

# Applying Lessons Learned from COVID-19 Research and Development to Future Epidemics: A Workshop

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Health and Medicine Division  
Board on Global Health  
Forum on Microbial Threats

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Workshop Briefing Book  
December 7-8, 2022

## Contents

About the Forum	2
Forum Members	5
Workshop Background	7
Workshop Agenda	8
Planning Committee Roster	12
Planning Committee Biographies	13
Speaker Biographies	18
National Academies' Statement on Preventing Discrimination, Harassment, and Bullying	28
National Academies' Statement on Diversity and Inclusion	29

## About the Forum

The Forum on Microbial Threats of the National Academies of Sciences, Engineering, and Medicine (National Academies) was created in 1996 at the request of the Centers for Disease Control and Prevention and the National Institutes of Health to provide a structured opportunity for discussion and scrutiny of critical, and possibly contentious, scientific and policy issues related to research on and the prevention, detection, surveillance, and responses to emerging and reemerging infectious diseases in humans, plants and animals as well as the microbiome in health and disease. The Forum brings together leaders from government agencies, industry, academia, and nonprofit and philanthropic organizations to facilitate cross-sector dialogue and collaboration through public debate and private consultation to stimulate original thinking about the most pressing issues across the spectrum of microbial threats.

Despite decades of progress, the need for the Forum on Microbial Threats remains. Emerging and persistent problems such as Ebola, Chikungunya, Zika, yellow fever, antibiotic resistance, and, in recent years, MERS and COVID-19 demonstrate how the issue of infectious threats is global and unrelenting. The drivers are ever more pervasive, and the consequences—human, social, and economic—loom larger than ever.

The Forum convenes several times each year to identify and discuss key problems and strategies in the area of microbial threats. To supplement the perspectives and expertise of its members, the Forum also holds public workshops to engage a wide range of experts, members of the public, and the policy community. All workshops are summarized in high quality scholarly workshop proceedings that are available for free download from the National Academies Press.

The Forum on Microbial Threats is part of the National Academies' Board on Global Health. For more information about the Forum, please visit our website:

[www.nationalacademies.org/microbalthreats](http://www.nationalacademies.org/microbalthreats).

## Sponsors

- U.S. Agency for International Development
- U.S. Centers for Disease Control and Prevention
- U.S. Department of Veterans Affairs
- U.S. Food and Drug Administration
- U.S. National Institute of Allergy and Infectious Diseases
- Uniformed Services University of the Health Sciences
- Burroughs Wellcome Fund
- American Society of Tropical Medicine and Hygiene
- EcoHealth Alliance
- ExxonMobil
- Infectious Diseases Society of America
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- New Venture Fund
- Rockefeller Foundation
- Sanofi Pasteur
- Society of Infectious Diseases Pharmacists

*The Forum greatly appreciates our sponsors that make intellectual and financial contributions to the Forum's work.*

## Highlights of Recent Publications

- *Toward a Post-Pandemic World: Lessons from COVID-19 for Now and the Future: Proceedings of a Workshop (2022)*
- *Innovations for Tackling Tuberculosis in the Time of COVID-19: Proceedings of a Workshop (2022)*
- *Systematizing the One Health Approach in Preparedness and Response Efforts for Infectious Disease Outbreaks: Proceedings of a Workshop (2022)*
- *The Critical Public Health Value of Vaccines: Tackling Issues of Access and Hesitancy: Proceedings of a Workshop (2021)*
- *Vaccine Access and Hesitancy: Part One of a Workshop Series: Proceedings of a Workshop—In Brief (2020)*
- *Exploring the Frontiers of Innovation to Tackle Microbial Threats: Proceedings of a Workshop (2020)*
- *The Convergence of Infectious Diseases and Noncommunicable Diseases: Proceedings of a Workshop (2019)*
- *Exploring Lessons Learned from a Century of Outbreaks: Readiness for 2030: Proceedings of a Workshop (2019)*
- *Understanding the Economics of Microbial Threats: Proceedings of a Workshop (2018)*
- *Urbanization and Slums: Infectious Diseases in the Built Environment: Proceedings of a Workshop (2018)*
- *Combating Antimicrobial Resistance: A One Health Approach to a Global Threat: Proceedings of a Workshop (2017)*

## Forum's Action Collaborative – One Health

The Forum's One Health Action Collaborative (OHAC), led by Gail Hansen, D.V.M., is an ad hoc activity that engages a community of participants who are interested in contributing to ongoing exploration and information sharing related to one health topics. OHAC is committed to accelerating the implementation of a one health approach in the field to counter microbial threats. Members include a subset of forum members and a diverse range of external stakeholders from multiple sectors and disciplines such as public health, animal health, plant pathology, agriculture, environment, biotechnology, and others. Drawing from the dynamic discussions over regular conference calls, OHAC advises on one health efforts that are internal and external to the national academies, through the publication of papers and the hosting of seminars. For more info, [click here](#).

## Upcoming Events from the Forum

### **TOWARD A COMMON RESEARCH AGENDA IN INFECTION-ASSOCIATED CHRONIC ILLNESSES: A WORKSHOP TO EXAMINE COMMON, OVERLAPPING CLINICAL AND BIOLOGICAL FACTORS**

Many chronic illnesses, including persistent Lyme disease and long COVID, have been associated with prior infectious disease and share common symptoms. However, the pathogenesis mechanisms and link between infection and long-lasting symptoms remain poorly understood, leading to limited treatment options for the often-debilitating symptoms of infection-associated chronic illnesses. In June 2023, the Forum on Microbial Threats will host a multi-day public workshop that brings together experts in research fields related to infection-associated chronic illnesses to examine common biological and clinical factors associated with these chronic illnesses, discuss gaps and opportunities for future collaborative work, and inform public health research and policy. This workshop will convene clinicians and researchers working in infectious diseases, immunology, neurology, and other related fields to increase collaboration among stakeholders and build a community of shared priorities that can enhance patient care. Stay tuned for more details!

To receive a "Save the Date" announcement for our events, sign up for our listserv here:  
[www.nationalacademies.org/microbiaalthreats](http://www.nationalacademies.org/microbiaalthreats)

## Forum on Microbial Threats Members

**Peter Daszak, Ph.D. (chair)**

EcoHealth Alliance

**Kent E. Kester, M.D. (vice chair)**

International AIDS Vaccine Initiative

**Emily Abraham, Dr.P.H.**

Johnson & Johnson

**Kevin Anderson, Ph.D.**

Retired

**Daniel Bausch, M.D., M.P.H.**

American Society of Tropical Medicine and Hygiene

**Christopher Braden, M.D.**

U.S. Centers for Disease Control and Prevention

**Cristina Casetti, Ph.D.**

National Institute of Allergy and Infectious Diseases

**Andrew Clements, Ph.D.**

U.S. Agency for International Development

**Malick Diara, M.D., M.B.A., M.P.H.**

ExxonMobil

**Scott F. Dowell, M.D., M.P.H.**

Bill and Melinda Gates Foundation

**Marcos A. Espinal, M.D., Dr.P.H., M.P.H.**

Pan American Health Organization

**Greg Frank, Ph.D.**

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**Jon H. Heinrichs, Ph.D., M.S.**

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**Michael Mair, M.P.H.**

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**Victoria McGovern, Ph.D.**

Burroughs Wellcome Fund

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**Suerie Moon, Ph.D., M.P.A.**

The Graduate Institute, Geneva

**Timothy D. Murray, Ph.D.**

Washington State University

**Melissa Nolan, Ph.D., M.P.H.**

University of South Carolina

**Rafael Obregon, Ph.D., M.A.**

United Nations Children's Fund

**Benjamin Pinsky, M.D., Ph.D.**

Stanford University

**Ameet J. Pinto, Ph.D., M.S.**

Georgia Institute of Technology

**Kumanan Rasanathan, M.B.Ch.B., M.P.H.**

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# Applying Lessons Learned from COVID-19 Research and Development to Future Epidemics

## A Workshop

December 7-8, 2022 | Washington, DC

### PURPOSE

A planning committee of the National Academies of Sciences, Engineering, and Medicine will organize and conduct a public workshop to explore innovative approaches sparked by COVID-19 to enhancing health systems preparedness and response to emerging infectious diseases. This workshop will consider basic scientific infrastructure and essential capabilities to support medical and behavioral countermeasures that were deployed during the COVID-19 pandemic response. Workshop participants will reflect on critical scientific infrastructure for stakeholder coordination and innovations that can facilitate rapid and effective responses to emerging threats. Virtual and in-person discussions at this workshop will discuss opportunities to:

- Broaden equitable collaboration, partnerships, and global coordination between academic, private, and public sectors, with participation of marginalized communities, to improve the research and development (R&D) of medical and behavioral countermeasures;
- Establish frameworks that address challenges to R&D stemming from the regulatory environment, including the review and approval of medical and behavioral countermeasures;
- Examine mechanisms for sustained financial, political, and operational support of the science behind health security and preparedness programs; and
- Enhance practical early and later stage communication strategies to support the adoption of scientific findings relevant to outbreak responses, including promotion of public trust in the biomedical research and public health enterprise.

Workshop discussions may also include discussion of science-community partnerships, as well as open science and transparency in the efficacy of public health measures, including campaigns and other outreach initiatives.

**This workshop is hosted by the Forum on Microbial Threats, in collaboration with the Forum on Drug Discovery, Delivery, and Translation and the Forum on Medical and Public Health Preparedness for Disasters and Emergencies.**



# Applying Lessons Learned from COVID-19 Research and Development to Future Epidemics

A Workshop

Virtual webcast or at the Keck Center | 500 5<sup>th</sup> St NW, Washington D.C. | Lecture Hall 100

<b>Day 1: December 7 (1:00 PM ET – 5:30 PM ET)</b>	
Please join us for light lunch and refreshments outside of Keck 100 (workshop main room) from 12:00-1:00 PM	
<b>1:00 PM ET</b>	<p><b>Welcome Remarks</b> Kent Kester (IAVI) <i>Forum vice chair</i></p> <p><b>Workshop Overview, and Goals</b> Jon Heinrichs (Sanofi) <i>Workshop co-chair</i></p>
<b>1:15–1:45 PM</b>	<p><b>Keynote (Day 1)</b> <b>Connecting COVID-19 with mpox (what we have or haven't learned from COVID-19): preparedness and response in the research community</b> <i>Moderated by Janet Tobias (Ikana Health Action Lab)</i></p> <p>Carlos del Rio (Emory University), <i>virtual</i></p>
<b>1:45–3:00 PM</b>	<p><b>[Session 1] Equitable Scientific Collaborations, Partnerships, and Coordination Within the US</b></p> <p><b>Introduction:</b> Dan Barouch (Harvard Medical School)</p> <p><b>Roundtable Discussion</b> <i>Moderated by Dan Barouch (Harvard Medical School) &amp; Elizabeth Hermsen (Pfizer)</i></p> <ul style="list-style-type: none"> <li>- <b>Industry perspective:</b> William Gruber (Pfizer)</li> <li>- <b>Academic/Clinical perspective:</b> Myron Cohen (University of North Carolina)</li> <li>- <b>Academia/Research perspective:</b> Barney Graham (Morehouse School of Medicine)</li> </ul>
<b>1:45–1:50 PM</b>	
<b>1:50–2:30 PM</b>	

2:30–3:00 PM	<ul style="list-style-type: none"> <li>- <b>Government perspective:</b> Umair Shah (Washington State Department of Health)</li> </ul> <p><b>Discussion</b></p>
3:00–3:30 PM	<p><b>Coffee Break</b></p>
<p>3:30–4:55 PM</p> <p>3:30–3:35 PM</p> <p>3:35–3:55 PM</p> <p>4:00–4:25 PM</p> <p>4:25–4:55 PM</p>	<p><b>[Session 2] Equitable Scientific Collaborations, Partnerships, and Coordination on the Global Scale</b></p> <p><b>Introduction:</b> Carla Saenz (Pan American Health Organization)</p> <p><b>Plenary speaker:</b> Peter Hotez (Baylor College of Medicine), <i>virtual</i></p> <p><b>Panel reflections</b></p> <ul style="list-style-type: none"> <li>- <b>Industry perspective:</b> James Anderson (International Federation of Pharmaceutical Manufacturers &amp; Associations), <i>virtual</i></li> <li>- <b>Academic perspective:</b> Glenda Gray (South African Medical Research Council), <i>virtual</i></li> <li>- <b>Foundation/NGO perspective (vaccines):</b> In-Kyu Yoon (Coalition for Epidemic Preparedness Innovations)</li> <li>- <b>Foundation/NGO perspective (diagnostics):</b> Daniel Bausch (FIND), <i>virtual</i></li> <li>- <b>Civil society perspective:</b> Walter Cotte (International Federation of Red Cross and Red Crescent Societies), <i>virtual</i></li> </ul> <p><b>Discussion</b> <i>Moderated by Kent Kester (IAVI) &amp; Carla Saenz (Pan American Health Organization)</i></p>
4:55–5:15 PM	<p><b>Bridging between national and global scale efforts: discussion with speakers from Sessions 1&amp;2</b></p>
5:15–5:30 PM	<p><b>Summary and Adjourn</b> Jon Heinrichs (Sanofi Vaccines) <i>Workshop co-chair</i></p>
<p><b>END OF DAY 1</b></p>	

Virtual webcast or at the Keck Center | 500 5<sup>th</sup> St NW, Washington D.C. | Lecture Hall 100

<b>Day 2: December 8 (8:30 AM ET – 4:30 PM ET)</b>	
<b>8:00–8:30 AM ET</b>	<b>Breakfast (Keck Center, first floor atrium)</b>
<b>8:30–8:45 AM</b>	<b>Welcome Remarks, Workshop Overview, and Goals</b> Timothy Burgess (Uniformed Services University of the Health Sciences) <i>Workshop co-chair</i>
<b>8:45–9:15 AM</b>	<b>Keynote (Day 2)</b> <b>Connecting COVID-19 with mpox (what we have or haven't learned from COVID-19): coordination and partnering between scientific researchers, policymakers, and the general public</b> <i>Moderated by Janet Tobias (Ikana Health Action Lab)</i>  Saad Omer (Yale Institute for Global Health)
<b>9:15–11:15 AM</b>	<b>[Session 3] Social and Behavioral Strategies to Motivate Acceptance and Uptake of Public Health Recommendations</b>
<b>9:15–9:20 AM</b>	<b>Introduction:</b> Theresa Bernardo (University of Guelph)
<b>9:20–9:55 AM</b>	<b>Part A – Civil Society</b> <i>Moderated by John Parrish-Sprowl (Indiana University—Purdue University Indianapolis)</i> - Naveen Thacker (The International Pediatric Association) - Chad Worz (American Society of Consultant Pharmacists)
<b>9:55–10:10 AM</b>	<b>BREAK (15 min)</b>
<b>10:10–10:45 AM</b>	<b>Part B – Individual Behavior and Identity</b> <i>Moderated by Dolores Albarracín (University of Pennsylvania)</i> - Heidi Larson (London School of Tropic Medicine and Hygiene), <i>virtual</i> - Neil Lewis (Cornell University)
<b>10:45–11:20 AM</b>	<b>Part C – Communicating Biomedical Research</b> <i>Moderated by Jason Newland (Washington University School of Medicine in St. Louis)</i> - Richard Horton (Lancet), <i>virtual</i> - Stefano Bertuzzi (American Society for Microbiology) - Kathleen Hall Jamieson (University of Pennsylvania), <i>virtual</i>
<b>11:25–12:25 PM</b>	<b>Lunch Break</b>

<p>12:30-1:45 PM</p> <p>12:30-12:35 PM</p> <p>12:35-1:00 PM</p> <p>1:00-1:45 PM</p>	<p><b>[Session 4] Sustainment: Critical Aspects of Leadership and Support</b></p> <p><b>Introduction:</b> Matthew Zahn (Orange County Health Care Agency)</p> <p><b>Panel to share lessons learned and current opportunities</b> <i>Moderated by Ezekiel Emanuel (University of Pennsylvania)</i></p> <ul style="list-style-type: none"> <li>- Moderator opening remarks <ul style="list-style-type: none"> <li>o Ezekiel Emanuel (University of Pennsylvania)</li> </ul> </li> <li>- Sustaining leadership for preparedness and response <ul style="list-style-type: none"> <li>o Nahid Bhadelia (White House COVID-19 Response)</li> <li>o Demetre Daskalakis (White House Mpox Response)</li> </ul> </li> <li>- Financial incentives and sustained market readiness <ul style="list-style-type: none"> <li>o Gary Disbrow (BARDA)</li> </ul> </li> </ul> <p><b>Discussion</b></p>
<p>1:45–2:15 PM</p>	<p><b>Coffee Break</b></p>
<p>2:15–2:45 PM</p>	<p><b>Visionary Presentation</b></p> <ul style="list-style-type: none"> <li>o Mark Feinberg (IAVI)</li> </ul>
<p>2:45–3:45 PM</p>	<p><b>Final Synthesis</b></p>
<p>3:45–4:00 PM</p>	<p><b>Summary and Adjourn</b> Timothy Burgess (Uniformed Services University of the Health Sciences) <i>Workshop co-chair</i></p> <p>Kent Kester (IAVI) <i>Forum vice chair</i></p>
<p style="text-align: center;"><b>END OF WORKSHOP</b></p>	

## Workshop Planning Committee

**Timothy Burgess, M.D., M.P.H. (chair)**

Director, Infectious Diseases Clinical Research Program  
Uniformed Services University of the Health Sciences

**Jon Henrichs, Ph.D. (co-chair) †**

Associate Vice President and the Head of Innovation and Emerging Sciences  
Sanofi Pasteur

**Dolores Albarracin, Ph.D., M.S.**

Professor  
University of Pennsylvania

**Dan Barouch, M.D., Ph.D.**

Director, Center for Virology and Vaccine Research; William Bosworth Castle Professor of Medicine  
Beth Deaconess Medical Center; Harvard Medical School

**Daniel Bausch, M.D., M.P.H. †**

President  
American Society of Tropical Medicine and Hygiene

**Theresa Bernardo, D.V.M., M.Sc.**

Professor, Ontario Veterinary College  
University of Guelph

**Ambika Bumb, Ph.D.**

Deputy Executive Director  
Bipartisan Commission on Biodefense

**Andrew Clements, Ph.D. †**

Senior Scientific Advisor, Emerging Threats Division  
US Agency for International Development

**Carla Saenz, Ph.D.**

Regional Bioethics Advisor, Department of Health Systems and Services  
Pan American Health Organization

**Elizabeth Hermsen, Pharm.D., M.B.A. †**

Lead, Global Antimicrobial Resistance & Antimicrobial Stewardship Medical Affairs  
Pfizer

**Kent Kester, M.D. †**

Vice President, Translational Medicine  
International AIDS Vaccine Initiative

**Jason Newland, M.D., M.Ed.**

Professor of Pediatrics, Infectious Diseases  
Washington University School of Medicine in St. Louis

**John Parrish-Sprowl, Ph.D., M.A.**

Director, Global Health Communication Center  
Indiana University

**Matthew Zahn, M.D. †**

Deputy Health Officer  
Orange County Health Care Agency

†Member, Forum on Microbial Threats

## Planning Committee Biographies

**Timothy Burgess, M.D., M.P.H. (Chair)**, is a physician-scientist, infectious diseases specialist, and retired U.S. Navy medical officer, recently completing service as Director of the Infectious Disease Clinical Research Program at Uniformed Services University in Bethesda, MD. His research and clinical experience over the past 28 years have encompassed emerging and re-emerging infectious diseases particularly important to human health. He previously served as investigator and department head at the Naval Medical Research Center in Silver Spring, MD and at Naval Medical Research Unit #2 in Jakarta, Indonesia; and as director of the US Military's dengue vaccine program. His research has focused on immunopathogenesis and epidemiology of viral diseases including influenza, COVID-19, and arboviral diseases. He served as Chief of the Infectious Diseases Clinical Service at Walter Reed National Military Medical Center (WRNMMC), Bethesda from 2012 – 2016 and established the Enhanced Precautions Unit at WRNMMC, developing the Defense Health Agency's capability for management of patients with high-consequence pathogens including Ebolavirus disease. He has served as a technical advisor to US Department of Defense and Interagency working groups in support of the US Federal Covid-19 Response; as a member of the U.S. Food and Drug Administration's (FDA) Antimicrobial Drugs Advisory Committee; and as DOD representative ex officio to the National Institutes of Health (NIH) Covid-19 Treatment Guidelines Panel.

**Jon Heinrichs, Ph.D. (Co-Chair)**, is an Associate Vice President and the Head of Innovation and Emerging Sciences at Sanofi Pasteur in Swiftwater, PA and serves as the Global Project Head for nirsevimab, a next generation RSV monoclonal antibody in late-stage development in collaboration with AstraZeneca. Prior to joining Sanofi, Dr. Heinrichs headed the Microbial Vaccine Research group at Merck Research Labs where he led a team of scientists developing vaccines for several bacterial pathogens. Dr. Heinrichs previously held positions of increasing responsibility at the biotechnology company MedImmune (now part of AstraZeneca), where he contributed to the identification of vaccine candidates and was involved in research on the efficacy of monoclonal antibodies for the prevention of infectious diseases and the treatment of cancer and inflammatory diseases. Dr. Heinrichs earned his doctoral degree in microbiology and molecular genetics from Rutgers University and the University of Medicine and Dentistry of New Jersey and completed a post-doctoral fellowship in the Laboratory of Bacterial Pathogenesis and Immunology at The Rockefeller University.

**Dolores Albarracín, Ph.D., M.S.**, is a social psychologist who studies social cognition and behavioral change. She is a fellow of the Society for Social and Personality Psychology, American Psychological Association, the Association for Psychological Science, and the Society for Experimental Social Psychology, and the American Academy of Political and Social Science. Her research (~ 200 publications) has been recognized with an award for Outstanding Mid-Career Contributions to the Psychology of Attitudes and Social Influence and the Diener Award to Outstanding Mid-Career Contributions to Social Psychology from the Society of Social and Personality Psychology, as well as an Avant Garde Award from the National Institutes of Health. She has published six books, which include three volumes of the Handbook of Attitudes and two authored monographs: *Action and Inaction in a Social World: Predicting and Changing Attitudes and Behaviors* (2021) and *Creating Conspiracy Beliefs: How Our Thoughts are Shaped* (2022), both published by Cambridge University Press. She was Editor-in-chief of *Psychological Bulletin* from 2014 to 2020, and is President-Elect of the Society for Personality and Social Psychology for 2023 and incoming editor of the *Journal of Personality and Social Psychology: Attitudes and Social Cognition*.

**Dan Barouch, M.D., Ph.D.**, received his Ph.D. in immunology from Oxford University and his M.D. from Harvard Medical School. He is currently the William Bosworth Castle Professor of Medicine and Professor of Immunology at Harvard Medical School, Director of the Center for Virology and Vaccine Research at Beth Israel Deaconess

Medical Center, a member of the Ragon Institute of MGH, MIT, and Harvard, and part of the Bill & Melinda Gates Foundation Collaboration for AIDS Vaccine Discovery. His laboratory focuses on studying the immunology and pathogenesis of viral infections and developing novel vaccine and treatment strategies. His group has led the development of vaccine candidates for multiple pathogens of global significance, including HIV, Zika virus, tuberculosis, and most recently SARS-CoV-2. His recent work contributed to the development of the Johnson & Johnson COVID-19 vaccine and the evaluation of multiple COVID-19 vaccines and monoclonal antibody therapeutics. He was elected to the National Academy of Medicine in 2020.

**Daniel Bausch, M.D., M.P.H.**, is the President of the American Society of Tropical Medicine and Hygiene; Senior Director for Emerging Threats and Global Health Security at FIND, the global alliance for diagnostics; and a Professor of Tropical Medicine at the London School of Hygiene and Tropical Medicine (LSHTM). Previously, he served as Director of the United Kingdom's Public Health Rapid Support team (2017-21), a joint effort by Public Health England and LSHTM to respond and conduct research to prevent and control outbreaks of dangerous infectious diseases around the world. He has also held posts at the World Health Organisation in Geneva, Switzerland; U.S. Naval Medical Research Unit No. 6 in Lima, Peru; Tulane School of Public Health and Tropical Medicine in New Orleans, USA; and the U.S. Centers for Disease Control and Prevention in Atlanta, USA. Dr Bausch is an internationally recognized leader in the research and control of emerging tropical viruses, with over 25 years' experience in sub-Saharan Africa, Latin America, and Asia combating viruses such as Ebola, Lassa, hantavirus, and SARS coronaviruses. He places a strong emphasis on capacity development in all his projects and has a keen interest in the role of the scientist in promoting health and human rights. He is trained in internal medicine, infectious diseases, tropical medicine, and public health. Dr Bausch is fluent in English, French and Spanish.

**Theresa Bernardo, D.V.M., M.Sc.**, is a globally connected innovator in addressing complex health problems through technology with more than a decade of experience in the United Nations and Inter-American systems in health informatics (humans/food/animals/plants), and another decade in academia. In her role as IDEXX Chair in Emerging Technologies and Preventive Healthcare at the University of Guelph's Ontario Veterinary College (OVC), Bernardo focuses on the intersection of health and information technology, more broadly referred to as health informatics. She and her research team tackle challenges related to access and integration of veterinary health data from various sources, demonstrating practical use of data for patient health monitoring and preparing veterinarians for success in a tech-enabled world.

**Ambika Bumb, Ph.D.**, is an entrepreneur with a background in nanomedicine whose professional path has bridged academia, industry, and government. She is currently the Deputy Executive Director of the Bipartisan Commission on Biodefense which is working to institute long-lasting programs and policies to protect from biothreats such as pandemics. She has also served as President Biden's Deputy Executive Director of the President's Council of Advisors on Science and Technology; Health, Science, and Technology Advisor for Secretary of State's Crisis Management and Strategy; Board Member for the International Biomedical Research Alliance; Strategic Advisor to the Energy Sciences Area of Berkeley Lab; and CEO of the biotech Bikanta. During the COVID-19 pandemic, Dr. Bumb and her team at the Department of State were awarded the Distinguished Honor Award for exceptionally outstanding service of marked international significance. The Senate unanimously passed the bipartisan Resolution 567 commending their efforts in bringing home more than 100,000 citizens during the COVID-19 pandemic, the largest repatriation effort in U.S. history. She received the NIH's Orloff Technical Advance Award for her work on a "platform" technology with implications that will broadly advance medicine on multiple fronts. Her research has led to 16 patents, the spinout of the biotech Bikanta, and was named one of 40 under 40 influential Bay Area business leaders. She graduated from Georgia Tech with a B.Sc. in Biomedical Engineering, obtained her doctorate from the

University of Oxford while on the Marshall Scholarship, and completed fellowships at the National Cancer Institute and National Heart, Lung and Blood Institute.

**Andrew Clements, Ph.D.**, is a Senior Scientific Advisor for the Emerging Threats Division in the U.S. Agency for International Development's Bureau for Global Health. He received his Ph.D. in Anaerobic Microbiology from Virginia Tech and completed his post-doctoral training in biochemistry at the National Institutes of Health. Between 1997 and 2005, he served as an infectious disease advisor at USAID focusing on the development, management, and monitoring of international programs to address malaria, tuberculosis, antimicrobial resistance, and infectious disease surveillance. Since 2005, he has managed a number of projects (PREDICT, PREVENT) and partnerships with the Food and Agriculture Organization of the UN and the World Health Organization that support prevention, detection, and response to emerging zoonotic threats in developing countries. He also analyzes trends for emerging zoonotic threats and has participated in USAID's responses to new diseases, including H5N1 and H7N9 avian influenza, H1N1 pandemic influenza, MERS-CoV, and Ebola.

**Carla Saenz, Ph.D.**, is the Regional Bioethics Advisor at the Pan American Health Organization (PAHO), which is the World's Health Organization's Regional Office for the Americas. She is responsible for PAHO's Regional Program on Bioethics, which provides support on bioethics to countries in Latin America and the Caribbean, e.g., strengthening national research ethics systems, integrating ethics in health-related work, and advancing capacity on bioethics. An elected fellow of the Hastings Center, she has been responsible for the development of PAHO's Zika and COVID-19 ethics guidance documents, including Catalyzing Ethical Research in Emergencies. Ethics Guidance, Lessons Learned from the COVID-19 Pandemic, and Pending Agenda. Dr. Saenz serves on the board of the International Association of Bioethics (IAB) and the Steering Committee of the Global Forum on Bioethics in Research (GFBR). She holds a PhD in Philosophy from the University of Texas at Austin and, before joining PAHO, she was at the Department of Bioethics at Clinical Center of the National Institutes of Health (NIH), and in the faculty in the Philosophy Department at the University of North Carolina at Chapel Hill.

**Elizabeth Hermsen, Pharm.D., M.B.A.**, is the Lead for Global Antimicrobial Resistance & Antimicrobial Stewardship Medical Affairs at Pfizer and an Adjunct Associate Professor at the University of Nebraska Medical Center, Colleges of Pharmacy and Medicine, in Omaha, Nebraska. Dr. Hermsen received her Doctor of Pharmacy degree from the University of Nebraska Medical Center followed by a pharmacy practice residency at The Nebraska Medical Center, a fellowship in Infectious Diseases Research at the University of Minnesota, College of Pharmacy, and a master's degree in business administration at the University of Minnesota, Carlson School of Management. Following her fellowship, Dr. Hermsen developed and co-directed the antimicrobial stewardship program at The Nebraska Medical Center and then joined Cubist, where she held medical affairs and outcomes research roles and created and led the Antimicrobial Stewardship Outreach Group. Subsequently, Dr. Hermsen was a Global Health Equity Director and the Head of Global Antimicrobial Stewardship at Merck & Co., Inc., where she was responsible for supporting efforts to improve equitable outcomes and creating and executing a strategy to advance antimicrobial stewardship through education, implementation, research, and advocacy, with a global scope, across human, animal, and environmental health. Now, in her role at Pfizer, she is responsible for leading the development and implementation of the antimicrobial stewardship medical strategy. Dr. Hermsen is a Fellow of the Society of Infectious Diseases Pharmacists (SIDP) and the Infectious Diseases Society of America (IDSA). She currently serves on the SIDP Policy & Government Affairs Committee, the IDSA Leadership Development Committee, and the Scientific Advisory Committee for the Antimicrobial Stewardship Project at the Center for Infectious Diseases Research and Policy. She has contributed to the profession with numerous publications in peer-reviewed journals, book chapters, and by serving as a reviewer for several professional journals. Dr. Hermsen has given over 100 invited presentations at state, regional, national, and international meetings, and she gave a TED talk regarding antimicrobial stewardship and resistance at TEDx Omaha 2019.



**Kent Kester, M.D.**, is currently Vice President, Translational Medicine, at IAVI. During a 24-year career in the US Army, he worked extensively in clinical vaccine development and led multiple research platforms at the Walter Reed Army Institute of Research, the U.S. Department of Defense's largest and most diverse biomedical research laboratory with a major emphasis on emerging infectious diseases, an institution he later led as its Commander. His final military assignment was as the Associate Dean for Clinical Research in the School of Medicine at the Uniformed Services University of the Health Sciences (USUHS). During his military service, Dr. Kester was appointed as the lead policy advisor to the US Army Surgeon General in both Infectious Diseases and in Medical Research & Development. More recently, he served as the head of translational medicine and biomarkers at Sanofi Pasteur. Dr. Kester holds an undergraduate degree from Bucknell University and an M.D. from Jefferson Medical College, completing his internship and residency in internal medicine at the University of Maryland and a research fellowship in infectious diseases at the Walter Reed Army Medical Center. Currently a member of the Department of Veterans Affairs Health Services Research & Development Service Merit Review Board, the National Academy Standing Committee on Emerging Infectious Diseases and 21st Century Health Threats, and the CEPI Scientific Advisory Committee, he previously chaired the Steering Committee of the NIAID/USUHS Infectious Disease Clinical Research Program, and has served as a member of the Presidential Advisory Council on Combating Antibiotic-Resistant Bacteria (PACCARB), the FDA Vaccines & Related Biologics Products Advisory Committee (VRBPAC), the NIAID Advisory Council, and the CDC Office of Infectious Diseases Board of Scientific Counselors. He is the Vice Chair of the National Academy of Medicine Forum on Microbial Threats. Board-certified in both internal medicine and infectious diseases, Dr. Kester holds faculty appointments at USUHS and the University of Maryland; and is a fellow of the American College of Physicians, the Royal College of Physicians of Edinburgh, the Infectious Disease Society of America, and the American Society of Tropical Medicine and Hygiene. He is a member of the clinical faculty at the University of Maryland Shock Trauma Center in Baltimore and the Wilkes-Barre VA Medical Center in Wilkes-Barre, PA.

**Jason Newland, M.D., M.Ed.**, focuses on the appropriate use of antimicrobials in all settings, including both human and animal health. His primary research focus has been in the dissemination and implementation of Antimicrobial Stewardship Programs for hospitalized children. He is the founder and leader of the Sharing Antimicrobial Reports for Pediatric Stewardship (SHARPS) national collaborative of over 50 children's hospitals across the United States. Additionally, he is involved with implementing strategies to improve antibiotic use in the ambulatory setting. His advocacy work has been in promoting appropriate antibiotic use in the agriculture industry. In 2022, the Department of Pediatrics at Washington University School of Medicine in St. Louis named Newland vice chair of community health and strategic planning. He also treats patients at St. Louis Children's Hospital and is frequently featured as a health care expert answering viewer questions on KSDK-TV in St. Louis.

**John Parrish-Sprowl, Ph.D., M.A.**, currently serves as the Director of the Global Health Communication Center (GHCC) of the Indiana University (IU) School of Liberal Arts as well as professor of Communication Studies and adjunct professor of Women, Gender, and Sexuality Studies. Prior to this position, he was the Chair of the Department of Communication Studies and a founding member of the Clinical and Translational Science Institute Community Health Engagement Program in the IU School of Medicine. In addition, he is a member of the IU Center for Global Health, University College, and Russian and Eastern Europe Institute faculties of Indiana University. Professor Parrish-Sprowl has been elected to the legislative Assembly of the National Communication Association, twice as Chair of the Applied Communication Division. He serves as a research associate of the Center for Intercultural New Media Research (CINMR), the CMM Institute and is on the World Health Organization (WHO) roster of experts for social and behavioral change. Dr. Parrish-Sprowl has worked with WHO and various Ministries of Health in the areas of risk communication, radiation emergency response guidelines, the development of communication strategy to increase influenza vaccine uptake, and in the development of complex approaches to community engagement. Dr. Parrish-Sprowl has served as a Fulbright Senior Specialist and has been honored with

awards from various organizations as well as his current, and past universities, including the Indiana University Bicentennial Medal, John W. Ryan award for international service, The University Gold Medal and the Scholar of Distinction in Social Sciences from the University of Wroclaw (Poland).

**Matthew Zahn, M.D.**, currently serves as the Deputy Health Officer and the Medical Director for the Communicable Disease Control Division of the Orange County Health Care Agency. He is also Adjunct Professor in the Division of Pediatric Infectious Diseases for the University of California-Irvine Department of Pediatrics. Dr. Zahn received his doctorate in medicine from St. Louis University School of Medicine and completed his Pediatric Infectious Disease Fellowship at the Children's Hospital of Colorado. From 2004 through 2011, he served as medical director for the Louisville Metro Department of Public Health and Wellness. During that time, he also served as an assistant professor of pediatric infectious disease at the University of Louisville School of Medicine. Since 2008, Dr. Zahn has served on behalf of the National Association of County and City Health Officials as the liaison to the CDC's Advisory Committee of Immunization Practices. From 2017-2018, he was President of the California Association of Communicable Disease Controllers. From 2016-2019, he served as Chair of the Infectious Diseases Society of America's Public Health Workgroup.

## Speaker Biographies

**James Anderson, M.A., M.B.A.**, joined the IFPMA as Executive Director of Global Health in January 2021, where he is responsible for leading the work on priorities in global health. This includes industry's policy and advocacy on pandemic preparedness, antimicrobial resistance (AMR) and global access to medicines and vaccines. James is also Board Chair of the AMR Industry Alliance. In his previous role as Head of Corporate Government Affairs at GSK, James led GSK's strategic engagement with the UK Government and was a member of the Life Science Strategy Board and Vice-Chair of Business at OECD's Healthcare Committee. He led GSK's work on AMR and advised on AMR policy development at the WHO, UN, EU Commission and National Governments. He was also in the Founding team of the AMR Action Fund and led the development of the Davos Declaration and UNGA Industry AMR Roadmap.

**Stefano Bertuzzi, Ph.D., M.P.H.**, is the Chief Executive Officer of the American Society for Microbiology (ASM). ASM is one of the largest life science professional societies in the world with over 30,000 members and activities in 122 countries. Its mission is to promote and advance microbial sciences. Stefano was a senior scientific executive at the National Institutes of Health (NIH) in the Office of the NIH Director, where he advised Dr. Elias Zerhouni on a wide range of science policy matters. He also worked with the Obama White House to develop an information system to capture benefits of scientific investments. Most recently, Stefano has led ASM's efforts to address the SARS-CoV-2 pandemic. This included working directly with Ambassador Deborah Birx and the Trump White House COVID-19 Task Force, and working with the Food and Drug Administration (FDA) to increase access to diagnostic testing supplies and addressing roadblocks to coronavirus testing.

**Nahid Bhadelia, M.D., MALD**, is the Senior Policy Advisor for Global COVID-19 Response for the White House COVID-19 Response Team. She is on sabbatical from Boston University where she is a board-certified infectious diseases physician, the founding director of BU's Center for Emerging Infectious Diseases Policy and Research and the associate director of the National Emerging Infectious Diseases Laboratories (NEIDL), a state-of-the-art maximum containment research facility at BU.

Over the last decade, Dr. Bhadelia designed and served as the medical director of the Special Pathogens Unit (SPU), a medical unit designed to care for patients with highly communicable diseases, and a state designated Ebola Treatment Center. She has prior and ongoing experience in health system response to pathogens such as H1N1, Zika, Lassa fever, Marburg virus disease, and COVID-19 at the state, national, and global levels, including medical countermeasure evaluation, diagnostic positioning, infection control policy development, and healthcare worker training. Dr. Bhadelia has served on state, national, and interagency groups focused on biodefense priority setting, development of clinical care guidelines, and medical countermeasures research. She has served as a subject matter expert to the US Centers for Disease Control and Prevention, Department of Defense (DoD), and World Bank. She was part of the World Health Organization's Technical Advisory Group on Universal Health and Preparedness Review (UHPR) before joining the US government.

Dr. Bhadelia has experience with direct patient care, outbreak response, and medical countermeasures research during multiple Ebola virus disease outbreaks in West and East Africa. During the West African Ebola epidemic, she served as a clinician in several Ebola treatment units, working with the World Health Organization and Partners in Health. She currently serves as medical lead of a DoD-funded viral hemorrhagic fever research group in Uganda, entitled Joint Mobile Emerging Disease Intervention Clinical Capability (JMEDICC) program. Dr. Bhadelia codirects

the National Institutes of Health's Fogarty International Center–funded research training program in Liberia, entitled Boston University and University of Liberia Emerging and Epidemic Virus Research (BULEEVR). Her research focuses on global health security, as well as identification of safe and effective clinical interventions and infection control measures related to viral hemorrhagic fevers and other emerging infectious diseases.

**Myron S. Cohen, M.D.**, is the Yeargan-Bate Eminent Professor of Medicine, Microbiology and Immunology and Epidemiology at the University of North Carolina at Chapel Hill, and Director of the Institute for Global Health & Infectious Diseases. Dr. Cohen serves as the co-principal investigator of the NIH HIV Prevention Trials Network (HPTN), where he has led efforts to use antiviral agents and monoclonal antibodies to prevent transmission of HIV. Dr. Cohen served as one of the leaders of the NIH COVID Prevention Network where he has focused on development of monoclonal antibodies for the prevention and treatment of COVID-19. Dr. Cohen is recipient of many awards for his work on the prevention of HIV and is a member of the National Academy of Medicine.

**Walter Cotte** is currently the Special Representative of the Secretary General (SRSG) for COVID-19 of the International Federation of Red Cross and Red Crescent Societies (IFRC). Walter counts with more than 50 years of experience in the humanitarian sector, dedicating most of his life to the Red Cross Red Crescent Network. He began working with the Colombian Red Cross in 1970 as a volunteer of the Red Cross School Brigades in Colombia, and since then has served in a range of positions with the Colombian Red Cross including being the Executive Director (CEO). In the IFRC he has served in different positions such as Disaster Manager in Asia-Pacific region; Under Secretary General for the Program Services Division in Geneva, Switzerland; Americas Regional Director; Head of Delegation, Permanent Observer of the IFRC to the United Nations in New York; among others. He has also been a consultant to the United Nations (UNDRO, INSARAG/USAR and UNDAC).

In the month of October 2020 was designated as Special Representative of the Secretary General for (SRSG) for COVID-19. In this key strategic role he is representing the IFRC Secretary General in guiding the COVID-19 institutional response, learning from the current pandemic to be prepared for future pandemics and global crises. He is in charge of developing and implementing a Global Risk Management System inside the IFRC and since August 2022 is performing as Enterprise Resource Planning (ERP) Project Sponsor and Strategic Lead.

**Demetre Daskalakis, M.D., M.P.H.**, Deputy Coordinator for the National mpox Response. Dr. Daskalakis is an infectious disease physician who serves as the Deputy Coordinator of the White House National mpox Response. He works closely with Robert Fenton, Coordinator of the WH National mpox Response, leading the coordination across agencies to control the mpox virus outbreak. Prior to his appointment, Dr. Daskalakis served locally and nationally as a leader in public health as the Director for the Division of HIV Prevention at the Centers for Disease Control and Prevention, Deputy Commissioner for the Division of Disease Control, and the Assistant Commissioner for the Bureau of HIV and then Deputy Commissioner of Disease Control at the NYC Department of Health and Mental Hygiene. Dr. Daskalakis is recognized internationally as an expert in HIV prevention and has focused much of his career on the treatment and prevention of HIV and other STIs as an activist physician with a focus on LGBTQ+ communities. Dr. Daskalakis has extensive experience with outbreak response including serving as incident commander during the measles outbreak of 2018-2019 and COVID-19 in 2020 while at NYC Department of Health and Mental Hygiene. He also served as Deputy Incident Manager of the vaccine taskforce in CDC's COVID-19 response in 2021.

**Carlos del Rio, M.D.**, is a Distinguished Professor of Medicine in the Division of Infectious Diseases at Emory University School of Medicine and Executive Associate Dean for Emory at Grady. He is also Professor of Global Health in the Department of Global Health and Professor of Epidemiology at the Rollins School of Public Health. He is also co-Director of the Emory Center for AIDS Research (CFAR) and co-PI of the Emory-CDC HIV Clinical

Trials Unit and the Emory Vaccine and Treatment Evaluation Unit. Dr. del Rio is a native of Mexico where he attended medical school at Universidad La Salle, graduating in 1983. He did his Internal Medicine and Infectious Diseases residencies at Emory University. In 1989 he returned to Mexico where he was Executive Director of the National AIDS Council of Mexico (CONASIDA, the Federal agency of the Mexican Government responsible for AIDS Policy throughout Mexico), from 1992 through 1996. In November of 1996 he returned to Emory where he has been involved in patient care, teaching and research. Dr. del Rio was Chief of the Emory Medical Service at Grady Memorial Hospital from 2001 - 2009 and Chair of the Department of Global Health from 2009 - 2019. Dr. del Rio's research focuses on the early diagnosis, access to care, engagement in care, compliance with antiretrovirals and the prevention of HIV infection. He has worked for over a decade with hard-to-reach populations including substance users to improve outcomes of those infected with HIV and to prevent infection with those at risk. He is also interested in the translation of research findings into practice and policy. His international work includes collaborations in the country of Georgia, Ethiopia, Vietnam, Mexico, Kenya and Thailand. He has also worked on emerging infections such as pandemic influenza and was a member of the WHO Influenza A(H1N1) Clinical Advisory Group and of the CDC Influenza A(H1N1) Task Force during the 2009 pandemic.

Dr. del Rio is a Member of the Board of Directors of the International Antiviral Society-USA (IAS-USA) and was a Board member and Chair of HIVMA of the Infectious Diseases Society of America (IDSA). He is also the Chair of the PEPFAR Scientific Advisory Board. He is Chief Section Editor for HIV/AIDS for NEJM Journal Watch Infectious Diseases, Associate Editor for Clinical Infectious Diseases and member of the editorial board of Journal of AIDS and Global Public Health. Dr. del Rio has co-authored 30 book chapters and over 350 scientific papers. Among his many honors are the James H. Nakano Citation received in 2001 and awarded by the CDC for an outstanding scientific paper published in 2000; the Emory University Marion V. Creekmore Achievement Award for Internationalization; he was selected by the "Atlanta Magazine" as one of the 55 most influential foreign born Atlantans in 2007. In 2013 Dr. del Rio was elected to the National Academy of Medicine and in 2020 was elected as Foreign Secretary of the National Academy of Medicine.

**Gary Disbrow, Ph.D.**, is the Director of the Biomedical Advanced Research and Development Authority (BARDA), a component of the Administration for Strategic Preparedness and Response in the U.S. Department of Health and Human Services. BARDA invests in the innovation, advanced research and development, acquisition, and manufacturing of medical countermeasures – vaccines, drugs, therapeutics, diagnostic tools, and non-pharmaceutical products needed to combat health security threats. BARDA has established hundreds of public-private sector partnerships and as of November 2022 BARDA now has a portfolio of 65 products that have earned FDA regulatory approvals, licensures or clearances.

Dr. Disbrow joined BARDA in January of 2007 and has held a variety of positions related to the advanced development and procurement of medical countermeasures against an array of threats to national security and public health. Prior to becoming the BARDA Director, Dr. Disbrow served as acting BARDA Director, Deputy Assistant Secretary of ASPR and Medical Countermeasures Program Director.

**Ezekiel J. Emanuel, M.D., Ph.D.**, is the Vice Provost for Global Initiatives and the Diane v.S. Levy and Robert M. Levy University Professor at the University of Pennsylvania. Dr. Emanuel is an oncologist and world leader in health policy and bioethics. He is a Special Advisor to the Director General of the World Health Organization, Senior Fellow at the Center for American Progress, and member of the Council on Foreign Relations. He was the founding chair of the Department of Bioethics at the National Institutes of Health and held that position until August of 2011. From 2009 to 2011, he served as a Special Advisor on Health Policy to the Director of the Office of Management and Budget and National Economic Council. In this role, he was instrumental in drafting the Affordable Care Act (ACA). Emanuel also served on the Biden-Harris Transition Covid Advisory Board. Dr. Emanuel is the most widely cited

bioethicist in history. He has over 350 publications and has authored or edited 15 books. His recent books include the books *Which Country Has the World's Best Health Care* (2020), *Prescription for the Future* (2017), *Reinventing American Health Care: How the Affordable Care Act Will Improve our Terribly Complex, Blatantly Unjust, Outrageously Expensive, Grossly Inefficient, Error Prone System* (2014) and *Brothers Emanuel* (2013). Dr. Emanuel regularly contributes to the *New York Times*, the *Washington Post*, the *Wall Street Journal*, *The Atlantic*, and often appears on BBC, NPR, CNN, MSNBC and other media outlets. He has received numerous awards including election to the Institute of Medicine (IOM) of the National Academy of Science, the American Academy of Arts and Sciences, the Association of American Physicians, and the Royal College of Medicine (UK). He received—but refused—a Fulbright Scholarship. He has been named a Dan David Prize Laureate in Bioethics and is a recipient of the AMA-Burroughs Wellcome Leadership Award, the Public Service Award from the American Society of Clinical Oncology, Lifetime Achievement Award from the American Society of Bioethics and Humanities, the Robert Wood Johnson Foundation David E. Rogers Award, President's Medal for Social Justice Roosevelt University, and the John Mendelsohn Award from the MD Anderson Cancer Center. Dr. Emanuel has received honorary degrees from Icahn School of Medicine at Mount Sinai, Union Graduate College, the Medical College of Wisconsin, and Macalester College. Dr. Emanuel is a graduate of Amherst College. He holds a M.Sc. from Oxford University in Biochemistry and received his M.D. from Harvard Medical School and his Ph.D. in political philosophy from Harvard University.

**Mark Feinberg, M.D., Ph.D.**, is president and CEO of IAVI where he leads a global team working to advance the development of vaccines and other biomedical innovations to protect against infection with HIV, TB, emerging viruses and other public health threats that disproportionately impact low-income countries.

Prior to joining IAVI in late 2015, Mark served as chief public health and science officer with Merck Vaccines. In this role, he helped advance the development and global availability of vaccines against rotavirus, human papillomavirus, and other infectious diseases. He also led a range of research initiatives to address unmet health needs in low-income countries including the coordination of a private-public partnership to expedite the development of an efficacious Ebola Zaire vaccine. Following the 2014-2016 Ebola outbreak in West Africa, Mark also played a central role in the establishment of the Coalition for Epidemic Preparedness Innovations (CEPI) and was the inaugural Chair of the CEPI Scientific Advisory Board. Previously, Mark spent more than 20 years exploring HIV/AIDS pathogenesis, treatment, and prevention research and the biology of emerging diseases in both academia and government.

Mark holds an M.D. and a Ph.D. from Stanford University, and B.A. degree from the University of Pennsylvania. He pursued post-graduate medical training in internal medicine at the Brigham and Women's Hospital and postdoctoral fellowship training in the laboratory of Dr. David Baltimore at the Whitehead Institute. He has previously served as a faculty member at the University of California, San Francisco and the Emory University School of Medicine, as a medical officer in the Office of AIDS Research at the National Institutes of Health (NIH) and as a fellow in the Advanced Leadership Initiative at Harvard University. Mark is a Fellow of the American College of Medicine, and a member of the Council on Foreign Relations and the Association of American Physicians.

**Barney Graham, M.D., Ph.D.**, is an immunologist, virologist, and vaccinologist recognized for his work on viral pathogenesis and vaccine development. He is especially known for studies on RSV pathogenesis and immunity and the application of atomic-level structure, protein-engineering, and mRNA delivery technology for making safe and effective vaccines. After obtaining a BA in biology from Rice University and an MD from the University of Kansas School of Medicine, he completed internship, residency, chief residencies, Infectious Diseases fellowship, and PhD in Microbiology & Immunology at Vanderbilt University School of Medicine and was on the faculty until joining the NIAID Vaccine Research Center at NIH as a founding member in 2000. He retired as Deputy Director

of the VRC in 2021 and is now Professor of Medicine & Microbiology, Biochemistry, Immunology and Senior Advisor for Global Health Equity at Morehouse School of Medicine in Atlanta. He is a member of the National Academy of Sciences and named one of the world's 100 most influential individuals and one of the Heroes of the Year in 2021 by Time magazine and recognized as the Federal Employee of the Year by the Partnership for Public Service for his work on COVID-19 vaccine development.

**Glenda Gray, DSc**, An NRF A1 rated scientist, CEO and President of the South African Medical Research Council (SAMRC), Professor Glenda Gray is a qualified pediatrician and co-founder of the internationally recognised Perinatal HIV Research Unit in Soweto, South Africa. Prior to her appointment at the SAMRC, she was the Executive Director of the Perinatal HIV Research Unit, an affiliate of Wits University. Glenda's global profile includes a role as Co-PI of the HIV Vaccine Trials Network (HVTN), a transnational collaboration for the development of HIV/AIDS prevention vaccines. She is also Director of International Programmes for HVTN and Chairperson of the Board of the Global Alliance for Chronic Diseases, and a member of the Institute of Medicine of the National Academies, USA.

As the COVID-19 pandemic developed, she was among the first to lead public discourse on the issue, and to move quickly to establish COVID-19 vaccine trials in South Africa, utilizing the experience and network developed over the years for the HIV vaccine work. Glenda served as a Protocol Co-Chair of the multi-country Ensemble Study investigating the single-dose Ad26.COVS vaccine as an emergency response intervention. When South Africa's national vaccine roll-out faltered, her international stature enabled her to negotiate a donation of 500 000 doses of the Ad26.CoV.2 vaccine before any emergency use authorization was available and conduct a phase 3B open-label study in health care workers, called the Sisonke Study.

She received South Africa's highest honour – the Order of Mapungubwe - for her pioneering research in PMTCT. Other prestigious accolades include the Nelson Mandela Health and Human Rights Award for significant contributions in the field of mother-to-child transmission of HIV. Selected as one of Time's 100 Most Influential People in the World, Glenda is a recognised leader in her field. Her qualifications include an MBBCh (Wits), FCPaed (SA), DSc (honoris causa Simon Fraser University), DSc (honoris causa Stellenbosch University), and LLD (honoris causa Rhodes University).

**William C. (Bill) Gruber, M.D.**, is Senior Vice President of Pfizer Vaccine Clinical Research and Development, and responsible for global clinical research and development of vaccines to meet licensure and post licensure requirements. He has over 35 years of experience in vaccine development. Bill joined in 1999 as Vice President of Clinical Vaccine Research and Development for Wyeth, now Pfizer Inc. Other experience includes: Associate Professor of Pediatrics in the Division of Pediatric Infectious Diseases, Vanderbilt University School of Medicine, Director of the Diagnostic Virology Laboratory at Vanderbilt University Hospital.

Dr. Gruber's clinical research group has been responsible for global clinical research and development of now licensed pneumococcal conjugate, meningococcal conjugate, rLP2086 meningococcal B, influenza and SARS-CoV-2 (COVID-19) vaccines, as well as investigational Staph aureus, C. difficile, HIV, RSV, parainfluenza, HSV vaccines, pentavalent meningococcal vaccine, and mRNA vaccines against influenza and varicella-zoster. Dr. Gruber also guides the clinical research and development for Pfizer's Group B streptococcus and RSV maternal immunization vaccine programs, as well as vaccines against Lyme disease and next generation COVID-19 vaccines.

He is Board certified in Pediatrics and Pediatric Infectious Diseases, Fellow of the American Academy of Pediatrics, Fellow of the Infectious Diseases Society of America, Fellow of the Pediatric Infectious Diseases Society, member of the Society for Pediatric Research, and member of the American Society for Microbiology.

**Richard Horton, FCRP, FMedSci**, is Editor-in-Chief of The Lancet. He qualified in physiology and medicine with honours from the University of Birmingham in 1986. He joined The Lancet in 1990, moving to New York as North American Editor in 1993. In 2016, he chaired the Expert Group for the High Level Commission on Health Employment and Economic Growth, convened by Presidents Hollande of France and Zuma of South Africa. From 2011 to 2015, he was co-chair of the UN's independent Expert Review Group on Information and Accountability for Women's and Children's Health. In 2011, he was elected a Foreign Associate of the US Institute of Medicine and, in 2015, he received the Friendship Award from the Government of China. In 2019, he was awarded the WHO Director-General's Health Leaders Award for outstanding leadership in global health and the Roux Prize in recognition of innovation in the application of global health evidence. In 2021, he received the Physicians for Human Rights Award in recognition of extraordinary leadership in advancing health and human rights. He now works to develop the idea of planetary health – the health of human civilizations and the ecosystems on which they depend. In 2020, he published *The COVID-19 Catastrophe: What's Gone Wrong and How to Stop It Happening Again*. A revised, updated, and expanded second edition was published in 2021.

**Peter Hotez, M.D., Ph.D.**, is professor of pediatrics and molecular virology at Baylor College of Medicine where he is also the Texas Children's Hospital Chair in Tropical Pediatrics. Prof. Hotez is a vaccine scientist who has co led the development of vaccines for neglected tropical diseases and a Covid vaccine technology leading to the production of Covid vaccines in India and Indonesia with almost 100 million doses administered so far. Dr. Hotez also leads efforts to combat antivaccine activism. He is the author of 650 scientific papers indexed on PubMed and is the author of 5 books including *The Deadly Rise of Antiscience* that will be published in 2023 by Johns Hopkins University Press. He is an elected member of the National Academy of Medicine and the American Academy of Arts and Sciences, and has been honored by the AMA, AAMC, ASTMH, American College of Physicians, American Medical Writers Association, among other organizations.

**Kathleen Hall Jamieson, Ph.D.**, is the Elizabeth Ware Packard Professor at the Annenberg School for Communication of the University of Pennsylvania, Program Director of the Annenberg Retreat at Sunnylands, and the Walter and Leonore Annenberg Director of the university's Annenberg Public Policy Center (APPC). She has authored or co-authored 17 books, including *Creating Conspiracy Beliefs: How Our Thoughts Are Shaped* (2022) and *Cyberwar: How Russian Hackers and Trolls Helped Elect a President*, which won the Association of American Publishers' 2019 R.R. Hawkins Award. Six of the books that Jamieson has authored or co-authored have received a total of 12 political science or communication book awards (*Cyberwar*, *Packaging the Presidency*, *Eloquence in an Electronic Age*, *Spiral of Cynicism*, *Presidents Creating the Presidency*, and *The Obama Victory*). She also co-edited *The Oxford Handbook of Political Communication* and *The Oxford Handbook of the Science of Science Communication* and has won teaching awards at each of the three universities at which she has taught. Jamieson is the recipient of the 2022 Warren J. Mitofsky Award for Excellence in Public Opinion Research and the 2020 National Academy of Sciences' Public Welfare Medal for her "non-partisan crusade to ensure the integrity of facts in public discourse and development of the science of scientific communication to promote public understanding of complex issues." She is a member of the American Philosophical Society and the National Academy of Sciences and a Distinguished Scholar of the National Communication Association. She also is a fellow of the American Academy of Arts and Sciences, the American Association for the Advancement of Science, the American Academy of Political and Social Science, and the International Communication Association, and a past president of the American Academy of Political and Social Science. Jamieson is the co-founder of FactCheck.org and its SciCheck project. In 2016, her paper "Implications of the Demise of 'Fact' in Political Discourse" received the American Philosophical Society's Henry Allen Moe Prize.



**Heidi J. Larson, Ph.D.**, is Professor of Anthropology, Risk and Decision Science and is the Founding Director of the Vaccine Confidence Project at the London School of Hygiene & Tropical Medicine. She is also Clinical Professor of Health Metrics Sciences, University of Washington, Seattle, USA, and Guest Professor at the University of Antwerp, Belgium.

Dr. Larson previously headed Global Immunisation Communication at UNICEF, chaired GAVI's Advocacy Task Force, and served on the WHO SAGE Working Group on vaccine hesitancy. The VCP is a WHO Centre of Excellence on addressing Vaccine Hesitancy.

Professor Larson's research focuses on the analysis of social and political factors that can affect uptake of health interventions and influence policies. Her particular interest is on risk and rumour management from clinical trials to delivery – and building public trust. She served on the FDA Medical Countermeasure (MCM) Emergency Communication Expert Working Group, and is currently Principal Investigator for a global study on acceptance of vaccination during pregnancy; an EU-funded (EBODAC) project on the deployment, acceptance and compliance of an Ebola vaccine trial in Sierra Leone; and a global study on Public Sentiments and Emotions Around Current and Potential Measures to Contain and Treat COVID-19.

She is author of *STUCK: How Vaccine Rumors Start – and Why They Don't Go Away* (Oxford U Press, 2020).

**Neil A. Lewis, Jr., Ph.D., M.S.**, is a behavioral and intervention scientist at Cornell University and Weill Cornell Medicine, where he is an assistant professor in the department of communication, division of general internal medicine, and graduate field of psychology. He also co-directs Cornell's Action Research Collaborative, which brings together researchers, practitioners, community members, and policymakers to address pressing issues in society. Lewis's research examines how people's social contexts and identities influence: (1) how they interpret and make meaning of the world around them, (2) their motivation to pursue their goals and success in goal pursuit efforts, and (3) the implications of these processes for interventions and policies to promote equity in social outcomes. He received the Janet Taylor Spence Award for Transformative Early Career Contributions from the Association for Psychological Science (2022), the Cornell CALS Research and Extension Award for Outstanding Accomplishments in Science and Public Policy (2021), and the SAGE Young Scholar Early Career Award from the Society for Personality and Social Psychology (2020).

**Saad Omer, MBBS, M.P.H., Ph.D.**, has conducted studies in the United States, Guatemala, Kenya, Uganda, Ethiopia, India, Pakistan, Bangladesh, South Africa, and Australia. Dr Omer's research portfolio includes epidemiology of respiratory viruses such as influenza, RSV, and - more recently - COVID-19; clinical trials to estimate efficacy of maternal and/or infant influenza, pertussis, polio, measles and pneumococcal vaccines; and trials to evaluate drug regimens to reduce mother-to-child transmission of HIV. Moreover, he has conducted several studies on interventions to increase immunization coverage and acceptance. Dr Omer's work has been cited in global and country-specific policy recommendations and has informed clinical practice and health legislation in several countries. He has directly mentored over 100 junior faculty, clinical and research post-doctoral fellows, and PhD and other graduate students. Dr. Omer has published widely in peer reviewed journals including the New England Journal of Medicine, JAMA, Lancet, British Medical Journal, Pediatrics, American Journal of Public Health, Science, and Nature and is the author of op-eds for publications such as the New York Times, Politico, and the Washington Post.

Dr Omer has received multiple awards –including the Maurice Hilleman Award by the National Foundation of Infectious Diseases for his work on the impact of maternal influenza immunization on respiratory illness in infants younger than 6 months–for whom there is no vaccine. He has served on several advisory panels including the U.S.

National Vaccine Advisory Committee, Presidential Advisory Council on Combating Antibiotic-Resistant Bacteria - Vaccine Innovation Working Group, and WHO Expert Advisory Group for Healthcare Worker Vaccination. He has also served as an academic affiliate of the Office of Evaluation Sciences –formerly known as the White House Social and Behavioral Sciences Team.

**Sanjay Sarin, M.S., Ph.D.**, is responsible for providing leadership for FIND's strategic plan development as well as implementation of current and planned operations across FIND's country offices, expanding and strengthening FIND's country programmes globally while ensuring continued engagement with partners and donors. Sanjay currently serves on the TB GLC for WHO's SEARO, the Lab technical working group for National AIDS Control Organization, India, India TB Research Consortium and Global Fund's COVID-19 Technical Advisory Group reviewing Covid-19 proposals.

Prior to this, Sanjay served as Country Head for FIND India for 6 years, providing leadership towards strategic plan development and implementation, resource mobilization and managing key relationships with policy makers, civil society, industry partners, and donors. He also led policy and advocacy efforts for FIND in India positioning FIND as a key partner in health systems strengthening.

Sanjay joined FIND from Becton Dickinson (BD), where he was Regional Director of Global Health for the Asia Pacific region and was responsible for design, development, and implementation of BD's public health strategies. During his stint with BD, he was instrumental in establishing several key programmes across communicable and non-communicable diseases resulting in improved access to health technologies across the region. Prior to BD, Sanjay served as the Regional Lab Advisor for Clinton Health Access Initiative and contributed towards strengthening access to critical HIV diagnostic and monitoring technologies across Asia, Africa and Eastern Europe.

**Umair A. Shah, M.D., M.P.H.**, was appointed Secretary of Health for the great State of Washington by Governor Jay Inslee in December 2020. His appointment came at a difficult time amid the severe winter wave of COVID-19 and only a few days after arrival of vaccines into the state. In assuming this leadership position at the nationally respected Washington State Department of Health, Dr. Shah made the transition from fighting the pandemic on the front lines of response in Texas as Executive Director and Local Health Authority for Harris County Public Health (HCPH). Over his career, Dr. Shah has been a clinician, innovator, educator, and leader in health. He has been a champion for underserved communities, at the intersection of health and healthcare, while charting a fresh course in health by centering on the cornerstone values of equity, innovation, and engagement.

**Naveen Thacker, M.D., FIAP**, is the Director of Deep Children Hospital & Research Centre at Gandhidham-Kutch, Gujarat, India and an Adjunct Professor of Pediatrics at Pramukhswami Medical College, Karamsad Anand, Gujarat, India.

He is the President-Elect of the International Pediatric Association (IPA) for the year 2021-2023 and Secretary of Child Health Foundation. He is a former President of Asia Pacific Pediatric Association (APPA) for the year 2016-18 and the National President of Indian Academy of Pediatrics (IAP) for the year 2007.

He is currently a member of the Advance Course of Vaccinology (ADVAC) Scientific Committee, France and the Steering Committee of the International Collaboration on Advanced Vaccinology training (ICAVT). Also, he is a member of the Covid-19 Vaccine Immunization Task Force of Gujarat Government and India Expert Advisory Group on Measles and Rubella (IEAG- MR) of Ministry of Health and Family Welfare, Government of India.

He completed ADVAC Training in Annecy, France in Pasteur Meriaux Institute in 2007.

He served as a course director for CHF INCLIN ADVAC 2011, 2016, EVAC 2017. He was faculty at CHF-INCLIN ADVAC, CMC Vellore INDVAC, IVI Korea.

His current interest is in the area of Vaccine Hesitancy and is leading the IPA Vaccine Trust Project. He has over 50 publications on vaccines and immunization in peer indexed journals.

His social media reach includes 78k+ followers on Twitter.

He is listed amongst the top influencer for the fight against Polio released by UNICEF on World Polio Day 2017 and has been awarded some prestigious awards i.e., Outstanding Asian Pediatrician Award 2012, Rotary International Regional Award for Polio-free World 2010.

**Janet Tobias** is an Emmy and Peabody Award winning filmmaker and journalist as well as an executive who works at the intersection of technology, human behavior, information, design, and story. Tobias started her film and television career at CBS' 60 Minutes as Diane Sawyer's associate producer. After holding editorial management positions on a magazine program at NBC and for network wide legal coverage at ABC, she moved to PBS where she created, and executive- produced the Emmy Award-winning PBS program Life 360, an eclectic mix of documentary, music, and performance pieces. Tobias made her theatrical debut in 2012 with the documentary feature No Place On Earth, which Variety called a "substantial contribution to Holocaust cinema." No Place On Earth debuted at the Toronto International Film Festival, and was released by Magnolia Pictures in the US and Senator in Europe.

In 2017 her prescient film about the 21st century threat of pandemics, Unseen Enemy, was released at the Copenhagen and Beijing International Film Festivals and broadcast on six continents in ten languages. Tobias was nominated for Writers Guild Awards for both No Place On Earth and Unseen Enemy. In 2018, her film, Memory Games, about four of the world's top memory contestants, was released at Doc NYC and then streamed on Netflix around the world. Her most recent film as a director is the National Geographic theatrical documentary FAUCI, which after its debut at the Telluride Film Festival in 2021, is now streaming on Disney+. It was nominated for three Critics Choice Awards. Tobias is currently a member of both the Writers and Directors Guilds.

In 2019, Tobias co-founded the non-profit Global Health Reporting Center. GHRC is dedicated to reporting on the key health issues of our time across diverse platforms: television, streaming, digital (text and video), and podcast. GHRC works regularly with both PBS NewsHour and CNN's medical unit on in-depth short form health/medical pieces. In 2021, Tobias executive produced GHRC's film RACE FOR THE VACCINE for the BBC/CNN Originals. Reviewers called RACE FOR THE VACCINE "gripping and inspiring" (Telegraph), "strikes the right balance between stories and science" (Sunday Times) and "unmissable" (Daily Mail). Recently, she executive produced GHRC's film ENDING AIDS IN AMERICA which was just released on PBS NOVA.

In 2004, Tobias co-founded Ikana Health Action Lab. Ikana works at the intersection of human behavior, information, and story to improve health outcomes. Ikana Health Action Lab has worked with Cisco, Johnson & Johnson, AARP, Mount Sinai School of Medicine, the Global Fund for Aids, TB, and Malaria, the Wellcome Trust, and the Gates Foundation. She is an adjunct assistant professor of Medicine at Mount Sinai School of Medicine and was formerly an adjunct research professor of Global Public Health at NYU. In addition, Tobias led a final year capstone class (focused on secondary school drug prevention education) at Columbia's School for International and Public Affairs and served as a senior fellow at the University of British Columbia's Sauder School of Business. She was a member of the Drug Forum of the Institute of Medicine, National Academy of Sciences from 2009 to 2015 and currently serves on the advisory board of Mount Sinai's East Harlem Outreach Partnership, a student run, physician

supervised free clinic.

**Chad Worz, PharmD, BCGP, FASCP**, is Chief Executive of the American Society of Consultant Pharmacists (ASCP) in Alexandria, Virginia, the only international professional society devoted to optimal medication management and improved health outcomes for all older persons. ASCP's senior care consultant pharmacist members manage and improve quality of life for geriatric patients and other individuals residing in a variety of environments, including nursing facilities, subacute care and assisted living facilities, psychiatric hospitals, hospice programs, and home- and community-based care. Dr. Worz received his Doctor of Pharmacy degree from the University of Cincinnati College of Pharmacy in Ohio, and he is a board-certified geriatric pharmacist. His career has focused on the medication management of older adults. Dr. Worz developed an innovative clinical practice in a long-term care setting in Ohio and directed the pharmacy practice of a regional, independent pharmacy serving 10,000 long-term care residents. Dr. Worz established a nation-wide, geriatric-based consulting company to educate and serve nursing facility residents, nursing facility administration, long-term care pharmacies, and the public through a comprehensive knowledge of medication use. He is a national thought leader, presenting on pharmacy- and medication-related topics, and he has served on a number of national boards related to pharmacy and medication utilization.

**In-Kyu Yoon, M.D.**, is currently based in Washington, DC, USA as Director and Global Head of Programmes and Innovative Technology for the Coalition for Epidemic Preparedness Innovations (CEPI). He has previously served as Vaccine Development Project Leader at CEPI; Senior Advisor for the International Vaccine Institute (IVI) in Seoul, Republic of Korea; Deputy Director General of Science for IVI; Director of the Global Dengue & Aedes-Transmitted Diseases Consortium (GDAC); Director of the Dengue Vaccine Initiative (DVI); and Chief of Virology at the U.S. Armed Forces Research Institute of Medical Sciences (AFRIMS) in Bangkok, Thailand. Dr. Yoon has conducted research on the epidemiology, pathophysiology and immunology of infectious diseases including dengue, Zika, chikungunya, MERS and influenza, and has authored over 140 publications in peer-reviewed journals. He has overseen vaccine development programs for candidate vaccines against COVID-19, dengue, Lassa fever, Nipah and MERS in international settings, and has led international public health initiatives in support of vaccine introduction efforts. He is a global expert on arboviruses, and has served as an advisor to the World Health Organization, among others. He has been a faculty member of the Uniformed Services University, USA, and is Fellow of the American College of Physicians. Dr. Yoon graduated magna cum laude with a Bachelor of Science degree from Yale University, and received his Doctor of Medicine from the New York University School of Medicine. He completed residency in Internal Medicine and a fellowship in Allergy/Immunology at the Walter Reed Army Medical Center, USA.

## The National Academies' Statement on Preventing Discrimination, Harassment, And Bullying: Policy for Participants in NASEM Activities (Updated December 2, 2021)

The National Academies of Sciences, Engineering, and Medicine (NASEM) are committed to the principles of diversity, inclusion, integrity, civility, and respect in all of our activities. We look to you to be a partner in this commitment by helping us to maintain a professional and cordial environment. **All forms of discrimination, harassment, and bullying are prohibited in any NASEM activity.** This policy applies to all participants in all settings and locations in which NASEM work and activities are conducted, including committee meetings, workshops, conferences, and other work and social functions where employees, volunteers, sponsors, vendors, or guests are present.

**Discrimination** is prejudicial treatment of individuals or groups of people based on their race, ethnicity, color, national origin, sex, sexual orientation, gender identity, age, religion, disability, veteran status, or any other

characteristic protected by applicable laws.

**Sexual harassment** is unwelcome sexual advances, requests for sexual favors, and other verbal or physical conduct of a sexual nature that creates an intimidating, hostile, or offensive environment.

**Other types of harassment** include any verbal or physical conduct directed at individuals or groups of people because of their race, ethnicity, color, national origin, sex, sexual orientation, gender identity, age, religion, disability, veteran status, or any other characteristic protected by applicable laws, that creates an intimidating, hostile, or offensive environment.

**Bullying** is unwelcome, aggressive behavior involving the use of influence, threat, intimidation, or coercion to dominate others in the professional environment.

### REPORTING AND RESOLUTION

Any violation of this policy should be reported. If you experience or witness discrimination, harassment, or bullying, you are encouraged to make your unease or disapproval known to the individual at the time the incident occurs, if you are comfortable doing so. You are also urged to report any incident by:

- Filing a complaint with the Office of Human Resources at 202-334-3400 or hrservicecenter@nas.edu, or
- Reporting the incident to an employee involved in the activity in which the member or volunteer is participating, who will then file a complaint with the Office of Human Resources.

Complaints should be filed as soon as possible after an incident. To ensure the prompt and thorough investigation of the complaint, the complainant should provide as much information as is possible, such as names, dates, locations, and steps taken. The Office of Human Resources will investigate the alleged violation in consultation with the Office of the General Counsel.

If an investigation results in a finding that an individual has committed a violation, NASEM will take the actions necessary to protect those involved in its activities from any future discrimination, harassment, or bullying, including in appropriate circumstances **the removal of an individual from current NASEM activities and a ban on participation in future activities.**

### CONFIDENTIALITY

Information contained in a complaint is kept confidential, and information is revealed only on a need-to-know basis. NASEM will not retaliate or tolerate retaliation against anyone who makes a good faith report of discrimination, harassment, or bullying.

## The National Academies' Statement on Diversity and Inclusion

The National Academies of Sciences, Engineering, and Medicine value diversity in our members, volunteers, and staff and strive for a culture of inclusion in our workplace and activities. Convening a diverse community to exchange ideas and perspectives enhances the quality of our work and increases our relevance as advisers to the nation about the most complex issues facing the nation and the world.

To promote diversity and inclusion in the sciences, engineering, and medicine, we are committed to increasing the diversity of the National Academies' staff, members, and volunteers to reflect the populations we serve. We pledge to cultivate an environment and culture that promotes inclusion and values respectful participation of all individuals who help advance the mission of the institution.