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Lurching from Complacency to Panic in the Fight Against Dangerous Microbes: A Blueprint for a Common Secure Future

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LURCHING FROM COMPLACENCY TO PANIC IN THE FIGHT AGAINST DANGEROUS MICROBES: A BLUEPRINT FOR A COMMON SECURE FUTURE[†]

*Lawrence O. Gostin**
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INTRODUCTION

In the modern era, the world faces a stark paradox in understanding the risk of fast-moving pathogens. While science brings enormous acumen for discovering and developing countermeasures (vaccines and pharmaceuticals), the potential for explosive pandemics has never been greater.¹ Why? Globalization propels pathogens more rapidly than ever across borders, regions, and the world. Mass migration, intercontinental travel, urbanization, and intense animal–human interchange facilitate the emergence of microbes from the forests and animal life to humans; then, these dangerous microbes spread uncontrollably.²

These dynamics have resulted in a significant increase in outbreaks since 1980: 12,012 outbreaks of 215 infectious diseases were recorded between 1980 and 2013, accounting for more than 44 million cases in 219 countries.³ In recent years, the world has experienced a series of health crises spanning severe acute respiratory syndrome (SARS), Middle Eastern respiratory syndrome (MERS), Ebola virus disease, and novel avian (H5N1) or human (H1N1 and H7N9) influenzas.⁴ At the height of each crisis, politicians often overreact (e.g., implementing unnecessary travel and trade restrictions or quarantines).⁵ In interpandemic periods, authorities underprepare. Lurching between complacency and panic is a dysfunctional strategy; while scientists cannot predict when the next pandemic will occur, or the exact pathogen at play, there *will* be a destructive pandemic in the foreseeable future.⁶

Naturally occurring infectious diseases are not the only threat. In an age of terrorism, it is not just guns, explosives, and chemical or radiologic hazards that destabilize communities and countries; there is also the prospect of

¹ See Lawrence O. Gostin & Ana S. Ayala, *Global Health Security in an Era of Explosive Pandemic Potential*, 9 J. NAT'L SECURITY L. & POL'Y 53, 53 (2017).

² See COMM'N ON A GLOB. HEALTH RISK FRAMEWORK FOR THE FUTURE, NAT'L ACAD. OF MED., SECRETARIAT, *THE NEGLECTED DIMENSION OF GLOBAL SECURITY: A FRAMEWORK TO COUNTER INFECTIOUS DISEASE CRISES 1* (2016) [hereinafter *THE NEGLECTED DIMENSION OF GLOBAL SECURITY*].

³ See INT'L WORKING GRP. ON FIN. PREPAREDNESS, FROM PANIC AND NEGLECT TO INVESTING IN HEALTH SECURITY: FINANCING PANDEMIC PREPAREDNESS AT A NATIONAL LEVEL 6 (2017); Katherine F. Smith et al., *Global Rise in Human Infectious Disease Outbreaks*, J. ROYAL SOC'Y. INTERFACE, Dec. 6, 2014, at 1, 2.

⁴ See *Emergencies Preparedness, Response: Disease Outbreaks by Year*, WORLD HEALTH ORG., <http://www.who.int/csr/don/archive/year/en/> (last visited Feb. 10, 2018).

⁵ See, e.g., Johanna Neuman, *Swine Flu: Time to Close the U.S.-Mexico Border?*, L.A. TIMES, (Apr. 28, 2009, 8:10 AM), <http://latimesblogs.latimes.com/washington/2009/04/swine-flu-time-to-close-the-usmexico-border.html> (responding to the threat of swine flu from Mexico by proposing to close the United States-Mexico border).

⁶ See *THE NEGLECTED DIMENSION OF GLOBAL SECURITY*, *supra* note 2, at 17.

accidental or deliberate release of dangerous pathogens. One week after the September 11th terrorist event, anthrax spores were mailed to media and U.S. senators, killing five people, infecting seventeen others, and grinding the postal system to a halt.⁷ In 2004, a Russian scientist (working at one of two known repositories of smallpox virus) died after accidentally pricking herself with a needle contaminated with the Ebola virus.⁸

Given the proliferation of scientific information on the internet, reputable scientists can create dangerous pathogens. So-called “garage” laboratory scientists can also acquire this skill, by which individuals handle highly virulent microbes without adequate scientific training and security precautions.⁹ As early as 1994, researchers genetically sequenced the extinct and deadly smallpox virus, openly publishing the results.¹⁰ A researcher in Canada recently synthesized the extinct horsepox virus—a cousin of the smallpox virus—using commercially available genetic materials.¹¹ New genetic technologies make it possible to recreate or “enhance” pathogens, making them more transmissible, virulent, or both.¹²

Even more worrying is when pathogens evolve and adapt to form resistant strains. Pathogens that gain resistance to most, or all, antimicrobial medications could unravel the gains made by modern medicine, returning the world to a pre-antibiotic era. The prospect of losing once highly effective drugs goes well beyond emerging novel infections: antimicrobial resistance makes common hospital-acquired infections (e.g., staph infections) potentially lethal, and undermines progress against enduring infectious diseases such as HIV/AIDS, tuberculosis, and malaria—causing a drumbeat of suffering and death worldwide.¹³

⁷ *Timeline: How the Anthrax Terror Unfolded*, NPR (Feb. 15, 2011, 11:00 AM) <http://www.npr.org/2011/02/15/93170200/timeline-how-the-anthrax-terror-unfolded>.

⁸ Judith Miller, *Russian Scientist Dies in Ebola Accident at Former Weapons Lab*, N.Y. TIMES (May 25, 2004), <http://www.nytimes.com/2004/05/25/world/russian-scientist-dies-in-ebola-accident-at-former-weapons-lab.html>.

⁹ See Heidi Ledford, *Life Hackers*, 467 NATURE 650, 650 (2010).

¹⁰ See Robert F. Massung et al., *Analysis of the Complete Genome of Smallpox Variola Major Virus Strain Bangladesh-1975*, 201 VIROLOGY 215 (1994).

¹¹ Joel Achenbach & Lena H. Sun, *Scientists Synthesize Smallpox Cousin in Ominous Breakthrough*, WASH. POST (July 7, 2017), https://www.washingtonpost.com/news/speaking-of-science/wp/2017/07/07/scientists-synthesize-smallpox-cousin-in-ominous-breakthrough/?utm_term=.caa2b275e57a.

¹² See generally Jan van Aken & Edward Hammond, *Genetic Engineering and Biological Weapons*, 4 EMBO REP. S57 (2003) (providing a systematic overview of the potential impact of biotechnology on the development of biological weapons).

¹³ See *Antimicrobial Resistance*, WORLD HEALTH ORG., <http://www.who.int/mediacentre/factsheets/fs194/en/> (last updated Sept. 2016).

There is another truth that society must confront: dangerous pathogens will never be conquered. Despite awe-inspiring scientific advancement, pathogens are an enduring part of the ecosystem. While public health has achieved notable victories such as the eradication of smallpox and the near elimination of wild polio, microbes have had millennia to learn how to adapt and survive.¹⁴ Instead, “smart” public health does not pretend to be able to eliminate infectious disease threats, but rather ameliorates the risk through rapid detection and effective response before outbreaks spread widely within communities, countries, and regions.

Part I explains the rising global hazard posed by infectious diseases, while emphasizing the extent to which the international community continually underestimates and underinvests in pandemic planning and response—despite the clear lessons of animal and human history. It argues that the need to shore up preparedness is more acute than ever. The world faces looming threats, namely rising populations, urbanization, mass migration, rapid travel and trade, climate change, weak states, and ethno-nationalism. Through modest investments, the international community could ensure greater global health security. Yet, political resolve to work cooperatively and internationally to build a more secure world may be waning with the rise of ethno-nationalistic populism, which cuts against the most important value in global health: mutual solidarity. A nationalist “country first” ideology risks destabilizing global action against fast-moving epidemics.

Part II offers a blueprint for a more secure future—a strategy that keeps the world safe from pathogenic threats that are equal to, or exceed, any other hazard facing humankind. States must migrate from the current reactive approach to one of thoughtful preparedness. What would it take to create a decidedly more secure world? What steps must we put in place to bolster defenses against infectious diseases? What are the political, financial, and regulatory obstacles standing in the way?

This Article proposes a new paradigm for global preparedness, rejecting the current narrow silos of health assistance, such as disease-specific interventions or eradication. Global health security requires economic investment, strong international institutions, resilient national health systems, targeted research and development, and effective communication with affected

¹⁴ *Impact of Vaccines Universally Recommended for Children—United States, 1990-1998*, 48 MORBIDITY & MORTALITY WKLY. REP. 243, 246 (1999); see also R.G. Webster & D.J. Hulse, *Microbial Adaptation and Change: Avian Influenza*, 23 REVUE SCIENTIFIQUE ET TECHNIQUE [REV. SCI. & TECH.] 453 (2004) (Fr.) (discussing the ability of the influenza virus to genetically evolve).

populations. We place particular emphasis on reform of the World Health Organization (WHO or Organization) and emergency response within the U.N. system. The values that ought to guide future action include cooperative action, shared responsibility, equity and fairness, and global norms that are respected and enforced.

I. SHORT-SIGHTED POLICIES: UNDERESTIMATING THE THREAT

At the 2017 Munich Security Conference, Bill Gates observed, “Whether it occurs by a quirk of nature or at the hand of a terrorist, . . . a fast-moving airborne pathogen could kill more than 30 million people in less than a year. And they say there is a reasonable probability the world will experience such an outbreak in the next 10–15 years.”¹⁵ Few other events—not war, a devastating earthquake, or conventional terrorism—pose the same probability and severity of risk.

Yet, politicians careen between panic and complacency. Microbial threats garner scant political attention or resources until they hit a critical threshold.¹⁶ Financing global health preparedness represents only a fraction of the sums devoted to more conventional threats, such as chemical, nuclear, and even conventional threats from terrorism.¹⁷

This dynamic is illogical. Infectious diseases are not a new or unexpected threat, but have been a constant presence throughout human history, causing untold suffering and innumerable deaths. Ancient Egyptian mummies harbor traces of tuberculosis,¹⁸ while the fourteenth century Black Death took over 20 million lives in Europe alone—nearly a third of the continent’s population.¹⁹ The Influenza Pandemic of 1918 infected a third of the world’s people, with an estimated 50 million deaths.²⁰ During the Crimean War (1845–1856), approximately ten times as many British soldiers died from dysentery

¹⁵ Bill Gates, *BILL GATES: A New Kind of Terrorism Could Wipe Out 30 Million People in Less Than a Year—And We Are Not Prepared*, BUS. INSIDER (Feb. 18, 2017, 9:00 AM), <http://www.businessinsider.com/bill-gates-op-ed-bio-terrorism-epidemic-world-threat-2017-2>.

¹⁶ See Ed Yong, *The Deadly Panic-Neglect Cycle in Pandemic Funding*, ATLANTIC (Oct. 24, 2017), <https://www.theatlantic.com/science/archive/2017/10/panic-neglect-pandemic-funding/543696/>.

¹⁷ See THE NEGLECTED DIMENSION OF GLOBAL SECURITY, *supra* note 2, at 1.

¹⁸ Andreas G. Nerlich et al., *Molecular Evidence for Tuberculosis in an Ancient Egyptian Mummy*, 350 LANCET 1404 (1997).

¹⁹ *Black Death*, HIST., <http://www.history.com/topics/black-death> (last visited Feb. 15, 2018).

²⁰ Jeffery K. Taubenberger & David M. Morens, *1918 Influenza: The Mother of All Pandemics*, 12 EMERGING INFECTIOUS DISEASES 15, 15 (2006).

than from battle; during the Boer War (1899–1902), the ratio was five to one.²¹ Similarly, uncontrolled infectious diseases caused two-thirds of all deaths during the American Civil War—predominantly pneumonia, typhoid, diarrhea and dysentery, and malaria.²² While the above epidemics took place in the pre-antimicrobial era, they also occurred before air travel and globalization. And we now face the frightening prospect of gravitating to a pre-antimicrobial era.

Yet, our ability to contain disease has been transformed in many ways. For much of history, humans' primary response to infectious disease was reactive—trying in vain to separate infected persons from the population—whether through quarantines, *cordon sanitaire* (a guarded area preventing people or animals from entering or leaving), and travel or trade restrictions.²³ But with the advent of evidence-based public health and modern medicine, societies developed and invested in powerful ways to prevent, detect, respond to, and treat disease.

Now, public health is capable of sophisticated surveillance—meticulous tracking and monitoring of infections worldwide. A visit to the U.S. Centers for Disease Control and Prevention's (CDC) emergency operations center will show that real-time data is tracked on novel infections in every corner of the globe.²⁴ Similarly, WHO tracks around 3,000 signals a month; very few ever pose a threat—but some do, and will become mass killers.²⁵

Further, biomedical countermeasures have rendered certain dreaded pestilences largely relics of the past. WHO helped to eradicate smallpox in 1980, and is on the way to doing the same for polio.²⁶ WHO resolution WHA66.12 urges Member States to expand and implement the Global Plan to Combat Neglected Tropical Diseases, which could signal the end of neglected tropical diseases such as Dracunculiasis (guinea-worm), Leishmaniasis, and

²¹ Clive Bell & Maureen Lewis, *The Economic Implications of Epidemics Old and New* 5 (Ctr. for Glob. Dev., Working Paper No. 54, 2005).

²² Jeffrey S. Sartin, *Infectious Diseases During the Civil War: The Triumph of the "Third Army,"* 16 CLINICAL INFECTIOUS DISEASES 580, 582 (1993).

²³ See LAWRENCE O. GOSTIN & LINDSAY F. WILEY, PUBLIC HEALTH LAW: POWER, DUTY, RESTRAINT 416, 424 (3d ed. 2016).

²⁴ See *Emergency Operations Centers: CDC Emergency Operations Center (EOC)*, CTNS. FOR DISEASE CONTROL & PREVENTION, <https://www.cdc.gov/phpr/eoc.htm> (last updated Sept. 1, 2016).

²⁵ See *Health Emergencies Represent Some of the Greatest Risks to the Global Economy and Security*, WORLD HEALTH ORG. (July 8, 2017), <http://www.who.int/dg/speeches/2017/g20-summit/en/>.

²⁶ *Smallpox*, WORLD HEALTH ORG., <http://www.who.int/csr/disease/smallpox/en/> (last visited June 30, 2017); see *Poliomyelitis*, WORLD HEALTH ORG., <http://www.who.int/mediacentre/factsheets/fs114/en/> (last visited June 30, 2017).

Human African trypanosomiasis (sleeping sickness).²⁷ Through pharmaceuticals and vaccinations, dangerous diseases like yellow fever and malaria can be prevented and treated. Scientists quickly brought to market an effective vaccine for influenza A(H1N1) during the 2009 pandemic, and are now developing a Zika vaccine²⁸ in the aftermath of the 2016–2017 epidemic in the Americas.

Additionally, new therapeutic agents and technologies allow scientists to ever more rapidly identify pathogens' weaknesses and develop medical countermeasures. New methods, such as the gene editing system "Clustered Regularly Interspaced Short Palindromic Repeats" (CRISPR), hold great promise for developing vaccines and treatments, as do innovative methods of stemming disease vectors, such as reducing mosquito populations.²⁹

Despite these gains, the global hazard level may be greater than ever before. Since the 1980s, successive emerging infectious diseases have reminded the international community that infectious diseases continue to cause devastating harms. Indeed, the HIV/AIDS epidemic shattered the myth that infectious diseases were a concern of the past.³⁰ By the mid-1990s, HIV/AIDS was a leading cause of death in the United States in people aged twenty-five to forty-four,³¹ and was spreading out of control in sub-Saharan Africa.³² Since the beginning of the epidemic, more than 70 million people

²⁷ World Health Assembly, *Neglected Tropical Diseases*, at 2, WHA66.12 (May 27, 2013), http://www.who.int/neglected_diseases/mediacentre/WHA_66.12_Eng.pdf; WORLD HEALTH ORG., GLOBAL PLAN TO COMBAT NEGLECTED TROPICAL DISEASES 2008–2015 2–3 (2007) (urging Member States to expand and implement the Global Plan to Combat Neglected Tropical Diseases 2008–2015 which identifies priority diseases including those listed in the text above).

²⁸ See *Vaccines for Pandemic (H1N1) 2009*, WORLD HEALTH ORG., http://www.who.int/csr/disease/swineflu/frequently_asked_questions/vaccine_preparedness/en/ (last visited June 30, 2017); *Zika Virus Vaccines*, NAT'L INST. ALLERGY & INFECTIOUS DISEASES, <https://www.niaid.nih.gov/diseases-conditions/zika-vaccines> (last visited June 30, 2017).

²⁹ See Valentino M. Gantz et al., *Highly Efficient Cas9-Mediated Gene Drive for Population Modification of the Malaria Vector Mosquito Anopheles Stephensi*, 112 PROC. NAT'L. ACAD. SCI. USA E6736, E6742 (2015); Liang et al., *A CRISPR/Cas9 and Cre/Lox System-Based Express Vaccine Development Strategy Against Re-Emerging Pseudorabies Virus*, SCI. REP., Jan. 18, 2016, at 1, 1; see also Michael Le Page, *Boom in Human Gene Editing as 20 CRISPR Trials Gear Up*, NEW SCIENTIST (May 30, 2017), <https://www.newscientist.com/article/2133095-boom-in-human-gene-editing-as-20-crispr-trials-gear-up/>.

³⁰ Daniel M. Fox, *AIDS and the American Health Polity: The History and Prospects of a Crisis of Authority*, MILBANK Q., 2005, at 1, 2–3.

³¹ See *A Timeline of HIV and AIDS*, HIV.GOV, <https://www.hiv.gov/hiv-basics/overview/history/hiv-and-aids-timeline> (last visited June 30, 2017).

³² See SOULEYMANE MBOUP ET AL., *DISEASE AND MORTALITY IN SUB-SAHARAN AFRICA* (Dean T. Jamison et al. eds., 2d ed. 2006).

have been infected and about 35 million people have died.³³ Globally, 36.7 million people were living with HIV in 2016.³⁴

Recent disease outbreaks, such as SARS in 2003, H1N1 in 2009, and the ongoing Zika epidemic, have been less devastating in terms of scale, but continue to expose global under-preparedness.³⁵ The West African Ebola epidemic caused over 11,000 deaths³⁶ in three of the world's poorest countries.³⁷ Future threats loom that could break out at any time, such as the SARS-like coronavirus that erupted in Saudi Arabia and South Korea (MERS),³⁸ or highly pathogenic avian influenza A(H7N9), currently circulating in China.³⁹ Accordingly, biomedical developments must not lull the international community into a state of complacency, feeling—wrongly—invincible from pathogens.

A. Drivers of Disease

Patterns and trends of modern life counter momentous scientific advances. While globalization and economic development bring enormous social benefits, there are also hidden costs: hyper-crowded cities, rapid air travel, mass migrations, and intense human–animal interchange alter how pathogens emerge and colonize, thus amplifying the risk and severity of outbreaks. Conflict zones unravel health systems and spur exoduses. Expanding human populations into new geographic areas, climate change, deforestation, intensive

³³ *Fact Sheet—Latest Statistics on the Status of the AIDS Epidemic*, UNAIDS, <http://www.unaids.org/en/resources/fact-sheet> (last visited June 30, 2017).

³⁴ *Id.*

³⁵ Robert Roos, *CDC Estimate of Global H1N1 Pandemic Deaths: 284,000*, U. MINN. CTR. FOR INFECTIOUS DISEASE RES. & POL'Y (June 27, 2012), <http://www.cidrap.umn.edu/news-perspective/2012/06/cdc-estimate-global-h1n1-pandemic-deaths-284000> (noting that the CDC estimates 284,000 deaths attributed to 2009 A(H1N1)); *Summary of Probable SARS Cases with Onset of Illness from 1 November 2002 to 31 July 2003*, WORLD HEALTH ORG., http://www.who.int/csr/sars/country/table2004_04_21/en/ (last visited Feb. 15, 2018) (attributing 774 deaths to SARS between November 1, 2002 and July 31, 2003); Michael McCarthy, *Microcephaly Risk with Zika Infection Is 1-13% in First Trimester, Study Shows*, BMJ (May 31, 2016), <http://www.bmj.com/content/353/bmj.i3048>.

³⁶ *See Ebola Outbreak 2014-2015*, WORLD HEALTH ORG., <http://www.who.int/csr/disease/ebola/en/> (last visited June 30, 2017) (listing 11,310 deaths from Ebola from 2014–2015).

³⁷ *See U.N. List of Least Developed Countries*, UNITED NATIONS CONF. ON TRADE & DEV., <http://unctad.org/en/Pages/ALDC/Least%20Developed%20Countries/UN-list-of-Least-Developed-Countries.aspx> (last visited Nov. 15, 2017) (listing Guinea, Liberia, and Sierra Leone in the thirty-five least developed countries).

³⁸ *See Agence France-Presse, South Korea: Mers Virus Outbreak Is Over*, GUARDIAN (Jul. 27, 2015, 10:05 PM), <https://www.theguardian.com/world/2015/jul/28/south-korea-mers-virus-outbreak-is-over>.

³⁹ *Asian Lineage Avian Influenza A (H7N9) Virus*, CTRS. FOR DISEASE CONTROL & PREVENTION, <https://www.cdc.gov/flu/avianflu/h7n9-virus.htm> (last updated August 28, 2017).

farming, and food production shift the web of interactions between humans, animals, and the planet, as never before.

1. *Rising Populations, Megacities, and the Loss of Natural Habitats*

A major feature of human civilization is an ever-increasing population migrating en masse to cities. In 2007, for the first time in history, more of the world's population lived in urban areas than rural.⁴⁰ Africa and Asia are urbanizing faster than any region and are expected to be 56% and 64% urban, respectively, by 2050.⁴¹ By 2050, the world's population is estimated to rise to 9.7 billion.⁴²

In crowded cities, dense populations of humans and animals often live in close proximity, fueling transmission of novel viruses from animals to humans, and then human to human. Natural habitats are lost through deforestation and extractive industries, like logging or mining, to ensure that vast populations have food, potable water, and abundant energy.⁴³ Dams, irrigation, and deforestation increase vector-borne diseases such as malaria and Rift Valley fever.⁴⁴ Backyard chicken flocks, wet (live animal) markets, and intense animal husbandry of poultry, pigs, and cows create troubling risks of zoonotic leaps to humans, such as avian influenzas and foot-and-mouth disease.⁴⁵ As domesticated animals infect wild birds (and vice versa), microbes travel on avian transcontinental migration routes.⁴⁶ The threat from zoonotic diseases cannot be overstated, constituting the majority (approximately 75%) of new or emerging infectious diseases.⁴⁷

⁴⁰ See UNITED NATIONS DEP'T ECON. & SOC. AFF., WORLD URBANIZATION PROSPECTS 7 (2014); see also *World Population Projected to Reach 9.7 Billion by 2050*, UNITED NATIONS DEP'T ECON. & SOC. AFF. (July 29, 2015), <http://www.un.org/en/development/desa/news/population/2015-report.html>.

⁴¹ UNITED NATIONS DEP'T ECON. & SOC. AFF., *supra* note 40, at 1.

⁴² *World Population Projected to Reach 9.7 Billion by 2050*, *supra* note 40.

⁴³ *Deforestation*, WILDSCREEN ARKIVE, <http://www.arkive.org/c/deforestation> (last visited June 30, 2017).

⁴⁴ Samuel S. Myers et al., *Human Health Impacts of Ecosystem Alteration*, 110 PROC. NAT'L ACAD. SCI. USA 18753, 18754 (2013).

⁴⁵ See Jun Yuan et al., *Effect of Live Poultry Market Closure on Avian Influenza A(H7N9) Virus Activity in Guangzhou, China, 2014*, 21 EMERGING INFECTIOUS DISEASES 1784 (2015) (documenting the effect of live poultry market closures on A(H7N9) virus detection and viability in Guangzhou, China); Tjeerd Kimman et al., *Assessing and Controlling Health Risks from Animal Husbandry*, NJAS–WAGENINGEN J. LIFE SCI., July 3, 2013, at 7, 8.

⁴⁶ See Kurt D. Reed et al., *Birds, Migration and Emerging Zoonoses: West Nile Virus, Lyme Disease, Influenza A and Enteropathogens*, 1 CLINICAL MED. RES. 5, 8 (2003).

⁴⁷ See *Zoonotic Diseases*, CTRS. FOR DISEASE CONTROL & PREVENTION, <https://www.cdc.gov/onehealth/basics/zoonotic-diseases.html> (last visited June 30, 2017).

While there is no single cause of a zoonotic leap, these factors can combine to create a perfect storm for outbreaks, such as the Ebola epidemic in West Africa. The rise in Ebola outbreaks since 1994 is associated with drastic changes in forest ecosystems in tropical Africa; indeed, the combination of “extensive deforestation and human activities in the depth of the forests may have promoted direct or indirect contact between humans and a natural reservoir of the virus.”⁴⁸ The “index” case of the West African epidemic was most likely a young boy having eaten bush meat (like a fruit bat)—a pestilence literally emerging from the jungle.⁴⁹

2. *Rapid Travel and Trade*

Globalization propels travel and trade, allowing microbes to span the globe at greater speed. Through globalized trade, infected animals transmit zoonotic diseases to new reaches. In 2001, diseased animals spread foot-and-mouth disease from the United Kingdom to Ireland and the Netherlands,⁵⁰ resulting in millions in economic losses. Likewise, affordable air travel has exploded in recent decades, meaning that a pathogen can rapidly span the globe through an unsuspecting host.⁵¹ It is possible to reach any corner of the world within twenty-four hours,⁵² and passengers may harbor infectious diseases and transport disease vectors.⁵³ And the world is undergoing an historic migrant crisis as refugees and asylum-seekers flood across borders from conflict zones.

Consider this: from 2015 to 2018, the CDC recorded 5,372 travel-related cases of Zika, compared to 228 locally transmitted cases.⁵⁴ In May 2015, a man returning from travel in the Middle East introduced MERS to South

⁴⁸ See J.J. Muyembe-Tamfum et al., *Ebola Virus Outbreaks in Africa: Past and Present*, 79 ONDERSTEEPOORT J. VETERINARY RES., no. 2, 2013, at 1, 3 (2012).

⁴⁹ See Dennis Lynch, *Ebola Patient Zero: Emile Ouamouno of Guinea First to Contract Disease*, INT’L BUS. TIMES (Oct. 28, 2014, 10:27 AM), <http://www.ibtimes.com/ebola-patient-zero-emile-ouamouno-guinea-first-contract-disease-1714698>.

⁵⁰ Patrick J. O’Reilly et al., *Foot-and-Mouth Disease in Ireland; History, Diagnosis, Eradication, and Serosurveillance*, in REPORT OF THE SESSION OF THE RESEARCH GROUP OF THE STANDING TECHNICAL COMMITTEE OF THE EUROPEAN COMMISSION FOR THE CONTROL OF FOOT-AND-MOUTH DISEASE 46 (2002).

⁵¹ See LAWRENCE O. GOSTIN, GLOBAL HEALTH LAW 39 (2014) [hereinafter GLOBAL HEALTH LAW].

⁵² *Id.*

⁵³ Mary E. Wilson, *Travel and the Emergence of Infectious Diseases*, 1 EMERGING INFECTIOUS DISEASES 39, 41 (1995).

⁵⁴ *Zika Cases in the United States*, CTNS. FOR DISEASE CONTROL & PREVENTION, <https://www.cdc.gov/zika/reporting/case-counts.html> (last updated Feb. 9, 2018) (showing that these figures relate to U.S. states; U.S. territories recorded 37,165 symptomatic Zika virus cases, with only 147 of them in travelers returning from affected areas).

Korea, leading to three-dozen deaths.⁵⁵ In April 2009, Mexico and the United States reported the first confirmed cases of swine influenza (A/H1N1) to the WHO.⁵⁶ On June 11, Dr. Margaret Chan declared the start of the 2009 influenza pandemic, with seventy-four countries reporting 28,744 cases.⁵⁷ Nine weeks after the first reported case, every WHO region reported cases of H1N1.⁵⁸ Mass travel will continue to rapidly propel disease, underlying the need to enhance global health security.

3. *Climate Change*

Historic changes in climate and the environment can unleash pathogenic risks that could devastate the world. Increased rainfalls multiply mosquito-breeding sites, which is especially problematic in areas with inadequate sanitation systems.⁵⁹ Global warming expands the geographic range of disease vectors, notably mosquitoes, and enables them and the diseases they carry to spread to new regions, subjecting previously unexposed populations to infections, such as chikungunya, dengue, and Zika.⁶⁰ Warmer temperatures also affect the lifecycles of certain pathogens. Waterborne diseases, such as cholera, become harder to fight with rising temperatures and flooding.⁶¹ Yemen, which has been decimated by war and famine, is now facing the worst

⁵⁵ K.H. Kim et al., *Middle East Respiratory Syndrome Coronavirus (MERS-Cov) Outbreak in South Korea, 2015: Epidemiology, Characteristics and Public Health Implication*, J. HOSP. INFECTION, Feb. 2017 207, at 207.

⁵⁶ GLOBAL HEALTH LAW, *supra* note 51, at 39; *see Swine Influenza A (H1N1) Infection in Two Children—Southern California, March–April 2009*, 58 MORBIDITY & MORTALITY WKLY. REP. 400 (2009) (stating that two laboratory-confirmed cases were reported in California).

⁵⁷ *Influenza A(H1N1)—Update 47*, WORLD HEALTH ORG. (June 11, 2009), http://www.who.int/csr/don/2009_06_11/en/; Dr. Margaret Chan, Dir.-Gen., World Health Org., Statement to the Press (June 11, 2009), http://www.who.int/mediacentre/news/statements/2009/h1n1_pandemic_phase6_20090611/en/.

⁵⁸ GLOBAL HEALTH LAW, *supra* note 51, at 39. For a step-by-step progression of the pandemic, *see The 2009 H1N1 Pandemic: Summary Highlights, April 2009–April 2010*, CTRS. FOR DISEASE CONTROL & PREVENTION, <https://www.cdc.gov/h1n1flu/cdcresponse.htm> (last updated June 16, 2017).

⁵⁹ *See* Linda Marsa, *Hot Zone—A Warming Planet’s Rising Tide of Disaster*, DISCOVER (Feb. 4, 2011), <http://discovermagazine.com/2010/dec/04-hot-zone-warming-planets-rising-tide-of-disaster>.

⁶⁰ *See Climate Risk and Spread of Vector-Borne Diseases*, CLIMATE NEXUS, <http://climatenexus.org/learn/public-health-impacts/climate-change-and-vector-borne-diseases> (last visited June 30, 2017).

⁶¹ *See Climate Change and Human Health*, WORLD HEALTH ORG., <http://www.who.int/globalchange/summary/en/index4.html> (last visited June 30, 2017).

cholera outbreak in the world.⁶² U.N. relief workers brought cholera to Haiti in 2010, and the nation is still in the grips of an unrelenting epidemic.⁶³

Arctic thawing from climate change could release long-dormant bacteria and viruses, for which humans have no immunity, that have been trapped in ice and permafrost for millennia.⁶⁴ In August 2016, in the Yamal Peninsula within the Arctic Circle, a twelve-year-old boy died and twenty people were hospitalized after being infected by anthrax.⁶⁵ A historic heat wave that summer thawed a long-dead reindeer infected with anthrax bacteria.⁶⁶

4. *Fragile States and Violent Conflict*

Civil strife—such as the Syrian civil war, political conflict in Libya, or bombing in Yemen—weakens populations' defenses, while further fueling mass migrations. The world is experiencing the worst humanitarian crisis since World War II, with 20 million people facing starvation and famine in northeastern Nigeria, South Sudan, Somalia, and Yemen.⁶⁷ Where states collapse or cannot govern, basic public health protections are decimated, sanitation systems cease to operate, immunization programs are disrupted, and health systems erode.⁶⁸ As a result, diseases like wild polio can re-emerge in unstable countries, such as Afghanistan, Nigeria, Pakistan, and Syria.⁶⁹

Mass movement of families fleeing violence transports diseases across borders, while refugee camps congregate people closely in unhygienic

⁶² Sarah Toy, *Yemen Faces Worst Cholera Outbreak in the World, Health Authorities Say*, USA TODAY (June 28, 2017, 5:41 PM), <https://www.usatoday.com/story/news/2017/06/28/yemen-facing-worst-cholera-outbreak-world-health-authorities-say/436858001/>.

⁶³ See Rick Gladstone, *U.N. Brought Cholera to Haiti. Now It Is Fumbling Its Effort to Atone*, N.Y. TIMES (June 26, 2017), <https://www.nytimes.com/2017/06/26/world/americas/cholera-haiti-united-nations-peacekeepers-yemen.html>.

⁶⁴ See Jasmin Fox-Skelly, *There Are Diseases Hidden in Ice, and They Are Waking Up*, BBC (May 4, 2017), <http://www.bbc.com/earth/story/20170504-there-are-diseases-hidden-in-ice-and-they-are-waking-up>.

⁶⁵ *Id.*

⁶⁶ *Id.*

⁶⁷ Associated Press, *World Faces Worst Humanitarian Crisis Since 1945, Says UN Official*, GUARDIAN (Mar. 10, 2017, 9:58 PM), <https://www.theguardian.com/world/2017/mar/11/world-faces-worst-humanitarian-crisis-since-1945-says-un-official>.

⁶⁸ See ENRICO PAVIGNANI & SANDRO COLOMBO, WORLD HEALTH ORG., ANALYSING DISRUPTED HEALTH SECTORS: A MODULAR MANUAL 208 (2009); see also TONY VAUX & EMMA VISMAN, CTR. FOR INT'L CO-OPERATION & SEC., DEP'T OF PEACE STUDIES, UNIV. OF BRADFORD, SERVICE DELIVERY IN COUNTRIES EMERGING FROM CONFLICT 67–73 (2005) (discussing how conflict negatively impacted the Ugandan health system).

⁶⁹ See Luma Akil & H. Anwar Ahmad, *The Recent Outbreaks and Reemergence of Poliovirus in War and Conflict-Affected Areas*, 49 INT'L J. INFECTIOUS DISEASES 40, 41 (2016).

conditions.⁷⁰ As vulnerable mass populations flee areas of conflict, drought, or flood, they may bring microbes with them.⁷¹ As temperatures change, disturbances in food production can create famines, forcing people to flee in search of food.⁷² Hungry people may destroy forests and other natural habitats to grow their crops.⁷³

The West African Ebola epidemic revealed another truth—the public health gains discussed above are inequitably distributed. Global inequalities of wealth and scientific resources critically undermine epidemic preparedness. Despite improvements, around 400 million people lack access to one of the following: clean water, adequate sanitation, or resilient health systems.⁷⁴ Even if vaccines or medicines are available in high-income countries, low- and middle-income states often lack access.⁷⁵ While lower-income countries bear disproportionate risks, every country is vulnerable as infectious diseases rapidly spread from country to country, region to region, and worldwide. All nations—whether rich or poor—face common vulnerabilities.

5. *Antimicrobial Resistance*

Many scientists view antimicrobial resistance (AMR) and antibacterial resistance (ABR) as some of the most significant threats facing the world.⁷⁶ Once treatable infections (e.g., hospital-acquired *Staphylococcus aureus*, malaria, and tuberculosis) become resistant to all known treatments, treatments will harken back to the days before the advent of antibiotic and antiviral medications.⁷⁷ Today, the world's most disadvantaged people face the highest burden from hard-to-treat infections. A couple hundred thousand people die

⁷⁰ See S.J. Cutler, *Refugee Crisis and Re-emergence of Forgotten Infections in Europe*, 22 CLINICAL MICROBIOLOGY INFECTION 8–9 (2015); see also Christos Louis, *Médecins Sans Frontières and the Refugee Crisis in Greece: An Interview with Dr. Apostolos Veizis*, 110 PATHOGENS GLOBAL HEALTH 219–22 (2016).

⁷¹ See *Climate Change and Human Health*, WORLD HEALTH ORG., <http://www.who.int/globalchange/summary/en/index4.html> (last visited Nov. 15, 2017); *Humanitarian Health Action: Flooding and Communicable Diseases Fact Sheet*, WORLD HEALTH ORG., http://www.who.int/hac/techguidance/ems/flood_cds/en/ (last visited June 30, 2017);.

⁷² See Somini Sengupta, *Heat, Hunger and War Force Africans onto a "Road on Fire,"* N.Y. TIMES (Dec. 15, 2016), <https://www.nytimes.com/interactive/2016/12/15/world/africa/agadez-climate-change.html>.

⁷³ See LAUREN BENNETT, CLIMATE INST., *DEFORESTATION AND CLIMATE CHANGE I* (2017).

⁷⁴ See *New Report Shows that 400 Million Do Not Have Access to Essential Health Services*, WORLD HEALTH ORG. (June 12, 2015), <http://www.who.int/mediacentre/news/releases/2015/uhc-report/en/>.

⁷⁵ See BERYL LEACH ET AL., *PRESCRIPTION FOR HEALTHY DEVELOPMENT: INCREASING ACCESS TO MEDICINES* 24 (2005).

⁷⁶ See generally *ANTIMICROBIAL RESISTANCE: GLOBAL REPORT ON SURVEILLANCE 2014*, WORLD HEALTH ORGANIZATION [WHO] (2014), <http://www.who.int/drugresistance/documents/surveillancecitereport/en/>.

⁷⁷ See *At UN, Global Leaders Commit to Act on Antimicrobial Resistance*, U.N. NEWS (Sept. 21, 2016), www.un.org/apps/news/story.asp?NewsID=55011#.V-QoiRNVhBc.

every year of drug-resistant tuberculosis,⁷⁸ which is perhaps humankind's oldest microbial nemesis. By 2050, the regions most at risk for drug-resistant infections will include sub-Saharan Africa, South Asia, and the Indian subcontinent; and globally, deaths from AMR could climb to 10 million every year.⁷⁹ AMR plagues even the richest countries and world-class health facilities, as seen in the 2011 outbreak of multi-drug resistant *Klebsiella pneumoniae* bacteria at the National Institutes of Health, causing six deaths.⁸⁰

But the proliferation of AMR and ABR organisms is avoidable; it has arisen as a result of discrete and destructive ways in which we have developed, or not, our health systems and farms—prophylactic antibiotic use in farmed animals, indiscriminate medical prescribing, and poor hospital infection control.⁸¹ The vast global networks in the manufacture and sale of substandard or falsified medications pose another major risk to the integrity and effectiveness of antimicrobials.⁸² Global health experts estimate that the illicit sale of substandard and falsified medicines is as great, if not much greater, than trafficking of illicit drugs such as cocaine.⁸³ Falsified and substandard medications often contain sub-therapeutic doses of a drug's active ingredient.⁸⁴ When patients buy these drugs unknowingly in a street market or on the internet, ineffective dosages enable microbes to become resistant.⁸⁵ In short, it is the behavior of human beings that enable superbugs to thrive.

⁷⁸ See REVIEW ON ANTIMICROBIAL RESISTANCE, TACKLING DRUG-RESISTANT INFECTIONS: FINAL REPORT AND RECOMMENDATIONS 10 (2016).

⁷⁹ See REVIEW ON ANTIMICROBIAL RESISTANCE, ANTIMICROBIAL RESISTANCE: TACKLING A CRISIS FOR THE HEALTH AND WEALTH OF NATIONS 5, 9 (2014); see Fergus Walsh, *Superbugs to Kill "More Than Cancer" by 2050*, BBC NEWS (Dec. 11, 2014), <http://www.bbc.com/news/health-30416844>.

⁸⁰ See NIH Uses Genome Sequencing to Help Quell Bacterial Outbreak in Clinical Center, NAT'L INSTS. HEALTH (Aug. 22, 2012), <https://www.nih.gov/news-events/news-releases/nih-uses-genome-sequencing-help-quell-bacterial-outbreak-clinical-center>.

⁸¹ James A. Ayukekbong et al., *The Threat of Antimicrobial Resistance in Developing Countries: Causes and Control Strategies*, ANTIMICROBIAL RESISTANCE & INFECTION CONTROL 2 (May 15, 2017), <https://aricjournal.biomedcentral.com/track/pdf/10.1186/s13756-017-0208-x?site=aricjournal.biomedcentral.com>.

⁸² See *id.*; see also *Antibiotic Resistance from the Farm to the Table*, CTNS. FOR DISEASE CONTROL & PREVENTION, <https://www.cdc.gov/foodsafety/challenges/from-farm-to-table.html> (last visited March 1, 2017).

⁸³ See COUNTERING THE PROBLEM OF FALSIFIED AND SUBSTANDARD DRUGS 72–73 (Gillian J. Buckley & Lawrence O. Gostin eds., 2013).

⁸⁴ *Id.* at 3.

⁸⁵ See THE EVOLVING THREAT OF ANTIMICROBIAL RESISTANCE: OPTIONS FOR ACTION, WORLD HEALTH ORGANIZATION [WHO] 39 (2012).

6. *Ethnocentric Nationalistic Politics*

It is axiomatic that infectious diseases do not respect borders. Global health preparedness is not a national project, but a global responsibility. Yet, populist politicians rail against the very values needed for global health preparedness: international cooperation, strong global institutions, and mutual solidarity.⁸⁶ Populist leaders are more likely to be inward-looking and less likely to provide robust technical and financial assistance to poorer countries. Instead, hyper-nationalists erect walls, literally and figuratively, putting country “first,” ahead of the world’s population and the planet we inhabit. They renege on promises of humanitarian assistance⁸⁷ and global climate change solidarity; they undermine international organizations; and they blame “the other.”

The United States is experiencing a pronounced shift to ethno-nationalism. In 2003, President George W. Bush created the President’s Emergency Program for AIDS Relief (PEPFAR), the largest global health program for a single disease in history.⁸⁸ In 2017, President Donald Trump proposed to cut funding for vital public health agencies, such as the CDC⁸⁹ and the National Institutes of Health, while eliminating the Fogarty International Center, which builds health capacities in low- and middle-income countries.⁹⁰

These pivots away from mutual solidarity are dangerous for global health. Cooperative action, moreover, is in every country’s national interest. Health security in high-income states becomes imperiled when poorer countries lack basic health infrastructures. No legal or physical barrier can impede the spread of a microbe so minute that it cannot be seen. Fighting a pathogenic threat where it arises is far less expensive and far more effective than waiting until the pestilence reaches our shores.

⁸⁶ See Miles Kahler, *President Trump and the Future of Global Governance*, COUNCIL ON FOREIGN REL. (Jan. 31, 2017), <https://www.cfr.org/blog-post/president-trump-and-future-global-governance>.

⁸⁷ See Lawrence O. Gostin, *Best Evidence Aside: Why Trump’s Executive Order Makes America Less Healthy*, 47 HASTINGS CTR. REP., Mar.–Apr. 2017, at 5, 5–6.

⁸⁸ See Myra Sessions, *Overview of the President’s Emergency Plan for AIDS Relief (PEPFAR)*, CTR. FOR GLOB. DEV., <https://www.cgdev.org/doc/HIVAIDSMonitor/OverviewPEPFAR.pdf> (last visited Nov. 17, 2017); see also *About Us*, U.S. PRESIDENT’S EMERGENCY PLAN FOR AIDS RELIEF, <https://www.pepfar.gov/about/270968.htm> (last visited July 11, 2017).

⁸⁹ Press Release, U.S. House of Representatives Comm. on Appropriations, Appropriations Committee Releases the Fiscal Year 2018 Labor, Health and Human Services, Education Funding Bill, (July 12, 2017), <https://appropriations.house.gov/news/documentsingle.aspx?DocumentID=394995>.

⁹⁰ See Lawrence Gostin, *JAMA Forum: The Fogarty International Center, a National Treasure for Global Health*, NEWS@JAMA (Apr. 27, 2017), <https://newsatjama.jama.com/2017/04/27/jama-forum-the-fogarty-international-center-a-national-treasure-for-global-health/>.

B. *Underinvesting in Preparedness: The Economic Costs of Epidemics*

Despite wealthy countries' reluctance to invest in pandemic preparedness, infectious diseases are not only a matter of public health, but also a serious economic concern. The National Academy of Sciences projects that novel infectious diseases will cost the global economy \$60 billion per year, amounting to \$6 trillion per century.⁹¹ What makes these data chilling is that they are not estimated, but rather *expected* minimum costs that are virtually certain to unfold given historical events. Further, these expected costs are *direct* costs only;⁹² we argue that they miss the vast impact of epidemics on global trade, travel, tourism, and worker productivity, which are harder to accurately estimate; and the toll on families and communities that can unravel social support networks.

Other economic models predict much higher costs. The World Bank estimates potential losses from a severe influenza pandemic—a once-or-twice-per-century event—at \$3 trillion in global direct and indirect losses or 4.8% of global GDP.⁹³ The National Bureau of Economic Research estimates a figure of \$490 billion that includes mortality costs.⁹⁴ A further approximation suggests that the added annual global cost of moderate-severe to severe pandemics is roughly \$570 billion, or 0.7% of global income.⁹⁵ In the United States alone, the CDC reports that international trade with countries that are at high risk of outbreaks (referred to as “first and second order” threat countries) represents \$308 billion annually, accounting for 1.6 million U.S. jobs.⁹⁶ Major infectious disease events would imperil all this economic activity, and probably more.

Although economic modeling is inexact, economic losses are steeped in reality. Disease outbreaks have caused massive economic disruption. The 2003

⁹¹ See Anas El Turabi & Philip Saynisch, *Modeling the Economic Threat of Pandemics*, in THE NEGLECTED DIMENSION OF GLOBAL SECURITY, *supra* note 2, at 109, 111. Please note, all dollar figures refer to U.S. dollars unless otherwise specified.

⁹² *Id.* at 113.

⁹³ OLGA JONAS, WORLD BANK, PANDEMIC RISK 2 (2013), http://www.worldbank.org/content/dam/Worldbank/document/HDN/Health/WDR14_bp_Pandemic_Risk_Jonas.pdf; see *Pandemic Preparedness and Health Systems Strengthening*, WORLD BANK, <http://www.worldbank.org/en/topic/pandemics> (last visited Feb. 11, 2018).

⁹⁴ See Victoria Y. Fan et al., *The Inclusive Cost of Pandemic Influenza Risk*, (Nat'l Bureau of Econ. Res., Working Paper No. 22137, 2016), <http://www.nber.org/papers/w22137>.

⁹⁵ *See id.*

⁹⁶ Cynthia H. Cassell et al., *Relevance of Global Health Security to the U.S. Export Economy*, 16 HEALTH SECURITY 563, 567 (2017).

SARS outbreak cost East Asia \$40 billion;⁹⁷ annual seasonal influenza costs the United States \$87 billion;⁹⁸ and Ebola caused Guinea, Liberia, and Sierra Leone at least \$2.2 billion in lost economic growth.⁹⁹ Global losses due to the six major zoonotic disease outbreaks from 1997 through 2009 cost on average \$6.7 billion per year.¹⁰⁰

At the societal level, catastrophic pandemics like HIV/AIDS dampen productivity by removing workers from the workforce and increasing absenteeism.¹⁰¹ Children are robbed of their parents, prompting knock-on effects on economic growth.¹⁰² Often their parents' condition means they cannot access education,¹⁰³ leading to worse job prospects. Economic activities such as farming are disrupted, affecting workers and food security; access to vital services like health care is impacted, meaning that chronic conditions go untreated and increase in severity.¹⁰⁴ In fact, illnesses and deaths from preventable causes (e.g., cardiovascular disease, diabetes, and complications of child birth) may have affected more people than Ebola itself during the epidemic in West Africa, as people avoided health facilities, while some health centers closed.¹⁰⁵

The costs are amplified by fear that prompts individuals, companies, and governments to overreact and alter their behavior.¹⁰⁶ As Tedros Adhanom

⁹⁷ Jong-Wha Lee & Warwick J. McKibbin, *Estimating the Global Economic Costs of SARS, in* LEARNING FROM SARS: PREPARING FOR THE NEXT DISEASE OUTBREAK—WORKSHOP SUMMARY 92, 103 (Knobler et al. eds., 2004).

⁹⁸ Noelle-Angelique Molinari et al., *The Annual Impact of Seasonal Influenza in the US: Measuring Disease Burden and Costs*, 25 VACCINE 5086, 5092 (Oct. 2007).

⁹⁹ See *World Bank Group Ebola Response Fact Sheet*, WORLD BANK (Apr. 6, 2016), <http://www.worldbank.org/en/topic/health/brief/world-bank-group-ebola-fact-sheet>. See generally JONAS, *supra* note 93.

¹⁰⁰ See WORLD BANK, 2 PEOPLE, PATHOGENS AND OUR PLANET: THE ECONOMICS OF ONE HEALTH xii (2012).

¹⁰¹ Kazeem O. Okosun et al., *Analysis of Recruitment and Industrial Human Resources Management for Optimal Productivity in the Presence of the HIV/AIDS Epidemic*, 39 J. BIOLOGICAL PHYSICS 99–121 (2013); see also Matthew P. Fox et al., *The Impact of HIV/AIDS on Labour Productivity in Kenya*, 9 TROPICAL MED. & INT'L HEALTH 318–24 (2004); Lawrence O. Gostin, *Meeting Basic Survival Needs of the World's Least Healthy People: Toward a Framework Convention on Global Health*, 96 GEO. L.J. 331 (2008).

¹⁰² See *Epidemics and Economics*, ECONOMIST (Apr. 10, 2003), <http://www.economist.com/node/1698814>.

¹⁰³ *Id.*

¹⁰⁴ See *Ebola and Other Disease Outbreaks: Implications for Economic Growth and Trade*, U.S. AGENCY INT'L DEV. (July 2015), https://www.msh.org/sites/msh.org/files/agoa_brief_final.pdf.

¹⁰⁵ See Kim J. Brolin Ribacke et al., *Effects of the West Africa Ebola Virus Disease on Health-Care Utilization—A Systematic Review*, 4 FRONTIERS PUB. HEALTH, Oct. 10, 2016, at 1, 2.

¹⁰⁶ See Sulzhan Bali et al., *Long Shadow of Fear in an Epidemic: Fearonomic Effects of Ebola on the Private Sector in Nigeria*, BMJ GLOBAL HEALTH 1, 11 (2016).

Ghebreyesus, the current WHO Director General, recently put it—when an outbreak hits, there are two epidemics—“one caused by the virus, and the other one caused by fear.”¹⁰⁷ For instance, while SARS claimed fewer than 800 lives, its economic costs are estimated at \$40 billion.¹⁰⁸ Tourism often suffers as vacationers seek to avert ill health by traveling elsewhere. During the SARS outbreak, hoteliers in Hong Kong experienced record-low bookings, driven by fear of contracting the disease.¹⁰⁹ The MERS outbreak in South Korea led to a 20% fall in tourism in 2015,¹¹⁰ while in Sierra Leone, hotel occupancy plunged from 70% to 13% in one year during the Ebola outbreak.¹¹¹

Fear of disease also leads consumers to avoid retail stores, sports and music events, and cinemas. Although trade often moves online, outbreaks primarily affect local, small sellers.¹¹² Beyond human behavior are the actions of governments themselves—along with the private sector—that overreact through quarantines and travel bans.¹¹³ Even rational government action can take an economic toll; the mass culling of chickens to prevent the spread of avian influenza deprives individuals of private property, and farmers may be under-compensated for lost livestock.¹¹⁴

Overall, we see an all-too familiar pattern repeated in historical cycles: under-preparedness in times of calm, juxtaposed with frenetic activity and calls for action in times of crisis, followed by a return to complacency. Albert Camus described this phenomenon in fiction mirroring reality:

Everybody knows that pestilences have a way of recurring in the world; yet somehow we find it hard to believe in ones that crash down on our heads from a blue sky. There have been as many

¹⁰⁷ *Health Emergencies Represent Some of the Greatest Risks to the Global Economy and Security*, *supra* note 25.

¹⁰⁸ Robert F. Breiman et al., *Role of China in the Quest to Define and Control SARS*, in *LEARNING FROM SARS: PREPARING FOR THE NEXT DISEASE OUTBREAK—WORKSHOP SUMMARY*, *supra* note 97, at 56, 57; *LEARNING FROM SARS: PREPARING FOR THE NEXT DISEASE OUTBREAK—WORKSHOP SUMMARY*, *supra* note 97, at 12.

¹⁰⁹ See Grace C.L. Chien & Rob Law, *The Impact of the Severe Acute Respiratory Syndrome on Hotels*, 22 *INT'L J. HOSPITALITY MGMT.* 327–32 (2003).

¹¹⁰ See Iain Marlow, *What's the Economic Impact of the MERS Outbreak in South Korea?*, *GLOBE & MAIL* (June 18, 2015), <https://www.theglobeandmail.com/news/british-columbia/whats-the-economic-impact-of-the-mers-outbreak-in-south-korea/article25031999/>.

¹¹¹ See *Ebola and Other Disease Outbreaks*, *supra* note 104.

¹¹² See Bali et al., *supra* note 106.

¹¹³ See *infra* Section II.C.5.

¹¹⁴ See J.A. Backer et al., *Controlling Highly Pathogenic Avian Influenza Outbreaks: An Epidemiological and Economic Model Analysis*, 121 *PREVENTATIVE VETERINARY MED.* 142–50 (2015).

plagues as wars in history; yet always plagues and wars take people equally by surprise.¹¹⁵

II. A NEW PARADIGM FOR GLOBAL HEALTH SECURITY

Having identified the major social, economic, and political challenges impeding preparedness, we now turn to a blueprint for a more secure world. First, we examine the economic investment needed to create a more secure world.

A. *The Peace Dividend*

In response to the vast direct and indirect economic costs of major outbreaks, virtually every expert in global health security has urged sustained investments in health systems, research and development, and robust international institutions.¹¹⁶ This is not only economically sound, but also promises economic benefits. Prevention is far more efficient than response. The World Bank estimates that investing in pandemic preparedness for zoonotic diseases alone could yield between \$11.6 and \$26.6 billion in global benefit, depending on the severity of the pandemic.¹¹⁷ Further, countries with reduced burdens of devastating diseases, such as HIV/AIDS, tuberculosis, and malaria, have more robust economic growth—a more productive workforce, enhanced consumer spending, and fewer demands on health and social services.¹¹⁸

What level of economic investment is required to ramp up preparedness? In 2012, the World Bank estimated that \$1.9 to \$3.4 billion was required to upgrade zoonotic disease prevention and control systems in developing countries to meet World Organisation for Animal Health (OIE) and WHO standards.¹¹⁹ In 2016, the Commission on a Global Health Risk Framework proposed a peace or security dividend—an incremental additional investment of \$4.5 billion per year for health systems, emergency response, and research;

¹¹⁵ ALBERT CAMUS, *THE PLAGUE* 34 (Stuart Gilbert trans., Alfred A. Knopf, 1957) (1948).

¹¹⁶ See, e.g., Phyllida Travis et al., *Overcoming Health-Systems Constraints to Achieve the Millennium Development Goals*, 364 *LANCET* 900–06 (2004); Dongbao Yu et al., *Investment in HIV/AIDS Programs: Does It Help Strengthen Health Systems in Developing Countries?*, *GLOBALIZATION & HEALTH* 8 (Sept. 16, 2008), <https://globalizationandhealth.biomedcentral.com/articles/10.1186/1744-8603-4-8>.

¹¹⁷ WORLD BANK, *supra* note 100, at 23.

¹¹⁸ See John Luke Gallup & Jeffrey D. Sachs, *The Economic Burden of Malaria*, in *THE INTOLERABLE BURDEN OF MALARIA* 85, 94 (Joel G. Breman et al. eds., 2001).

¹¹⁹ See WORLD BANK, *supra* note 100, at xi.

that is, just sixty-five cents per person per annum would buy the world far greater security.¹²⁰

Table I: “Annual Expected Rate of Return on Investments in Prevention”¹²¹

		Disease Outbreaks Prevented			
		Mild Pandemic		Severe Pandemic	
		Low Preventive Effort	High Preventive Effort	Low Preventive Effort	High Preventive Effort
Reduction in expected disease outbreak impact	20%	31%	14%	49%	25%
	50%	65%	44%	88%	57%
	100%	97%	71%	123%	86%

More broadly, the WHO Commission on Macroeconomics and Health determined that high-income countries should allocate 0.1% of gross national income (GNI) to official development assistance (ODA) for health.¹²² Yet, in 2009, ODA for health from wealthier countries was 0.048% of GNI, half of what is required by this measure.¹²³ The majority of this spending was not for strengthening health systems, but rather for targeting specific diseases such as AIDS, tuberculosis, malaria, and polio. A small fraction of global health assistance goes to developing capabilities for surveillance and rapid response to emerging diseases.¹²⁴

The same is true of in-country spending. In April 2001—in Abuja, Nigeria—African Union countries pledged to allocate at least 15% of their annual budget to the health sector and urged donor countries to scale up support.¹²⁵ A decade later, only two countries have reached this target, and seven countries actually decreased their health sector expenditures.¹²⁶ Current donor spending varies dramatically.¹²⁷

¹²⁰ THE NEGLECTED DIMENSION OF GLOBAL SECURITY, *supra* note 2, at 82.

¹²¹ WORLD BANK, *supra* note 100, at 23.

¹²² See COMMISSION ON MACROECONOMICS & HEALTH, MACROECONOMICS AND HEALTH: INVESTING IN HEALTH FOR ECONOMIC DEVELOPMENT 12 (2001).

¹²³ See OECD, STATISTICS ON RESOURCE FLOWS TO DEVELOPING COUNTRIES 2 (2011).

¹²⁴ OECD, MEASURING AID 50 YEARS OF DAC STATISTICS – 1961–2011 13 (2011).

¹²⁵ See THE ABUJA DECLARATION: TEN YEARS ON, WORLD HEALTH ORGANIZATION [WHO] 1–2 (2011).

¹²⁶ *Id.*

¹²⁷ *Id.*

If preparedness offers such good economic yields and the devastation caused is on par with, or far exceeds, other disasters—chemical, nuclear, or natural—why do countries fail to ensure health security? The West African Ebola outbreak will certainly yield a new tranche in preparedness, particularly WHO reform. In 2014, the Gates Foundation committed more than \$500 million toward research and development “to stay ahead of emerging disease threats.”¹²⁸ Yet, previous outbreaks such as SARS and H1N1 also led to similar calls that were never sustained.¹²⁹ Why is it that countries fail to meet financing targets and respect international norms? The World Bank suggests the answers include complexity of the task, the limited perceived returns, and competing demands as key determinants.¹³⁰ Political leaders seek demonstrable short term “wins”—sustainable systems for shoring up defenses in the long term seems outside their political attention span. Instead, governments need to understand and act on the clear economic and human dividends of investing in preparedness.

B. Strong International Institutions with National Commitment to Global Norms

Leadership from well-functioning global institutions forms the apex of global health security. Infectious diseases rapidly transcend borders, requiring strong international institutions to set norms and coordinate action.¹³¹ International institutions can develop the global standards, offer the technical assistance, and mobilize the resources to prevent, detect, and respond to outbreaks. U.N. institutions in particular have the legitimacy to promote cross-border cooperation, information sharing, and compliance with international rules. Investing in institutions will produce dividends for population health and human security.

Yet, trust in international institutions crumbled in the aftermath of the West African Ebola epidemic. U.N. institutions proved to be utterly underprepared and underfunded, unable to mount a swift response.¹³² The leading global

¹²⁸ See *Gates Foundation Commits More than \$500 Million to Tackle the Burden of Infectious Disease in Developing Countries*, BILL & MELINDA GATES FOUND. (Nov. 2, 2014), <http://www.gatesfoundation.org/Media-Center/Press-Releases/2014/11/ASTMH-Address>.

¹²⁹ See Harvey V. Fineberg, *Pandemic Preparedness and Response—Lessons from the H1N1 Influenza of 2009*, 370 NEW ENG. J. MED 1335, 1335 (2014).

¹³⁰ See INT’L WORKING GRP. ON FIN. PREPAREDNESS, *supra* note 3, at 10–11.

¹³¹ David P. Fidler, *Epic Failure of Ebola and Global Health Security*, 21 BROWN J. WORLD AFF. 180, 181–82 (2015).

¹³² See generally Lawrence O. Gostin et al., *Toward a Common Secure Future: Four Global Commissions in the Wake of Ebola*, 13 PLOS MED., May 19, 2016, at 1.

health institution—WHO—exhibited marked dysfunction as headquarters in Geneva could not coordinate effectively with WHO’s Regional Office for Africa (AFRO) and country offices.¹³³ Member States’ neglect of global preparedness and WHO’s weaknesses were starkly highlighted with the deep structural problems underlying the Organization becoming center stage. The WHO Director-General at the time, Margaret Chan,¹³⁴ appeared unresponsive to desperate calls for help from the region, waiting more than four months after international spread to declare a Public Health Emergency of International Concern, even after Médecins Sans Frontières (MSF) implored her to act.¹³⁵

The West African Ebola epidemic spurred major WHO reforms, but it is too early to know whether they will be adequate. Thus far, dynamic new structures are in place, such as an Emergency Response Program and a contingency emergency fund (discussed below), but both remain badly underfunded.¹³⁶ Meanwhile, the world continues to spring from complacency to panic without building the long-term sustainability needed for a more secure world. In short, we remain vulnerable to the next pandemic.

Instead, robust institutions require leadership, transparency, inclusive participation (civil society and stakeholder engagement), and accountability—abiding by the rule of law.¹³⁷ Institutions, moreover, must lead by setting authoritative norms, building robust health system capacities, and influencing outcomes. Institutions that govern well will be more politically persuasive and gain international legitimacy and public trust. Good governance will preserve human rights, advance equity, curtail corruption, and ensure transparency and accountability. Member States, moreover, must act as stakeholders invested in the success of global institutions, while institutional leaders should act boldly and competently. Although these benchmarks of good governance are applicable to all institutions, we focus on WHO, along with the World Bank, which launched new initiatives after the West African Ebola outbreak.

¹³³ See generally Lawrence O. Gostin & Eric A. Friedman, *A Retrospective and Prospective Analysis of the West African Ebola Virus Disease Epidemic: Robust National Health Systems at the Foundation and an Empowered WHO at the Apex*, 385 LANCET 1902 (2015).

¹³⁴ Former Director-General: Dr. Margaret Chan, WORLD HEALTH ORG., <http://www.who.int/dg/chan/en/> (last visited Nov. 17, 2017).

¹³⁵ Gostin & Friedman, *supra* note 133, at 1902.

¹³⁶ See *infra* Section II.D.1.

¹³⁷ See generally CHELSEA CLINTON & DEVI SRIDHAR, GOVERNING GLOBAL HEALTH: WHO RUNS THE WORLD AND WHY? (2017).

C. Enhanced Security Through the World Health Organization

No other institution has the legitimacy, partnerships, ties with health ministries, or normative authority that WHO has. Established as the first U.N. specialized agency in 1948, its 194 Member States each have an equal vote in the World Health Assembly.¹³⁸ Its constitution mandates WHO “to act as the directing and co-ordinating authority on international health work,”¹³⁹ working collaboratively with U.N. organs, specialized agencies, and governments. The constitution directs WHO “to furnish appropriate technical assistance and, in emergencies, necessary aid.”¹⁴⁰ In light of this unique mandate, WHO leads the U.N. Global Health Cluster, which coordinates forty-eight Health Cluster partners (U.N. and non-U.N.) at the global level and over 300 country partners.¹⁴¹

Despite its powerful mandate, the record of WHO in leading the global response to infectious diseases has been mixed. Its signal achievement was to eradicate smallpox in 1980,¹⁴² but it has not had as much success with other eradication campaigns, such as malaria.¹⁴³ Over time, the position of the Organization as the guardian of global public health began to erode, sidelined in fundamental ways by the World Bank, UNAIDS, the Global Fund, and large donors such as the Gates Foundation. By the turn of the century, high-income states lost confidence in the Organization.¹⁴⁴ Marred by accusations of corruption and cronyism, States steadfastly refused to increase the WHO budget, and mostly earmarked funds for their own preferred projects through public-private partnerships that were viewed as more nimble and efficient, such as the Global Fund and the GAVI Alliance.¹⁴⁵

In the wake of the West African Ebola outbreak, many of WHO’s most important functions are being monopolized by new public-private partnerships. For instance, WHO should set priorities for vaccine development and mobilization of resources for research and development. But even this vital

¹³⁸ THE GLOBAL GUARDIAN OF PUBLIC HEALTH, WORLD HEALTH ORGANIZATION [WHO] (2016).

¹³⁹ See Constitution of the World Health Organization art. 2, July 22, 1946, 14 U.N.T.S. 185.

¹⁴⁰ See *id.*

¹⁴¹ See Secretariat, World Health Org. [WHO], 70th World Health Assembly, *Health Workforce Coordination in Emergencies with Health Consequences*, at 4, WHO Doc. A70/11 (Apr. 13, 2017), http://apps.who.int/gb/ebwha/pdf_files/WHA70/A70_11-en.pdf.

¹⁴² See World Health Org. Res. 33.3, WHA 33/1980/REC/1, at 1 (May 8, 1980).

¹⁴³ See José A. Nájera et al., *Some Lessons for the Future from the Global Malaria Eradication Programme (1955–1969)*, 8 PLOS MED., Jan. 2011, at 1, 5.

¹⁴⁴ GLOBAL HEALTH LAW, *supra* note 51, at 130.

¹⁴⁵ See *id.* at 129–73.

task has shifted to the Coalition for Epidemic Preparedness Innovations (CEPI).¹⁴⁶

Post-Ebola Global Commissions—by the U.N. Secretary-General, WHO, the National Academy of Sciences, and Harvard University/London School of Hygiene and Tropical Medicine—provide fresh impetus to reform and revitalize WHO’s constitutional mandate.¹⁴⁷ While WHO has begun the reform process, many of its deep-seated structural problems remain: (1) unsustainable funding, (2) dysfunction between headquarters and regional offices, (3) ineffective stewardship, (4) failure to actively engage civil society, and (5) incapacity to ensure compliance with the International Health Regulations (IHR). Finally, as discussed in more detail below, WHO’s emergency response requires significant reform to avert future health catastrophes.

1. *Unsustainable Funding*

Systemic underfunding brought disastrous consequences for West Africa and the world, yet WHO remains inadequately financed to respond to health emergencies. WHO is chronically starved of funding, culminating in a budget deficit of \$300 million in 2010.¹⁴⁸ In response, the Organization’s biennial budget was cut by \$1 billion, 35% of which came from funds dedicated to epidemic preparedness and response.¹⁴⁹ Currently, only about 20% of the budget comes from member states’ mandatory contributions, which is needed to ensure long-term, predictable, conflict-free funding that supports its ongoing work in line with global health priorities.¹⁵⁰

The rest of WHO’s funding comes from voluntary contributions mostly earmarked for the donor’s selected project.¹⁵¹ Although voluntary contributions

¹⁴⁶ See *Mission*, COALITION FOR EPIDEMIC PREPAREDNESS INNOVATIONS, <http://cepi.net/mission> (last visited Feb. 16, 2018); *infra* Section II.D.2.

¹⁴⁷ See Suerie Moon et al., *Will Ebola Change the Game? Ten Essential Reforms Before the Next Pandemic. The Report of the Harvard-LSHTM Independent Panel on the Global Response to Ebola*, 386 LANCET 2204, 2216 (2015); THE NEGLECTED DIMENSION OF GLOBAL SECURITY, *supra* note 2; U.N. HIGH-LEVEL PANEL ON THE GLOB. RESPONSE TO HEALTH CRISES, PROTECTING HUMANITY FROM FUTURE HEALTH CRISES ¶¶ 130, 133 (2016) [hereinafter U.N. HIGH-LEVEL PANEL]; REPORT OF THE EBOLA INTERIM ASSESSMENT PANEL, WORLD HEALTH ORGANIZATION [WHO] ¶ 28 (2015) [hereinafter EBOLA INTERIM ASSESSMENT PANEL].

¹⁴⁸ GLOBAL HEALTH LAW, *supra* note 51, at 90.

¹⁴⁹ See Lawrence O. Gostin, *Global Health Security After Ebola: Four Global Commissions*, 94 MILBANK Q. 34 (2016); Devi Sridhar & Lawrence O. Gostin, *Reforming the World Health Organization*, 305 JAMA 1585, 1586 (2011).

¹⁵⁰ Sridhar & Gostin, *supra* note 149, at 1586.

¹⁵¹ *Id.*

have always accounted for part of the budget, discretionary funding has comprised the lion's share since the 1990s.¹⁵² This has transformed WHO into a donor-driven organization with powerful benefactors—such as the United States, the European Union, and the Gates Foundation—heavily influencing agenda-setting and priorities. Accordingly, global health priorities are badly misaligned with the global burden of disease with funding reserved for specific diseases or narrowly perceived national security interests placed high on the global health agenda.¹⁵³

The current budget is wholly incommensurate with WHO's worldwide mandate. To put it in perspective, WHO's budget is just over a quarter of the CDC's, and less than the budget of a large hospital.¹⁵⁴ WHO's 2016–2017 budget was set at \$4.39 billion, but was supplemented by \$160 million to finance the new WHO Health Emergencies Program.¹⁵⁵ Its budget for 2018–2019 of \$4.42 billion is actually a *decrease* in real dollars.¹⁵⁶ This funding pattern propagates a vicious cycle: Member States underfund the agency, making it hard for WHO to succeed. When the Organization inevitably falls short, donors further lose confidence and seek out other institutions for their financial largess. This dysfunctional pattern may become more insecure with two of its largest donors—the United States and United Kingdom—¹⁵⁷ embroiled in the politics of ethno-nationalism.

Member States must become genuine shareholders in WHO by raising contributions and doubling WHO's overall budget. Reforms have begun to increase WHO control over its budget and adjust financing to priorities.¹⁵⁸ In 2013, World Health Assembly gave itself the power to approve the entire budget, rather than only the assessed contributions.¹⁵⁹ But WHO must go

¹⁵² *Id.* (stating that voluntary contributions comprise approximately 80% of the WHO's budget).

¹⁵³ See Lawrence O. Gostin, *A Framework Convention on Global Health: Health for All, Justice for All*, 307 JAMA 2087, 2089 (2012).

¹⁵⁴ See *Humanitarian Health Action: Donor Centre*, WORLD HEALTH ORG., <http://www.who.int/hac/donorinfo/en/> (last visited July 7, 2017).

¹⁵⁵ World Health Org. [WHO], 68th World Health Assembly, *Proposed Programme Budget 2016-2017*, at 6, WHO Doc. A68/7 (Apr. 30, 2015); see *Contingency Fund for Emergencies (CFE): Contributions and Allocations*, WORLD HEALTH ORG., http://www.who.int/about/who_reform/emergency-capacities/contingency-fund/contribution/en/ (last updated Dec. 22, 2017).

¹⁵⁶ See World Health Org. [WHO], 70th World Health Assembly, *Proposed Programme Budget 2018-2019*, at 5, WHO Doc. A70/7 (Apr. 10, 2017).

¹⁵⁷ See Nuriith Aizenman, *Trump's Proposed Budget Would Cut \$2.2 Billion from Global Health Spending*, NPR (May 25, 2017, 3:13 PM), <http://www.npr.org/sections/goatsandsoda/2017/05/25/529873431/trumps-proposed-budget-would-cut-2-2-billion-from-global-health-spending>.

¹⁵⁸ Lawrence O. Gostin et al., *The Normative Authority of the World Health Organization*, 129 PUB. HEALTH 854, 859 (2015).

¹⁵⁹ *Id.*

further. We argue that mandatory dues from Member States should comprise at least 50% of the WHO budget—a proposition that is improbable in the age of austerity. Perhaps more feasible is that WHO could charge overheads on earmarked voluntary contributions of 20% to 30% for flexible voluntary contributions to supplement its core budget.¹⁶⁰ Still, WHO would risk losing donors or driving them toward other multilateral or bilateral organizations that do not charge overhead.¹⁶¹

2. *Dysfunction Between Headquarters and Regional Offices*

The decentralized structure of WHO poses further challenges that came to the fore during the West African Ebola epidemic. WHO's six regional offices are uniquely independent within the UN system, with full power over regional personnel.¹⁶² During the outbreak, Director-General Chan and AFRO fought over control, perhaps hindering international assistance.¹⁶³ AFRO did not convene health ministers or open a regional coordination center until three months after Ebola was confirmed.¹⁶⁴ In January 2015, the Director-General deflected responsibility, saying that it was the obligation of AFRO to respond.¹⁶⁵

To address these challenges, WHO headquarters should exercise greater oversight and control over regional personnel and decision making. WHO should fully disclose the funds held within each regional office and how regions meet health objectives, with monitoring and benchmarks of success. Even if decentralized decision making remains the norm, WHO should apply the same yardstick across regions to assess efficiency and effectiveness. Regional offices can be effective. Member States, for example, generously fund the Pan American Health Organization (WHO's regional office for the Americas), which has gained wide respect. During the Zika epidemic, it was proactive, taking the lead from WHO headquarters in Geneva.¹⁶⁶

¹⁶⁰ Sridhar & Gostin, *supra* note 149, at 1586.

¹⁶¹ *Id.*

¹⁶² *Health Statistics and Information Systems*, WORLD HEALTH ORG., http://www.who.int/healthinfo/global_burden_disease/definition_regions/en/ (last visited Nov. 18, 2017); *see also* David P. Fidler, *Ebola Report Misses Mark on International Health Regulations*, CHATHAM HOUSE (July 17, 2015), <http://www.chathamhouse.org/expert/comment/ebola-report-misses-mark-international-health-regulations#>.

¹⁶³ *See* Somini Sengupta, *Effort on Ebola Hurt W.H.O. Chief*, N.Y. TIMES (Jan. 6, 2015), <https://www.nytimes.com/2015/01/07/world/leader-of-world-health-organization-defends-ebola-response.html>.

¹⁶⁴ Gostin & Friedman, *supra* note 133, at 1904.

¹⁶⁵ *See* Sengupta, *supra* note 163.

¹⁶⁶ *See WHO and PAHO Initiative to Support 17 New Research Proposals on Zika in Seven Countries in Latin America and the Caribbean*, PAHO, http://www.paho.org/hq/index.php?option=com_content&view=article&id=12998%3Awho-and-paho-initiative-to-support-17-new-research-proposals-on-zika-in-seven

3. *Ineffective Stewardship*

WHO operates in a sea of powerful actors; it must reestablish its legitimacy as the guardian of global health. Currently, WHO struggles to compete.¹⁶⁷ Global health governance is packed with approximately 200 international health institutions, spanning public international organizations (e.g., UNICEF, UNAIDS), public–private partnerships (e.g., GAVI, Global Fund, UNITAD, and CEPI), and philanthropies (e.g., Gates, Rockefeller, and Ford foundations).¹⁶⁸ The proliferation of global health actors has yielded new funding sources, innovative governance, and civil society engagement. Yet, the global landscape is plagued by failures of leadership, accountability, and coordination.¹⁶⁹

WHO should influence and coordinate the many institutions and regimes that affect and intersect with global health security. Intellectual property, for example, can undermine access to essential medicines; trade in services impacts health worker migration; and climate change implicates food, disease vectors, and natural disasters. The Organization should advocate the importance of global health security and how complementary sectors can protect human wellbeing. WHO must work closely with the OIE to ensure coordination with animal health and harmonized approaches to AMR. It must guide the World Trade Organization (WTO) in fulfilling its mission of trade liberalization while respecting the right to the highest attainable standard of health. In turn, these institutions can shore up their understanding of global health and advance health in decisions and norms. For instance, during the H1N1 pandemic, the Food and Agriculture Organization, OIE, and WTO issued joint statements with WHO, discouraging trade restrictions on pigs or pig products.¹⁷⁰ Through stewarding international governance, WHO can underscore the multifaceted threat posed by outbreaks.

countries-in-latin-america-and-the-caribbean&catid=740%3Apress-releases&Itemid=1926&lang=en (last updated Feb. 23, 2017, 5:47 PM); see also Donald G. McNeil Jr., *How the Response to Zika Failed Millions*, N.Y. TIMES (Jan. 17, 2017), <https://www.nytimes.com/2017/01/16/health/zika-virus-response.html>.

¹⁶⁷ See COLIN MCINNES ET AL., *THE TRANSFORMATION OF GLOBAL HEALTH GOVERNANCE* 8 (2014).

¹⁶⁸ See STEVEN J. HOFFMAN ET AL., CHATHAM HOUSE, *MAPPING GLOBAL HEALTH ARCHITECTURE TO INFORM THE FUTURE* 24–30 (2015).

¹⁶⁹ MCINNES ET AL., *supra* note 167, at 8.

¹⁷⁰ See *Joint FAO/WHO/OIE/WTO Statement on Influenza A(H1N1) and the Safety of Pork*, WORLD HEALTH ORG. (May 2, 2009), http://www.who.int/mediacentre/news/statements/2009/h1n1_20090502/en/; see also *Joint FAO/WHO/OIE/WTO Statement on Influenza A(H1N1) and the Safety of Pork*, WORLD HEALTH ORG. (May 7, 2009), http://www.who.int/mediacentre/news/statements/2009/h1n1_20090430/en/.

4. *Failure to Actively Engage Civil Society*

Civil society plays a crucial role in health security. Nongovernmental organizations often are the first to identify threats, issue urgent calls to action, support sufferers, and hold governments and international organizations to account. Often civil society organizations lead the humanitarian response, as MSF did during the West African Ebola outbreak.¹⁷¹ Community-based organizations understand local cultures and can guide health behaviors from within.

Yet, WHO's engagement with civil society is limited. Reflecting the principle of state sovereignty, non-state actors play no formal role in WHO governing structures. This contrasts with newer organizations, like UNAIDS, which includes civil society on its governing board, although with non-voting status.¹⁷² Civil society, businesses, and foundations may be full board members of the Global Fund and GAVI Alliance.¹⁷³ Yet, WHO has devised a cumbersome process that inhibits nongovernmental organizations from participating in governance meetings. NGOs must gain "official relations" status to take part, even in their non-voting capacity.¹⁷⁴ WHO rules require these organizations to have international membership or scope,¹⁷⁵ which often excludes domestic, poorly funded, and small NGOs.¹⁷⁶ Even NGOs that gain official status often struggle to be heard.¹⁷⁷

WHO must make it simpler for stakeholders to participate. The Executive Board and Assembly should be open to NGO participation. For example, WHO could offer scholarships to developing country NGOs. It could expand opportunities for civil society input, such as by allowing extemporaneous statements, facilitating NGO side sessions, and conducting open hearings.

¹⁷¹ See MÉDECINS SANS FRONTIÈRES, PUSHED TO THE LIMIT AND BEYOND: A YEAR INTO THE LARGEST EVER EBOLA OUTBREAK 6 (2015).

¹⁷² UNAIDS Programme Coordinating Board [UNAIDS], *2012-2015 Unified Budget, Results and Accountability Framework UNAIDS Engagement with Civil Society*, ¶ 79, UNAIDS/PCB (34)/14.CRP5 (June 6, 2014).

¹⁷³ See *Civil Society*, GLOBAL FUND, <https://www.theglobalfund.org/en/civil-society/> (last visited Feb. 16, 2018); see also *Civil Society Organisations*, GAVI: VACCINE ALLIANCE, <http://www.gavi.org/about/partners/cso/> (last visited Feb. 16, 2018).

¹⁷⁴ See *Principles Governing Relations with Nongovernmental Organizations*, WORLD HEALTH ORG., <http://www.who.int/governance/civilsociety/principles/en/> (last visited July 13, 2017).

¹⁷⁵ See World Health Org. [WHO], 69th World Health Assembly, *Framework of Engagement with Non-State Actors*, ¶ 51, WHO Doc. A69/10 (May 28, 2016).

¹⁷⁶ See GLOBAL HEALTH LAW, *supra* note 51, at 118.

¹⁷⁷ See Thomas Schwarz, *A Stronger Voice of Civil Society at the World Health Assembly?*, MEDICUS MUNDI INT'L NETWORK (June 2010), <http://www.medicusmundi.org/contributions/reports/2010/a-stronger-voice-of-civil-society-at-the-world-health-assembly>.

Going further, to reflect modern governance structures, WHO should include civil society as part of its governance structure—even if this would require a constitutional amendment. And from the very earliest moments of an outbreak, it should work closely with civil society to develop culturally sensitive responses.

5. *Incapacity to Ensure Compliance with the IHR*

WHO has unparalleled normative powers. Article 2 of its constitution authorizes the World Health Assembly “to propose conventions, agreements and regulations, and make recommendations with respect to international health matters.”¹⁷⁸ Article 19 permits the World Health Assembly to adopt a convention by two-thirds vote, while article 20 directs members to “take action” by accepting or rejecting the convention or agreement within eighteen months after adoption.¹⁷⁹ To date, the World Health Assembly has adopted only one convention, which has been a powerful force for global health—the Framework Convention on Tobacco Control.¹⁸⁰

The Organization’s authority to adopt regulations is even more remarkable. By article 22, regulations enter “into force for all Members after due notice has been given of their adoption by the Health Assembly except for such Members as may notify the Director-General of rejection or reservations within the period stated in the notice.”¹⁸¹ Consequently, States must proactively “opt out” or they are automatically bound. Perhaps standing alone in international law, the Constitution of the WHO permits the imposition of binding obligations absent a State’s express assent.

The IHR is the Organization’s most prominent regulation, standing as the governing authority for global health security.¹⁸² However, the Organization has struggled to secure State compliance with the Regulations. Countries continue to clutch sovereignty, often failing to internalize international norms,

¹⁷⁸ See Constitution of the World Health Organization, *supra* note 139, at art. 2(k).

¹⁷⁹ *Id.* at arts. 19–20.

¹⁸⁰ See *About the WHO Framework Convention on Tobacco Control*, WORLD HEALTH ORG., <http://www.who.int/fctc/about/en/> (last visited Nov. 18, 2017); see also World Health Organization Framework Convention on Tobacco Control, May 21, 2003, 2302 U.N.T.S. 41032 [hereinafter FCTC].

¹⁸¹ See Constitution of the World Health Organization, *supra* note 139, at art. 22.

¹⁸² World Health Organization International Health Regulations, May 23, 2005, 2509 U.N.T.S. 44861 [hereinafter IHR].

endangering global health. Developing countries, moreover, lack the financial and technical assistance needed to ensure their health system capacities.¹⁸³

The 2005 revision of the IHR—in response to SARS—implemented vital reforms, including an “all-hazards” strategy (instead of targeting specific diseases), early state reporting (articles 6 and 7), use of unofficial (non-State) data sources (article 9.1), and development of health-system capacities to prevent, detect, and respond to potential public health emergencies of international concern (PHEIC) (article 5.1).¹⁸⁴ The IHR empowers WHO to coordinate stakeholders and make recommendations. Yet, as highlighted by recent public health emergencies, weaknesses remain.¹⁸⁵

Under the IHR, WHO’s Director-General has the power to declare a PHEIC (article 12.1) and issue temporary recommendations to 196 States Parties (article 15).¹⁸⁶ The Director-General decides—based on advice from an emergency committee, available evidence from the state and extraneous sources, scientific principles and evidence, and an assessment of the risk to human health—risk of international spread and interference with international traffic (article 12.4).¹⁸⁷ Since entry into force, the Director-General has declared four PHEICs: influenza (H1N1) (2009), polio (2014), Ebola (2014), and Zika (together with associated neurological conditions) (2016).¹⁸⁸

Yet, WHO failed to convene an emergency meeting for Ebola or declare a public health emergency for four and a half months.¹⁸⁹ WHO was also criticized during the 2009 H1N1 pandemic when the Organization was accused of promoting panic.¹⁹⁰ Further, its designation of polio as a PHEIC has prompted criticism, given that only a handful of wild polio cases had been identified.¹⁹¹ A more flexible governance structure could enable WHO to

¹⁸³ See, e.g., Lawrence O. Gostin et al., *The Global Health Law Trilogy: Towards a Safer, Healthier, and Fairer World*, 390 LANCET 1918 (2017).

¹⁸⁴ IHR, *supra* note 182. Article 1 defines a PHEIC as “an extraordinary event which is determined, as provided in these Regulations: (i) to constitute a public health risk to other States through the international spread of disease and (ii) to potentially require a coordinated international response.” *Id.*

¹⁸⁵ See Gostin et al., *supra* note 132, at 4.

¹⁸⁶ See IHR, *supra* note 182, at art. 12.1, 15.

¹⁸⁷ *Id.* at art. 12.4.

¹⁸⁸ See World Health Org. [WHO], 70th World Health Assembly, *Implementation of the International Health Regulations (2005): Annual Report on the Implementation of the International Health Regulations (2005) Report by the Director-General*, at 5, WHO Doc. A70/15 (May 17, 2017).

¹⁸⁹ See Moon et al., *supra* note 147.

¹⁹⁰ See Lena H. Sun et al., *Out of Control: How the World’s Health Organizations Failed to Stop the Ebola Disaster*, WASH. POST (Oct. 4, 2014), http://www.washingtonpost.com/sf/national/2014/10/04/how-ebola-spred-out-of-control/?utm_term=.af2a6cf9efd2.

¹⁹¹ See Lawrence O. Gostin & Rebecca Katz, *The International Health Regulations: The Governing*

mount earlier, event-specific responses. Post-Ebola global commissions proposed an intermediate-level emergency declaration and/or a standing emergency committee to continuously monitor circulating pathogens of concern.¹⁹² Enhancing transparency and accountability would improve international confidence.

Further, when outbreaks arise, governments and private actors often overreact. While the IHR aim to balance trade (article 2)¹⁹³ and human rights (article 3.1),¹⁹⁴ States routinely ignore the Director-General's recommendations in favor of overly punitive, non-evidence based restrictions on trade and travel, fearing economic and other harm.¹⁹⁵ During the Ebola epidemic, over 30% of IHR States Parties disregarded WHO recommendations, imposing more restrictive measures than recommended.¹⁹⁶ Under international trade law, States have a right to restrict trade to protect human, animal, and plant life or health.¹⁹⁷ But lawful restrictions require sufficient scientific evidence with a scientific risk assessment. Further, trade-restricting health measures must be non-discriminatory and the least trade-restrictive measures possible.¹⁹⁸

Similarly, the IHR require States Parties to promptly notify WHO of events that may constitute a PHEIC with an ongoing obligation to inform and respond to follow-up requests (article 6.2).¹⁹⁹ Yet, States have hesitated to report suspected outbreaks, fearing the imposition of travel bans and trade restrictions, and resulting loss of tourism. While dispute resolution is available (article 56),²⁰⁰ it is subject to parties' consent, and the Director-General has not held States accountable for counterproductive travel and trade restrictions or publicly identified uncooperative governments.

Framework for Global Health Security, 94 MILBANK Q. 264, 273 (2016).

¹⁹² See Gostin & Friedman, *supra* note 133, at 1906.

¹⁹³ See IHR, *supra* note 182, at art. 2.

¹⁹⁴ *Id.* at art. 3.1.

¹⁹⁵ See Wendy Rhymer & Rick Speare, *Countries' Response to WHO's Travel Recommendations During the 2013-2016 Ebola Outbreak*, 95 BULLETIN OF THE WORLD HEALTH ORGANIZATION [WHO] 10, 13 (2017), <http://www.who.int/bulletin/volumes/95/1/16-171579/en/>.

¹⁹⁶ *Id.*

¹⁹⁷ See *The WTO Agreement on the Application of Sanitary and Phytosanitary Measures (SPS Agreement)*, WORLD TRADE ORG. art. 2.1, http://www.wto.org/english/tratop_e/sps_e/spsagr_e.htm (last visited Nov. 19, 2017).

¹⁹⁸ *Id.* at art. 2.3.

¹⁹⁹ See IHR, *supra* note 182, at art. 6.2.

²⁰⁰ See *id.* at art. 56.

To enhance compliance, WHO should publicly request States Parties to justify additional measures and urge private actors against restrictions. WHO should publicize States that impose unnecessary travel and trade restrictions. States Parties should consider pursuing dispute mediation through the Director-General or compulsory arbitration. Successful cases brought by States harmed by travel or trade restrictions or human rights violations would be a powerful precedent to enhance compliance. Trade restrictions could also be challenged through the WTO, as Mexico did during the H1N1 pandemic.²⁰¹ Yet, WTO dispute resolution can drag on for years, meaning economic damage is already inflicted.²⁰² Lastly, the World Health Assembly could amend the IHR to raise temporary recommendations to a binding status.

D. Reforming Emergency Response

WHO must undergo fundamental technical reform if it is to attain its rightful position as leader in coordinating global health security. In the wake of Ebola, the Organization has developed new responses: (1) the Health Emergencies Program, (2) the Contingency Fund for Emergencies, and (3) the Global Health Emergency Workforce. Meanwhile, the World Bank established the Pandemic Emergency Financing Facility (PEF). Tedros Adhanom Ghebreyesus, the first African Director-General of WHO, has promised a robust commitment to epidemic preparedness and response, with WHO acting in a leadership role.²⁰³ Yet, the new Director-General's record is mixed—he served as health minister of Ethiopia, a country with a dismal human rights record, and during his post, Ethiopia was accused of covering up a cholera epidemic.²⁰⁴

1. WHO Health Emergencies Program

In March 2016, drawing on recommendations of the panels that reviewed WHO's response to Ebola, WHO launched the Health Emergencies Program;

²⁰¹ See generally *Import Restrictions on Pork Products Due to Influenza A/H1N1*, WORLD TRADE ORG: SANITARY & PHYTOSANITARY INFO. MGMT. SYS., <http://spsims.wto.org/en/SpecificTradeConcerns/View/279> (last visited Feb. 16, 2018).

²⁰² See GILLIAN J. BUCKLEY & RACHEL E. PITTLUCK, GLOBAL HEALTH RISK FRAMEWORK: PANDEMIC FINANCING 8, 74 (2016).

²⁰³ See Dr. Tedros Adhanom Ghebreyesus, Dir.-Gen., World Health Org., Remarks to G20 Health Emergencies Represent Some of the Greatest Risks to the Global Economy and Security (July 8, 2017), <http://www.who.int/dg/speeches/2017/g20-summit/en/>.

²⁰⁴ See Lawrence O. Gostin, *The World Health Organization's Ninth Director-General: The Leadership of Tedros Adhanom*, 95 MILBANK Q. 467, 459 (2017).

the 2018–2019 WHO budget provides \$554.2 million in financing.²⁰⁵ The Program aimed to “deliver rapid, predictable, and comprehensive support to countries and communities as they prepared for, faced, or recovered from emergencies caused by any type of hazard to human health, whether disease outbreaks, natural or man made disasters, or conflicts.”²⁰⁶ Designed to be agile and streamlined, it has one clear line of authority, one workforce, one budget, one set of rules and processes, and one set of standard performance metrics. It creates a common structure combining infectious hazard management, country preparedness, health emergency information and risk assessment, emergency operations and management, and administration.²⁰⁷ Standard operating procedures are being developed to safeguard more coherent and clear responses and improve communication.²⁰⁸

The Program will draw on existing strengths, partnering with U.N. agencies, States, and nongovernmental organizations, such as MSF. An Independent Oversight and Advisory Committee oversees and monitors progress of the Program. Yet, while the Committee has members from national governments, international organizations, and civil society, they are appointed by the Director-General,²⁰⁹ which potentially undermines its independence.

2. *Novel Funding Mechanisms: Contingency Fund for Emergencies*

The failure to provide a quick release of funds to the world’s most impacted countries is one of the most widely recognized causes of the rapid spread of Ebola in 2014. Even countries with resources can flounder; during the alarming spread of Zika throughout the Americas, it took Congress 233 days to pass President Obama’s emergency request for funding—eventually agreeing to \$1.1 billion (\$800 million less than requested).²¹⁰ This inertia

²⁰⁵ See World Health Org. [WHO], 70th World Health Assembly, *Proposed Programme Budget 2018-2019*, at 5, WHO Doc. A70/5 (May 26, 2017).

²⁰⁶ See Anne Gulland, *WHO to Set Up Emergencies Programme*, *BMJ* (May 31, 2016), <http://www.bmj.com/content/353/bmj.i3052>.

²⁰⁷ *Update WHO Health Emergencies Programme: Progress and Priorities Financing Dialogue*, WORLD HEALTH ORG. 7 (Oct. 31, 2016), <http://www.who.int/about/finances-accountability/funding/financing-dialogue/who-update.pdf>.

²⁰⁸ *Id.* at 4.

²⁰⁹ See *Independent Oversight and Advisory Committee for the WHO Health Emergencies Programme: Terms of Reference*, WORLD HEALTH ORG. § 3, http://www.who.int/about/who_reform/emergency-capacities/oversight-committee/Terms-of-Reference-Independent-Oversight-Committee.pdf?ua=1 (last visited July 13, 2017).

²¹⁰ Alison Kodjak, *Congress Ends Spat, Agrees to Fund \$1.1 Billion to Combat Zika*, *NPR* (Sept. 28, 2016, 3:56 PM), <https://www.npr.org/sections/health-shots/2016/09/28/495806979/congress-ends-spat-over-zika-funding-approves-1-1-billion>.

delayed the speed of research and development, including vital vaccines.²¹¹ Delayed reactions following disease epidemics prompt the question, should an emergency fund be put in place that can rapidly deploy resources when an outbreak strikes?

Two global initiatives aim to ensure the rapid flow of funding early in an outbreak. First, WHO launched an emergency contingency fund in the aftermath of Ebola alongside the Health Emergencies Programme. Yet, despite the clear need for flexible resources capable of rapid deployment, it is yet to be fully funded. Second, in 2016, World Bank President Jim Kim launched the Pandemic Emergency Financing Facility.

a. WHO Emergency Contingency Fund

Before the West African Ebola epidemic, WHO labored under the belief that it could mobilize funds rapidly in the face of a crisis. But the absence of readily available resources led to fatal delays.²¹² Therefore, the World Health Assembly launched a specific, replenishable contingency fund with a target capitalization of \$100 million.²¹³ The Contingency Fund for Emergencies seeks to fill a critical gap from the beginning of an emergency until resources from other financing mechanisms begin to flow, but only for a maximum of three months.²¹⁴

The fund is financed by flexible voluntary contributions, not additional core funding through mandatory assessed dues.²¹⁵ If one considers the billions of dollars in humanitarian assistance, \$100 million seems inadequate. Further, as of June 2017, the fund is far from meeting even this modest target—with contributions amounting to a mere \$41 million.²¹⁶ Adding resources to WHO's core budget would have been more viable and sustainable. The program has echoes of the African Public Health Emergency Fund, which began

²¹¹ See Reuters, *How a Long Delay in Congress Hurt the Effort to Fight Zika*, FORTUNE (Oct. 4, 2016), <http://fortune.com/2016/10/03/zika-virus-funding-delay/>.

²¹² See Lawrence O. Gostin & Eric A. Friedman, *Ebola: A Crisis in Global Health Leadership*, 384 LANCET 1323, 1323 (2014).

²¹³ *Contingency Fund for Emergencies*, WORLD HEALTH ORG. (Oct. 13, 2015), http://www.who.int/about/who_reform/emergency-capacities/contingency-fund/Contingency-Fund-Emergencies.pdf?ua=1; see Director-General, World Health Org. [WHO] 68th World Health Assembly, *2014 Ebola Virus Disease Outbreak and Follow-up to the Special Session of the Executive Board on Ebola: Options for Contingency Fund to Support WHO's Emergency Response Capacity*, at 2, 7, Doc. A68/26 (May 12, 2015).

²¹⁴ See *Contingency Fund for Emergencies*, *supra* note 213.

²¹⁵ See *Contingency Fund for Emergencies (CFE): Contributions and Allocations*, *supra* note 155 (describing allocation figures as of June 15, 2017).

²¹⁶ *Id.*

disbursements to countries to help them respond to public health emergencies, including disease outbreaks, and natural and manmade disasters. Yet, from 2012 to 2016, only thirteen African nations contributed a total of less than \$4 million.²¹⁷

The trigger point for deployment of the fund is also important. The agency plans to use its Emergency Response Framework grading system as the prompt for drawing down the contingency fund, although the Assembly left the final decision to the Director-General to determine when to deploy the emergency fund for Grade 3 emergencies, the highest on the scale.²¹⁸ To be effective, the contingency fund must be commensurate with the need, sustainable, available for rapid use, and of global reach.

b. Pandemic Emergency Financing Facility

In 2016, World Bank President Jim Kim launched the Pandemic Emergency Financing Facility (PEF). The PEF is an insurance mechanism that aims to rapidly provide funding for lower-income countries facing epidemic outbreaks before they turn into pandemics.²¹⁹ The PEF will be financed through mobilizing and leveraging resources from the private sector (reinsurance and capital markets) and the public sector, and disbursing them quickly to governments, multilateral agencies, NGOs, and other agencies.²²⁰

PEF thereby functions as the first-ever insurance market for pandemics, capable of rapidly disbursing financial resources for pandemic outbreaks. It further marks the first instance in which World Bank has issued catastrophe bonds for controlling infectious diseases.²²¹ In the event of an outbreak, funds are released based on “parametric triggers” to the world’s poorest countries and international responders alike.²²² The funding consists of an “insurance window,” funded from a private insurance market and a “cash window,”

²¹⁷ See Secretariat, Reg’l Office for Afr., World Health Org. [WHO], *The African Public Health Emergency Fund: The Way Forward*, at 1, Doc. AFR/RC66/15 (July 27, 2016).

²¹⁸ WORLD HEALTH ORG. [WHO], EMERGENCY RESPONSE FRAMEWORK 20 (2013).

²¹⁹ See *Pandemic Emergency Financing Facility: Frequently Asked Questions*, WORLD BANK (May 9, 2017), <http://www.worldbank.org/en/topic/pandemics/brief/pandemic-emergency-facility-frequently-asked-questions>.

²²⁰ See *Pandemic Preparedness and Health Systems Strengthening*, *supra* note 3.

²²¹ Press Release, World Bank, World Bank Group Launches Groundbreaking Financing Facility to Protect Poorest Countries Against Pandemics (May 21, 2016), <http://www.worldbank.org/en/news/press-release/2016/05/21/world-bank-group-launches-groundbreaking-financing-facility-to-protect-poorest-countries-against-pandemics>.

²²² *Id.*

funded by donors.²²³ The cash window is a more flexible source of funds and may be used to combat pathogens that are not dangerous enough to reach the criteria for the insurance window.

Any country that qualifies for funding from the International Development Agency (IDA), which finances the world's poorest countries, will also be eligible for funding from the PEF.²²⁴ Disease-causing viruses, such as new influenza virus, coronaviruses, and filoviruses, are within the scope of PEF. The World Bank estimates that if the PEF had existed in 2014, \$100 million could have been mobilized within three months, averting loss of life.²²⁵

The PEF is an important development, but requires adequate stewardship by States. The cash window depends on donations. So far Japan and Germany have committed \$50 million, but since then, the PEF has not seen any significant new funding from States.²²⁶ Further, the parametric trigger for funds to be released has yet to be decided. What is WHO's role? It further remains unclear whether the IHR will govern PEF. The WHO Director-General could determine when the fund should be triggered, thereby combining the expertise of WHO with the financial resources of the World Bank. Further, entities that violate the IHR could be ordered to donate to the private insurance fund of the PEF. These two remedies, however, face practical and legal challenges. For example, if WHO vouches for the PEF and triggers its payouts, might the agency violate securities regulations or otherwise incur liability?

3. *Global Health Workforce*

As part of the Emergencies Program, WHO also developed a new Global Health Emergency Workforce (GHEW) of independently verified teams of capable responders from governments and civil society on standby to join WHO and others in an emergency response, while supporting national capacity.²²⁷ During the Ebola epidemic, international responders "faced challenges in terms of scale, quality assurance, training, coordination,

²²³ *Id.*

²²⁴ *Id.*

²²⁵ *Id.*

²²⁶ Press Release, World Bank, World Bank Launches First-Ever Pandemic Bonds to Support \$500 Million Pandemic Emergency Financing Facility (June 28, 2017), <http://treasury.worldbank.org/cmd/htm/World-Bank-Launches-First-Ever-Pandemic-Bonds-to-Support-500-Million-Pandemic-Emergency.html>.

²²⁷ See Director-General, *supra* note 213; see also Peter Salama, *WHO's New Emergencies Programme Bridges Two Worlds*, 95 BULLETIN OF THE WORLD HEALTH ORGANIZATION [WHO] 8, 9 (2017), <http://www.who.int/bulletin/volumes/95/1/17-030117/en/>.

financing and opportunities to share lessons learnt between and among deploying partners.”²²⁸ The new GHEW is made up of national and international responders from networks and partnerships, including the Global Outbreak Alert and Response Network (GOARN), which pools human resources and equipment, and the U.N. Inter-Agency Standing Committee.²²⁹ It “aims to improve coordination, readiness and quality assurance in the deployment” of Global Emergency Medical Teams (EMT).²³⁰

The new unit is designed for speed and flexibility, “showing what must happen within 24, 48, and 72 hours, not months.”²³¹ The EMT list sets international minimum standards that teams must meet to be registered and successfully vetted. This assures Member States that teams meet the required standards.²³² WHO is also adding logisticians and experts in risk communication to its emergency staff.²³³

Yet, a global health workforce cannot be effective unless barriers to its deployment are dismantled. During Ebola, airlines cancelled more than a third of flights to West Africa,²³⁴ impeding the arrival of response teams, equipment, and humanitarian aid. Some countries also restricted entry of anyone coming from the region by erecting mandatory quarantines, as occurred in the United States in New York, New Jersey, and Illinois.²³⁵ Even Ebola-affected States

²²⁸ Director-General, *supra* note 213.

²²⁹ *WHO's New Health Emergencies Programme*, WORLD HEALTH ORG. (Oct. 31, 2016), <http://www.who.int/features/qa/health-emergencies-programme/en/>.

²³⁰ See Nieves Amat Camacho et al., *Education and Training of Emergency Medical Teams: Recommendations for a Global Operational Learning Framework*, PLOS CURRENTS DISASTERS 5 (Oct. 21, 2016), <http://currents.plos.org/disasters/article/education-and-training-of-emergency-medical-teams-recommendations-for-a-global-operational-learning-framework/>.

²³¹ See Dr. Margaret Chan, Dir.-Gen., World Health Org., Speech at the 68th World Health Assembly (May 18, 2015), <http://www.who.int/dg/speeches/2015/68th-wha/en/>.

²³² See James Gosney, *WHO Emergency Medical Team Initiative & “WHO Minimum Technical Standards and Recommendations for Rehabilitation for EMTs,”* WORLD HEALTH ORG. (June 2, 2016) http://www.isprm.org/wp-content/uploads/2012/10/WHO-Emergency-Medical-Team-Initiative_WHO-minimum-technical-standards-and-recommendations-for-rehabilitation-for-EMTs_James-Gosney_ISPRM-WHOII-Session_ISPRM-2016_2-June-2016.pdf.

²³³ Chan, *supra* note 231 (discussing the Director-General’s efforts to “strengthen[] the skills base of my emergency staff, adding logisticians, medical anthropologists, and experts in risk communication”); see also Sheri Fink, *W.H.O. Leader Describes the Agency’s Ebola Operations*, N.Y. TIMES (Sept. 4, 2014), <https://www.nytimes.com/2014/09/04/world/africa/who-leader-describes-the-agencys-ebola-operations.html?mcubz=3>.

²³⁴ See Mark Anderson, *Ebola: Airlines Cancel More Flights to Affected Countries*, GUARDIAN (Aug. 22, 2014, 1:33 PM), <https://www.theguardian.com/society/2014/aug/22/ebola-airlines-cancel-flights-guinea-liberia-sierra-leone>.

²³⁵ See Holly Yan & Greg Botelho, *Ebola: Some U.S. States Announce Mandatory Quarantines—Now What?*, CNN (Oct. 27, 2014, 9:34 PM), <http://www.cnn.com/2014/10/27/health/ebola-us-quarantine-controversy/index.html>.

refused or delayed to issue visas to emergency workers.²³⁶ Systems must be put in place to expedite visas for foreign workers and permits to allow entry of essential medical and humanitarian supplies. If health workers fall ill, there is an ethical duty to provide the most effective available treatment and, if necessary, medical evacuation.

4. *Harnessing the U.N. System*

Finally, while WHO should take the lead in a global health emergency, the U.N. system can bolster security through enhancing legitimacy, improving coordination, and stiffening political resolve. Where a public health crisis reaches the highest levels of emergency,²³⁷ WHO should look to the United Nations for reinforcement. Unlike the Director-General or World Health Assembly, the U.N. Security Council can issue binding resolutions.²³⁸ In 2014, the Security Council adopted a resolution declaring the Ebola epidemic a “threat to international peace and security.”²³⁹ The Ebola resolution was only the second time in its history that the Security Council acted to stem a public health threat (AIDS was the first).²⁴⁰ To cement this role, one of the post-Ebola review panels recommended a standing health committee within the Security Council and a permanent U.N. “Accountability Commission” providing system-wide assessments of international responses to major epidemics.²⁴¹ The U.N. Secretary General’s panel would have preferred to house the Standing Committee with the General Assembly.²⁴² Irrespective of where the standing oversight function is placed, having the United Nations keep a watchful eye over fast-moving epidemics would bolster political attention.

In September 2014, the Secretary-General Ban Ki-Moon established the United Nations’ first-ever emergency health mission, the United Nations Mission for Ebola Emergency Response (UNMEER).²⁴³ Although it had undoubted flaws, UNMEER can serve as a model for future outbreaks that

²³⁶ See Dr. Margaret Chan, Dir.-Gen., World Health Org., Address at the Institute of Medicine Ebola Workshop (Sept. 1, 2015), <http://www.who.int/dg/speeches/2015/18months-after-ebola-outbreak/en/>.

²³⁷ See *Funding and Funding Gap of WHO Grade 3 and Grade 2 Emergencies*, WORLD HEALTH ORG., http://www.who.int/hac/donorinfo/g3_contributions/en/ (last visited Feb. 16, 2018) (explaining WHO’s criteria for the highest levels of public health emergency).

²³⁸ See U.N. Charter art. 25.

²³⁹ S.C. Res. 2177, ¶ 5 (Sept. 18, 2014).

²⁴⁰ See S.C. Res. 1308, ¶ 2 (July 17, 2000).

²⁴¹ See Moon et al., *supra* note 147, at 2204.

²⁴² U.N. HIGH-LEVEL PANEL, *supra* note, at 147, at ¶ 78.

²⁴³ UNMEER was established on September 19, 2014 after the unanimous adoption of resolutions by the General Assembly and Security Council. G.A. Res. 69/1, ¶ 1–2 (Sept. 19, 2014); S.C. Res. 2177, *supra* note 239, ¶ 7.

require a major U.N.-wide response. Its mandate was to lead and coordinate the activities of U.N. agencies working on the ground to stop the outbreak. UNMEER adopted a regional perspective and improved cross-border coordination, information sharing, and monitoring of viral transmission. Yet, while UNMEER galvanized political support, it bypassed existing humanitarian systems, such as the U.N. Cluster, and was perceived as unwieldy.²⁴⁴

The Ebola outbreak placed a spotlight on the ineffectiveness of international governance, in particular WHO, in responding to infectious disease outbreaks. Yet, whether the international community will act decisively on the recommendations issued by multiple commissions remains to be seen. Through addressing governance reforms, such as better internal and external coordination, and more effective and transparent decision making, WHO can more effectively meet its mission. Ultimately, WHO remains dependent on its Member States for increased funding, political support, and implementation of its norms. Will Member States pull back from populist trends and empower an effective WHO?

²⁴⁴ U.N. HIGH-LEVEL PANEL, *supra* note, at 147, at ¶ 78.

Table II: Four Global Commissions to Advance Global Governance—
WHO Emergency Operations and Response²⁴⁵

	CGHRF	Harvard/LSHTM	UN Panel	WHO Interim Assessment
Independent Centre for Preparedness & Response	WHO should create a Centre for Health Emergency Preparedness & Response (CHEPR), governed by an independent Technical Governing Board, to coordinate global outbreak preparedness and response. (Rec. C.1)	WHO should create a unified Centre for Emergency Preparedness & Response with clear responsibility, adequate capacity, and strong lines of accountability. (Rec. 3)	WHO's Program for Outbreaks & Emergency Management should be converted into a Centre for Emergency Preparedness & Response (CEPR) with unified command and control authority. (Rec. 7)	WHO should establish a Centre for Emergency Preparedness & Response that integrates its outbreak control and humanitarian functions. (Rec. 11) An independent board should oversee the Centre and provide an annual global health security report to the WHA and UN GA. (Rec. 12)
Create Contingency Fund for Rapid Response	By the end of 2016, WHO should create a sustainable contingency fund of US\$100 million to support rapid deployment of emergency response capabilities. (Rec. C.3)	No recommendation.	WHO should establish a contingency fund for emergency response, managed by the CEPR. Member States should provide at least US\$300 million in financing. (Rec. 20)	Member States and partners should contribute to a contingency fund in support of outbreak response, with a minimum target capitalization of US\$100 million. (Rec. 8)
Communications & Outbreak Monitoring	WHO should generate a high-priority "watch list" of outbreaks, released daily to national focal points and weekly to the public. (Rec. C.7)	Responsibility for declaring a PHEIC should be delegated to a transparent and politically protected WHO standing committee. (Rec. 4)	WHO must re-establish itself as the authoritative body for health emergencies, capable of rapidly and accurately informing governments and the public about the severity and extent of an outbreak. (Rec. 14)	The IHR Review Committee should consider the creation of an intermediate level of emergency to alert the international community at an earlier stage of a health crisis before it becomes a global threat. (Rec. 5)

E. Resilient Health Systems: The Foundation of Global Health Security

Since Ebola was first identified in 1976, there have been at least fifteen outbreaks in Sub-Saharan Africa; before 2014, all had been rapidly contained.²⁴⁶ Why was the West African epidemic so much worse? Part of the answer lies in the weak health systems of the countries affected. In countries with a well-functioning health system, outbreaks can be rapidly brought under control—as occurred when Nigeria experienced a worrying outbreak at the

²⁴⁵ Gostin et al., *supra* note 132, at 6 (citing to Table 5: "Recommendations from the Four Global Commissions Concerning Global Governance—WHO Emergency Operations and Response").

²⁴⁶ Jon Greenberg, *Counting the Number of Ebola Outbreaks Since 1976*, POLITIFACT (Oct. 22, 2014, 11:57 AM), <http://www.politifact.com/punditfact/statements/2014/oct/22/corey-hebert/counting-number-ebola-outbreaks/>.

height of the Ebola epidemic.²⁴⁷ In contrast, Liberia, Sierra Leone, and Guinea had among the world's lowest-ranking healthcare systems.²⁴⁸

Creating effective health systems is therefore both a public health and legal imperative. The global health system is only as strong as the weakest health system. Wealthy countries depend on developing States' capacity to detect and then halt the spread of disease before it spills over international borders. Accordingly, uniformly strong health systems are not simply in the interests of lower-income States.

From a public health perspective, how a society orders, finances, regulates, and monitors national health systems implicates who lives and who dies. How *should* a health system function? WHO specifies six "building blocks": "(i) service delivery, (ii) health workforce, (iii) health information systems, (iv) access to essential [vaccines and] medicines, (v) financing, and (vi) leadership/governance."²⁴⁹ These require adequate and equitable distribution of in-hospital and community health services, trained health workers, essential vaccines and medicines, and health information systems.²⁵⁰ Importantly, good health systems focus on population-based services, including surveillance, health education, sanitation, hygiene, and vector control (such as controlling mosquito breeding grounds).²⁵¹

A strong health system reduces disease transmissibility and susceptibility, as it ensures that all individuals have prompt access to care. For example, "treatment as prevention" for HIV/AIDS has been a stunning success.²⁵² Individuals on strict regimens of antiretroviral treatment (ART) are virtually unable to transmit the virus, while pre-exposure HIV prophylaxis (PrEP) can significantly reduce susceptibility to the virus.²⁵³ But when individuals cannot

²⁴⁷ See *Successful Ebola Responses in Nigeria, Senegal and Mali*, WORLD HEALTH ORG., (Jan. 2015), <http://www.who.int/csr/disease/ebola/one-year-report/nigeria/en/>.

²⁴⁸ See Ajay Tandon et al., *Measuring Overall Health System Performance for 191 Countries*, (World Health Org. GPE Discussion Paper Series, Paper No. 30, 2000), <http://www.who.int/healthinfo/paper30.pdf>.

²⁴⁹ MONITORING THE BUILDING BLOCKS OF HEALTH SYSTEMS: A HANDBOOK OF INDICATORS AND THEIR MEASUREMENT STRATEGIES, at vi, WORLD HEALTH ORGANIZATION [WHO] (2010) [hereinafter MONITORING THE BUILDING BLOCKS].

²⁵⁰ *Id.* at xi–xii.

²⁵¹ See generally *id.*

²⁵² *HIV Treatment as Prevention*, CTRS. FOR DISEASE CONTROL & PREVENTION, <https://www.cdc.gov/hiv/risk/art/index.html> (last visited Nov. 21, 2017).

²⁵³ See generally Michael Haggmann, *Study Confirms Effectiveness of Antiretroviral Drugs for HIV Patients*, 81 BULL. WORLD HEALTH ORG. 918 (2003); *Pre-Exposure Prophylaxis (PrEP)*, CTRS. FOR DISEASE CONTROL & PREVENTION, <https://www.cdc.gov/hiv/risk/prep/index.html> (last visited Nov. 21, 2017).

access or afford countermeasures,²⁵⁴ how can a community be immune to a controllable disease or be protected by the herd immunity that prevents the spread of disease?²⁵⁵

Across the globe, individuals struggle to access basic health services. Many countries have wholly inadequate health facilities. In West Africa, during the Ebola outbreak, poor road systems and inadequate transportation made it difficult for patients to travel to treatment centers and for blood samples to get to laboratories,²⁵⁶ imposing harmful—and sometimes fatal—delays. In Sub-Saharan Africa, about 40% of tuberculosis cases were detected and successfully treated in 2013; in South Asia, this figure was about 50%; and in Latin America and the Caribbean, this number was less than 60%.²⁵⁷ The inaccessibility of care impacts everything from immunization rates to availability of clean water and sanitation to outbreak prevention and response.²⁵⁸

Even if patients reach a hospital, there may be no staff to offer treatment.²⁵⁹ Indeed, an inadequate public health workforce was a central factor during the Ebola epidemic. There were too few trained epidemiologists and laboratory workers, and poor infection control in clinics and hospitals.²⁶⁰ Health workers used personal protective equipment (PPE) sporadically and inconsistently, sometimes repeatedly using single-use disposable PPE.²⁶¹ Many facilities suffered from staff shortages, insufficient soap and other hygienic supplies, and limited capacity to safely dispose of contaminated waste.²⁶² Thus, tragically, 881 doctors, nurses, and midwives contracted Ebola during the West

²⁵⁴ Hagmann, *supra* note 253.

²⁵⁵ See generally Paul E.M. Fine, *Herd Immunity: History, Theory, Practice*, 15 EPIDEMIOLOGIC REVS. 265 (1993).

²⁵⁶ See *Factors that Contributed to Undetected Spread of the Ebola Virus and Impeded Rapid Containment*, WORLD HEALTH ORG. (Jan. 2015), <http://www.who.int/csr/disease/ebola/one-year-report/factors/en/>.

²⁵⁷ See TRACKING UNIVERSAL HEALTH COVERAGE, WORLD HEALTH ORGANIZATION [WHO] & WORLD BANK GROUP [WBG] 75 (2015).

²⁵⁸ See *id.* at 18.

²⁵⁹ See Irene Garcia-Subirats et al., *Barriers in Access to Healthcare in Countries with Different Health Systems. A Cross-Sectional Study in Municipalities of Central Colombia and North-Eastern Brazil*, 106 SOC. SCI. & MED. 204, 208 (2014).

²⁶⁰ Kevin Sack et al., *How Ebola Roared Back*, N.Y. TIMES (Dec. 29, 2014), <https://www.nytimes.com/2014/12/30/health/how-ebola-roared-back.html?mcubz=3>.

²⁶¹ See HEALTH WORKER EBOLA INFECTIONS IN GUINEA, LIBERIA AND SIERRA LEONE: A PRELIMINARY REPORT, WORLD HEALTH ORGANIZATION [WHO] 10 (2015).

²⁶² See *id.*

Africa Ebola epidemic, 513 of whom died from the virus.²⁶³ Without better preparation, training, and tools, the health workforce will not only experience its own losses, but be less effective in controlling the next outbreak.

To remedy this, governments must promote worker education and retention by prioritizing a well-trained and sustainable health workforce.²⁶⁴ In November of 2013, WHO reported a deficit of 7.2 million health workers; by 2035, that number is expected to increase to 12.9 million.²⁶⁵ The problem stems largely from low-quality or insufficient training and failure to retain professionals, many of whom are drawn by the lure of richer countries. Only 168 medical schools exist across all forty-seven Sub-Saharan African countries; eleven countries have no medical schools, and twenty-four countries have only one.²⁶⁶ Without greater investments, a strong health force is illusory.

A novel outbreak can lead to a breakdown in routine care in already stretched systems. During the Ebola outbreak, ill-prepared hospitals shut down to prevent in-hospital-transmission of the virus; emergency obstetric care decreased dramatically, leading to increased maternal mortality.²⁶⁷ Staff shortages required reducing hospital capacity.²⁶⁸ Patients attending healthcare facilities to treat noncommunicable diseases (NCDs) declined,²⁶⁹ while routine immunization services were disrupted.²⁷⁰ The Ebola epidemic instigated a 50% reduction in malaria, tuberculosis, and HIV treatment services in Guinea, Liberia, and Sierra Leone. With the wholesale breakdown in care and the diversion of funding to fight Ebola, people succumbed to everyday diseases; by the end of the outbreak, an estimated 10,623 additional people died of HIV, tuberculosis, and malaria.²⁷¹

²⁶³ See EBOLA SITUATION REPORT, WORLD HEALTH ORGANIZATION [WHO] 3 (2015); see also *Cost of the Ebola Epidemic*, CTRS. FOR DISEASE CONTROL & PREVENTION, <https://www.cdc.gov/vhf/ebola/outbreaks/2014-west-africa/cost-of-ebola.html> (last visited July 3, 2017).

²⁶⁴ See ANNA NICHOLSON ET AL., GLOBAL HEALTH RISK FRAMEWORK: RESILIENT AND SUSTAINABLE HEALTH SYSTEMS TO RESPOND TO GLOBAL INFECTIOUS DISEASE OUTBREAKS 38, 41 (2016).

²⁶⁵ *Global Health Workforce Shortage to Reach 12.9 Million in Coming Decades*, WORLD HEALTH ORG. (Nov. 11, 2013), <http://www.who.int/mediacentre/news/releases/2013/health-workforce-shortage/en/>.

²⁶⁶ See *id.*

²⁶⁷ See Kim J. Brolin Ribacke et al., *The Impact of the West Africa Ebola Outbreak on Obstetric Health Care in Sierra Leone*, PLOS ONE 2 (Feb. 24, 2016), <http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0150080> (discussing the negative repercussions of the Ebola outbreak on maternal health care).

²⁶⁸ See, e.g., *id.* at 6.

²⁶⁹ T. Samba et al., *Non-communicable Diseases in the Western Area District, Sierra Leone, Before and During the Ebola Outbreak*, 7 PUB. HEALTH ACTION SUPP. S16, S20 (2017).

²⁷⁰ See J.W.T. Elston et al., *Impact of the Ebola Outbreak on Health Systems and Population Health in Sierra Leone*, 38 J. PUB. HEALTH 674, 674–75 (2015).

²⁷¹ See Alyssa S. Parpia et al., *Effects of Response to 2014–2015 Ebola Outbreak on Deaths from Malaria, HIV/AIDS, and Tuberculosis, West Africa*, 22 EMERGING INFECTIOUS DISEASES 433, 439 (2016); see

Many low-resource countries, particularly in Africa, lack the diagnostic, tracking, and reporting tools necessary for a strong disease surveillance system,²⁷² leaving disease incidence woefully misunderstood and underreported. Without effective surveillance, outbreak detection and assessment becomes disorganized, and response too often fails.²⁷³ Essential medicines, including antibiotics and antiviral medications, are often unavailable to individuals in Africa, Southeast Asia, and the Western Pacific.²⁷⁴ Substandard and falsified medications can create antibiotic resistance and harm efforts to contain the spread of disease.²⁷⁵ Laws, regulations, and policies must be in place to manage the health system.²⁷⁶

If an infectious disease outbreak takes hold, States with robust health systems will have the power to mitigate its impact. Health systems with capable disease surveillance can detect a disease risk quickly, assess that risk, and respond accordingly.²⁷⁷ Outbreak preparedness includes having well-designed plans and protocols in place, as well as stockpiling vaccines, medicines, and personal protective equipment.²⁷⁸ Without sound preparation, health ministries, providers, and communities can waste valuable time making decisions about how to respond rather than executing an already well-devised plan. That critical period can constitute the difference in how quickly and extensively an infectious disease spreads.

The public health system is also the first line of defense against bioterrorism—the deliberate release of viruses, bacteria, or other agents to

also Cost of the Ebola Epidemic, CTRS. FOR DISEASE CONTROL & PREVENTION, <https://www.cdc.gov/vhf/ebola/outbreaks/2014-west-africa/cost-of-ebola.html> (last visited July 3, 2017).

²⁷² Ernest Tambo et al., *Need of Surveillance Response Systems to Combat Ebola Outbreaks and Other Emerging Infectious Diseases in African Countries*, 3 *INFECTIOUS DISEASES POVERTY*, 2014, at 1, 5.

²⁷³ See NICHOLSON ET AL., *supra* note 264, at 65–66.

²⁷⁴ See Sheila Mysorekar, *Silent Murder*, *International Relations and Cooperation*, DEV. & COOPERATION (Mar. 14, 2013), <https://www.dandc.eu/en/article/medicines-are-too-expensive-poor-people-developing-countries-local-production-could-make>. See generally 19TH WHO MODEL LIST OF ESSENTIAL MEDICINES, WORLD HEALTH ORGANIZATION [WHO] (2015) (listing of medicines to fulfill the minimal medical needs for the priority diseases in a basic health-care system).

²⁷⁵ Atholl Johnston & David W. Holt, *Substandard Drugs: A Potential Crisis for Public Health*, 78 *BRITISH J. CLINICAL PHARMACOLOGY* 218, 225–27 (2014).

²⁷⁶ See Roger Magnusson et al., *ADVANCING THE RIGHT TO HEALTH: THE VITAL ROLE OF LAW*, WORLD HEALTH ORGANIZATION [WHO] 1–2 (2017).

²⁷⁷ See generally PANDEMIC INFLUENZA PREPAREDNESS FRAMEWORK FOR THE SHARING OF INFLUENZA VIRUSES AND ACCESS TO VACCINES AND OTHER BENEFITS, WORLD HEALTH ORGANIZATION [WHO] (2011), [hereinafter PANDEMIC INFLUENZA PREPAREDNESS FRAMEWORK].

²⁷⁸ *Id.*

cause illness or death in people, and also in animals or plants.²⁷⁹ The “health care system should rapidly identify threats, help to prevent the spread of disease in the population, and care for infected patients.”²⁸⁰ The threat is so grave that, under international law, the Biological Weapons Convention (BWC) prohibits States Parties from developing, producing, and stockpiling biological weapons.²⁸¹ However, in the absence of a formal verification regime to monitor compliance, the BWC has limited effectiveness. States Parties, moreover, have thus far failed to adopt a supplementary protocol authorizing objective verification. Further, implementation capacities for the BWC are underfunded.²⁸² The 1997 U.N. Convention on the Suppression of Terrorist Bombings also makes the use of biological weapons against a civilian population a war crime, and potentially a crime against humanity.²⁸³ Still, criminal and political sanction cannot supplement adequate preparedness through a responsive health system.

Finally, to ensure global health security, health must be reflected across government, including through a “One Health” approach. This holistic response to infectious disease involves forging links between scientists and ministries concerned with human and animal health. It focuses on zoonotic diseases that spread from animals to humans, such as HIV, Ebola, and SARS.²⁸⁴ WHO and the OIE recognize the importance of the approach and have accordingly established an operational framework.²⁸⁵

One Health recognizes that monitoring diseases in animals can serve as an early warning; West Nile virus often kills birds before humans experience symptoms, for example.²⁸⁶ Further, preventing disease in animals can reduce

²⁷⁹ See David P. Fidler, *Bioterrorism, Public Health, and International Law*, 3 CHI. J. INT'L L. 7, 7–8 (2002).

²⁸⁰ Matthew K. Wynia & Lawrence O. Gostin, *Ethical Challenges in Preparing for Bioterrorism: Barriers Within the Health Care System*, 94 AM. J. PUB. HEALTH 1096, 1097 (2004).

²⁸¹ See Convention on the Prohibition of the Development, Production and Stockpiling of Bacteriological (Biological) and Toxin Weapons and on Their Destruction art. 1, Mar. 26, 1975, 26 U.S.T. 583, 1015 U.N.T.S. 163.

²⁸² See Gregory D. Koblentz & Paul F. Walker, *Can Bill Gates Rescue the Bioweapons Convention?*, BULL. ATOMIC SCIENTISTS (Apr. 3, 2017), <http://thebulletin.org/can-bill-gates-rescue-bioweapons-convention10665>.

²⁸³ See International Convention for the Suppression of Terrorist Bombings, Dec. 15, 1997, S. TREATY DOC. No. 106-6, 2149 U.N.T.S. 256.

²⁸⁴ See *One Health*, CTRS. FOR DISEASE CONTROL & PREVENTION, <https://www.cdc.gov/onehealth/> (last updated Aug. 4, 2017).

²⁸⁵ See WHO-OIE OPERATIONAL FRAMEWORK FOR GOOD GOVERNANCE AT THE HUMAN-ANIMAL INTERFACE, WORLD HEALTH ORGANIZATION [WHO] & WORLD ORGANISATION FOR ANIMAL HEALTH ix–x (2014).

²⁸⁶ See *One Health*, *supra* note 284.

transmission to humans.²⁸⁷ In India, dog vaccination brought a decline of human rabies cases to zero.²⁸⁸ Pursuing a One Health approach can be cost effective. In Canada, integrating animal and human facilities led to a 26% reduction in operation costs.²⁸⁹

Similarly, a One Health approach to AMR addresses food production and the health system: going beyond highly targeted policies such as improved clinical and patient education. Broader reforms need to be socially and institutionally embedded, such as more humane food production, without intense factory farming that requires heavy antibiotic prophylaxis; health systems capable of controlling infections and testing for resistance; and law enforcement to prevent and prosecute trafficking in fake medicines. Political momentum is growing, such as the 2016 U.N. High-Level meeting and G7 Health Ministers' declaration on AMR, but it remains to be seen whether the world will spring into action in time.²⁹⁰

1. *States' Duties to Conform to Global Norms*

States are legally obliged to prepare for, and effectively respond to, disease outbreaks. At the international level, states have committed to prioritizing strong health systems through the Sustainable Development Goals (SDGs), the IHR, and the right to health. The IHR are legally binding on all 196 States Parties. Further, all WHO Member States (except South Sudan) have ratified at least one international treaty committed to upholding the right to health.²⁹¹ The Constitution of the WHO also recognizes a right to health, while the Alma Ata declaration proclaimed a goal of "health for all" in 1978.²⁹² Furthermore, the right to health is incorporated into many national constitutions and domestic statutes, legally binding a government to ensure that the national health system realizes and maintains that right.²⁹³

²⁸⁷ See *One Health Basics: Zoonotic Diseases*, CTRS. FOR DISEASE CONTROL & PREVENTION, <https://www.cdc.gov/onehealth/basics/zoonotic-diseases.html> (last updated July 14, 2017).

²⁸⁸ WORLD BANK, *supra* note 100, at 28 tbl.8.1.

²⁸⁹ See *id.* at x.

²⁹⁰ See Press Release, Gen. Assembly, U.N., High-Level Meeting on Antimicrobial Resistance (Sept. 21, 2016), <http://www.un.org/pga/71/2016/09/21/press-release-hl-meeting-on-antimicrobial-resistance/>; see also DECLARATION OF THE G7 HEALTH MINISTERS OF 8 - 9 OCTOBER 2015, G7 GERMANY 3 (2015).

²⁹¹ See Lawrence Gostin & Devi Sridhar, *Global Health and the Law*, 370 NEW ENG. J. MED. 1732, 1736 (2014).

²⁹² E.g., Constitution of the World Health Organization, *supra* note 139, at pmb1.; see also DECLARATION OF ALMA ATA, WORLD HEALTH ORGANIZATION [WHO] arts. 2–3 (Sept. 6–12, 1978).

²⁹³ See THE RIGHT TO HEALTH IN THE CONSTITUTIONS OF MEMBER STATES OF THE WORLD HEALTH ORGANIZATION SOUTH-EAST ASIA REGION, WORLD HEALTH ORGANIZATION [WHO] REGIONAL OFFICE FOR SOUTH-EAST ASIA 2–3 (2011).

2. *The Right to the Highest Attainable Standard of Health*

Post-World War II, the international community enshrined health as a global public good, creating a trilogy of inspirational instruments. On December 10, 1948, the U.N. General Assembly adopted the Universal Declaration of Human Rights (UDHR) as a common standard for the universal respect for human rights, including the right to health.²⁹⁴ In the ensuing years, States have negotiated further international human rights treaties, enshrining a raft of rights relating to good health, including the rights to health, to life, and to a safe environment, without discrimination.²⁹⁵ Yet, accountability for adherence to the right to health is weak. While human rights treaty bodies require State reporting and permit “shadow” reporting by civil society organizations, they cannot coerce States to adhere to treaty norms.²⁹⁶ Human rights abuses, including abuses of the right to health, remain common.²⁹⁷

3. *The Sustainable Development Goals*

Building on existing commitments, in 2015, 193 United Nations Member States adopted the SDGs, with a bold vision: healthy people living on a habitable planet. Goal 3 addresses health, whereby governments agree to “[e]nsure healthy lives and promote well-being for all at all ages.”²⁹⁸ Universal health coverage (UHC) is one of the most important health targets: quality promotive, preventive, curative, rehabilitative, and palliative health services;

²⁹⁴ G.A. Res. 217 (III) A, Universal Declaration of Human Rights, at art. 25 (Dec. 10, 1948).

²⁹⁵ International Covenant on Economic, Social and Cultural Rights arts. 11–12, Dec. 16, 1966, 993 U.N.T.S. 3; International Covenant on Civil and Political Rights arts. 1, 3–4, 6, Dec. 16, 1966, S. TREATY DOC. No. 95-20, 999 U.N.T.S. 171.

²⁹⁶ See U.N. Commissioner for Human Rights, *Human Rights: Civil and Political Rights Fact Sheet No. 15*, 17 (May 2005), <http://www.ohchr.org/Documents/Publications/FactSheet15rev.1en.pdf>; U.N. Comm. on Econ., Soc. & Cultural Rights, *Monitoring the Economic, Social and Cultural Rights*, U.N. HUMAN RIGHTS OFFICE HIGH COMM’R, <http://www.ohchr.org/EN/HRBodies/CESCR/Pages/CESCRIntro.aspx> (last visited July 13, 2017).

²⁹⁷ See *Statistics of Recommendations*, UPR INFO, https://www.upr-info.org/database/statistics/index_issues.php?fk_issue=41&cycle= (last visited July 13, 2017) (showing human rights issues statistics on the Universal Periodic Review recommendations and voluntary pledges, such as since 2008, 1,712 recommendations to 184 States were made regarding the right to health).

²⁹⁸ See *Goal 3: Ensure Healthy Lives and Promote Well Being for All at All Ages*, UNITED NATIONS, <http://www.un.org/sustainabledevelopment/health/> (last visited Feb. 16, 2018); see also *Historic New Sustainable Development Agenda Unanimously Adopted by 193 U.N. Members*, UNITED NATIONS (Sept. 25, 2015), <http://www.un.org/sustainabledevelopment/blog/2015/09/historic-new-sustainable-development-agenda-unanimously-adopted-by-193-un-members/>.

access to safe, effective, and affordable essential medicines and vaccines; and protection from financial hardship.²⁹⁹

The SDGs are not legally binding, but aspirational goals.³⁰⁰ Despite the absence of formal legal authority, the SDGs still embed a collective international responsibility to ensure good health. While they aspire to vastly reduce poverty and ill health, the SDGs will require resource mobilization, measurable indicators, and accountability mechanisms.

4. *International Health Regulations*

While the SDGs and the right to health set high-level norms for robust health systems, the IHR impose specific and concrete obligations on states to develop national capacities to detect, report, and respond to outbreaks.³⁰¹ Yet by 2014, little more than 30% of States Parties reported meeting these responsibilities.³⁰² Further, the noncompliance rate is likely higher, as this is based on self-evaluation. High-income states have not offered developing countries the resources needed to shore up core capacities, despite IHR language encouraging collaboration.³⁰³ WHO, moreover, cannot impose sanctions on states for failing to fulfill responsibilities, and the agency does not have many incentives to offer to non-complying states. Crucial reforms include rigorous matrices for meeting health system capacities, independent external evaluations, transparency, and accountability.³⁰⁴

In 2016, WHO announced a new framework to monitor IHR core capacities, the Joint External Evaluation (JEE).³⁰⁵ JEE, which integrates and improves upon President Obama's Global Health Security Agenda (GHS) matrices,³⁰⁶ relies on external independent experts working alongside national

²⁹⁹ See TRACKING UNIVERSAL HEALTH COVERAGE: FIRST GLOBAL MONITORING REPORT, WORLD HEALTH ORGANIZATION [WHO] & WORLD BANK GROUP [WBG] 7 (2015).

³⁰⁰ See Jerome Amir Singh, *The Sustainable Development Goals*, 29 SIGHT & LIFE MAG., 2015 at 58, 58.

³⁰¹ World Health Organization International Health Regulations, art. 5, 2005, 2509 U.N.T.S. 79 [hereinafter IHR]; see also *id.* at annex 1.

³⁰² See *Spotlight: International Health Regulations 2015*, CTRS. FOR DISEASE CONTROL & PREVENTION, <http://www.cdc.gov/globalhealth/ihr/> (last updated July 6, 2015).

³⁰³ See IHR, *supra* note 301, at annex 1(a).

³⁰⁴ See Director-General, World Health Org. [WHO], 69th World Health Assembly, *Implementation of the International Health Regulations (2005): Report of the Review Committee on the Role of the International Health Regulations (2005) in the Ebola Outbreak and Response*, WHO Doc. A69/21 (May 13, 2016); *Joint External Evaluation Tool: International Health Regulations*, WORLD HEALTH ORGANIZATION [WHO] (2016).

³⁰⁵ See Director-General, World Health Org. [WHO], 69th World Health Assembly, *Implementation of the International Health Regulations (2005): Annual Report on the Implementation of the International Health Regulations (2005)*, ¶ 17, WHO Doc. A69/20 (May 18, 2016).

³⁰⁶ Press Release, Office of Press Sec'y, White House, Executive Order—Advancing the Global Health

health officials, with outcomes made fully transparent.³⁰⁷ Governments are then expected to develop country action plans. JEE is voluntary; as of 2017, thirty-three States had completed evaluations, with thirty-two more planning to undertake the JEE.³⁰⁸ However, there is a five-year interval between JEE evaluations,³⁰⁹ which is too long given the need for up-to-date capacities. WHO also encourages States to conduct in-country simulations, such as “tabletop” exercises—role-playing a national health emergency.³¹⁰

Still, the IHR is unlikely to reach its full potential unless political leaders prioritize funding and empower WHO. The JEE is critically underfunded. While the GHSA provided \$1 billion toward building and evaluating core capacities,³¹¹ the Trump Administration is unlikely to reauthorize GHSA funding. The World Bank’s PEF could condition grants based on completion of the JEE process, but PEF itself is narrowly focused and under-funded.³¹² One approach could be for the International Monetary Fund (IMF) to include national preparedness in its macro-economic assessments. Countries pay close attention to IMF assessments because it expands their access to capital.³¹³ Long-term, sustainable funding is necessary to guarantee effectiveness.

F. Equitable Research and Development

When novel diseases take hold and spread, particularly in lower-income countries, the absence of effective vaccines and treatments is painfully obvious. Think about most of the major global health crises in recent memory—there were few, if any, medical countermeasures in the research and development (R&D) pipeline. From SARS and MERS, to Ebola and Zika, nations were bereft of effective countermeasures, instead left to implement crude responses such as isolation and quarantine, along with fever-screening at the borders.

Security Agenda to Achieve a World Safe and Secure from Infectious Disease Threats (Nov. 4, 2016).

³⁰⁷ See *Joint External Evaluation Tool: International Health Regulations*, *supra* note 304.

³⁰⁸ *Joint External Evaluation*, CTNS. FOR DISEASE CONTROL & PREVENTION, <https://www.cdc.gov/globalhealth/healthprotection/fieldupdates/winter-2017/joint-external-evaluation.html> (last visited July 13, 2017).

³⁰⁹ *Joint External Evaluation Tool: International Health Regulations*, *supra* note 304.

³¹⁰ WHO SIMULATION EXERCISE MANUAL, WORLD HEALTH ORGANIZATION [WHO] (2017).

³¹¹ See GLOB. HEALTH SEC. AGENDA, ADVANCING THE GLOBAL HEALTH SECURITY AGENCY: PROGRESS AND EARLY IMPACT FROM U.S. INVESTMENT, <https://www.ghsagenda.org/docs/default-source/default-document-library/ghsa-legacy-report.pdf?sfvrsn=12> (last visited Feb. 17, 2018); *What is GHSA?*, GLOBAL HEALTH SECURITY AGENCY, <https://ghsagenda.org/> (last visited Nov. 22, 2017).

³¹² See Jeff Tyson, *Inside the World Bank’s Pandemic Emergency Facility*, DEVEX (May 23, 2016), <https://www.devex.com/news/inside-the-world-bank-s-pandemic-emergency-facility-88195>.

³¹³ See THE NEGLECTED DIMENSION OF GLOBAL SECURITY, *supra* note 2, at 34.

How do states transition from a landscape of underinvestment and delayed R&D for infectious diseases—whether ancient scourges like tuberculosis, reemerging infections like Ebola, or AMR pathogens—to robust investment and rapid deployment? Emerging and resurgent infectious diseases demand tools and technologies, such as vaccines, drugs, diagnostics, personal protective equipment, and medical devices. Yet, novel infectious diseases lack market-driven incentives: the next epidemic is difficult to predict and likely to hit poor countries first.

As evident from the Ebola commission reports, an effective R&D strategy requires an international coordinating entity; sustainable investments; convergence of diverse regulatory pathways; and access to intellectual property, data, and biological samples—ensuring rigorous scientific standards.³¹⁴ To ensure rapid rollout of medical countermeasures, the R&D community must cultivate knowledge and products ready for advanced development when an outbreak strikes. The potential of medical countermeasures to contain outbreaks or minimize harm make them vital investments. How do we transition from an R&D landscape where a vaccine can take over ten years to develop³¹⁵ to investment and rapid deployment? Have recent initiatives gone far enough?

1. Perverse R&D Incentives Fueling Health Inequalities

Pharmaceutical companies have financial incentives to invest in treatments for “profitable” diseases, not novel viruses or diseases endemic in poor countries. Diseases like tuberculosis that are concentrated among poorer, marginalized populations have a low global priority for research and development. For instance, for decades, research into new drugs for tuberculosis all but ground to a halt—leaving patients with complex, lengthy drug regimens with, particularly for multi-drug-resistant tuberculosis, serious side effects. With a renewed focus on tuberculosis following the Millennium Development Goals (MDGs), funding for tuberculosis R&D rose from \$358 million in 2005 to \$637 million in 2009.³¹⁶ Yet, it remains only a fraction of

³¹⁴ See *id.* at 72; see also EBOLA INTERIM ASSESSMENT PANEL, *supra* note 147, at 21–22.

³¹⁵ See Lena H. Sun, *Scientists Don't Have a Decade to Find a Zika Vaccine. They Need Volunteers Now*, WASH. POST (Jan. 12, 2017, 3:53 PM), https://www.washingtonpost.com/national/health-science/three-volunteers-on-the-front-lines-of-zika-vaccine-testing/2017/01/12/9d0f1b76-bbff-11e6-ac85-094a21c44abc_story.html?utm_term=.fcdc74934aaa.

³¹⁶ MIKE FRICK, TREATMENT ACTION GRP., 2015 REPORT ON TUBERCULOSIS RESEARCH FUNDING TRENDS, 2005–2014: A DECADE OF DATA 3 (2015).

what is needed.³¹⁷ Strategic investments in and altered incentive systems for R&D could restock the antimicrobial pipeline. For instance, a modest security dividend of \$16 billion every ten years could support fifteen new drugs.³¹⁸

Like tuberculosis, Ebola and Zika are not new diseases—Ebola emerged nearly four decades ago, and Zika was first detected in humans in 1952.³¹⁹ Yet, in recent outbreaks, countermeasures were not prioritized, and when they escalated into global health emergencies, there was no operational vaccine. This inertia is attributable not to biology and science, but the low priority, limited funding, and practical challenges of conducting human trials for episodic infections. A mere \$3.2 billion was invested in R&D of more than twenty neglected diseases in 2013, compared to \$500 million for Ebola when the outbreak occurred.³²⁰ Driven by the recent outbreak, an Ebola vaccine—rVSV-ZEBOV—is now in the final stages, but it required major investments from both public and private entities.³²¹ This vaccine is in fact not new; it was first created in 2003, but stalled due to prohibitive costs, which the countries known to experience Ebola were ill-equipped to pay.³²² But will those without the means be able to access the vaccine in time? Despite huge public investments in developing a Zika vaccine, the United States controversially sold exclusive rights of a potential vaccine to a pharmaceutical company, meaning that States affected by Zika may have to buy the vaccine back at exorbitant costs.³²³

While international law recognizes the need for exceptions to strict patent protections in these emergency situations, States are often unwilling or unable to exercise these rights. For instance, the Doha Declaration underscores States' rights to use flexibilities that provide exceptions and limitations to improve

³¹⁷ *Id.*

³¹⁸ Lawrence O. Gostin & Eric A. Friedman, *Reimagining WHO: Leadership and Action for a New Director-General*, 389 *LANCET* 755, 755 (2017).

³¹⁹ See *Zika Virus*, WORLD HEALTH ORG. (Sept. 6, 2016), <http://www.who.int/mediacentre/factsheets/zika/en/>; see also *Ebola Virus Disease*, WORLD HEALTH ORG. (June 2017), <http://www.who.int/mediacentre/factsheets/fs103/en/>.

³²⁰ See U.N. HIGH-LEVEL PANEL, *supra* note 147, at ¶¶ 185, 216.

³²¹ See News Release, World Health Org., *Final Trial Results Confirm Ebola Vaccine Provides High Protection Against Disease* (Dec. 23, 2016).

³²² See Ed Yong, *A Global Plan to Defend Against the Future's Deadliest Diseases*, ATLANTIC (Jan. 18, 2017), <https://www.theatlantic.com/science/archive/2017/01/cepi-vaccines/513335/>.

³²³ See Alison Kodjak, *States Fear Price of New Zika Vaccine Will Be More than They Can Pay*, NPR (May 30, 2017, 7:36 AM), <https://www.npr.org/sections/health-shots/2017/05/30/529887446/states-fear-price-of-new-zika-vaccine-will-be-more-than-they-can-pay>.

availability and accessibility of essential medicines.³²⁴ The Declaration further provides for compulsory licensing³²⁵ and parallel importation of patented medicines for countries with insufficient manufacturing capacities.³²⁶ Yet, politics, pressure from industry, and lack of legal capacity often inhibit States' abilities to exercise these protections, meaning that nationals lack access to life saving countermeasures.³²⁷

2. *Solidarity Through WHO*

To address these limitations, WHO should prioritize potentially high-value diagnostics, vaccines, and therapies for pathogens with pandemic potential as well as their equitable distribution. To enable researchers to develop a vaccine for novel pathogens, the first step is to identify, and then share the pathogen. In the case of pandemic influenza, WHO Member States have agreed on innovative global governance arrangements. WHO's Global Influenza Surveillance and Response System (GISRS)—formerly the Global Influenza Surveillance Network—serves as a global alert system for the emergence of influenza with pandemic potential. GISRS monitors the evolution of influenza viruses and provides recommendations regarding laboratory diagnostics, vaccines, antiviral susceptibility, and risk assessment.³²⁸

GISRS, however, is a non-binding system, which means that states are not mandated to share virus samples with WHO laboratories. In 2007, the system was shaken by Indonesia's assertion of sovereignty, grounded on the Convention on Biological Diversity, over influenza A(H5N1) isolated within its territory. Indonesia argued that pharmaceutical companies were gaining free access to its nationals' "property," only to sell the eventual vaccine back at

³²⁴ See World Trade Organization, Ministerial Declaration of 14 November 2001, WTO Doc. WT/MIN(01)/DEC/1, 41 ILM 746 (2002) [hereinafter Doha Declaration]; Do Hyung Kim, *Research Guide on TRIPS and Compulsory Licensing: Access to Innovative Pharmaceuticals for Least Developed Countries*, GLOBALLEX (Feb. 2007), http://www.nyulawglobal.org/globalex/TRIPS_Compulsory_Licensing.html.

³²⁵ See Doha Declaration, *supra* note 324, at ¶ 5.

³²⁶ See *id.* at ¶ 6; see also Abdulqawi A. Yusuf, *TRIPS: Background, Principles and General Provisions*, in *INTELLECTUAL PROPERTY AND INTERNATIONAL TRADE: THE TRIPS AGREEMENT 3-4* (Carlos M. Correa & Abdulqawi A. Yusuf, eds., 3d ed. 2016).

³²⁷ See Kim, *supra* note 324.

³²⁸ See World Health Org. [WHO], 64th World Health Assembly, *Pandemic Influenza Preparedness Framework for Sharing of Influenza Viruses and Access to Vaccines and Other Benefits*, at 33, WHO Doc. A64/8 (May 5, 2011) [hereinafter PIP Framework] ("Annex 4: Guiding Principles for the development of Terms of Reference for current and potential future WHO global influenza surveillance and response system (GISRS) laboratories for H5N1 and other human pandemic influenza viruses").

exorbitant costs.³²⁹ This was not without grounds; during the 2009 H1N1 pandemic, wealthy countries had agreements with pharma companies that enabled them to access the vaccine, whereas poorer countries did not.³³⁰

Following Indonesia's refusal to share the virus, WHO adopted the Pandemic Influenza Preparedness (PIP) Framework in May 2011, following years of tense negotiations.³³¹ The framework is a landmark in global governance for health, representing the first international agreement on influenza virus and benefit sharing. States commit to voluntarily share viruses with GISRS, guided by the principle of solidarity. While the framework is not legally binding on States, companies enter binding contracts where they agree to make contributions to WHO, providing benefits to developing countries (such as vaccine donations and granting royalty-free licenses to manufacturers in developing countries) in exchange for access to biological materials needed for R&D. The PIP Framework, however, does not expressly cover genetic sequencing data that are increasingly used to transfer knowledge. Nor does it cover non-pandemic influenza materials or, for that matter, any other pathogen, such as Ebola, Zika, or corona viruses. Therefore, it is necessary to extend these protections to other types of viruses to ensure equitable distribution.

3. *Galvanizing Action*

The failure of industry to swiftly and equitably develop vaccines has galvanized international action. For instance, the U.N. High-Level Panel recommended developing a \$1 billion funding mechanism. The panel advised that funds should be directed to global priorities, abiding by the principles of open access and data sharing, and that research products should be treated as public goods.³³²

Firstly, responding to recommendations for greater engagement from WHO in R&D,³³³ WHO established an R&D Blueprint for Action to reduce delay between declaring an emergency and the availability of medical interventions.³³⁴ It will include a Global Coordination Mechanism (GCM) with

³²⁹ See Laurie Garrett & David P. Fidler, *Sharing H5N1 Viruses to Stop a Global Influenza Pandemic*, 4 PLOS MED. 1712, 1712–13 (2007).

³³⁰ See Noni MacDonald, *H1N1 Influenza Vaccine: Global Access for a Global Problem*, 181 CMAJ 123 (2009).

³³¹ See PIP Framework, *supra* note 328.

³³² See Moon et al., *supra* note 147.

³³³ See THE NEGLECTED DIMENSION OF GLOBAL SECURITY, *supra* note 2, at 69.

³³⁴ See AN R&D BLUEPRINT FOR ACTION TO PREVENT EPIDEMICS, WORLD HEALTH ORGANIZATION [WHO] (2017).

WHO at the helm.³³⁵ The Blueprint's focus includes: prioritization of a shortlist of pathogens most likely to lead to epidemics, developing an operational plan to transition from preparedness to response, identifying research priorities for urgent pathogens, coordinating stakeholders and expanding capacity, assessing preparedness and impact of intervention, and exploring funding models for R&D preparedness and response.³³⁶

Secondly, and drawing on the Blueprint, CEPI was launched in January 2017 at the World Economic Forum. CEPI is a partnership between governments and the private sector, including the Gates Foundation and leading pharmaceutical companies. It focuses on prioritizing global infectious disease threats, identifying research priorities, global coordination and expanding capacity, continuous assessment, and mobilizing funding.³³⁷

CEPI aims to stimulate the development of new vaccines against diseases that could cause the next devastating epidemic but do not offer a sufficient economic incentive for pharmaceutical companies. For now, CEPI is focusing on three diseases (MERS, Nipah, and Lassa fever), bringing vaccines from development through preclinical research.³³⁸ The vaccines will then be stored in a holding pattern until an outbreak, and they can be rapidly tested and accelerated toward manufacture deployment. CEPI has already raised \$540 million, with pledges totaling \$790 million.³³⁹

Accelerated research is also needed to maximize knowledge of pathogens with pandemic potential, including hundreds yet to be discovered, establishing a foundation of knowledge for outbreak detection and future research. Since 2009, one such effort, the PREDICT project, has identified more than 820 novel viruses in wild animals and humans in thirty countries.³⁴⁰ Such efforts

³³⁵ See *Global Coordination Mechanism*, WORLD HEALTH ORG., http://www.who.int/blueprint/what/improving-coordination/global_coordination_mechanism/en/ (last visited July 13, 2017).

³³⁶ See AN R&D BLUEPRINT FOR ACTION TO PREVENT EPIDEMICS, *supra* note 334.

³³⁷ See *Approach*, CEPI, <http://cepi.net/approach> (last visited Nov. 22, 2017) ("CEPI wants to galvanise the development of new vaccines against diseases we know could cause the next devastating epidemic.").

³³⁸ Stephanie Soucheray, *New \$460 Million Effort Takes Aim at MERS, Lassa, Nipah*, CIDRAP NEWS (Jan. 19, 2017), <http://www.cidrap.umn.edu/news-perspective/2017/01/new-460-million-effort-takes-aim-mers-lassa-nipah>.

³³⁹ See Michael Dumiak, *A Crisis Gives You Wings*, 21 IAVIREPORT, 2017, at 4, 4–5; *PREDICT: The World's Most Comprehensive Zoonotic Disease Surveillance & Capacity Development Program*, U.C. DAVIS VETERINARY MED., http://www.vetmed.ucdavis.edu/ohi/predict/predict_what-weve-found.cfm (last visited Nov. 22, 2017).

³⁴⁰ *Id.*

are eminently affordable—\$175 million is supporting PREDICT’s work in thirty-five countries³⁴¹—and need to be brought to scale in every country.

At the same time, scientific freedom and biosecurity must be balanced. While open research is vital to scientific breakthroughs, dual use research of concern can also pose biosecurity threats, especially in less secure facilities. Researchers could further recreate an ancient virus, like smallpox, which could either improve the existing vaccine or be potentially manipulated to form a dangerous virus.³⁴² While access to certain genetic materials, like smallpox, is prohibited, other materials are easy to access through the internet. Dual use research of concern goes through an extra round of review in the United States, while WHO cautions that no institution should hold more than 20% of the smallpox virus’s genome.³⁴³ Yet, there are no universal rules, and biosecurity measures vary considerably. Even if there were rules, it is near impossible to monitor every company in the world.

Effective R&D for global health security requires investment from multiple actors. As pharma companies often lack financial incentives, nation States and private donors should support and invest in an R&D agenda driven by equity, solidarity, and economic sense. Otherwise, when the next epidemic strikes—be it severe fever with thrombocytopenia syndrome, Nipah, or a yet unheard-of pathogen—the international community will be as ill prepared as ever.

G. Effectively Communicating Public Health Messages

Lastly, failures in communication systems between health workers, patients, community members, and public health officials undermine timely, transparent, and accurate information during an outbreak.³⁴⁴ Outbreaks trigger panic and can undermine the trust that is central to an effective response. The devastation caused by Ebola was escalated by a deep distrust among communities of the government and foreigners, as their governments had a history of corruption, poor governance, and even brutality.³⁴⁵ This created major obstacles for WHO, governments, and other responders, as people failed to heed public health messages.

³⁴¹ Interview with Dr. Jonna Mazet, Principal Investigator and Director, PREDICT, (Mar. 7, 2016).

³⁴² See Kai Kupferschmidt, *How Canadian Researchers Reconstituted an Extinct Poxvirus for \$100,000 Using Mail-Order DNA*, SCI. MAG. (July 6, 2017, 5:00 PM), <http://www.sciencemag.org/news/2017/07/how-canadian-researchers-reconstituted-extinct-poxvirus-100000-using-mail-order-dna>.

³⁴³ See Achenbach & Sun, *supra* note 11.

³⁴⁴ See NICHOLSON ET AL., *supra* note 264.

³⁴⁵ See Ranu S. Dhillon & J. Daniel Kelly, *Community Trust and the Ebola Endgame*, 373 NEW ENG. J. MED. 787, 787–89 (2015).

Yet, public authorities often overreact, and reach for counterproductive measures that drive fear. During the SARS epidemic of 2003, China and Singapore employed mass quarantines, sometimes monitored by guards or ankle bracelets.³⁴⁶ In Taiwan, over 150,000 individuals were quarantined, although there were only twenty-four confirmed cases.³⁴⁷ In the Republic of Korea, breaking quarantine for MERS-CoV was made a criminal offense, risking up to two years in prison.³⁴⁸ Where nations target the vulnerable or neglect disadvantaged groups, they erode the values necessary to promote public trust. During the West African Ebola outbreak, authorities in Liberia cordoned off the West Point slum of the capital where the disease was rapidly spreading.³⁴⁹ *Cordon sanitaire* imposes enormous social, economic, and trust costs for very few benefits. There are few instances where it is appropriate. Riots broke out, and in the chaos, authorities shot a fifteen-year-old boy.³⁵⁰ Poor communication exacerbated the distrust, led to resistance, and eventually resulted in violence. In one horrifying instance, villagers in rural Guinea attacked and killed eight health workers and journalists.³⁵¹

Instead, to build trust and stability, governments' responses to outbreaks must be driven by solidarity. Vulnerable communities should not be abandoned. Health authorities should mitigate fear and promote trust by providing evidence-based prevention and adequate treatment. States should further strive for a more coherent balance between individual freedoms and public health necessity. In light of states' obligations under international human rights law, public health powers are not unlimited, but must be exercised in a manner proportionate to the threat, and should be non-

³⁴⁶ See Martin Cetron et al., *Isolation and Quarantine: Containment Strategies for SARS 2003*, in LEARNING FROM SARS: PREPARING FOR THE NEXT DISEASE OUTBREAK: WORKSHOP SUMMARY 71, 77 (Stacey Knobler et al. eds., 2004); Amena Ahmad et al., *Controlling SARS: A Review on China's Response Compared with Other SARS-Affected Countries*, 14 TROPICAL MED. & INT'L HEALTH 36, 36–45 (2009).

³⁴⁷ See Ying-Hen Hsieh et al., *Quarantine for SARS, Taiwan*, 11 EMERGING INFECTIOUS DISEASES 278, 278 (2005); Richard Schabas, *Severe Acute Respiratory Syndrome: Did Quarantine Help?*, 15 CAN. J. INFECTIOUS DISEASES & MED. MICROBIOLOGY 204, 204 (2004).

³⁴⁸ See Eric Dodds, *South Korea Authorizes Prison Time for MERS Patients Who Break Quarantine*, TIME (June 26, 2015), <http://time.com/3938212/south-korea-mers-quarantine/>.

³⁴⁹ Norimitsu Onishi, *Clashes Erupt as Liberia Sets an Ebola Quarantine*, N.Y. TIMES (Aug. 21, 2014), <https://www.nytimes.com/2014/08/21/world/africa/ebola-outbreak-liberia-quarantine.html>.

³⁵⁰ See Marc Silver, *In Riots Sparked by an Ebola Quarantine, A Teen Is Shot and Dies*, NPR: HEALTH, (Aug. 22, 2014, 10:06 AM), <https://www.npr.org/sections/goatsandsoda/2014/08/22/342404795/in-riots-sparked-by-an-ebola-quarantine-a-teen-is-shot-and-dies>.

³⁵¹ See *Ebola Outbreak: Guinea Health Team Killed*, BBC (Sept. 19, 2014), <http://www.bbc.com/news/world-africa-29256443>.

discriminatory and evidence-based. Any infringement of liberty must be the least restrictive alternative.³⁵²

The Ebola epidemic also illustrated how cultural factors can facilitate the spread of disease, and the importance of conveying and implementing public health messages in a manner that is culturally sensitive. With burial rituals a key factor in the spread of Ebola in the region, WHO and others failed to appreciate the value of an anthropological approach to stopping the epidemic.³⁵³ A traditional funeral and burial ceremony of an Ebola-infected deceased person resulted in more than 300 new Ebola cases.³⁵⁴ Health workers belatedly pursued the support of community leaders, who were persuaded to adapt cultural beliefs, such as burial practices, in light of the emergency.³⁵⁵ Lately, WHO has supported the deployment of anthropologists to help understand local culture, behavior and traditions.³⁵⁶ Control measures like changes to burial practices and quarantine require deep local cultural knowledge, which civil society, the community, and experts can bring. Again, trust between communities and officials is vital.

Further, mass media, including social networking, can either be a tool for fighting infectious disease or an instigator for greater spread. During an outbreak, people are desperate for any useful information, regardless of its source (traditional mass media, such as radio, television, or newspaper; or social media, such as Twitter, Facebook, and YouTube). However, the information circulated on social media could be misleading or dangerously incorrect. For example, during the West African Ebola outbreak, media overreaction in the United States fueled panic and calls for unwarranted restrictions.³⁵⁷ In the affected regions, medical misinformation (such as using

³⁵² See RUTH GAARE BERNHEIM, ET AL., *ESSENTIALS OF PUBLIC HEALTH ETHICS* 8 (2015).

³⁵³ See Angellar Manguvo & Benford Mafuvadze, *The Impact of Traditional and Religious Practices on the Spread of Ebola in West Africa: Time for a Strategic Shift*, PAN AFR. MED. J. (SUPP. 1), Oct. 10, 2015, at 1,1.

³⁵⁴ *Sierra Leone: A Traditional Healer and a Funeral*, WORLD HEALTH ORG., <http://www.who.int/csr/disease/ebola/ebola-6-months/sierra-leone/en/> (last visited Feb. 17, 2018).

³⁵⁵ See Amy Maxmen, *An Epidemic Evolves: How the Fight Against Ebola Tested a Culture's Traditions*, NAT'L GEOGRAPHIC (Jan. 30, 2015), <https://news.nationalgeographic.com/2015/01/150130-ebola-virus-outbreak-epidemic-sierra-leone-funerals/>.

³⁵⁶ See *Anthropologists Work with Ebola-Affected Communities in Mali*, WORLD HEALTH ORG. (Jan. 2015), <http://www.who.int/features/2015/anthropologists-ebola-mali/en/>; Sheri Fink, *W.H.O. Leader Describes the Agency's Ebola Operations*, N.Y. TIMES (Sept. 4, 2014), https://www.nytimes.com/2014/09/04/world/africa/who-leader-describes-the-agencys-ebola-operations.html?_r=0.

³⁵⁷ See, e.g., Saeed Ahmed & Dorrine Mendoza, *Ebola Hysteria: An Epic, Epidemic Overreaction*, CNN: HEALTH (Oct. 20, 2014, 8:57 PM), <http://www.cnn.com/2014/10/20/health/ebola-overreaction/index.html>.

the plant ewedu as a “cure,” blood transfusions, and drinking salty water) was commonly tweeted.³⁵⁸ Therefore, public health authorities and community leaders should promote trustworthy sources, while debunking false information.

To build trust and public ownership, effective public health interventions should harness public support. Community-driven solutions can effectively tailor disease control approaches to local needs. Still, communities may reject novel approaches where their concerns are not adequately alleviated. In the United States, constituencies in Monroe County voted fifty-eight to forty-two in favor of releasing genetically modified mosquitoes that could reduce populations of *Aedes aegypti*. But, the community of Key Haven, where the mosquitoes would be released, opposed the resolution by a sixty-five to thirty-five margin.³⁵⁹ Therefore, the populations most affected must be central to any response.

Accordingly, governments should liaise with the community to ensure viable public health measures. In response to ongoing circulating avian influenzas, Chinese authorities sometimes shut down live poultry markets. While this appears to be effective in reducing virus transmission, permanent closures lack public support. High percentages of Chinese prefer to buy from wet markets to ensure their meat is fresh. Instead, less disruptive practices may be more effective, such as separating types of poultry by species, redesigning poultry cages, and closing the markets for off-days.³⁶⁰

CONCLUSION: FROM AN UNVIRTUOUS CYCLE OF COMPLACENCY AND PANIC TO GLOBAL HEALTH PREPAREDNESS

This is a pivotal moment for the future of global health security—the West African Ebola outbreak has prompted renewed momentum. Here we set a clear path for beefing up epidemic preparedness. Instead of lurching from crisis to crisis, the international community should urgently translate the lessons learned into sustained investments in pandemic preparedness. Global solidarity and cooperation are more important than ever to address critical policy,

³⁵⁸ See Sunday Oluwafemi Oyeyemi et al., *Ebola, Twitter, and Misinformation: A Dangerous Combination?*, *BMJ* (Oct. 14, 2014), <http://www.bmj.com/content/349/bmj.g6178>.

³⁵⁹ See William Axford, *Keys Bug Board Says No to Contract for Genetically Modified Mosquitoes Unless Feds Approve*, *MIAMI HERALD: FLA. KEYS* (Apr. 22, 2015, 7:39 AM), <http://www.miamiherald.com/news/local/community/florida-keys/article19207230.html>.

³⁶⁰ See Jun Yuan et al., *Effect of Live Poultry Market Closure on Avian Influenza A(H7N9) Virus Activity in Guangzhou, China, 2014*, 21 *EID J.* 1784, 1790 (2015).

operational, and capacity barriers to global health security. Enhanced health security requires greater equity and fairness in the distribution of health services and resources. Ultimately, this requires robust investment, invigorated international and national leadership, resourced health systems, cutting-edge R&D, and trust and communication. If not, when the next pandemic hits, it might not be easily defeated. Unless the world acts now, global awareness will fade as we tumble toward the next public health crisis.