

GLOBAL HEALTH & SECURITY



Lawrence W. Gernon, MD, MPH & Tropical Medicine, FACP

Associate Professor of Global Health Security/ Global & National Security Policy Institute
University of New Mexico

Minister Counselor (RETD) Regional Medical Officer US Department of State

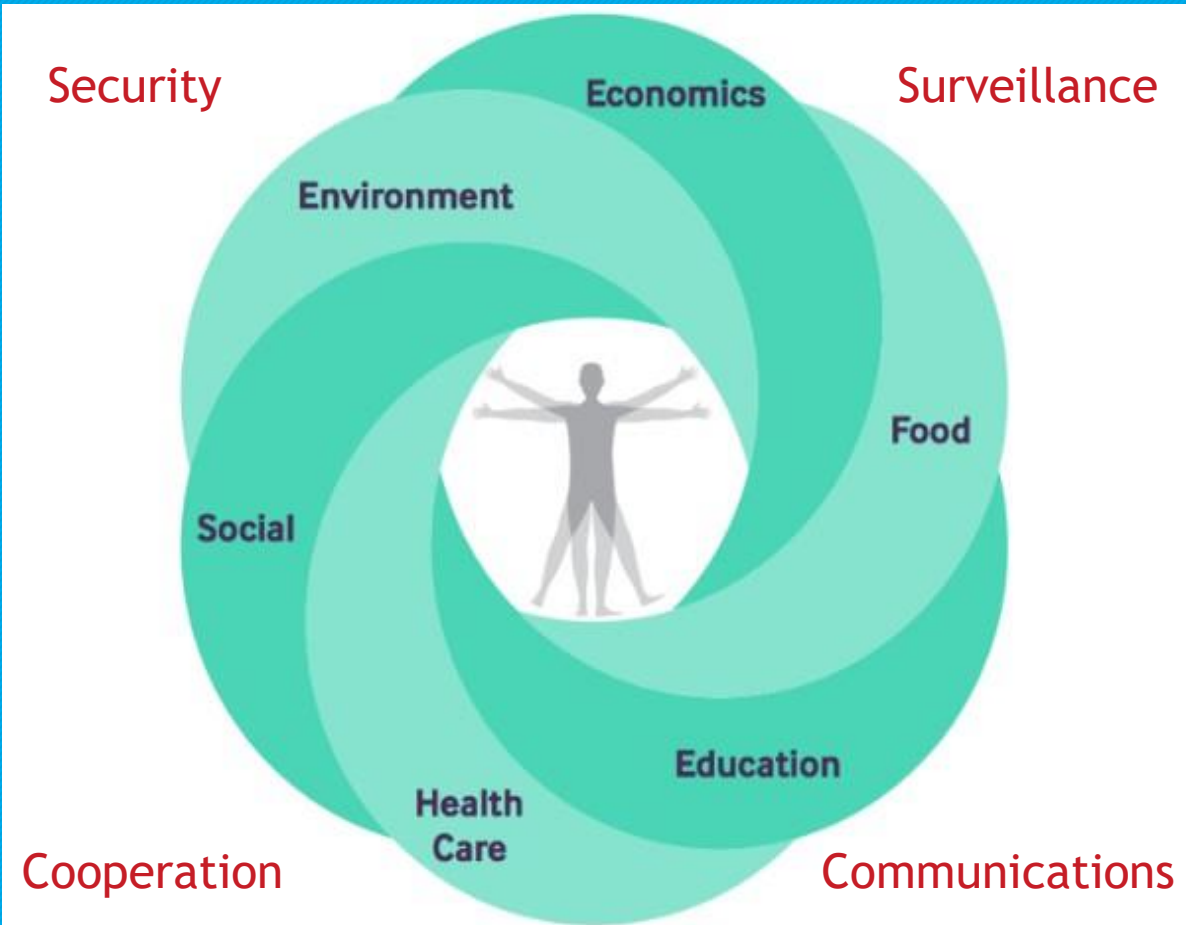
Associate Clinical Professor of Medicine Burrell College of Osteopathic Medicine

Attending Physician/ Consultant Department of Emergency Medicine Presbyterian Health
Care System

Lecturer Global and Border Health University of Arizona, Department of Community
Medicine

NATIONAL SECURITY IS NOT JUST ABOUT PROTECTION FROM STATE AND NONSTATE ACTORS, BUT ALSO ENCOMPASSES PROTECTION FROM EMERGING INFECTIOUS DISEASES AND OTHER HEALTH OUTCOMES THAT CAN THREATEN GLOBAL, REGIONAL & NATIONAL ECONOMIC VITALITY AND ITS VERY WAY OF LIFE

- DISEASES ARE UNAWARE OF NATIONAL BOUNDRIES**



What is Global Health Security?



"the activities required, both proactive and reactive, to minimize the danger and impact of acute public health events that endanger people's health across geographical regions and international boundaries." (WHO)

"statist vs. globalist perspective"

Principle foundations are :





DETECT



PREVENT



RESPOND

Action Packages to Achieve Targets



Antimicrobial Resistance



National Laboratory Systems



Emergency Operations
Centers



Zoonotic Diseases



Surveillance



Linking Public Health
with Law Enforcement
and Multisectoral Rapid
Response



Biosafety/Biosecurity



Reporting



Medical
Countermeasures and
Personnel Deployment



Immunization



Workforce Development

Key Concepts and Definitions

INCIDENCE: new cases over a specified period of time (fraction or percentage)

PREVALENCE: number of disease cases in a population over a specified period of time (fraction, percentage, per 10,000, per 100,000)

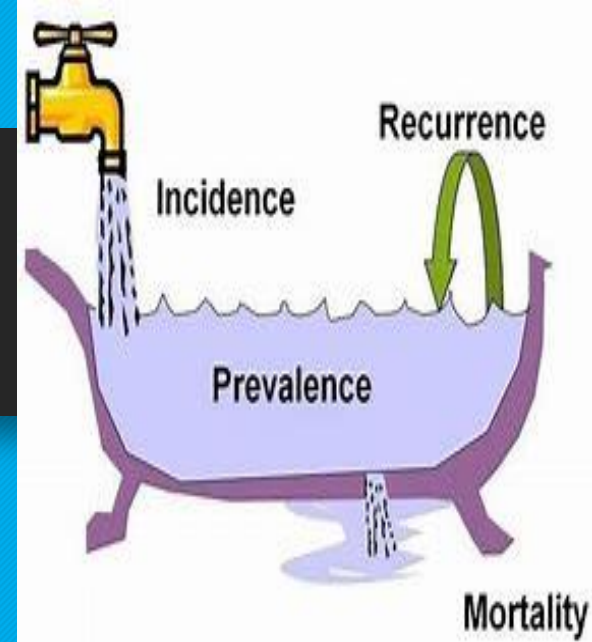
MORTALITY RATE: measure of the number of deaths in a particular population per unit of time. (per 1000)

CASE FATALITY RATE: ($\frac{\text{\# of deaths from a specified disease over defined period of time}}{\text{total number diagnosed with disease over defined period of time}} \times 100$ (percentage))

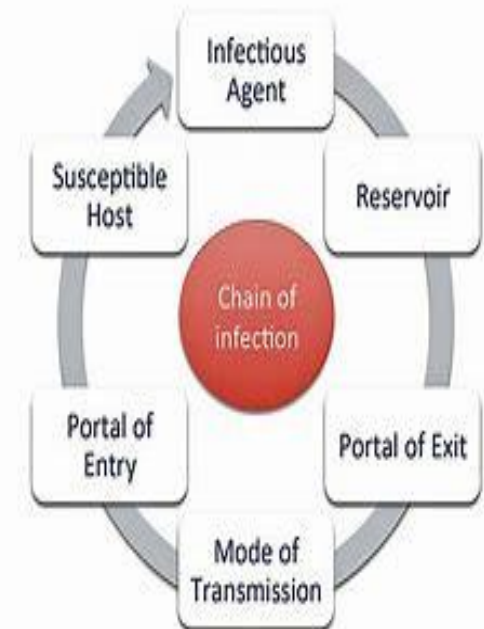
MORBIDITY RATE: measure of illness

Ro (“naught”): the average number of people that one sick person goes on to infect in a group that has no immunity (measure of transmissibility, infectiousness)

RESERVOIR vs. VECTOR



Chain of Transmission



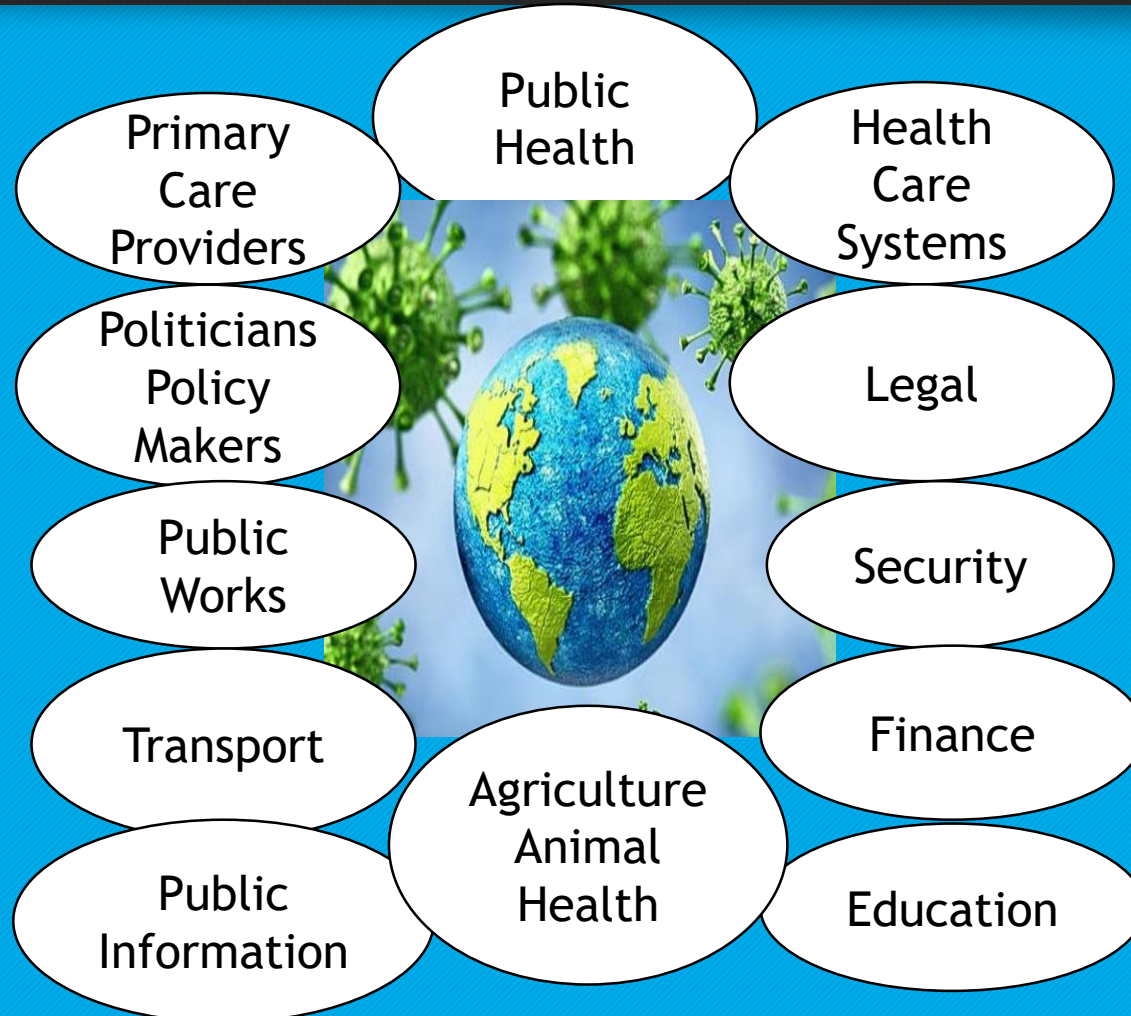
Stakeholders to Global Health Security



INTERNATIONAL



FEDERATION

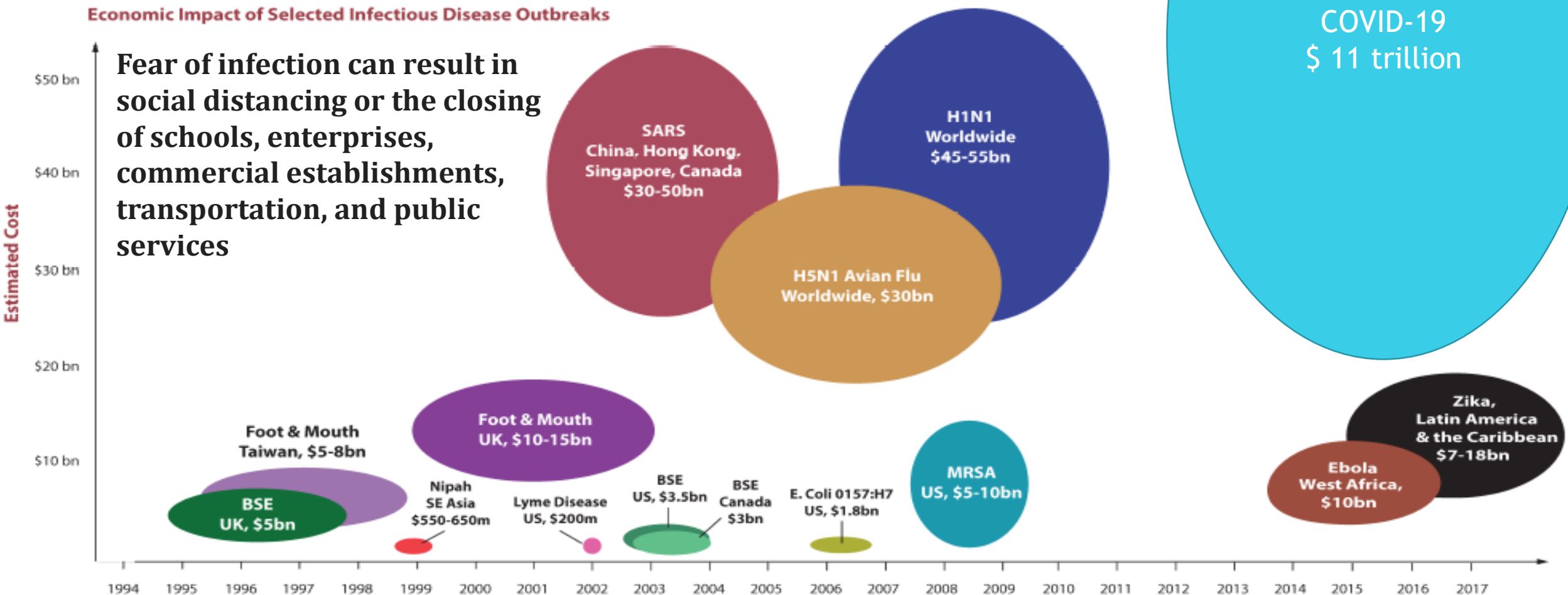


CONFLICT, WAR, HUMANITARIAN ASSISTANCE AND DISEASE

MILITARY

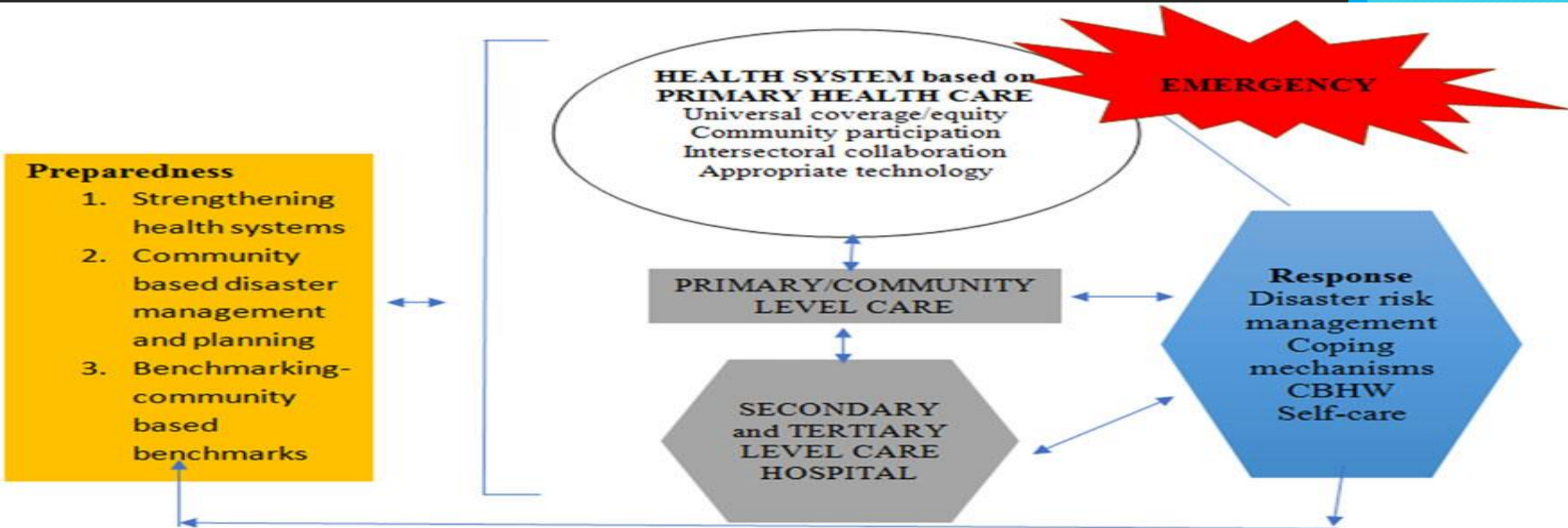
- Until World War II, more war victims died of microbes introduced by the enemy, than of battle wounds. 4 died of Infectious diseases for every 1 killed in combat. (Karlen, 1995)
- More often than not, the victors in past wars were not those armies with the best weapons and generals, but those bearing the deadliest pathogens. Spanish American war 85% of deaths due to Typhoid. (Zinsser, 1943; Diamond, 1998).
- Malaria the Great Conqueror: 1. 28 year old British Serviceman stationed in Germany, called to the Falklands for 4 month. 2. 1945 Burma Front. Japanese were decimated by Malaria and the victory went to the British and Indian troops.

Economic Impacts of Infectious Diseases



Figures are estimates and are presented as relative size. Based upon bio-era, World Bank, and UNDP data. Chart updated by EcoHealth Alliance.

Countries with strong Public Health and Primary Care Systems fare better



Mawardi, F., Lestari, A., Randita, A., Kambey, D., & Prijambada, I. (2021). Strengthening Primary Health Care: Emergency and Disaster Preparedness in Community with Multidisciplinary Approach. *Disaster Medicine and Public Health Preparedness*, 15(6), 675-676. doi:10.1017/dmp.2020.143

2 Case Scenarios



Gardening Phenomena (1999)

Two males are admitted to the same hospital (ages 60. 75) with sudden paralysis, disorientation, fevers. Assumed to have and treated for a bacterial/viral meningitis, but not responding. 8 other patients present to other hospitals with similar symptoms. Samples sent to CDC and initially felt to be St. Louis encephalitis, but CDC revised the diagnosis, 6 weeks after the initial cases. All the patients enjoyed gardening in the evenings. As of 2018, now reported in every state.

Super spreaders Doctor Shopping (2012)

Saudi Arabia, first case with a pneumonia infecting 8 health care workers. 1783 cases with 726 deaths. flu like symptoms. 30% mortality. Korean Businessman travels to Saudi Arabia. 5 days later seen in Korean clinic with flu like symptoms of fever, muscle aches and nonproductive cough. All 186 patients exposed at different hospitals. Affected health care workers. 17000 people quarantined for 14 days, cost \$ 8.5 billion. 2015 Outbreak in Korea with 186 people sick and 38 deaths.

What, Who, Where, When, Why (5 W's to disease process)



- **What** : Transmission (airborne, contact, fecal-oral, vector), Organism (Bacteria, Viral, Parasite, Chemical, Toxin)
- **Who**: group or population affected (children, adults, elderly, co-morbid medical conditions, gender)
- **Where**: location, rural vs. urban
- **When**: temporal relationship (seasonal)
- **Why**: can only be answered once the other questions have been answered

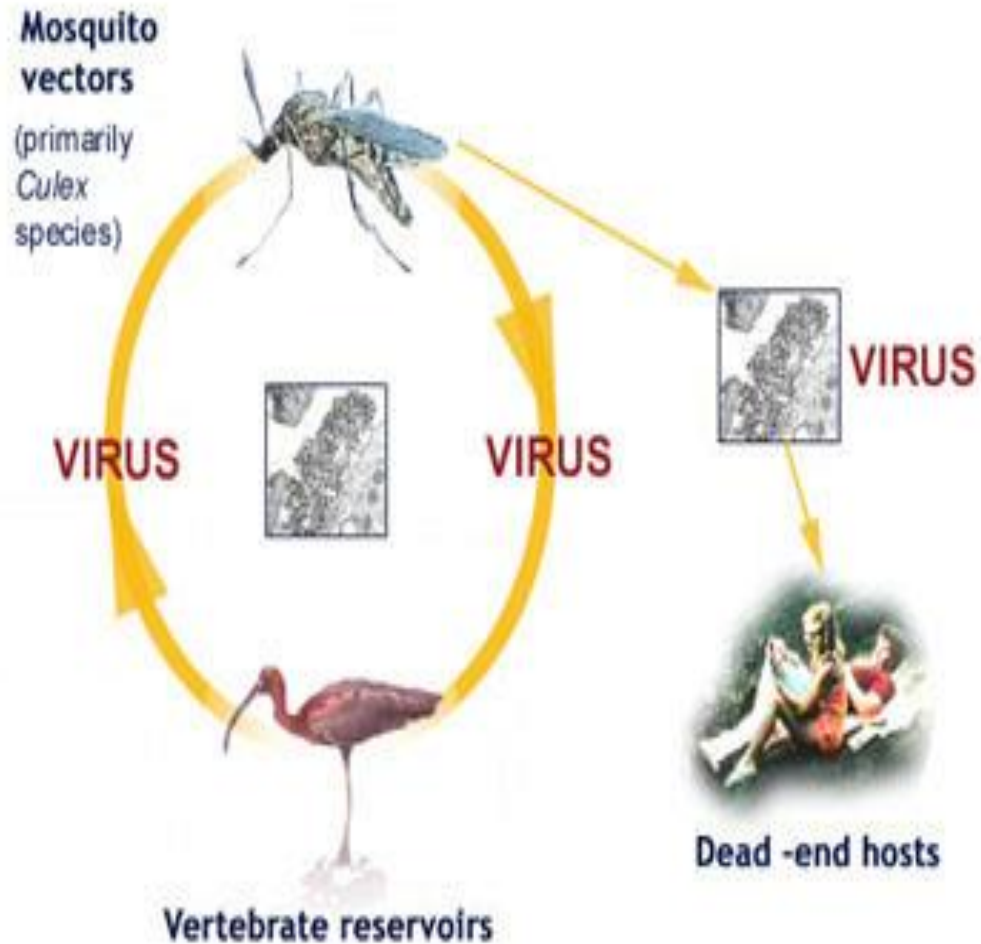
What did these Epidemic Infectious Diseases have in common?



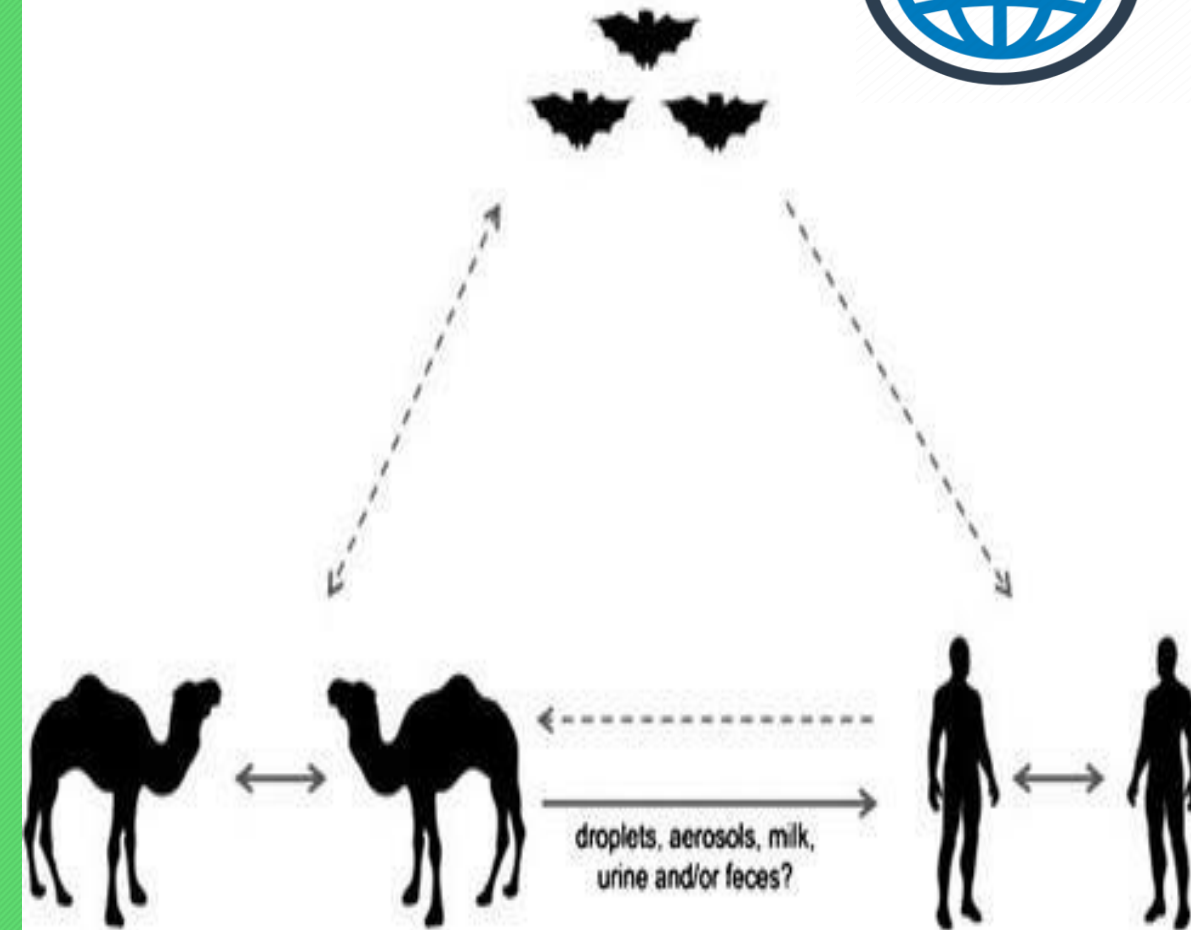
- ALL WERE CAUSED BY ZOO NOTIC PATHOGENS
- ALL SPREAD BY MODERN TRANSPORTATION
- MOST HAD ASIAN ORIGIN
- LABORATORY AND CLINICAL DIAGNOSES WERE PROBLEMATIC
- POOR COMMUNICATION AMONG COUNTRIES
- MAJOR ECONOMIC IMPACT

CASE 1

West Nile Virus Transmission Cycle

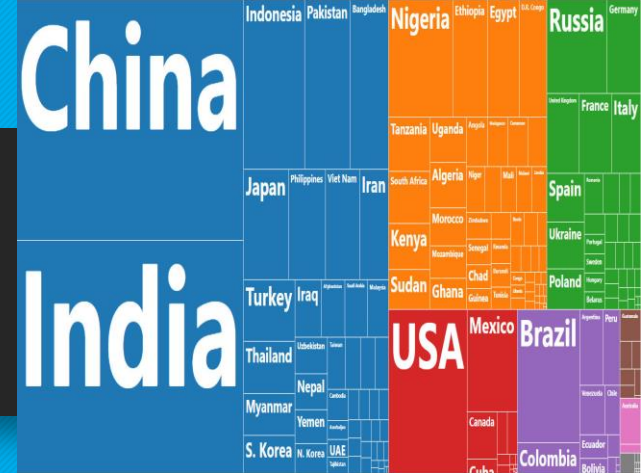


CASE 2



Solid line, documented direction of MERS-CoV transmission
Dashed line, hypothetical direction of MERS-CoV transmission

Urban Crucible: Impacts of urbanization on chronic and infectious diseases



8 BILLION

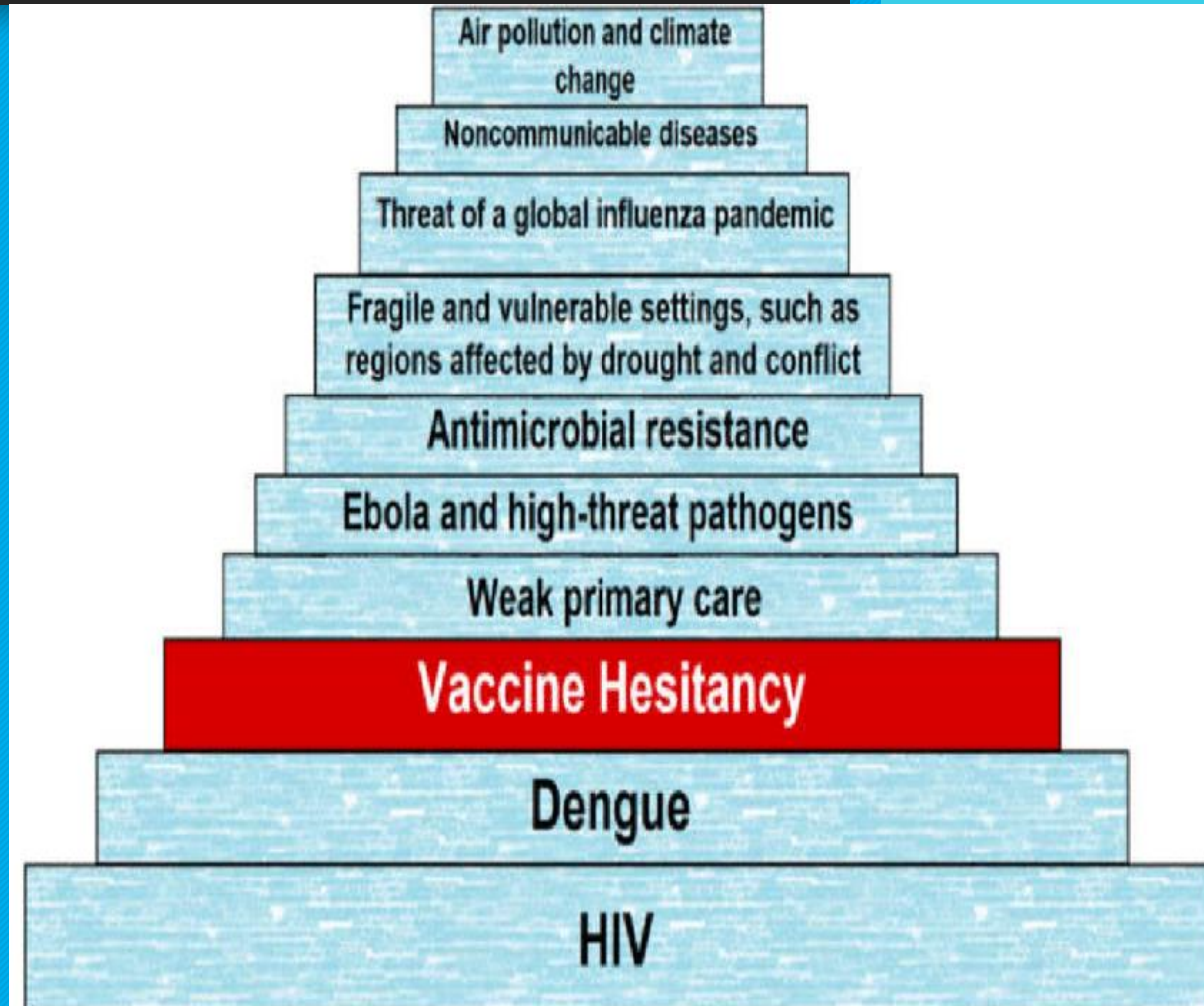


Current Global Threats

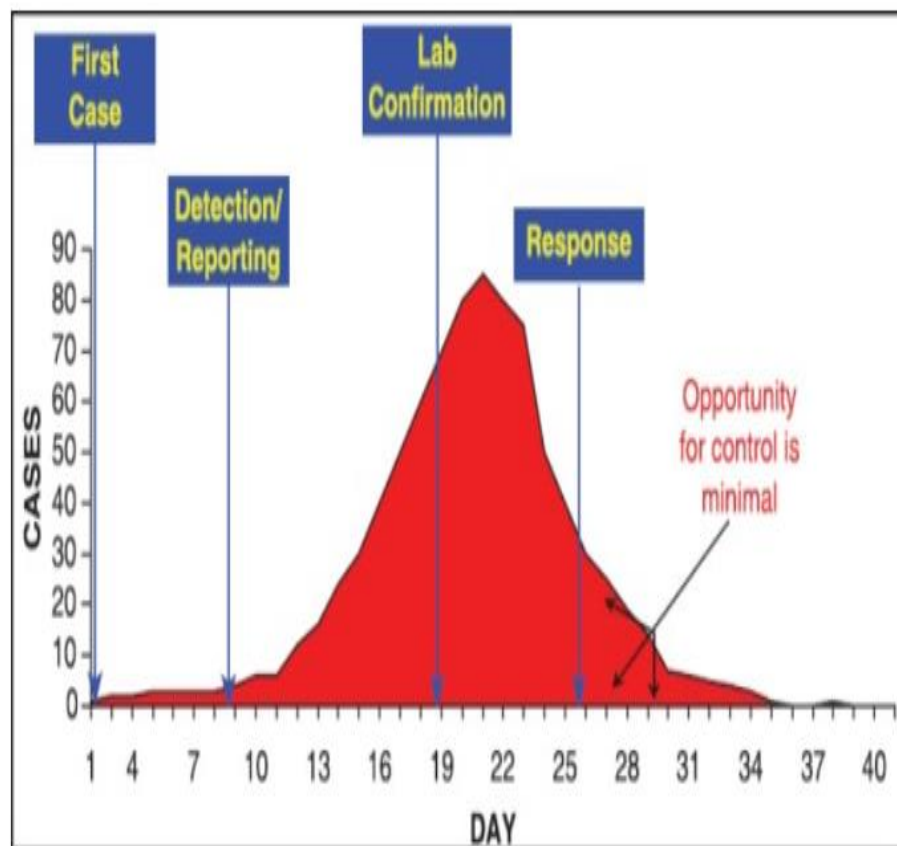


■ Economic ■ Environmental ■ Geopolitical ■ Societal ■ Technological

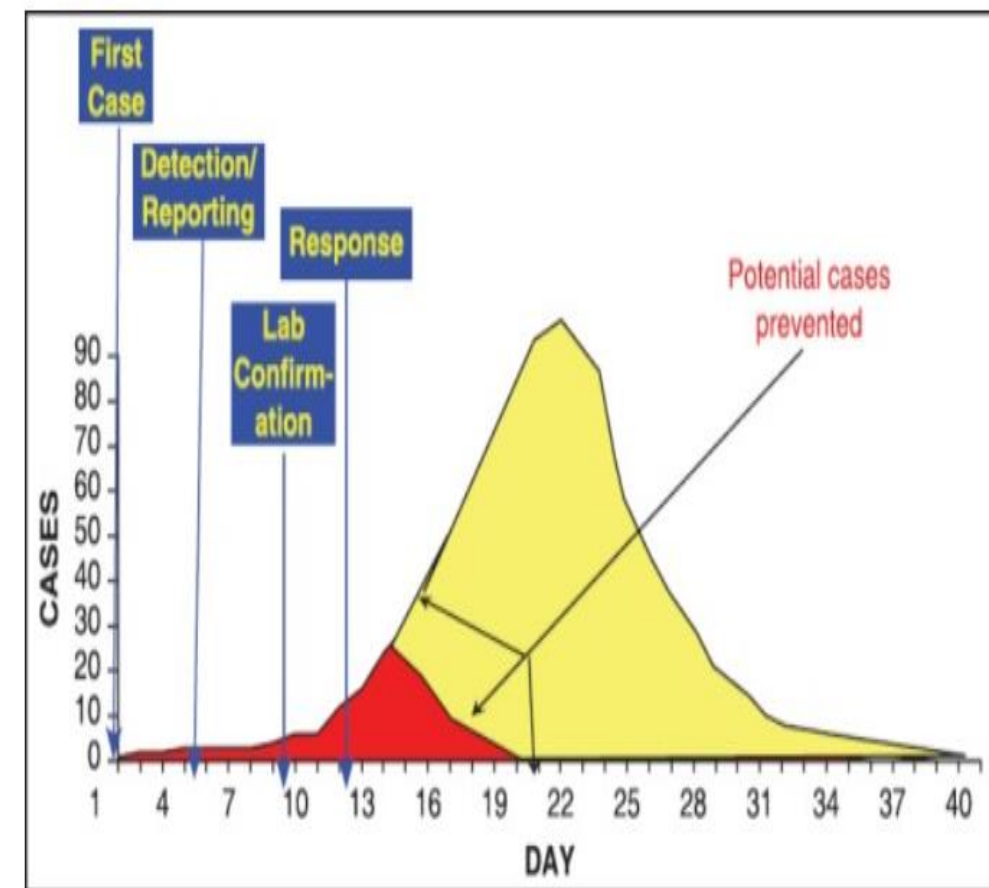
Source: World Economic Forum Global Risks Report 2022



WHY GLOBAL SURVEILLANCE MATTERS



Impact of delayed reporting of infectious diseases by clinicians on disease outbreak control and prevention



Impact of early reporting of infectious diseases by clinicians on disease outbreak control and prevention

Conflict, Refugees, Internally Displaced People, Host Countries, Health



The World at War in 2022

Countries in which armed clashes between state forces and/or rebels were reported in 2022*



* As of Feb 4

Source: The Armed Conflict Location & Event Data Project



statista

THE WORLD'S TOP 10 REFUGEE HOST COUNTRIES



#RefugeeCrisis



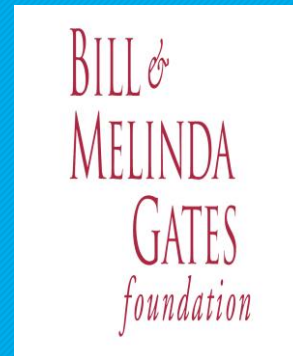
U.S. National Security Strategy of 2002 recognizes Infectious Diseases as a potential danger to the Nations Security



NO UNIVERSAL HEALTH CARE COVERAGE/ 50 STATES EACH WITH THEIR OWN ABILITY TO DETERMINE HEALTH CARE POLICIES/ WHY?

Question?

NAME EITHER THE COUNTRIES INVOLVED OR 3 LARGEST ANNUAL RELIGIOUS PILGRIMAGES



60-75% emerging infectious diseases have a zoonotic origin



Antibiotic Resistance



Antibiotic class



PENICILLINS



MACROLIDES



CARBAPENEMS

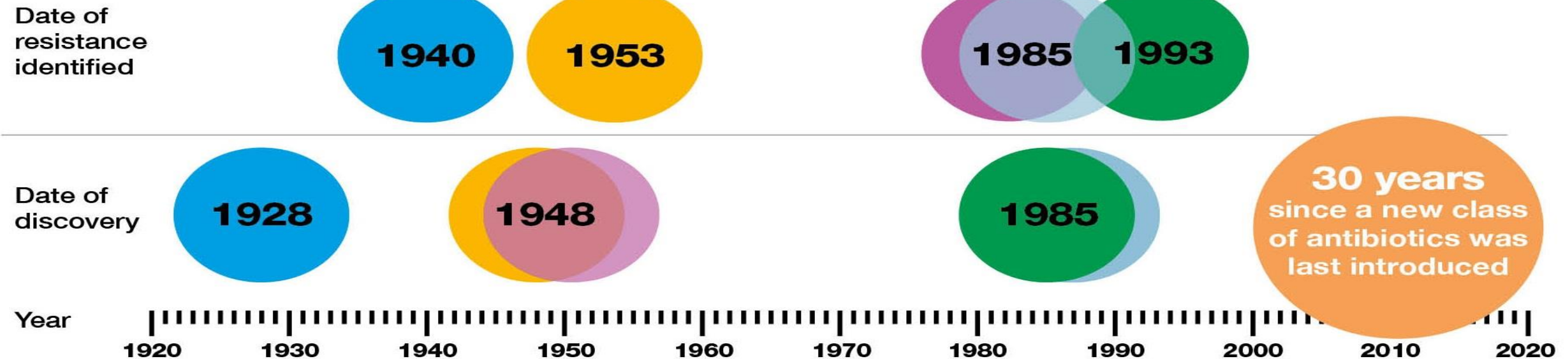


TETRACYCLINES



FLUOROQUINOLONES

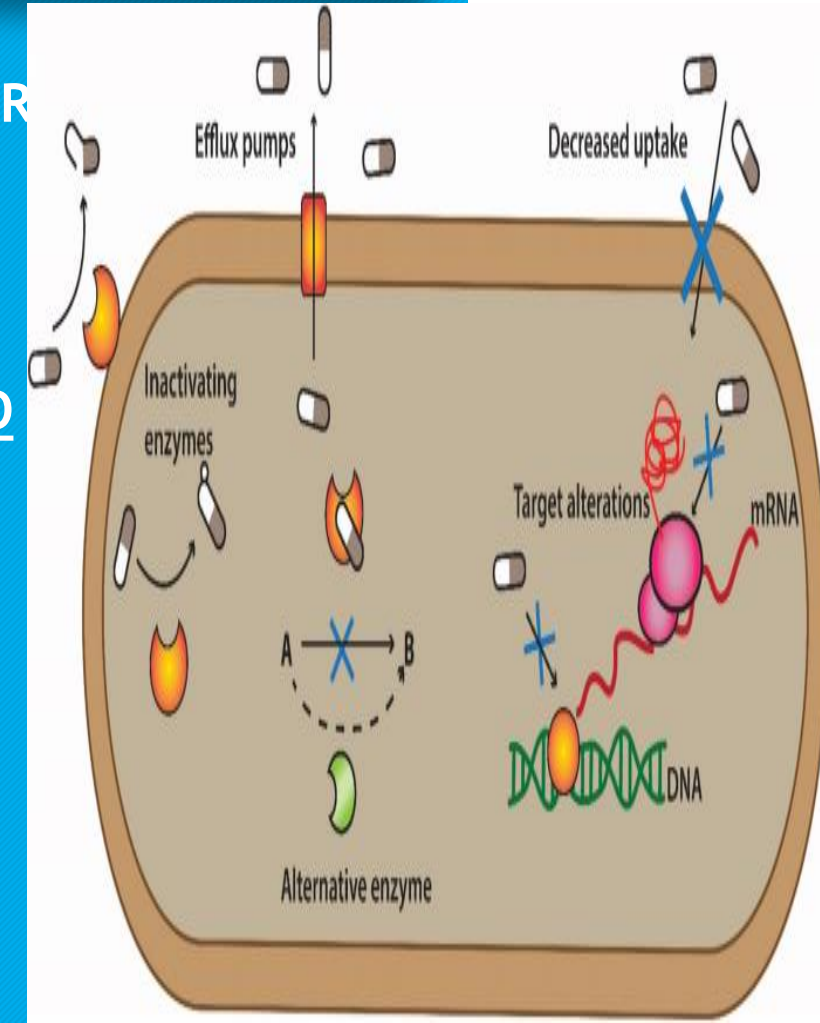
Antibiotic discovery and resistance timeline



HOW PATHOGENS CAN ELLUDE THE IMMUNE SYSTEM?



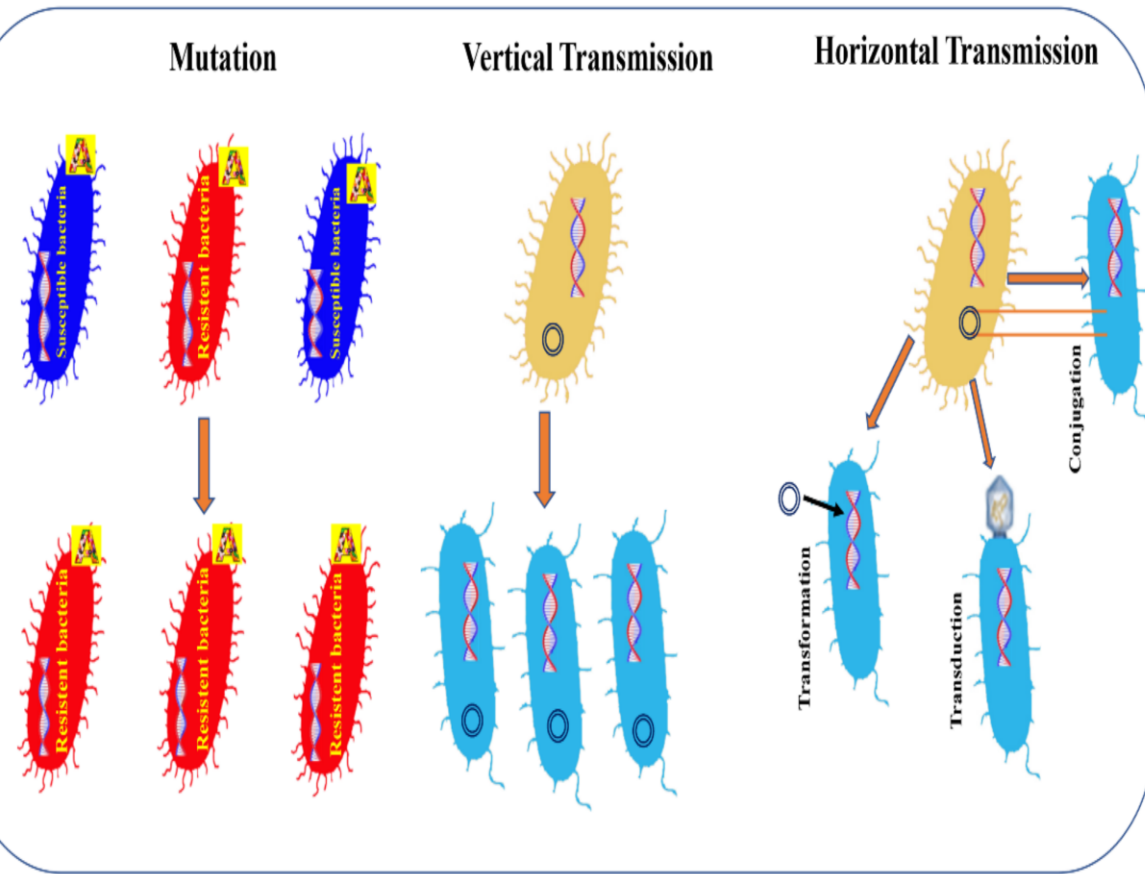
- ANTIGENIC VARIATION: CHANGE SURFACE PROTEINS , COAT, OR ALTER THE DNA (INFLUENZA, STREPTOCOCCUS, TRYPANOSOMES, MALARIA, GONORRHEA)
- LATENCY (DORMANT): HERPES VIRUS
- PREVENTS MACROPHAGES FROM RELEASING COMPOUNDS TO KILL BACTERIA (TB, LISTERIA, TOXOPLASMA)
- AVOID RECOGNITION OF ANTIBODIES BY COATING ITSELF WITH HOST MOLECULES (LYMES, SYPHILIS)
- KIDNAPPING AND PIRACY: SYNTHESIZING COMPLEMENT REGULATORY MOLECULES, INHIBITING MHA SYNTHESIS OR ASSEMBLY, PRODUCING DECOY PROTEINS



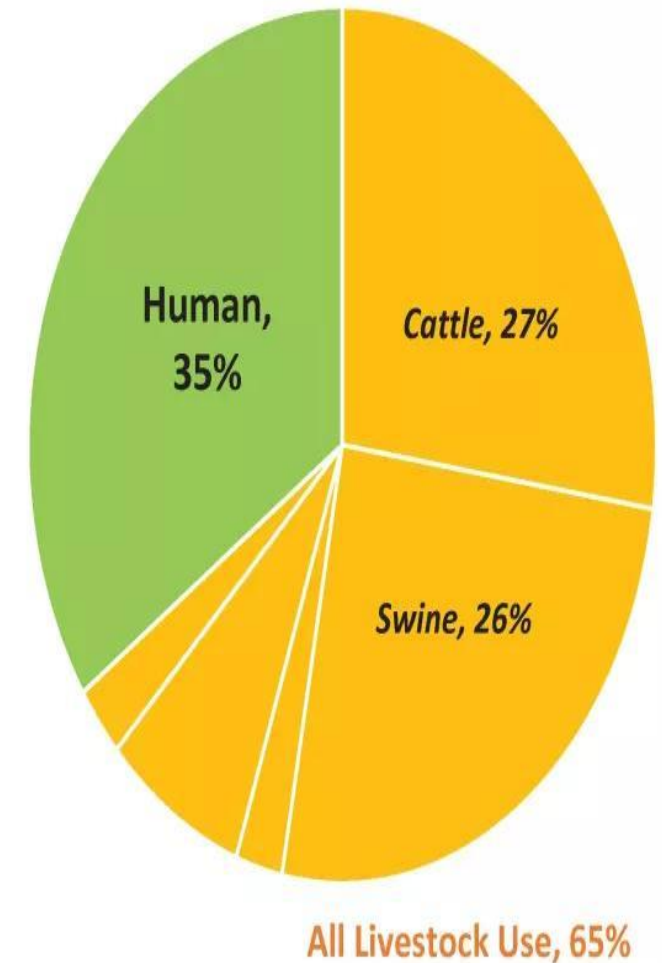
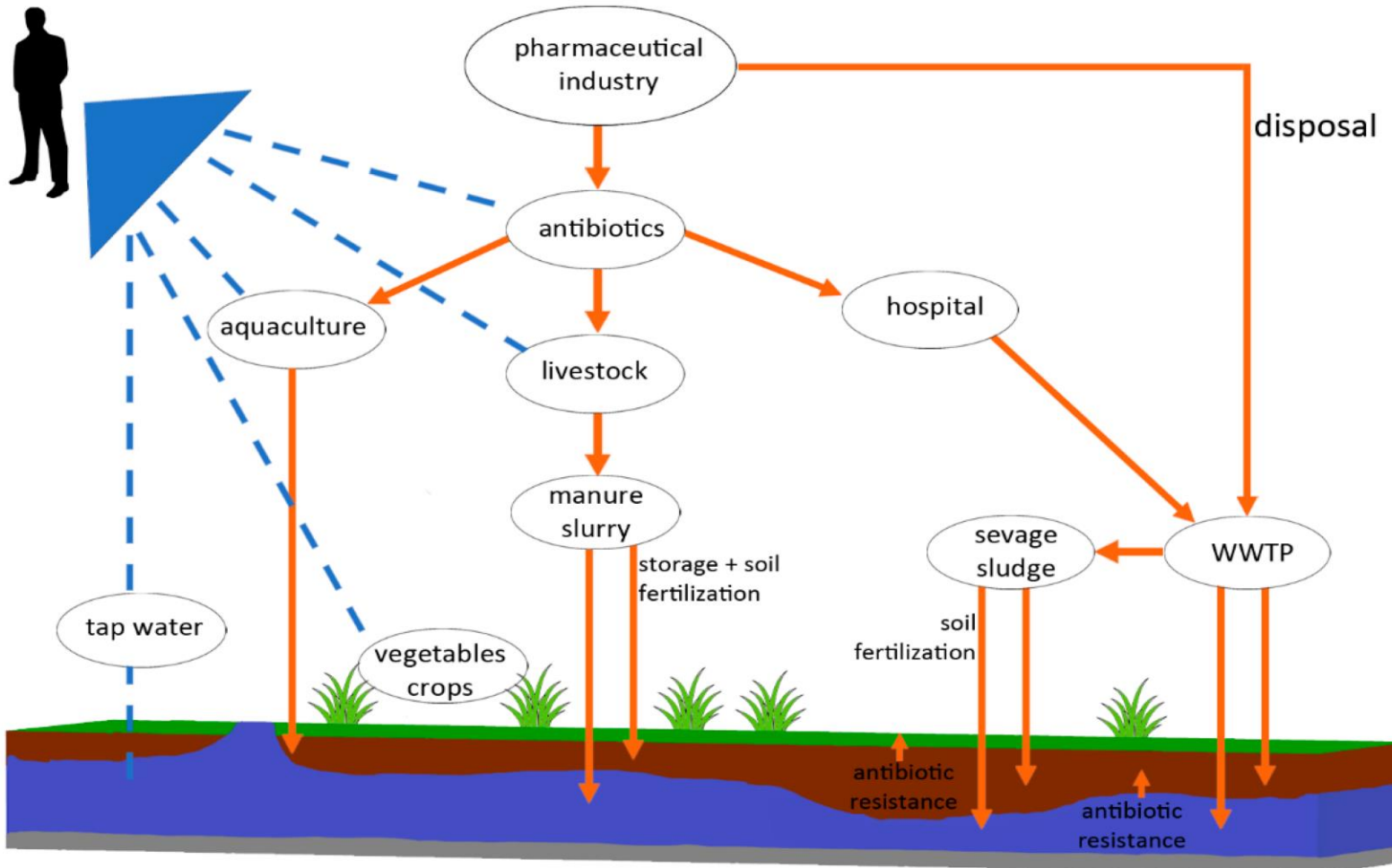
Survival is the ability to adapt



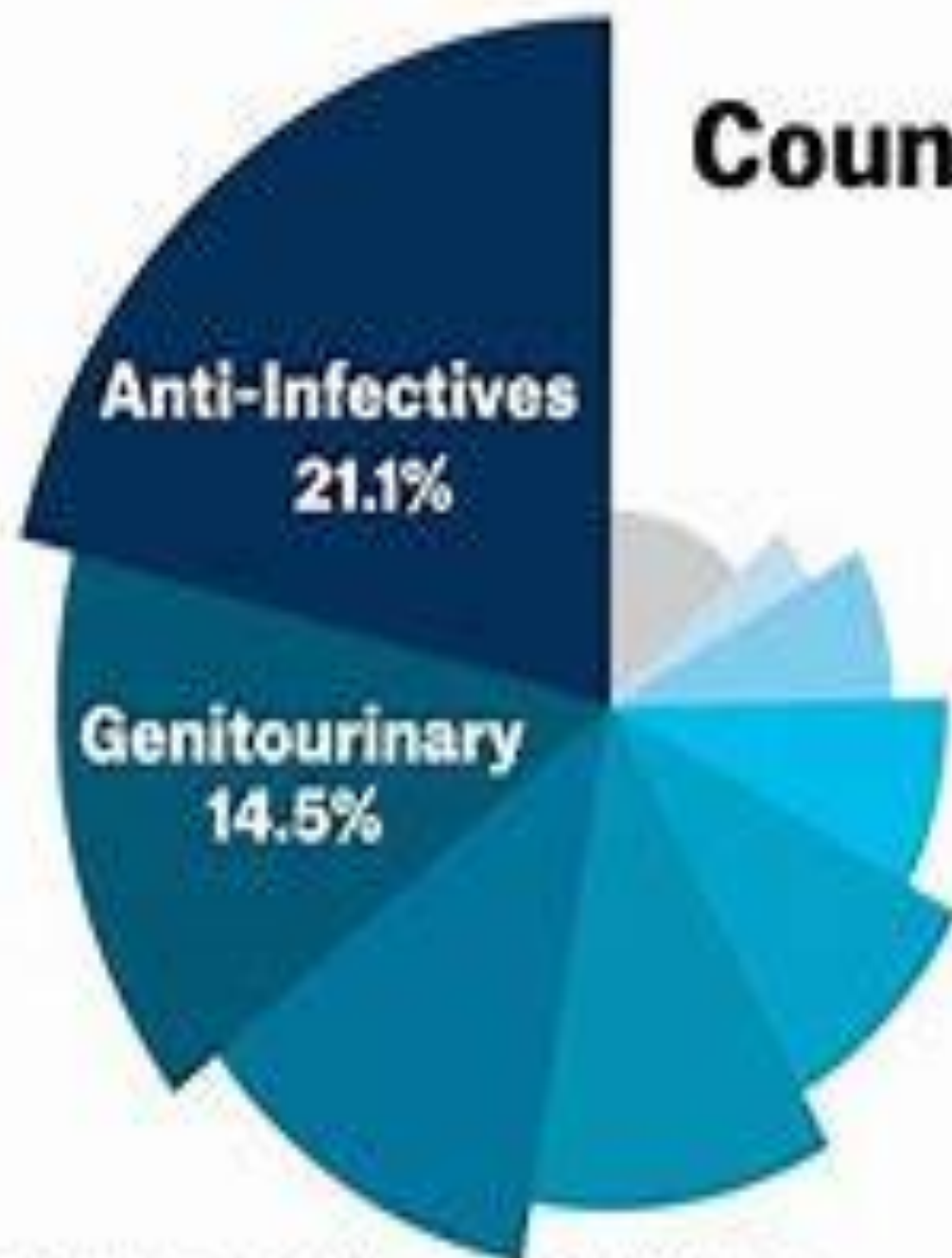
How antibiotic resistance spread



Survival is the ability to adapt



Counterfeit Drugs, by Category



Cardiovascular	11.6%
Central Nervous System	11%
Alimentary	9.1%
Musculoskeletal	8.1%
Metabolism	7.7%
Respiratory	3.8%

SUBSTANDARD MEDS



**\$ 75
BILLION**



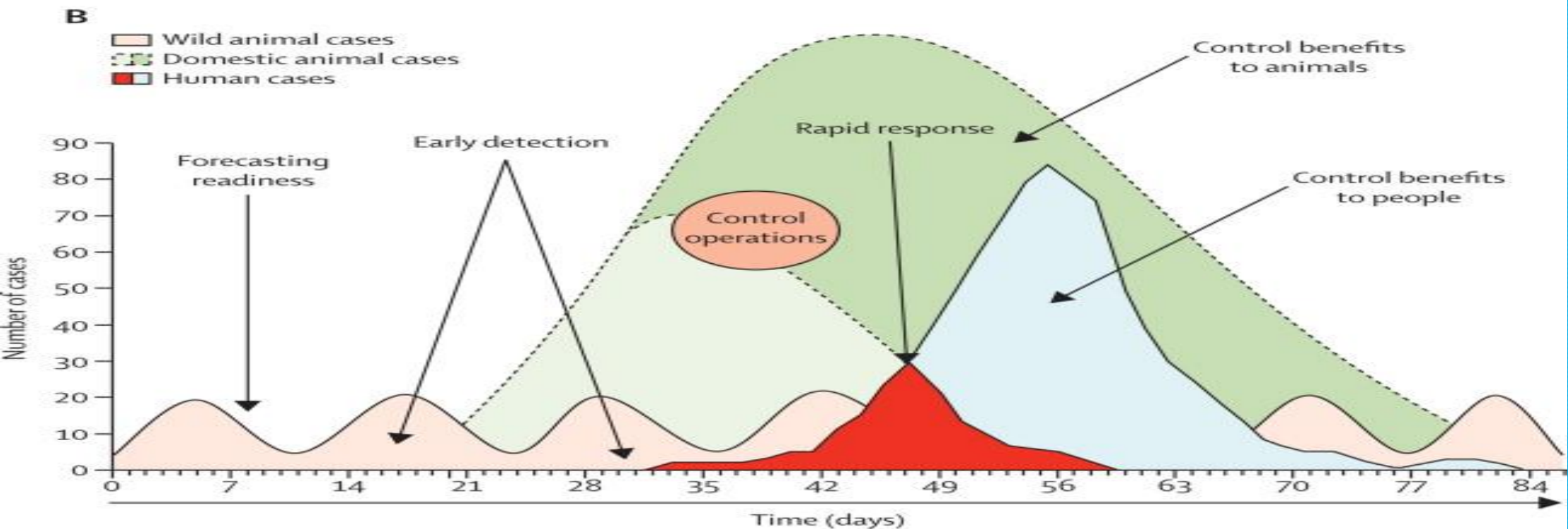
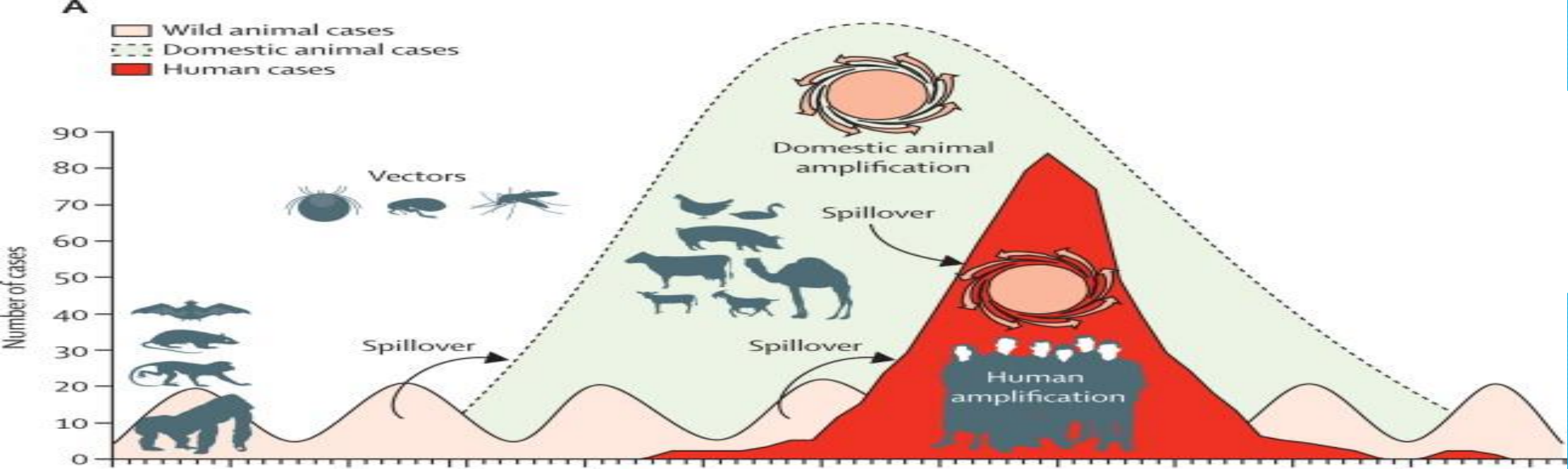
Field Tests and Scanners



The Global Pharma Health Fund (GPHF) Minilab Test Kit

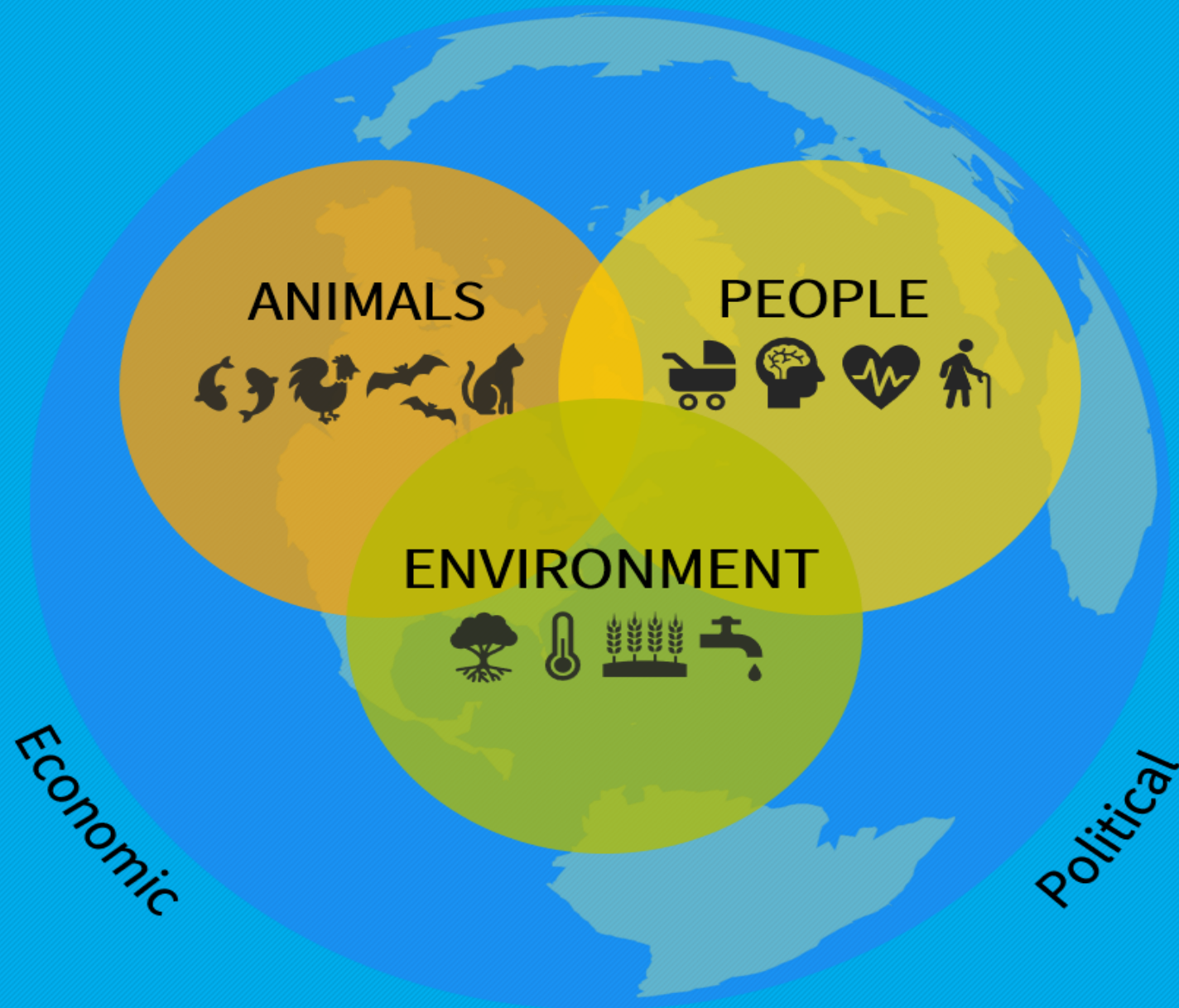


Rahrnan's spectroscopy



ONE HEALTH

Social



Economic

Political



Lessons Learned: 3 years into this pandemic



Where Did We Go Wrong with This Pandemic?

Gernon, L.W. (2022) Where Did We Go Wrong with This Pandemic?.
Open Journal of Emergency Medicine, 10, *-*.
https://doi.org/10.4236/***.2022.****

Lessons Learned: Health care and Public Health Funding



Lack of funding towards pandemic preparedness, health care infrastructure, recruitment and training for health care workers and public health



The escape part with `std::bind` (ID 602) was not found in the 19



Lessons learned: Data reporting/ Accuracy?

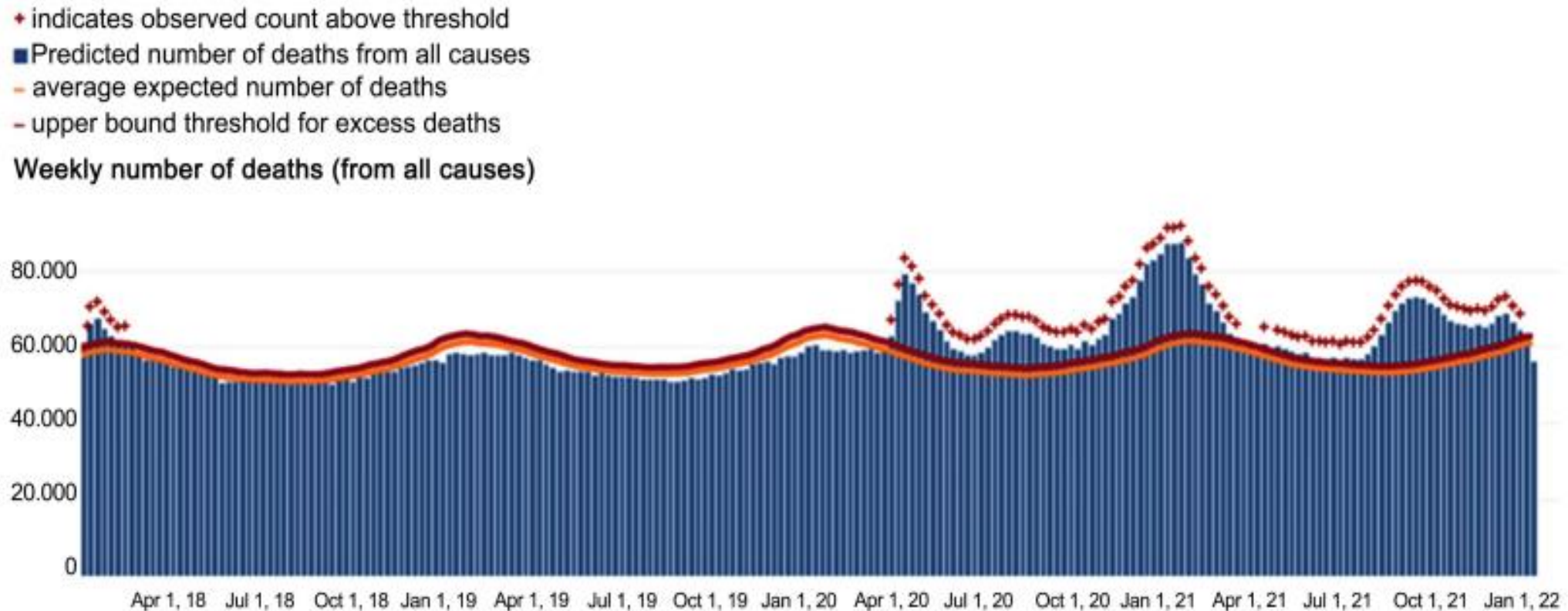


Figure 6. US deaths (Source: https://www.cdc.gov/nchs/nvss/vsrr/COVID19/excess_deaths.htm).

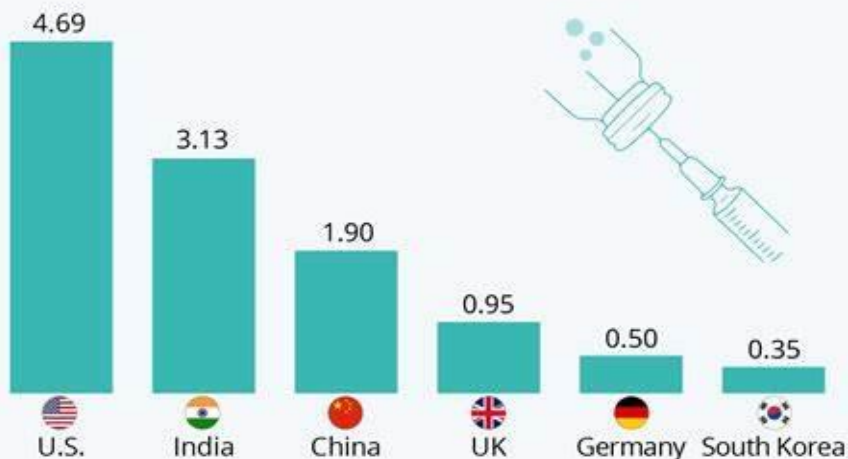
Lessons Learned: Vaccines & Vaccine Equity



Vaccine Nationalism, Shortages, Proprietary Rights

Where Coronavirus Vaccines Will Be Produced

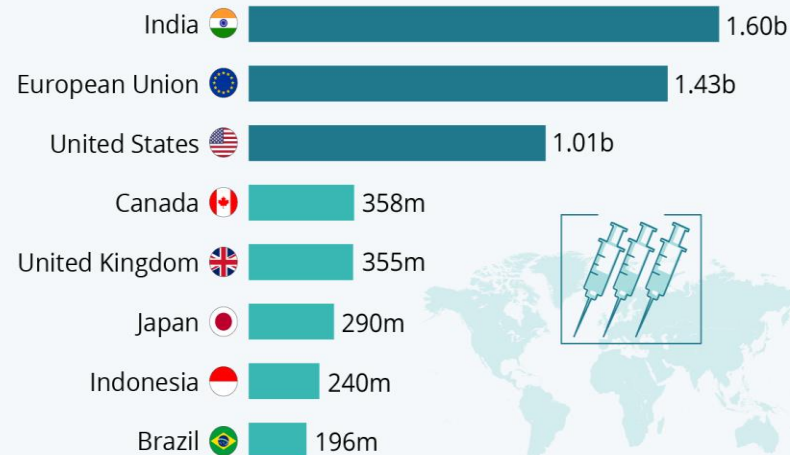
Estimated coronavirus vaccine production capabilities in 2020 and 2021 by country (in billion doses)



Source: Airfinity via DW

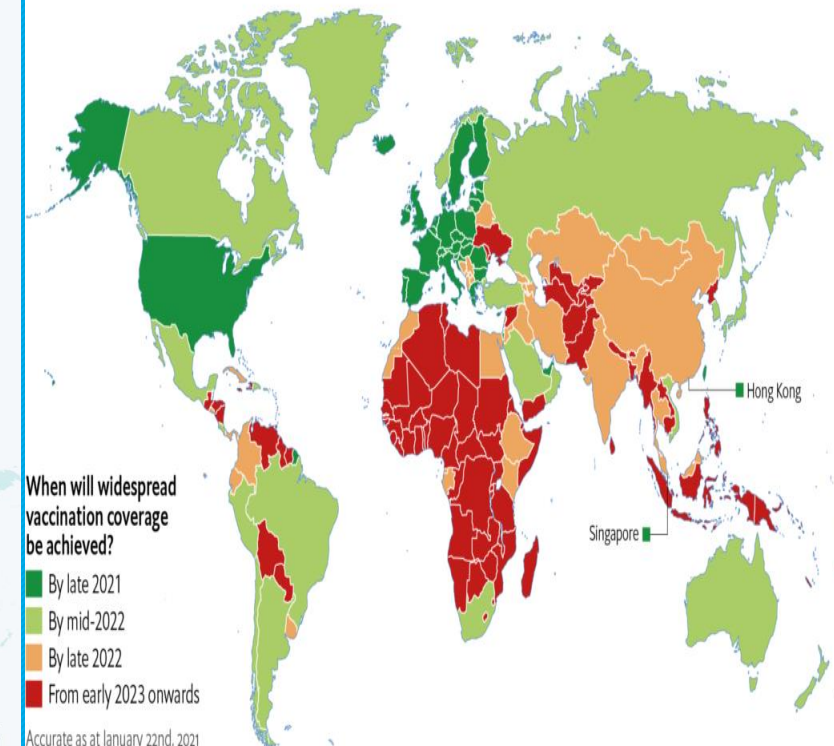
Covid-19 Vaccine Doses Secured By Governments

Total number of Covid-19 vaccine doses secured as of November 20, 2020



Source: Duke University Launch and Scale Speedometer

Rich countries will get access to coronavirus vaccines earlier than others



Accurate as at January 22nd, 2021
Source: The Economist Intelligence Unit.

Lessons learned: Communications & Public Information



effective communication during a public health crisis is not merely about messaging. Instead, it is an interactive process of exchange of information and opinion among individuals, groups, and institutions.

trust is widely recognised as being a central pillar of effective public health crisis management. establishment of trust requires transparency and civic engagement.

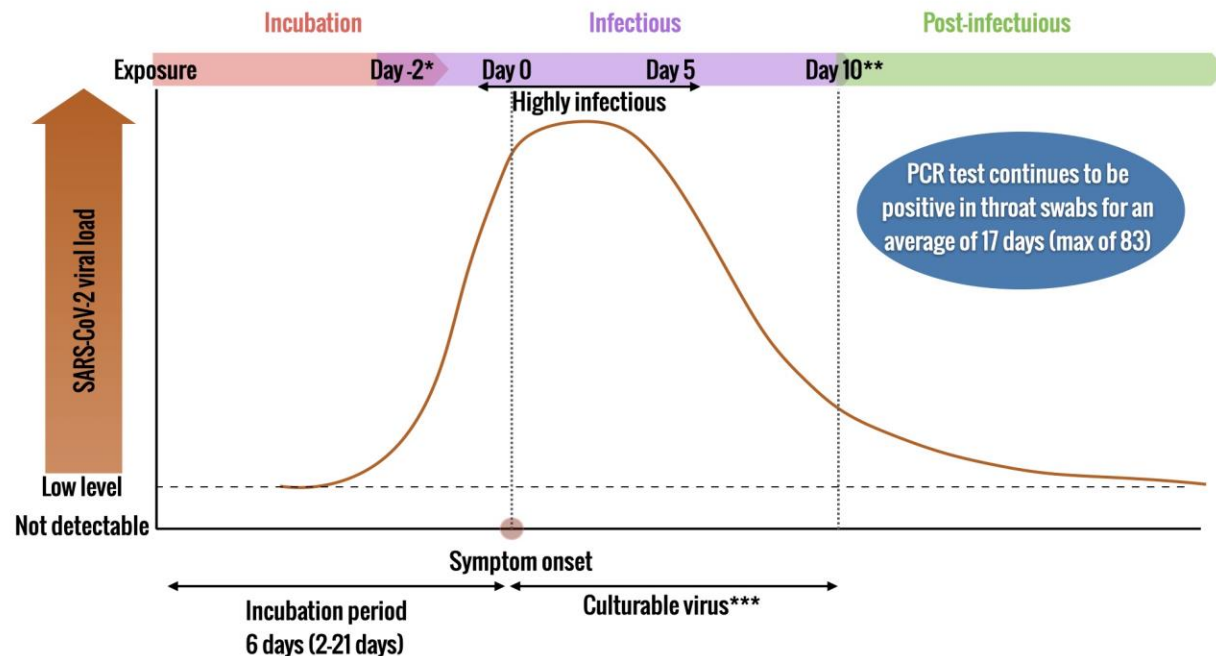
**TRUST, TRANSPARENCY, EMPATHY and
UNCERTAINTY IS INEVITABLE**

Lessons learned: Immunology & Laboratory

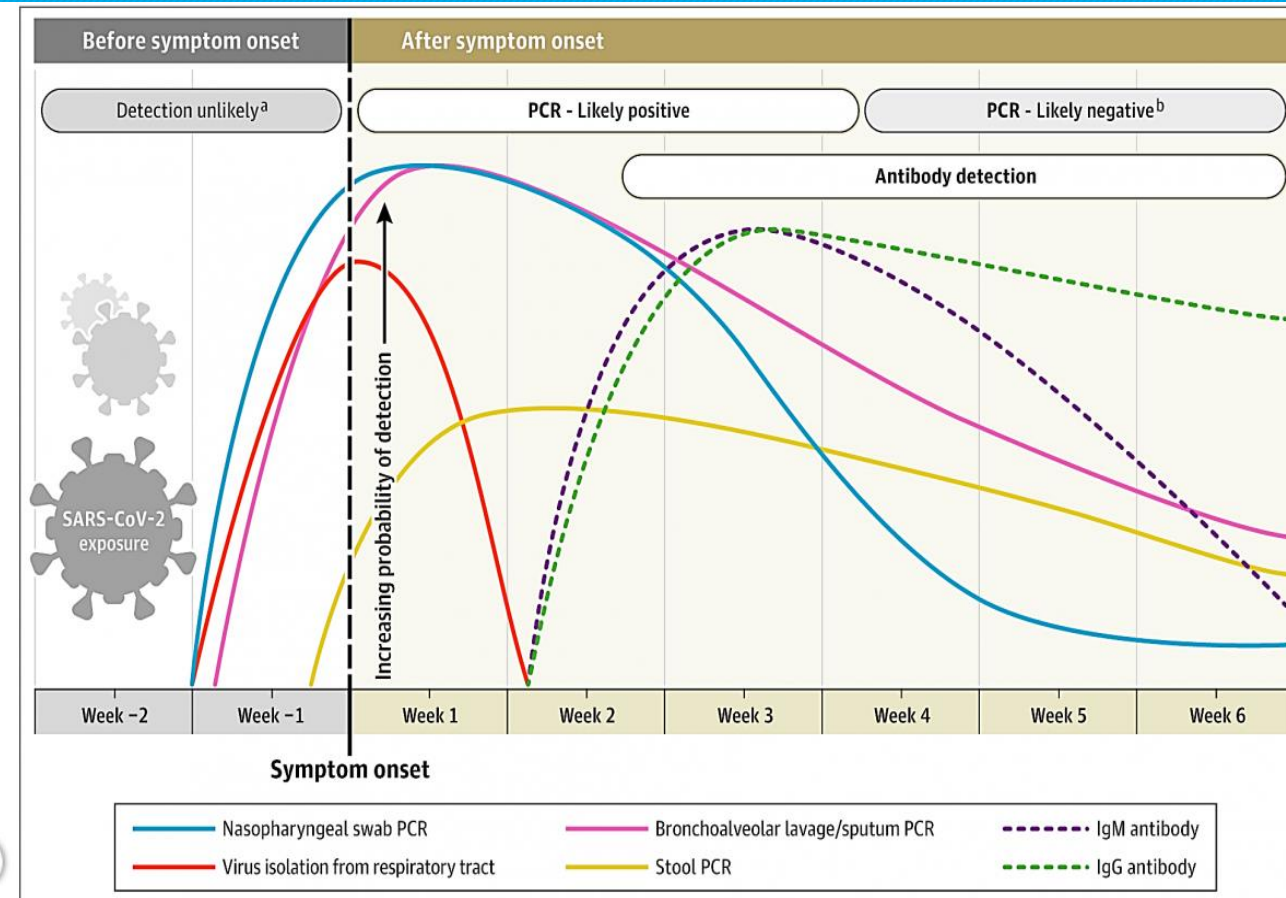


Understanding the Immunology and Laboratory parameters of Covid Infection

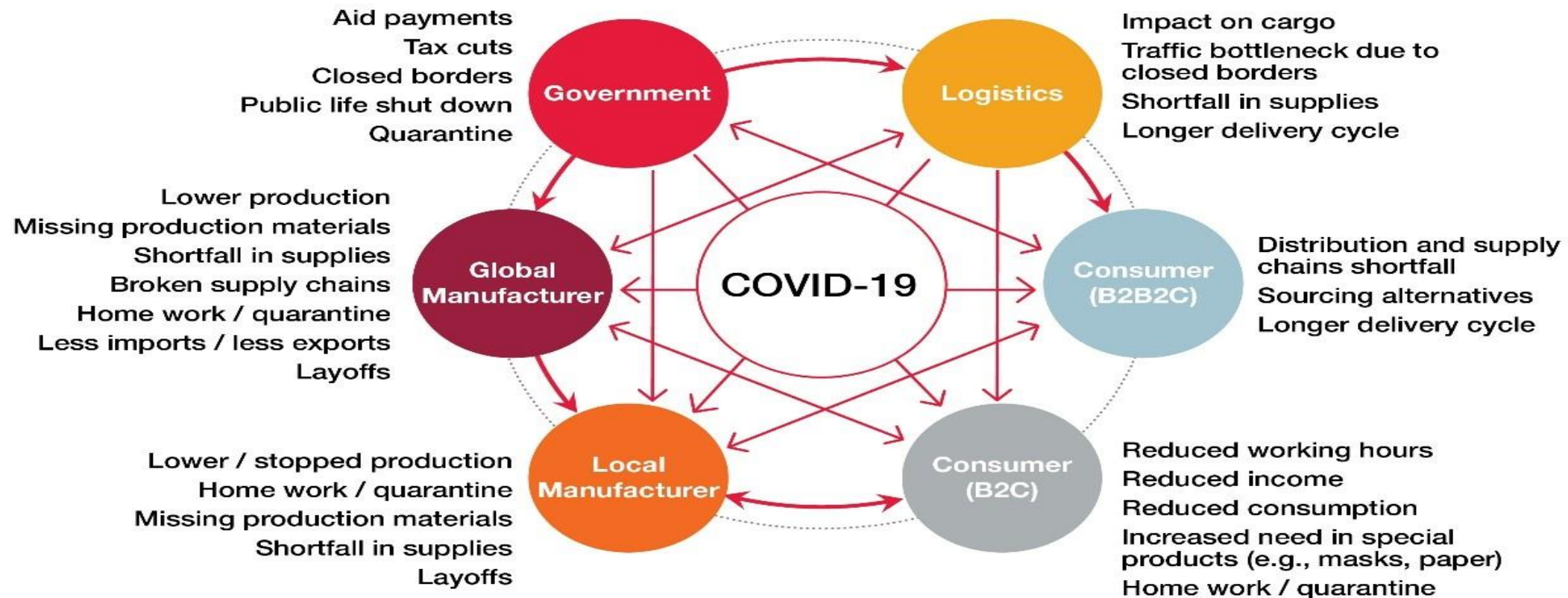
SARS-COV-2 VIRAL LOAD AND PERIOD OF INFECTION



* Individual-level differences are expected
** Patients with severe illness may shed infectious virus up to day 14
*** Based on studies that cultured samples
Source: Cevik M et al: <https://doi.org/10.1101/2020.07.25.20162107>



Lessons learned: Global supply chains



Lessons learned: National Responses



The Best and Worst Rated National COVID-19 Responses

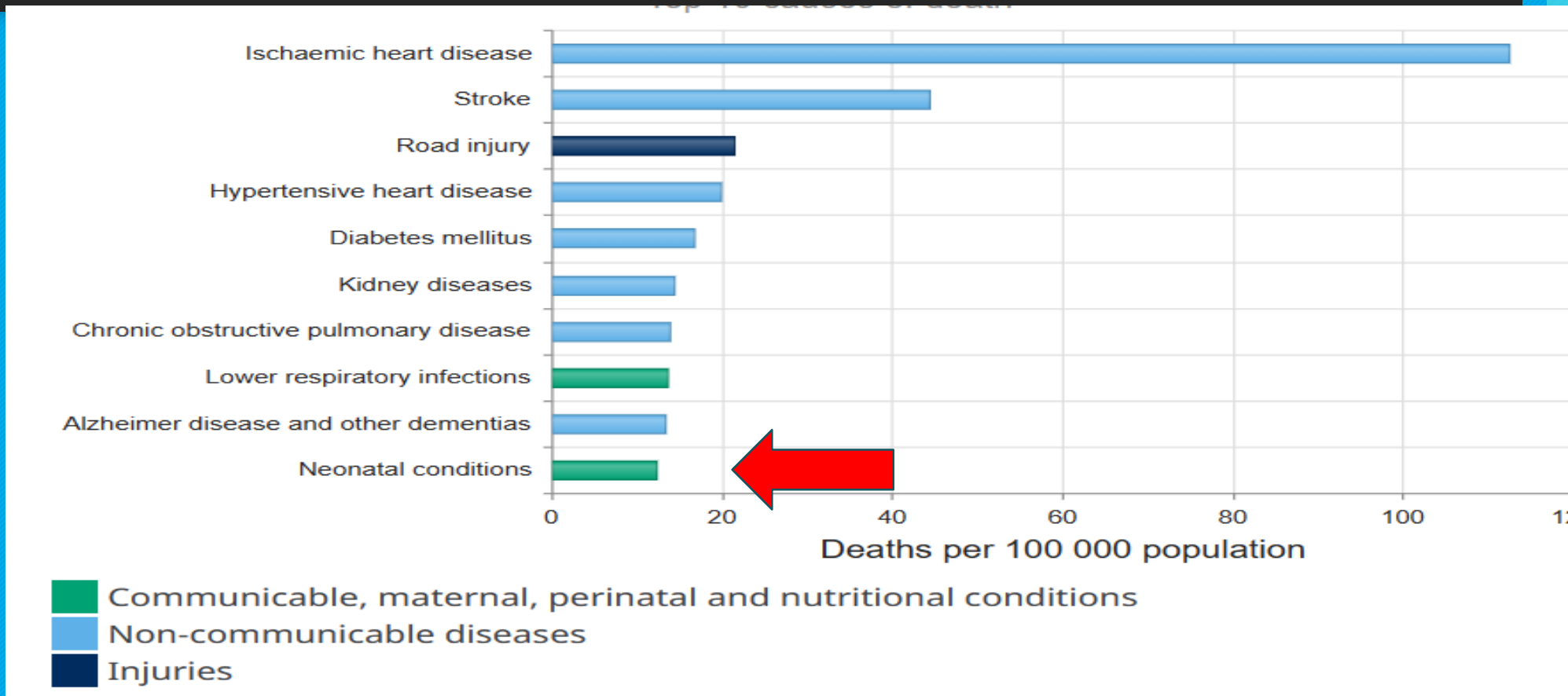
Countries with best/worst net approval rating for government handling of COVID-19 (2 June)



Approval ratings calculated by subtracting 'handling badly' from 'handling well' response shares.

Sources: YouGov, Our World in Data

Lessons learned: Chronic Diseases vs. Communicable Diseases



Top 10 causes of death in Islamic Republic of Iran (2019)

In preparation for the next epidemic/pandemic:



Should Nations and Regions develop collaborative research facilities for sharing health data, surveillance, laboratory capabilities and vaccine production and how do we engage in this process?

What is the mechanism for reporting possible communicable or novel infections?

Is digital surveillance and telemedicine an acceptable means of contact tracing and disease surveillance?

How prepared is your locality for natural disasters?

How do we engage Government in providing continuous resources, training, funding to health care/public health and emergencies?

Should Governments develop a Strategic National Stockpile given the shortages we have seen in the Global supply chain?

