition, more than 2 billion people already have a latent form of TB infection, with a 5–10 percent lifetime risk of developing active TB disease.⁹ Often, it is most difficult to reach the most vulnerable subpopulations, for example, the homeless, migrants, refugees, and incarcerated people.

The evolution of the global TB pandemic threatens U.S. national interests in at least four ways.

First, TB remains an issue of national import at home, where, although case numbers have been steadily declining over the past two decades, 9,945 TB cases were reported in 2012, the most recent year with complete data. The threat of TB resurgence persists, including from TB infections that are resistant to the most commonly used and most effective anti-TB drugs. An increasing proportion of domestic (U.S.) TB cases occur in people who were born in other countries, which means that eliminating TB in the United States and guarding effectively against the persistent threat of domestic TB resurgence are both processes that are inextricably linked to how well TB is addressed around the world.

Second, an estimated 3 million of the nearly 9 million people who get sick with TB each year around the world are not reported to national TB surveillance systems. Some of these people are never diagnosed as having TB; others may be diagnosed and treated in the private health care sector, which does not always treat them effectively, investigate the TB status of their close contacts, or report their cases to national authorities.¹⁰ The ongoing spread of TB resulting from untreated or poorly treated TB cases imposes persistent disease and economic burdens upon many countries that are expected to be the cornerstones of future global growth and prosperity.

Third, bacterial resistance to anti-TB drugs is of direct relevance to the Obama administration's Global Health Security agenda, a recently launched program that seeks higher levels of international commitment and collaboration to build national emergency capacities to prevent, detect, and respond to the spread of drug-resistant organisms and emerging zoonotic (animal-borne) disease outbreaks that increasingly

⁸ World Health Organization, *Global Tuberculosis Report 2013* (Geneva: WHO, October 2013), http://apps.who.int/iris/bitstream/10665/91355/1/9789241564656_eng.pdf?ua=1.

⁹ Brittany K. Moore et al., "Tackling Tuberculosis Abroad: The Key to TB Elimination in the United States," CSIS, June 2014, 1, <http://www.csis.org/tuberculosis>.

¹⁰ Nick Herbert et al., "World TB Day 2014: Finding the missing 3 million," *The Lancet* 383 (March 22, 2014): 1016–18, <http://www.unza-uclms.org/Lancet%20commentary%20for%20World%20TB%20Day.pdf>. Of these 3 million missed TB cases, 75 percent are concentrated in 12 countries.

threaten vulnerable populations.¹¹ While global numbers of new TB cases and TB deaths have decreased at an average rate of at least 2 percent per year,¹² the face of TB is changing. Alarming TB strains that are resistant to the most commonly used, inexpensive, and least-toxic TB drugs have been identified in almost every country. Due to recent advances in diagnostic testing, these *multidrug resistant TB* (MDR-TB) strains can be detected more readily, enabling better documentation of their extensive global spread as well as the growing numbers of the even more serious *extensively drug resistant TB* (XDR-TB) strains being reported from nearly all countries.¹³ MDR-TB and XDR-TB cases can be exceedingly difficult and expensive to diagnose and treat successfully, and containment of these strains demands more resources and greater technical and political attention than is currently available.^{14, 15} If not successfully checked, the spread of MDR-TB and XDR-TB could erode recent successes in the global response to TB and could ultimately pose a serious threat to the United States.

Fourth, the burden of TB disease among the growing numbers of people living with HIV (PLHIV) threatens the long-term integrity and success of PEPFAR, the United States' signature twenty-first-century global health initiative. The U.S. government has invested over \$50 billion in PEPFAR since its launch in 2003, and currently supports life-saving antiretroviral treatment for an estimated 6.7 million men, women, and children.^{16, 17} Yet, as PEPFAR recently noted,¹⁸ TB remains the leading infectious killer of PLHIV and is particularly problematic among PLHIV in eastern and southern Africa, the areas that have received the bulk of U.S. HIV/AIDS investments. As PEPFAR focuses increasingly on achieving an "AIDS-Free Generation"¹⁹ and transitioning in the years ahead to ever-greater country ownership (with flat or reduced U.S. investment), achieving effective control of TB becomes even more critical for long-

¹¹ The U.S. Global Health Security agenda is a two-year, \$85 million effort that features collaboration among CDC, USAID, and the U.S. Departments of Defense, Agriculture, State, and Health and Human Services. The United States is committed to working with at least 30 partner countries to help strengthen countries' capacities to detect and respond to infectious disease threats. The program includes the creation of a series of health emergency operations centers around the world. See GlobalHealth.gov, "U.S. Commitment to the Global Health Security Agenda," http://www.globalhealth.gov/global-health-topics/global-health-security/GHS%20US%20Commitments%20Factsheet_a.pdf.

¹² World Health Organization, *Global Tuberculosis Report 2013*, ix.

¹³ It is not clear at the time of this writing whether the increased reporting of MDR-TB and XDR-TB infections represents actual increases in numbers (or rates) of infections or merely an increase in the ability of disease surveillance systems to identify and report them.

¹⁴ MDR-TB infections are defined as those TB infections that are no longer susceptible to two or more of the most commonly used anti-TB drugs. These infections require treatment with an entirely different set of "second line" anti-TB drugs that are more difficult to obtain, are more expensive, have more and greater side effects, and require longer treatment courses. The even more extreme XDR-TB is resistant to even more—if not most—of the "second line" drugs used to treat MDR-TB. MDR-TB has been detected in every country of the world and XDR-TB has been identified in at least 92 countries.

¹⁵ The average cost of treating MDR-TB cases in the United States (\$134,000) has been documented at nearly eight times the cost of treating drug-sensitive TB. See Suzanne M. Marks et al., "Treatment practices, outcomes, and costs of multidrug-resistant and extensively drug-resistant tuberculosis, United States, 2005–2007," *Emerging Infectious Diseases* (May 2014): 812–20, <http://wwwnc.cdc.gov/eid/article/20/5/pdfs/13-1037.pdf>.

¹⁶ Kaiser Family Foundation, "The U.S. President's Emergency Plan for AIDS Relief (PEPFAR)," January 8, 2014, <http://kff.org/global-health-policy/fact-sheet/the-u-s-presidents-emergency-plan-for/>.

¹⁷ PEPFAR, "Latest Results," December 1, 2013, <http://www.pepfar.gov/funding/results/index.htm>.

¹⁸ For example, President's Emergency Plan for AIDS Relief, "Technical considerations provided by PEPFAR Technical Working Groups for FY 2013 COPS [Country Operational Plans] and ROPS [Regional Operational Plans], October 2012," <http://www.pepfar.gov/documents/organization/199147.pdf>.

¹⁹ U.S. Department of State, "The President's Emergency Plan for AIDS Relief (PEPFAR) Blueprint: Creating an AIDS-free Generation," November 29, 2012, <http://www.state.gov/r/pa/prs/ps/2012/11/201195.htm>.

term success in keeping PLHIV alive in PEPFAR-supported countries. At present, only 3 percent of PEPFAR resources are being used to address TB issues.

The U.S. approach to global TB has been challenged by persistent shortcomings.

One conspicuous weakness is a woefully inadequate pool of U.S. agency resources allocated to control global TB. Despite ambitious goals, the available financial and personnel resources have consistently fallen far short of what is needed and far short of the up to \$4 billion authorized by Congress in 2008 to support implementation of a new U.S. global TB strategy. U.S. programs to address global TB receive fewer resources than those addressing HIV/AIDS and malaria—in absolute terms, in terms relative to global disease burdens, and in terms relative to the magnitude of the disease threat to the United States (Table 2). Moreover, U.S. policymakers seem uncertain about what the U.S. resource contribution to global TB control should be. Even as U.S. congressional representatives acknowledge that the U.S. and global resources available for global TB control are inadequate, the Obama administration has proposed a \$45 million (19 percent) *decrease* to the USAID global TB budget for FY 2015, putting it below \$200 million for the first time in five years, on the grounds that the response to global TB “has been a success story.”²⁰

Table 2. Estimated (FY 2013) and Proposed (FY 2015) U.S Government Expenditures for Global HIV/AIDS, Malaria, and Tuberculosis, per Disease-specific Disability Adjusted Life Year (DALY)^a

		FY 2013 U.S. Government Expenditures, (millions) ^c			Total U.S. Dollars Spent in FY 2013 per Global DALY ^e (thousands)	Proposed FY 2015 U.S. Dollars per Global DALY ^f (thousands)
Disease	Global DALYs ^b (thousands)	U.S. Dollars Spent Bilaterally ^c	U.S Dollars Contributed to Global Fund ^d	Total U.S. Dollars Spent in FY 2013		
HIV/AIDS	81,547	4695	847	5442	66.7	62.3
Malaria	82,685	820	439	1259	17.1	12.8
Tuberculosis	49,396	392 ^g	266	658	13.3	12.0

a. Recommended by the World Health Organization as the standard for measuring any population’s burden of disease, the Disability-Adjusted Life Year (DALY) includes years of “healthy” life lost due to nonfatal illness and/or disability plus the potential years of life lost due to premature death. See WHO, “Metrics: Disability Adjusted Life Year (DALY),” http://www.who.int/healthinfo/global_burden_disease/metrics_daly/en/.

b. DALY numbers were taken from the 2010 disease burden estimates published in Christopher J.L. Murray et al., *Lancet* 380, no. 9859 (December 15, 2012): 2197–2223.

c. Calculations are based on estimated FY 2013 U.S. government budget numbers, rounded to the nearest dollar.

d. Amounts are based on the FY 2013 U.S. contribution to the Global Fund and the estimated proportional allocation of Global Fund resources to the three diseases.

e. Dollars per Global DALY amounts include U.S. contributions to the Global Fund.

f. Proposed 2015 budget figures, which include relevant proportions of U.S. contributions to the Global Fund, were derived from Adam Wexler and Jennifer Kates, “The U.S. Global Health Budget: Analysis of the Fiscal Year 2015 Budget Request,” issue brief, Kaiser Family Foundation, March 2014, <http://kff.org/global-health-policy/issue-brief/the-u-s-global-health-budget-analysis-of-the-fiscal-year-2015-budget-request/>.

g. This amount includes both the \$232 million USAID TB budget and a PEPFAR TB/HIV allocation of \$160 million.

²⁰ USAID administrator, before the U.S. House of Representatives, Subcommittee on State, Foreign Operations, and Related Programs of the Committee on Appropriations, April 10, 2014, testimony in response to a question from Rep. Barbara Lee.

Another fundamental weakness in the U.S. approach is the lack of visible high-level TB leadership. Over the last decade, the U.S. government has pursued well-coordinated—and successful—strategic approaches to HIV/AIDS (through OGAC) and malaria (through the President’s Malaria Initiative), but its approach to global TB has been unfocused by comparison.²¹ OGAC and the President’s Malaria Initiative each provide for a single, high-level coordinator, but no single person or office is effectively in charge of U.S. global TB activities. The absence of White House-supported high-level leadership limits the administration’s ability to:

- Successfully make the case for adequate financing to Congress and to the American people.
- Clearly define top U.S. priorities and align those priorities with activities and available resources.
- Make the difficult trade-offs required when resources dedicated to global TB fall far short of program aspirations;
- Develop and pursue a robust and well-funded long-term U.S. strategy for global TB R&D.
- Effectively orchestrate the breadth of U.S. global TB activities, with a large number of collaborating multilateral agencies, partner governments, foundations, and NGOs.

What is to be done? The White House—backed by Congress—can take concrete steps to address more strategically and more effectively the diverse threats to U.S. national interests posed by global TB over the long term, while at the same time advancing the overall U.S. global health goal of improving the lives of vulnerable populations. First, with the backing of the Congress the highest levels of political leadership in the administration should identify and empower a new U.S. coordinator of global TB activities. Second, the administration should match that critical appointment with substantially increased resources dedicated to global TB control activities and long-term R&D, while maximizing efficient use of resources. Third, U.S. leadership must develop an updated vision for addressing global TB, one that prioritizes the 3 million unreported and potentially untreated TB cases per year, the threat of MDR-TB, the complex challenges of TB among PLHIV, and the need for long-term research partnerships in countries with heavy TB burdens—and aligns available resources against them. Finally, the White House needs to engage politically and diplomatically at a very high level to win greater commitment and better coordination among TB donors, international organizations, and other partners, in support of the Global Plan

²¹ Without question, there has been some progress in U.S. efforts against global TB, even in the absence of adequate funding and identifiable high-level leadership. Operational cooperation among U.S. agencies in carrying forward global TB work has been good; there was increasing mobilization of U.S. resources for TB up to 2009–2010; and, within the constraints of available resources the implementation of some programmatic components of the U.S. global TB strategy has clearly advanced. However, these promising developments by themselves have not been sufficient.

to Stop TB as promulgated by the Stop TB Partnership and WHO,²² and in support of the new WHO post-2015 global TB strategy.²³

U.S. Progress in Eliminating Domestic TB

After a resurgence of TB in the United States in the late 1980s and early 1990s, the U.S. government invested additional resources in its domestic TB prevention and control infrastructure and instituted new screening and treatment approaches. TB case rates in the United States have fallen steadily since that time.

That said, there are an estimated 10 million people with latent TB infection (LTBI) in the United States—and 9,945 new TB cases were reported in the United States in 2012. In 2010, the most recent year with complete death certificate data, 576 TB deaths were reported in the United States—essentially all of them preventable.

Sixty-three percent of new active U.S. TB cases now occur among foreign-born individuals, with more than half of these patients coming from one of five countries: Mexico, the Philippines, India, Vietnam, and China. Rates of TB among the foreign-born in the United States are decreasing annually, but at a slower pace than TB rates among U.S.-born residents, with the result that the proportion of all domestic TB cases in foreign-born individuals is increasing. Although the rate of TB disease is higher within the first two years after entry of foreign-born residents, the great majority of foreign-born TB cases occur among persons who have *not* recently entered the United States, suggesting that this latter group may have arrived with latent TB infection that only became active TB disease years later. While the U.S. government has established overseas screening programs for active TB disease for certain individuals immigrating to the United States, strengthening these programs, including expanded screening, prevention, and treatment approaches and, specifically, addressing latent TB infection, could significantly reduce TB among immigrants to the United States.

Such targeted efforts to address TB control within high-burden countries of origin for U.S. TB cases could help accelerate the decline in domestic TB. If the United States invested greater resources in targeted TB prevention, detection, and control activities in those high-burden countries that account for most U.S. TB cases, decreased TB incidence in those countries would improve TB control in the United States.²⁴ For example, research has indicated that such a targeted approach in just three moderate- to high-burden countries could save \$130 million over 20 years in reduced U.S. healthcare costs while further reducing the U.S. TB case load.²⁵ As of now, the United States has not invested substantially in that kind of targeted TB control approach in major countries of origin of U.S. TB cases²⁶—a critical gap that could be corrected with relatively modest outlays.

²² World Health Organization, *The Global Plan to Stop TB, 2011–2015* (Geneva: World Health Organization, 2010), http://www.stoptb.org/assets/documents/global/plan/TB_GlobalPlanToStopTB2011-2015.pdf.

²³ World Health Organization, “Global Strategy and Targets for Tuberculosis Prevention, Care and Control after 2015.”

²⁴ Moore et al., “Tackling Tuberculosis Abroad,” 6.

²⁵ K. Schwartzman et al., “Domestic Returns from Investment in the Control of Tuberculosis in Other Countries,” *New England Journal of Medicine* 353, no. 10 (2005): 1008-20

²⁶ Moore et al., “Tackling Tuberculosis Abroad,” 8.

The Current U.S. Approach to Global TB

The *U.S. Leadership Against HIV/AIDS, Tuberculosis, and Malaria Act of 2003*, which established PEPFAR, laid the foundation for U.S. policy on global TB. This foundation was expanded by the Lantos-Hyde Act of 2008²⁷ and the PEPFAR Stewardship and Oversight Act of 2013,²⁸ which extended the earlier legislative authorities governing PEPFAR and other U.S. global health programs.

The 2008 Lantos-Hyde Act set specific funding targets for U.S. efforts to help control global TB—up to \$4 billion in FY 2009–2013 for both U.S. global TB control activities and for the WHO Global TB Programme and the Stop TB Partnership to help high-burden countries implement appropriate TB control activities. The act requested a new five-year global TB strategy from the administration that included support for the goals of WHO and the Stop TB Partnership.

The administration’s resulting multiagency, five-year Lantos-Hyde global TB strategy, which was developed in 2010 under the assumption that the authorized funding of up to \$4 billion would actually be made available,²⁹ called for four key interventions in the U.S. global TB response (Box 1):

- Accelerated detection and treatment of TB in 25 countries;
- Scaled-up prevention and treatment of MDR-TB;
- Expanded coverage of TB/HIV coinfection interventions in coordination with PEPFAR; and
- Strengthening of broader health systems, including human resource development and the capacities of laboratories and information systems.

Because of the major shortfall that has occurred in appropriated U.S. funding for global TB, this well-crafted intervention plan has been less useful as an overall strategy than it might have been if adequately funded.³⁰ Moreover, the strategy could have had greater practical value even in the face of large funding gaps if it had allowed for the possibility of prioritizing investments in such scenarios. As appropriately noted in recent U.S. government comments about global TB, “In our current resource-constrained environment, there is an increasing need to define priorities and align resource allocation decisions to ensure that PEPFAR more strategically, sustainably, and efficiently meets its goals; allocation decisions must be

²⁷ Tom Lantos and Henry J. Hyde United States Global Leadership against HIV/AIDS, Tuberculosis, and Malaria Reauthorization Act of 2008, Section 302, <http://www.gpo.gov/fdsys/pkg/PLAW-110publ293/html/PLAW-110publ293.htm>.

²⁸ S.1545: PEPFAR Stewardship and Oversight Act of 2013.

²⁹ Lantos-Hyde United States Government Tuberculosis Strategy, March 24, 2010, http://pdf.usaid.gov/pdf_docs/PDACP707.pdf. The U.S. agencies involved in creating this strategy included USAID, OGAC, CDC, NIH, and the Departments of Defense and Health and Human Services.

³⁰ Many policy experts consider the issue of resources to be an integral component of strategy. For example, strategy has been defined as “the guiding philosophy of the organization in the commitment of its resources to attain or fulfill its goals.” See Donald L. Bates and David L Eldredge, *Strategy and Policy: Analysis, Formulation, and Implementation* (Dubuque, IA: Wm. C. Brown, 1984), 4, 11.

Box 1. Goals of the Lantos-Hyde U.S. Government Tuberculosis Strategy (2010)

1. Accelerated detection and treatment of TB for all patients
 - Full coverage of quality DOTS services, including a reliable anti-TB drug supply and full implementation of infection control measures;
 - Effective monitoring, evaluation, and surveillance of TB;
 - Active engagement of the private sector, NGOs, and other public-sector entities to control TB;
 - Active involvement of and support for communities affected by TB; and
 - Accelerated introduction of new tools for diagnosis and treatment, ensuring their optimal use.
2. Scaled-up prevention and treatment of MDR-TB
 - Increased diagnosis and treatment of drug-resistant TB within national TB programs;
 - Introduction of new and more effective MDR-TB diagnostic tools;
 - Implementation of infection control measures to prevent the spread of MDR-TB;
 - Routine surveillance for drug-resistant TB at the country level; and
 - Improved access to quality-assured second-line anti-TB drugs.
3. Expanded coverage of interventions for TB among PLHIV in coordination with PEPFAR efforts
 - Ensure HIV testing for all TB patients and effective referral of those found to be HIV-positive;
 - Provide TB screening of all HIV patients and referral to TB services for those who are suspected cases of TB; and
 - Accelerate the implementation of the “Three Is” (Intensified case finding for TB, Isoniazid preventive therapy, and TB Infection control) to reduce the burden of TB among those with HIV.
4. Improvements in the overall health systems
 - Increase TB diagnosis by scaling up a fully functioning laboratory network with appropriate biosafety provisions;
 - Strengthen information systems through improved data quality and reporting; and
 - Increase health worker capacity to provide high-quality health services.

driven by the potential for greatest impact.”³¹ That comment could apply equally well to non-PEPFAR U.S. global TB investments.

U.S. TB Resources and Strategy

U.S. government resources used in global TB control activities are principally channeled through USAID and OGAC/PEPFAR and a few key multilateral organizations. USAID, OGAC, and CDC enjoy ongoing, constructive interagency dialogue and active coordination; consultations on country-level resource allocations have also intensified in recent years between various U.S. agencies and the Global Fund. However, there is not strong oversight of overall TB-related spending decisions across U.S. agencies.³²

The Lantos-Hyde TB strategy assigned some specific programmatic responsibilities to USAID and OGAC/PEPFAR as well as to NIH and CDC, but stopped short of designating

³¹ President’s Emergency Plan for AIDS Relief, “Technical considerations provided by PEPFAR Technical Working Groups for FY 2014 COPS and ROPS, October 2013,” 189, <http://www.pepfar.gov/documents/organization/217761.pdf>.

³² The ultimate resource allocation situation may be even more complex than described here because important allocation and coordination decisions for use of U.S. TB resources in many countries are made at the country level, in part by U.S. country teams and in part by host-country decisionmakers.

a single entity to direct or otherwise coordinate resources and programs. USAID was named “the lead agency in international TB control,” while PEPFAR was named lead organization for the U.S. government’s “response to TB-HIV coinfection.” In line with their missions and special expertise, NIH and CDC were tasked with supporting biomedical research and providing technical assistance and conducting operational research in the field, respectively.^{33, 34}

U.S. Agency for International Development

USAID funds bilateral agreements and direct technical support to national TB control programs. Its TB budget increased from less than \$100 million per year during FY 2001–2007 to over \$200 million/year through FY 2014. Funding in FY 2013 was \$236 million—the largest global TB account among U.S. agencies. Even so, these FY 2009–2013 amounts totaled less than \$1.2 billion, which is less than 30 percent of the 2008 Lantos-Hyde legislation’s \$4 billion five-year target.³⁵ Even if PEPFAR’s annual TB/HIV allocations of up to \$160 million are included, the total is still less than one-half of the \$4 billion resource target. Not surprisingly, this huge funding gap has seriously limited the ability of USAID and its partners to achieve the ambitious and worthy goals laid out in the Lantos-Hyde TB strategy.

USAID’s global TB resources support a major component of all U.S. global TB activities. The agency focuses on 27 priority countries, but provides targeted technical assistance to other countries as well, including through WHO. In fact, USAID is the top donor to WHO’s Global TB Programme for coordination of technical assistance and for development of recommendations for policies, strategy, and monitoring and evaluation.

Within that context, USAID is currently carrying out and otherwise supporting an impressively large number of programmatically important TB control activities. Beyond staff training and other direct support for many national TB programs, including their laboratories and surveillance systems, USAID support has also included expanded use of new point-of-care diagnostic tests such as Xpert MTB/RIF.

USAID also provides support for:

- Activities of the Global Drug Facility;³⁶

³³ NIH, the largest single funder of TB research, works to facilitate the translation of various categories of TB discovery science (e.g., vaccines, diagnostic tests, new drugs) into human studies and implementation research.

³⁴ CDC staff contributes expertise on TB guideline development to WHO, serves on most major boards and working groups of global TB policy organizations, works closely with the ministries of health in high-burden countries, and conducts clinical trials and operational research studies through its TB Clinical Trials Consortium and its Division of Tuberculosis Elimination.

³⁵ Kaiser Family Foundation, “The U.S. Government and Global Tuberculosis,” <http://kff.org/global-health-policy/fact-sheet/the-u-s-government-and-global-tuberculosis/>.

³⁶ USAID is a major donor to the Global Drug Facility, an innovative global procurement mechanism that provides TB drugs to national TB programs at reduced cost as well as providing support to those programs for monitoring usage of those and other TB drugs. See Stop TB Partnership, “Global Drug Facility,” <http://www.stoptb.org/gdf/>.

- The International Union against Tuberculosis and Lung Disease’s multicountry TREAT-TB program (Technology, Research, Education, and Technical Assistance for TB);
- Drug discovery and market-shaping activities carried out by the TB Alliance;
- The establishment of country-level TB drug management systems;
- National TB surveys in an increasing number of countries;
- Programs to increase case detection rates and successful treatment rates for both drug-sensitive and drug-resistant TB;³⁷
- Patient-centered programs to expand outpatient TB care in countries that had previously focused on inpatient TB care;
- Programs to improve infection control in health facilities;
- Operational field research to improve case finding and treatment adherence;
- Preparing national applications for TB resources from the Global Fund to Fight AIDS, Tuberculosis and Malaria.

A set of USAID-supported national TB surveys that provide detailed geographic and other data about the frequency of known and previously unknown TB disease in the population is a unique contribution to helping national TB programs identify populations and geographic areas needing additional program attention.³⁸

Finally, USAID leadership and staff participate on delegations, boards, and working groups of other organizations that address global TB issues, such as WHO, the Global Fund, and the Stop TB Partnership.

PEPFAR and the Office of the Global AIDS Coordinator (OGAC)

Through PEPFAR, OGAC has since 2009 provided annual allocations ranging from \$131–\$160 million in TB/HIV-related funds to national TB programs, national HIV/AIDS programs, and other partners that are working to integrate activities of their TB and HIV services.³⁹ These funds are used to support a number of activities, including HIV testing and counseling of TB patients, TB screening of PLHIV, cross training of TB and HIV/AIDS program staff, and health system strengthening.⁴⁰ (Resources for early initiation of ART for TB patients also found to be PLHIV are

³⁷ See <http://www.tbcare1.org/> and <http://tbcare2.org/>.

³⁸ David Bryden, RESULTS, personal communication with authors, April 25, 2014.

³⁹ Andrea A. Howard et al., “PEPFAR support for the scaling up of collaborative TB activities,” *Journal of Acquired Immune Deficiency Syndromes* 60, supplement 3 (August 15, 2012): S136–S144.

⁴⁰ U.S. Department of State, “Tuberculosis and HIV/AIDS,” March 21, 2014, <http://www.pepfar.gov/press/223809.htm#By>.

provided through a different PEPFAR allocation.⁴¹ These PEPFAR TB/HIV resources increased by more than 700 percent from a fairly nominal level of \$19 million in 2005 to a peak of \$158–\$160 million in 2010; subsequent annual amounts have averaged approximately \$138 million. Although TB is the most common cause of death among PLHIV, this TB/HIV investment amounts to only about 3 percent of total PEPFAR expenditures.

In November 2012, U.S. and PEPFAR priorities for global TB and TB/HIV control were further articulated in the PEPFAR Blueprint for Creating an AIDS-Free Generation. That document identified the targeting of HIV-related tuberculosis as the first of eight “smart investments” and recommended a specific set of TB-related goals:⁴²

- Closely track indicators of TB/HIV care recommendations, including provision of isoniazid preventive therapy;
- Improve early identification and treatment of TB among PLHIV;
- Support infection control measures to reduce the spread of TB to vulnerable people in healthcare facilities, particularly those settings that serve PLHIV;
- Provide immediate access to antiretroviral therapy to all PLHIV who are diagnosed with TB, regardless of their CD4 count; and
- Improve services for comanagement of TB and HIV care.

Goals 1, 2, and 3 comprise the “Three I’s” strategy (Isoniazid preventive therapy, Intensified TB case finding, and Infection control) that, along with TB and HIV program coordination/integration and scale-up of antiretroviral treatment, form the cornerstone of the global approach to TB/HIV coinfection.⁴³

Taken together with the goals of the 2010 Lantos-Hyde U.S. global TB strategy (Box 1), these Blueprint goals provide clear guidance for agency TB control activities. However, the PEPFAR Blueprint did not acknowledge either the challenges posed by the yawning gap between these useful U.S. goals for global TB control and the limited resources available or the need to allocate scarce resources among top TB control priorities.

There are different perspectives on the relative importance of the links between the global HIV and global TB pandemics.

The argument for lesser importance includes that HIV is a major driver of the TB pandemic in only eastern and southern Africa and perhaps in parts of Eastern Europe, and the TB-affected populations in question are modest in proportion to the overall global TB-affected population. Computer modeling data suggest, for instance, that only

⁴¹ It is likely that many other aspects of PEPFAR’s program support—such as HIV testing, program monitoring, access to ART, supply chain management—have indirectly benefited ongoing efforts to address TB/HIV coinfection.

⁴² U.S. Department of State, “PEPFAR Blueprint: Creating an AIDS-Free Generation,” November 2012, <http://www.pepfar.gov/documents/organization/201386.pdf>.

⁴³ World Health Organization, “Scaling up the Three I’s for TB/HIV,” <http://www.who.int/hiv/topics/tb/3is/en/>.

13 percent of new global TB patients in 2012 were HIV-infected⁴⁴—although global TB case reporting data indicate that 20 percent of TB patients who were HIV-tested in that year were found to be HIV-infected.⁴⁵

On the other hand, HIV-associated TB accounted for an estimated 25 percent of all TB deaths in 2012. In sub-Saharan Africa, which is where the bulk of PEPFAR's \$50 billion has been invested, and where HIV is a predominant driver of TB's spread, 43 percent of new TB patients are also infected with HIV.

In addition, women who died from TB in 2012 were twice as likely to be HIV-infected as men who died from TB.⁴⁶

In a number of countries where PEPFAR and USAID TB programs both operate, the TB-related resources from these two funding sources are programmed jointly, a sign of both active and effective interagency cooperation and of the relative importance attached to TB among PLHIV.

Finally, when considered in the context of USAID's annual TB budget of \$230–238 million, PEPFAR's TB/HIV allocation of up to \$160 million annually since 2009 has represented about 40 percent of the U.S. government's total resources directed bilaterally at programmatic for global TB.⁴⁷

U.S. Government Collaboration with International Organizations

U.S. collaboration and coordination with the WHO, the Stop TB Partnership, and the Global Fund is specifically called for in all three recent laws that cite TB along with HIV/AIDS and malaria as U.S. foreign assistance priorities: the U.S. Leadership Against HIV/AIDS, Tuberculosis and Malaria Act of 2003; the Lantos-Hyde U.S. Global Leadership Against HIV/AIDS, Tuberculosis, and Malaria Reauthorization Act of 2008; and the PEPFAR Stewardship and Oversight Act of 2013.

Although there is limited overlap between the roles of these groups, in general the WHO works in a complementary fashion with USAID, CDC, PEPFAR, and other U.S. entities to provide evidence-based global TB technical assistance; policy guidance; and appropriate national and international attention to disease monitoring, prevention, and treatment. The Global Fund and the Stop TB Partnership concentrate on arranging and providing access to resources needed for national TB program functioning.⁴⁸

⁴⁴ WHO, *Global Tuberculosis Report 2013*, Table 2.1, p. 9.

⁴⁵ *Ibid.*, Table 6.1, p. 70. In 2012, only 46 percent of reported TB patients had a documented HIV test result.

⁴⁶ *Ibid.*, Chapter 2. These calculations were made from several estimates presented in Table 2.1, p. 9, and Box 2.2, p. 12.

⁴⁷ For example, in FY 2013, a year in which USAID's TB budget was \$236 million, PEPFAR's \$160 million for TB/HIV represented approximately 40 percent of the combined \$396 million of U.S. bilateral TB-related funding.

⁴⁸ For additional details, see Nellie Bristol, "Toward a Well-Oiled Machine: U.S. Government Engagement with Multilateral Organizations in Pursuit of Global TB Control," CSIS, June 2014, <http://www.csis.org/tuberculosis>.

The Global Fund to Fight AIDS, TB, and Malaria

The Global Fund is a public-private partnership established in 2002. Through 2013, U.S. contributions have accounted for 31 percent of its budget.⁴⁹ Over that period, the fund has distributed an estimated \$4.6 billion in TB and TB/HIV control resources, an amount equal to approximately 17 percent of its total program disbursements, compared to 54 percent allocated for HIV/AIDS and 28 percent allocated for malaria control.⁵⁰ In 2013 the Global Fund's board—which includes, from the United States, representatives of the Bill & Melinda Gates Foundation and Merck & Co., as well as former U.S. Global AIDS Coordinator Dr. Eric Goosby—voted to raise the proportion of grant funding allocated to TB control to 18 percent beginning in 2014.⁵¹

The Global Fund is also the single-largest multilateral channel for U.S. global TB resources, although U.S. resources contributed to the Global Fund are not specifically earmarked for TB. In FY 2013, the U.S. contribution to the Global Fund was \$1.569 billion, making the U.S. contribution to Global Fund TB control programs approximately \$266 million. In FY 2014, with an increased U.S. contribution and an increased proportion going to TB, the U.S. TB contribution was approximately \$295 million. However, based on the administration's proposed FY 2015 global health budget, the U.S. contribution to the Global Fund's TB allocation in FY 2015 would be reduced to \$243 million.

In the past, Global Fund grant awards were often more closely related to the quantity and quality of country proposals, and the most dramatic disease crises, than to where investments were likely to have the greatest long-term benefit in disease control.⁵² However, the new funding model recently put in place promises a more explicit focus on the potential disease control impact of grants. Finally, the board's strategy committee voted in October 2013 to require that, for countries with high rates of TB/HIV coinfection, national applications for control programs for either TB or HIV must take the form of a unified application for *both* TB and HIV control.⁵³ These reforms expand on the Global Fund's earlier efforts to address the related co-epidemics of TB and HIV and are likely to have a positive impact on the results of global TB control activities.

⁴⁹ The Global Fund to Fight AIDS, Tuberculosis and Malaria, "Government Donors," <http://www.theglobalfund.org/en/partners/governments/>.

⁵⁰ The Global Fund to Fight AIDS, Tuberculosis and Malaria, "Grant Portfolio: Grant Overview," <http://portfolio.theglobalfund.org/en/Home/Index>.

⁵¹ The Global Fund to Fight AIDS, Tuberculosis and Malaria, "Allocations Process," 2014, <http://www.theglobalfund.org/en/fundingmodel/allocationprocess/>.

⁵² Amanda Glassman and Victoria Fan, "Does the Money Match the Message? Current Practice in Allocation of Aid for Tuberculosis and Implications for the U.S. Government," CSIS, June 2014, <http://www.csis.org/tuberculosis>.

⁵³ The Global Fund, "Global Fund Board Decision: Submissions of Single Concept Notes for HIV and TB" (paper presented at ESA regional meeting on Global Fund single TB and HIV concept notes, February 17–19, 2014), http://www.who.int/tb/challenges/hiv/session_2a_global_fund_board_decision_single_concept_notes.pdf.

The World Health Organization⁵⁴

In collaboration with the World Health Assembly⁵⁵ and its executive board, WHO's Global TB Programme (GTB) is responsible for:

- Developing overall global TB strategy and evidence-based policies, standards, and norms for TB prevention, care, and control;
- Monitoring global and national TB burdens and investments;
- Annually publishing the comprehensive *Global Tuberculosis Report*;
- Guiding the global TB research agenda; and
- Coordinating a network of TB experts located in WHO regional offices and WHO country offices to provide technical assistance to national TB programs. The network focuses on countries with high burdens of TB, TB/HIV, and MDR-TB.

In 2010–2011, GTB suffered resource reductions proportional to WHO's core budget cut, ultimately resulting in an approximate 15 percent reduction in its staff. At present, the United States finances approximately 70 percent of the WHO GTB Programme.

The Stop TB Partnership

The Stop TB Partnership was created in 2001 after several high-profile TB outbreaks, including in the United States, forced a realization that TB must be tackled globally, collaboratively, and comprehensively. Today, the Stop TB Partnership comprises more than 1,000 members: universities, governments, private-sector groups, and other international and nongovernmental organizations. Its most active members normally hold seats on its coordinating board.

The partnership's major goals include raising awareness about TB and advocating for additional resources for global TB prevention, treatment, and research. In cooperation with WHO and other engaged partners, the partnership has produced a series of global plans to stop TB, the early versions of which were the guiding documents for the U.S. Lantos-Hyde TB strategy. The most recent version, *The Global Plan to Stop TB 2011–2015*, aims “to dramatically reduce the global burden of TB by 2015 in line with the Millennium Development Goals and the Stop TB Partnership targets.”⁵⁶ The *Global Plan's* TB priorities are also reflected in the recent PEPFAR Blueprint.

⁵⁴ See World Health Organization, “WHA Approves Post-2015 Global TB Strategy and Targets,” <http://www.who.int/tb/en/>.

⁵⁵ The World Health Assembly, which is composed of members from every WHO member state, meets annually in Geneva to determine the strategic, programmatic, and financial policies of WHO and to build consensus on those policies.

⁵⁶ Stop TB Partnership and WHO, “The Global Plan to Stop TB 2011–2015,” http://www.stoptb.org/assets/documents/global/plan/TB_GlobalPlanToStopTB2011-2015.pdf.

The Stop TB Partnership was seen initially as a powerful step in the direction of global coordination, but in recent years, it has been criticized for an unfocused mission and weak performance evaluation. In response, it has recently revised its work plan and directions, and significantly restructured management. Its reorganized board has been praised as leaner and more effective, and its new 2013–2015 operational strategy lays out meaningful, measurable objectives for progress. In order for the partnership to reach those targets, however, sustained U.S. support will be critical.

There is no high-level diplomatic gathering that regularly brings together the political leadership of key investors, high-burden countries, and international organizations to review progress, renew commitments, hold each other to account, and concentrate the world's attention on outstanding global TB threats and the steps essential to address them.

The “Big Three” Challenges

Multidrug-resistant TB (MDR-TB)

“Antimicrobial resistance is a global problem, and some of our most significant global threats are multi-drug resistant tuberculosis and drug-resistant malaria.”—CDC Director Tom Frieden, M.D.⁵⁷

MDR-TB is a form of tuberculosis caused by *M.tb.* strains that are no longer susceptible to at least the two most effective (and relatively inexpensive) anti-TB drugs. MDR-TB cases require treatment course of up to two years (versus the usual six-month treatment) with a combination of alternative “second line” drugs that cost more, are more difficult to access, and cause serious side effects.

In 2012, an estimated 450,000 new MDR-TB cases emerged globally. Already, some countries in Eastern Europe and central Asia are seeing MDR-TB in nearly a third of people newly diagnosed with TB.⁵⁸ Some of these MDR-TB cases are resistant to most current TB drugs, including many of the second-line drugs, and are thus even more difficult to treat. This latter group of cases is categorized as *extensively drug resistant TB (XDR-TB)*.⁵⁹ Current estimates of numbers of both MDR-TB and XDR-TB infections are imprecise, in part because many countries lack the relatively sophisticated laboratory capacity required to identify TB bacteria that are resistant to anti-TB drugs. WHO estimates that no more than 25 percent of recent MDR-TB cases are being identified.⁶⁰

A major obstacle to reducing the spread of—and effectively treating—MDR-TB is the difficulty in accurately identifying MDR-TB cases. The recent addition of the Xpert MTB/RIF technology to the diagnostic armamentarium has been a step forward, although the ultimate benefits of that new diagnostic test—and similar new diagnostic tests—can only be realized if testing is done within the context of a health system that

⁵⁷ Thomas R. Frieden, “Testimony to the Committee on Energy and Commerce Subcommittee on Health, U.S. House of Representatives,” April 28, 2010, <http://www.cdc.gov/washington/testimony/2010/t20100428.htm>.

⁵⁸ WHO, *Global Tuberculosis Report 2013*.

⁵⁹ Even when XDR-TB treatment regimens are carefully followed, treatment is not always successful.

⁶⁰ WHO, *Global Tuberculosis Report 2013*.

can assure follow-up with testing of specific drug sensitivities and effective second-line drug treatment of confirmed MDR-TB patients.

Given the frequency and ease of international travel, any global increase in MDR-TB cases threatens people everywhere, including in the United States. One particularly notable example occurred in the southeastern United States in 2007, when a traveler with suspected XDR-TB, despite being urged by health officials not to travel, flew from the United States to Europe, visited several countries, and then returned to the United States.⁶¹ In March 2013, U.S. border officials identified and detained yet another person with active XDR-TB disease who was trying to enter the United States.⁶² New York City's major TB outbreak in the late 1980s and early 1990s resulted in thousands of new TB cases, nearly a quarter of which were found to be drug resistant.⁶³ To resolve this TB outbreak, over \$1 billion was expended eventually. Although drug-resistant TB found in that instance appeared not to be associated with a TB importation from other countries, that outbreak demonstrated how quickly TB can spread, even in the United States, if people with TB disease are not quickly identified and appropriately treated so they become noncontagious to others.⁶⁴ Finally, a recent review of 92 people with MDR-TB infections identified in eight U.S. states found that the majority, many of whom had been treated for TB previously, had acquired their disease outside the United States.⁶⁵

TB Disease among People Living with HIV: A Threat to PEPFAR and Those it Serves

"[I]f it is not adequately addressed, TB has the potential to undermine the great strides that PEPFAR has made in rapidly expanding HIV care and treatment."⁶⁶

TB among PLHIV disproportionately affects the people of sub-Saharan Africa but threatens other populations as well. Numbers of *new* HIV infections are declining in many places but, because many more PLHIV are receiving life-saving antiretroviral treatment (ART), global numbers of PLHIV continue to increase. Latent TB infections in PLHIV are far more likely to become active TB disease than they are in other people. In PLHIV with TB disease, TB and HIV each accelerate the progression of the other. While PEPFAR continues a stellar job of extending and saving lives by providing PLHIV with access to ART, at least 20 percent of all global AIDS deaths are still linked to TB disease, and autopsy data from multiple studies strongly suggest that

⁶¹ "The XDR Tuberculosis Incident: A Poorly Coordinated Federal Response to an Incident with Homeland Security Implications," Hearing of the House Committee on Homeland Security, June 6, 2007, <http://www.gpo.gov/fdsys/pkg/CHRG-110hhrg48919/html/CHRG-110hhrg48919.htm>.

⁶² Betsy McKay, "Dangerous TB Patient Detained on U.S. Border," *Wall Street Journal*, March 1, 2013, <http://online.wsj.com/news/articles/SB10001424127887323978104578332461533970412>.

⁶³ Thomas R. Frieden, "Tuberculosis in New York City—Turning the Tide," *New England Journal of Medicine* 333 (1995), 229–33.

⁶⁴ Richard Coker, "Lessons from New York's tuberculosis epidemic," *British Medical Journal* 317, no. 7159 (1998): 616–20.

⁶⁵ Patrick K. Moonan et al., "Transmission of multidrug-resistant tuberculosis in the USA," *Lancet Infectious Diseases* 13, no. 9 (September 2013): 777–84.

⁶⁶ President's Emergency Plan for AIDS Relief, "Technical considerations provided by PEPFAR Technical Working Groups for FY 2013 COPS and ROPS, October 2012," <http://www.pepfar.gov/documents/organization/199147.pdf>.

an even greater proportion of global HIV/AIDS mortality is due to TB.⁶⁷ Finally, based on available mortality data, it appears that the combination of TB and HIV may affect women more severely than men, probably for a combination of biological and social reasons.

It seems clear from the nature of the multiple biological, epidemiologic, programmatic, and policy relationships of TB and HIV that globally and in countries with high burdens of HIV, the burdens of each of these two diseases must be prevented and controlled in the context of the other, with close collaboration between the programs working to address them, particularly in countries with high rates of coinfecting individuals. However, despite global efforts to encourage greater integration of disease control activities between programs that address these two infections, overall progress in coordination between programs has been disappointingly slow. Some progress has been made in early diagnosis and treatment of TB in PLHIV,⁶⁸ yet neither HIV testing of patients with active TB nor TB screening of PLHIV has reached global targets.⁶⁹ Program coverage of crucial interventions, such as providing early ART to all PLHIV with active TB or providing isoniazid to PLHIV who have not yet developed active TB, continues to increase. However, more remains to be done.

A recent review of PEPFAR by the U.S. Institute of Medicine concluded that, without important changes, PEPFAR would be challenged to meet its goals related to TB, threatening hard-won gains in the clinical management of PLHIV.⁷⁰ From a U.S. government perspective, effective control of TB in many countries is vital to PEPFAR's continued lifesaving successes. Conversely, ongoing participation of PEPFAR programs and resources in global TB control activities is critical to maintain and scale up collaborative global TB/HIV activities.

Allocating Limited Resources across Multiple Global TB Goals

“The choice is not between reduced TB burden and reduced MDR-TB burden. Attention and support are needed to both ‘general’ TB control and MDR-TB control simultaneously—neither can wait, and the approach cannot be one or the other, or one followed by the other. Without support for general TB control,

⁶⁷ Janneke A. Cox et al., “Autopsy Causes of Death in HIV-Positive Individuals in Sub-Saharan Africa and Correlation with Clinical Diagnoses,” *AIDS Review* 12 (2010): 183–94.

⁶⁸ Terms such as “TB/HIV coinfection” are commonly used to describe the existence of active—and contagious—TB disease in people who are also infected with HIV. However, the term “coinfection” is not technically precise when used in that context because the first phase of most human TB infections is usually a latent (inactive and noncontagious) phase as the body initially is able to control the TB infection. Thus most PLHIV who are also infected with TB still have a latent and noncontagious TB infection (and an important opportunity to reduce the odds of developing active TB). Nevertheless, because the “TB/HIV coinfection” term is still widely used—and understood—to describe active TB disease in PLHIV and because alternative terminology is relatively awkward, we will sometimes use this coinfection term in that context in this paper.

⁶⁹ WHO, *Global Tuberculosis Report, 2013*, p. 71, 74. See also USAID, “Impact and leadership: U.S. government report on international foreign assistance for tuberculosis—Fiscal Year 2013” (Washington, DC: USAID, 2014).

⁷⁰ U.S. Institute of Medicine, *Evaluation of PEPFAR* (Washington, DC: The National Academies Press, 2013), 266–72. The current authors are aware that, because the data used to draw the conclusions reached in the IOM report are now several years out of date, progress is likely to have occurred in many—or all—PEPFAR program areas that were of concern to the IOM committee.

programs will create more MDR-TB . . . I would respectfully submit that this is not an either/or situation. Both are important to address, and we need to find a way to do this.”⁷¹

Each year, low- and middle-income countries spend approximately \$3.9 billion of their own funds on TB control programs.⁷² According to the most recent WHO estimates, a full response to global TB through 2015 will require \$1.6–2.3 billion per year.⁷³

In recent years, the United States has provided a relatively modest \$224–256 million annually in bilateral TB aid through USAID. Even when PEPFAR’s annual TB/HIV expenditures of up to \$160 million are included, these combined U.S. government global TB resources have fallen well short of the levels envisioned by the U.S. Congress in the 2008 Lantos-Hyde legislation, and the limited funds have been spread thinly across many objectives.⁷⁴ The current U.S. Lantos-Hyde global TB strategy, while an important conceptual step forward, does not suggest any approach to prioritizing where or how limited U.S. resources might have the greatest impact in support of national TB programs.

In particular, the global challenge of MDR-TB clearly warrants greater U.S. and global attention and resources than it has received to date. However, that drug resistance challenge must be met without diverting necessary attention or resources from the ongoing TB control efforts that are successfully continuing to reduce rates of drug-susceptible TB globally, and are at the same time addressing the formidable, continued challenge of HIV/TB coinfection.

Although substantial additional U.S. resources to address global TB are necessary, they may not become available quickly. (In fact, as noted earlier, the recent FY 2015 global health budget proposal from the U.S. administration is an effort to significantly *further reduce* USAID’s global TB funding.) Meeting multiple important long-term challenges with constrained resources remains a core dilemma of U.S. government efforts in global TB control, one that is increasingly being recognized^{75, 76} and one that is likely to require prioritizing some approaches over others and aligning them with decisions on resource allocation.

⁷¹ Comment of a CSIS Global TB Working Group member, cited in Glassman and Fan, “Does the Money Match the Message?,” 6.

⁷² Katherine Floyd, Christopher Fitzpatrick, Andrea Pantoia, and Mario Raviglione, “Domestic and Donor Financing for Tuberculosis Care and Control in Low-income and Middle-income Countries: An analysis of trends, 2002–11, and Requirements to Meet 2015 Targets,” *Lancet Global Health* 1, no. 2 (August 2013): e105–e115.

⁷³ *Ibid.*

⁷⁴ One of the several potential benefits of Xpert MTB/RIF and similar testing technologies is the more rapid identification of larger numbers of patients with drug-resistant TB. However, diagnosing MDR-TB is just one early step in a necessary cascade of actions. In fact, WHO and others have noted the “global shortfall in capacity to place people diagnosed with MDR-TB on treatment.” See World Health Organization, *Global Tuberculosis Report, 2013*, 54.

⁷⁵ President’s Emergency Plan for AIDS Relief, “Technical considerations provided by PEPFAR Technical Working Groups for FY 2014 COPS and ROPS, October 2013,” 189, <http://www.pepfar.gov/documents/organization/217761.pdf>.

⁷⁶ Evelyn Cornelissen et al., “Determining and Broadening the Definition of Impact from Implementing a Rational Priority Setting Approach in a Healthcare Organization,” *Social Science & Medicine* (May 2014).

Until sufficient additional resources become available, the solution may involve a more systematic and more deliberate use of cost-effectiveness or similar analyses to guide allocation of scarce U.S. resources for global TB across competing demands. An effective approach is likely to require trade-offs among several worthy goals, or scaling back at least some program goals and expectations to a level that more realistically matches available resources.

To be successful, such a deliberate allocation approach will also require strong senior leadership, a decisionmaking process that solicits and considers input from all stakeholders, and a robust monitoring and evaluation component.

What Now? Recommendations for U.S. Policy

The United States and its international partners in TB control face an increasingly complex global pandemic—one in which slowly falling numbers of TB cases disguise several entrenched challenges and emerging threats. To meet the challenges highlighted above, the United States should elevate TB in political, budgetary, and strategic terms—as it did over the last decade with HIV/AIDS and malaria.

To that end, we urge four concrete steps:

1. Appoint and empower a U.S. Global TB Coordinator.

The single most important next step is for the White House to appoint a U.S. Global TB Coordinator and for Congress to work with the administration in enacting authorizing legislation.

The coordinator should be a senior public health expert familiar with TB and the relevant agencies, mandated to lead and oversee U.S. global TB policy and programs. The administration, working with Congress, will be responsible for defining the best institutional arrangements to support the work of the coordinator, who should be mandated through legislative language (as with the OGAC and PMI coordinator positions) to carry out important responsibilities:

- Advocate internally and with Congress for new resources;
- Set clear priorities that can be achieved realistically with current constrained finances;
- Devise a coherent U.S. approach that aligns resources with goals and that sets concrete targets for the years beyond 2015⁷⁷;
- Ensure continued interagency cooperation within the U.S. government; and
- Represent the United States in the orchestration of global TB efforts.

⁷⁷ World Health Organization, “Global Strategy and Targets for Tuberculosis Prevention, Care and Control after 2015.”

Even without a large increase in resources in the near term, a U.S. Global TB Coordinator would provide visible TB leadership here and abroad, and a clear focal point for goals, programs, and funding streams across agencies. Empowered by the Congress and the White House, a coordinator would personify a high-level political commitment to accomplishing with global TB what has been accomplished with HIV/AIDS and malaria.

To be effective, the future U.S. Global TB Coordinator must have a robust mandate from the president and the Congress; direct, regular access to the White House and relevant senior cabinet officers; expert staff; significant authority over the ultimate allocation of U.S. global TB resources; and an expectation of accountability against realistic goals. The coordinator will need to keep U.S. efforts focused on the pandemic of drug-sensitive TB that accounts for the majority of global TB cases, while not losing sight of the special challenges of MDR-TB and TB/HIV coinfection.

Any move by the administration or Congress to graduate to a more strategic approach to global TB will be met, understandably, with skepticism in some quarters. There will be apprehension within operational agencies that many of the essential prerequisites of certain success will ultimately be missing: for example, that White House backing will be weak, that the coordinator will not have an authoritative mandate over budgets and spending decisions, or that available resources will continue to fall short of what is truly required. Special care will be needed to assuage and address these legitimate concerns.

2. Increase global TB control resources and improve their use.

The United States should increase the fiscal and personnel resources dedicated to global TB to a level at least commensurate with the aspirations of the 2008 Lantos-Hyde legislation (i.e., \$4 billion over five years), commensurate with the goals of the 2010 Lantos-Hyde TB strategy, and, most importantly, commensurate with the magnitude of TB's global disease burden (Table 2). In addition to meeting USAID's obvious need for a more robust TB budget to help continue to address both drug-sensitive and drug-resistant TB globally, the United States should increase significantly the proportional TB-related allocations of PEPFAR from its current 3 percent. (Increasing the proportion of PEPFAR funds allocated to TB and TB/HIV activities may become easier if the overall PEPFAR budget rises above current levels but, even at current budget levels, it was surprising that only 3 percent of PEPFAR resources are allocated to TB/HIV, an essentially preventable disease complication responsible for at least 20 percent of all AIDS deaths.)

As the long-term impact of the recent Global Fund increase in its TB and TB/HIV allocation to 18 percent and its recent policy change requiring unified TB and HIV grant proposals becomes clear, the United States and others may decide in future years to press for still further increases in that TB allocation.

The return on dollars invested in TB can also be improved by strong program outcome evaluations that measure programs' impact on the occurrence of TB disease and TB deaths. More importantly, the United States should move toward an approach that seeks and uses existing and new cost-effectiveness data to inform the prioritization of investments of scarce TB program dollars across competing demands. Success in such

an approach will require strong senior leadership and oversight, and a transparent and accountable decisionmaking process.

Sustaining and building congressional support will also be essential. While creation of the House TB Elimination Caucus is a promising beginning, frequent congressional turnover mandates ongoing engagement with Congress to cultivate and support new champions. For its part, Congress should give serious consideration to mandating an independent external review of U.S. global TB programs, including the program interfaces between TB at home and TB abroad, by an institution such as the Institute of Medicine or the Government Accountability Office.

3. Lay out a clear vision.

In each of the four priority areas, it will be critical to set concrete targets for measuring progress and reporting back to Congress and senior administration leaders.

(a) *Continue building on the successes of controlling drug-sensitive TB.* The United States must continue its overall support for the care and control of drug-sensitive TB, which is the *sine qua non* of any TB control activity.

(b) *Reduce the transmission and global burden of MDR-TB.* Clear priorities must be set that address the various critical prevention, diagnosis, treatment, and care aspects of this emerging threat without inadvertently undercutting the global programs that have been effective in addressing drug-sensitive TB. Prevention of new MDR-TB cases must be addressed by ensuring completion of drug-sensitive TB regimens, thereby preventing the development and emergence of new MDR-TB strains. Direct (person-to-person) transmission of MDR-TB must be prevented through early detection and treatment of MDR-TB cases, investigation of their household and other close contacts, and through new or strengthened infection control programs in facilities where patients with TB disease and/or HIV disease are likely to congregate.

(c) *Significantly improve the prevention, diagnosis, and control of TB in PLHIV.* Because of TB's significant role in HIV-related mortality, the success of TB prevention, screening, and treatment programs in many countries, especially in Africa, will remain vital to PEPFAR's continued HIV/AIDS successes. Conversely, continued participation and coordination of PEPFAR programs and resources with ongoing global TB and TB/HIV control activities is critical to addressing current and emerging challenges such as MDR-TB, TB in PLHIV, and TB infection control in health facilities. These participation issues are particularly critical in terms of PEPFAR's impending transition to country ownership, a process that will need close attention to detail in order to minimize the kind of adverse effects already being reported.⁷⁸

(d) *Create robust long-term research partnerships with key institutions in selected emerging economies.* The global TB pandemic's evolution toward greater degrees of drug resistance and the great need for better diagnostic tests, new treatment

⁷⁸ Matthew M. Kavanagh, *The Politics of Transition & the Economics of HIV: AIDS and PEPFAR in South Africa* (Washington, DC: Health GAP, January 2014), <https://static.squarespace.com/static/507f75d8e4b010bec5a04de1/t/52d6a6d8e4b0f7cacc74d117/1389799128021/Politics%20of%20Transition%20Report-AIDS%20&%20South%20Africa.pdf>.

medications, and ground-breaking preventive interventions argue for an expanded TB research and development (R&D) agenda, from basic discovery research to product development, program implementation research, and behavioral research.

Discovery and development of these new tools may well emerge from rising economic powers such as Brazil, India, China, South Africa, Mexico, and Indonesia. And despite the grave worsening of the bilateral relationship, U.S.-Russian scientific cooperation could bring promising results as well. Many of these nations are home to significant proportions of the world's active TB cases (including many of its MDR-TB strains).⁷⁹ The U.S. government should seize the opportunities that exist, by enlarging and formalizing its TB research partnerships with emerging economy partners.

4. Create high-level diplomatic engagement on TB.

The United States cannot identify and ensure effective care and treatment of the world's 3 million annual undetected or unreported TB cases on its own. Ultimately, any fundamental, generational reshaping of the TB pandemic will rest on access to expanded resources across many institutions, higher levels of political will among diverse world leaders, and far better orchestration of global efforts through high-level political attention.

The May 2014 approval by the World Health Assembly of a post-2015 global TB strategy (Table 1) will almost certainly strengthen global coordination. The recent reorganization of the Stop TB Partnership's board was another encouraging step. Now, the United States should press for a new annual high-level diplomatic meeting on global TB that can signal that the TB pandemic has risen as a foreign policy and health priority; muster political will to follow through on commitments; highlight both the continued progress and the complex threats associated with TB; and win new commitments to address critical gaps. Such an annual meeting could be scheduled around meetings of the G20, the World Health Assembly, or other similarly high-profile summits, and should include principals from high-burden countries, donor nations, foundations, and key multilateral organizations and implementers.

Closing Comment

In important ways, global TB is a paradox. There has been considerable recent progress in prevention and control and in the overall reduction in the global burden of TB disease. There is considerable optimism about future gains both programmatically and in terms of research and development achievements, provided that investment and commitment can be increased to match the global TB goals. The Global Fund, the Stop TB Partnership, and the World Health Organization and its World Health Assembly among others have each taken important steps forward. Beneath that hopeful picture, however, there remain 3 million new cases of global TB disease that go undiagnosed or unreported each year, as well as the threats of both MDR-TB and TB among PLHIV. Each of these issues touches on important U.S. national interests, including preventing and otherwise coping with TB on U.S. soil. At the same

⁷⁹ Brazil, China, India, Russia, and South Africa account for 80 percent of new infections in the 22 highest-burden countries, as well as three-fifths of the world's documented MDR-TB infections. See Katherine E. Bliss, "Building New Relationships on TB Control, One BRIC at a Time," CSIS, June 2014, <http://www.csis.org/tuberculosis>.

time, the U.S. policy approach to TB notably lacks high-level White House leadership, congressional engagement, and adequate resources. At the international level, there is the need to enlist high-level political leadership on a regular basis to boost the orchestration efforts. Despite these challenges, this is a propitious moment of considerable opportunity for the United States to continue—and strengthen—its leadership role by doing more to protect Americans from TB, by helping accelerate the decline of the overall global TB burden, and by better addressing drug resistance and TB among PLHIV. Money and other resources matter, and more is required from the United States, high-burden countries, and other investors to address major gaps. Beyond the resource gap, however, it is equally critical that the United States exercise true strategic leadership, in partnership with international and multilateral organizations, program implementers, high-burden countries, research institutions, foundations, and other nongovernmental groups.

Companion Analyses

The following companion CSIS policy analyses on specific aspects of global tuberculosis are available at <http://www.csis.org/tuberculosis>:

Katherine E. Bliss, “Building New Relationships on TB Control, One BRIC at a Time”

Nellie Bristol, “Toward a Well-Oiled Machine: U.S. Government Engagement with Multilateral Organizations in Pursuit of Global TB Control.”

Amanda Glassman and Victoria Fan, “Does the Money Match the Message? Current Practice in Allocation of Aid for Tuberculosis and Implications for the United States Government.”

Brittany K. Moore, Drew L. Posey, Susan A. Maloney, Martin Cetron, and Kenneth Castro, “Tackling Tuberculosis Abroad: The Key to TB Elimination in the United States.”

Phillip Nieburg, Sharon Stash, and Alisha Kramer, “The Global Challenge of Tuberculosis among People Living with HIV: Overlapping Pandemics Require U.S. Government Leadership.”

Peter Small, J. Stephen Morrison, and Seth Gannon, “Strengthening the U.S. Approach to Tuberculosis Research and Development.”

Further Readings on Global TB

CDC Domestic TB surveillance data:

CDC, “Reported Tuberculosis in the United States, 2012,”
<http://www.cdc.gov/tb/statistics/reports/2012/default.htm>.

WHO’s post-2015 Global TB Strategy:

WHO, “Draft Global Strategy and Targets for Tuberculosis Prevention, Care and Control after 2015,” Sixty-seventh World Health Assembly, Agenda item 12.1.

WHO, “Global Strategy and Targets for Tuberculosis Prevention, Care and Control after 2015,” 2013, http://www.who.int/tb/post2015_tbstrategy.pdf?ua=1.



1616 Rhode Island Avenue NW | Washington, DC 20036
t. (202) 887-0200 | f. (202) 775-3199 | www.csis.org

Cover photos: (Top left) Lewis Tse Pui Lung / Shutterstock.com. (Top right) National Geographic Stock Image. (Bottom left) <https://www.flickr.com/photos/usaaid-indonesia/7313214200/in/photolist-c9f8N1-c9f8ey-8PKsZS-7rvzj2-f5JV1E-f5uCZp-dQv3ma-dQACLE-7XDqHy-8k3CgZ-awt2tX-awt3ue-awt1Up-dPxoze-9UV4sE-8RmLm2-55UMAu-4xTfkU-7u5pzU-8tL4uZ-8tLgCB-8tKtk6-f5uECH-f5JV9E-f5JUXJ-f5uDv6-f5uD8c-f5uDjt-f5JW3h-ffJ5KX-cF9GE-6Rmsib-Cy14b-74wuUp-74Ap57-74ww8c-74Apb9-arXw9-ehnGz6-74ww14-74Ap7y-74wvVF-9iej2-bAHtnP-bowweC-7k7XMG-7r8rxM-7dgMwp-kJEW9M-7djL6s>. (Bottom right) ©Donna Todd.