

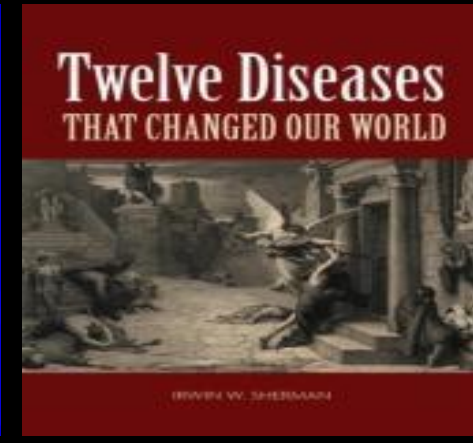
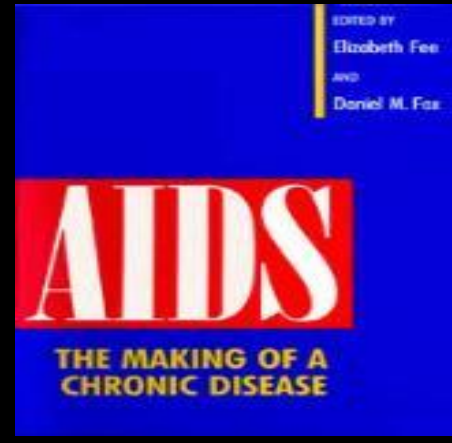
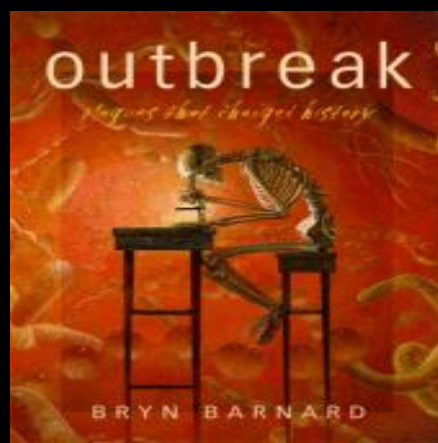
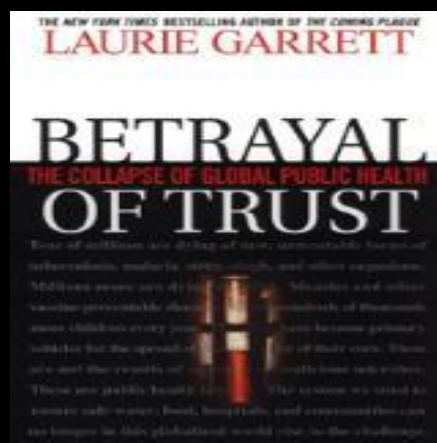
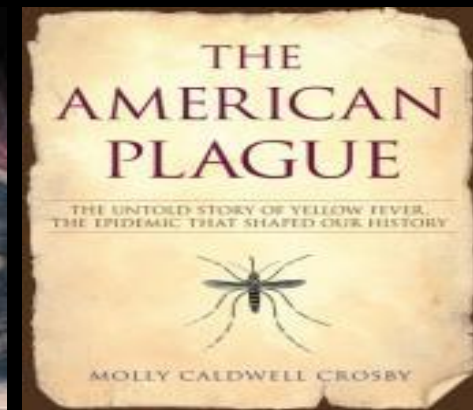
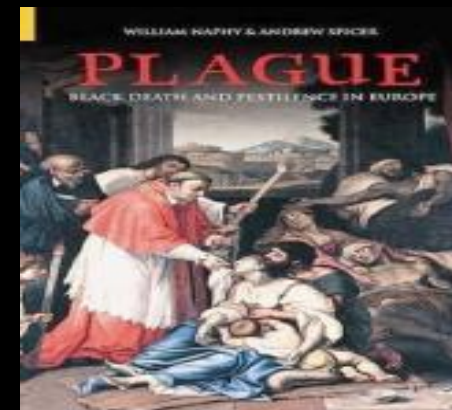
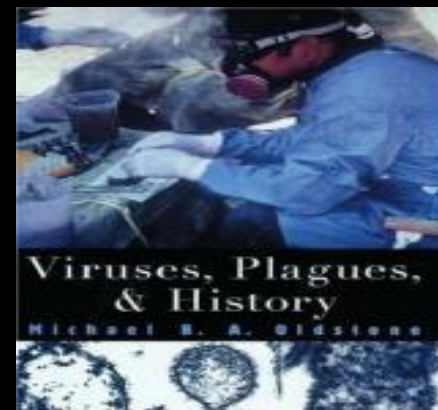
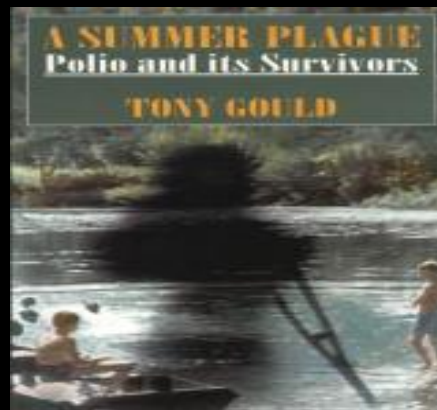
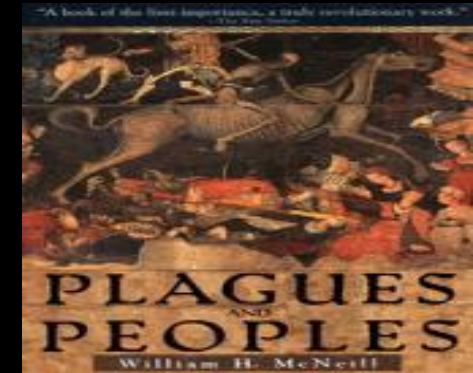
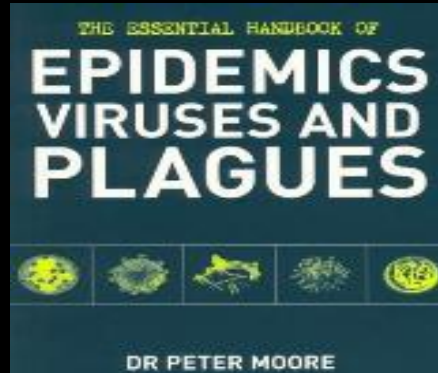
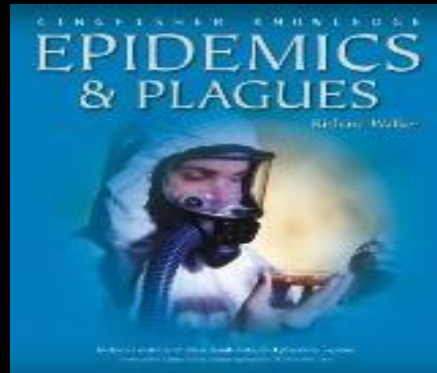
Pandemic Preparedness: Complexity, Complacency & Commitment

Dr. George Poste

Regents' Professor and Del E. Webb Chair in Health Innovation
Complex Adaptive Systems Initiative, Arizona State University
Co-Director, ASU-UA Institute for Future Health
george.poste@asu.edu

Slides available @ <https://casi.asu.edu/presentations/>

Infectious Diseases: A Powerful Force in Human History and Societal Disruption



The Relentless Ever-Changing Dynamics of Infectious Diseases

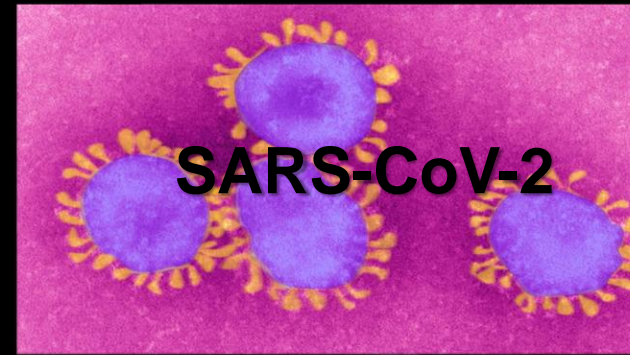
**old foes resurgent:
Rx – resistance**



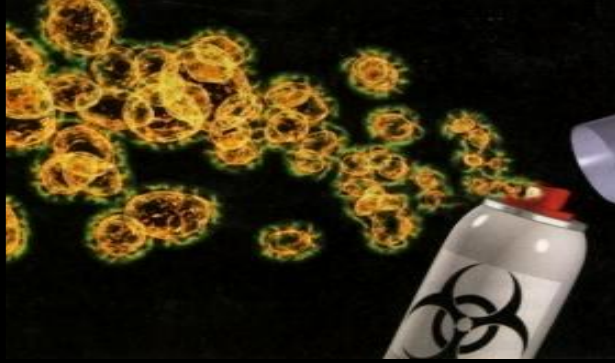
**omnipresent
pandemic threats**



**new foes:
emerging infectious
diseases**



**climate change and
new vector ranges**



**bioterrorism and
bioweapons**



**dual-use
research of concern**

Biothreat Preparedness, Response, Resiliency & Recovery (PR3) Capabilities



U.S. National Security Policy and Biodefense

BIODEFENSE FOR THE 21ST CENTURY



APRIL 2004

NATIONAL BIODEFENSE STRATEGY

2018



NATIONAL INTELLIGENCE STRATEGY

of the United States of America

2019



COUNCIL on
FOREIGN
RELATIONS



Independent Task Force Report No. 78

Improving Pandemic Preparedness

Lessons From COVID-19

The National Academies of
SCIENCES • ENGINEERING • MEDICINE

CONSENSUS STUDY REPORT

A STRATEGIC VISION FOR BIOLOGICAL THREAT REDUCTION

The U.S. Department of Defense
and Beyond



United States Health Security National Action Plan:

Strengthening Implementation of the International Health Regulations
based on the 2016 Joint External Evaluation

October 2018

NTI:bio

Preventing Global Catastrophic Biological Risks

Lessons and
Recommendations
from a Tabletop
Exercise Held at the
2020 Munich Security
Conference

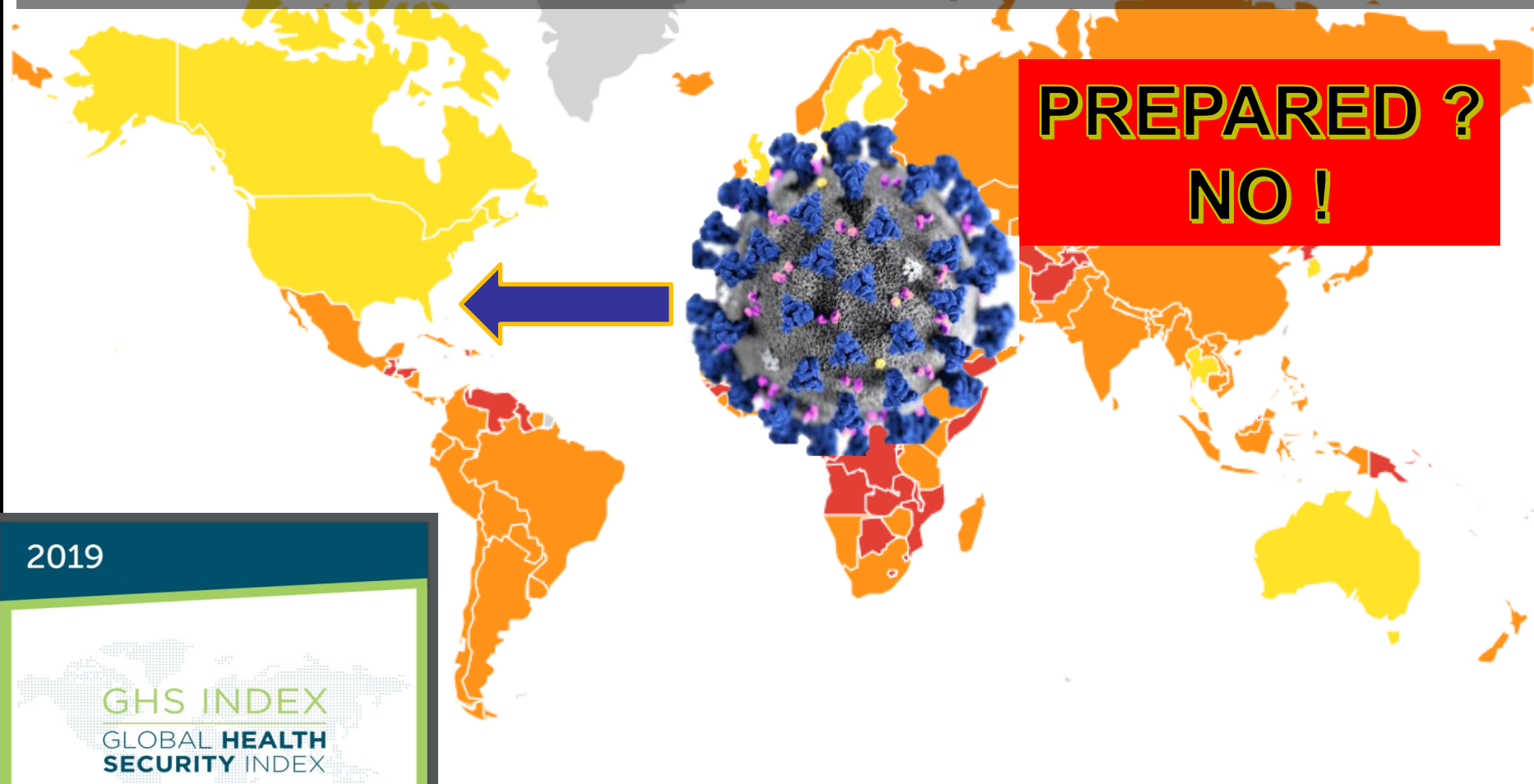
BETH CANNON, PH.D. • JIA MEYASSIR, PH.D. • JACOB JORDAN, PH.D. • JACOB ROLES, M.P.H.



Report to Congressional Committees
NATIONAL SECURITY
Long-Range Emerging Threats Facing the United States
As Identified by Federal Agencies
December 2018

GAO
U.S. GOVERNMENT
ACCOUNTABILITY OFFICE
2018-10-18

SARS-CoV-2 Revealed Major Shortcomings in US Public Health Capabilities



2019

GHS INDEX
GLOBAL HEALTH
SECURITY INDEX

Building Collective Action and Accountability



Index developed with
The Economist

1.1 million US deaths
Jan. 2020 – Apr 2023

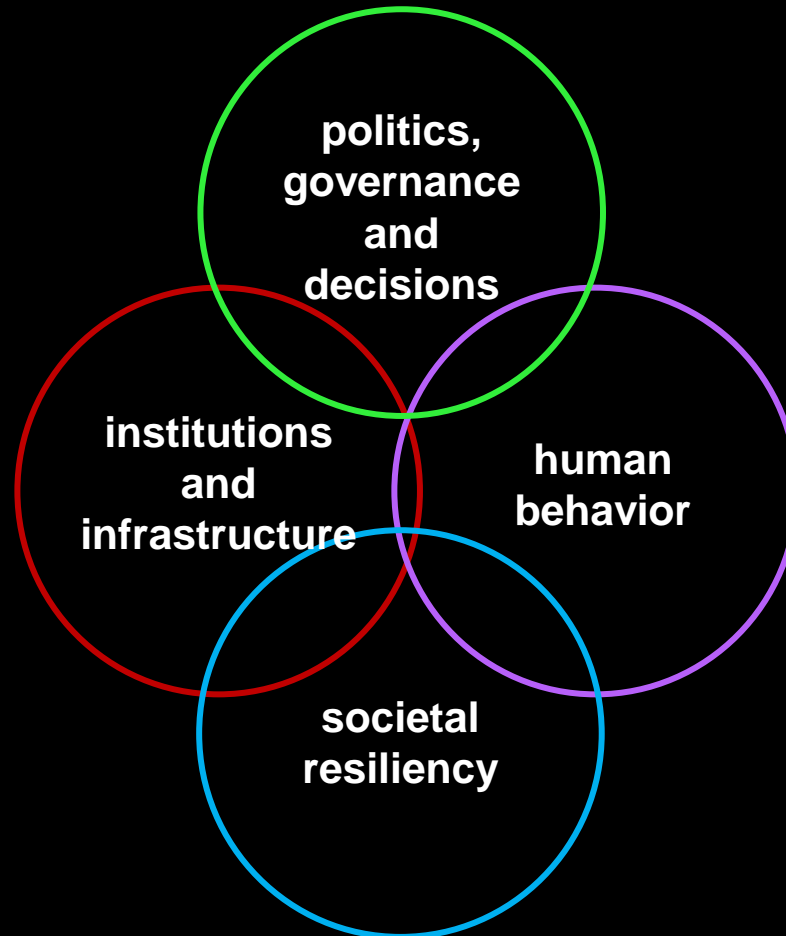
- Most Prepared
- More Prepared
- Least Prepared

A Dismal US Report Card: COVID Deaths/100,000 People*

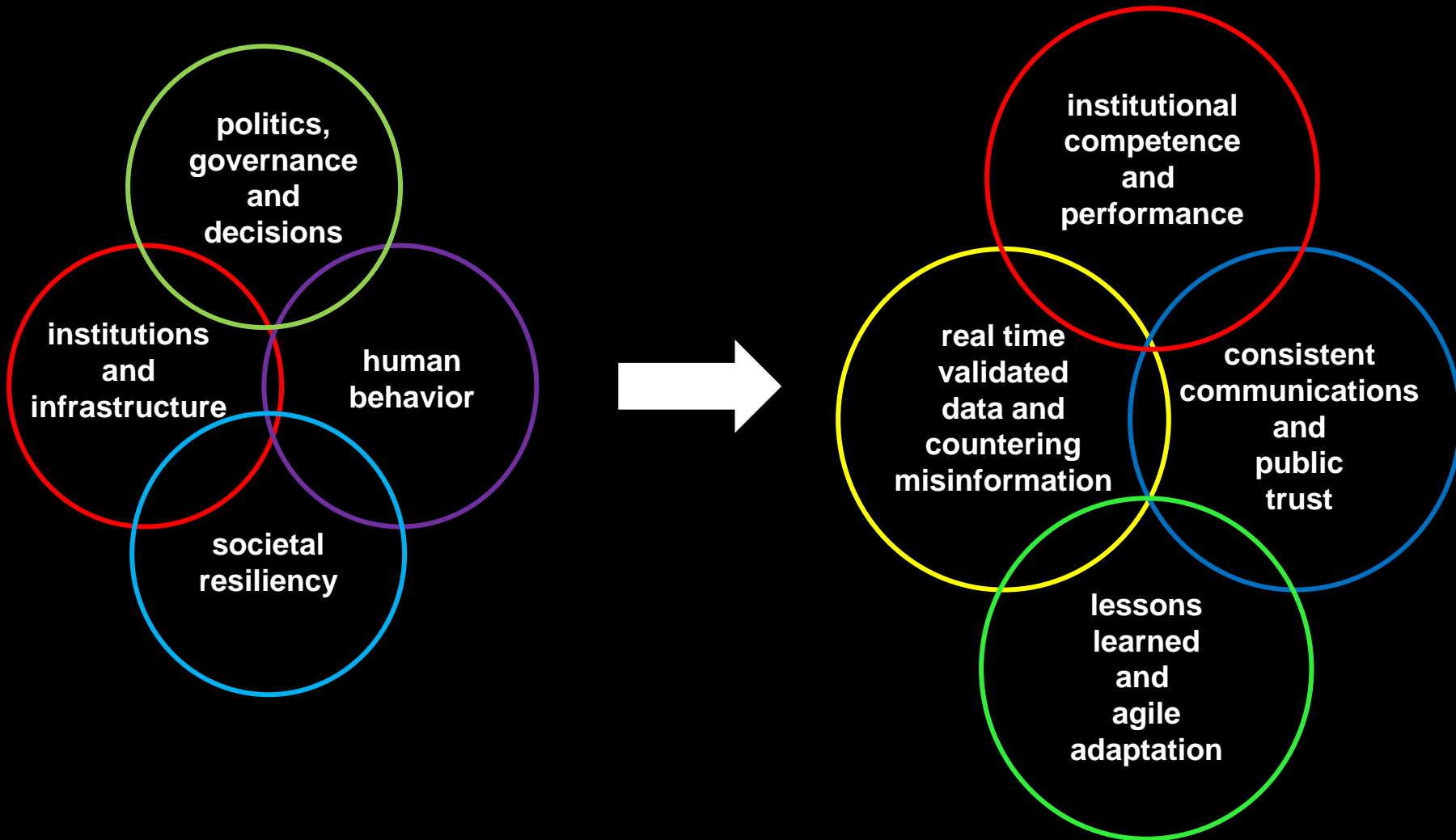
- **Worst Performance**
 - **Arizona: 581***
 - **DC: 526**
 - **New Mexico: 521**
- **Best Performance**
 - **Hawaii: 147**
 - **New Hampshire: 215**
 - **Maine: 281**
- **Arizona's death rate comparable to Russia, Bulgaria and Peru**

*T. Bollyky et al. 23 March 2023 (Lancet S01140-6736(23)00461-0)

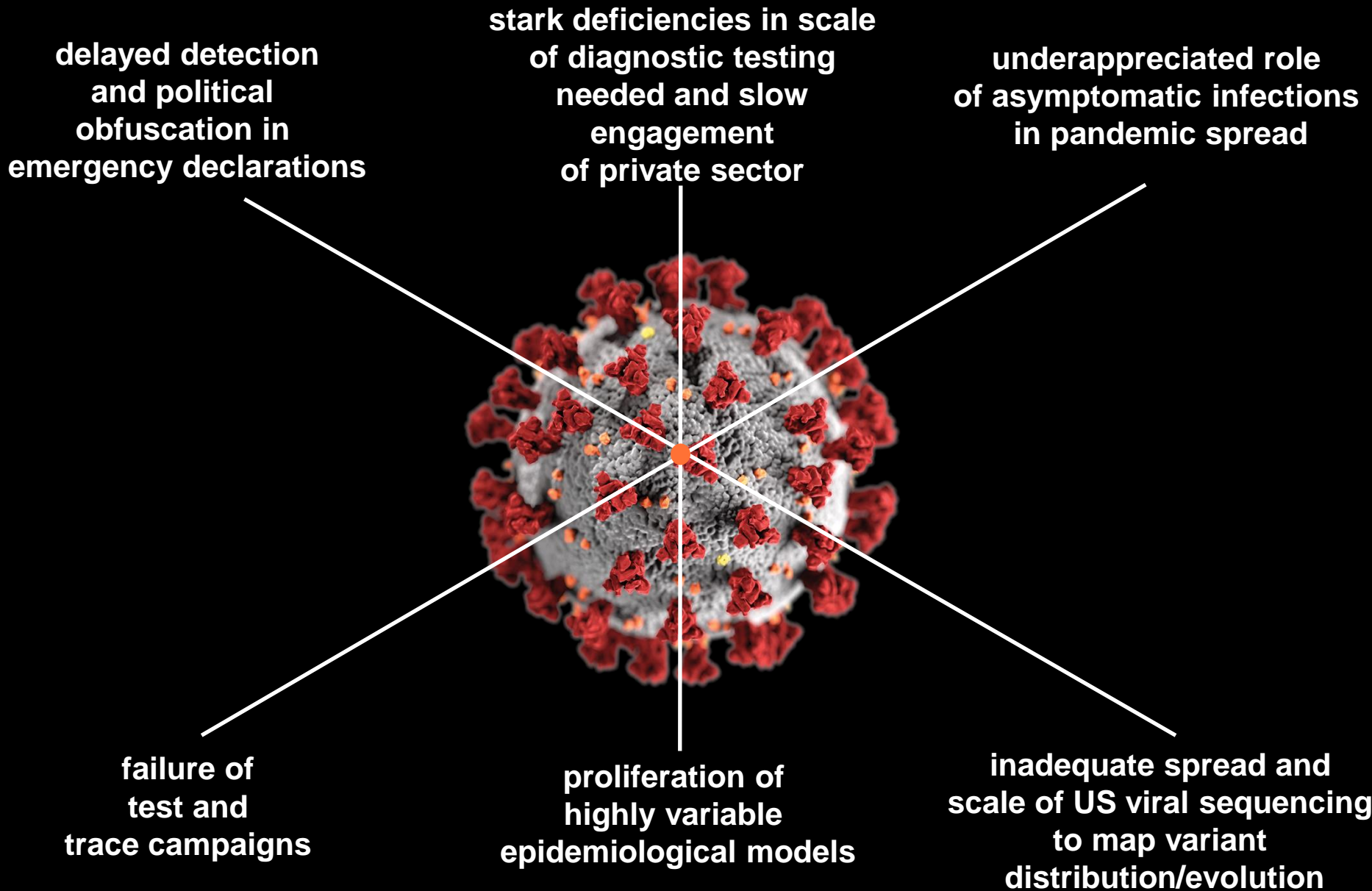
The Macrodeterminants of Pandemic Preparedness



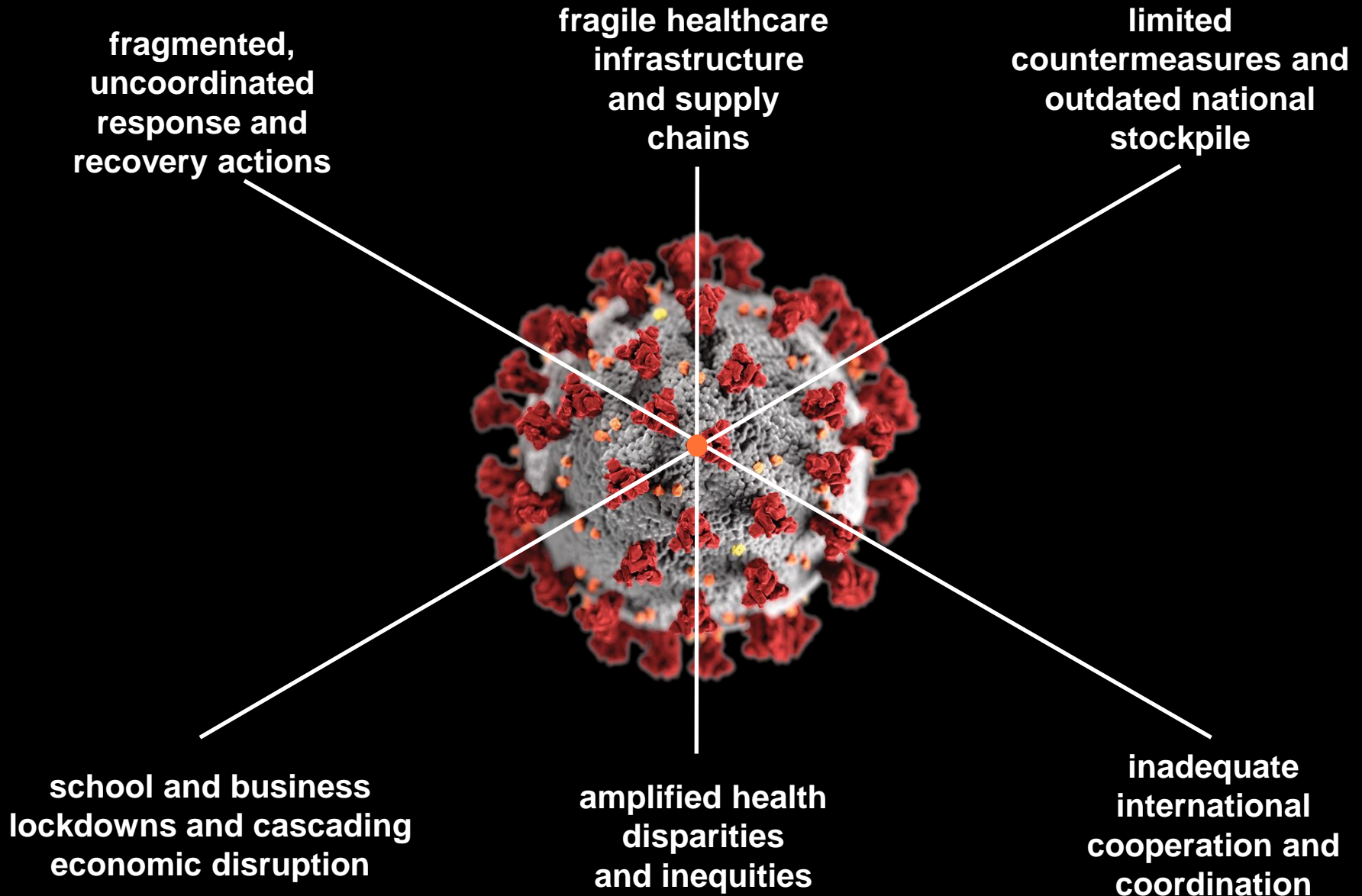
The Macrodeterminants of Pandemic Preparedness



A Report Card on the US Response to the SARS-CoV-2 Pandemic



A Report Card on the US Response to the SARS-CoV-2 Pandemic

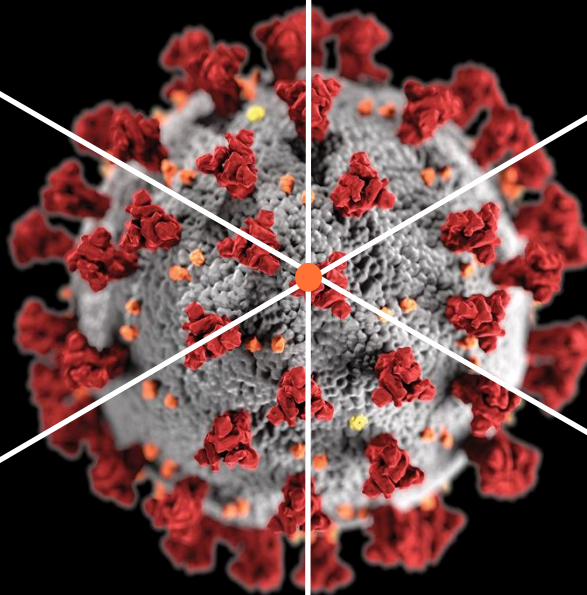


A Report Card on the US Response to the SARS-CoV-2 Pandemic

**multiple warnings of
zoonotic-EID
risks ignored**

**chronic
underinvestment
in preparedness**

**failure of public
institutions and
national leadership**



**domestic political
divisiveness
and conflicting,
confusing
messaging**

**social media disinformation
campaigns and
foreign interference**

**erosion of
public trust**

COVID-Backlash and Future Public Health Pandemic Responses

- **populist anger and rejection of government responses (Federal, State)**
- **over 30 US states have passed laws since 2020 to limit public health authority**
- **permission from state legislatures before implementation**
 - **emergency orders**
 - **mandated diagnostic testing**
 - **mask mandates**
 - **school and business closures**
 - **social distancing**
 - **proof of vaccination**
 - **quarantine**
- **more than 1000 legal decisions made at Federal, State and local level since March 2020***
- **staff harassment/threats, workforce demoralization and resignations**

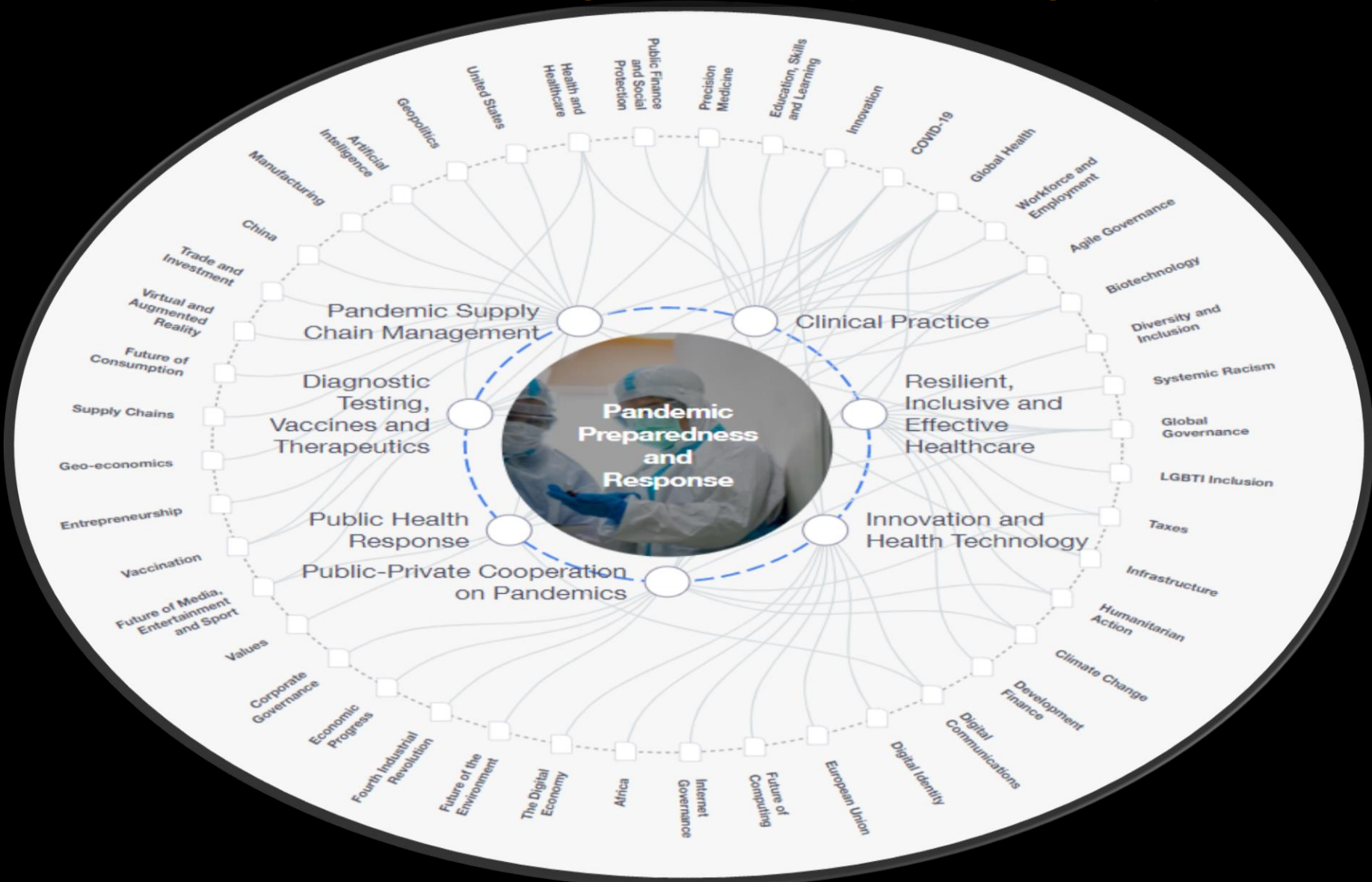
**Am. J. Pub. Health (2023) 113, 2, 280*

Operation Warp Speed: The One Great Success in an Otherwise Far From Optimum Management of the COVID-19 Pandemic



Complexity

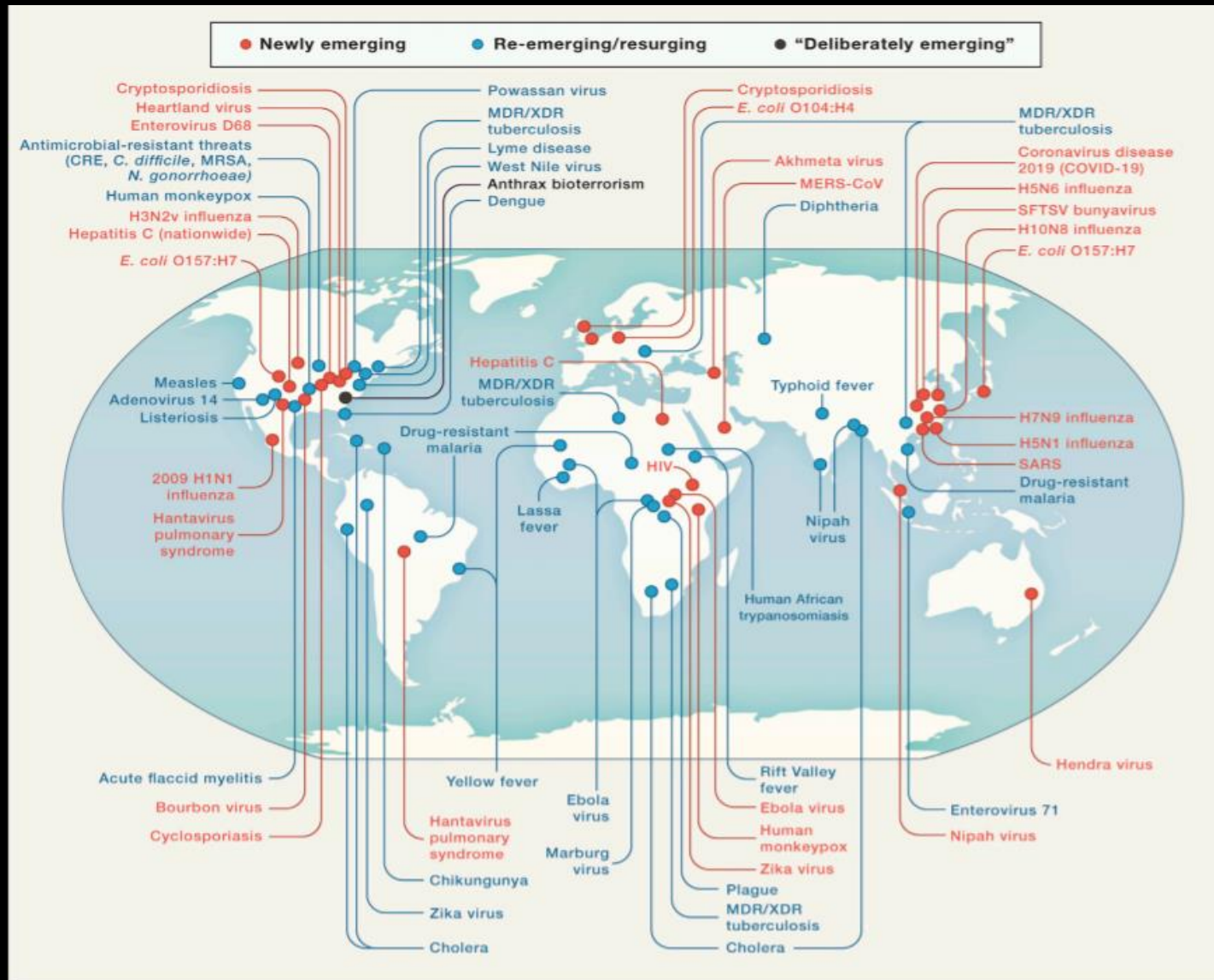
Pandemics and Biosecurity: A Multidimensional Challenge of Escalating Complexity and Urgency



Biosecurity Preparedness, Response, Resiliency & Recovery (PR3): Mapping The Risk Spectrum

- **infectious disease epidemics/pandemics**
 - **higher-order complexity than most other disaster risk categories**
 - **large populations at risk across broad geographies (humans, livestock, plants)**
 - **protracted timelines for full control and recovery (months/years)**
- **potential to trigger cascading global systemic vulnerabilities as revealed by COVID-19 pandemic**
- **risk amplification by cyber-disruption and disinformation campaigns**
- **proliferation of dual-use technologies and new threat categories**

Four Decades of Emerging Infectious Diseases (EIDs): The Dominant Role of Zoonotic Pathogens



The One Health Concept

- an integrated, systems-based approach to optimize the health of people and animals, availability of crucial food resources and sustainable environmental ecosystems



Strengthened Global Biosurveillance for Zoonotic EIDs: The Front Line in Preparedness



- geographic range and frequency of physical contact both between species and human exposure
- environmental factors

- demographics
- cultural, political and economic factors
- health system capacity to detect/respond

Urbanization and Mega-Cities in Developing Countries and the Increased Threat of Zoonotic EIDs

High Population Density With Inadequate Biosurveillance



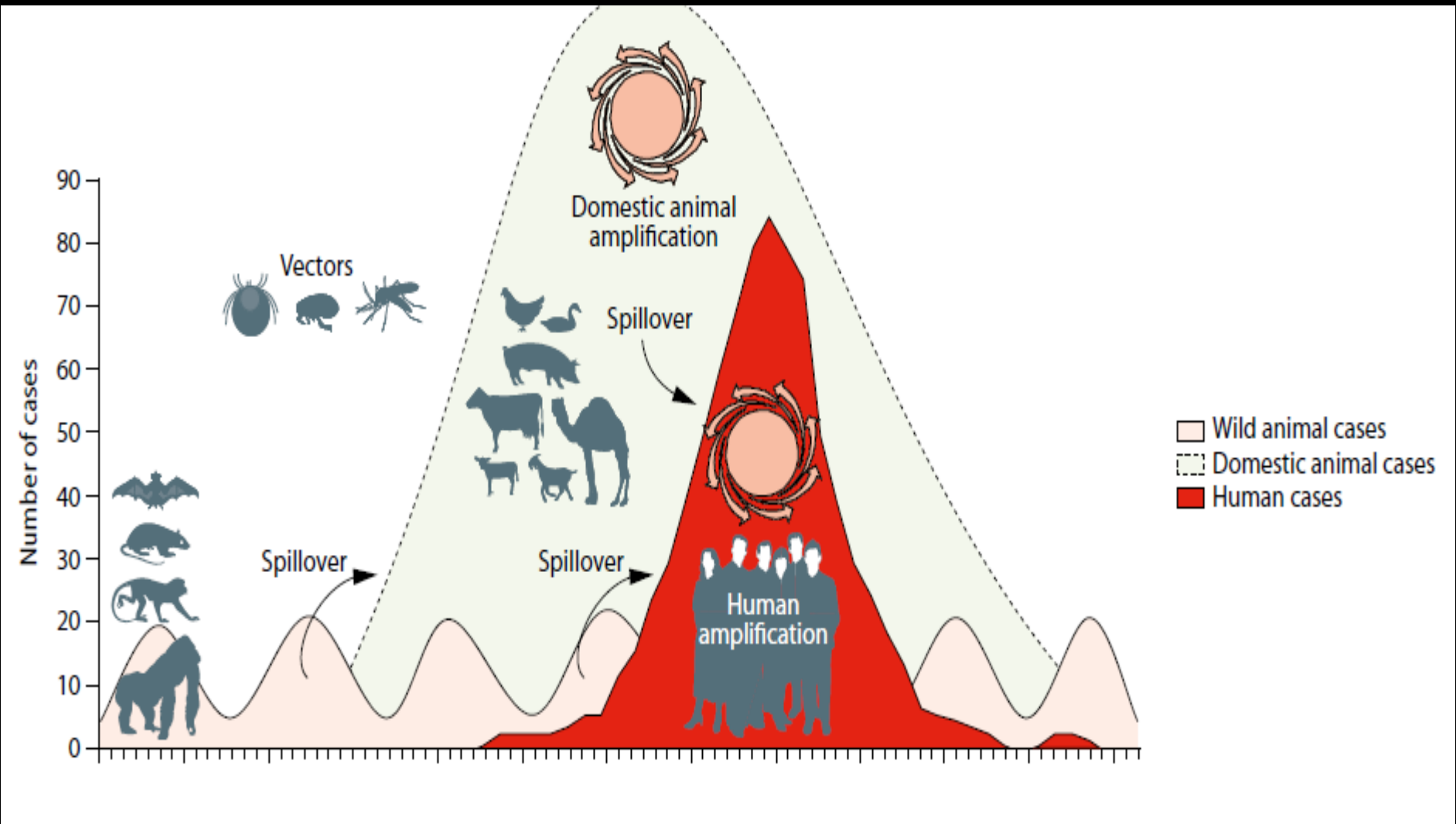
Expanded Eco-niches and New Zoonotic Exposures/Risks



Major Gaps in Health Infrastructure and Rapid Disease Reporting



Dynamics of Cross-Species Zoonotic Pathogen Risk Spillover



Food Production Systems and Changing Infectious Disease Risks in Low-and Middle-Income Countries (LMICs)

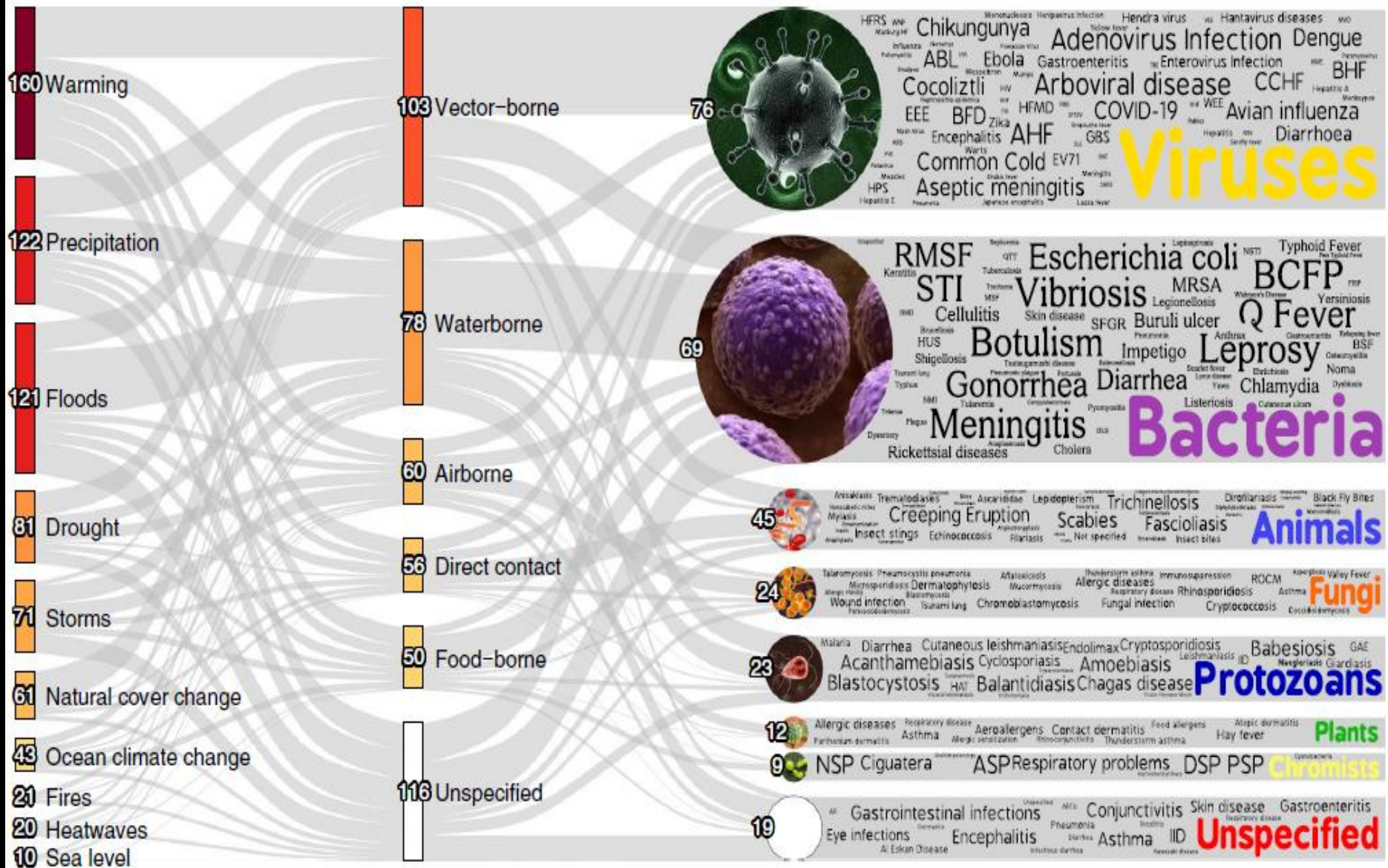
- **population growth, urbanization and consumer demand for meat-based diets**
- **intensification of livestock production**
 - **shift from rural smallholders to large periurban production units**
- **deforestation for livestock production and expanded encounters with zoonotic EID reservoir hosts**



Climate Shifts and New Pathogen-Host Interactions

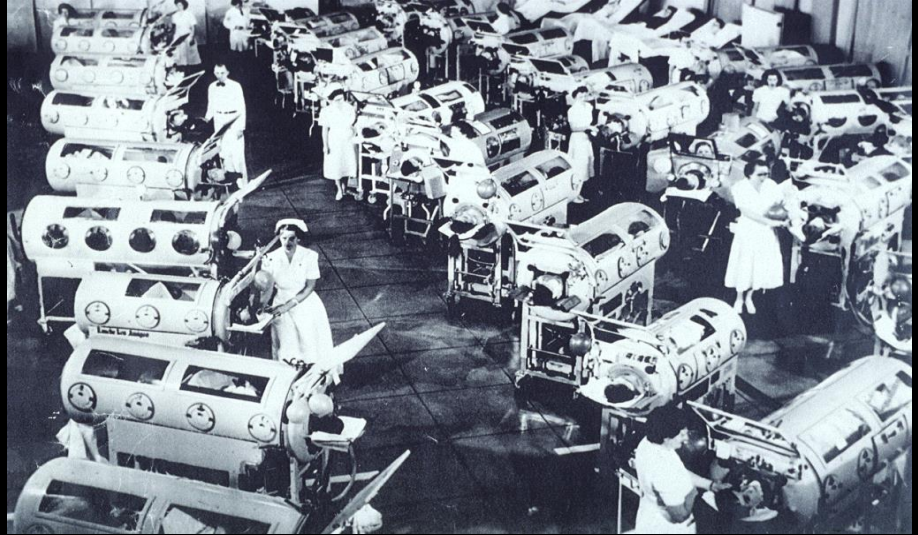
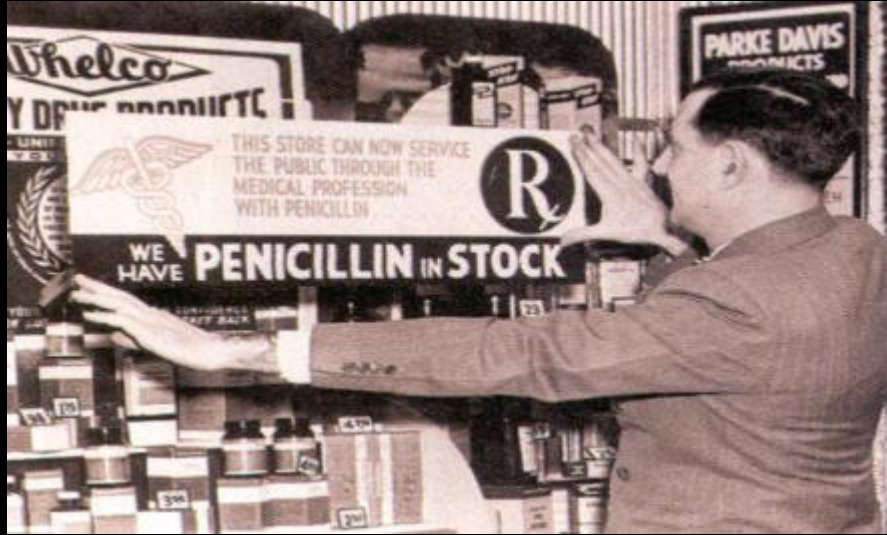
- **warming, precipitation changes and expanded vector geographic ranges**
 - **mosquitoes, ticks, fleas, birds, mammals**
- **warming at higher latitudes and increased pathogen and vector survival**
 - **Zika, dengue**
- **land cover changes and habitat destruction**
 - **wildlife migrations over larger areas for food foraging and zoonotic spillover risks**
- **floods and storms**
 - **wastewater overflow and food-borne illness**
 - **human displacement and refugee migrations**

Over Half of Known Human Communicable Diseases Can Be Aggravated By Climate Change



Complacency

Comfort and Complacency: The Enemies of Vigilance and Preparedness

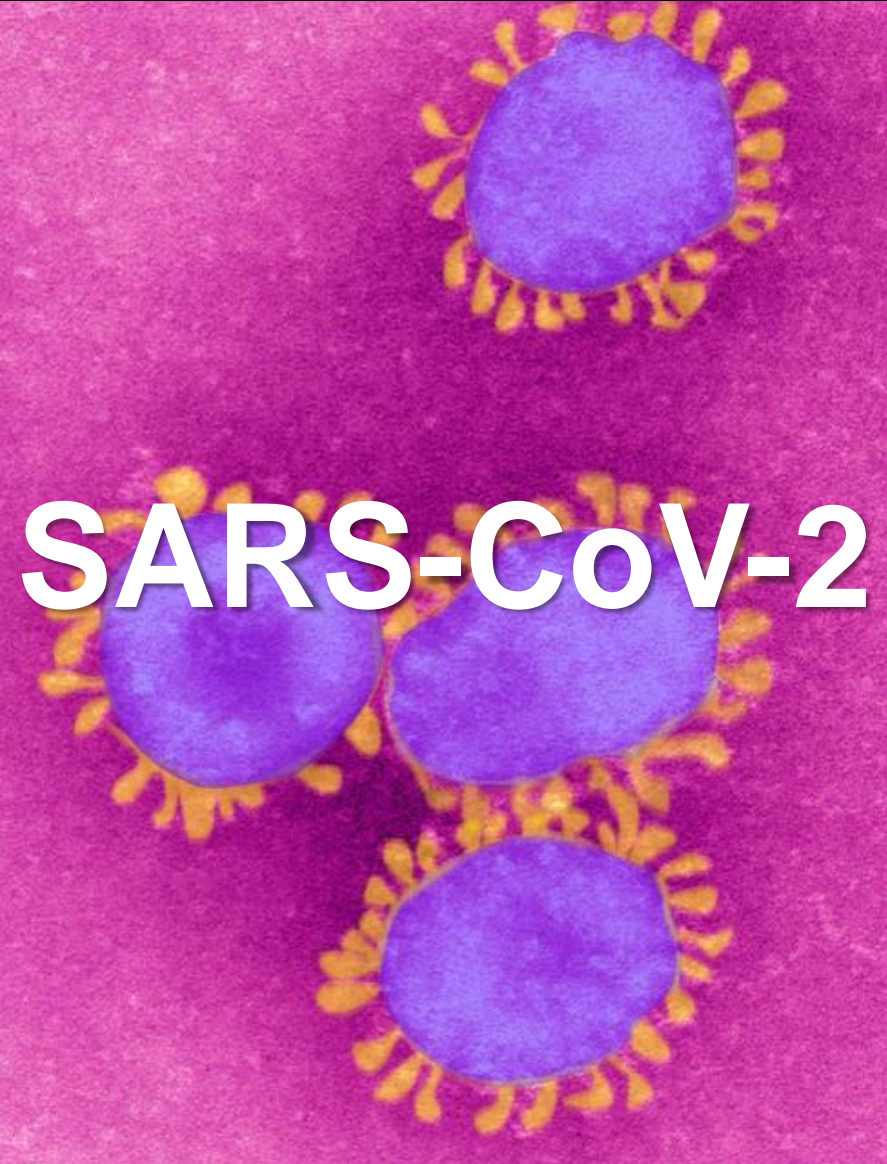


Out-of-Sight: Out-of-Mind

- **dismal repeated cycles of panic-fund-forget**
- **the curse of short-termism in public and private sector priorities**
- **competing political priorities move center-stage as perception of threat wanes**
- **economic slow down, government austerity measures and rise of nationalistic attitudes as barriers to sustained funding and cooperation for global biosecurity**
 - **disproportionate impact on LMICs**

Commitment

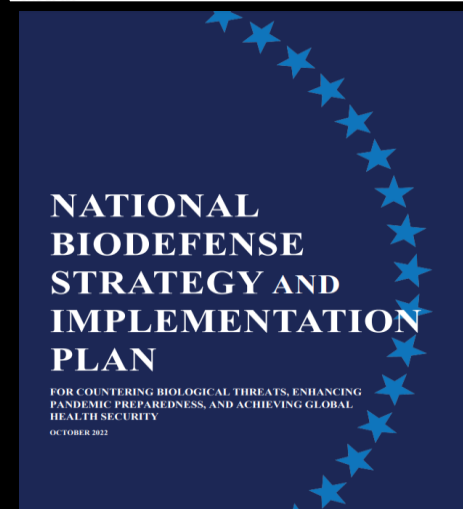
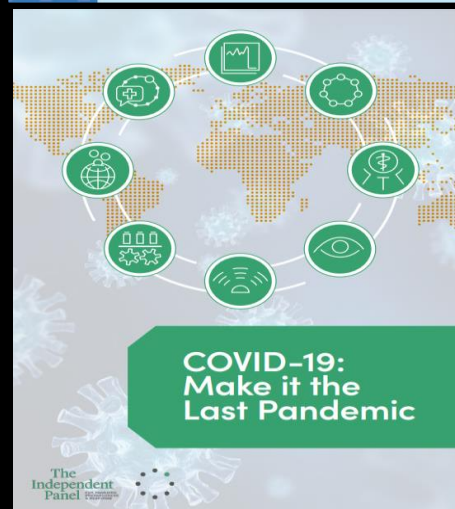
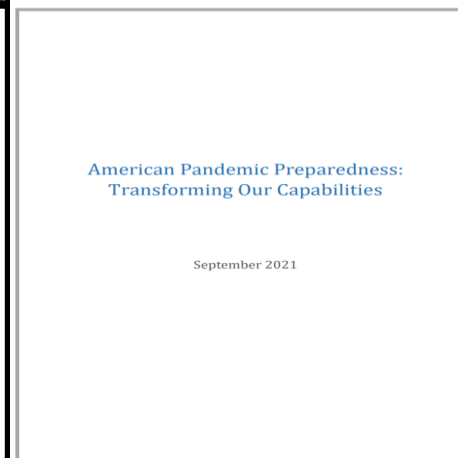
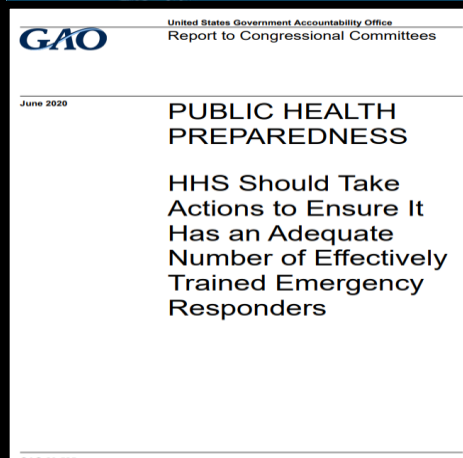
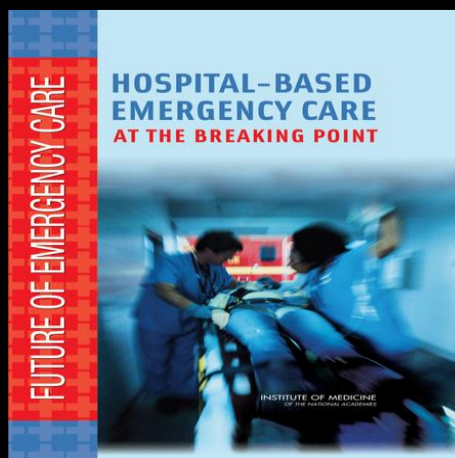
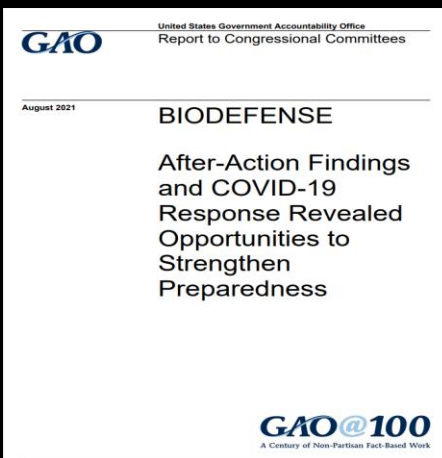
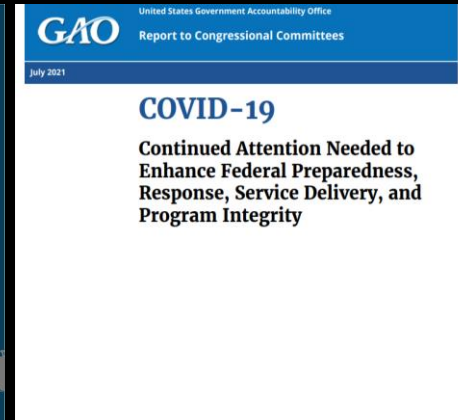
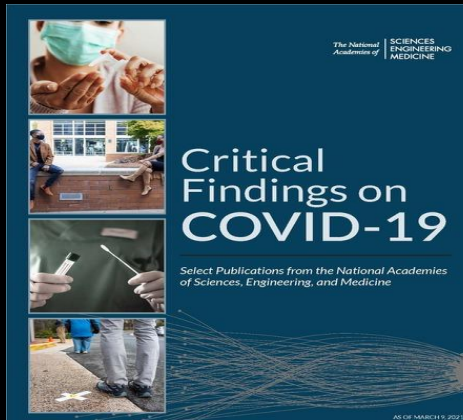
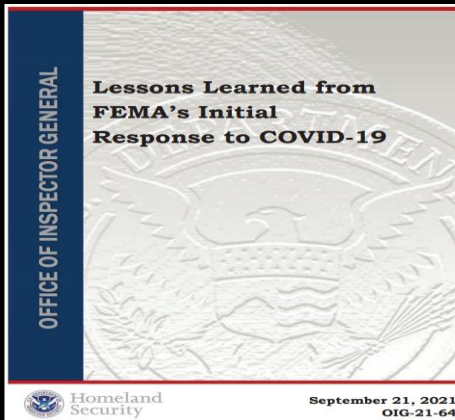
**Surveillance and Rapid Threat Decision:
Comprehensive Global Biosurveillance and Preparedness
for Epidemic/Pandemic Threats**



SARS-CoV-2

A transmission electron micrograph showing several SARS-CoV-2 virus particles. The particles are roughly spherical with a distinct outer layer of orange, spike-like projections (glycoprotein spikes) and a smoother inner core. They are set against a magenta background.





Driving Public Health in the Fast Lane

The Urgent Need for a 21st Century Data Superhighway

Transforming Public Health Data Systems

Supplemental Materials

This document is part of a group of supplemental materials for use by the National Commission to Transform Public Health Data Systems, an independent commission convened by the Robert Wood Johnson Foundation (RWJF). These materials were used to inform Commission discussions and recommendations.

National Commission to
Transform Public Health
Data Systems

May 2021

THE FUTURE of Public Health: A Synthesis Report for the Field

NOVEMBER 2021

National Network
of Public Health Institutes

TEXAS
HEALTH
INSTITUTE

Public Health Information and Technology Infrastructure Modernization Funding Report

Core Investment Strategies to Modernize and Interoperate
Federal, State, Local, Tribal Public Health Systems

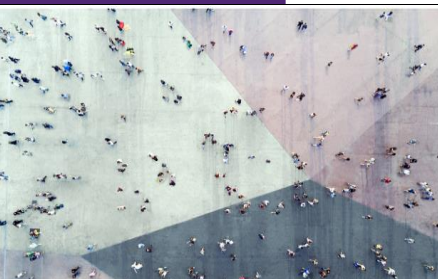
April 29, 2022

Future Planning for the Public Health Emergency Preparedness Enterprise

Lessons Learned from
the COVID-19 Pandemic



Proceedings of a Workshop



MEETING AMERICA'S PUBLIC HEALTH CHALLENGE

Recommendations for Building a National Public Health
System That Addresses Ongoing and Future Health Crises,
Advances Equity, and Earns Trust

The Commonwealth Fund Commission on a National Public Health System

JUNE 2022

The
Commonwealth
Fund

The Impact of Chronic Underfunding on America's Public Health System: Trends, Risks, and Recommendations, 2022

ISSUE REPORT



Trust for
America's Health

2022



Challenges and Opportunities for Strengthening the US Public Health Infrastructure

Findings from the Scan of the Literature

MAY 2021

National Network
of Public Health Institutes

Wastewater-based Disease Surveillance for Public Health Action

Consensus Study Report

Integrating Public and Ecosystem Health Systems to Foster Resilience

A Workshop to Identify Research to
Bridge the Knowledge-to-Action Gap



Proceedings of a Workshop

ONE HEALTH HIGH-LEVEL EXPERT PANEL

PREVENTION OF ZOOONOTIC SPILLOVER

FROM RELYING ON
RESPONSE TO REDUCING
THE RISK AT SOURCE
OHHLEP whitepaper/Opinion piece

PREVENTING THE NEXT PANDEMIC

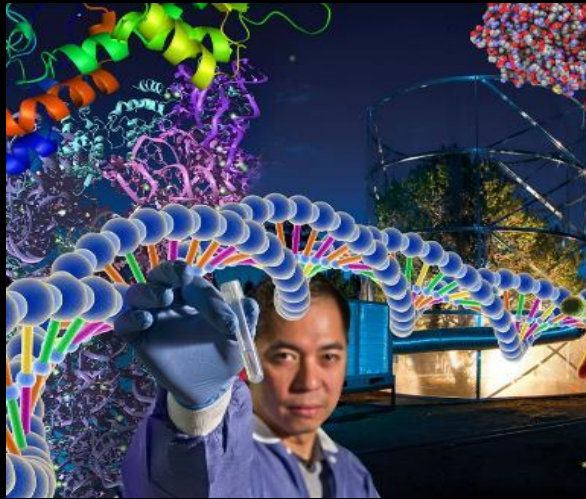
Zoonotic diseases and how to
break the chain of transmission



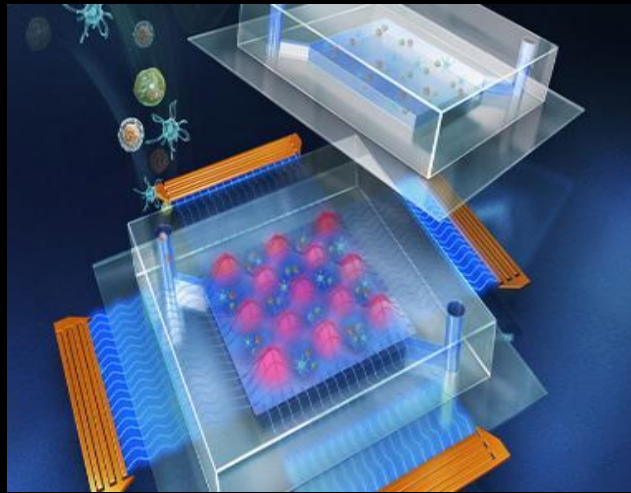
A Scientific Assessment with Key Messages for Policy-Makers
A Special Volume of UNEP's Frontiers Report Series

The Primacy of Diagnostics in Biosurveillance and PR3 Capabilities

Profile:
signatures of infectious agents



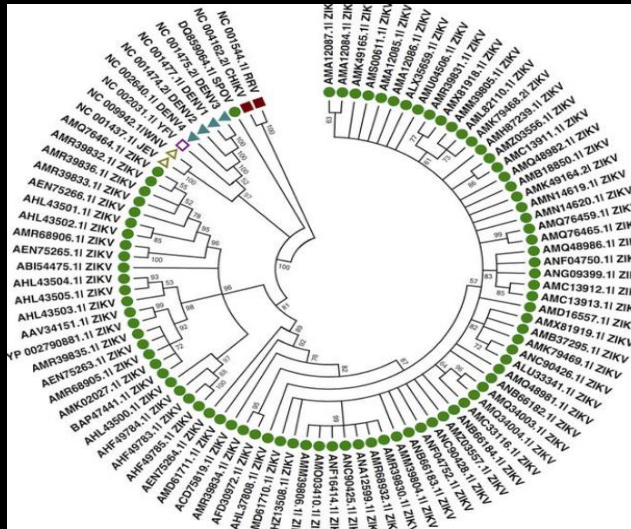
Detect:
rapid automated PON/POC diagnostics



Act:
real-time situation awareness, decisions



**surveillance
sans frontières**



**genomics of
pathogen evolution**



**dual-use research and
engineered biothreats**

Aggressive Actions to Contain Highly Pathogenic Avian Influenza as a Potential Human Pandemic Agent:



**Monitoring Emergence of H5, H7 Strains
for Potential Switch from Birds to Mammals**

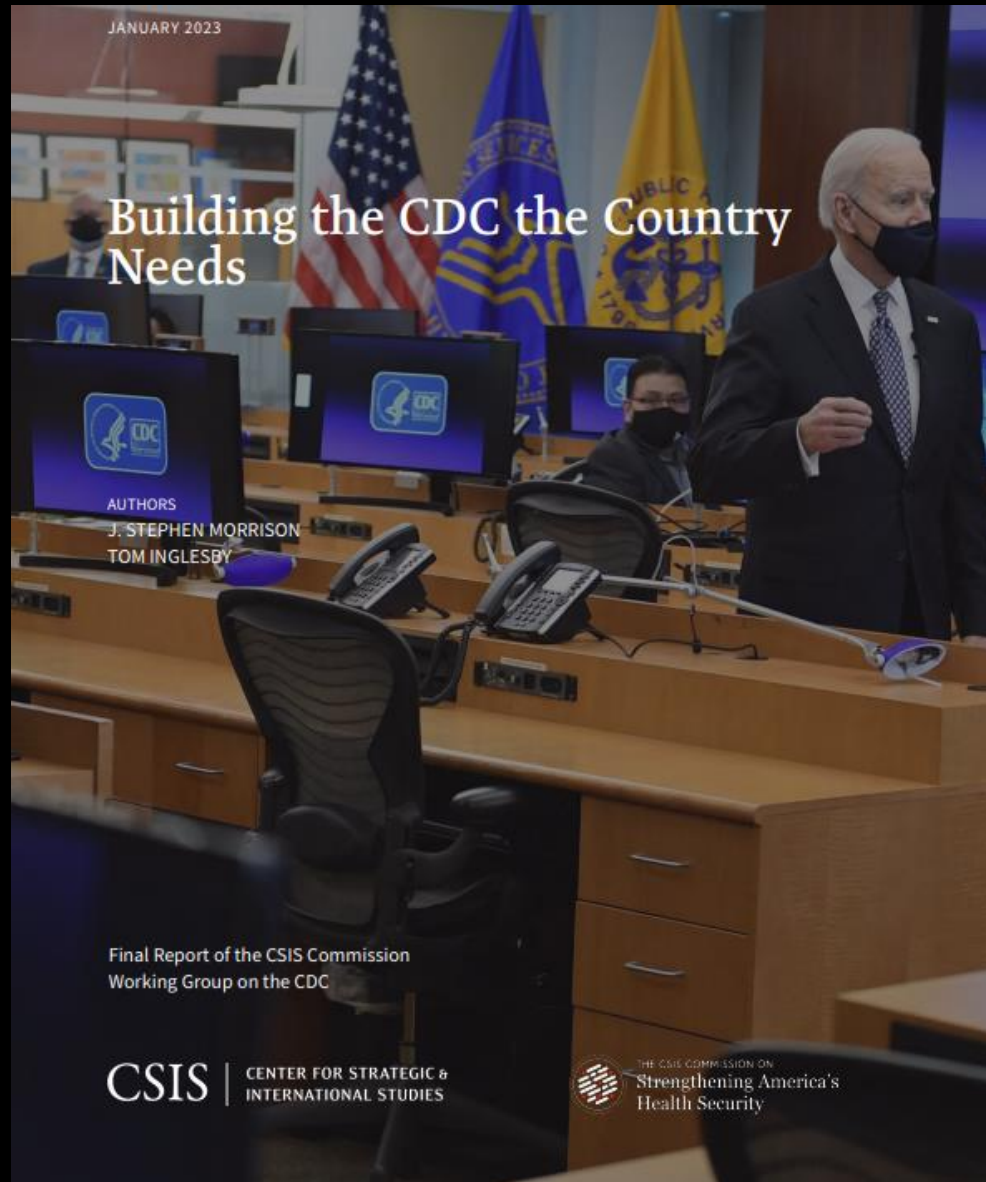
New Technologies for Faster Detection and Rapid Responses to Biothreats



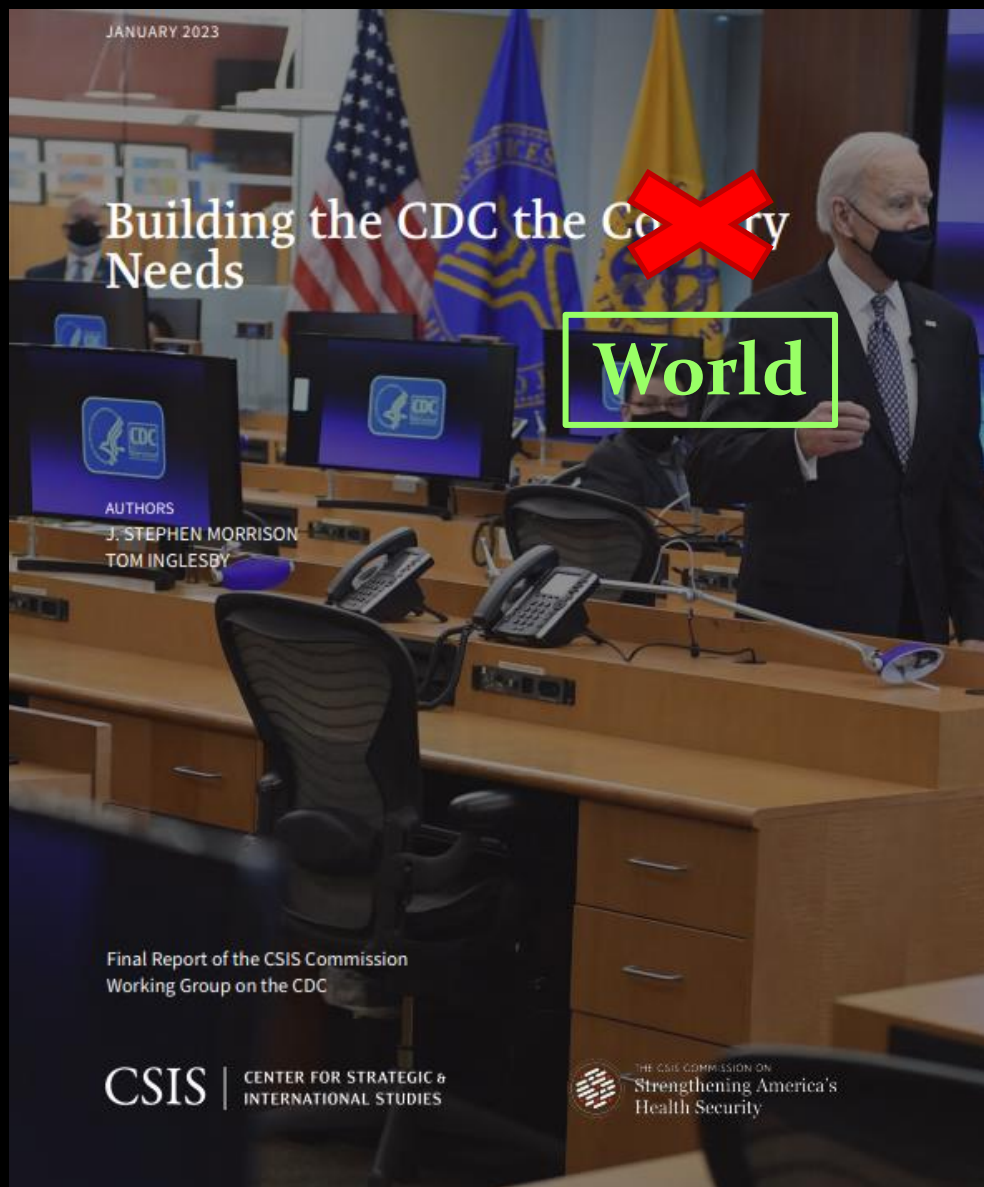
- **waste-water
surveillance and
pathogen detection**



Reinvestment and Strengthening the CDC: Vision, Organization, Competency and Agility



Once Again, a Siloed US-Centric Perspective:





Financing the
Global Commons for
PANDEMIC
PREPAREDNESS
AND RESPONSE

REPORT OF THE
G20 HIGH LEVEL
INDEPENDENT
PANEL

THE NEW PANDEMIC FUND AIMS TO:

- *bring additional, dedicated resources*
- *incentivize countries to increase investments*
- *enhance coordination among partners*
- *serve as a platform for advocacy*



WORLD BANK GROUP



World Health
Organization

G20 PRESIDENCY OF INDONESIA

RECOVER TOGETHER
RECOVER STRONGER



Mobilizing Global Commitments to Enhance Pandemic PRR Capabilities

- (re)build greater resilience in public health and healthcare infrastructure
- essential and welcome actions (assumes commitment to deliver)

BUT

- heavily weighted to protection of G20 populations
- still largely **'reactive'** focus on strengthened response and resilience once a bio-incident has occurred versus the more challenging task of **'proactive'** threat detection and elimination at source
- **funding imbalance** in focus on strengthening capacities to respond to human disease outbreaks versus expanded investment in **One Health** initiatives to reduce frequency/intensity of infection threats from zoonoses, climate shifts and ecosystems perturbations

Who Pays for Preparedness?

The Obligate Role of Private-Public Partnerships in Biosecurity Policy

PROCEEDINGS OF A WORKSHOP

Engaging the
**Private-Sector Health
Care System** in Building
Capacity to Respond to
Threats to the **Public's
Health and National
Security**

The National Academies of
SCIENCES • ENGINEERING • MEDICINE



Neglect of Proactive R&D and Availability (Stockpiling) of Medical Countermeasures (MCMs) for Potential Pandemic Pathogens and AMR

- **‘market failure’**
 - **lack of incentives for private sector to undertake high-risk/high-cost R&D absent guaranteed markets and ROI**
 - **antibiotic resistance (global)**
 - **MCMs for EIDs and biowarfare select agents**
 - **neglected diseases of the developing world**

Neglect of Proactive R&D and Availability (Stockpiling) of Medical Countermeasures (MCMs) for Potential Pandemic Pathogens and AMR

- **outsourcing of critical supply chains (China, India)**
 - **generic drugs (80% of US prescriptions)**
 - **active ingredients for key drug classes (antibiotics)**
 - **PPE, laboratory testing supplies**
 - **devices (ventilators)**

Pathogens Sans Frontières

Strengthened Global Governance of Health Security

- **update IHRs (original 2005)**
- **risk assessment and early warning triggers**
- **intensified inspection, compliance and capability assessments**
- **transparency in timely sharing of critical data on outbreaks**
- **enforcement and accountability for non-compliance**
- **health equity, technology transfer, IP rights and distributed manufacturing**
- **biosafety protocols for dual-use research**

Pathogens Sans Frontières

Strengthened Global Governance of Health Security

- update IHRs (original 2005)
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- enforcement and accountability for non-compliance
- equity, technology transfer, IP rights and distributed manufacturing
- biosafety for dual-use research

Accountability

Trust But Verify



Rising Geopolitical Tensions and Pressures for Uncoupling of the World's Two Largest Economies



- **growing inventory of tensions and flashpoints**
 - Taiwan, BRI, trade practices, industrial espionage and IP theft
- **suspicion and distrust regarding lack of PRC transparency in COVID-19**
- **intensified technological competition for industrial/military superiority**
 - biotechnology, synthetic biology, AI and Quantum computing, outer space

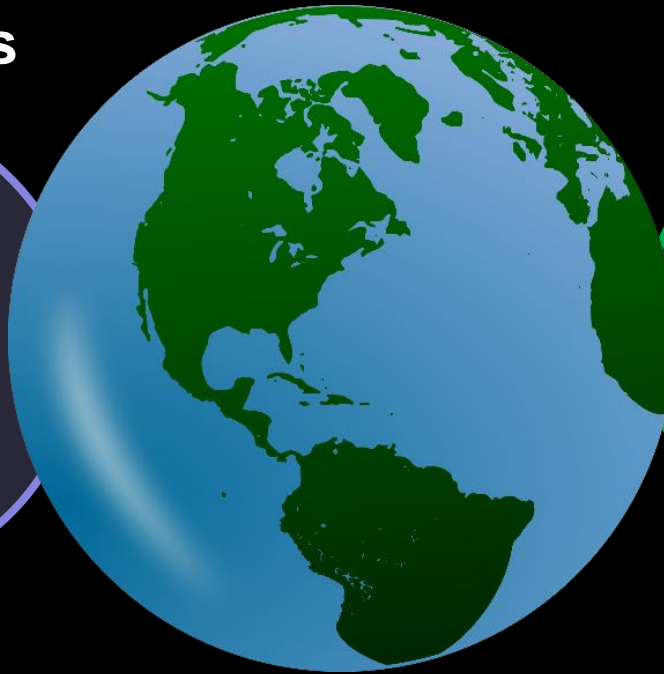
Potential Dangers of Growing Bipolar Political Alignments for Global Public Health

- **socio-political barriers to international cooperation, transparency and investment in global bio-surveillance and outbreak PR3 capabilities**
- **asymmetries in commitment to mitigate climate-induced health risks**
 - **communicable and non-communicable diseases**

Pandemics and Global Biosecurity: Understanding the Interactions Between Multiple Complex Adaptive Systems and Their Subsystems

One Health Interactions

- humans
- animals
- plants
- ecosystems



Anthropogenic Interactions

- socio-cultural
- economic
- technical
- institutional structures
- geopolitical
- military

The Curse of Contemporary Governance: 'Quick Fixes' and the Retreat from Complexity

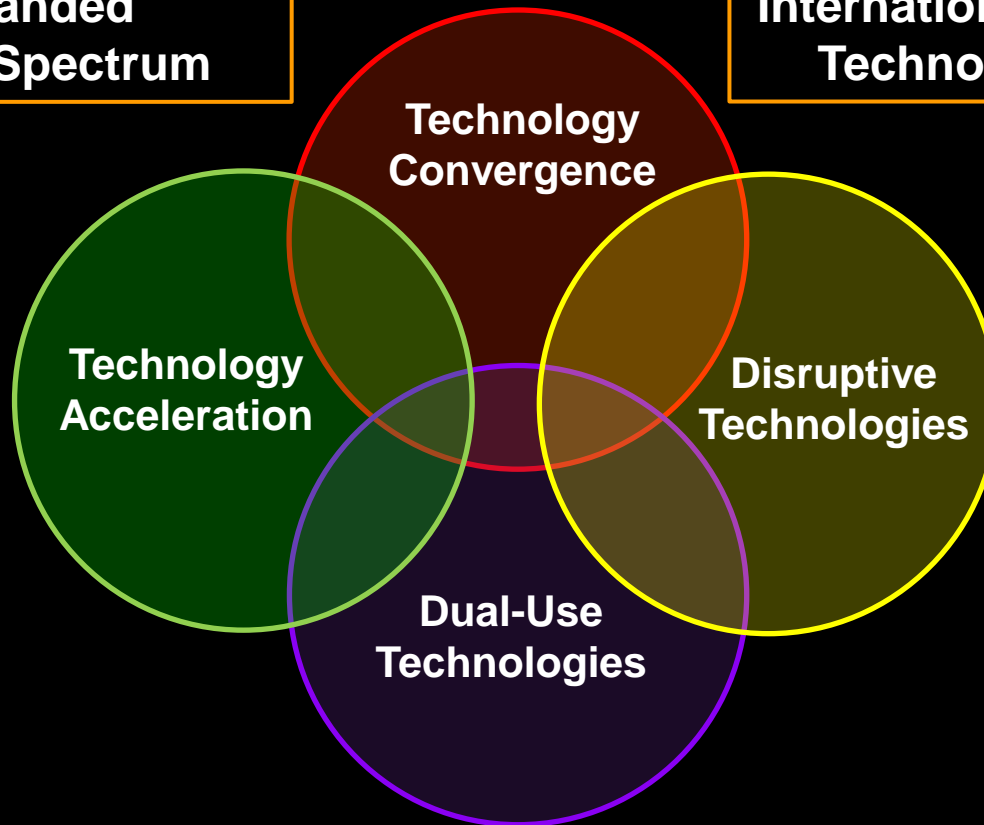
- **institutional and policy sclerosis and inability of governance mechanisms to keep pace with technical advances**
- **society increasingly “cocooned” from complexity and risk**
- **pervasive and dangerous scientific illiteracy among legislative and policy makers about biosecurity(and advanced technologies at large)**
- **“quick fixes” and unidimensional, short-term policies**
 - **failure to address long term, multidimensional complexities**
 - **dangerous myopia of national vs global perspectives**

Biosecurity: A Global Challenge of Escalating Complexity and Urgency in an Era of Radical Technological Change

Risk Assessment and Mitigation

**Expanded
Threat Spectrum**

**International Competition for
Technology Dominance**



**Strategic Surprises
and Dislocations**

**Governance and
Institutional Competencies**

**International
Cooperation**

“Plus ça change, plus c’est la même chose”

**“Politics is the art of the possible,
the calculated science of survival”**

Prince Otto von Bismarck



**“Survival owes little to the art of politics,
but everything to the calculated application
of science”.**

**Professor Rudolph Virchow
(in reply)**



“Plus ça change, plus c’est la même chose”

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Slides available @ <https://casi.asu.edu/presentations/>

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