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**The Critical Public Health Value
of Vaccines - Tackling Issues
of Access and Hesitancy**

A Virtual Workshop
August 17-20, 2020

 **#MicrobialThreats**

Organized by the
Forum on Microbial Threats

The National Academies of
SCIENCES • ENGINEERING • MEDICINE

**THE CRITICAL PUBLIC HEALTH VALUE OF VACCINES – TACKLING ISSUES
OF ACCESS AND HESITANCY**

A VIRTUAL MEETING

August 17-20, 2020

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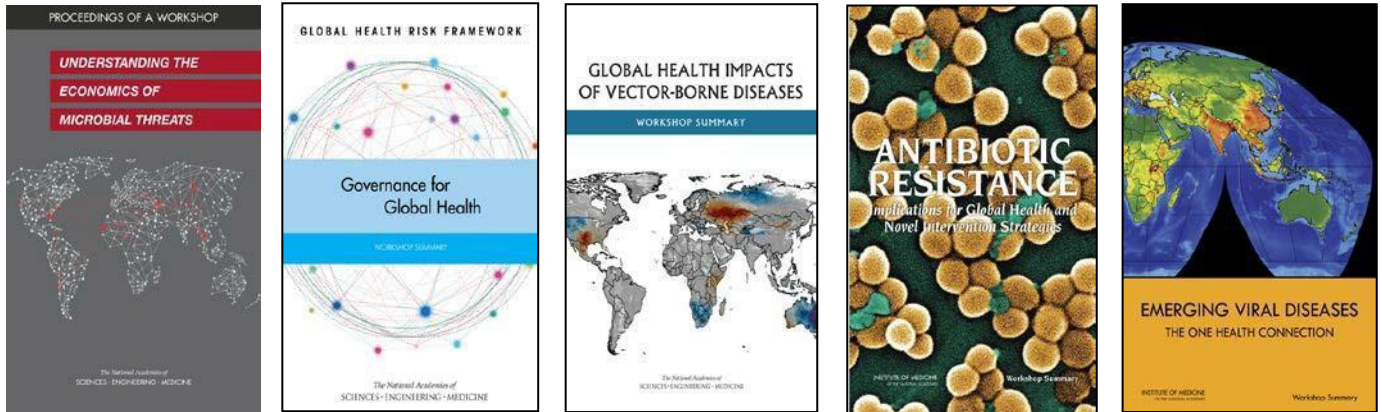
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HEALTH AND MEDICINE DIVISION
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THE FORUM ON MICROBIALTHREATS

---- An Overview ----



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. Problems such as MERS, Ebola, Chikungunya, Zika, yellow fever, and antibiotic resistance demonstrate how the issue of emerging infections 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.

SPONSORS

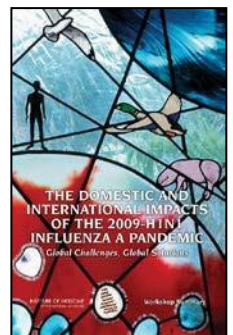
Financial support for the Forum is derived from the following government agencies, industries, and nonprofit and philanthropic associations:

- Biomedical Advanced Research and Development Authority
- U.S. Agency for International Development
- U.S. Centers for Disease Control and Prevention
- U.S. Department of Homeland Security
- U.S. Department of Veterans Affairs
- U.S. Food and Drug Administration
- U.S. National Institutes of Health
- Uniformed Services University of the Health Sciences
- American Society of Tropical Medicine and Hygiene
- EcoHealth Alliance
- Infectious Diseases Society of America
- Johnson & Johnson
- Merck & Co., Inc.
- Sanofi Pasteur

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

HIGHLIGHTS OF RECENT WORKSHOP PROCEEDINGS

- 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)
- Building Communication Capacity to Counter Infectious Disease Threats: Proceedings of a Workshop (2017)
- Big Data and Analytics for Infectious Disease Research, Operations, and Policy: Proceedings of a Workshop (2016)
- The Ebola Epidemic in West Africa: Proceedings of a Workshop (2016)
- Global Health Impacts of Vector-Borne Diseases: Workshop Summary (2016)
- Global Health Risk Framework: Governance for Global Health: Workshop Summary (2016)



FORUM'S ACTION COLLABORATIVE – ONE HEALTH

The Forum's One Health Action Collaborative (OHAC), led by Forum member Jonna Mazet, 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](#).

FORUM MEMBERSHIP

Membership in the Forum includes a diverse range of stakeholders from multiple sectors.

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

EcoHealth Alliance

Kent E. Kester, M.D. (*Vice Chair*)

Sanofi Pasteur

Rima F. Khabbaz, M.D. (*Vice Chair*)

U.S. Centers for Disease Control and Prevention

Kevin Anderson, Ph.D.

U.S. Department of Homeland Security

Timothy Burgess, M.D., M.P.H.

Uniformed Services University of Health Sciences

Rick Bright, Ph.D.

Biomedical Advanced Research and Development Authority

Cristina Cassetti, Ph.D.

National Institute of Allergy and Infectious Diseases

Andrew Clements, Ph.D.

U.S. Agency for International Development

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

Pan American Health Organization

Eva Harris, Ph.D.

University of California, Berkeley

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

Merck & Co., Inc.

Chandy C. John, M.D., M.S.

American Society of Tropical Medicine and Hygiene

Michael Mair, M.P.H.

U.S. Food and Drug Administration

Jonna A. K. Mazet, D.V.M., M.P.V.M., Ph.D.

University of California, Davis

Sally A. Miller, Ph.D.

The Ohio State University

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

The Graduate Institute, Geneva

David Nabarro, B.M.B.Ch., MFPHM, FRCP

4SD – Skills, Systems & Synergies for Sustainable Development

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

United Nations Children's Fund

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

Health Systems Global

Gary A. Roselle, M.D.

U.S. Department of Veterans Affairs

Peter A. Sands, M.P.A.

The Global Fund to Fight AIDS, Tuberculosis & Malaria

Thomas W. Scott, Ph.D.

University of California, Davis

Alan Tennenberg, M.D., M.P.H.

Johnson & Johnson

Matthew Zahn, M.D.

Orange County Health Care Agency

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DAY 1 – MONDAY, August 17 2020
11:00 am – 2:00pm

11:00am

Welcome Remarks

PETER DASZAK, *Chair of the Forum on Microbial Threats*
President
EcoHealth Alliance

Workshop Overview and Goals

HEIDI LARSON, *Workshop Co-Chair*
Professor of Anthropology, Risk and Decision Science
Director, The Vaccine Confidence Project
London School of Hygiene & Tropical Medicine

Moderator: Matthew Zahn, Orange County Health Care Agency, Workshop Co-Chair

Keynote Address

The Global Impact of COVID-19 on Vaccination Uptake and Access

ANN LINDSTRAND
EPI Coordinator
World Health Organization, Department of Immunization and Biologicals

The Global State of Vaccine Confidence: How Do We Enhance the Uptake of Vaccines?

SAAD B. OMER
Director
Yale Institute for Global Health

11:45am

Q&A

Session I: Improving Access and Closing the Global Immunization Gap

12:00pm

Session I objectives:

- Assess the current state of vaccine-preventable diseases globally, delineating the key barriers to dissemination and uptake of vaccines.
- Examine evidence-based strategies to improve access to vaccines and increase immunization coverage, globally and locally.

Moderator: Noni MacDonald, Dalhousie University

Applying an Equity Lens in Immunization to Close the Global Immunization Gap

ANURADHA GUPTA
Deputy Chief Executive Officer
Gavi, The Vaccine Alliance

Reducing Barriers and Increasing Vaccine Uptake

LITJEN (L.J.) TAN
Chief Strategy Officer
Immunization Action Coalition

Case Presentations

Using mHealth Interventions to Improve Vaccination Coverage

MOMIN ABDUL KAZI

Assistant Professor

The Aga Khan University, Pakistan

The Role of Community-Based Pharmacy Interventions in Increasing Vaccine Access

JEFF GOAD

Chair, Department of Pharmacy Practice Chapman University School of Pharmacy

1:00pm

Q&A

1:45pm

Observations from Day 1

HEIDI LARSON, *Workshop Co-Chair*

Professor of Anthropology, Risk and Decision Science Director, The Vaccine Confidence Project

London School of Hygiene & Tropical Medicine

2:00pm

Adjourn

DAY 2 – TUESDAY, August 18 2020
10:00 am – 12:00pm

Session II: Assessing Global and Local Drivers of Vaccine Hesitancy

Session II Objectives:

- Examine trends in hesitant attitudes toward vaccination and the impact on declining immunization rates.
- Evaluate the complex determinants and drivers of vaccine uptake, including sociocultural factors that influence perceptions, attitudes, and behaviors towards vaccination.
- Explore methods to monitor and measure vaccine hesitancy to better address concerns, and to sustain confidence in vaccination.

10:00am

Welcome and Recap Day 1

MATTHEW ZAHN, *Workshop Co-Chair*
Medical Director, Division of Epidemiology and Assessment
Orange County Health Care Agency

Moderator: Alison Buttenheim, University of Pennsylvania

Case Presentation

Vaccine-Attributable Severe Dengue in the Philippines and the Impact on National Immunization Programs

STEFAN FLASCHE
Associate Professor
London School of Hygiene and Tropical Medicine

Measuring Behavioral and Social Drivers of Vaccination

JULIE LEASK
Professor
University of Sydney, Australia

Understanding Drivers of Vaccine Hesitancy

JULIE BETTINGER
Associate Professor
Vaccine Evaluation Center, University of British Columbia

Increasing Vaccination Model

NOEL BREWER
Professor of Health Behavior
Gillings School of Global Public Health and Lineberger Comprehensive Cancer Center
University of North Carolina

11:00am

Q&A

11:45am

Observations from Day 2

MATTHEW ZAHN, *Workshop Co-Chair*
Medical Director, Division of Epidemiology and Assessment
Orange County Health Care Agency

12:00pm

Adjourn

DAY 3 – WEDNESDAY, August 19 2020

11:00am – 2:00pm

Session III: Employing a Systems Approach to Building Confidence and Increasing Uptake

Session III – Part A Objectives:

- Explore opportunities in research, communication, legislation, and technology in influencing vaccine behavior, improving access, and building confidence in immunization practices.

11:00am

Welcome and Recap Day 2

WALTER ORENSTEIN

Professor and Associate Director

Emory Vaccine Center

Moderator: Chandy C. John, Indiana University School of Medicine

Legal Approaches to Promoting Parental Compliance with Childhood Immunization Recommendations

DORIT REISS

Professor of Law

University of California Hastings College of the Law

Impact of Eliminating Non-Medical Exemptions in California

MICHELLE MELLO

Professor of Law and Medicine

Stanford University

Harnessing Cultural Insights to Increase Vaccination Uptake and Compliance

DAN CARUCCI

Global Medical Director

McCann Health

The Role of Physicians in Building Vaccine Confidence and Acceptance

TODD WOLYNN

Chief Executive Officer

Kids Plus Pediatrics

Strategies for Improving Healthcare Providers' Communication about Vaccination

SEAN O'LEARY

Associate Professor

University of Colorado, Denver

12:00pm

Q&A

12:30pm

Session III – Part B Objectives:

- Discuss how community-based approaches and strategies can effectively and ethically be employed to reduce vaccine hesitancy and increase vaccine confidence.

Moderator: Rafael Obregon, UNICEF, Paraguay

Social Mobilization as a Strategy to Increase Vaccine Acceptance and Uptake

MOHAMED JALLOH
Senior Behavioral Epidemiologist
U.S. Centers for Disease Control (CDC)

Adaptation of the COM-B Model to Increase Vaccination Acceptance and Uptake: the Tailoring Immunization Programmes (TIP) Approach

CATH JACKSON
Director and WHO Consultant
Valid Research Limited

The Immunity Community: A Community Engagement Strategy to Boost Vaccine Confidence

CLARISSA HSU
Assistant Investigator
Kaiser Permanente Washington Health Research Institute

Engaging with Faith Communities to Increase Vaccine Acceptance and Uptake: A Charedi Orthodox Jewish Community Example

LOUISE LETLEY
Nurse Manager for Research, Immunisation Operations,
Public Health England

Engaging with Immigrant Communities to Increase Vaccine Acceptance and Uptake: A Somali-American Community Example

PATSY STINCHFIELD
Senior Director, Infection Prevention and Control
Children's Minnesota

1:25pm **Q&A**

1:55pm **Observations from Day 3**
WALTER ORENSTEIN
Professor and Associate Director
Emory Vaccine Center

2:00pm **Adjourn**

DAY 4 – THURSDAY, August 20 2020

11:00am – 1:30pm

Session IV: Moving Forward: Optimizing the Utilization of Vaccines

- 11:00am Session IV – Part A Objective:
- Discuss the impact of vaccines in mitigating the effects of emerging threats during an outbreak.

Welcome and Recap Day 3

KENT KESTER

Vice President and Head, Translational Science and Biomarkers

Sanofi Pasteur

Moderator: Kent Kester, Sanofi Pasteur (Vice-Chair of the Forum on Microbial Threats)

- 11:10am Plenary Presentation
New Vaccines in the Midst of an Outbreak
NICOLE LURIE
Strategic Advisor to the CEO
Coalition for Epidemic Preparedness Innovations (CEPI)

- 11:25am **Q&A**

-
- 11:45am Session IV – Part B Objectives:
- Discuss approaches to strengthen public trust in science and public health programs.
 - Synthesize priority actions that could ensure that immunization programs reach the last mile.

Moderator: Alison Bутtenheim (University of Pennsylvania)

Panel: Inoculating Against Misinformation and Rebuilding the Public's Trust in Science

SANDER VAN DER LINDEN

Director

Cambridge Social Decision-Making Laboratory

IMRAN KHAN

Head of public Engagement

Wellcome Trust

ETHAN LINDENBERGER

Activist

KASISOMAYAJULA VISWANATH

Lee Kum Kee Professor of Health Communication

Harvard T. H. Chan School of Public Health

- 12:30pm **Visionary Statements on Priorities in Building Vaccine Acceptance and Uptake for the Next Generation**

Moderator: Amanda Cohn, U.S. Centers for Disease Control and Prevention

PETER HOTEZ
Dean, National School of Tropical Medicine
Baylor College of Medicine

NARENDRA ARORA
Executive Director Inclin

MONIKA NAUS
Medical Director
Communicable Diseases & Immunization Service BC Centre for Disease Control

JEAN-MARC OLIVE
Independent Consultant

12:55pm

Panel Discussion and Audience Q&A

1:20pm

Closing Remarks
PETER DASZAK, *Chair of the Forum on Microbial Threats*
President EcoHealth Alliance

1:30pm

Adjourn

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A Workshop Series

PLANNING COMMITTEE ROSTER

Heidi Larson, M.A., Ph.D. (Co-Chair)

Professor of Anthropology, Risk and Decision
Science London School of Hygiene & Tropical
Medicine Director, The Vaccine Confidence
Project

Matthew Zahn, M.D. (Co-Chair)

Member, Forum on Microbial Threats
Medical Director, Division of Epidemiology and
Assessment, Orange County Health Care Agency

Kevin Anderson, Ph.D.

Member, Forum on Microbial Threats
Senior Program Manager
Science & Technology Directorate Department
of Homeland Security

Alison Buttenheim, Ph.D., M.B.A.

Associate Professor, Family and Community
Health, School of Nursing
Associate Professor, Health Policy Perelman
School of Medicine University of Pennsylvania

Andrew Clements, Ph.D.

Member, Forum on Microbial Threats
Deputy Director, Pandemic Influenza and Other
Emerging Threats Unit
U.S. Agency for International Development

Amanda Cohn, M.D.

Executive Secretariat, Advisory Committee on
Immunization Practices
Acting Chief Medical Officer, National Center for
Immunization and Respiratory Diseases
U.S. Centers for Disease Control and Prevention

Peter Daszak, Ph.D. (NAM)

Chair, Forum on Microbial Threats
President EcoHealth Alliance

Eva Harris, Ph.D.

Member, Forum on Microbial Threats
Professor, Division of Infectious Diseases and
Vaccinology
Director, Center for Global Public Health
University of California, Berkeley

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

Member, Forum on Microbial Threats Head,
Global Antimicrobial Stewardship Merck & Co.,
Inc.

Noni MacDonald, M.D., M.Sc.

Professor, Department of Pediatrics Dalhousie
University
Nova Scotia, Canada

Walter Orenstein, M.D.

Professor, Emory University
Associate Director, Emory Vaccine Center
Director, Emory Vaccine Policy and
Development

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THE CRITICAL PUBLIC HEALTH VALUE OF VACCINES – TACKLING ISSUES OF ACCESS AND HESITANCY
A Workshop

PLANNING COMMITTEE BIOGRAPHIES

Heidi J. Larson, Ph.D. (Co-Chair), is an anthropologist and Director of The Vaccine Confidence Project™ (VCP); Professor of Anthropology, Risk and Decision Science, Dept. Infectious Disease Epidemiology, London School of Hygiene & Tropical Medicine; Clinical Professor, Institute of Health Metrics & Evaluation, University of Washington; and Chatham House Centre on Global Health Security Fellow. 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. Prof. 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 Principle Investigator of the EU-funded (EBODAC) project on the deployment, acceptance and compliance of an Ebola vaccine trial in Sierra Leone. Prof. Larson has recently joined the Centre for the Evaluation of Vaccination (CEV) (University of Antwerp) as associate professor, as the CEV at the Antwerp University will host the European regional Office of the Vaccine Confidence Project as of May 15, 2019, and will closely collaborate with Vaccine Confidence Project partners at European level on implementing the Vaccine Confidence Index™ and developing and evaluating interventions to address vaccine hesitancy.

Matthew Zahn, M.D. (Co-chair), is Medical Director of the Division of Epidemiology and Assessment for the Orange County Health Care Agency. Dr. Zahn received his Bachelor of Science from Santa Clara University, his doctorate in medicine from St. Louis University School of Medicine and completed his fellowship in Pediatric Infectious Disease at the Children's Hospital of Colorado in 2004. 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. He has been adjunct professor of Pediatrics at the University of California – Irvine since 2011. Dr. Zahn has served as chair for the Immunization Advisory Workgroup for the National Association of County and City Health Officials (NACCHO) from 2009 until 2012, currently serves on NACCHO's Infectious Disease Workgroup, and is the liaison from NACCHO to CDC's Advisory Committee on Immunization Practices. He has served on multiple national public health committees, including CDC's school-located vaccination advisory committee, and as president of the California Association of Communicable Disease Controllers. His primary work responsibility is in public health, but he continues to practice as a pediatric infectious disease physician.

Kevin Anderson, Ph.D., serves 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.

Alison Buttenheim, Ph.D., M.B.A., is a public health researcher and behavioral epidemiologist who combines her interest in behavioral economics with a focus on improving child health on a global level. She has designed and evaluated interventions to improve parental and family decision making across a broad range of topics, including food access in low-income neighborhoods, childhood obesity, vaccine hesitancy, and participation in large-scale vector control programs. Through her involvement with Penn's Center for Health Incentives and Behavioral Economics, Dr. Buttenheim is working with colleagues in epidemiology, politics, statistics, and mathematics on an NIH-funded study to reduce the transmission of Chagas disease (a neglected tropical parasitic disease) in Arequipa, Peru's second largest city. The study aims both to eliminate transmission of the parasite and to use behavioral economics to understand factors that influence residents' decisions about having their homes sprayed with insecticide. In a large pragmatic randomized trial, households were assigned to one of three interventions: improving the schedule for spraying; creating social norms for spraying; and participating in a lottery that offered financial rewards for spraying. Data analysis is underway. Dr. Buttenheim and colleagues hope that study findings will help address other common and emerging problems such as bed bugs or the Zika virus. With funding from NIH, Dr. Buttenheim studied California laws on nonmedical exemptions from school-mandated immunizations. After examining school records, she found that 47 percent of children whose parents requested exemptions had received the first dose of the measles-mumps-rubella vaccine. This suggests that using exemption rates as a proxy for vaccination rates is misleading; and, importantly, that the risk of disease in unvaccinated populations is therefore higher than previously thought. Colleagues in biostatistics and epidemiology participated in this study. With support from the Robert Wood Johnson Foundation, Dr. Buttenheim is part of an interdisciplinary team analyzing vaccination exemption laws in several states. The team's goal is to identify ideal state-level exemption legislation.

Andrew Clements, Ph.D., is the Deputy Director of the Pandemic Influenza and Other Emerging Threats Unit in the U.S. Agency for International Development's Bureau for Global Health. He received his doctorate in Anaerobic Microbiology from Virginia Tech and completed his post-doctoral training in biochemistry at the National Institutes of Health's National Cancer Institute. Including his Diplomacy Fellowship through the American Association for the Advancement of Sciences, he has served as an infectious disease advisor at USAID for the past 17 years focusing on the development, management, and monitoring of programs to address tuberculosis, malaria, avian influenza, antimicrobial resistance, and disease surveillance. He is currently the manager of a grant with the UN Food and Agriculture Organization (FAO) to monitor influenzas in animals and the PREDICT project, part of USAID's Emerging Pandemic Threats program, which monitors wildlife for new zoonotic threats, characterizes the spill-over risk associated with specific interfaces between wild animals and humans, and improves models for predicting geographic "hot spots" for emergence of new public health threats. He also analyzes trends for avian influenza and other emerging public health threats and serves as a liaison to USAID missions in the Asia and Near East regions for programs related to avian influenza and emerging pandemic threats.

Amanda Cohn, M.D. (CAPT, USPHS), is the Acting Director for the National Center on Birth Defects and Developmental Disabilities (NCBDDD). Previous to joining NCBDDD in this new role, Dr. Cohn served as

the Acting Chief Medical Officer in the National Center for Immunization and Respiratory Diseases (NCIRD), where she led Center activities in Vaccine Policy, Preparedness, and Global Health. She is also the Executive Secretary of the Advisory Committee on Immunization Practices (ACIP). Dr. Cohn previously served as the Deputy Director of NCIRD's Immunization Services Division. She came to CDC in 2004 as an Epidemic Intelligence Service Officer and joined the Meningitis and Vaccine Preventable Diseases Branch in 2006, where she focused on prevention and control of meningococcal disease, both domestically and internationally. She is board certified in Pediatrics and is a fellow of the American Academy of Pediatrics. Dr. Cohn graduated from Brown University with a bachelor's degree in English and obtained her from Emory University School of Medicine. She completed a residency in pediatrics at Boston Children's Hospital and Boston Medical Center in Massachusetts.

Peter Daszak, Ph.D., is president of EcoHealth Alliance, a U.S.-based organization that conducts research and outreach programs on global health, conservation, and international development. Dr. Daszak's research has been instrumental in identifying and predicting the impact of emerging diseases across the globe. His achievements include identifying the bat origin of SARS, identifying the underlying drivers of Nipah and Hendra virus emergence, producing the first ever global emerging disease 'hotspots' map, developing a strategy to find out how many unknown viruses exist that could threaten to become pandemic, identifying the first case of a species extinction due to disease, and discovering the disease chytridiomycosis as the cause global amphibian declines. Dr. Daszak is a member and chair-elect of the National Academy of Sciences, Engineering and Medicine's Forum on Microbial Threats. He is a member of the National Research Council (NRC) Advisory Committee to the U.S. Global Change Research Program, the Supervisory Board of the One Health Platform, the One Health Commission Council of Advisors, the Center of Excellence for Emerging and Zoonotic Animal Diseases External Advisory Board, the Cosmos Club, and the Advisory Council of the Bridge Collaborative; he has served on the Institute of Medicine committee on global surveillance for emerging zoonoses, the NRC committee on the future of veterinary research, the International Standing Advisory Board of the Australian Biosecurity Cooperative Research Centres, and has advised the Director for Medical Preparedness Policy on the White House National Security Staff on global health issues. Dr. Daszak is a regular advisor to the World Health Organization (WHO), World Organization for Animal Health, and the Food and Agriculture Organization of the United Nations, and is actively involved in the WHO Expert group on Public Health Emergency Disease Prioritization. Dr. Daszak won the 2000 Commonwealth Scientific and Industrial Research Organization medal for collaborative research on the discovery of amphibian chytridiomycosis, is the EHA institutional lead for USAID-EPT-PREDICT, is on the editorial boards of Conservation Biology, One Health, and Transactions of the Royal Society of Tropical Medicine & Hygiene, and is editor-in-chief of the journal EcoHealth. He has authored over 300 scientific papers, and his work has been the focus of extensive media coverage, ranging from popular press articles to television appearances.

Eva Harris, Ph.D., is a professor in the Division of Infectious Diseases in the School of Public Health and Director of the Center for Global Public Health at the University of California, Berkeley. She has developed a multidisciplinary approach to study the molecular virology, pathogenesis, immunology, epidemiology, clinical aspects, and control of dengue, Zika, and chikungunya, the most prevalent mosquito-borne viral diseases in humans. Specifically, her work addresses immune correlates of protection and pathogenesis, viral and host factors that modulate disease severity, and virus replication and evolution, using in vitro approaches, animal models, and research involving human populations. This has been possible through a close collaboration with the Ministry of Health in Nicaragua for over 28 years. Her international work focuses on laboratory-based and epidemiological studies of dengue, chikungunya, Zika, and influenza in endemic Latin American countries, particularly in Nicaragua, where ongoing projects include clinical and biological studies of severe dengue, a pediatric cohort study of

dengue, Zika, chikungunya, and influenza transmission in Managua, a household transmission study of Zika, and a recently concluded cluster-randomized controlled trial of evidence-based, community-derived interventions for prevention of dengue via control of its mosquito vector. She is also directing a study of Zika in infants and pregnancy in Nicaragua and evaluating a number of Zika diagnostic tests with her team in Nicaragua. In 1997, she received a MacArthur Award for work over the previous 10 years developing programs to build scientific capacity in developing countries to address public health and infectious disease issues. This enabled her to found a nonprofit organization in 1998, Sustainable Sciences Institute (SSI; www.sustainableciences.org), with offices in San Francisco, Nicaragua, and Egypt, to continue and expand this work. Dr. Harris was named a Pew Scholar for her work on dengue pathogenesis. She received a national recognition award from the Minister of Health of Nicaragua for her contribution to scientific development and was selected as a “Global Leader for Tomorrow” by the World Economic Forum. In 2012, she was elected Councilor of the American Society of Tropical Medicine and Hygiene and received a Global Citizen Award from the United Nations Association. She has published over 200 peer-reviewed articles, as well as a book on her international scientific work.

Elizabeth D. Hermsen, Pharm.D., M.B.A., is the head of Global Antimicrobial Stewardship at Merck & Co., Inc. 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 with an emphasis in health care industry. Following her fellowship, Dr. Hermsen developed and co-directed the antimicrobial stewardship program at The Nebraska Medical Center and subsequently joined Cubist, where she created and led the Antimicrobial Stewardship Outreach Group. Now, in her role at Merck, she is responsible for creating and executing a strategy to advance antimicrobial stewardship through education, implementation, research, and advocacy focused on patient outcomes, population health, and the value of care. When leading the program at The Nebraska Medical Center, Dr. Hermsen developed a publicly available antimicrobial stewardship website that subsequently was featured in an article regarding top web resources for antimicrobial stewardship (Pagani L, et al. Navigating the Web in Search of Resources on Antimicrobial Stewardship in Health Care Institutions. *Clin Infect Dis.* 2009; 48:626-32.). Dr. Hermsen actively contributed to the advancement of the Society of Infectious Diseases Pharmacists (SIDP) Antimicrobial Stewardship Certificate Program during her term as SIDP president and continues to participate as a lecturer in the program. Dr. Hermsen served as a contributing member of the Antimicrobial Stewardship Knowledge & Skills Collaborative, coordinated by the Society for Healthcare Epidemiology of America; an expert panel on Antimicrobial Practice Improvement in Hospitals, coordinated by the American Society of Health-System Pharmacists; an expert panel on Hospital-based Antimicrobial Utilization Surveillance via the National Healthcare Safety Network, coordinated by the U.S. Centers for Disease Control and Prevention (CDC); the Cardinal Health Infectious Diseases Advisory Group; and an expert panel coordinated by the National Quality Forum and CDC to develop the practical tool entitled, *Antibiotic Stewardship in Acute Care: A Practical Playbook*. Dr. Hermsen is currently co-chair of the Antimicrobial Stewardship Work Package (1A) for the Innovative Medicines Institute's Driving Reinvestment in Research & Development and Responsible Antibiotic Use (DRIVE-AB) initiative. Dr. Hermsen is a board certified pharmacotherapy specialist with added qualifications in infectious diseases. She has contributed to the profession with numerous publications in peer-reviewed journals, book contributions, and by serving as a reviewer for several professional journals. Dr. Hermsen has also given over 100 invited presentations at state, regional, national, and international meetings.

Noni MacDonald, M.D., M.Sc., is a Professor of Paediatrics (Infectious Diseases) at Dalhousie University and the IWK Health Centre in Halifax Canada. She is a former Dean of Medicine. Her current three major areas of interest are: 1) Vaccines, especially vaccine hesitancy, vaccine safety, vaccine pain mitigation at immunization and AEFI surveillance in pregnant women through her work with the World Health Organization as well as vaccine pain and hesitancy research and policy work in Canada; 2) MicroResearch, building capacity in community focused research in developing countries (www.microresearch.ca) and 3) application of Health Information Systems in developing countries to improve health outcomes. She has published over 350 papers; is the founding Editor-in-Chief of Paediatrics and Child Health, and a former Editor-in-Chief of CMAJ (Canadian Medical Association Journal). Dr. MacDonald has long been recognized in Canada and internationally as an advocate for children and youth health and as a leader in paediatric infectious disease.

Walter Orenstein, M.D., is a Professor of Medicine, Epidemiology, Global Health, and Pediatrics at Emory University; as well as the Associate Director of the Emory Vaccine Center and Director, Emory Vaccine Policy and Development. From 2008 through 2011, Dr. Orenstein was Deputy Director for Immunization Programs at the Bill & Melinda Gates Foundation. His primary focus at the foundation had been on polio eradication, measles control, and improving routine immunization programs. Prior to 2004, Dr. Orenstein worked for 26 years in the Immunization Program at the Centers for Disease Control and Prevention. From 1988-2004, he was the Director of the United States Immunization Program. He is a former Assistant Surgeon General of the USPHS. Dr. Orenstein successfully developed, promoted, facilitated and expanded new vaccination strategies to enhance disease prevention. Dr. Orenstein has authored and co-authored numerous books, journals and reviews. Dr. Orenstein co-edited Plotkin's Vaccines, 7th edition in 2018 – the leading textbook in the field. He is a past Chair of the WHO's Poliomyelitis Technical Consultative Group. He served as the Chair of the National Vaccine Advisory Committee (NVAC) from 2012 to 2016. He is also currently a member of the WHO's Strategic Advisory Group of Experts (SAGE) on Immunization Polio as well as Measles and Rubella Working Groups. He is currently the Chair of WHO's Immunization and Vaccines Related Implementation Research Advisory Committee (IVIR-AC). Between July 1, 2016 and June 30, 2018, Dr. Orenstein was the President of the National Foundation for Infectious Diseases (NFID).

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SPEAKER BIOGRAPHIES

Narendra Kumar Arora, M.B.B.S., M.D. is a pediatrician and public health expert. He obtained his M.B.B.S. (1976), and M.D. (1979) degrees from All India Institute of Medical Science (AIIMS), New Delhi. He was the recipient of the ICMR Talent Search Scheme to pursue his post-graduation and subsequent fellowship training. Dr. Arora was instrumental in establishing the Pediatric Gastroenterology and Hepatology Division at the AIIMS, New Delhi and was a pioneer in promoting this pediatric super-specialty in India. He received his master's training in Clinical Epidemiology & Biostatistics from the Centre for Clinical Epidemiology & Biostatistics, University of New South Wales, under the Rockefeller INCLIN Fellowship program in 1993. Dr. Arora joined the Faculty of AIIMS New Delhi in 1983 and left in 2005 to join the INCLIN Trust International (INCLIN) as the Global Executive Director. In 2018, the Government of India Ministry of Health & Family Welfare (MOHFW) nominated him the President of AIIMS-Patna and AIIMS-Deoghar.

Dr. Arora has had an extensive academic and research career, having made major contributions to the immunization sector at both national and global levels. He has been working for the immunization of Indian children through a series of large multi-center studies that address performance of pulse polio-immunization programs, injection practices and safety in India, the safety of vaccines administered under the UIP including Pentavalent, and cold chain infrastructure in the country. He has also provided leadership to several national policy-making bodies: the National AEFI Committee, Expert Group for the roll-out of rotavirus vaccine and pneumococcal vaccines; the MCH steering group of ICMR; and DBT Biopharma Mission, DBT Scientific & Technical Advisory Group. Dr. Arora has been a member of MOHFW, ICMR, and DBT for the last two decades. He has served as Chairman of the National Certification Committee for Polio Eradication since 2014 and as Chair of the National Verification Committee for Measles, Rubella and CRS. He has been a member of the National Technical Advisory Group for Immunization (India) since 2004.

Dr. Arora is credited with over 200 research papers, and is the recipient of numerous academic awards, including the Hon. Surg. Cmde. Late Dr. Shantilal C Sheth Oration at the PEDICON 2017, the Kerala Health Sciences University Oration (2017) and the Yogamaya Devi Award (2019), Maharashtra Association for the Cultivation of Science (Pune).

Julie Bettinger, Ph.D., M.P.H. is an Associate Professor at the Vaccine Evaluation Center in the Department of Pediatrics at the University of British Columbia. She was trained in infectious disease epidemiology and public health at Johns Hopkins University in Baltimore, USA. Her research interests include vaccine safety and vaccine-preventable diseases (specifically meningococcal and pneumococcal invasive infections), as well as attitudes and beliefs around immunization uptake and use. She is the epidemiologist and data center director for the Canadian Immunization Monitoring Program, Active (IMPACT), an active surveillance network for vaccine-preventable diseases and vaccine-adverse events in 12 tertiary care pediatric hospitals across Canada. Dr. Bettinger is also the lead investigator for the Canadian National Vaccine Safety (CANVAS) network, which conducts influenza vaccine safety monitoring in over 40,000 Canadians each year.

Dr. Bettinger's research addresses key questions about vaccines and immunization programs to ensure optimal disease protection in the population. She uses quantitative and qualitative methods to address important questions about vaccine use across the life cycle of provincial and national immunization programs. By providing a clear understanding of the epidemiology of vaccine-preventable diseases, her research enables further study of the factors (social, cultural, environmental, microbiological and economic) that can result in sub-optimal immunization and poor protection against these diseases at a population level. Her work is featured in publication such as the Pediatric Infectious Disease Journal, Vaccine, Clinical Infectious Diseases, and the Canadian Medical

Association Journal. Her research is supported by operating and infrastructure funding from the Canadian Institutes of Health Research, the Public Health Agency of Canada, the Michael Smith Foundation for Health Research, and the British Columbia Immunization Committee.

Noel T. Brewer, Ph.D. is Professor of Health Behavior at the Gillings School of Global Public Health and a member of the Lineberger Comprehensive Cancer Center, both at the University of North Carolina. Dr. Brewer's research explores why people engage in vaccination and other health behaviors that prevent cancer. He has published over 280 papers on these topics including behaviors related to HPV vaccination, tobacco warnings, and screening tests. He was recognized by Clarivate as among the top 0.1% most cited researchers in the world, 2017 - 2019. The Announcement Approach Training developed by Dr. Brewer and colleagues teaches provider to communicate more effectively about HPV vaccination and other vaccines for adolescents. Over 1,200 providers in 17 states have received the training. The National Cancer Institute designated it as a Research-Tested Intervention Program, and the CDC and American Academy of Pediatrics now recommend use of presumptive announcements when recommending HPV vaccine. Free materials are available at hpvIQ.org. A large clinical trial by Dr. Brewer and colleagues found that pictorial warnings for cigarette packs help smokers quit. The findings informed a successful lawsuit by the American Medical Association and 7 other organizations to force FDA to implement the enhanced warnings that had been held up by a previous lawsuit. Implementation of the new warnings is now ongoing. Dr. Brewer was the inaugural chair of the National HPV Vaccination Roundtable. He has advised on vaccination for the World Health Organization, Centers for Disease Control and Prevention, the President's Cancer Panel under two presidents, and the National Vaccine Advisory Committee. Dr. Brewer co-edited the FDA's book, *Communicating Risks and Benefits: An Evidence-Based User's Guide*. Media coverage of his research includes the *New York Times*, *Wall Street Journal*, *Washington Post*, NPR and CNN. He is proudest of the coverage by the *Onion*. Over 40 students and 11 post-doctoral researchers have completed their training in his Health Cognition and Behavior Lab. Many of these trainees have moved on to postdocs and faculty positions at leading institutions.

Daniel J. Carucci, M.D., M.Sc., Ph.D. is the Global Medical Director for McCann Health's new Global Health offering, providing strategic and technical support for health communications programs that focus on the needs of women and children in the developing world. He is currently the chair of the Scientific Advisory Committee for the Southern Africa International Centers of Excellence for Malaria Research (NIH). He is the co-creator of The Immunity Charm™, a simple and inexpensive communications tool that harnesses long-standing traditional beliefs to improve vaccine coverage and compliance among children in the developing world. Dr. Carucci is the former Vice President for Global Health at the United Nations Foundation, and the former director of the Grand Challenges in Global Health Initiative at the Foundation for NIH. He has served on the Boards of Directors for the Global Fund to Fight AIDS, TB, and Malaria; the Rollback Malaria Partnership; the Jane Goodall Institute; Grand Challenges Canada; and the McLaughlin-Rotman Center for Molecular Medicine. Dr. Carucci served 20 years active duty as a U.S. Navy flight surgeon and researcher, retiring with the rank of Captain. He received his M.D. from the University of Virginia, School of Medicine. He also holds an M.Sc. in Clinical Tropical Medicine and a Ph.D. in Molecular Biology from the London School of Hygiene and Tropical Medicine. Dr. Carucci has published more than 70 peer-reviewed articles and book chapters, and has been the recipient of numerous awards and medals for his research, military service and medical practice.

Stefan Flasche, Ph.D. has a diploma (Masters equivalent) in mathematics from the Technische Universität in Berlin, and earned a Ph.D. in mathematical modelling of infectious diseases with Strathclyde University and Public Health England. Since his Ph.D. years he has been fascinated by the complexities and challenges of pneumococcal vaccination, which has been his main focus of work. As of 2018, Dr. Flasche's research in this area is funded through a Sir Henry Dale Wellcome Trust Fellowship. Dr. Flasche has also worked in outbreak response (Swine Flu and Ebola) and has advised WHO on disease modelling (including dengue and malaria). He currently serves on WHO's Strategic Advisory Group of Experts on Immunization's (WHO SAGE) working group on pneumococcal conjugate vaccines and on the WHO SAGE working group on dengue vaccines as well on the Joint Committee on Vaccination and Immunization's (JCVI) pneumococcal subgroup.

Jeffery A. Goad, Pharm.D., M.P.H. is a Tenured Professor of Pharmacy Practice and the inaugural Chair of the Chapman University School of Pharmacy. He received his Doctor of Pharmacy degree from the USC School of

Pharmacy and his Master of Public Health from the Keck School of Medicine at USC. He completed a residency in pediatric pharmacy practice at Children's Hospital Los Angeles and holds the Certificate of Knowledge in Travel Health from the International Society of Travel Medicine. For over 20 years, Dr. Goad has maintained an active practice in Travel Health clinics and immunization services. He coordinates and teaches courses in travel medicine, immunizations, epidemiology, and parasitology. He is currently a national faculty and advisory board member for the American Pharmacists Association Pharmacy Based Immunization Training Program and chair of the APhA Travel Medicine Advanced Competency Training Course. He has presented at over 300 pharmacy and medical conferences and published more than 70 articles and book chapters. Dr. Goad is the Vice President for the National Foundation for Infectious Diseases, former Chair for the International Society of Travel Medicine Pharmacist Professional Group and former President for the California Immunization Coalition and California Pharmacists Association.

Anuradha Gupta is the Deputy Chief Executive Officer of Gavi, the Vaccine Alliance. Since joining Gavi in 2015, Ms. Gupta has led efforts to put equity and gender at the center of Gavi's programmatic planning and to tailor support to countries within Gavi's strategy. She has also driven efforts to create a new model of country-level Alliance support, through the establishment of a Partners' Engagement Framework. At the same time, Ms. Gupta has helped improve country ownership and leadership of Gavi-supported programs besides enhancing accountability for results. Prior to Gavi, Ms. Gupta served as Mission Director of the National Health Mission in India where she ran the largest - and possibly most complex – public health program in the world with an annual budget of US\$ 3.5 billion. A passionate and influential advocate of women, young girls and children, Ms. Gupta played a leading role in India's efforts to eradicate polio transmission, reduce maternal and child mortality and revitalize primary health care. Ms. Gupta has contributed to a number of important global health initiatives. She served as a member of the Steering Committee for 'Child Survival: Call to Action', co-chaired the Stakeholder Group for the London Family Planning Summit 2020 and was a member of the Family Planning 2020 Reference Group. Ms. Gupta served as Co-Chair of the Partnership for Maternal, Neonatal and Child Health (PMNCH) and is currently a Board Member. She also played a role in the shaping of the Global Financing Facility (GFF) and is a member of the GFF Investors' Group. From 2015 to 2018, Ms. Gupta served on the Merck for Mothers Advisory Board. Anuradha holds an MBA from the University of Wollongong in Australia and received executive education from Harvard's Kennedy School of Government, Stanford School of Business and Maxwell School at Syracuse University. She was included on the list of Top 300 Global Women Leaders in Health in 2015 by the Graduate Institute of International and Developments Studies and the Lancet.

Peter Hotez, M.D., Ph.D. is an internationally-recognized physician-scientist in neglected tropical diseases and vaccine development. He is Dean of the National School of Tropical Medicine and Professor of Pediatrics and Molecular Virology & Microbiology at Baylor College of Medicine, where he is also the Director of the Texas Children's Center for Vaccine Development (CVD) and Texas Children's Hospital Endowed Chair of Tropical Pediatrics. He is also University Professor at Baylor University, Fellow in Disease and Poverty at the James A Baker III Institute for Public Policy, Senior Fellow at the Scowcroft Institute of International Affairs at Texas A&M University, Faculty Fellow with the Hagler Institute for Advanced Studies at Texas A&M University, and Health Policy Scholar in the Baylor Center for Medical Ethics and Health Policy. As head of the Texas Children's CVD, Dr. Hotez leads a team and product development partnership for developing new vaccines for hookworm infection, schistosomiasis, leishmaniasis, Chagas disease, and SARS/MERS/SARS-2 coronavirus – diseases affecting hundreds of millions of children and adults worldwide – while championing access to vaccines in the United States and globally. In 2006 at the Clinton Global Initiative, he co-founded the Global Network for Neglected Tropical Diseases to provide access to essential medicines for hundreds of millions of people.

Dr. Hotez obtained his undergraduate degree in molecular biophysics from Yale University in 1980 (*phi beta kappa*), followed by a Ph.D. degree in biochemistry from Rockefeller University in 1986, and an M.D. from Weil Cornell Medical College in 1987. He has authored more than 500 original papers and is the author of four single-author books, including *Forgotten People, Forgotten Diseases* (ASM Press); *Blue Marble Health: An Innovative Plan to Fight Diseases of the Poor amid Wealth* (Johns Hopkins University Press); *Vaccines Did Not Cause Rachel's Autism* (Johns Hopkins University Press); and a forthcoming 2020 book on vaccine diplomacy in an age of war, political collapse, climate change and antiscience (Johns Hopkins University Press).

Dr. Hotez served previously as President of the American Society of Tropical Medicine and Hygiene and he is

founding Editor-in-Chief of *PLoS Neglected Tropical Diseases*. He is an elected member of the National Academy of Medicine (Public Health Section) and the American Academy of Arts & Sciences (Public Policy Section). In 2011, he was awarded the Abraham Horwitz Award for Excellence in Leadership in Inter-American Health by the Pan American Health Organization of the WHO. In 2014-16, he served in the Obama Administration as US Envoy, focusing on vaccine diplomacy initiatives between the US Government and countries in the Middle East and North Africa. In 2018, he was appointed by the US State Department to serve on the Board of Governors for the US Israel Binational Science Foundation, and is frequently called upon frequently to testify before US Congress. He has served on infectious disease task forces for two consecutive Texas Governors. For these efforts in 2017 he was named by FORTUNE Magazine as one of the 34 most influential people in health care, while in 2018 he received the Sustained Leadership Award from Research!America. In 2019 he received the Ronald McDonald House Charities Award for Medical Excellence. Most recently as both a vaccine scientist and autism parent, he has led national efforts to defend vaccines and to serve as an ardent champion of vaccines going up against a growing national “antivax” threat. In 2019, he received the Award for Leadership in Advocacy for Vaccines from the American Society of Tropical Medicine and Hygiene. Dr. Hotez appears frequently on television (including BBC, CNN, Fox News, and MSNBC), radio, and in newspaper interviews (including the New York Times, USA Today, Washington Post, and Wall Street Journal).

Clarissa Hsu, Ph.D. is an Assistant Investigator at Kaiser Permanente Washington Health Research Institute. As a medical anthropologist, she has spent over 20 years exploring how social and cultural factors shape health and health care. Dr. Hsu’s work spans a wide variety health related issues, including: clinical transformation and health care design, addressing social determinants of health in clinical settings, patient-centered care, and complementary and integrative medicine. Dr. Hsu has been the principal investigator for a number of qualitative and mixed methods studies, including the evaluation of the Immunity Community intervention, an innovative approach to addressing vaccine hesitancy using concepts drawn from social marketing. She also serves on the Steering Committee for Vax Northwest.

Catherine Jackson, Ph.D., M.Sc. has more than 15 years’ experience in the university sector, undertaking applied health services research and evaluation. She has worked as a Public Health Specialist and held research positions at the Universities of Leeds and York. In addition to managing Valid Research, Dr. Jackson is a Visiting Senior Research Fellow in the Department of Health Sciences at the University of York and a Consultant for the WHO Regional Office for Europe. She has a Ph.D. in Health Psychology and an M.Sc. in Health Promotion and Health Education. Dr. Jackson has considerable experience in all stages of delivering research and evaluation projects, from securing funding, establishing teams, collecting and analysing data through to writing up and reporting and publishing findings. Skilled in conducting quantitative, qualitative and mixed methods research, she has worked in the UK and internationally with a focus on public health. Her particular research interests are health literacy and decision-making for childhood immunisation. She has a track record of conducting research with marginalised communities.

Mohamed F. Jalloh, M.P.H. is a behavioral epidemiologist at CDC-Tanzania. Prior to his current position, Mr. Jalloh served as a behavioral epidemiologist in the Global Immunization Division at CDC where he designed, implemented, and evaluated interventions to improve global demand and uptake of life-saving vaccines. His immunization work comprises a diverse portfolio of projects including strengthening of immunization systems in Sierra Leone; responding to an outbreak of diphtheria among displaced Rohingyas in Bangladesh; evaluating RTS,S malaria vaccine implementation in Kenya, Ghana, and Malawi; and assessing the drivers of Ebola vaccine acceptance in Sierra Leone, Uganda, and the Democratic Republic of Congo. In addition, he led the development and validation of the Vaccination Acceptance and Demand Scale, and represented CDC on WHO’s global working group to standardize global measures of vaccination behaviors. Prior to working in immunization, Mohamed was an epidemiologist in the Division of Global Health Protection where he provided technical guidance on CDC’s global health security priorities in Sierra Leone and Liberia. In Sierra Leone, he contributed to establishing the Child Health and Mortality Prevention Surveillance study site in Sierra Leone and supported the evaluation of Sierra Leone’s implementation of intermittent preventative treatment of malaria in infants. Before joining CDC, he served as a senior research and evaluation manager with FOCUS1000, a non-governmental organization in Sierra Leone, where he led mixed-method assessments on reproductive, maternal, newborn, and child health.

While there he managed a team of 10 full-time staff and a roster of data collectors in monitoring and evaluating national public health programs. During the 2014-2016 Ebola outbreak response in West Africa, Mohamed led five national surveys to measure changes in the public's Ebola-related knowledge and behaviors in Sierra Leone and Guinea. In this same period, he also managed a digital reporting system for community-based Ebola surveillance used by 2,000 community reporters. Mohamed is scheduled to defend his Ph.D. in September 2020 at Karolinska Institutet where his doctoral research has focused on Ebola behavioral surveillance. He obtained his MPH in health behavior from UNC-Chapel Hill and completed his Bachelor of Science in Public Health from Rutgers University. Mohamed has published over 30 peer-reviewed papers on a range of public health topics.

Momin Abdul Kazi, M.B.B.S., M.P.H., Ph.D.(c) is an Assistant Professor at the Aga Khan University Hospital. He is a physician (M.B.B.S., Dow Medical College, Pakistan), an epidemiologist (M.Sc., Vanderbilt University), and is pursuing his Ph.D. from the University of British Columbia. Dr. Kazi's research focuses on evaluating and implementing digital/mobile health (mhealth) interventions, using technology as a research tool in studies and public health projects related to vaccine-preventable diseases. Currently Dr. Kazi is involved as an investigator with multiple research studies funded by the NIH, BMGF, GAVI and GCC, to name a few. He is also co-director of the "Research Methods & Applications for Digital Health" course, offered to graduate students at AKU. His current work and interests include development and evaluation of systems for real time data visualization, geospatial analysis, development of auto-generated programs to disseminate public health messages through SMS and voice messages, and other digital applications for improving maternal and child health, including vaccination coverage. He has published over 40 papers with an h-index of 22, and heavily advocates for mobile phone-based interventions for improving coverage of vaccine-preventable diseases in lower-middle income countries. He has both published and reviewed for leading journals including Lancet, Bulletin of the WHO, BMJ, BMC, Vaccine and Journal Medical Internet Research with topics primarily focusing on digital health.

Imran Khan, M.Sc., M.B.A., is Wellcome's Head of Public Engagement, and works on the connections between science, society, and culture. He leads Wellcome's efforts in involving the public in its mission of improving health through science and research. This includes supporting the public to trust, use, and inform health research, as well as working with scientists to connect with the rest of society. Mr. Khan is also a trustee of the UK's innovation foundation, Nesta.

Julie Leask, Ph.D., M.P.H. is a professor and social scientist in the Susan Wakil School of Nursing and Midwifery, Faculty of Medicine and Health, University of Sydney. Her research focuses on risk communication, responding to vaccine hesitancy and refusal, and strengthening vaccination programs and policy. She has 137 publications in the field. Dr. Leask is a visiting professorial fellow at the National Centre for Immunisation Research and Surveillance. She is chair of the WHO Working Group on Measuring Behavioural and Social Drivers of Vaccination, and she sits on the WHO Immunization and Vaccines-related Implementation Research advisory committee. Dr. Leask is also a member of the South East Asia Regional Immunization Technical Advisory Group. She was named overall winner of the Australian Financial Review 100 Women of Influence in 2019.

Louise Letley, R.N., M.Sc. qualified as a nurse in Northern Ireland in 1987. She has extensive Primary Care clinical research experience. This included almost 15 years working at a national level for the Medical Research Council's General Practice Research Framework where she worked on a number of large public health studies and obtained her M.Sc. from Queen Mary University of London in 2002. Following this she worked at both the national and local level of the newly developing NIHR Primary Care Research Network before moving to the National Immunisation Team at Public Health England in 2013. Initially, the main responsibility of the role was to coordinate the evaluation and help support the sites piloting the implementation of the childhood flu programme. Since the successful national rollout of the programme, Ms. Letley has worked on a number of research projects within the department, including the infant and teenager attitudinal surveys. She was also part of the team working in collaboration with the World Health Organisation to deliver the Tailoring Immunisation Programmes (TIP) within the Charedi community in northeast London.

Ethan Lindenberger is a 19-year-old high school graduate from Norwalk High School in Norwalk Ohio. He is by all accounts a normal teenager. Mr. Lindenberger has a part-time job, works an internship, and is going to college in

the fall. However, in early February of 2019, he began to find media attention after pursuing vaccines against the approval of his mother. This became a national story, even leading him to testify in front of the US Senate Committee on Health, Education, Labor, and Pensions about his experiences. Since then, Mr. Lindenberger has continued to take part in advocating for science. He has appeared on most major news networks, including Fox, GMA, CNN, MSNBC, and more. He believes that each individual has a role in ending misinformation, and has spoken to the importance of scientific truth while also maintaining respect for those that have fallen victim to misinformation.

Ann Lindstrand, Ph.D., M.P.H. is a pediatrician and public health specialist with a MPH from Harvard School of Public Health, and PhD in pneumococcal vaccine epidemiology from Karolinska Institute in Sweden. She has 30 years of experience in global health, in research, lecturing, and program implementation working mainly in Uganda, Mozambique, Angola, India and French Guyana. Her main focus of interest is vaccinology, maternal and child health and humanitarian work. She has worked for MSF, Doctors without Border, in the field and served as President of the MSF board in Sweden for many years. She works as EPI Coordinator in the Department of Immunization and Biologicals at WHO since September 2018. Before WHO she was the EPI manager for the national immunization program in Sweden for 5 years.

Nicole Lurie, M.D., M.S.P.H. is currently the Strategic Advisor to the CEO of the Coalition for Epidemic Preparedness Initiatives (CEPI). She is also a Senior Lecturer at Harvard Medical School, a member of the research faculty at Massachusetts General Hospital and Professor of Medicine at George Washington University School of Medicine. She served an 8-year term as Assistant Secretary for Preparedness and Response at the US Department of Health and Human Services. In that role she led the HHS response to numerous public health emergencies, ranging from infectious disease to natural and man-made disasters and is responsible for many innovations in emergency preparedness and response. She also chaired the Public Health Emergency Medical Countermeasures Enterprise, a government-wide organization ultimately responsible for the development of medical countermeasures, including vaccines against pandemics and emerging threats.

Prior to federal service, Dr. Lurie was the Paul O'Neill Professor of Policy Analysis at RAND, where she started and led the public health preparedness program and RAND's Center for Population Health and Health Disparities. She has also had leadership roles in academia, as Professor of Medicine and Public Health at the University of Minnesota; as Medical Advisor to the Commissioner, Minnesota Department of Health; and as Principal Deputy Assistant Secretary for Health at the US Department of Health and Human Services. Dr. Lurie received her BA and MD degrees from the University of Pennsylvania, and completed her residency and public health training at UCLA. Her research has focused on access to and quality of care, health system redesign, equity, mental health, public health and preparedness. She is recipient of numerous awards and is a member of the National Academy of Medicine. She continues to practice clinical medicine in a community clinic in Washington DC.

Michelle Mello, J.D., Ph.D. is Professor of Law at Stanford Law School and Professor of Medicine in the Center for Health Policy/Primary Care and Outcomes Research in the Department of Medicine at Stanford University School of Medicine. She conducts empirical research into issues at the intersection of law, ethics, and health policy. She is the author of more than 200 articles and book chapters on medical liability, public health law, pharmaceuticals and vaccines, biomedical research ethics and governance, health information privacy, and other topics.

The recipient of a number of awards for her research, Dr. Mello was elected to the National Academy of Medicine at the age of 40. From 2000 to 2014, she was a professor at the Harvard T.H. Chan School of Public Health, where she directed the School's Program in Law and Public Health.

Dr. Mello teaches courses in torts and public health law. She holds a J.D. from Yale Law School, a Ph.D. in Health Policy and Administration from the University of North Carolina at Chapel Hill, an M.Phil. from Oxford University, where she was a Marshall Scholar, and a B.A. from Stanford University.

Monika Naus, M.D. is the Medical Director of the Communicable Diseases & Immunization Service, and the Head of Vaccine Preventable Diseases & Immunization Programs at the British Columbia Centre for Disease Control. She is also a Professor at the School of Population and Public Health at the University of British Columbia. Dr. Naus obtained her medical training at the University of Alberta and her training in Public Health and Preventive Medicine at the University of Toronto. She then served as a federal field

epidemiologist with the Laboratory Centre for Disease Control while still in her residency, and subsequently her career focus has been in communicable disease prevention and control. Before joining BCCDC in July 2001, she was the provincial epidemiologist and Physician Manager of the Disease Control Service in Ontario from 1997 to 2001, and a Senior Medical Consultant in Vaccine Preventable Diseases and TB control for the Ontario Ministry of Health and Long- Term Care from 1990 to 1997. She has been active in immunization at the national level, including on the [Canadian National Advisory Committee on Immunization](#), which she chaired from 2003 to 2007 after being a member for eight years, and is a member of several NACI expert groups and liaison representative as the co- chair of the Canadian Immunization Committee. She is a member of the Canadian Immunization Registries and Coverage Network, co-chair of the Automated Identification of Vaccine Products Working Group, member of the [Canadian Immunization Research Network](#) and involved in other national and provincial committees. She is a Fellow of the Royal College of Physicians of Canada and of the American College of Preventive Medicine.

Sean O’Leary, M.D., M.P.H is a Professor of Pediatrics at the University of Colorado School of Medicine, a pediatric infectious diseases specialist, an investigator at ACCORDS (Adult and Child Consortium for Outcomes Research and Delivery Science), and the Director of the Colorado Children’s Outcomes Network (COCONet), Colorado’s pediatric practice-based research network. After completing college at Brown University and medical school at the University of Texas at Houston, Dr. O’Leary did his pediatric residency in Denver at Children’s Hospital/University of Colorado. Following residency, Dr. O’Leary was a partner in a large pediatric practice in Fort Collins, Colorado for 8 years. He then returned to Denver to pursue an infectious diseases fellowship as well as a Primary Care Research Fellowship. Dr. O’Leary’s research focuses on prevention of vaccine-preventable diseases (VPDs) through understanding clinical, attitudinal and infrastructural barriers to vaccination, and developing and testing interventions to address those barriers. Dr. O’Leary serves as the liaison to CDC’s Advisory Committee on Immunization Practices (ACIP) for the Pediatric Infectious Diseases Society and is Vice Chair of the Committee on Infectious Diseases (the Red Book Committee) of the American Academy of Pediatrics (AAP).

Jean-Marc Olivé, M.D., M.P.H. started as a general practitioner and an occupational medicine physician in Paris, then as Resident Gynecologist and Obstetrician at the Ministry of Health in Zambia. Before joining WHO, he worked for disaster relief in Zaire and was a resident in preventive medicine at the Maryland State Department, USA. In 1980, he was appointed as Expanded Program on Immunization (EPI) Medical Epidemiologist for the World Health Organization (WHO), posted in Sudan, then in Pakistan, and later in Peru. At the Pan American Health Organization (PAHO), Dr. Olivé became EPI Regional Adviser where he contributed to the successful poliomyelitis eradication and measles elimination in the Americas, both initiatives part of the effort to further strengthen and institutionalize EPI in the region. In 1994, he moved to WHO HQ in Geneva as Measles focal point, then served as acting Chief of EPI and finally Special Project Leader for the Vaccines & Biologicals Department in charge of Strengthening Immunization Services. In 2002, Dr. Olivé was appointed as WHO Representative in the Philippines and then in Viet Nam until his retirement at the end of 2010. Since 2011 he has worked as a consultant supporting the Polio Partnership in priority countries, including measles/rubella and routine immunization activities. He has been appointed Chair of several Polio Technical Advisory Groups (Horn of Africa, Afghanistan, Pakistan and Lake Chad) and member of various WHO vaccine related Technical Advisory groups and Reviews. He is a member of the GAVI Independent Review Committee (IRC).

Saad B. Omer, M.B.B.S., Ph.D., M.P.H. is the inaugural Director of the Yale Institute for Global Health, and a Professor of Medicine and Epidemiology at Yale University, Schools of Medicine and Public Health. He has conducted studies in the United States, Guatemala, Kenya, Uganda, Ethiopia, India, Pakistan, Bangladesh, and South Africa. Dr Omer’s research portfolio includes clinical trials to estimate efficacy and safety 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. He has published over 300 papers in peer reviewed journals and has mentored over 100 junior faculty, clinical, and research post-doctoral fellows and PhD and other graduate students.

Dorit Rubinstein Reiss, Ph.D. is a professor of law at the University of California, Hastings College of the Law. Increasingly, her research and activities are focused on legal issues related to vaccines, including exemption laws

and tort liability related to non-vaccination. She has published law review and peer reviewed articles and blog posts on legal issues related to vaccines. She received an undergraduate degree in Law and Political Science (1999, Magna cum Laude) from the Faculty of Law at the Hebrew University of Jerusalem. She received her Ph.D. from the Jurisprudence and Social Policy program at UC Berkeley. She is a member of the Parents Advisory Board of Voices for Vaccines, and active in vaccine advocacy in other ways.

Patricia A. (Patsy) Stinchfield, R.N., M.S., C.P.N.P. has been a pediatric nurse practitioner for over 30 years. She is currently specializing in infectious disease, infection prevention, and vaccines at the Children's Hospitals and Clinics of Minnesota. She is also the senior director of infection control and program director for The Children's Immunization Project, a collaborative effort in Minnesota bringing immunization information to parents, providers, and the community. Ms. Stinchfield is a past voting member and current liaison to the Centers for Disease Control's (CDC) Advisory Committee on Immunization Practices (ACIP), representing the National Association of Pediatric Nurse Practitioners (NAPNAP). She serves as an associate clinical faculty member at the University of Minnesota's School of Nursing and sits on several committees, including the Minnesota Department of Health Immunization Advisory Committee. She is vice president of the National Foundation for Infectious Diseases (NFID). A frequent presenter on immunization topics at local and national conferences, including the CDC National Immunization Conference, she is a graduate of Moorhead State University and the University of Utah School of Nursing.

Litjen (L.J.) Tan, M.S., Ph.D. is the Chief Strategy Officer for the Immunization Action Coalition (IAC). Prior to joining the IAC, Dr. Tan was the director of medicine and public health at the American Medical Association (AMA), a position he held since 2008. From 1997 to 2008, he was the AMA's director of infectious disease, immunology, and molecular medicine. Dr. Tan was a voting member of the Department of Health and Human Services' National Vaccine Advisory Committee from 2009 to 2013, where he served on the adult immunization, vaccine safety, and healthcare worker immunization working groups, and chaired the immunization infrastructure working group. He also served for more than ten years as the AMA's liaison to the Centers for Disease Control and Prevention's Advisory Committee on Immunization Practices, where he served on the influenza, pneumococcal, zoster, and adult immunization working groups. Dr. Tan co-founded and currently co-chairs the National Adult and Influenza Immunization Summit. He serves or has served on the steering committees/advisory boards of the 317 Coalition, the Adult Vaccine Access Coalition (AVAC), the Unity (United for Adolescent Vaccination) Consortium, the National Network for Immunization Information, and the National Viral Hepatitis Roundtable and on the IAC scientific advisory board. Dr. Tan has also serves, or has served on the National Quality Forum's Adult Immunizations Expert Committee, the Pharmacy Quality Alliance's Adult Immunization Working Group, and numerous national and international expert and technical advisory committees, including panels for the Centers for Medicare and Medicaid Services, The Joint Commission, and the Centers for Disease Control and Prevention, on issues ranging from vaccine hesitancy, to immunization quality measurement development, to adult immunizations, to immunization access and delivery. In 2007, he founded the National Immunization Congress and organized its 2007 and 2010 meetings.

Dr. Tan received his M.S. in biology at New York University and earned his Ph.D. in microbiology/immunology from Northwestern University Feinberg School of Medicine. Dr. Tan is an editor for Vaccine, BMC Infectious Diseases, Medscape Infectious Diseases, and a member of the ESCMID Vaccine Study Group and has published more than 50 peer-reviewed articles. During his tenure at the AMA, he wrote numerous scientific reports to guide the association's policies on a diverse range of public health topics. A skilled and sought-after speaker, Dr. Tan has been invited to address international, national, and state immunization audiences on issues ranging from vaccine financing to risk management in vaccine safety to emerging infectious diseases.

Dr. Tan has received several awards for his advocacy work including the 2011 CDC National Center for Immunization and Respiratory Diseases Honor Awards: Excellence in Partnering recognition, and most recently was awarded the American Pharmacists Association's national Friend of Pharmacy Award. As a former part-time faculty member at the Institute for Science Education and Science Communication, Columbia College, Chicago, he received the 2000 Excellence in Teaching Award.

Sander Van Der Linden, Ph.D. is Professor of Social Psychology and Director of the Cambridge Social Decision-Making Lab in the Department of Psychology at the University of Cambridge. He has won numerous awards for his research on human judgment and decision-making, including the Rising Star Award from the Association for Psychological Science (APS), the Sage Young Scholar Award from the Society for Personality and Social Psychology (SPSP) and the Sir James Cameron Medal for the Public Understanding of Risk from the Royal College of Physicians. He also received the 2020 Frank Prize from the University of Florida for his research on fake news. Wired Magazine described him as one of 15 Top Thinkers and Fast Company referred to him as one of four heroes of digital democracy. His research papers have received awards from organizations such as the [American Psychological Association](#) (APA), the International Association of Applied Psychology (IAAP) and the Society for the Psychological Study of Social Issues (SPSSI). He is the Editor-in-Chief of the Journal of Environmental Psychology and co-editor of the recent book “Risk and Uncertainty in a Post-Truth Society” (2019).

K. “Vish” Viswanath, Ph.D. is the Lee Kum Kee Professor of Health Communication in the Department of Social and Behavioral Sciences at the Harvard T. H. Chan School of Public Health (HSPH) and in the McGraw-Patterson Center for Population Sciences at the Dana-Farber Cancer Institute (DFCI). He is also the Faculty Director of the Health Communication Core of the Dana-Farber/Harvard Cancer Center (DF/HCC). Other additional administrative and scientific leadership positions held by Dr. Viswanath include: Director of the Center for Translational Communication Science, DFCI/Harvard Chan; Director, Harvard Chan, India Research Center and Co-Director, Lee Kum Sheung Center for Health and Happiness, Harvard Chan. He is the founding Director of DF/HCC’s Enhancing Communications for Health Outcomes (ECHO) Laboratory.

Dr. Viswanath’s work, drawing from literature in communication science, social epidemiology, and social and health behavior sciences, focuses on translational communication science to influence public health policy and practice. His primary research is in documenting the relationship between communication inequalities, poverty and health disparities, and knowledge translation to address health disparities. He has written more than 250 journal articles and book chapters concerning communication inequalities and health disparities, knowledge translation, public health communication campaigns, e-health and digital divide, public health preparedness and the delivery of health communication interventions to underserved populations. He is the Co-Editor of four books and monographs and the Editor of the Social and Behavioral Research section of the 12-volume *International Encyclopedia of Communication* (Blackwell Publishing, 2008).

Dr. Viswanath has served and is continuing to serve on several national committees including for the US Department of Health and Human Services, the Centers for Disease Control and Prevention and the National Academy of Sciences and the National Academy of Medicine.

In recognition of his academic and professional achievements, Dr. Viswanath has received several awards including the Postdoctoral Mentor of the Year Award from the DFCI; the Joseph W. Cullen Memorial Award For Excellence in Tobacco Research, American Society for Preventive Oncology; the Dale Brashers Distinguished Mentorship Award, National Communication Association; the Outstanding Health Communication Scholar Award, jointly given out by the International Communication Association and the National Communication Association; the Mayhew Derryberry Award from the American Public Health Association (APHA), for his contribution to health education research and theory; and the CLA Alumnus of Notable Achievement, University of Minnesota. He delivered the 23rd Annual Aubrey Fisher Lecture at University of Utah in 2009. He was elected Fellow of the International Communication Association (2011), the Society for Behavioral Medicine (2008) and the Midwest Association for Public Opinion Research (2006).

Todd Wolynn, M.D., M.M.M. is CEO of Kids Plus Pediatrics. He received his M.D. from the University of Pittsburgh School of Medicine in Pennsylvania and earned a Master of Medical Management from Heinz College at Carnegie Mellon University. He led clinical vaccine research at Kids Plus for 14 years, including 40+ studies as both a sub-investigator and a principal investigator. His areas of focus for the past decade have been Vaccine Communication, Patient/Family Engagement, and "Pediatricians as Advocates." Dr. Wolynn has served in a variety of roles as consultant and advisor on vaccine-related projects in his practice, as well as with professional medical organizations, vaccine manufacturers, and other vaccine-related entities. In addition to his work with Kids Plus, he currently serves as President of the Advisory Board of Shots Heard Round the World, a non-profit organization dedicated to supporting, defending, empowering, and galvanizing vaccine advocates.

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