NATIONAL ACADEMIES Sciences Engineering Medicine

FORUM ON MICROBIAL THREATS

Understanding the Introduction of Pathogens into Humans-Preventing Patient Zero: A Workshop

January 15-16, 2025 | 09:00–5:30pm EST | Hybrid

ATTENDEE PACKET

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About the Forum on Microbial Threats

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/microbialthreats

Sponsors

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- National Institute of Allergy and Infectious Diseases
- U.S. Agency for International Development

The Forum greatly appreciates our sponsors that make intellectual and financial contributions to our work.

Highlights of Recent Publications

- Assessing the Burden of and Potential Strategies to Address Antimicrobial Resistance: Proceedings of a Workshop – in Brief (2024)
- Mitigating Arboviral Threats and Strengthening Public Health Preparedness: Proceedings of a Workshop (2024)
- Toward a Common Research Agenda in Infection-Associated Chronic Illnesses: Proceedings of a Workshop (2024)
- Applying Lessons Learned from COVID-19 Research and Development to Future Epidemics: Proceedings of a Workshop (2023)
- Accelerating the Development and Uptake of Rapid Diagnostics to Address Antibiotic Resistance: Proceedings of a Workshop (2023)
- The Role of Plant Agricultural Practices on Development of Antimicrobial Resistant Fungi Affecting Human Health: Proceedings of a Workshop Series (2023)
- 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)

One Health Action Collaborative

The Forum's One Health Action Collaborative (OHAC), led by Jonathan Sleeman, M.A., VetMB, Dipl. ACZM, 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.

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Understanding the Introduction of Pathogens into Humans-Preventing Patient Zero

A Workshop

January 15-16, 2025
Day 1: 9:00 am – 5:30 pm ET
Day 2: 9:00 am – 12:45 pm ET
Virtual webcast *or* in person at the NAS Building | Washington, DC | NAS 120

Day 1	
9:00 – 9:15 am	**Welcome remarks, workshop overview, and goals** Daniel Bausch, National University of Singapore *Co-Chair, Workshop Planning Committee, in person* Sumiko Mekaru, Epivoyant, LLC *Co-Chair, Workshop Planning Committee, in person*
9:15 – 11:00 am	**Session 1: Pathogen introduction into humans** **Moderator:** Cristina Cassetti, National Institutes of Health, *in person* **Pathogen exposures from wildlife** Raina Plowright, Cornell University*, in person* **Pathogen exposures from farming and agriculture** Charles Bebay, Food and Agriculture Organization, *virtual* **Pathogen exposure in laboratory settings** Luis Ochoa Carrera, Global Health Security Fund; PandemicTech, *virtual* **Intentional release and biosecurity** Paul Freidrichs, Office of Pandemic Preparedness and Response Policy*, in person* **Q&A**
11:00 – 11:15 am	**BREAK**

11:15 am – 12:45 pm	**Session 2: Pathogen amplification and dissemination** **Moderator:** Keith Klugman, Bill & Melinda Gates Foundation*, in person* **Systems-level effects on pathogen dynamics and spillover: Case studies from the hemorrhagic fever viruses** Vincent Munster, National Institutes of Health*, in person* **Amplification in secondary hosts** Richard Webby, World Health Organization Collaborating Centre for Studies on the Ecology of Influenza in Animals and Birds*, in person* **Amplification in health care settings** Mary Choi, US Centers for Disease Control and Prevention*, in person* **Overcoming blind spots in pathogen detection** Erik Karlsson, Institut Pasteur du Cambodge*, in person* **Q&A**
12:45 – 1:45 pm	**LUNCH**
1:45 – 3:30 pm	**Session 3: Forecasting, surveillance and early warning – panel discussion** **Moderator:** Sumiko Mekaru, Epivoyant LLC*, in person* *Co-Chair, Workshop Planning Committee* **Panelists:** Barbara Han, Cary Institute of Ecosystem Studies*, in person* Lauren Charles, Pacific Northwest National Laboratory*, virtual* Aparupa Sengupta, NTI, *virtual* Marc Lipsitch, Harvard University, *virtual* **Q&A**
3:30 – 3:45 pm	**BREAK**

3:45 – 5:30 pm	**Session 4: Interventions for prevention and mitigation** **Moderator:** Andrew Clements, US Agency for International Development*, in person* **Societal framing for behavioral interventions** Emily Gurley, Johns Hopkins University*, in person* **Diagnostics for early warning** Emmanuel Agogo, FIND*, in person* **Nature-based solutions** Jamie Reaser, Smithsonian Institution*, virtual* **Mitigation of risks in agricultural settings** David Swayne, Birdflu Veterinarian LLC*, in person* **Laboratory biosafety and biosecurity** Gigi Gronvall, Johns Hopkins University*, in person* **Q&A**
5:30 – 5:45 pm	**Synthesis and Adjourn** Sumiko Mekaru, Epivoyant, LLC*, in person* *Co-Chair, Workshop Planning Committee*
END OF DAY 1	

Day 2	
9:00 – 9:15 am	**Welcome remarks, review of day 1** Daniel Bausch, National University of Singapore, *in person* *Co-Chair, Workshop Planning Committee* Sumiko Mekaru, Epivoyant, LLC, *in person* *Co-Chair, Workshop Planning Committee*
9:15 – 10:45 am	**Session 5: Legal, ethical, and policy considerations – panel discussion** **Moderator:** Carla Saenz, Pan American Health Organization, *in person* **Panelists:** Alex Phelan, Johns Hopkins Center for Health Security, *virtual* Jennifer Nuzzo, Brown University Pandemic Center, *virtual* Fifa Rahman, Matahari Global Solutions, *in person* Colin McIff, US Department of Health and Human Services, *in person* **Q&A**
10:45 – 11:00 am	**BREAK**
11:00 am – 12:30 pm	**Session 6: Next steps in disease mitigation** **Moderator:** Daniel Bausch, National University of Singapore, *in person* *Co-Chair, Workshop Planning Committee* **Panelists:** Sumiko Mekaru, Epivoyant, LLC, *in person* Jonathan Sleeman, US Geological Survey, *in person* Matiangai Sirleaf, University of Maryland, *virtual* Kevin Anderson, Department of Homeland Security (retired), *in person* **Q&A**
12:30 – 12:45 pm	**Synthesis and Close** Daniel Bausch, National University of Singapore, *in person* *Co-Chair, Workshop Planning Committee*

END OF WORKSHOP

Workshop Planning Committee

Daniel Bausch, M.D., M.P.H, *(co-chair)
Visiting Professor, National University of Singapore

Sumiko Mekaru, D.V.M., Ph.D., *(co-chair)*
Instructor of Public Health and Community Medicine, Tufts University School of Medicine

Kevin Anderson, Ph.D.,*
Former Senior Program Manager, Department of Homeland Security

Cristina Cassetti, Ph.D.,*
Deputy Director of the Division of Microbiology, National Institutes of Allergy and Infectious Diseases

Ricardo Castillo, D.V.M., Ph.D., MSPH,
Assistant Professor of Epidemiology, Perelman School of Medicine at the University of Pennsylvania

Andrew Clements, Ph.D.,*
Senior Scientific Advisor, Emerging Threats Division of the U.S. Agency for International Development

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Principal Research Staff Member and Manager, IBM Research Artificial Intelligence

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Senior Program Officer, Nuclear Threat Initiative

Matiangai Sirleaf, J.D.,
Professor of Law, University of Maryland Francis King Carey School of Law

Jonathan M. Sleeman, M.A., VetMB, Dipl. ACZM,*
Science Advisor for Wildlife Health, U.S., Geological Survey

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* Member, Forum on Microbial Threats

Planning Committee Member Biographies

Daniel Bausch (co-chair)

Daniel Bausch, M.D., M.P.H., is a visiting professor at the National University of Singapore. He previously served as 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). He also 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.

Sumiko Mekaru (co-chair)

Sumiko Mekaru, D.V.M, Ph.D., is an Instructor of Public Health and Community Medicine at Tufts University School of Medicine. She previously served as the lead epidemiologist for the modeling and analytics workstream for the Department of Defense COVID Task Force and the Vice President of Client Delivery for Epidemico, an informatics company that provided early insights on disease outbreaks, drug safety, and supply chain vulnerabilities. As a veterinarian and epidemiologist, Dr. Mekaru brings both clinical experience and deep training in analytic methods to innovating new techniques for infectious disease surveillance, modeling, and prediction. At Boston Children's Hospital, she helped create, maintain, and revise health surveillance tools such as Flu Near You/Outbreaks Near Me, Vaccine Finder, and the award-winning healthmap.org. She has coauthored dozens of peer-reviewed manuscripts on disease outbreaks and surveillance, and data analysis methods. Dr. Mekaru received her DVM from the Cummings School of Veterinary Medicine at Tufts University. After practicing at a small animal hospital, she received a Master of Preventive Veterinary Medicine from UC Davis and a PhD in epidemiology from Boston University.

Kevin Anderson

Kevin Anderson, Ph.D., most recently served as a senior program manager in the Department of Homeland Security's (DHS's) Science and Technology Directorate, providing oversight and requirements for biodetection and biodiagnostics systems development for government-wide customers and stakeholders. Since joining DHS in 2003, Dr. Anderson has provided leadership for science program development, laboratory design, and strategic planning; served as a subject matter expert and advisor to the Bioterrorism Risk Assessment and Biological Threat Characterization programs; and has participated in interagency working groups and assessments which provide guidance to medical countermeasure development, a key component of the nation's biodefense strategy. Prior to joining DHS, Dr. Anderson was a principal investigator at the U.S. Army Medical Research Institute of Infectious Diseases, leading research focused on understanding basic mechanisms of viral diseases causing hemorrhagic fever and development of medical countermeasures. He received postdoctoral training in molecular virology at the University of Alabama at Birmingham and the University of North Carolina at Chapel Hill, performing basic research on human respiratory syncytial viruses, and earned Ph.D. and B.S. degrees in microbiology from Montana State University and the University of Maryland, College Park, respectively.

Cristina Cassetti

Cristina Cassetti, Ph.D., is the Deputy Director of the Division of Microbiology and Infectious Diseases (DMID) at the National Institutes of Allergy and Infectious Diseases (NIAID), a component of the US

National Institutes of Health (NIH). Dr. Cassetti has a Ph.D. in virology from the University of Rome, Italy. She conducted research on poxviruses replication at the NIH, influenza virus biology at Rutgers University and HPV vaccine development at the Vaccine Discovery Department at Wyeth (now Pfizer). In 2003, she became a Program Officer at NIAID where she was responsible for the management and direction of extramural research programs on several emerging viral diseases of global health importance including influenza and dengue. In 2016, she was appointed to coordinate the Zika research response in extramural NIAID and to manage translational research in the Virology Branch. In 2017 she was appointed as Chief of the Virology Branch in DMID. In 2019, she become the Deputy Director of DMID where she shares responsibilities with the director for the overall scientific direction, administration and management of the largest extramural Division at NIAID.

Ricardo Castillo

Ricardo Castillo, DVM PhD MSPH, is an Assistant Professor of Epidemiology at the Perelman School of Medicine at the University of Pennsylvania and the Scientific Director of the Zoonotic Diseases Research Center, a collaborative research consortium between multiple US-based and international institutions employing over 30 staff. Applying a One Health approach, Dr. Castillo has researched human cysticercosis in South America's tropical coast, echinococcosis in the Andean mountains, and urban zoonoses such as dog-mediated rabies and urban Chagas disease. In the US, he has studied antimicrobial-resistant bacterial infections of animal origin in urban and rural communities. His research focuses on zoonotic diseases in urban areas, exploring how human and animal migration, social and ecological urban dynamics, and gaps in preventive strategies drive outbreaks. He holds a PhD in infectious disease epidemiology and an MSPH in international health from Johns Hopkins Bloomberg School of Public Health, supported by a Fulbright Scholarship.

Andrew Clements

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.

Payel Das

Payel Das, M.Sc., Ph.D., is a principal research staff member and a manager at IBM Research Artificial Intelligence (AI), IBM Thomas J. Watson Research Center, Yorktown Heights, NY 10597 USA. She received a Ph.D. from Rice University. Her research interests include statistical physics, trustworthy machine learning, bio-inspired AI, and machine creativity. At IBM, she leads a team and manages research across global labs on advancing next-generation AI architectures to enable safe and trustworthy AI. Das has co-authored over 80 peer-reviewed publications and 40+ patent disclosures and given dozens of invited talks. Das is the recipient of several IBM Outstanding Technical Achievement Awards (the highest technical award at IBM), five IBM Invention Achievement Awards, and funding awards from NSF and EU. Her work on open-sourcing generative AI-based services has been recognized by Harvard Belfer Center's Technology and Public Purpose (TAPP) Project and IEEE Open Software Services Award. In 2024, she has received IEEE 2024 Region 1 Technological Innovation (Industry / Government) Award and VentureBeat Women in AI Research award for her research on novel large language model architectures for advancing science and technologies.

Gigi K. Gronvall

Gigi Gronvall, Ph.D., is a Professor in the Department of Environmental Health and Engineering at the Johns Hopkins Bloomberg School of Public Health and a Senior Scholar at the Johns Hopkins Center for Health Security. She is an immunologist by training.
During the COVID-19 pandemic, she led the Center's efforts to track the development and marketing of diagnostic tests. She leads work on improving indoor air quality to reduce pathogen transmission, including guidance for K-12 schools and the development of a Model State Indoor Air Quality Act. She also has written about the scientific response to the COVID-19 pandemic, the contested origin of SARS-CoV-2, and implications for national and international security.
Dr. Gronvall is the author of Synthetic Biology: Safety, Security, and Promise. She is a member of the Department of State's International Security Advisory Board; NIH's Novel and Exceptional Technology and Research Advisory Committee (NExTRAC); and the National Academies' Forum on Microbial Threats.

Keith P. Klugman

Keith Klugman, M.D., Ph.D., is the Director of the Pneumonia, Meningitis, Neonatal Sepsis, Antimicrobial Resistance and Surveillance and Epidemic Preparedness and Response Programs at the Bill and Melinda Gates Foundation in Seattle WA. He is the Emeritus William H. Foege Chair of Global Health at the Hubert Department of Global Health, Emory University, Atlanta, Georgia. In addition, he serves as an Honorary Professor in the Respiratory and Meningeal Pathogens Research Unit at the University of the Witwatersrand, in Johannesburg, South Africa.

Professor Klugman is a past president of the International Society of Infectious Diseases; and a past chair of the International Board of the American Society for Microbiology. In 2015 Keith was elected to membership of the US National Academy of Medicine. He has chaired or served on numerous expert committees for the World Health Organization (WHO), the Welcome Trust and the Centers for Disease Control and Prevention (CDC). He currently serves as an editor or member of the editorial advisory board of the journals Clinical Infectious Diseases, Emerging Infectious Diseases and MBio.

Professor Klugman has made his major contributions in the field of pneumococcal research, including antimicrobial resistance. His work demonstrating pneumococcal conjugate vaccine efficacy in the developing world, has led to interventions that continue to save millions of lives especially in Africa and in Asia. He has published more than 650 scientific papers which have been cited more than 44,000 times to date. During the covid pandemic he has kept the staff of the Gates Foundation up to date of developments with weekly or biweekly one hour zoom calls open to all the staff. His current position allows him the opportunity to contribute to the mission of the Gates Foundation to reduce deaths from pneumonia (including covid), neonatal sepsis and meningitis in children, thus allowing them the chance to lead healthy and productive lives.

Carla Saenz

Carla Saenz, Ph.D., is responsible for the Regional Program on Bioethics of the Pan American Health Organization (PAHO), which supports countries in the Americas primarily on research ethics and public health ethics. An elected fellow of the Hastings Center since 2019, she was responsible for the development of the Organization's ethics guidance for zika and COVID-19, including Catalyzing Ethical Research in Emergencies. Ethics Guidance, Lessons Learned from the COVID-19 Pandemic, and Pending Agenda. Carla serves on the board of the International Association of Bioethics and the Steering Committee of the Global Forum on Bioethics in Research. She is a native from Peru and holds a PhD in Philosophy from the University of Texas at Austin. 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.

Aparupa Sengupta

Aparupa Sengupta, Ph.D., is an accomplished scientist, life science safety and security practitioner, and global bioscience and technology policy expert with an emphasis on US and global south policy. She currently serves as a Senior Program Officer for NTI's Global Biological Policy and Programs team (NTI | bio), where she leads the Biosecurity Innovation and Risk Reduction Initiative portfolio. This initiative focuses on preventing biotech catastrophes at the intersection of technology and life science, such as those arising from AI-bio convergence. Prior to joining NTI, she served at the University of California, Merced, as the campus biosafety and biosecurity officer and Director of High Containment Research Laboratories. In recognition of her outstanding service during the pandemic, the chancellor of UC Merced presented her with the COVID-19 Hero award. Dr. Sengupta is a sought-after speaker and expert in global biological threat reduction. She has given numerous talks advocating for the safe and secure use of emerging technologies. Originally from India, Dr. Sengupta holds a doctorate in biological sciences, an MS in molecular genetics and biotechnology from Michigan Technological University, and an MSc in biotechnology from Bangalore University, India. She is also a Registered Biosafety Professional (RBP) with ABSA International.

Matiangai Sirleaf

Matiangai Sirleaf, JD, is an interdisciplinary international scholar, justice seeker, and human rights advocate who has worked to unearth unjust hierarchies embedded in international law and to remedy the inequities that emerge and persist. She is the Nathan Patz Professor of Law at the University of Maryland Francis King Carey School of Law. She holds a secondary appointment as a professor in the Department of Epidemiology and Public Health at the University of Maryland School of Medicine

Jonathan M. Sleeman

Jonathan Sleeman, M.A., VetMB, Dipl. ACZM, is currently a Science Advisor for Wildlife Health for the US Geological Survey. Previous positions include Center Director for the USGS National Wildlife Health Center where he led a team of scientists and support staff to investigate and research wildlife diseases that threaten wildlife populations, public health, and the economy. He received his master's degree in zoology and his veterinary degree from the University of Cambridge, and completed an internship and residency in zoological medicine at the University of Tennessee. He is a Diplomate of the American College of Zoological Medicine. He has published widely on topics related to wildlife anesthesia, emerging diseases of wildlife, wildlife epidemiology, risk assessment, One Health, and Ecohealth. He holds a variety of leadership positions including a member of the World Organisation of Animal Health's Working Group on Wildlife and the National Academy of Sciences Forum on Microbial Threats. Current interests include development of national wildlife health programs, broad-scale wildlife disease risk assessments, and leadership skills in wildlife health.

Speaker Biographies

Emmanuel Agogo

Emmanuel Agogo, is the Director of Pandemic Threats at FIND (Foundation for Innovative New Diagnostics) Geneva, where he spearheads strategic efforts to enhance diagnostic readiness for pandemic threats. His work at FIND includes launching the Diagnostic Readiness Index (PDxRI), which identifies global gaps in diagnosing outbreak-prone diseases. He has also collaborated with various organizations to unveil the 100 Days Mission Roadmap, a significant investment to enhance diagnostic readiness across multiple pillars.

Before joining FIND, Dr. Agogo held several key positions in public health leadership across Nigeria and Africa. As the Deputy Director at the Nigeria Centre for Disease Control (NCDC), he was pivotal in strengthening the country's disease surveillance and response systems. Additionally, he served as the Country Director for Resolve to Save Lives in Nigeria, where he led innovative initiatives for pandemic preparedness at the national and sub-national levels. Dr Agogo has also consulted for the WHO, Africa Union- Africa Risk Capacity and the World Bank on pandemic preparedness and financing

Dr. Agogo is trained in Primary/Community Health and Infectious Diseases. He is a Fellow of the Royal College of General Practitioners and an Honorary Member of the Faculty of Public Health, UK. He was previously a Biosecurity Leadership Fellow (2019) at the Johns Hopkins Centre for Health Security, a Center for Strategic and International Studies (CSIS) Leadership Fellow, and a Kofi Annan Africa CDC Leadership Fellow. He has co-authored book chapters in surveillance and epidemiology and has over 30 peer-reviewed papers. Dr. Agogo is also an adjunct professor at the Global Health Institute, Nasarawa State University in Nigeria.

Charles Bebay

Charles Bebay, MD, is Senior Animal Health Officer who has worked with FAO since 2009, serving in several positions both at FAO headquarters in Rome, and in Africa. Since November 2018, he is providing leadership for the FAO's Emergency Centre for Transboundary Animal Diseases (FAO ECTAD) program in Eastern and Southern Africa. Charles is veterinarian with postgraduate degrees on livestock development, tropical animal diseases, banking and finance.

Lauren Charles

Lauren Charles, Ph.D., DVM, is a veterinarian and Chief Data Scientist within the National Security Directorate at Pacific Northwest National Laboratory (PNNL). Her research integrates multimodal data, e.g., medical records and disease reporting with opensource data, natural disasters, meteorology, topography, and socioeconomic factors, into complex models to advance current Biosurveillance, event and anomaly detection, risk assessment, and early warning through a One Health (OH) approach. Dr. Charles leads PNNL's AI-Driven OH Security program, which focuses on disrupting health threats and their impacts. Leveraging PNNL's leadership in operational AI and OH, the team works at the local, regional, national, and global levels to achieve optimal health and security results. Charles sits on the editorial board of Nature's Scientific Reports, Pathogens journal, and is an associate editor for CABI One Health. She also serves as an advisor on Senator Gillibrand's One Health Security Council and holds a joint appointment with Washington State University's Paul Allen School for Global Health.

Mary Choi

Mary J. Choi, MD, MPH is a medical epidemiologist in the Viral Special Pathogens Branch at the U.S. Centers for Disease Control and Prevention. She has responded to multiple viral hemorrhagic fever outbreaks including the 2014 West Africa Ebola outbreak, where she worked to strengthen infection prevention and control practices in Guinea; the 2023 Marburg outbreak in Equatorial Guinea, where she

initiated and organized contact tracing for healthcare workers; and the 2024 Marburg outbreak in Rwanda, where she provided technical assistance to the Ministry of Health. Domestically, she has responded to imported cases of Ebola virus disease and Lassa fever. She completed residency training in Emergency Medicine at the University of Michigan and a fellowship in International Emergency Medicine at Columbia University, where she also received her MPH. She graduated from CDC Epidemic Intelligence Service in 2014. Prior to joining CDC, she worked as an emergency medicine physician in the U.S. Army.

Paul Friedrichs

Paul Friedrichs currently serves as Deputy Assistant to the President and as the inaugural Director of The White House Office of Pandemic Preparedness and Response Policy. In this role, Paul advises the President and coordinates U.S. government efforts to enhance the United States and its partners' ability to prepare for and respond to pandemics and other biologic events.

Paul previously served as Special Assistant to the President and Senior Director for Global Health Security and Biodefense at the White House National Security Council, where he coordinated US policy to detect, prevent, prepare for, and respond to, infectious diseases and biological threats.

Paul previously served as the Joint Staff Surgeon at the Pentagon, where he provided medical advice to the Chairman of the Joint Chiefs of Staff on Department of Defense (DOD) operations and also served as the medical advisor to the DOD COVID-19 Task Force. He was also the United State's representative to the North Atlantic Treaty Organization's Committee of the Chiefs of Military Medical Services. In addition to caring for patients in combat, Antarctica and other austere locations, he has led DOD's global medical evacuation system and assisted in multiple major domestic and international responses to natural disasters and biological outbreaks, as well as global health diplomacy efforts. As Chair of the Military Health System's Joint Task Force on High Reliability Organizations, Paul oversaw development of a roadmap to continuously improve military health care. Paul received his commission at Tulane University through the Reserve Officer Training Corps in 1986, his Doctor of Medicine degree (M.D.) from the Uniformed Services University in 1990 and was a Distinguished Graduate of the National War College, where he received a Masters Degree in Strategic Security Studies. He has commanded multiple medical units, served as an Assistant Professor of Surgery and led joint and interagency teams which earned numerous awards. He has been awarded the Bronze Star and has been named a Chevalier in the French Ordre National du Merite.

Emily Gurley

Emily Gurley, Ph.D., is a Distinguished Professor of the Practice in the Department of Epidemiology at the Johns Hopkins Bloomberg School of Public Health and has worked in Bangladesh for two decades. She spent 12 years at the icddr,b in Dhaka, Bangladesh where she investigated outbreaks and built public health surveillance systems with government partners, and served as the Director of icddr,b's Emerging Infections Program. Her interests include development of novel surveillance strategies and improving the communication and collaboration between field epidemiologists and infectious disease modelers. She leads multi-disciplinary studies on the transmission and prevention of emerging diseases, such as Nipah virus. Her research adopts a One Health approach to the study and prevention of infectious disease, taking into account the ecological context in which human disease occurs. Emily is lead for the Bat Virus Spillover Evidence Compendium (Bat-Com), which is building a publicly accessible summary of all existing evidence about bat virus spillovers. She also serves on the Board of Directors for the American Society for Tropical Medicine and Hygiene (ASTMH), and as a commissioner for the Lancet Commission on Prevention of Viral Spillovers.

Barbara A. Han

Barbara A. Han, Ph.D., is an Associate Scientist and disease ecologist at Cary Institute of Ecosystem Studies in New York. Her research focuses on advancing infectious disease intelligence to improve the

prediction and prevention of zoonotic disease emergence. By integrating machine learning with ecological and evolutionary principles, Dr. Han's work enhances upstream surveillance and management strategies, aiming to preempt spillover transmission and mitigate epidemic spread in humans. Dr. Han is a pioneer in applying AI and ecoinformatics to predict spillover risks associated with zoonoses, including Ebola, SARS-CoV-2, Zika, Nipah, and understudied hemorrhagic fevers. Her research program is supported by multiple U.S. federal agencies and private foundations and seeks to provide actionable predictions about when, where, and from which species future disease risks are likely to arise. A trusted advisor to global organizations, Dr. Han has contributed her expertise to the World Health Organization, Wellcome Trust, United Nations Environment Programme, the U.S. National Academies, and the National Security Council. She earned her undergraduate degree from Pepperdine University and completed her Ph.D. at Oregon State University in 2008. Before joining Cary Institute, she held research fellowships from the National Science Foundation (ecological informatics), National Institutes of Health (machine learning), and the U.S. Department of State (Fulbright Scholar).

Erik Karlsson

With nearly two decades of experience in virology, molecular epidemiology, and viral genomics, especially in the Global South, Dr. Erik Karlsson has dealt with viruses from every angle. As Head of Virology at Institut Pasteur du Cambodge, he focuses on building One Health early warning systems to stop emerging infectious diseases before they spread. He monitors zoonotic and seasonal pathogens where humans, animals, and the environment intersect. Using innovative techniques like environmental sampling, next-generation sequencing, and metagenomics, he tracks viruses with pandemic or epidemic potential. Dr. Karlsson’s work also goes beyond human health—he is also addressing agricultural viruses, tackling threats to food security and livelihoods. Dr. Karlsson serves as the Director of the Cambodian National Influenza Center and a WHO H5 Reference Laboratory, and he collaborates with WHO, FAO, and many others to shape policies and strategies to improve surveillance, prevention, and control at critical hotspots like live animal markets. He has played a key role in the COVID-19 pandemic and responding to avian influenza outbreaks in birds and humans, translating data into actionable One Health solutions when it matters most.

Marc Lipsitch

Marc Lipsitch, D.Phil, is Professor of Epidemiology at the Harvard T. H. Chan School of Public Health. He directs the Center for Communicable Disease Dynamics and the Interdisciplinary Program on Infectious Disease Epidemiology. He is an honorary faculty member at the Wellcome Sanger Institute. He is currently on part-time secondment to the US CDC as Senior Advisor for the Center for Forecasting and Outbreak Analytics, for which he was the founding co-director (though this talk is in his personal and academic capacity). His scientific research concerns the effect of naturally acquired host immunity, vaccine-induced immunity, and other public health interventions on the population biology of pathogens and the consequences for human health. In the area of biosafety and biosecurity, he co-founded the Cambridge Working Group, whose efforts led to the US government funding pause on gain-of-function research to enhance potential pandemic pathogens, and he has been writing and speaking on policy issues in this area in both popular and peer-reviewed forums for over a decade. He has authored 400 peer-reviewed publications on antimicrobial resistance, epidemiologic methods, mathematical modeling of infectious disease transmission, pathogen population genomics, research ethics, biosafety/security, and immunoepidemiology of Streptococcus pneumoniae. Dr. Lipsitch is a leader in research and scientific communication on COVID-19. Dr. Lipsitch received his BA in philosophy from Yale and his DPhil in zoology from Oxford. He did postdoctoral work at Emory University and CDC. He is a member of the American Academy of Microbiology and the National Academy of Medicine.

Colin McIff

Colin McIff currently serves as the Deputy Assistant Secretary (DAS) of the Office of Global Affairs at the U.S. Department of Health and Human Services.

Prior to this, Mr. McIff served from 2016-2018 as the Director of the Europe Office of the Food and Drug Administration (FDA) and HHS Representative to the European Union in Brussels, Belgium. From September 2010 to August 2016, Mr. McIff served as Health Attaché at the U.S. Mission to the United Nations in Geneva, leading U.S. engagement with the World Health Organization and other Geneva-based health institutions.

Mr. McIff received his Bachelor of Arts in History and East Asian Studies from the University of Arizona in 1994 and his Master of Pacific International Affairs from the University of California San Diego in 1998.

Vincent Munster

Vincent Munster, Ph.D., is the chief of the Virus Ecology Section at NIAIDs Rocky Mountain Laboratories. He received his Ph.D. in virology from Erasmus University, Rotterdam, the Netherlands, in 2006. During his Ph.D. studies, Dr. Munster studied the ecology, evolution, and pathogenesis of avian influenza viruses. Dr. Munster leads a dedicated team of researchers with the overall goal of understanding the drivers of virus emergence. The main objectives of the VES research program include identification of the underlying biotic or abiotic changes in virus-host ecology that allow these emerging viral pathogens to cross the species barrier. He combines field and basic research, with a special emphasis placed on studying the virus and host ecology of high and maximum containment pathogens such as filoviruses, coronaviruses and henipaviruses. Insufficient understanding of the ecology and evolution of high and maximum containment pathogens has been a major hindrance to the development of successful preemptive strategies to control zoonosis and transmission of these deadly pathogens. Dr. Munster has been actively involved in the response to MERS-CoV, Ebola virus, COVID19 and mpox outbreaks. During the COVID19 pandemic he was actively involved in the development of medical countermeasures and providing critical experimental data supporting direct public health decisions and interventions.

Jennifer Nuzzo

Jennifer Nuzzo, DrPH, is Professor of Epidemiology and Director of the Pandemic Center at Brown University School of Public Health. An epidemiologist by training, her work focuses on global health security, public health preparedness and response, and health systems resilience. Together with colleagues from the Nuclear Threat Initiative and Economist Impact, she co-leads the development of the first-ever Global Health Security Index, which benchmarks 195 countries' public health and healthcare capacities and capabilities, their commitment to international norms and global health security financing, and socioeconomic, political, and environmental risk environments. She also founded the Outbreak Observatory, which conducts, in partnership with frontline public health practitioners, operational research to improve outbreak preparedness and response. Prior to coming to Brown, Dr. Nuzzo was an Associate Professor at the Johns Hopkins Bloomberg School of Public Health and the Johns Hopkins School of Medicine. She was also a Senior Scholar at the Johns Hopkins Center for Health Security.

Luis Ochoa Carrera

Luis Ochoa currently serves as the High-Containment Lab/Pandemic Safety Manager and Responsible Official for the Select Agent Program for the Office of Environmental Health and Safety at Michigan State University. From October 2019 to June 2021, he worked as the Director of the Epidemiological Surveillance and Research Laboratory Network of the Mexican Institute for Social Security (IMSS) and from March 2013 to October 2019 he served as BSL-3 Lab Coordinator at the National Reference Laboratory in Mexico. Prior to his current position, he received a Master´s Degree in Public Health Management focused on Biological Risk Management and another in Risk Management. He is the former President of the American Biological Safety Association (ABSA-International) and has served as the Chair of the Publications Committee, member of the International Engagement Committee, member of the Emerging Infectious Diseases

Working Group, and international editor for Applied Biosafety Journal. As one of the eighteen founding members and past President of the AMEXBIO, he has strengthened the network between biosafety professionals in the region and helped to create strategic alliances with international and national institutions. Additionally, Mr. Ochoa has served as a mentor of different mentoring programs for Sandia National Laboratories, the Next Generation Global Health Security Network, and the IFBA Mentorship Program. In addition, Mr. Ochoa serves as Senior Advisor for the Global Health Security Fund, member of the IFBA Board of Directors, and is a Certified Biosafety Professional from IFBA in five disciplines: Biorisk Management, Biological Risk Assessment, Biosecurity, Biocontainment Facility Design, Operations and & Maintenance, and Biosafety Cabinet Selection, Installation and Safe Use.

Alexandra Phelan

Raina Plowright

Raina Plowright, Ph.D., is the Rudolf J. and Katharine L. Steffen Professor at Cornell University and a Cornell Atkinson Scholar at the Cornell Atkinson Center for Sustainability. A veterinarian with an M.S. in epidemiology and a Ph.D. in ecology from UC Davis, her research focuses on the biological mechanisms of zoonotic spillover to inform pandemic prevention strategies. Plowright leads transdisciplinary collaborations on emerging disease biology, particularly WHO-priority pathogens originating in bats. Her work links sub-cellular to landscape-scale processes, revealing how land-use and climate changes drive disease emergence and identifying prevention strategies. Plowright co-chairs the Lancet Commission on Prevention of Viral Spillover and serves on advisory boards, including the NSF Advisory Committee for Environmental Research and Education. She is a member of the National Academy of Medicine (2023) and the American Association for the Advancement of Science (2022).

Fifa A. Rahman

Fifa A. Rahman, Ph.D., is Principal Consultant at Matahari Global Solutions, a consultancy firm focused on global health solutions with local relevance. She is a specialist global health lawyer with a PhD in political economy and trade-related intellectual property for biologic medicines. At Matahari, she leads a team of eight working predominantly in Africa on a number of key projects, including on developing the African Union health workforce compact, on gender in public health emergencies, decolonial grantmaking, and critical path analyses for novel diagnostics, including those for chlamydia/gonorrhea and TB – and is well-networked among decision-makers through to patient groups. She was pandemic negotiations consultant for Africa CDC from February to August 2024, advising Africa group negotiators on the Pandemic Accord. She is also on the WHO Guideline Development Group for SARS-CoV-2 testing and the WHO Recommendations Development Group for Rapid Diagnostic Test Accessibility Considerations for professional use and self-tests.

Jamie K. Reaser

Jamie K. Reaser, Ph.D., is a Senior Transdisciplinary Scientist and Policy Analyst with the Smithsonian Institution National Zoo & Conservation Biology Institute, as well as Affiliate Faculty for the Smithsonian Mason School of Conservation. She holds a PhD in Biology from Stanford University and B.S. in Field Biology from the College of William and Mary. She is also a Certified Health Practitioner, Master Practitioner, and Trainer in Neuro-linguistic Programming.

Dr. Reaser takes a multi-faceted approach to the human dimensions of conservation and has worked in more than 70 countries as an ecologist, communication psychologist, and international environmental policy negotiator. Much of her career has focused on delivering science into the policy context. This has included science advisory roles across the U.S. Executive Branch and multiple components of the Executive Office of the President, as well as providing direction to United Nations agencies, foreign governments, and private sector leadership. The COVID-19 pandemic inspired her to co-develop the

Land Use-Induced Spillover model to provide a framework for investigating the drivers of zoonotic spillover. The framework is being operationalized by scientific and policy making communities globally. Currently, among other projects, she is leading an American Rescue Plan appropriated project to assess the zoonotic disease risk of wildlife entering the United States through international trade with a view toward listing high risk species as injurious under the Lacey Act. Jamie is also an award-winning literary writer, artist, and regenerative farmer. Her 1754 homestead is nestled in central Virginia at the interface of the Rockfish River and Blue Ridge Mountains.

David E. Swayne

David E. Swayne, Ph.D., is a veterinarian with specialization as a Veterinary Pathologist and Poultry Veterinarian. For the past 38 years, his research focused on control of avian influenza. He has published over 369 peer-reviewed papers and 119 book/proceedings chapters and served as Editor or Associate Editor for 16 books, including Diseases of Poultry, Avian Influenza, and Fenner's Veterinary Virology. He is on the editorial boards of Emerging Infectious Diseases and Avian Diseases. He has served in leadership roles at the World Organization for Animal Health (WOAH) in updating the Avian Influenza chapters in Terrestrial Animal Health Code and Manual and completed a 1.5-year sabbatical to study HPAI control. With WOAH and FAO, he served on the revision committee for the Global Strategy for Prevention and Control of HPAI. He currently serves as a member of the Steering Committee for OFFLU, the joint WOAH/FAO Animal Influenza Network. Previously, he was the Laboratory Director for the Southeast Poultry Research Laboratory (28.5 years), USDA, Athens, Georgia, USA and for 7 years as a tenured faculty member at The Ohio State University. He is currently a private veterinarian consulting on avian influenza control and an adjunct Professor at the University of Georgia.

Richard Webby

Richard Webby, Ph.D., received his BSc in Microbiology and PhD from the University of Otago, New Zealand. He moved to St Jude Children's Research Hospital, Memphis US, to work on emerging influenza viruses in the laboratory of Rob Webster, a pioneer in the field. His initial work focused on a group of influenza viruses that had recently moved into swine in the United States. He has remained at St Jude and is currently a Full Member in the Department of Host Microbe Interactions where he leads a research program that has continued the focus on understanding how viruses, particularly influenza viruses, jump between host species and how we can improve our pandemic preparedness and response. He leads the US NIH-funded St Jude Center of Excellence in Influenza Research and Response, and the World Health Organization Collaborating Center for Studies on the Ecology of Influenza.

Preventing Discrimination, Harassment, and Bullying Expectations for Participants in NASEM Activities

The National Academies of Sciences, Engineering, and Medicine (NASEM) are committed to the principles of diversity, 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 commitment 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.

Section 1.01 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, 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
- 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.

Section 1.02 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.

Diversity, Equity, and Inclusion Statement and Guiding Principles

We, the National Academies of Sciences, Engineering, and Medicine (the National Academies), value diversity among our staff, members, volunteers, partners, vendors, and audiences. We recognize that talent is broadly distributed in society and that many perspectives enhance the quality of our work and drive innovation and impact.

We pledge to cultivate a workplace culture and climate that promotes inclusion, belonging, accessibility, and anti-racism; upholds equity; and values the participation of all who are engaged in advancing our mission.[1] By embracing the values of diversity, equity, and inclusion in our programs, institutional policies and practices, and products, we will be able to better advise the nation on the most complex issues facing society and the world.

Guiding Principles:

The following diversity, equity, and inclusion principles guide our work at the National Academies:

1. Integrate diverse perspectives and experiences into our programs, institutional policies and practices, and products.

2. Foster a culture of inclusion where all staff, members, and volunteers have full access to participation and feel welcomed, respected, valued, and a sense of belonging.

3. Approach scientific endeavors with a consideration of diversity, equity, and inclusion frameworks.

4. Cultivate mutually beneficial diverse partnerships and collaborations with a variety of communities, including, but not limited to, marginalized and underrepresented communities.

Our institutional strategy for putting these values and principles into practice are outlined in the National Academies DEI Action Plan, a comprehensive five-year plan that charts a path toward achieving our diversity, equity, and inclusion goals. The DEI Action Plan is one of many ways that we commit to systems of accountability and transparency to uphold these principles and allow for continuous learning and improvement.

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