Global Biosecurity: Complexity, Complacency & Commitment

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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
● 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

SARS-CoV-2
The Need for Continued Vigilance Against Known Pathogens

Global Emergence of Monkey Pox Virus (2022)

Poliovirus New York 2022

Poliovirus Afghanistan

POLIO IS SPREADING IN ROCKLAND COUNTY

Where are the cases?

It is difficult to fear something we cannot see.

- Approximately 70% of people who are infected with Polio will not experience any symptoms and will not know they are contagious.
- For every 1 case with symptoms of paralytic Polio virus, hundreds or thousands of people may have been infected with the disease.

Our new generation is in danger!

There are now over 11,000 infants under the age of 2 in Rockland County who are at risk, because they are not fully immunized.

What is Polio?

Polio is a disease caused by the Poliovirus that can infect the spinal cord and cause permanent paralysis or even death. Polio is preventable, only with immunization.

There is no cure for Polio.

Who is at risk?

- Newborn babies

Anyone not fully immunized, including children, adults and pregnant women, immunocompromised individuals, and in one state of the Polio vaccine is right for you.
Cronobacter sakazakii and National Infant Formula Shortage (2022)
SARS-CoV-2 Revealed Major Shortcomings in US Public Health Capabilities
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 online 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 intercepts)
It's where the government is keeping the real statistics on new hospitalisation and deaths due to COVID-19.
Big wave modelling
China, covid-19, SEIR model

Estimated deaths*, by model scenario, m

\[ R = \text{new infections caused per person infected} \]

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Days since outbreak</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plausible state of outbreak Dec 15th</td>
<td>0</td>
</tr>
<tr>
<td>Current vaccination rate, ( R=3.3 )</td>
<td>1.0</td>
</tr>
<tr>
<td>80% booster coverage, three months waned</td>
<td>0.5</td>
</tr>
<tr>
<td>90% booster coverage, no waning</td>
<td>0.0</td>
</tr>
</tbody>
</table>

*Note: Estimated deaths are calculated based on different vaccination and waning scenarios.
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

healthcare delivery

$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

- estimated $4.1 trillion direct cost
- unknown long-term health effects
  - long-COVID
- the shadow pandemic
  - healthcare
  - education
  - mental illness
  - LMICs

USG global public health investment $50 billion

healthcare delivery $4.1 trillion
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

One Health Dynamics
- humans
- animals
- plants
- ecosystems

Anthropogenic Dynamics
- socio-economic
- cultural
- financial
- technical
- geopolitical
What’s Out There?
Comprehensive Global Biosurveillance and Preparedness for Epidemic/Pandemic Threats

SARS-CoV-2

Agent-X
The Communicable Disease Landscape: Predictive Risk Assessment and Response

- **risk determinants**
  - anthropocentric change
  - ecological/environmental
  - socio-economic
  - trade/transport
  - geopolitical

- **risk frequency prevalence and distribution**
  - host-pathogen-environment interaction networks
  - risk trajectories

- **risk mitigation capabilities**
  - institutions
  - infrastructure
  - investment
  - incentives
  - innovation
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

- 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 – VHF**
  - 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
Wildlife Markets and Transmission of Zoonotic EIDs
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

- 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
Antimicrobial Resistance is Linked to More Deaths Than HIV and Malaria

Deaths in 2019, millions

- Ischemic heart disease
- Stroke
- Dementias
- Antimicrobial resistance
- HIV/AIDS
- Malaria

Source: Global Burden of Disease Collaborative Network [link]
'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  


Rita Rubin, MA

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

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

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, Ethiopia
South Sudan
Somalia
Economic & Health Risks from Extreme Weather Events: Flooding and Sewage Contamination
Water Security and the Sustainable Development Goals
Humanitarian Disasters:
Refugee Migration Caused by Environmental Events and/or Conflict
Increased Spread of Infectious Diseases

Report on the Impact of Climate Change on Migration

October 2021
A report by
The White House
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 interoperability 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

© @dficosi
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
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- $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

The Public Health Emergency Medical Countermeasures Enterprise
Innovative Strategies to Enhance Products from Discovery Through Approval
Workshop Summary
(2010)

The Nation’s Medical Countermeasure Stockpile
Opportunities to Improve the Efficiency, Effectiveness, and Sustainability of the CDC Strategic National Stockpile
Workshop Summary
(2016)

Ensuring an Effective Public Health Emergency Medical Countermeasures Enterprise
(2021)
Who Pays for Preparedness?

The Obligate Role of Private-Public Partnerships in Biosecurity Policy

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

Technology Platforms

- 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

Pan-Agent (Threat Agnostic) Platforms

- 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

targeted modification of any biological pathway in any organ
modulation of neural sensory and cognitive pathways
rapid global technology diffusion and competition
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

Adele: *Hello*
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 University. 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/
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
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

Lessons Learned from
FEMA’s Initial
Response to COVID-19

September 21, 2021
OIG-21-64

Critical Findings on
COVID-19
Select Publications from the National Academies
of Sciences, Engineering, and Medicine

COVID-19
Continued Attention Needed to
Enhance Federal Preparedness,
Response, Service Delivery, and
Program Integrity

United States Government Accountability Office
Report to Congressional Committees

BIODEFENSE
After-Action Findings
and COVID-19
Response Revealed
Opportunities to
Strengthen
Preparedness

FUTURE OF EMERGENCY CARE
Hospital-Based
Emergency Care
At the Breaking Point

PUBLIC HEALTH
PREPAREDNESS
HHS Should Take
Actions to Ensure It
Has an Adequate
Number of Effectively
Trained Emergency
Responders

United States Government Accountability Office
Report to Congressional Committees

American Pandemic Preparedness:
Transforming Our Capabilities

September 2021
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

G20 PRESIDENCY OF INDONESIA

RECOVER TOGETHER
RECOVER STRONGER
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

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Collective Myopia and One Critical Omission

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

One Health Dynamics

- humans
- animals
- plants
- ecosystems

Anthropogenic Dynamics

- socio-economic
- cultural
- financial
- technical
- geopolitical
“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)
“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)

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