Pandemic Preparedness: Complexity, Complacency & Commitment

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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

SARS-CoV-2
Biothreat Preparedness, Response, Resiliency & Recovery (PR3) Capabilities

- Threat spectrum
- Threat detection
- Threat scale and trajectories
- Threat mitigation and recovery
U.S. National Security Policy and Biodefense
SARS-CoV-2 Revealed Major Shortcomings in US Public Health Capabilities

PREPARED? NO!

1.1 million US deaths
Jan. 2020 – Apr 2023
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 S0114-6736(23)00461-0
The Macrodeterminants of Pandemic Preparedness

- Politics, governance, and decisions
- Institutions and infrastructure
- Human behavior
- Societal resiliency
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- Institutions and infrastructure
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- Politics, governance and decisions

- Institutional competence and performance
- Real time validated data and countering misinformation
- Lessons learned and agile adaptation
- Consistent communications and public trust

Communications and data analysis.

Agile adaptation and real-time validated data.

Points of intersection:

- Human behavior
- Institutions and infrastructure
- Societal resiliency
- Politics, governance and decisions

- Institutional competence and performance
- Real time validated data and countering misinformation
- Lessons learned and agile adaptation
- Consistent communications and public trust
A Report Card on the US Response to the SARS-CoV-2 Pandemic

delayed detection and political obfuscation in emergency declarations

stark deficiencies in scale of diagnostic testing needed and slow engagement of private sector

underappreciated role of asymptomatic infections in pandemic spread

failure of test and trace campaigns

proliferation of highly variable epidemiological models

inadequate spread and scale of US viral sequencing to map variant distribution/evolution
A Report Card on the US Response to the SARS-CoV-2 Pandemic

- fragmented, uncoordinated response and recovery actions
- fragile healthcare infrastructure and supply chains
- limited countermeasures and outdated national stockpile
- school and business lockdowns and cascading economic disruption
- amplified health disparities and inequities
- inadequate international cooperation and coordination
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

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

- 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

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

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

BUT
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
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
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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

Technology Convergence

International Competition for Technology Dominance

Technology Acceleration

Disruptive Technologies

Dual-Use Technologies

Strategic Surprises and Dislocations

Governance and Institutional Competencies

International Cooperation

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Professor Rudolph Virchow (in reply)
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Plus ça change, plus c’est la même chose