



Global Health Systems Preparedness

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Outline

- Previous Epidemics
- How Prepared are we
- Challenges for Global Preparedness
- Human and Economic Impacts
- Practicalities
- Research-treatment and vaccines
- Prevention
- Way Forward-policies

What are We Preparing for?

Pandemics

Large-scale outbreaks of infectious disease that can greatly increase morbidity and mortality

Over a wide geographic area

Cause significant economic, social, and political disruption.

Notable Pandemics since the Middle Ages

Starting year	Event	Geographic extent	Estimated direct morbidity or mortality	Estimated economic, social, or political impact
1347	Bubonic plague (Black Death) pandemic	Eurasia	30–50 percent mortality of the European population (DeWitte 2014)	Likely hastened end of the feudal system in Europe (Platt 2014)
Early 1500s	Introduction of smallpox	Americas	More than 50 percent mortality in some communities (Jones 2006)	Destroyed native societies, facilitating the hegemony of European countries (Diamond 2009)
1881	Fifth cholera pandemic	Global	More than 1.5 million deaths (9.7 per 10,000 persons) (Chisholm 1911)	Sparked attacks on Russian tsarist government and medical officials (Frieden 1977)
1918	Spanish flu influenza pandemic	Global	20 million–100 million deaths (111–555 deaths per 10,000 persons) (Johnson and Mueller 2002)	GDP loss of 3 percent in Australia, 15 percent in Canada, 17 percent in the United Kingdom, 11 percent in the United States (McKibbin and Sidorenko 2006)
1957	Asian flu influenza pandemic	Global	0.7 million–1.5 million deaths (2.4–5.1 deaths per 10,000 persons) (Viboud and others 2016)	GDP loss of 3 percent in Canada, Japan, the United Kingdom, and the United States (McKibbin and Sidorenko 2006)
1968	Hong Kong flu influenza pandemic	Global	1 million deaths (2.8 deaths per 10,000 persons) (Mathews and others 2009)	US\$23 billion–US\$26 billion direct and indirect costs in the United States (Kavet 1977)

Notable Pandemics since the Middle Ages

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1981	HIV/AIDS pandemic	Global	More than 70 million infections, 36.7 million deaths (WHO Global Health Observatory data, http://www.who.int/gho/hiv/en/)	2–4 percent annual loss of GDP growth in Africa (Dixon, McDonald, and Roberts 2001) ^a
2003	SARS pandemic	4 continents, 37 countries	8,098 possible cases, 744 deaths (Wang and Jolly 2004)	GDP loss of US\$4 billion in Hong Kong SAR, China; US\$3 billion–US\$6 billion in Canada; and US\$5 billion in Singapore (Keogh-Brown and Smith 2008)
2009	Swine flu influenza pandemic	Global	151,700–575,500 deaths (0.2–0.8 per 10,000 persons) (Dawood and others 2012)	GDP loss of US\$1 billion in the Republic of Korea (Kim, Yoon, and Oh 2013)
2015	Zika virus pandemic	76 countries	2,656 reported cases of microcephaly or central nervous system malformation (WHO 2017)	US\$7 billion–US\$18 billion loss in Latin America and the Caribbean (UNDP 2017)

The likelihood of Pandemics has increased

because of

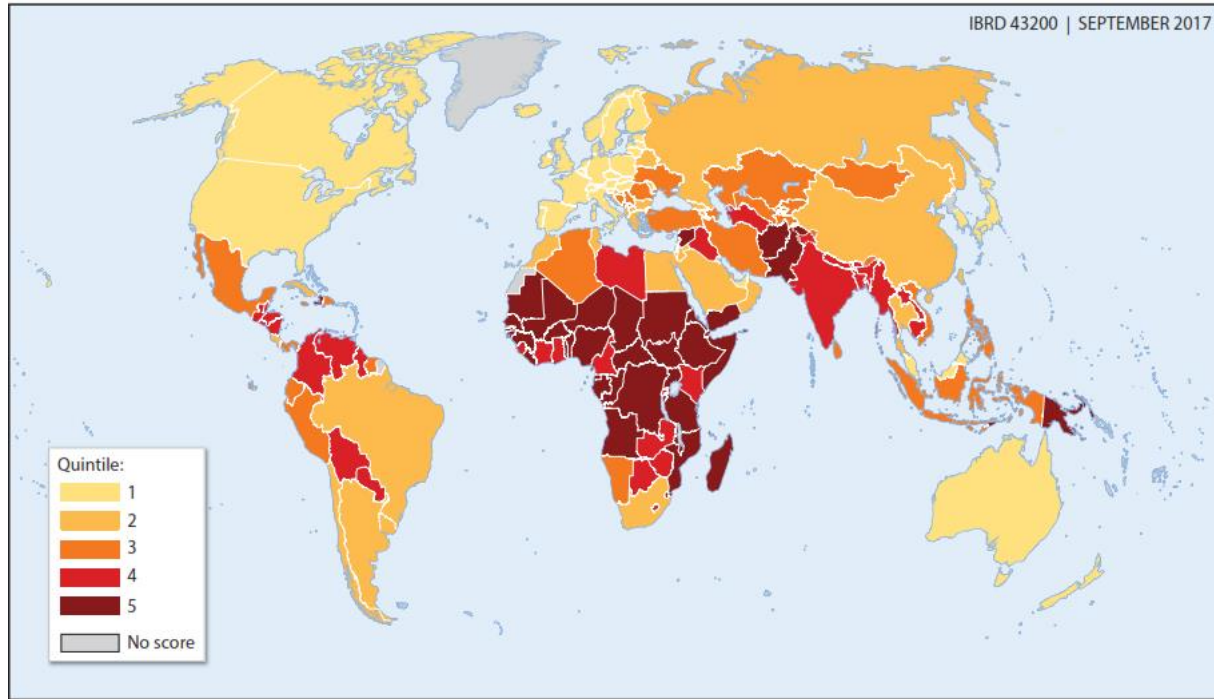
- Increased global travel and integration,
- Urbanization, changes in land use,
- Greater exploitation of the natural environment
 - Creating a new interface between humans and wildlife
- Of the 335 emerging infectious diseases they identified, 60.3 percent are zoonotic in origin.

How Prepared are we?

The Preparedness Index

- **Public health infrastructure** capable of identifying, tracing, managing, and treating cases
- **Adequate physical and communications** infrastructure to channel information and resources
- Fundamental bureaucratic and **public management** capacities
- **Capacity to mobilize financial resources** to pay for disease response and weather the economic shock of the outbreak
- Ability to undertake **effective risk communications**.

Global Distribution of Epidemic Preparedness, 2017



Countries are grouped into quintiles of epidemic preparedness (1 = most prepared, 5 = least prepared).

Why should this concern us?

Spark and spread risk

- Europe and US have high levels of preparedness.
- China has capacity too but lags behind.
- Geographic areas with high spark risk from wildlife species (including Central and West Africa) have some of the lowest preparedness scores globally.
- Potentially dangerous overlap of spark risk and spread risk

Lancet 2020

Health security capacities in the context of COVID-19 outbreak: an analysis of International Health Regulations annual report data from 182 countries

Nirmal Kandel, Stella Chungong, Abbas Omaar, Jun Xing

- Only 104 (**57%**) of 182 countries had the functional capacity to prevent, detect, and respond to an outbreak of a novel infectious disease at national and sub-national levels.
- 32 (**18%**) countries had low readiness and would require external resources to control an emerging infectious disease event.

Global Preparedness needs Intel!

- **Situational Awareness-Surveillance**
- Need an accurate, up-to-date view of potential or ongoing infectious disease threats.
- And resources - human, financial, informational, and institutional.

How do we know a Pandemic is coming?

Requires

- The health care workforce to **recognize** the illness and **report** it rapidly.
- Technical and laboratory capacity to **identify** the pathogen and respond to **surges** of clinical specimens in a timely manner.

Why You Cannot Delay!

During the 2003 SARS pandemic,

- A one-week delay in applying control measures may have nearly tripled the size of the outbreak and increased its duration by four weeks.

Pandemic Impact on Health Care systems

- When pandemics cause spikes in morbidity and mortality they can overwhelm health systems.
- Overwhelmed health systems and other indirect effects may contribute to a 2.3-fold increase in all-cause mortality during pandemics.
 - During the 2009 influenza pandemic increases in acute myocardial infarction and stroke reported

Impact on the Health Care Workforce

Even if health care workers do not die, their ability to provide care may be reduced.

At the peak of a severe influenza pandemic, up to 40 percent of healthcare workers might be unable to report for duty because they:

- Are ill themselves,
- Need to care for ill family members,
- Need to care for children because of school closures,
- Are afraid to come to work

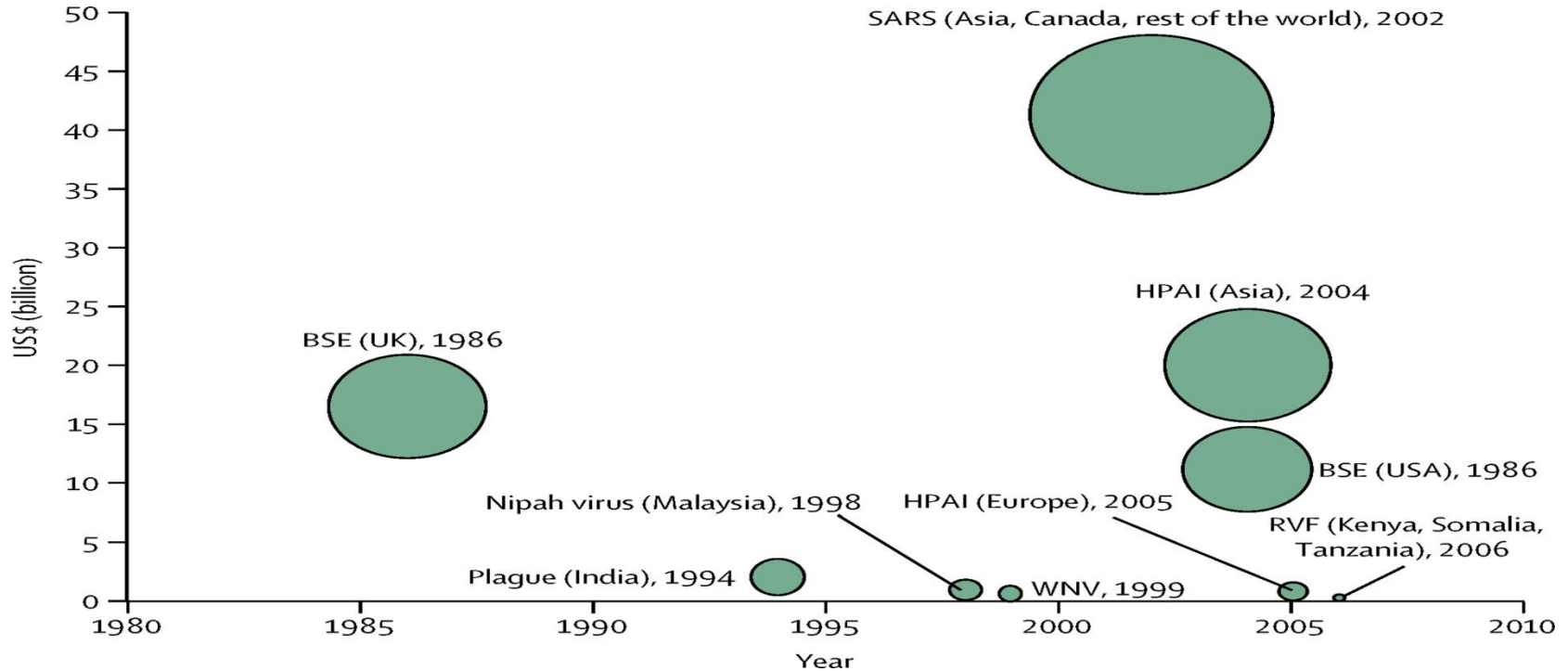
Pandemics can have significant social and political consequences

- Creating clashes between States and citizens.
- Eroding state capacity.
- Driving population displacement.
- Heightening social tension and discrimination.
- Fear-induced behavioral changes

Preparedness for Economic Shutdown

- Employment Issues
- Governments closure of land borders and restricted entry of citizens from affected countries and migrant workers.
- Private sector can disrupt transport, trade, travel, and commerce by cancelling commercial flights and reducing shipping and cargo services.

Estimated cost of selected emerging zoonotic diseases (1986–2006)



Pandemic Preparedness Response Activities

Prepandemic period (before a pandemic starts)

- Stockpile building
- Continuity planning
- Public health workforce training
- Simulation exercises
- Risk transfer mechanism set-up
- Situational awareness^a

Spark period (as a pandemic starts)

- Initial outbreak detection
- Pathogen characterization or laboratory confirmation
- Risk communication and community engagement
- Animal disease control

- Contact tracing, quarantine, and isolation
- Situational awareness^a

Spread period (after a pandemic starts)

- Global pandemic declaration
- Risk communications
- Contact tracing, quarantine, and isolation
- Social distancing
- Stockpile deployment
- Vaccine or antiviral administration
- Care and treatment
- Situational awareness^a

a. Situational awareness includes passive and active animal and human disease surveillance and monitoring of public health facilities and resources.

Preparedness -Practicalities

- Procurement and supply chain management must also be enhanced to ensure adequate stocks of personal Protective equipment and essential medications
- Enable equitable access to new diagnostics, therapeutics and vaccines during health emergencies

Preparedness -Practicalities

- We must scale up laboratory capacity and other surveillance capabilities,
- Augment the readiness of health systems to care for large numbers of seriously ill patients
- Safeguard the health-care workforce,
- Improve communication and coordination strategies

Research

- Being ready to deliver clinically useful research in the narrow timeframe available during an infectious disease epidemic requires pre-planning pre-positioning and practice of research responses.

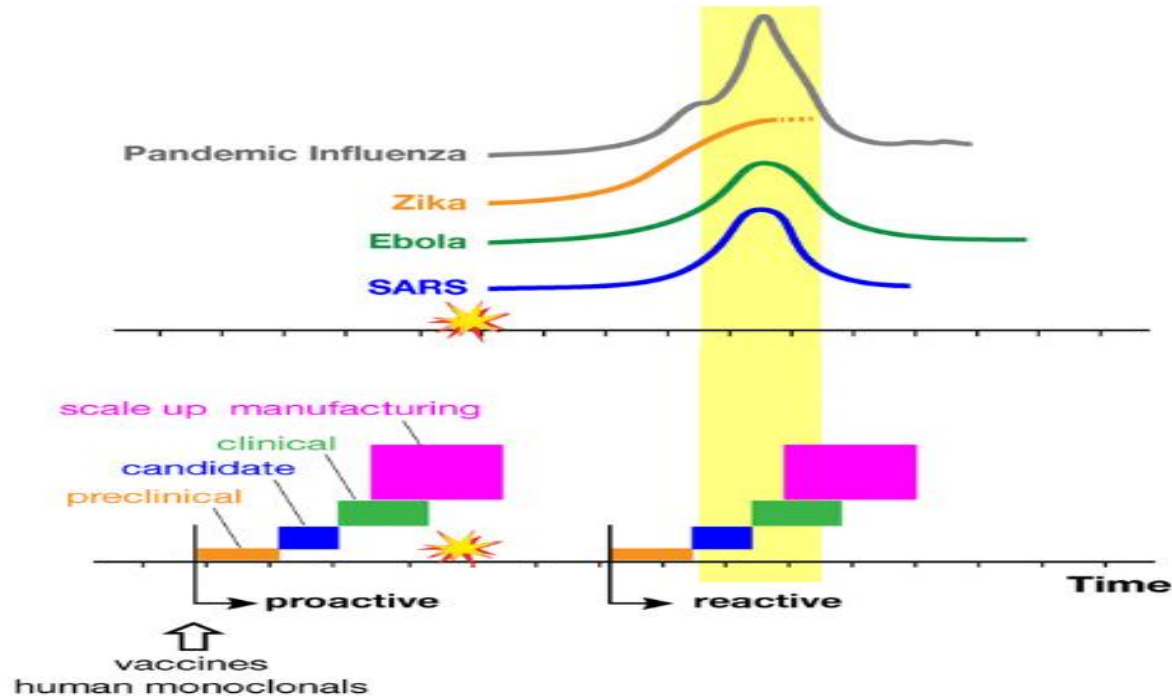
However time and again this narrow window of opportunity is missed

Preparedness for Drug Trials

- Regulatory Changes to approve studies
- Pilot to full trials need to be rapid
- Single drug versus combination therapies
- Antiviral versus anti-inflammatory
- Manufacturers ready to upscale
- Co-ordination crucial

Timing of Vaccine Development

Proactive and Reactive approach



Vaccine Preparedness

- Identify candidates early
- Significant efforts have focused on speeding up vaccine development and scaling up production.
- Vaccine manufacturers may need to take production risks...
- Need Capacity for last-mile delivery to rural areas,
- Populations willingness to adopt the vaccine.



- The Coalition for Epidemic Preparedness Innovations (CEPI) has made an urgent call for \$2 billion to support the development of a vaccine against the coronavirus responsible for COVID-19.

Preventing Pandemics

- Obtaining Data from outbreaks at the Animal Human Interface
- Understanding the determinants and risk factors through research
- Devising and testing mitigation strategies
- Policy uptake

Pandemic Prevention

The concept of One Health

Considers human health, animal health, and the environment to be fundamentally **interconnected**

Prevention

One Health activities

Understand the aetiology of pandemics

The surveillance of zoonotic pathogens of pandemic potential at the human-animal interface,

The modelling of evolutionary dynamics,

The risk assessments of zoonotic pathogens,

Understanding the interplay between Environmental changes and pathogen emergence

Global organisations formally endorsing the One-health approach

- WHO,
- Food and Agriculture Organization (FAO) of the UN,
- World Organization for Animal Health (OIE),
- UN System Influenza Coordination (UNSIC),
- The World Bank.

Research-related efforts in the one-health arena supported by

The European Commission

The US Centers for Disease Control and Prevention (CDC),

The US Agency for International Development,

The Bill & Melinda Gates Foundation, and

The Wellcome Trust

WHO, OIE, and FAO have created the Global Early Warning System (GLEWS), a platform shared by the three organisations to improve early warning and risk assessment on zoonoses and EIDs worldwide.

Other Ways forward-Policy

- Globally implement the International Health Regulations (IHR)
- “to prevent, protect against, control and provide a public health response to the international spread of disease in ways that are commensurate with and restricted to public health risks, and which avoid unnecessary interference with international traffic and trade”
- WHO and the Global Preparedness Monitoring Board have shown that responses to urgent crises have improved under the IHR (2005), but important deficiencies in coverage still exist.

And Finally Preparedness-Policy

Complement the IHR by The Sendai Framework

- This integrates infrastructure, climate change, and economic considerations into disaster management plans and promotes inclusive policies that protect vulnerable populations during all phases of mitigation, preparedness, response, and recovery.