Complex Adaptive Systems Initiative
Arizona State University

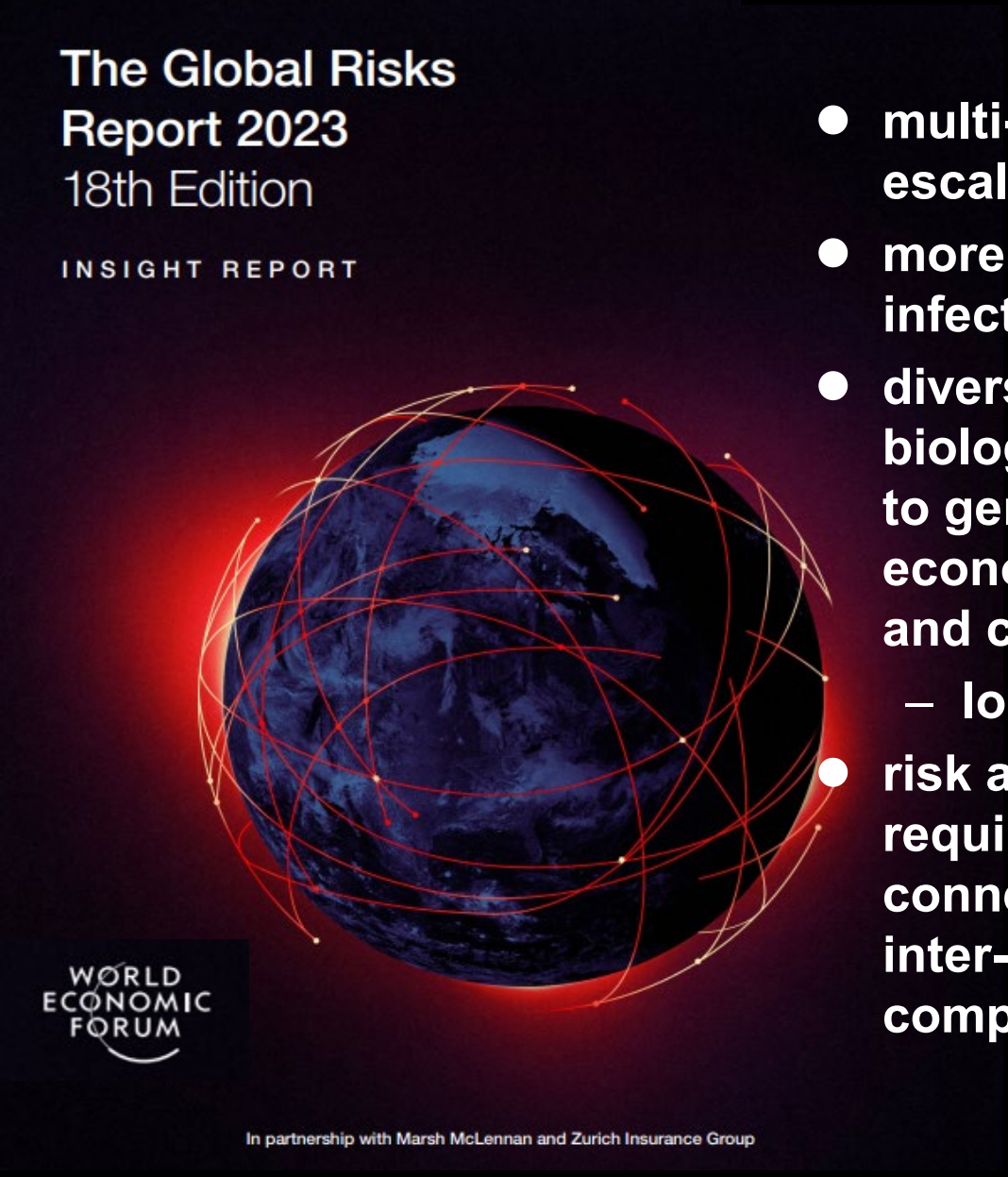
Stanford MEDICINE

Global Biosecurity: 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

BIOE 122, EMED 122/222, PUBL POL 122/222
Stanford University School of Medicine
23 January 2023

Biosecurity



- multi-dimensional challenges of escalating complexity and urgency
- more than detection and control of infectious diseases
- diverse constellation of threats to biological systems with the potential to generate profound societal, economic, geopolitical instabilities and conflict
  - local, national, international
- risk assessment and mitigation require understanding myriad connectivities and inter-dependencies between diverse complex adaptive systems

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

- shared and unique features of different natural and disaster categories
- acute catastrophes/hazards
  - typically limited duration and damage scale known from the outset
- 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)
  - massive global systemic vulnerabilities as revealed by COVID-19 pandemic
- cyber-disruption and disinformation campaigns
- proliferation of dual-use technologies and new threat categories

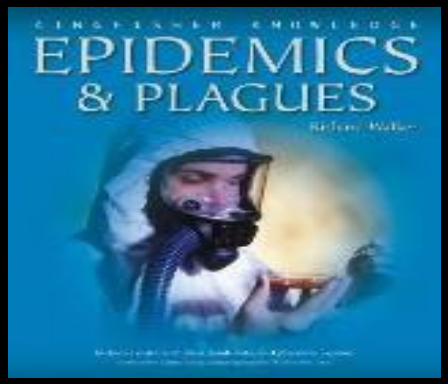
The Risk Hierarchy

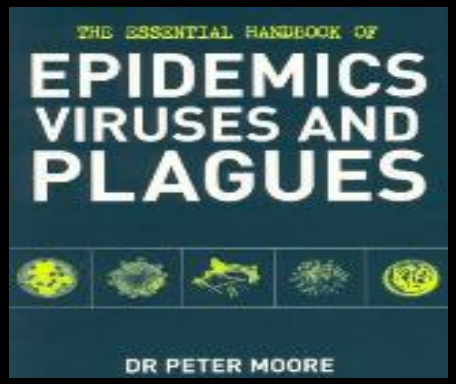
Hon. D. Rumsfield
US Secretary of Defense

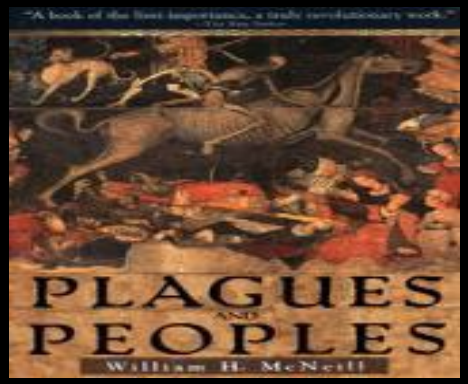
- known knowns
  (even if ignored)
- known unknowns
  (intelligence, surveillance)
- unknown unknowns
  (adaptive survival, resiliency)

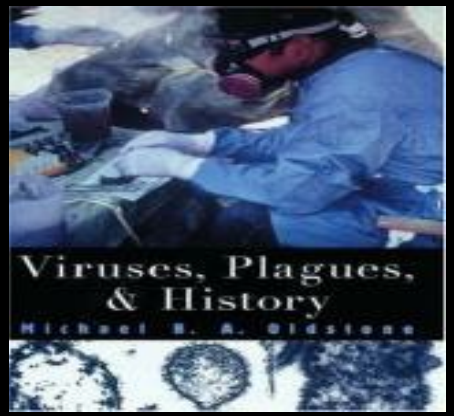
Biothreat Preparedness, Response, Resiliency & Recovery (PR3) Capabilities

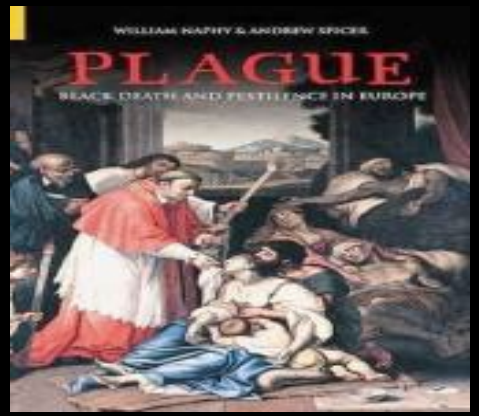
Infectious Diseases:
A Powerful Force in Human Evolution

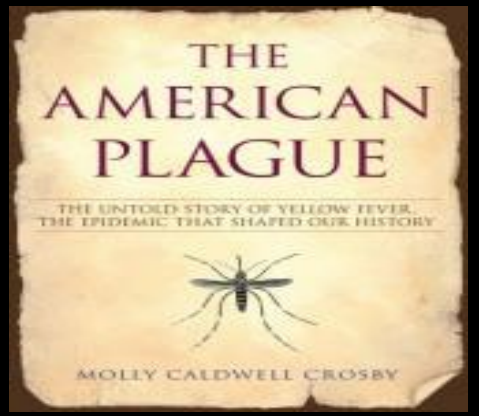


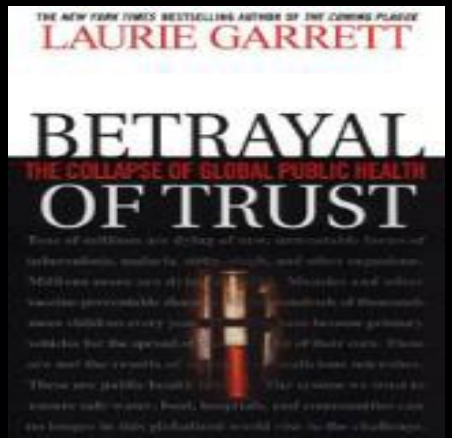


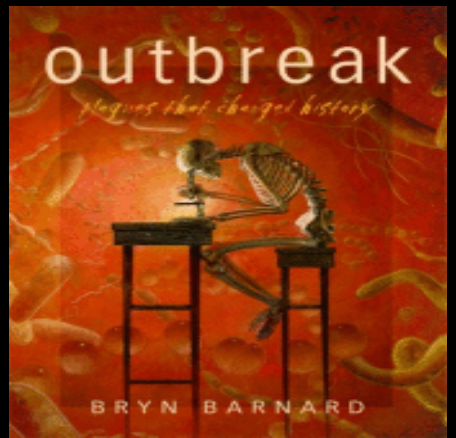


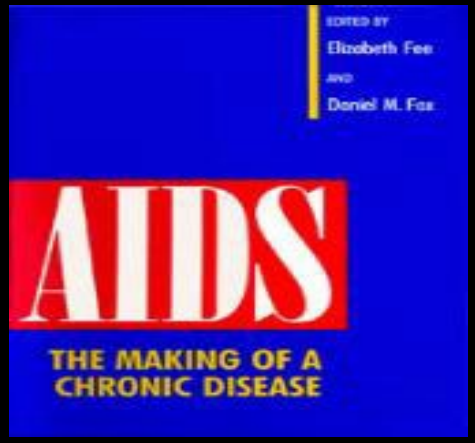


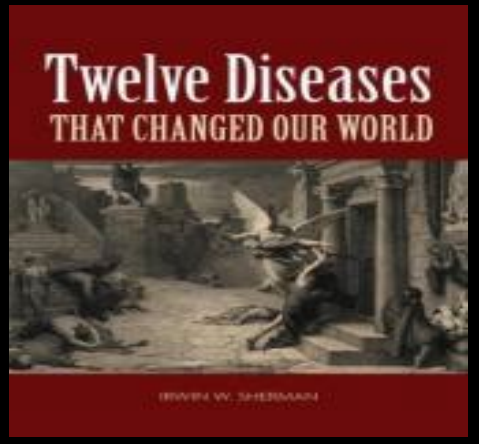










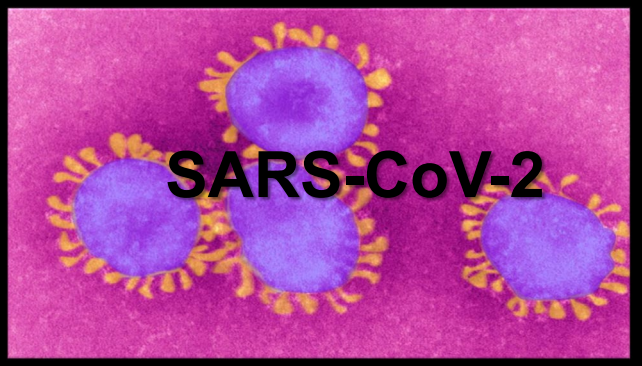


The Relentless Ever-Changing Dynamics of Infectious Diseases

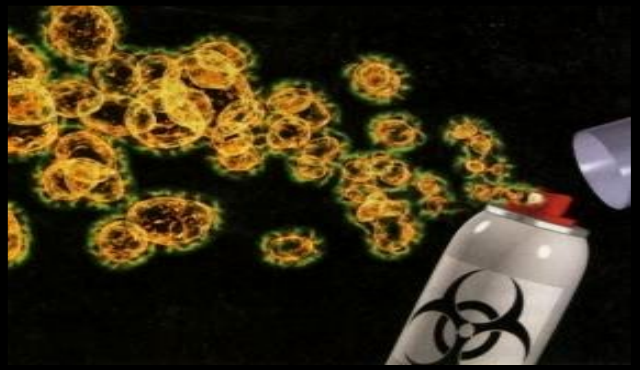
old foes resurgent: Rx – resistance

omnipresent pandemic threats

new foes: emerging infectious diseases



climate change and new vector ranges



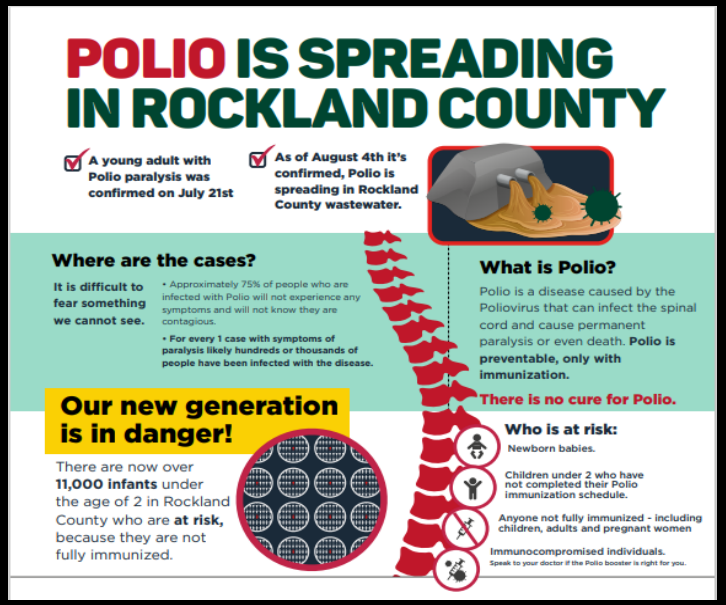
bioterrorism and bioweapons

dual-use research of concern

The Need for Continued Vigilance Against Known Pathogens

Global Emergence of Monkey Pox Virus (2022)

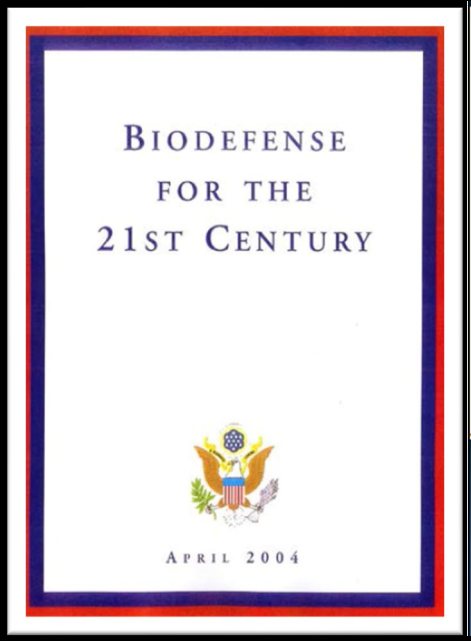
Poliovirus New York 2022

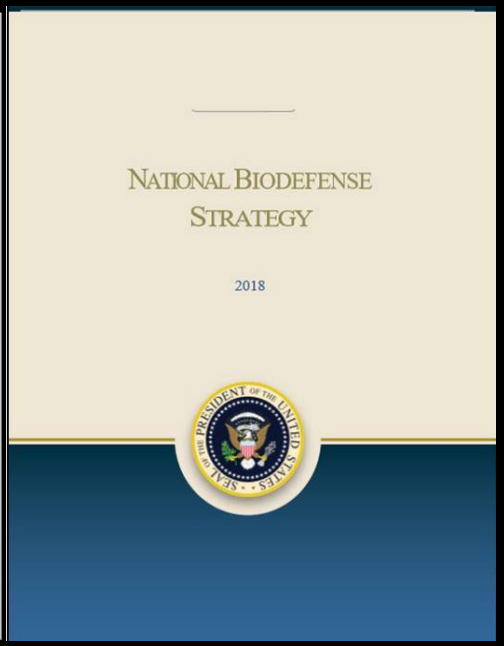


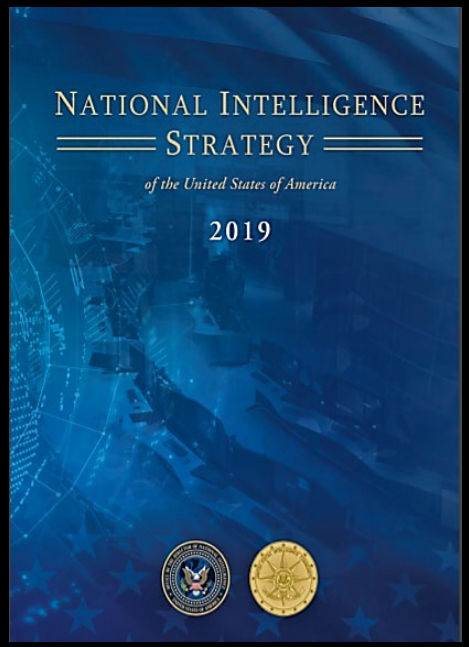
Poliovirus Afghanistan

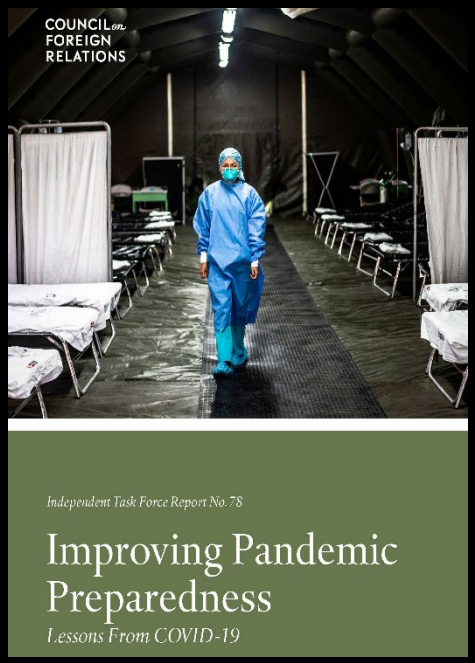
Cronobacter sakazakii and National Infant Formula Shortage

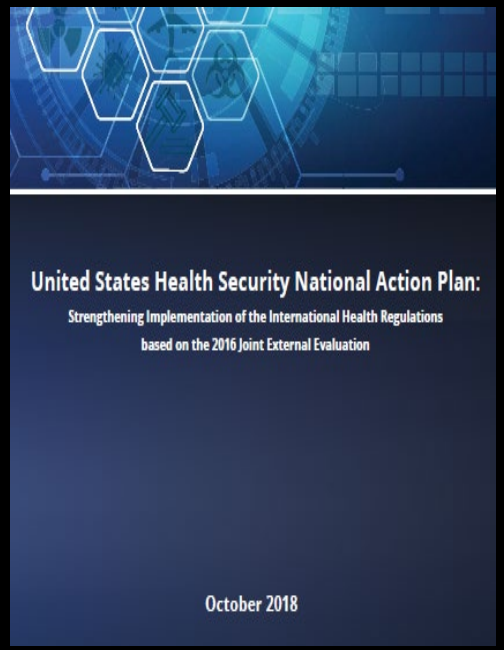
U.S. National Security Policy and Biodefense

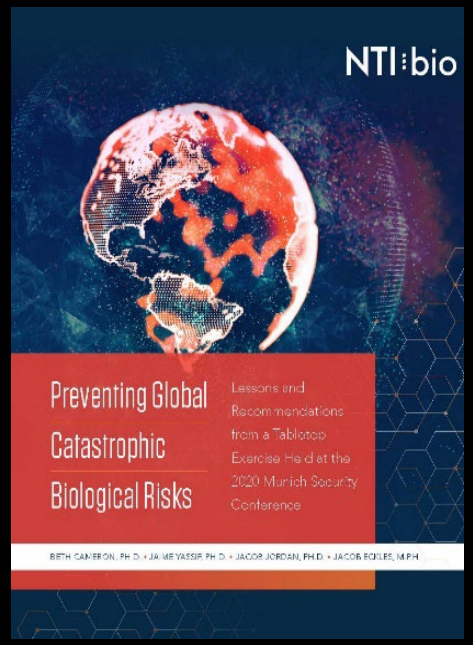


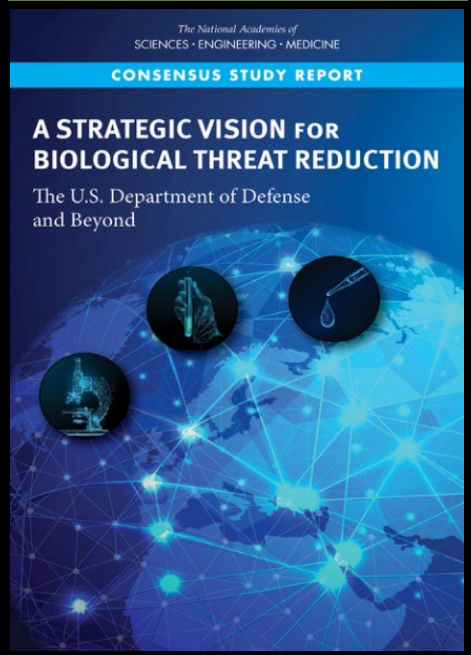








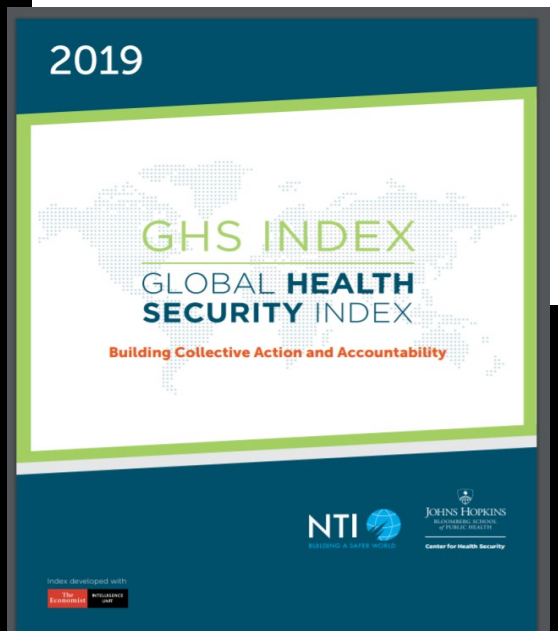




SARS-CoV-2 Revealed Major Shortcomings in US Public Health Capabilities

PREPARED ?

NO !



Key

- Most Prepared
- More Prepared
- Least Prepared

US Operation Warp Speed:
The One Great Success in the COVID-19 Pandemic

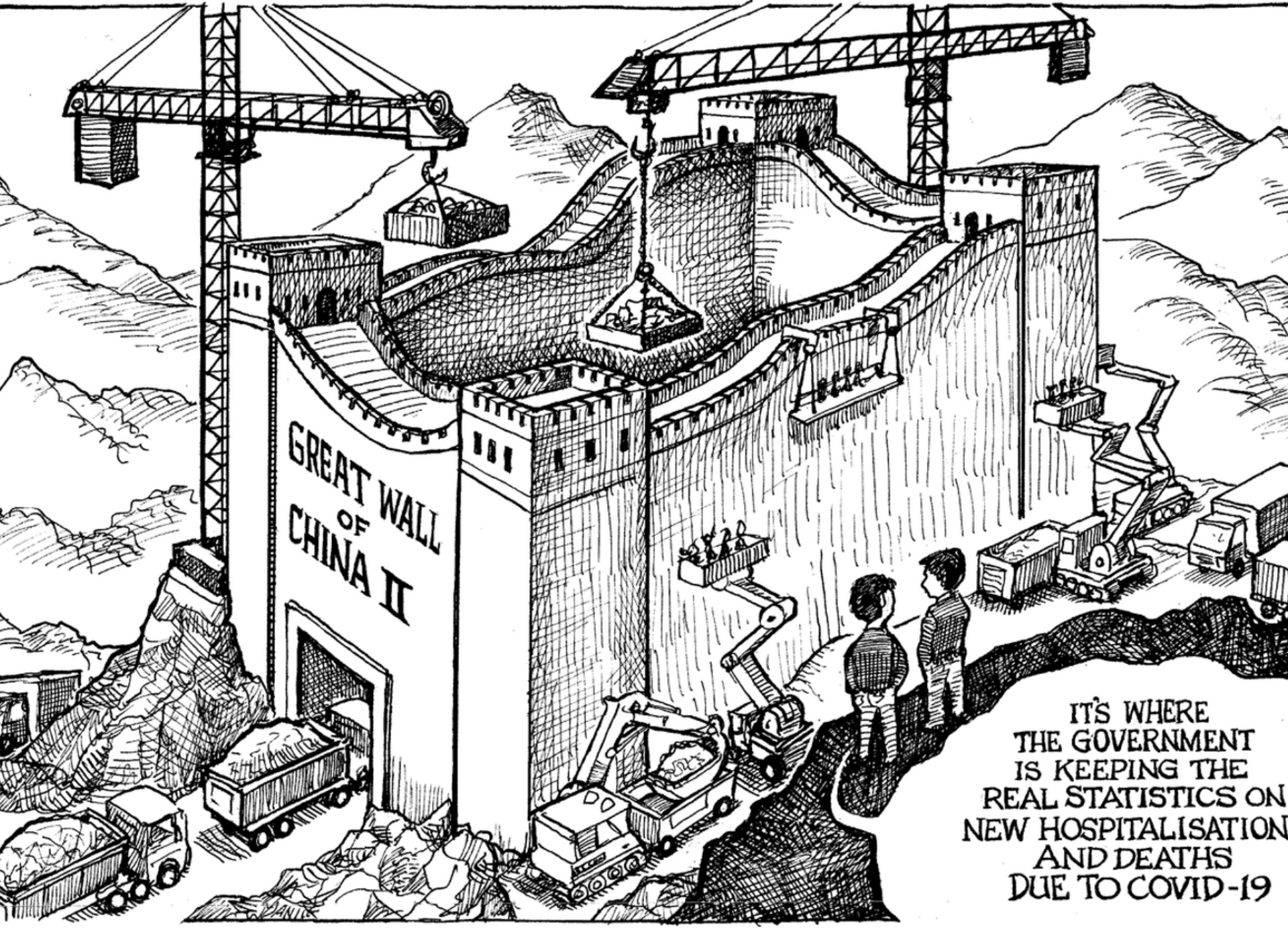
PRC Zero-COVID Policy: “The People’s War”

- draconian lockdown and comprehensive surveillance of population compliance
- censorship of on-line criticism of zero-covid policy
- propaganda that low disease burden and death toll in 2020-22 vs Western democracies was “proof of Western decadence and callousness”
- thoughts of “coexisting with the virus are erroneous” (Ma Xiaowei, Health Minister, April 2022)
- growing public dissent and protests (4Q/22)
- policy abandoned 7 Dec. 2022
- country ill-prepared for rapid spread of Omicron BA.5.2 and BF.7 variants and inevitable arrival of XBB.1.5 from outside China

Omicron Runs Rampant in PRC (Jan. 2023)

Spin, Obfuscation and Lies

- how to spin transition from zero-COVID policy (2020-22) to negative outcomes of complete abandonment (12/22)
  - immunologically naïve population with no exposure to Omicron and prior variants
  - poor efficacy of domestic vaccines, limited herd immunity and booster adoption
  - reluctance to purchase Pfizer/Moderna mRNA vaccines and Paxlovid antiviral
- sadly, predictable lack of transparency regarding viral spread
  - “no worse than the flu” (CCP 12/22)
  - claim of 138,000 ICU beds (12/22) double what was reported in 11/22
  - under-reporting of hospital and ICU admission and deaths (satellite surveillance and other IC interceptions)

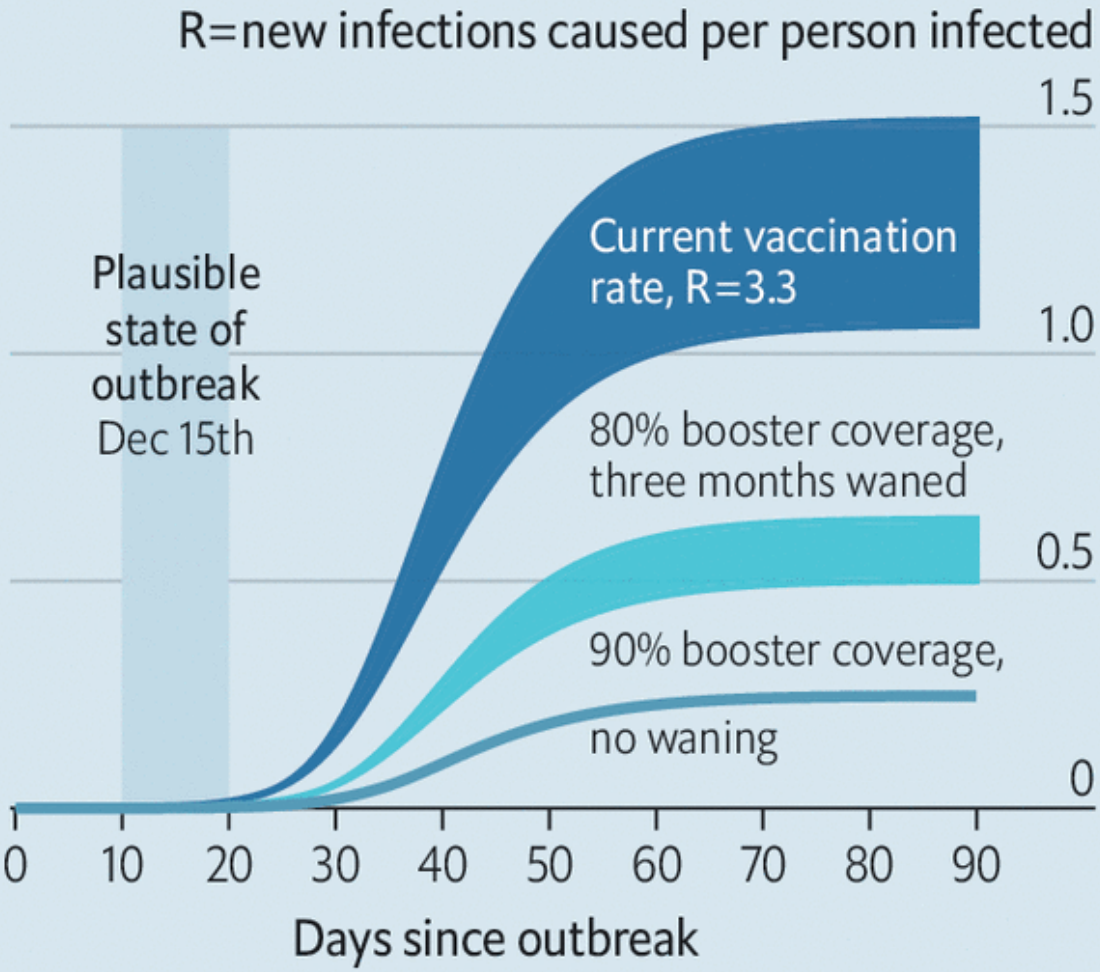

GREAT WALL OF CHINA II
IT'S WHERE THE GOVERNMENT IS KEEPING THE REAL STATISTICS ON NEW HOSPITALISATION AND DEATHS DUE TO COVID-19

https://www.economist.com/china/2022/12/15/our-model-shows-that-chinas-covid-death-toll-could-be-massive

Big wave modelling

China, covid-19, SEIR model

Estimated deaths*, by model scenario, m



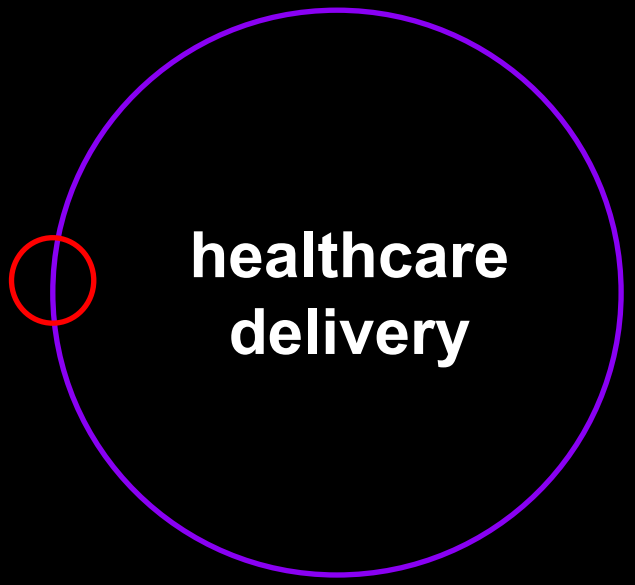
SARS-CoV-2: The Great Reset

- lessons learned?
- what will the ‘new normal’ look like?
- what will be the recovery time for different countries/sectors?
- new geopolitical instabilities?
- impact on the race for technological/military dominance (US vs PRC)
- implications of rebound of PRC economy and new global inflationary price pressures

Complexity

The Dangerous Uncoupling of US Public Health and Healthcare Delivery in the COVID-19 Pandemic

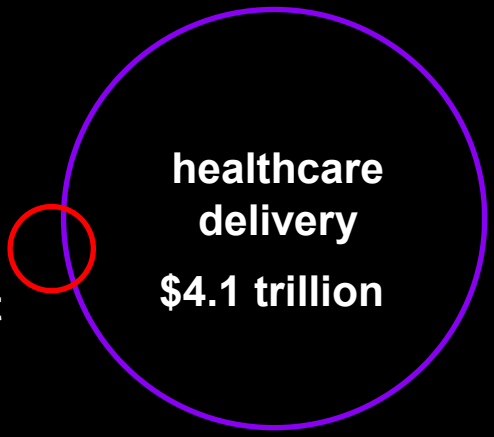
USG global public health investment $50 billion



$4.1 trillion annual expenditure

The Cost of the US COVID-19 Pandemic 2020-2022: A Classic Example of a 'False Economy' in Underinvestment in Public Health PR3 Infrastructure

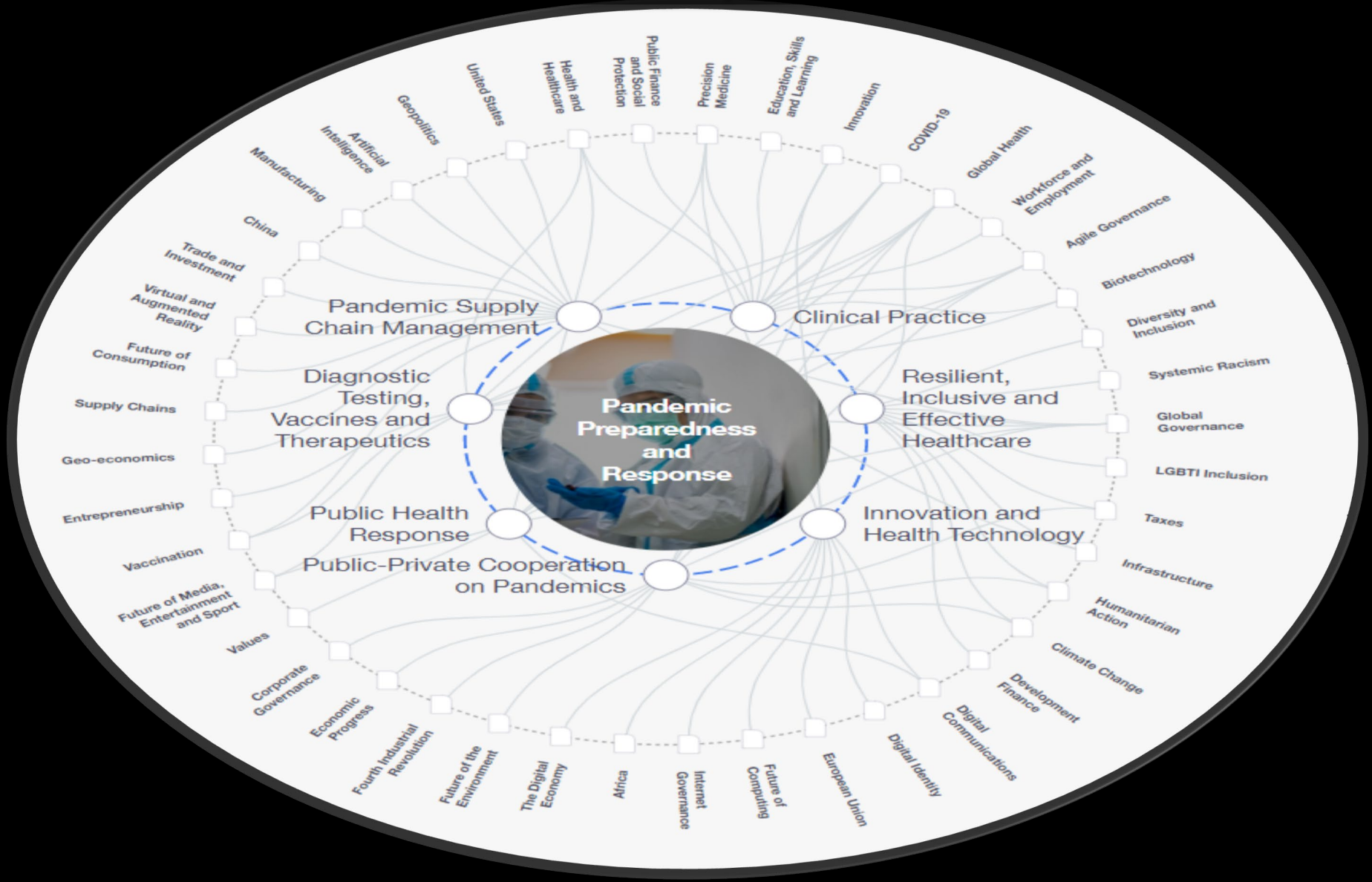
USG global public health investment $50 billion



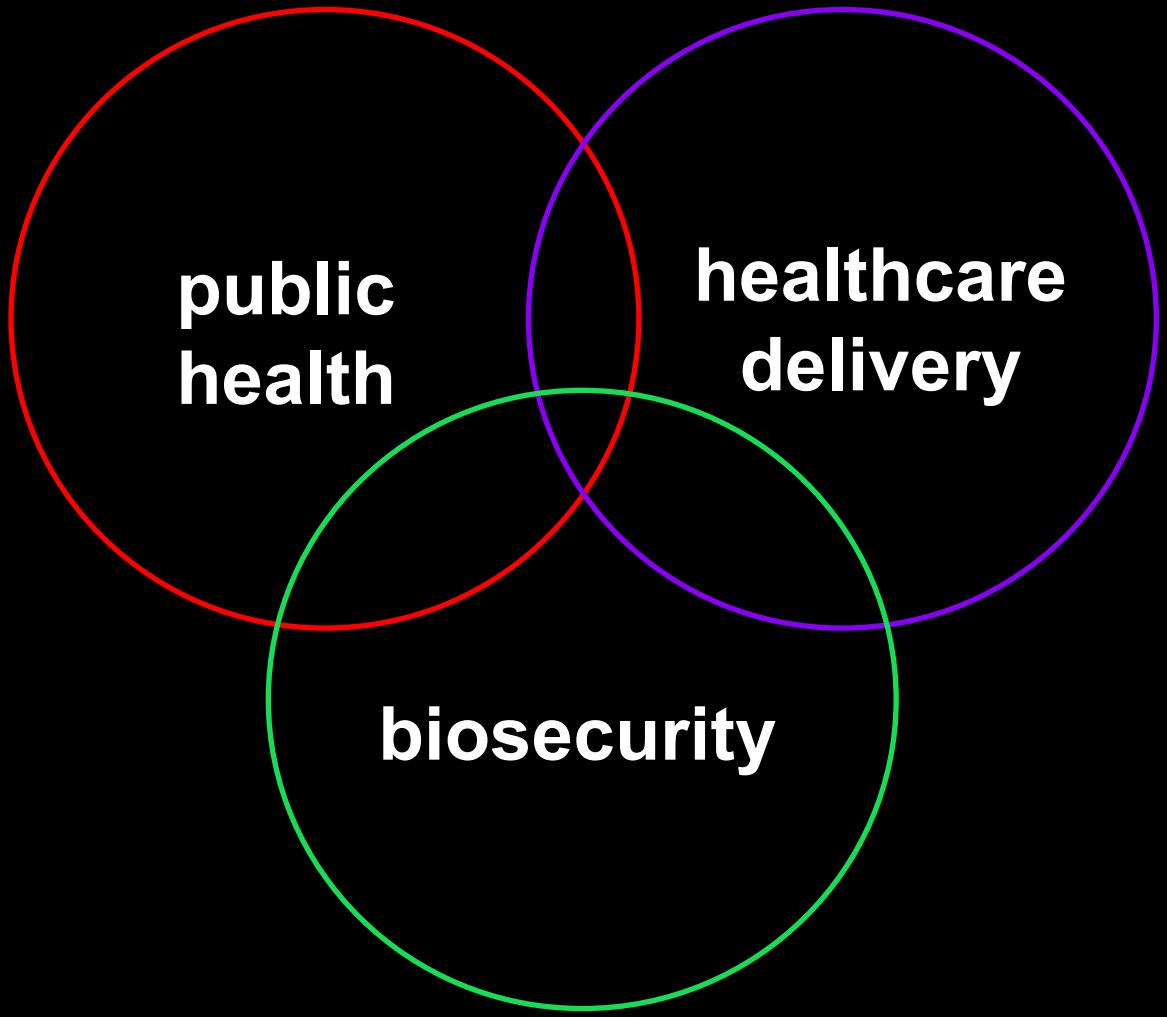
- estimated $4.1 trillion direct cost

- unknown long-term health effects
  - long-COVID
- the shadow pandemic
  - healthcare
  - education
  - mental illness
  - LMICs

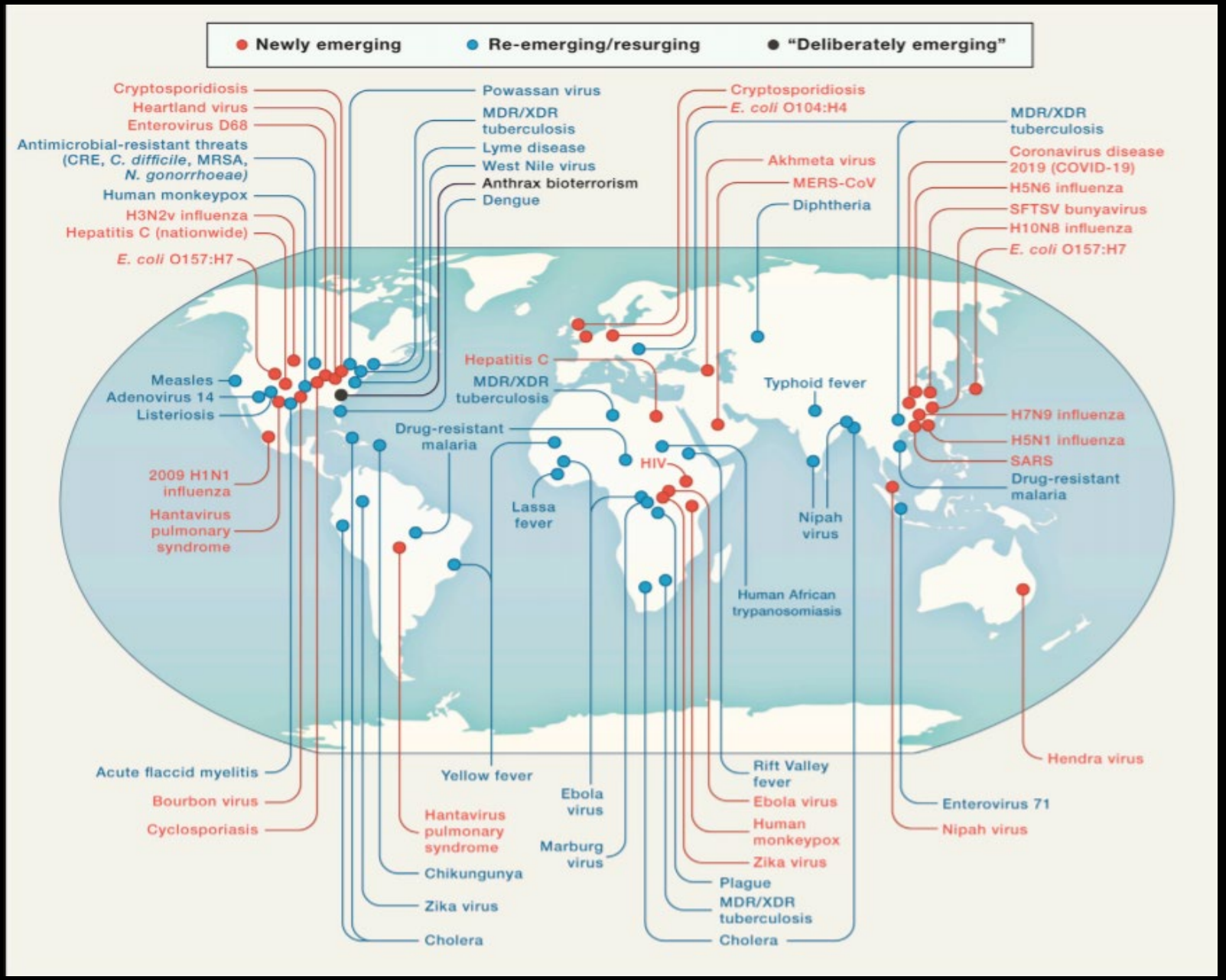
Biosecurity: A Multidimensional Challenge of Escalating Complexity and Urgency



The Evolving GLOBAL Biosecurity Landscape



Emerging Infection Diseases (1990-2020)

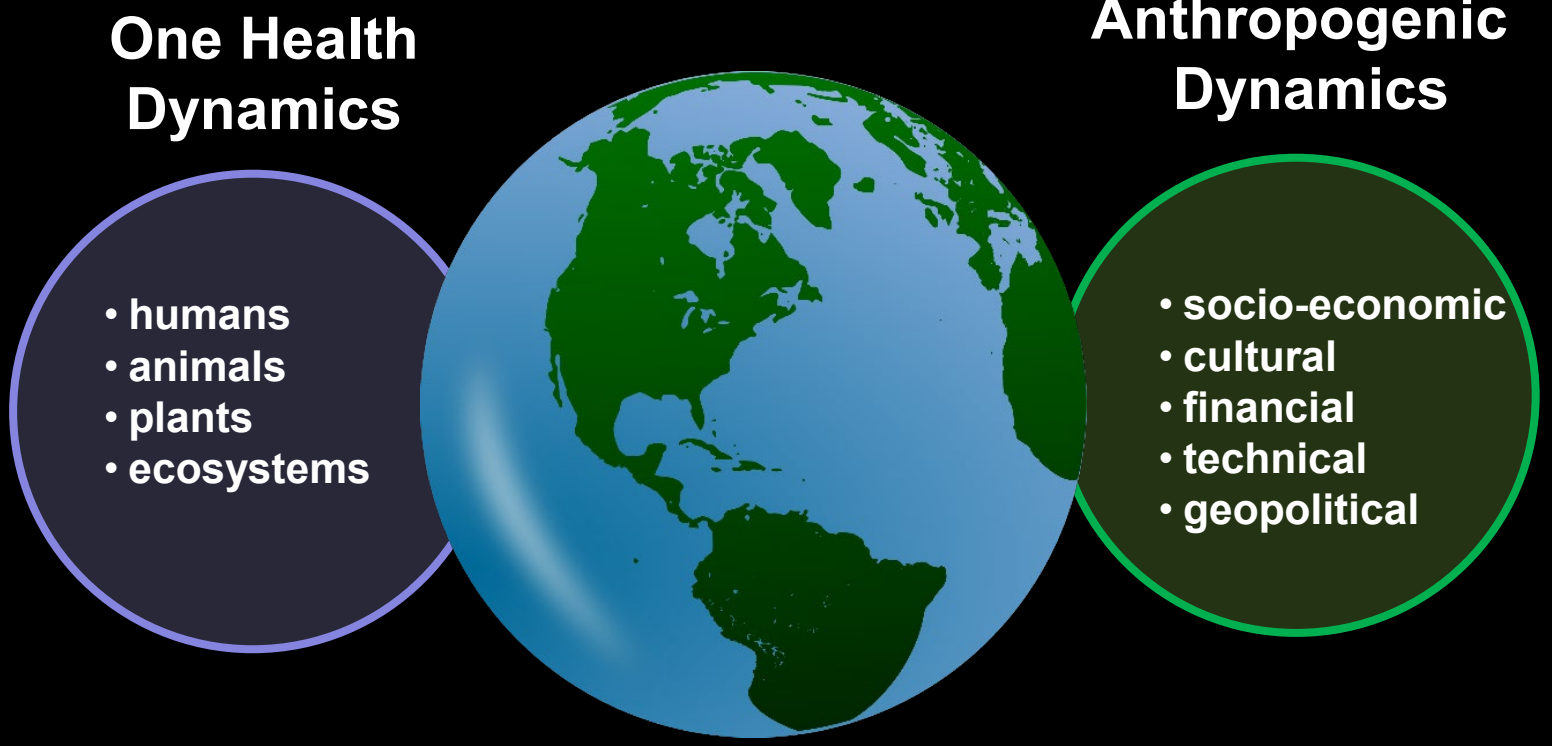


D. Morens, A. Fauci (2020), Cell 182, 1082

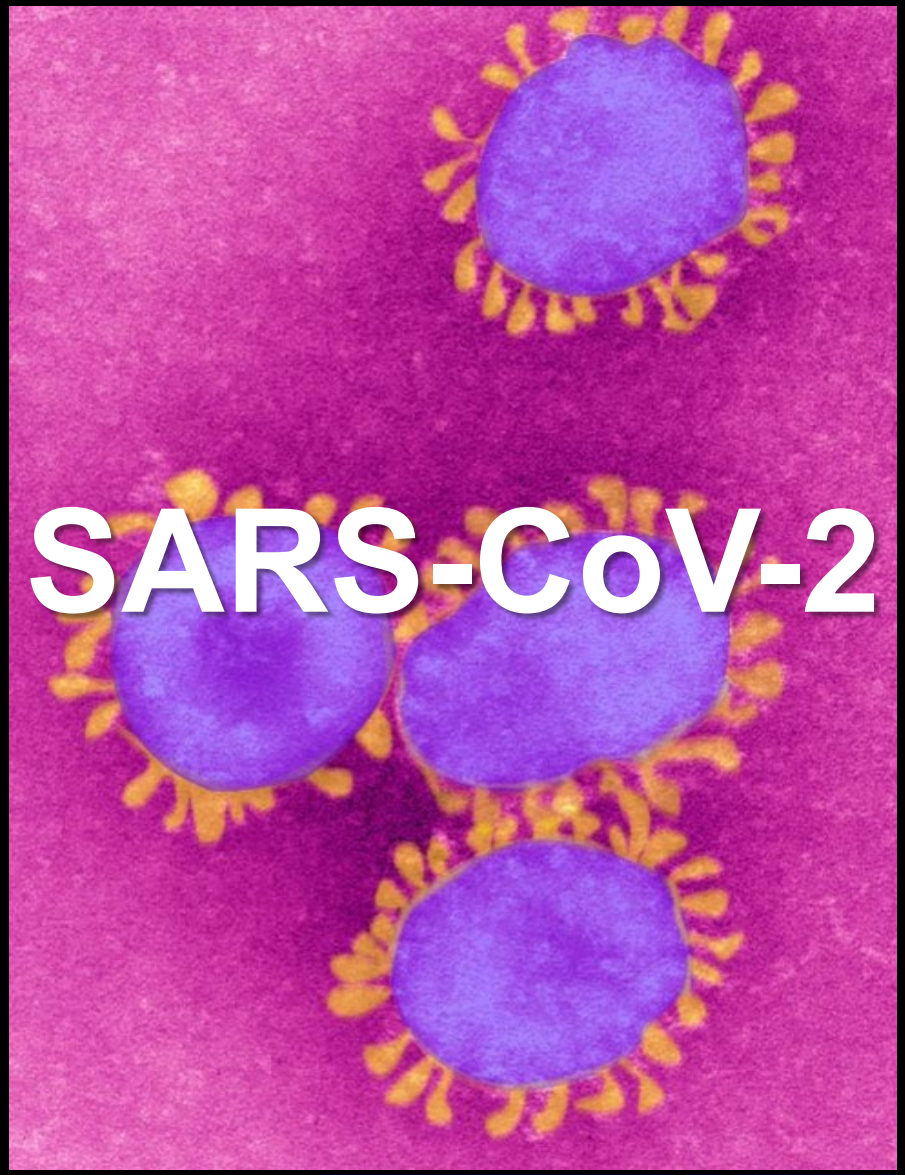
One Health

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

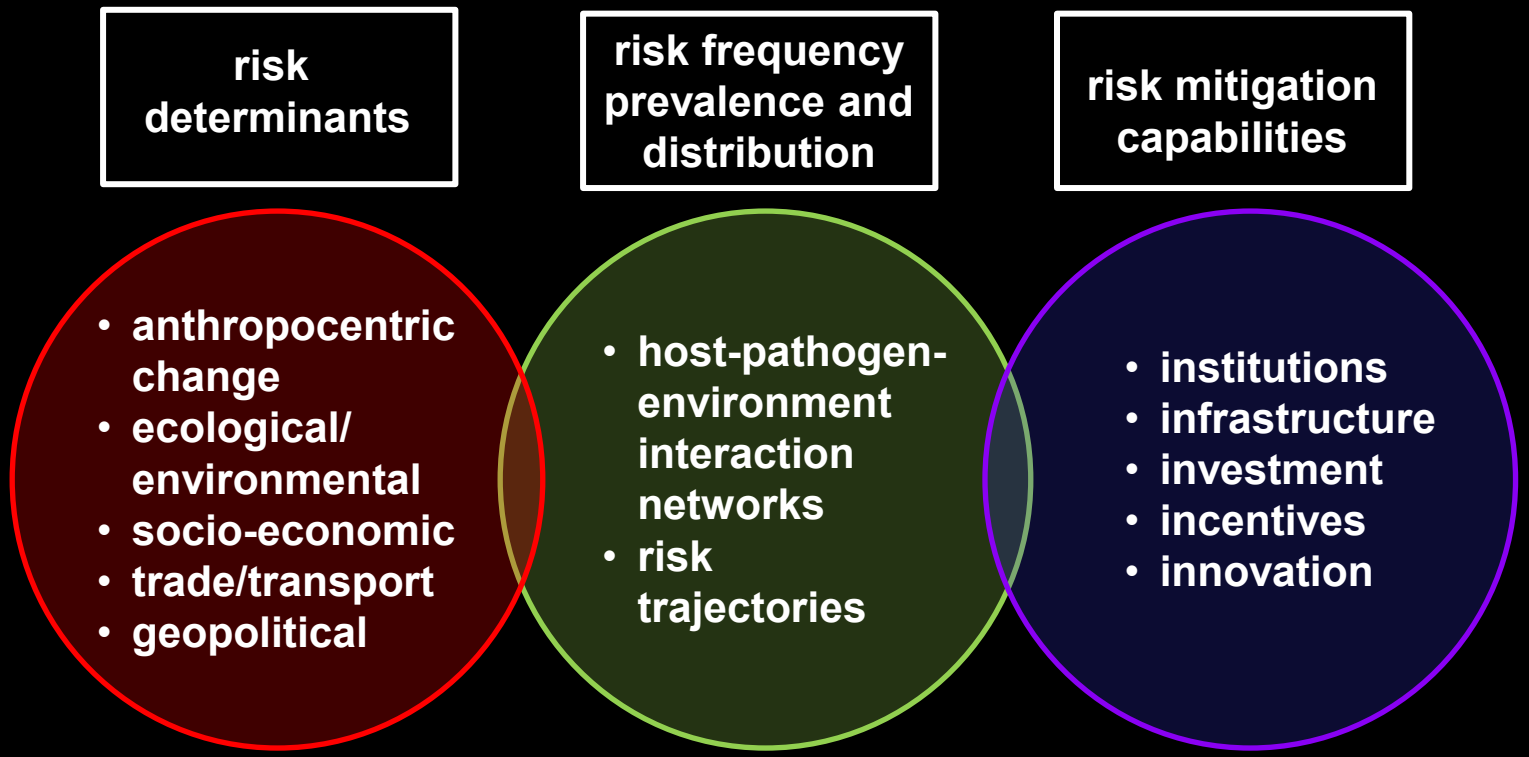
Global Biosecurity: Understanding the Interactions Between Complex Adaptive Systems and Subsystems in Diverse, Spatio-Temporal Landscapes



What's Out There?
Comprehensive Global Biosurveillance and Preparedness for Epidemic/Pandemic Threats



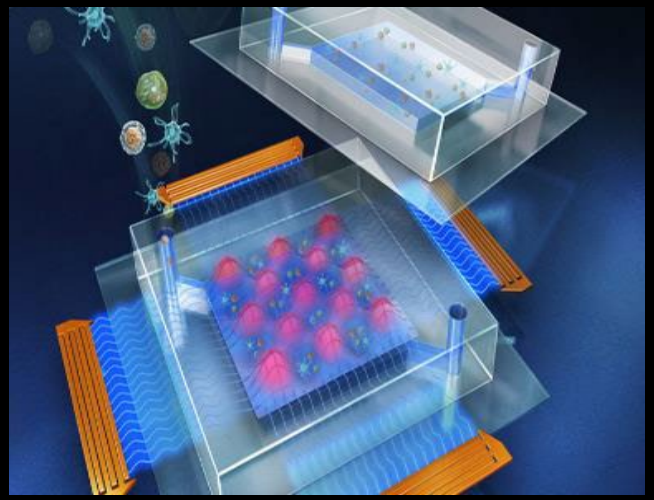
The Communicable Disease Landscape: Predictive Risk Assessment and Response



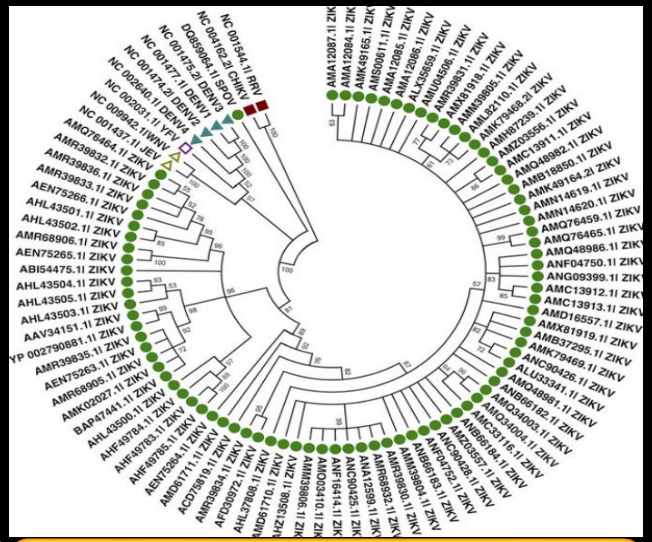
The Primacy of Diagnostics in Biosurveillance and PR3 Capabilities

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

Flying Blind!
The Dangerous Void Created by Lack of Comprehensive Diagnostic Infrastructure for Pathogen Detection

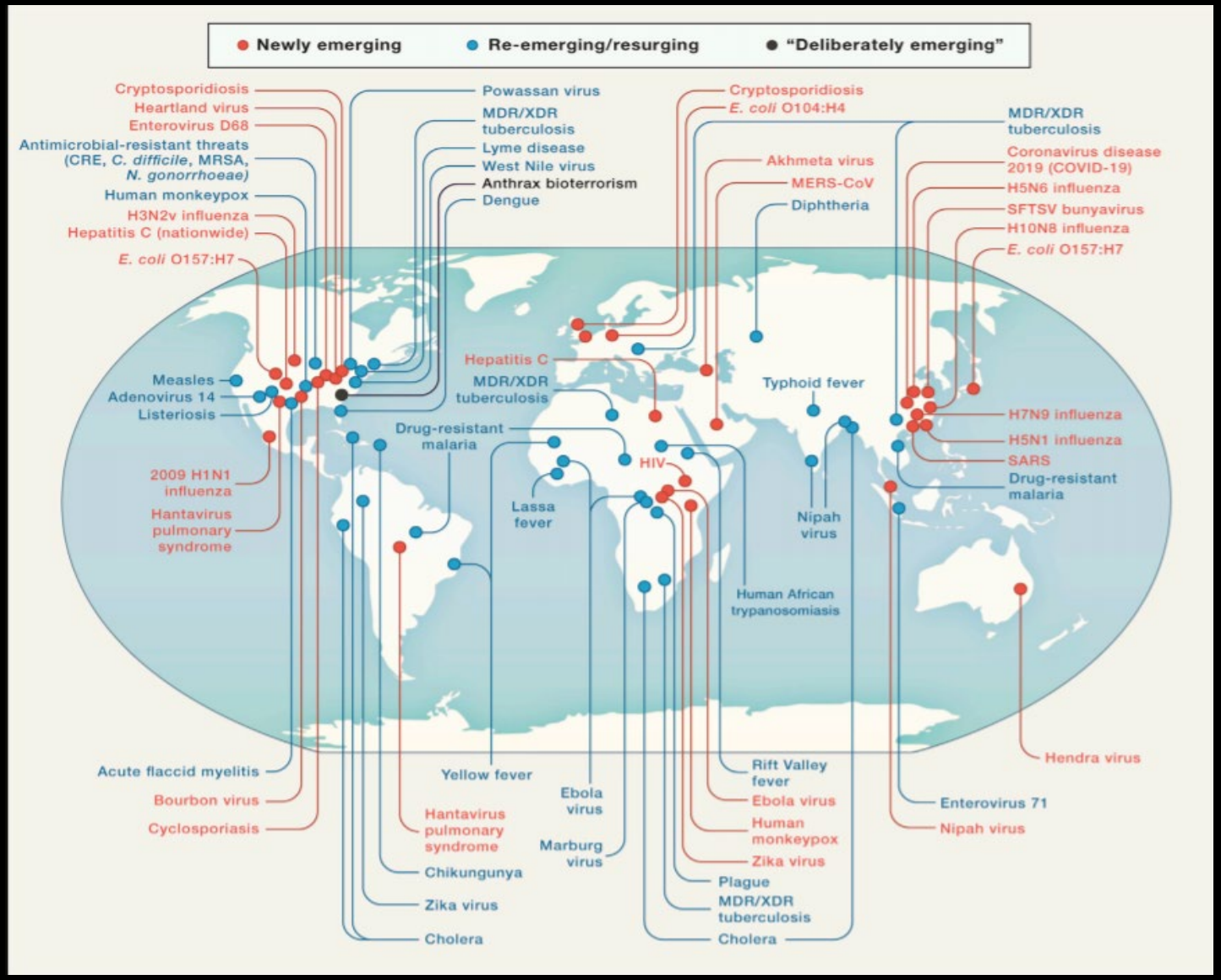
- massive gaps in real-time spatio-temporal epidemiological data in early stages of COVID-19 pandemic evolution
  - inadequate availability of diagnostic tests to map infection prevalence and distribution
  - underappreciation of major fraction of asymptomatic infections
- negative impact on accuracy of computational forecast modeling of pandemic trajectory
  - influential in national policy decisions
  - ‘lock downs’, school/work closures, travel bans, employment
  - multibillion USG emergency financing to support the economy

The Tragic Decline of a Once Great Institution: An Unenviable Record of Repeated Failure in the COVID-19 Pandemic

- Center for Disastrous Consequences
- Center for Disseminating Confusion
- Center for Disarray and Chaos

- slow mobilization at the start of the pandemic
- poor coordination with private sector for rapid scale up of diagnostic testing and surveillance
- fragmented interactions with other USG agencies and executive branches
- outdated IT systems and inability to provide decision making it real-time information
- incoherent, inconsistent, contradictory messaging and loss of public trust
- leadership gaps

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



D. Morens, A. Fauci (2020), Cell 182, 1082

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

Adapted from: R. A. Medina (2018) Nature Rev. Microbiol. 16, 61

- 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

Ecological Shifts and Cross-Species Viral Transmission Risk

- estimated 10,000 virus species have the ability to infect humans
  - only 1% of documented global mammalian virome
- vast majority circulate silently in wild mammals and birds
- changes in land use and climate change and increased opportunities for viral sharing among previously geographically isolated species
- most cross-species transmission events are dead ends
- virus-phylogenetics and host phylogeny as predictors of pathogen sharing and spillover invasion of new pathogens

Zoonotic Pathogen Spillover

- attribution of spillover to a single species as primary zoonotic source is not straightforward
  - many zoonotic pathogens infect multiple animal species
- growing evidence that multiple spillover events are needed before pathogen evolves significant replication efficiency in new species, including humans, to achieve high transmissibility
- reciprocal transmission from humans to animals (reverse zoonoses) may accelerate evolution of pathogen traits compatible with increased spillback to humans

RNA Viruses as Major EID Threats

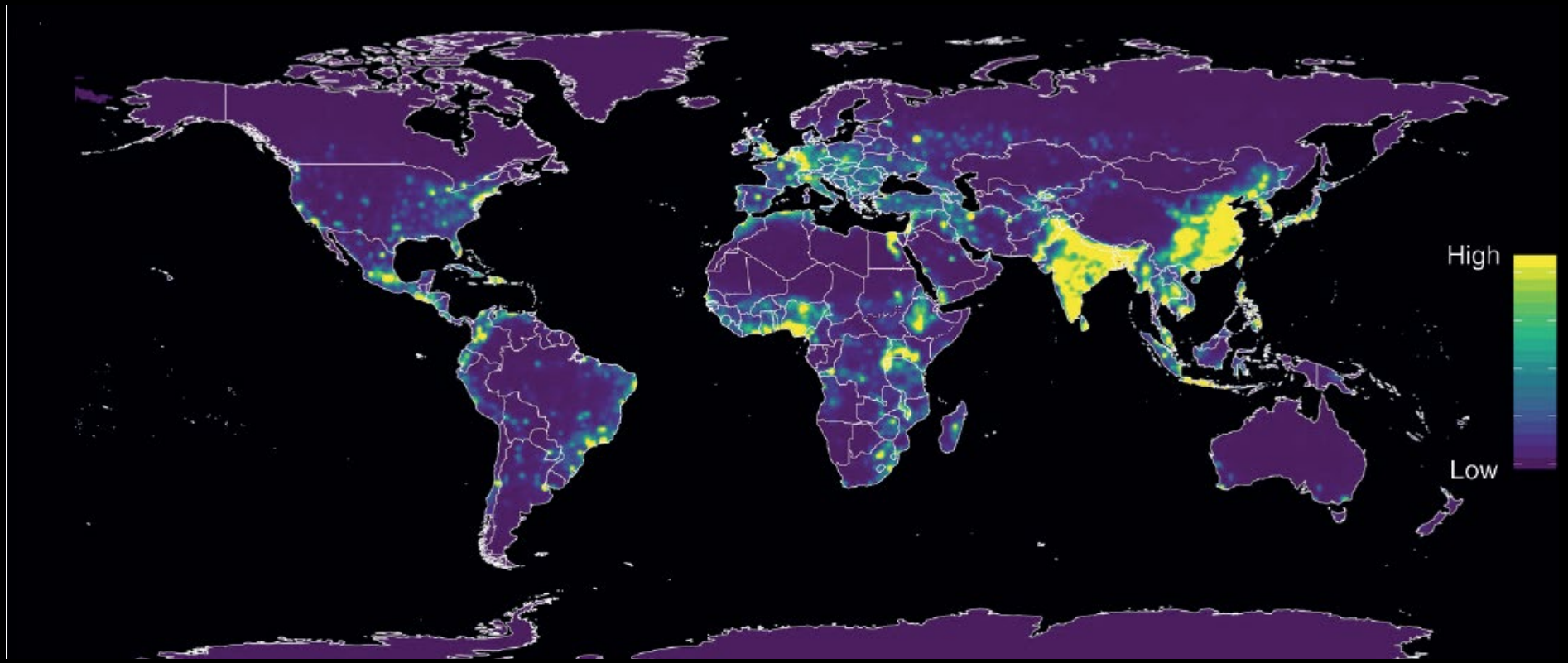
- 45-50% of EIDs
- error-prone replication cycles and rapid mutation
- faster evolutionary rates and emergence of variants
  - higher risk of ‘species-jump’
  - immune evasion
  - altered tissue tropism
- genetic reassortment between avian, mammalian and human viruses

Five Virus Families Prioritized for Biosurveillance and Pathogen-Agnostic Diagnostics and Therapeutics

- Coronaviridae
  - encephalitides
  - dengue, Zika, West Nile, Japanese encephalitis
- Orthomyxoviridae
  - influenza and genetic reassortment combinations
- Paramyxoviridae
  - measles, mumps
  - henipaviruses
    - Hendra, Nipah, Langya
- Togaviridae (alphaviruses)
  - Chikungunya, Ross River fever, Eastern-, Western-, and Venezuelan equine encephalitides
- Arenaviridae – VHFs
  - Rift Valley fever, Crimean-Congo hemorrhagic fever, Hantaviruses, Lassa
- Filoviridae
  - Ebola, Marburg, Mengla

Global Hotspot Map of Projected Wildlife Zoonotic EID Risk Emergence

T. Allen et. al. (2017) Nature Comm. 8, 017-00923-8



- tropical forested regions
- mammalian species richness
- high human population density and rapid urbanization
- altered land use and increased wildlife and domesticated livestock-human encounters

Biosurveillance Sentinel Networks for Zoonotic EID Threat Awareness and Early Containment

- sampling reservoir species/vectors in geographic 'hot spots'
- wastewater/food chain sampling
- monitoring populations at higher risk
  - agricultural workers at the human-animal nexus
  - clinical laboratory personnel
  - first responder/ER personnel, LTCF/nursing homes/ prisons
  - refugee migration centers

Proactive Large Scale Biosurveillance (BSV) for EID Pathogen Prevalence and Spillover Risk

- obvious logic but financial, technical, logistical and political barriers to implementation at scale
- many predicted zoonotic spillover 'hot spots' are located in LICs
  - limited technical infrastructure/workforce
  - access to remote locations and conflict zones
  - political fragility and varied levels of government cooperation from governments/local populations
  - local concern over potential adverse economic input if viewed as a 'hot spot' (trade, tourism)

East African's Community Mobile Network Negative Pressure Glovebox Workstations for Rapid Response to Ebola Sudan Virus (SVD) in Uganda (9/22)

- reduced diagnostic TT to 7.8hrs
- faster Dx for improved case management
- accelerated quarantine to block transmission

F. Gehre et. al. (2022) BMJ Global Health 7, e.011073

Bushmeat Food Chains

Wildlife Markets and Transmission of Zoonotic

Urbanization and Mega-Cities in LMICs

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

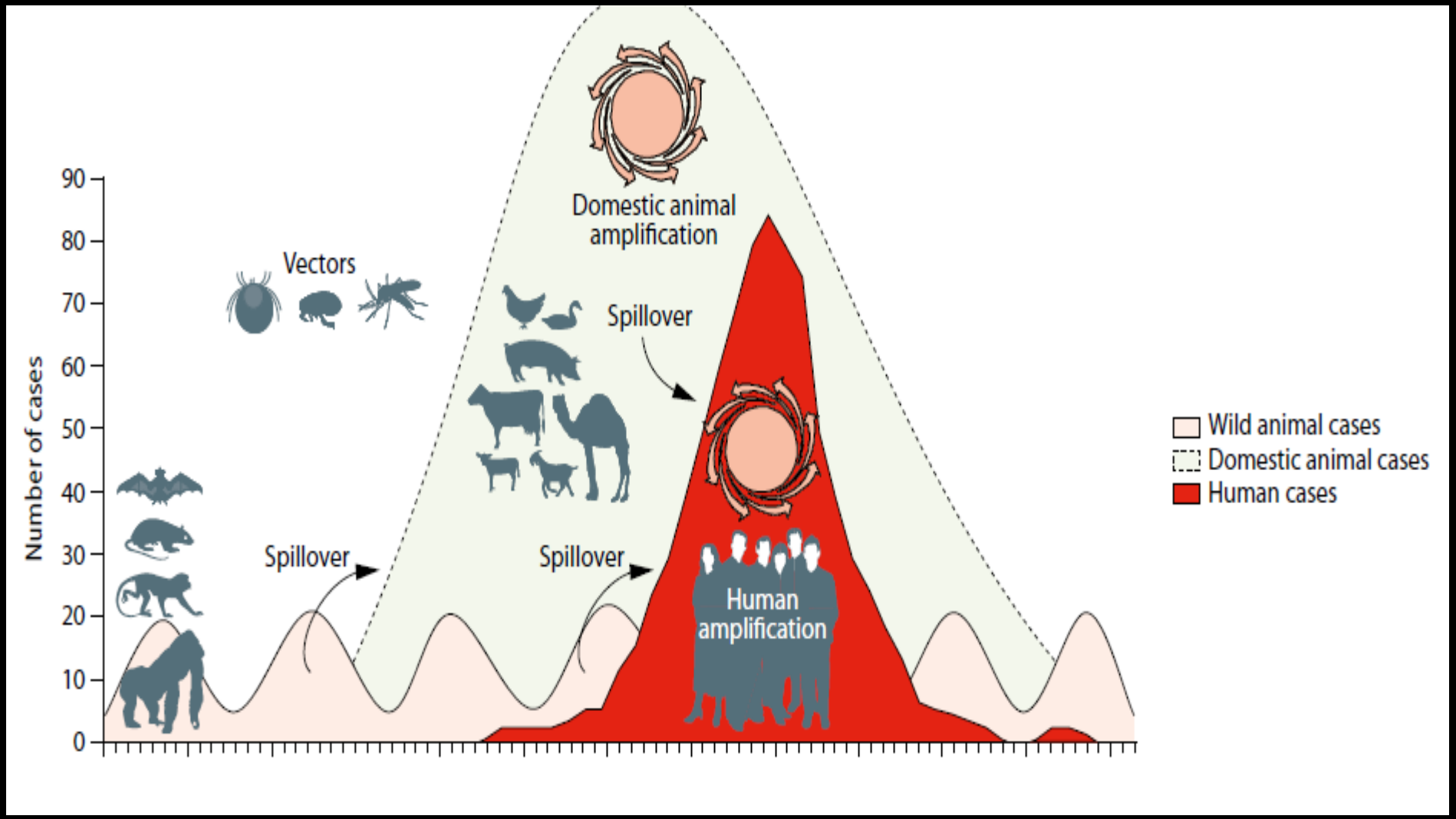
Major Gaps in Health Infrastructure and Rapid Disease Reporting

Changing Food Production Systems and 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 smallholder to large periurban production units
  - changing land use and expansion of encounters with zoonotic EID reservoir hosts

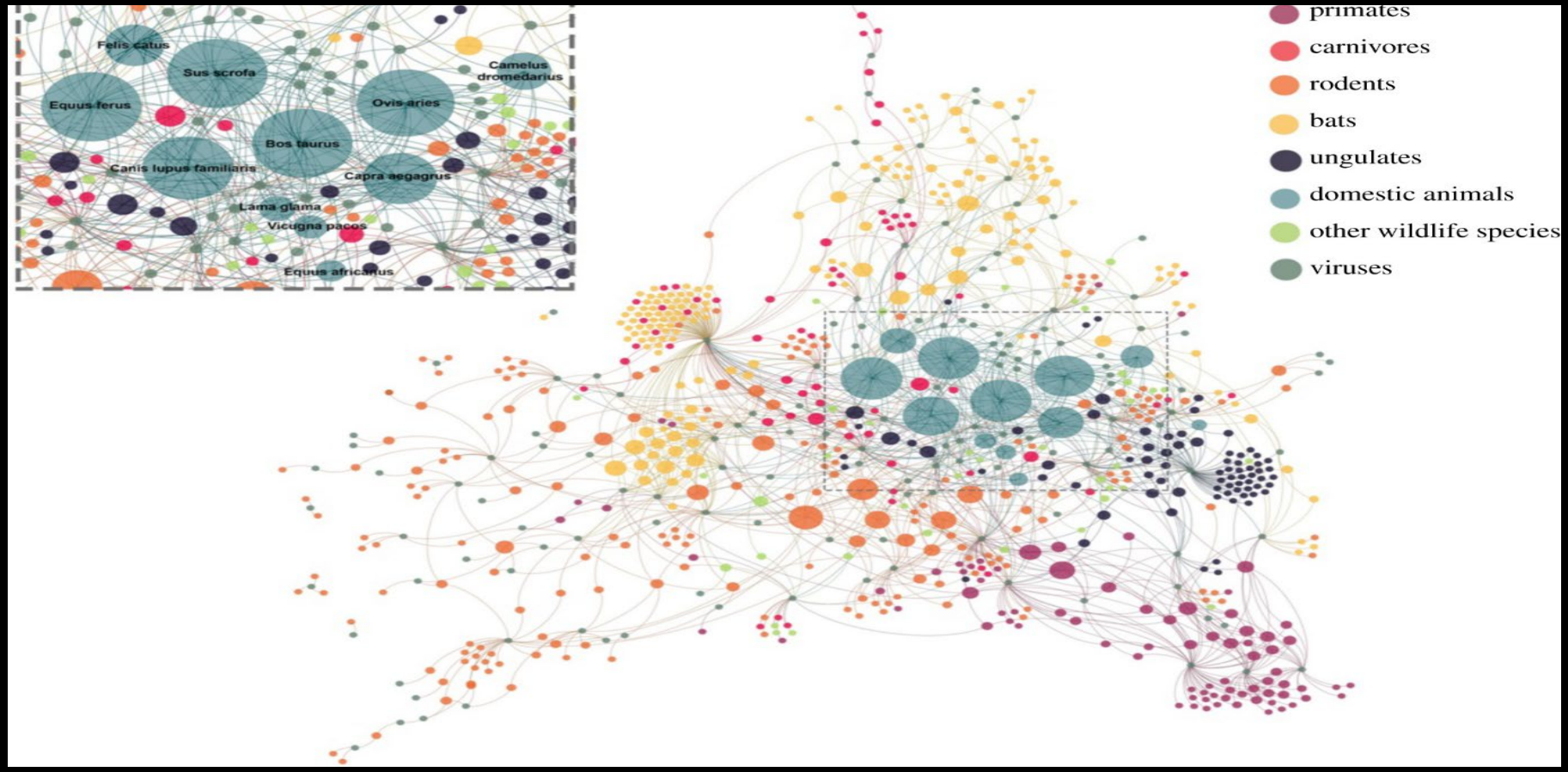
Concentrated Animal Feeding Operations (CAFO)

Dynamics of Cross-Species Zoonotic Pathogen Risk Spillover



W. Karesh et. al. (2012) Lancet 380, 1942

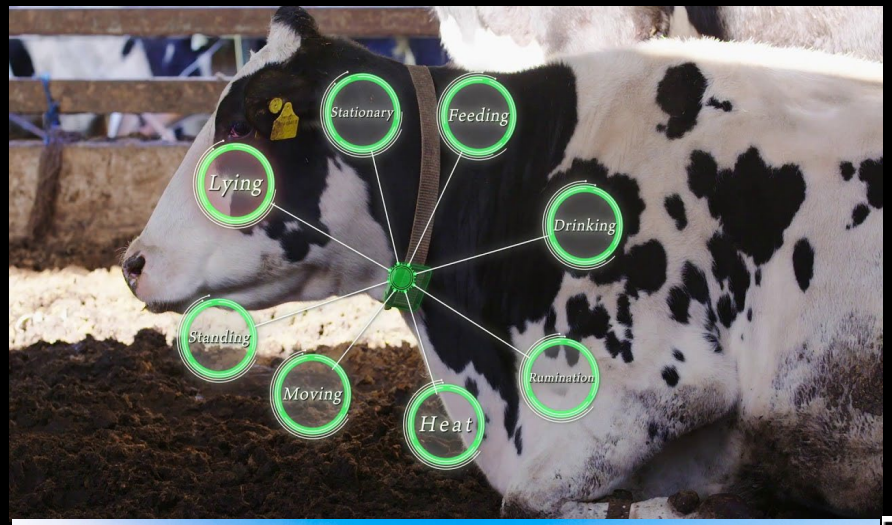
Network Of Zoonotic Virus Associations in Wild and Domesticated Mammals

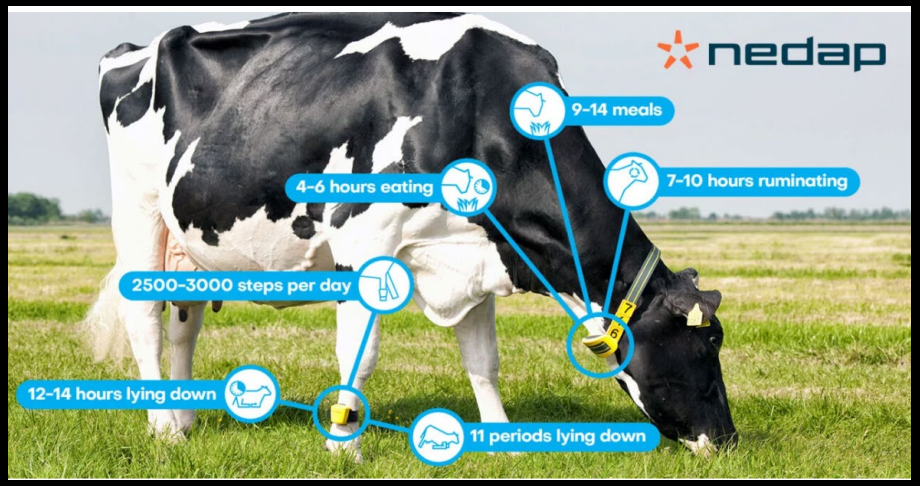


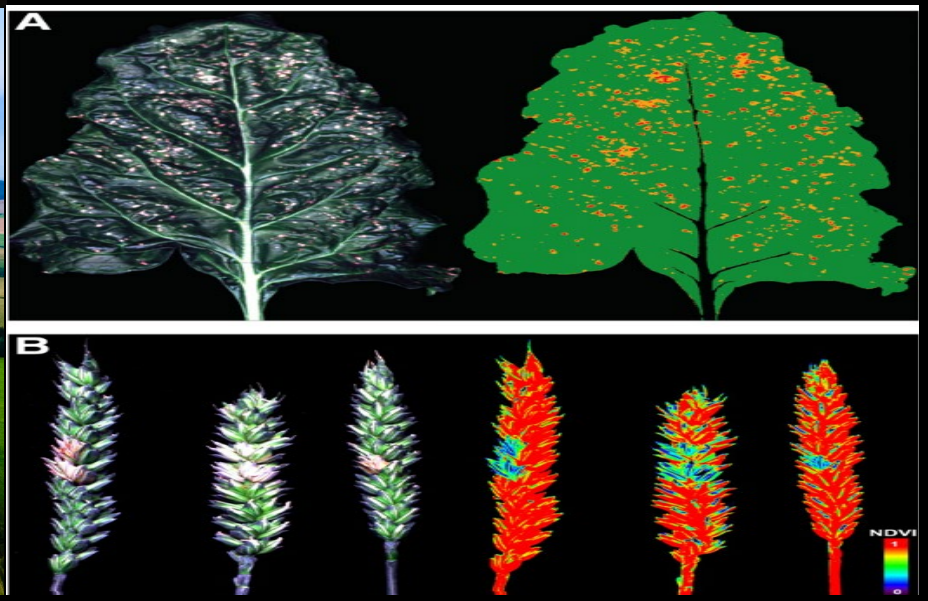
adapted from: C.K. Johnson et. al. (2020) Proc. Roy. Soc. B287.20192736

- domesticated animals are the most central species in shared viral networks between domestic and wildlife species
- domesticated livestock host 50% of known zoonotic viral threats
  - 12 species with average 19 viral species/host

Rapid Growth of Markets for Remote Health Monitoring Systems for Livestock and Crops (DigitalAg)







Antimicrobial Resistance (AMR)

Lacks the Drama of a Pandemic But Inexorable Rise as Major Cause of Mortality, Morbidity and Cost of Care

Lack of New Antimicrobials

Fast Track Action Committee Report: Recommendations on the Select Agent Regulations Based on Broad Stakeholder Engagement

October 2015

National Science and Technology Council
Committee on Homeland and National Security
Subcommittee on Biological Defense Research and Development
Fast Track Action Committee on the Select Agents Regulations

Addressing Antibiotic Resistance

A REPORT FROM THE JOINT APLU | AAVMC TASK FORCE ON ANTIBIOTIC RESISTANCE IN PRODUCTION AGRICULTURE

Association of Public and Land-grant Universities
AAVMC Association of American Veterinary Medical Colleges

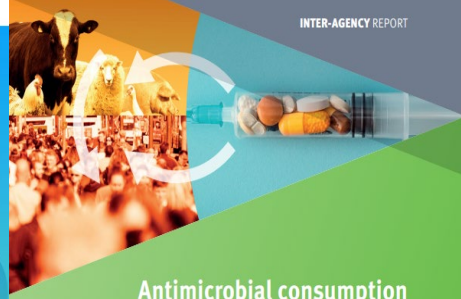
NATIONAL QUALITY FORUM

National Quality Partners Playbook™:

ANTIBIOTIC STEWARDSHIP IN POST-ACUTE AND LONG-TERM CARE

ecdc efsa European Food Safety Authority European Medicines Agency

INTER-AGENCY REPORT



Antimicrobial consumption and resistance in bacteria from humans and animals

Third joint inter-agency report on integrated analysis of antimicrobial agent consumption and occurrence of antimicrobial resistance in bacteria from humans and food-producing animals in the EU/EEA

JIACRA III
2016–2018

ANTIBACTERIAL AGENTS IN CLINICAL DEVELOPMENT

An analysis of the antibacterial clinical development pipeline, including tuberculosis

World Health Organization

ReAct

Dag Hammarskjöld Foundation

development dialogue paper
no.26 | december 2018

Antimicrobial resistance and sustainable development:

A planetary threat but a financing orphan

Planet Earth faces the very real threat of having to survive and thrive in a 'post-antibiotic' era in which there are few, if any, antibiotics which effectively and affordably cure infections. A world without antibiotics would necessitate radical changes in health care and farming. Despite the severity of this threat, many low- and middle-income countries struggle to identify resources for even basic activities related to antimicrobial resistance (AMR).

In this context, the Dag Hammarskjöld Foundation and ReAct - Action on Antibiotic Resistance hosted a meeting to discuss how AMR could become more visible and how more funds to tackle AMR could be mobilised.

WHO GUIDELINES ON USE OF MEDICALLY IMPORTANT ANTIMICROBIALS IN FOOD-PRODUCING ANIMALS

World Health Organization

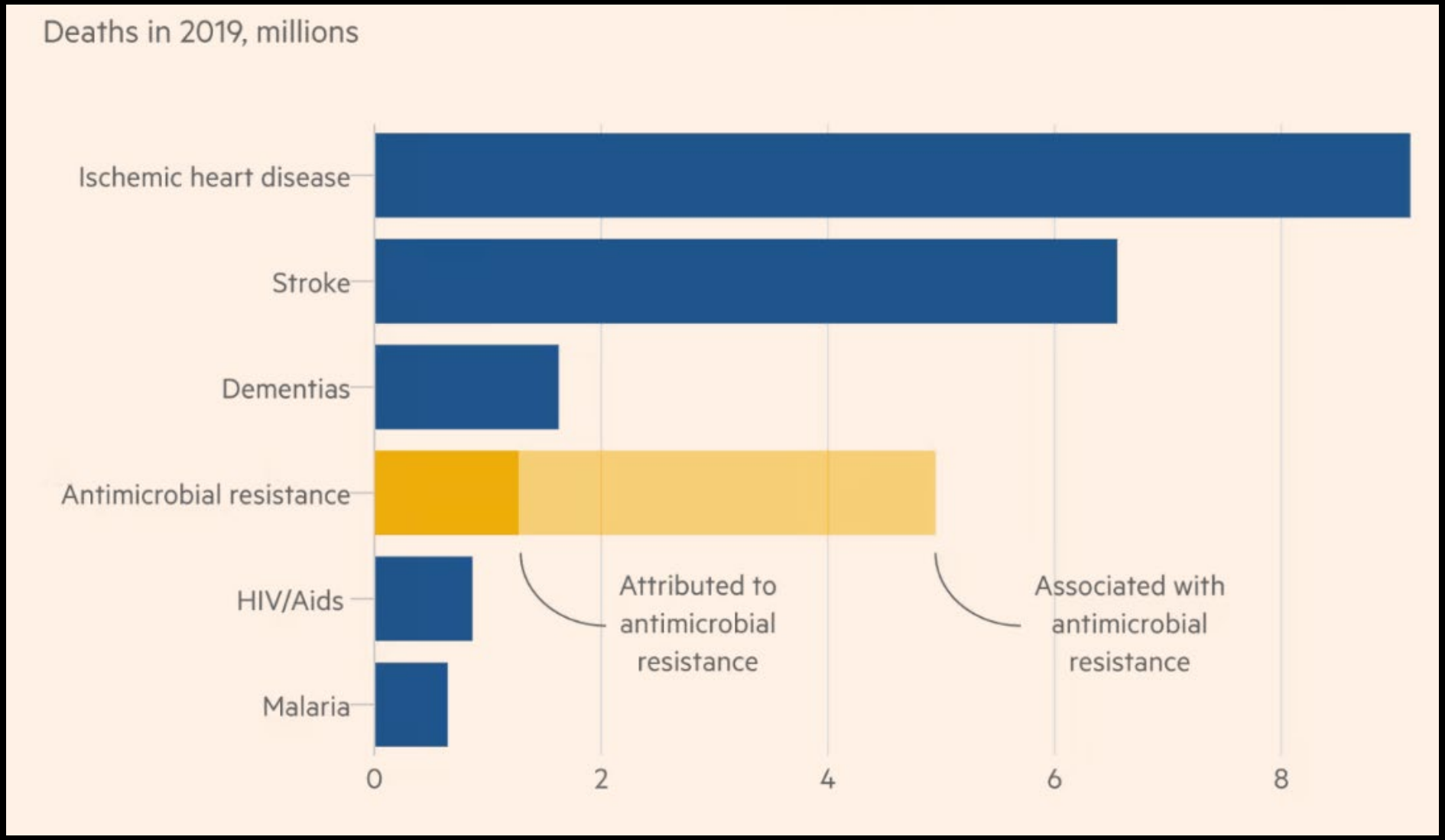
Review on Antimicrobial Resistance
Tackling drug-resistant infections globally

TACKLING DRUG-RESISTANT INFECTIONS GLOBALLY:
FINAL REPORT AND RECOMMENDATIONS

THE REVIEW ON ANTIMICROBIAL RESISTANCE
CHAIRED BY JIM O'NEILL

MAY 2016

Antimicrobial Resistance is Linked to More Deaths Than HIV and Malaria



Source: Global Burden of Disease Collaborative Network https://www.ft.com/content/accf1951-48db-40f8-910f-16f66ff5531d

‘The Wrong Pocket Problem’: Conflicting Priorities Between Veterinary and Public Health

- **livestock infections with serious human impact but no direct animal health benefits for testing**
  - ***E.Coli* 0175**

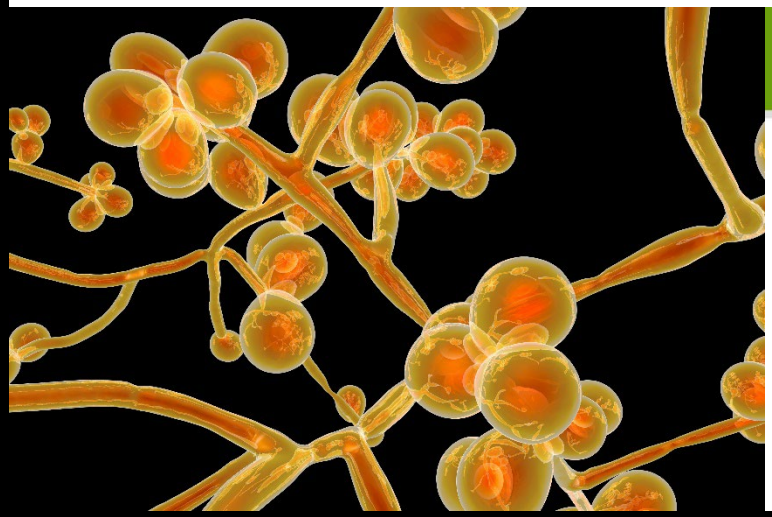
Agricultural Use of Azole Anti-Fungal Sprays and Emergence of Resistant Fungal Infections

Medical News & Perspectives

On the Rise, *Candida auris* Outwits Treatments and Travels Incognito in Health Care Settings

JAMA (2023) 329, 3; 197-199 doi:10.1001/jama.2022.17760

Rita Rubin, MA



Surfaces close to patients with *Candida auris* commonly recontaminated within 4 hours post-cleaning included:

24%	24%	19%
overbed tables	bed handrails	remotes/ call buttons

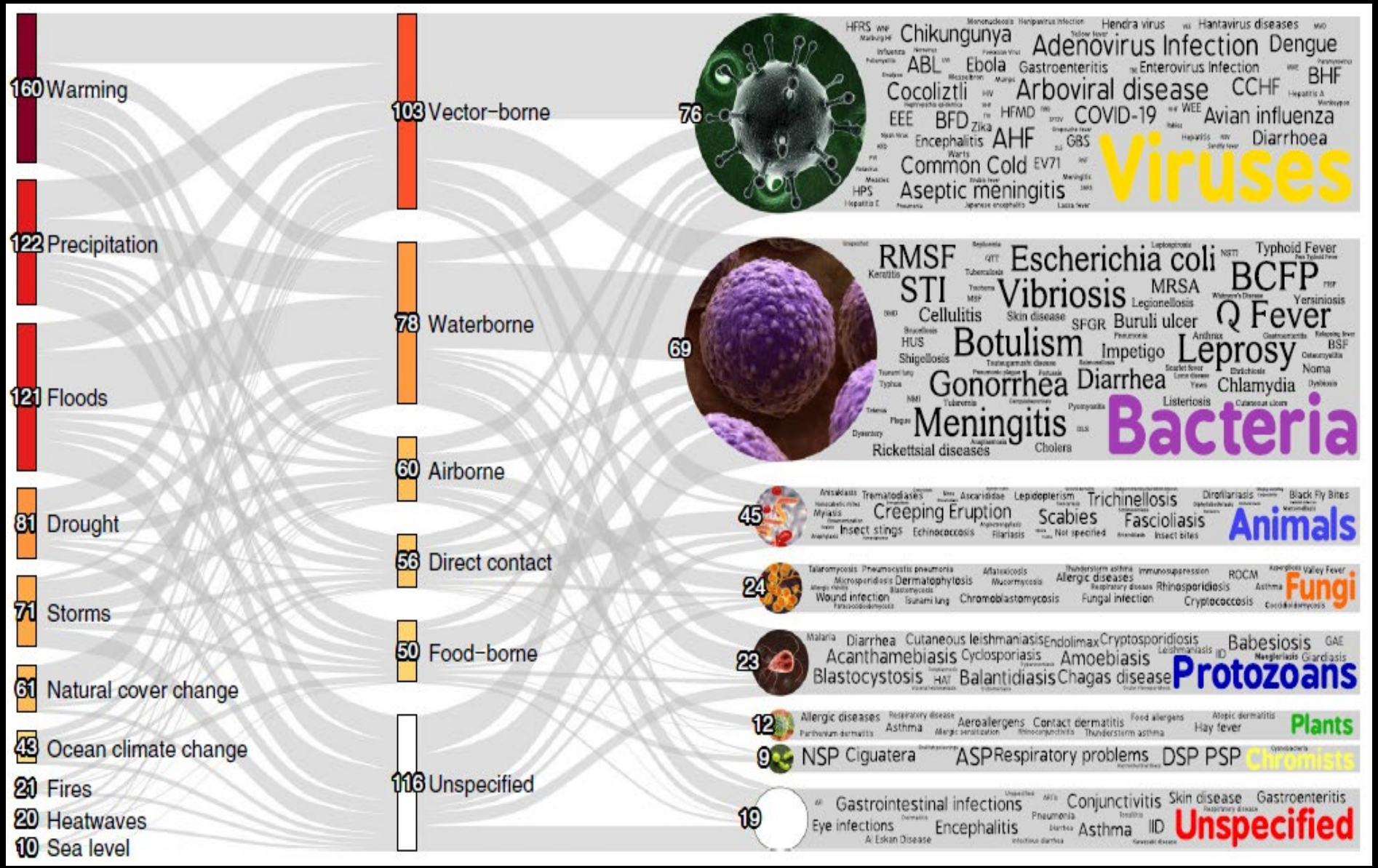
Healio

Climate Change and Health Risks

Climate Shifts and New Pathogen-Host Interactions

- warming, precipitation changes and expanded vector 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

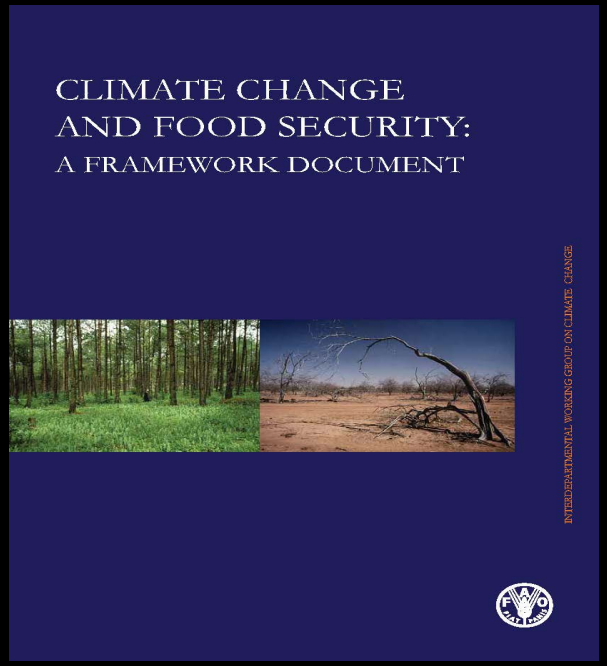
Over Half of Known Human Pathogenic Diseases Can Be Aggravated By Climate Change

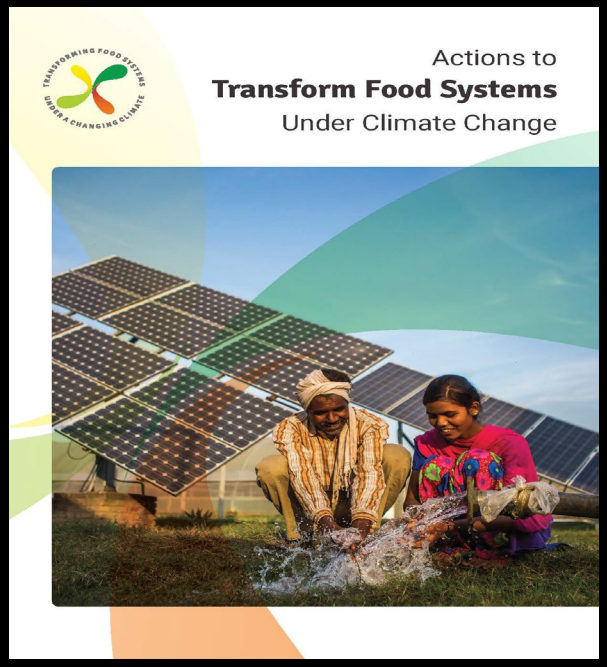


C. Mora et. Al. (2022) Nature Clim. Chan. 12, 869

Increased Ocean Temperatures and Algae Blooms: Proliferation of Virulent Microorganisms and Microbial Toxins

Climate Change and Growing Challenges of Global Food Security





Economic & Health Risks from Extreme Weather Events: Drought

Rhine River, Germany

Mississippi River, USA

Lake Mead, USA

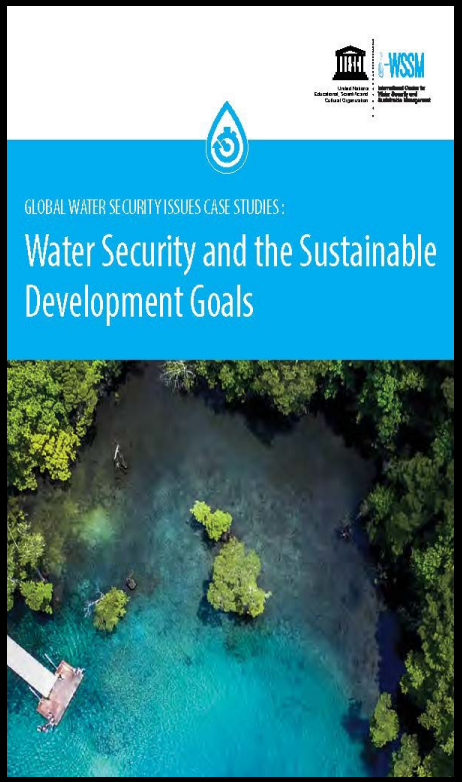
Gode, Ethopia

South Sudan

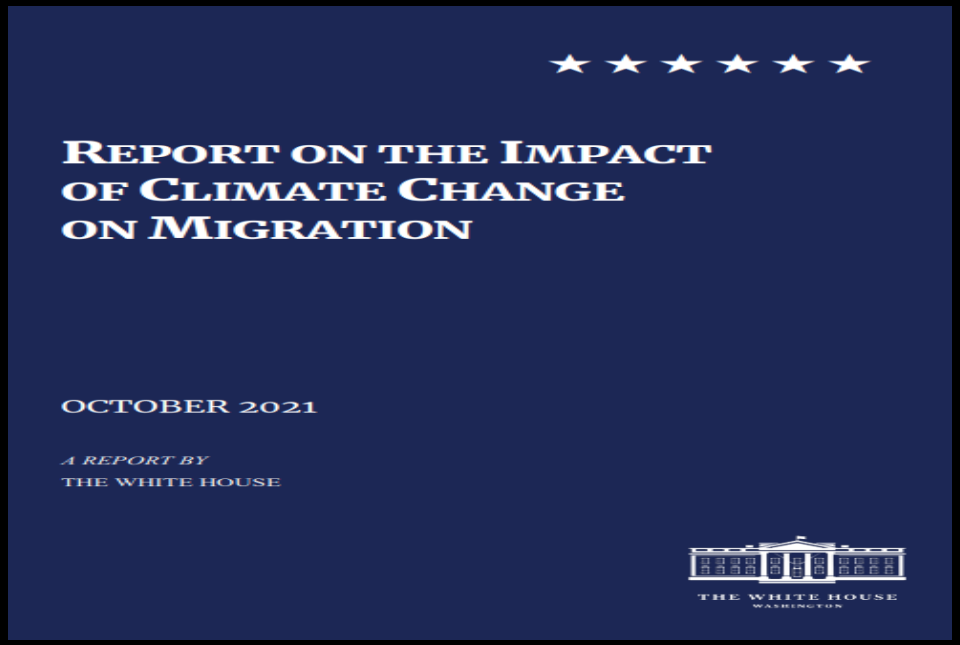
Somalia

Economic & Health Risks from Extreme Weather Events: Flooding and Sewage Contamination

Water Security

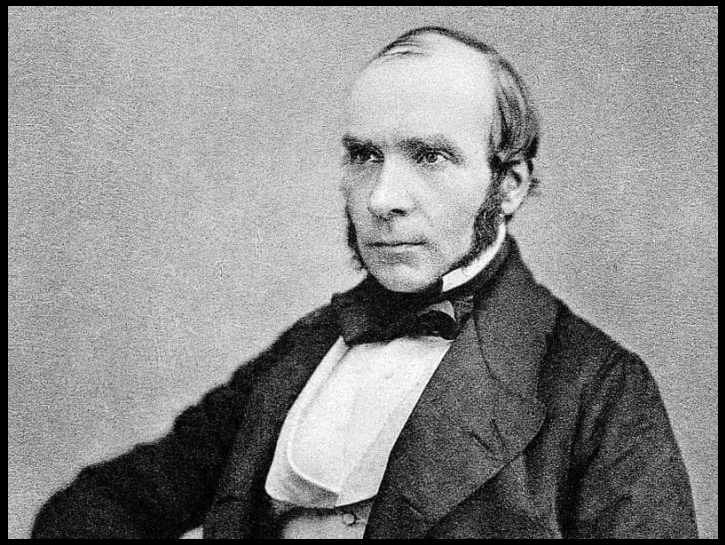


Humanitarian Disasters:
Refugee Migration Caused by Environmental Events and/or Conflict
Increased Spread of Infectious Diseases

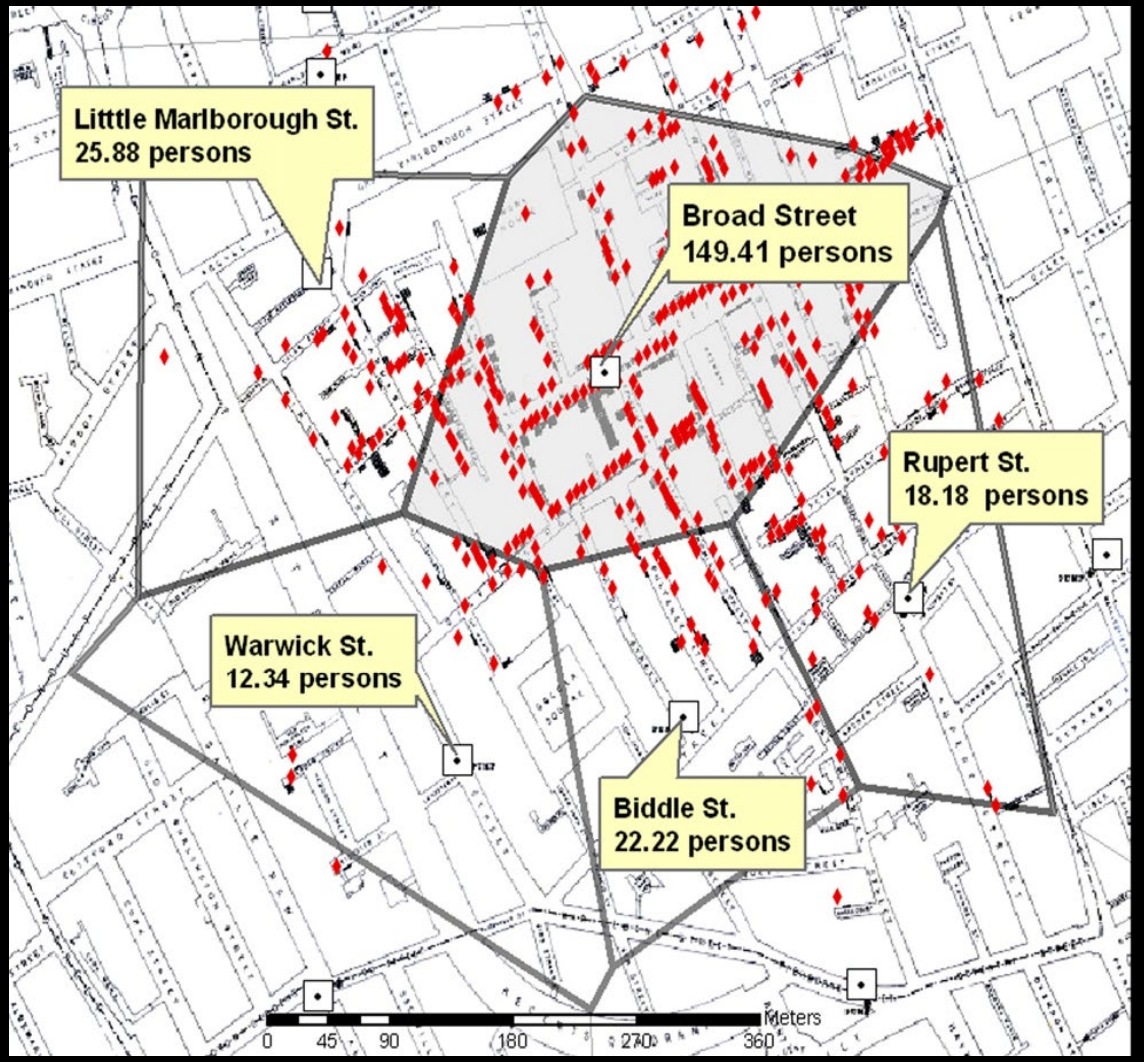


Data: The Foundation of Epidemiology and Informed Decisions

Dr. John Snow, 1855



- cholera deaths per 1,000 population



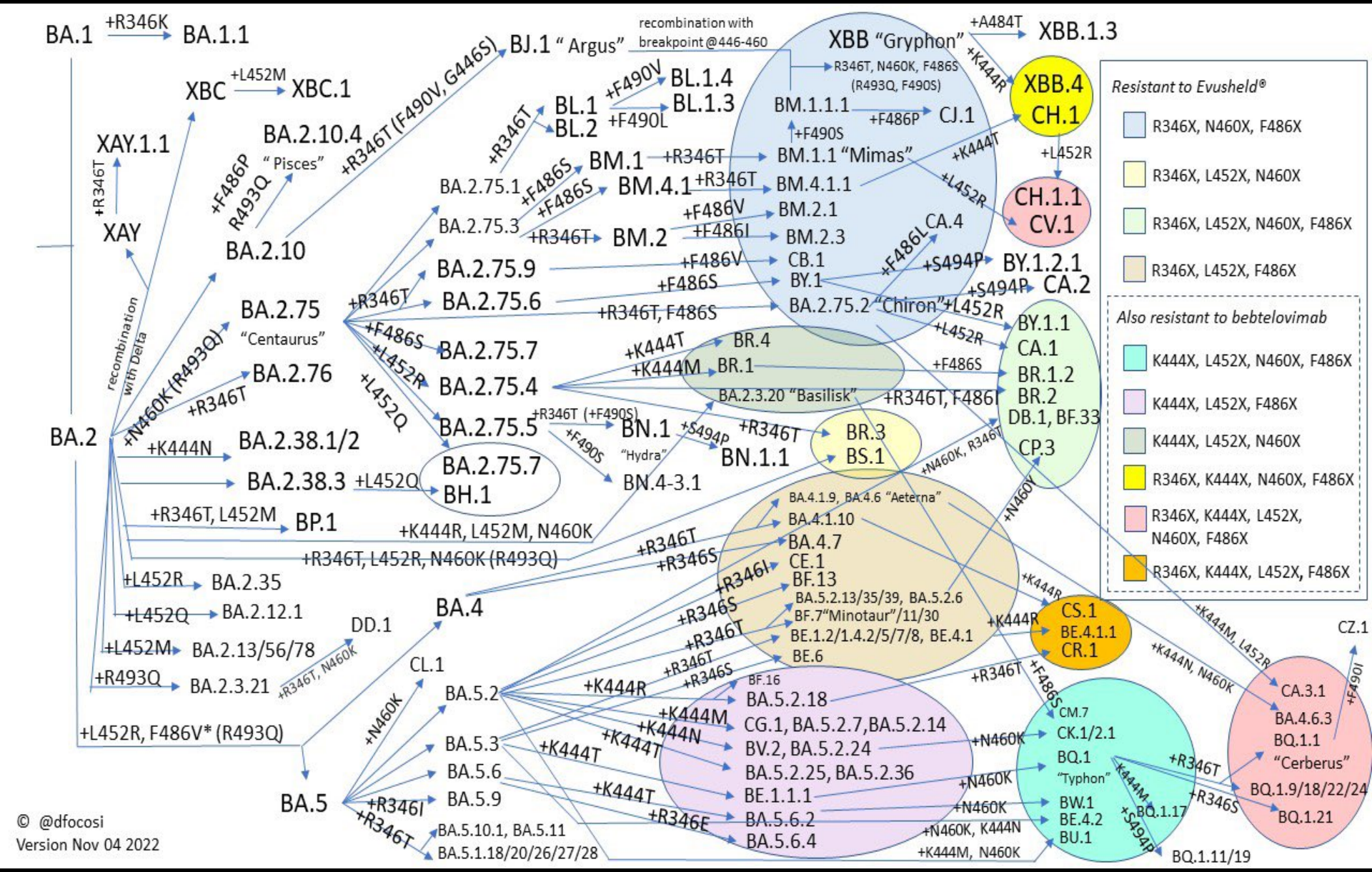
US Public Health System

- COVID-19 demonstrated the critical importance of accurate, rapid and transparent communication (messaging) in sustaining public and political trust
  - major lags due to lack of real-time data to guide optimum decisions at multiple levels (White House to your house)
  - slow response to counter inaccurate information on social media and adversarial disinformation campaigns (the infodemic)
- growing political interference in messaging

The US Public Health System: A Data Backwater

- massive gaps in timely data capture, analysis and sharing during COVID -19 pandemic
- widespread dependence on paper documentation/FAX transmission
- over one-third of local health departments cannot access electronic data from local emergency departments
- fragmented and tardy capture and limited inter-operability of data feeds at Federal level
- a classic case study in the consequences of underinvestment in laboratory infrastructure, IT capabilities and workforce staffing/skills for robust PR3

SARS-CoV-2 Phylogenomic Mapping :
Omicron XBB.1.5: Convergent Evolution and Recombination



Version Nov 04 2022

SARS-CoV-2 Viral Genome Sequencing (VGS) and Monitoring of New Variants of Concern (VOCs)

- deposition of VGS into GISAID has dropped 90% since start of 2022
- public complacency and less political pressure in belief that illness is milder and pandemic peak has been reached (except PRC)
- classification of VOCs requires accurate parallel data on disease severity (hospitalization, deaths) and vaccine/Rx resistance

Center for Forecasting and Outbreak Analytics (CFA)

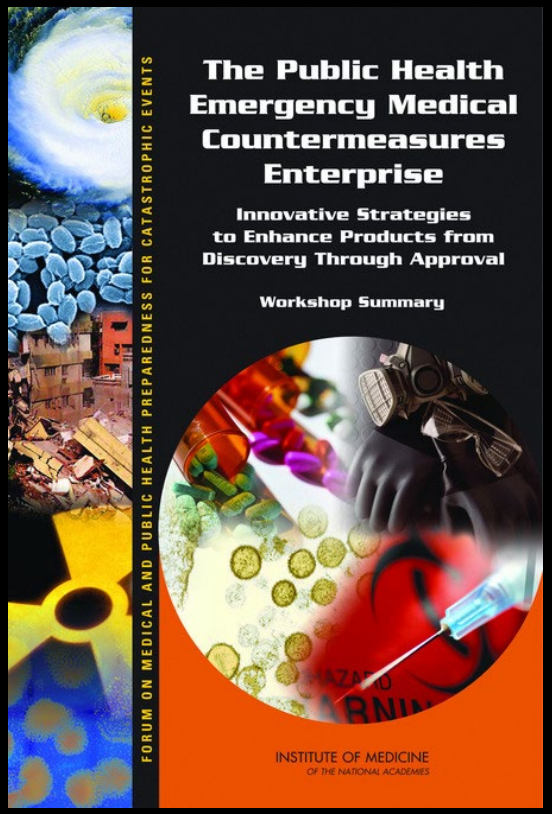
- established August 2021
  - $200 million from American Rescue Plan
- establish network of innovation hubs among state and local jurisdictions
- $21 million invested in academic institutions to advance workforce development and health equity

Center for Forecasting and Outbreak Analytics (CFA)

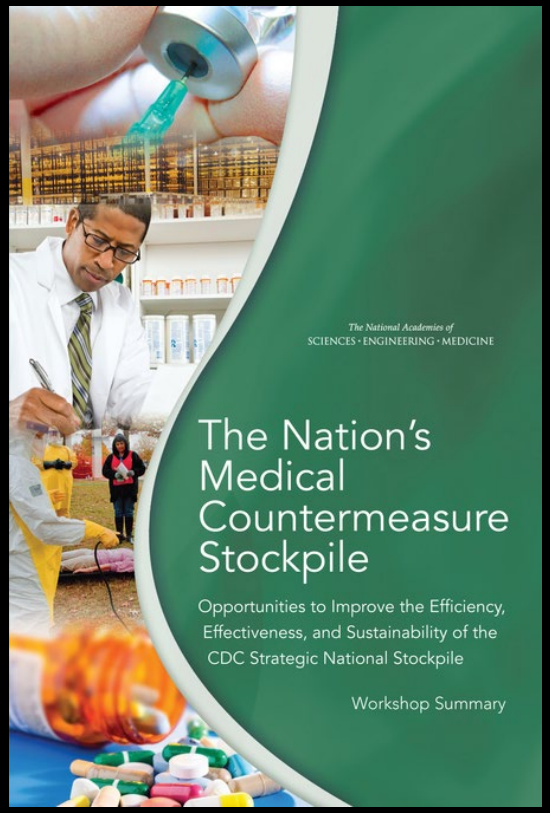
- established August 2021
  - $200 million from American Rescue Plan
- establish network of innovation hubs among state and local jurisdictions
- $21 million invested in academic institutions to advance workforce development and health equity

- without parallel investment to acquire real-time data this resource will be useless from the outset
- continued siloed-thinking versus implementation of an integrated systems-based data network

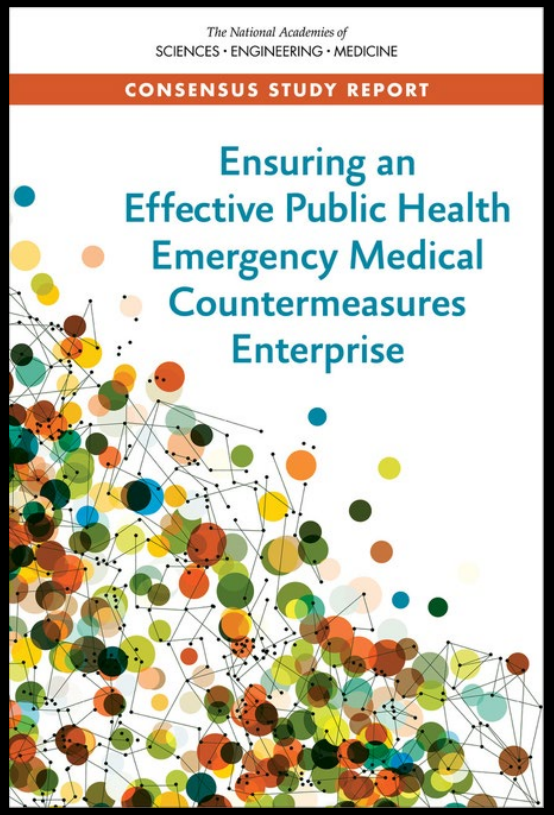
Emergency Medical Countermeasures: Warnings Long Ignored



(2010)



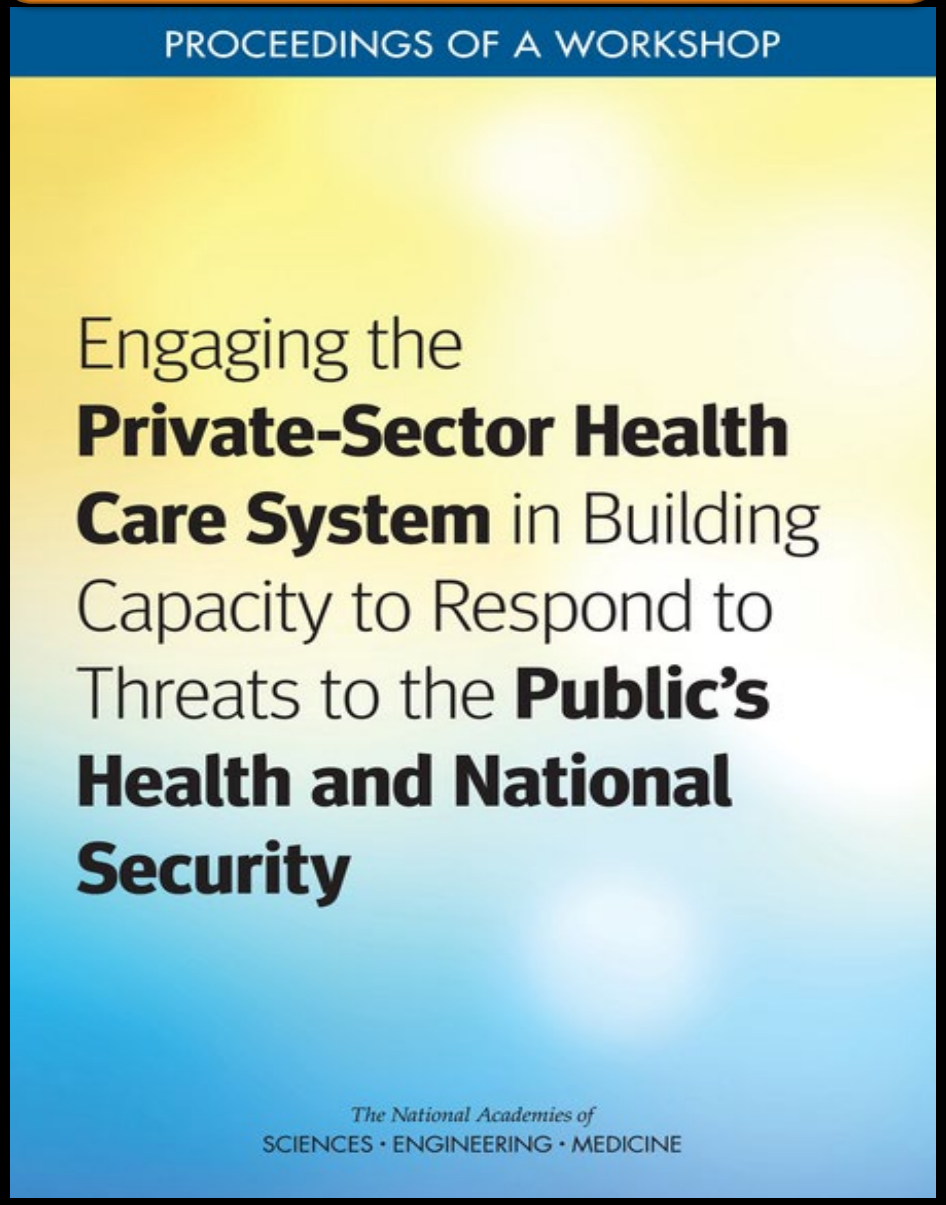
(2016)



(2021)

Who Pays for Preparedness?

The Obligate Role of Private-Public Partnerships in Biosecurity Policy



Building a National and Global Infectious Disease Diagnostics Infrastructure

- rapid surge capabilities for large scale testing
- proactive engagement of private sector R&D for manufacturing scale
- 'de-risk' corporate investment by USG- "advance contracts' for products/services with no current conventional markets
  - lease of reserve capacity in manufacturing facilities (rapid warm-to-hot mobilization)
- rapid sharing of clinical samples with private sector test developers
- standardize regulatory requirements

Neglect of Proactive Development 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

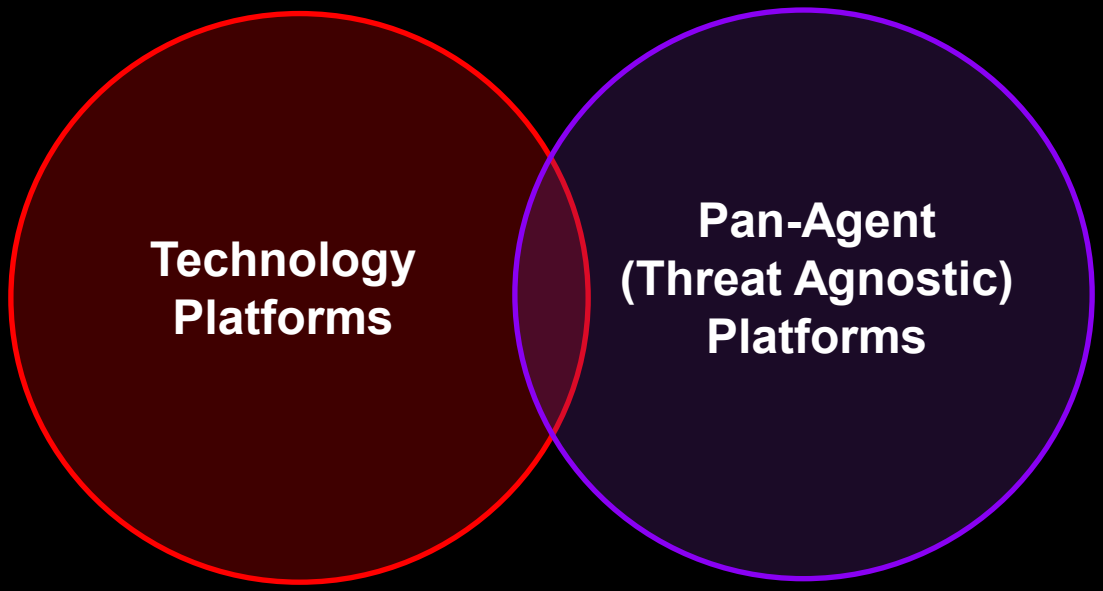
Neglect of Proactive Development and Availability (Stockpiling) of Medical Countermeasures (MCMs) for Potential Pandemic Pathogens and AMR

- 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)

New Technologies for Rapid Responses to Biothreats

- waste-water surveillance and pathogen detection

New Technologies for Rapid Responses to Biothreats

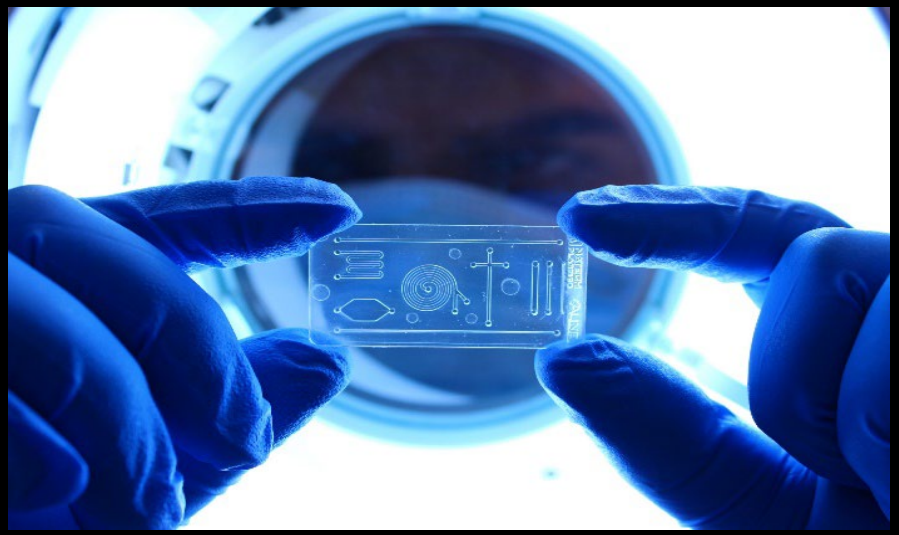


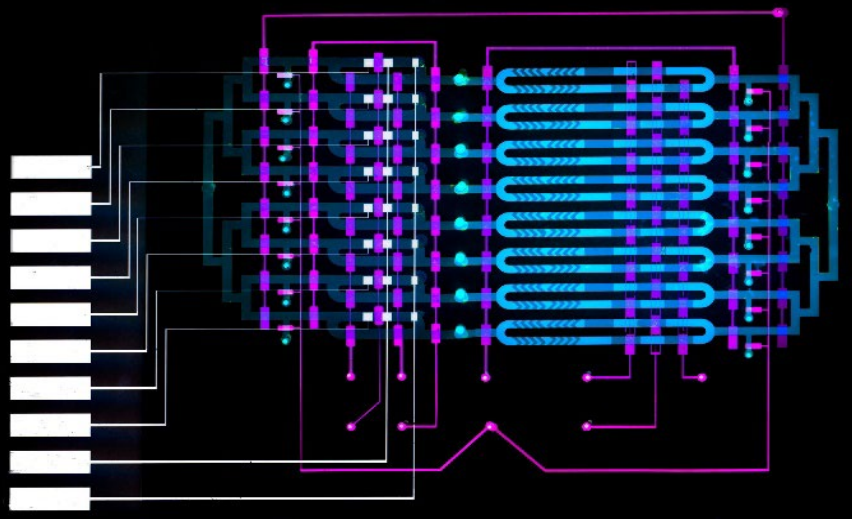
- next-generation vaccines
  - mRNA
  - saRNA
- increased mucosal immunity
  - IgA (gut, airway)
- new delivery systems
- no cold chain dependence
- long-acting monoclonal antibodies (LAABs)
  - YTI Fc modification

- multiplex Dx and rapid reconfiguration with emergence of variants
- broad-spectrum antimicrobials
- broad-spectrum ‘universal’ vaccines
- pathogen class-specific genome/epitope templates for rapid vaccine scale up

Trends in Molecular Diagnostic Testing for Infectious Diseases

- decentralized testing with automated, point-of-care, point-of-need (POC/PON) and in-home testing
  - multiplex/Dx for detection of multiple pathogens
  - direct electronic upload of test results to centralized databases for RTSA
- launch of test-to-treat paradigm

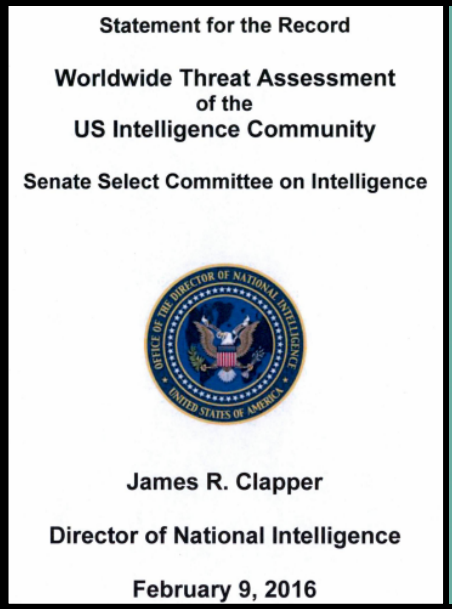


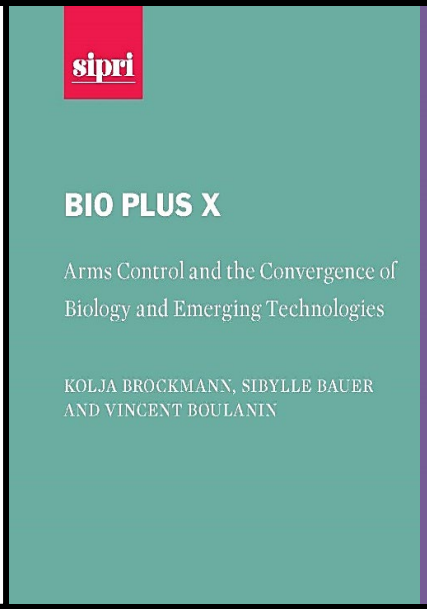


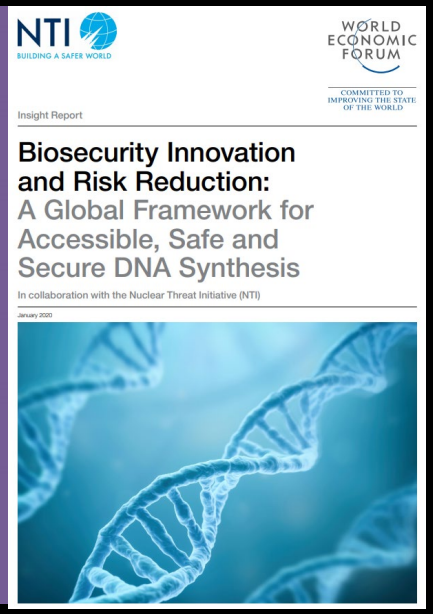
Science, Technology and National Security

The Challenge of the Proliferation of Dual-Use Research

Dual-Use Applications of Advances in Biology and an Expanded Threat Spectrum







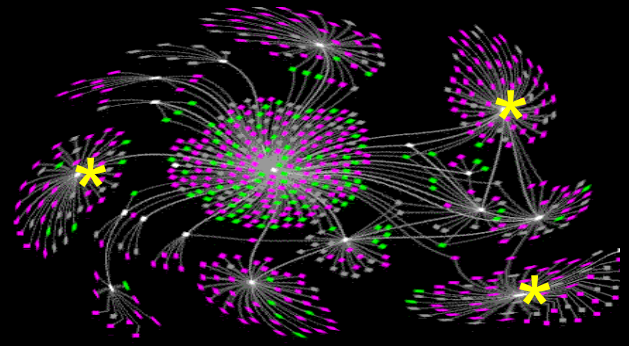
- beneficent and maleficent applications of same knowledge
- potential to cause profound societal disruptions based on deliberate misuse, error or accident
- automation, simplification and cost reduction
- rapid global technology diffusion competition and adversarial risk
- new oversight mechanisms and international harmonization

New Technologies and Increased Complexity of Dual-Use Issues in Biosecurity: Synthetic Biology, Genome Editing and Manipulation of Biological Pathways

digital biology: "it from bits"

de novo synthesis of organisms

engineered virulence



华大基因学院
BGI college
华大基因研究院
BGI research

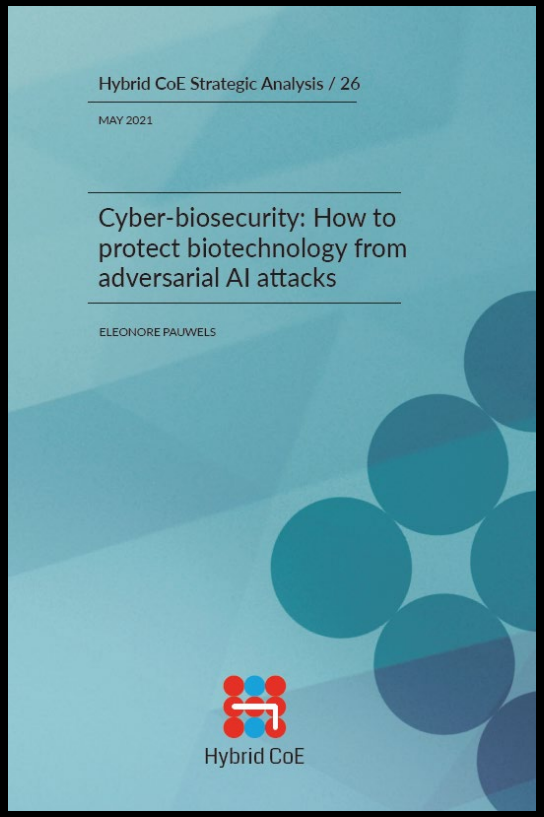
targeted modification of any biological pathway in any organ

modulation of neural sensory and cognitive pathways

rapid global technology diffusion and competition


UNIDIR
UNITED NATIONS INSTITUTE
FOR DISARMAMENT RESEARCH
Stakeholder perspectives on the Biological Weapons Convention
EDITED BY JAMES REVILL, VIVIENNE ZHANG AND MARÍA GARZÓN MACEDA

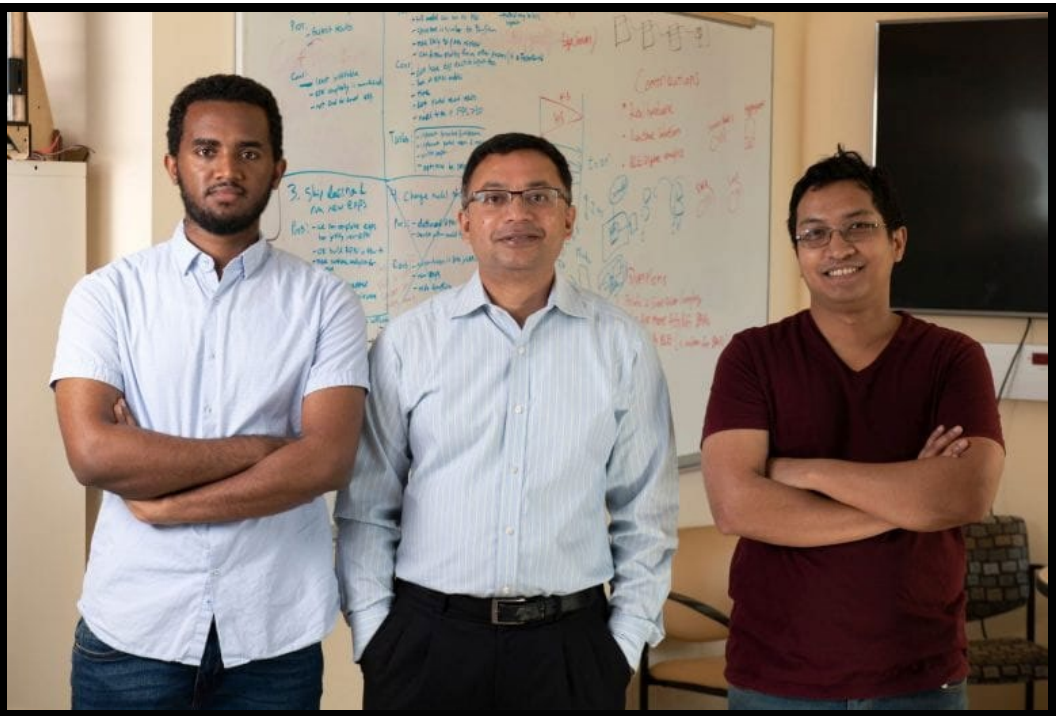
Cybervigilance in Biosecurity



- espionage (PRC: Pfizer/Moderna mRNA vaccines)
- corruption of critical datasets to compromise PR3, including clinical data
- disruption of critical PR3 supply chains and key infrastructure (electrical grid, water transport)

UCI researchers demonstrate how to trigger a pathogen release with music

17 November 22



M.A. Faruque and Ph.D. Students
Y. Achamyeleh and A. Barua

Bulletin of the Atomic Scientists

Researchers hacked a lab's pathogen containment system. Was it a good idea to publish the results?

By George Poste, David Gillum | January 19, 2023

George Poste

George Poste is Regents' Professor, Del E. Webb Chair in Health Innovation and Director of the Complex Adaptive Systems Initiative at Arizona State... Read More

David Gillum

David Gillum is a PhD student in the School for the Future of Innovation in Society at Arizona State University. David is also the assistant vice... Read More

https://thebulletin.org/2023/01/researchers-hacked-a-labs-pathogen-containment-system-was-it-a-good-idea-to-publish-the-results/

Complacency

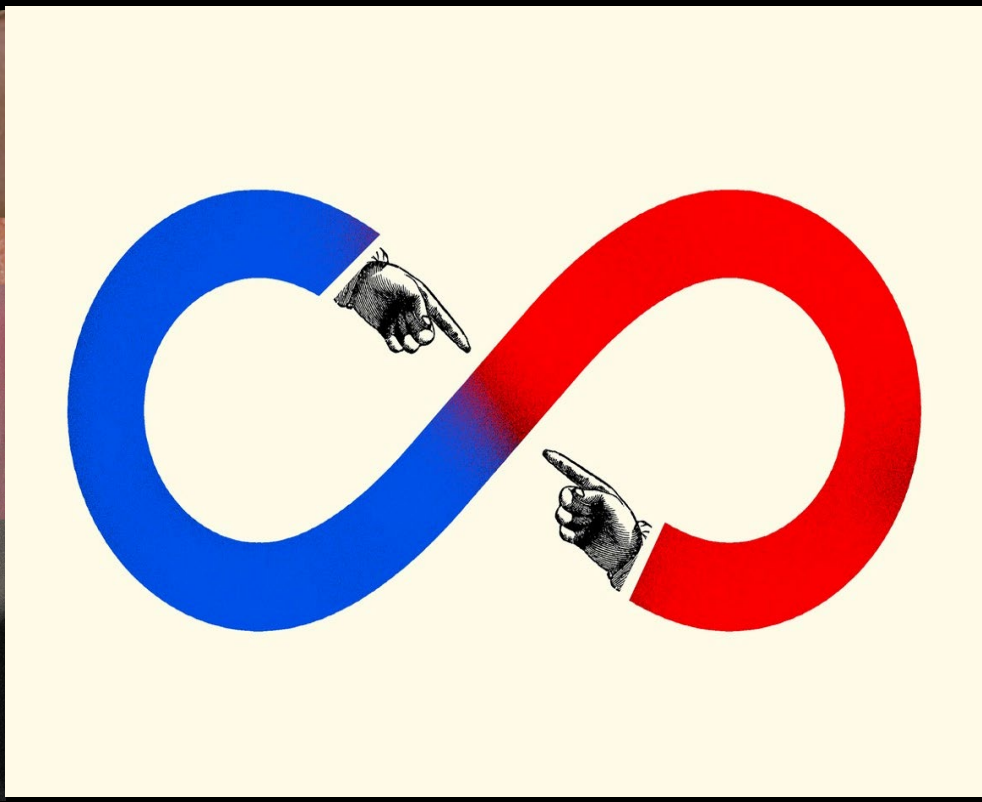
(False) Comfort and Complacency

- COVID-19: Deja vu
- just latest episode in the repeated historical cycles of neglect-panic-fund-forget
- out-of-sight/out-of-mind
- chronic neglect of public health investment in an era of globalization of commerce and transport
- risk warnings long ignored
- rude shocks

Rude Shocks

- misplaced complacency, indifference and arrogant assumptions about American technological superiority and public health capabilities
- confused and conflicting policy messaging from White House and CDC policies and prioritizing economic considerations ahead of rational epidemiological/public health actions
- pandemic struck at a perilous moment in US politics
  - growing distrust in experts, amplified by partisan political divisions and proliferation of disinformation on social media

A Critique of the US Response to COVID-19

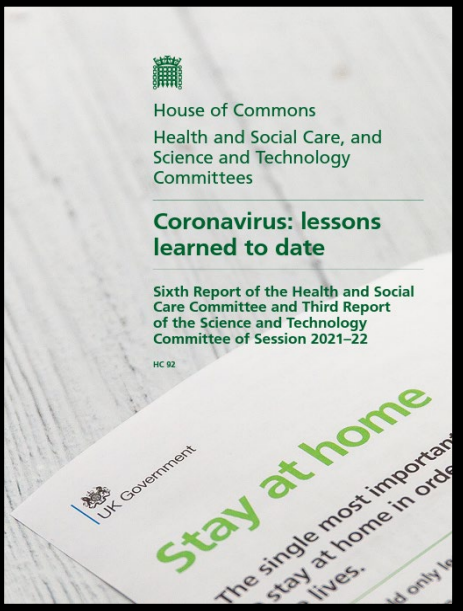


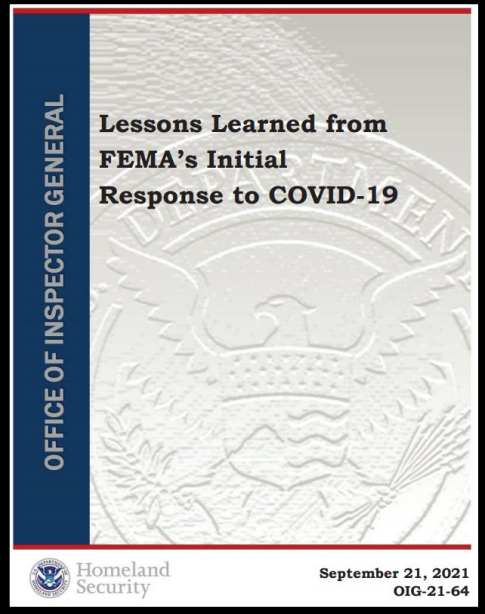
- mix politics and public health then politics will always win
- alarming technological illiteracy of both legislative and executive branches
- partisan politics and divisiveness
- ever changing messaging
- media sensationalism
- proliferation of disinformation on social media
- public confusion and mistrust

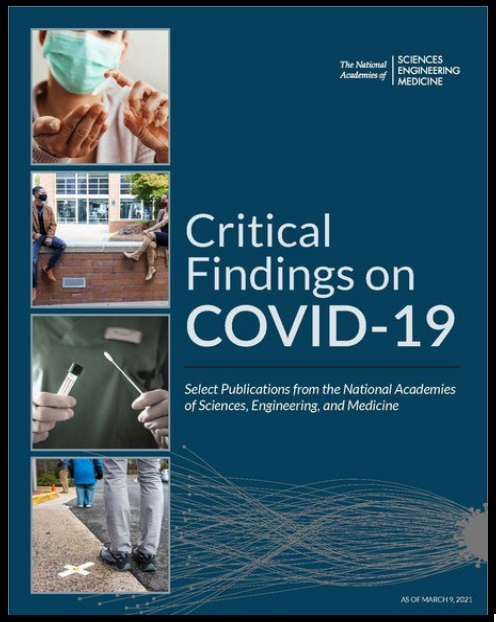
Out-of-Sight: Out-of-Mind

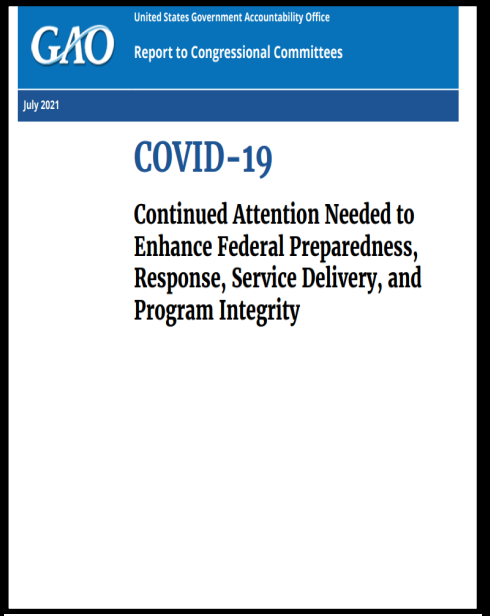
- the curse of short-termism in public and private sector priorities
- competing political priorities move center-stage as perception of threat wanes
- economic slow down, government austerity measures and rise of nationalistic attitudes as barriers to sustained funding for biosecurity
  - disproportionate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

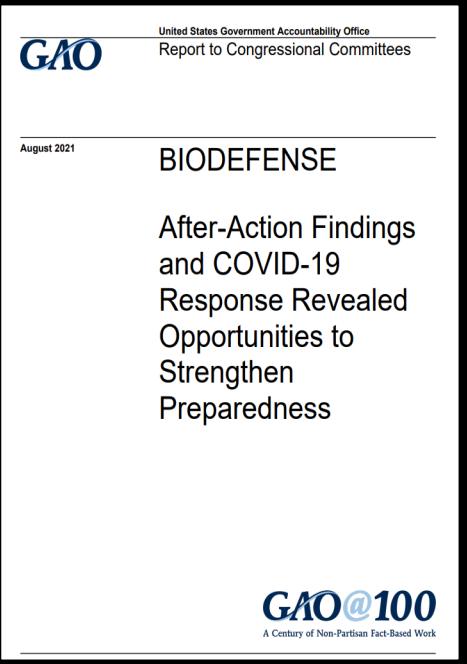
Commitment

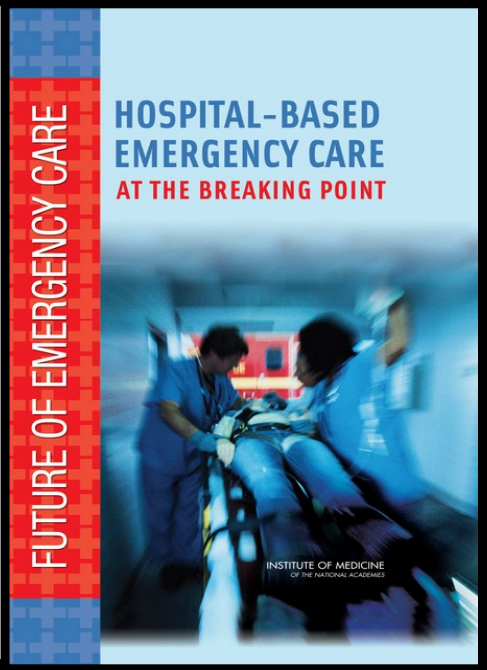

House of Commons
Health and Social Care, and Science and Technology Committees
Coronavirus: lessons learned to date
Sixth Report of the Health and Social Care Committee and Third Report of the Science and Technology Committee of Session 2021–22
HC 92
UK Government
Stay at home

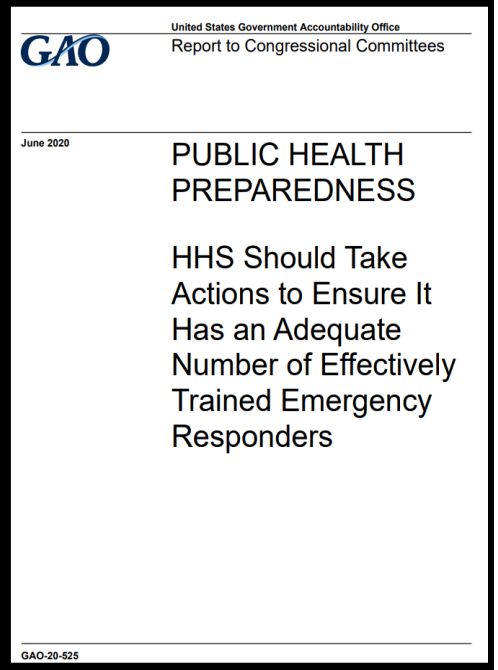

OFFICE OF INSPECTOR GENERAL
Lessons Learned from FEMA's Initial Response to COVID-19
Homeland Security
September 21, 2021
OIG-21-64

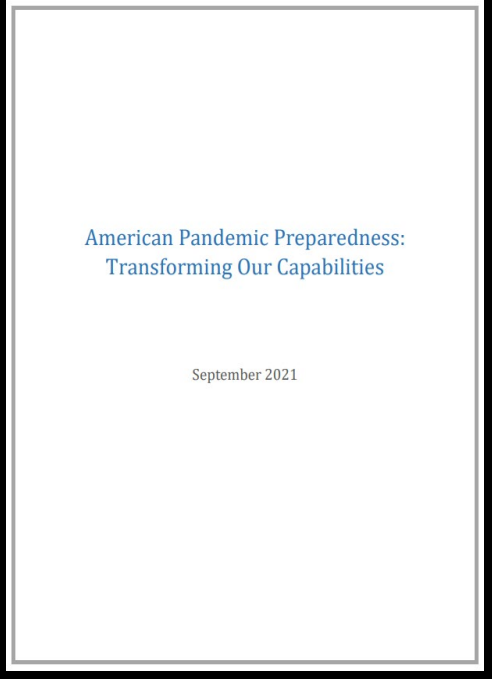

The National Academies of SCIENCES ENGINEERING MEDICINE
Critical Findings on COVID-19
Select Publications from the National Academies of Sciences, Engineering, and Medicine
AS OF MARCH 9, 2021


United States Government Accountability Office
GAO
Report to Congressional Committees
July 2021
COVID-19
Continued Attention Needed to Enhance Federal Preparedness, Response, Service Delivery, and Program Integrity

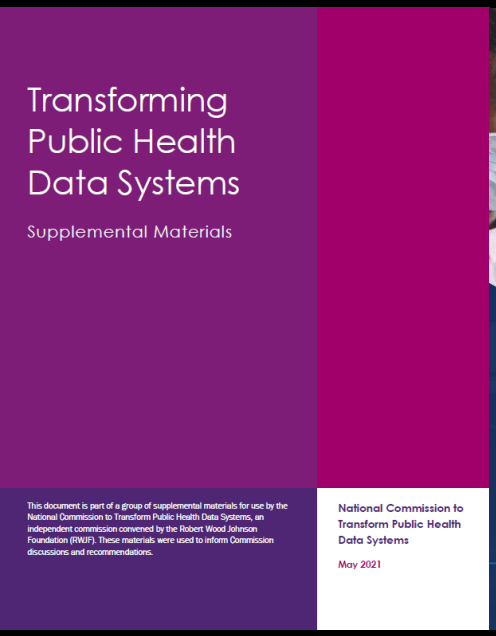

United States Government Accountability Office
GAO
Report to Congressional Committees
August 2021
BIODEFENSE
After-Action Findings and COVID-19 Response Revealed Opportunities to Strengthen Preparedness
GAO@100
A Century of Non-Partisan Fact-Based Work

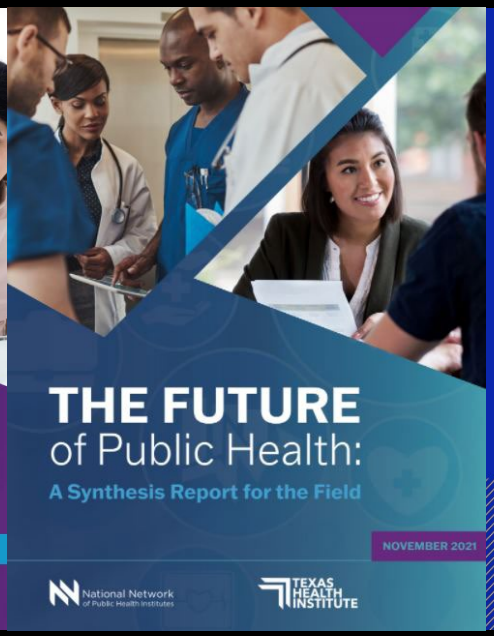

FUTURE OF EMERGENCY CARE
HOSPITAL-BASED EMERGENCY CARE
AT THE BREAKING POINT
INSTITUTE OF MEDICINE
OF THE NATIONAL ACADEMIES

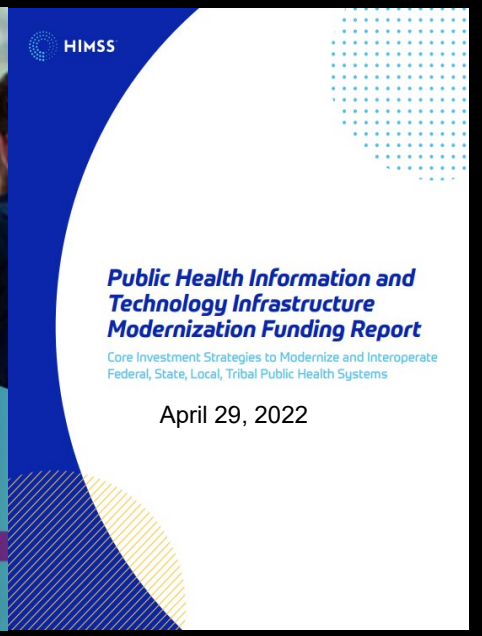

United States Government Accountability Office
GAO
Report to Congressional Committees
June 2020
PUBLIC HEALTH PREPAREDNESS
HHS Should Take Actions to Ensure It Has an Adequate Number of Effectively Trained Emergency Responders
GAO-20-525


American Pandemic Preparedness: Transforming Our Capabilities
September 2021

Increased Financing of US Public Health Infrastructure







- recommendation of $8 billion in new investments each year to establish and sustain physical and data infrastructures and workforce recruitment/retention
  - Commonwealth Fund Commission on a National Public Health System 2022

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

Lessons Learned

- prevention and preparedness efforts are more cost-effective than financing response and recovery
- major funding shortfalls for both preparedness and response/recovery
- World Bank Pandemic Fund (2022)
  - estimated $124 billion over 5 years for preparedness
  - estimated $100 billion for response
  - no mention of financing to address socioeconomic impact of emergencies
  - unclear linkages to IHR processes and PHEICs
- need for long-term (10-15) year stable financing

*M.R. Royce et al. BMJ Global Health (2023) 8.e011172

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
- focused almost exclusively on pandemic threats and communicable diseases versus threat-agnostic/disaster PR3
- still largely *'reactive'* focus on enhanced detection versus the more challenging task of *'proactive'* threat elimination at source

Mobilizing Global Commitments to Enhance Pandemic PRR Capabilities

- (re)build greater resilience in public health and healthcare infrastructure
- essential and welcome actions / assumed commitment to deliver)
- heavily weighted to protection of populations
- focused almost exclusively on pandemic threats and communicable diseases versus threat-agnostic/disaster PR3
- still largely *'reactive'* focus on enhanced detection versus the more challenging task of *'proactive'* threat elimination at source

Collective Myopia
and
One Critical Omission

BUT

ONE HEALTH !

- renewed focus and funding to strengthen global public health is necessary but not sufficient
- without adoption of One Health as a core principle in global biosecurity then laudable aspirations for human and planetary health will be:
  - undermined by continued cycles of emergent zoonotic EIDs
  - food insecurity and depletion of non-renewable natural resources and other ecosystem disruptions
  - socio – cultural – economic on stabilities and triggers of conflict

Building Global One Health Capabilities: Silos Subvert Solutions

- current single discipline, vertically oriented, siloed institutional systems, expertise and funding policies are ill-suited to design and implement One Health as a holistic systems-based approach to global biosecurity risks
  - multidisciplinary, multi-institution, multi-sector (whole-of-government; whole-of-society)
- sustained long-term funding investments
  - education and training
  - performance metrics, accountability, transparency

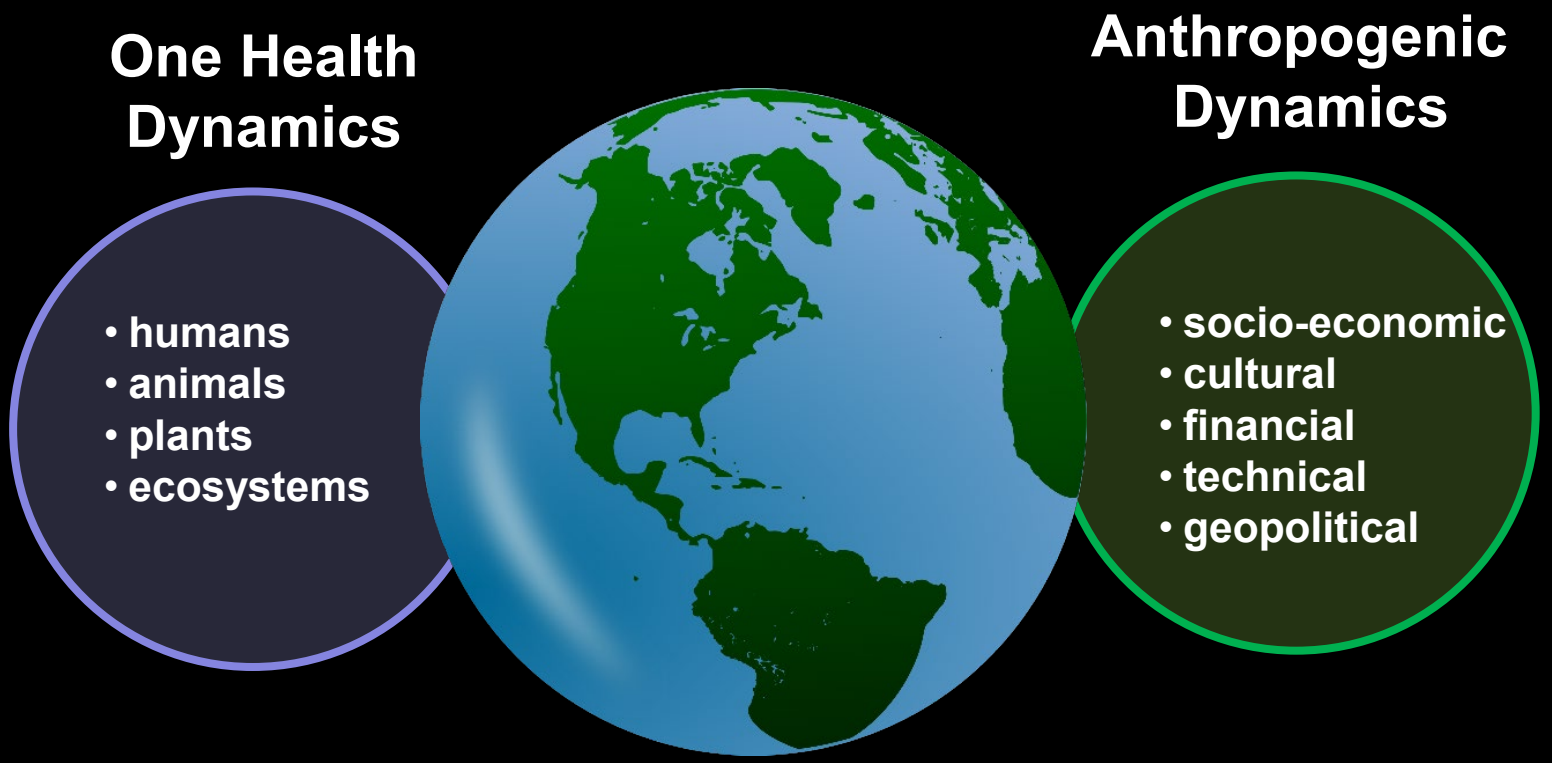
Building Global One Health Capabilities: Silos Subvert Solutions

- awareness and training in One Health concepts still largely absent from educational curricula in many of the disciplines needed to implement coherent One Health strategies
  - human and veterinary medicine, ecology and environmental sciences, social sciences
  - integrated data networks to support rapid decisions
  - urban planning and the built environment
  - financial systems and global supply chain planning
  - regulatory harmonization
  - law, IP
  - foreign policy and international studies
  - governance for international cooperation to counter global threats

Building Global One Health Capabilities: Silos Subvert Solutions

- embed One Health biosecurity risk analysis and expertise in institutional systems with the reach and scale to drive global PR3 capabilities
  - national security (military, IC, foreign policy)
  - financial services
  - trade, transport and supply chain logistics
  - large scale macro-engineering projects (dams, urban planning)
- inclusion in ESG metrics (environmental, social and governance) for corporate investment

One Health:
A Unifying Grand Challenge and Core Foundation for Improved Global Biosecurity and Planetary Health



“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”

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

Prince Otto von Bismarck

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

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

Professor Rudolph Virchow
(in reply)