COLLEGE OF
OSTEOPATHIC MEDICINE
at the Cherokee Nation

History & Pandemics

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TERMINOLOGY

Terminology

- OUTBREAK
  - Disease occurs in a greater number than expected
  - Occur in a community or a region, or can occur during a season
- EPIDEMIC
  - Illness in a community or a region that clearly exceeds normal expected level
- PANDEMIC
  - Worldwide epidemic of a disease

WHO Pandemic Phases

Phases	Phase Description	Level
Inter-Pandemic Phase	Low Risk of Human Cases	1
New Virus in Animals, No Human Cases	Higher Risk of Human Cases	2
Pandemic Alert	No or Very Limited Human-To-Human Transmission	3
New Virus Causes Human Cases	Evidence of Increased Human-To-Human Transmission	4
	Evidence of Significant Human-to-Human Transmission	5
Pandemic	Efficient and Sustained Human-to-Human Transmission	6

Terminology

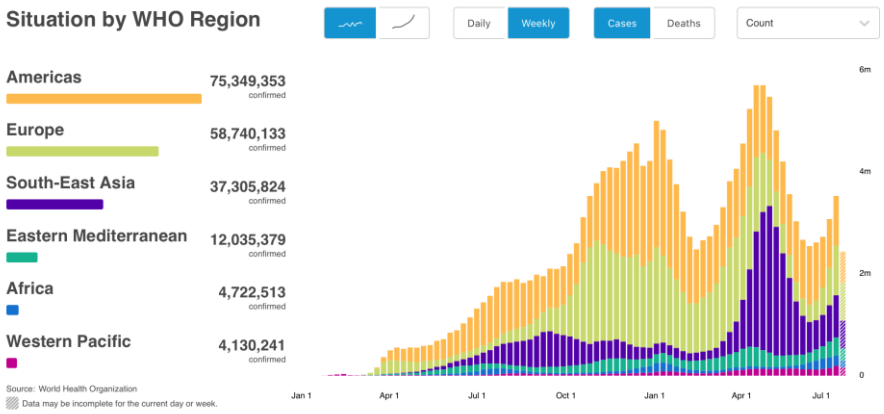
- Cell Tropism
  - Ability of a pathogen to infect a particular cell type
- Endemic
  - Prevalence of human infection
- Fomite
  - An inanimate object that transmits infection
- Host-Switching
  - Process by which a pathogen adapted to one host species becomes adapted to another host species
- Disease Emergence
  - Appearance of a disease in a new host
- Zoonosis
  - Human infection caused by an animal pathogen that may be either a dead-end infection or that may initiate person-to-person spread

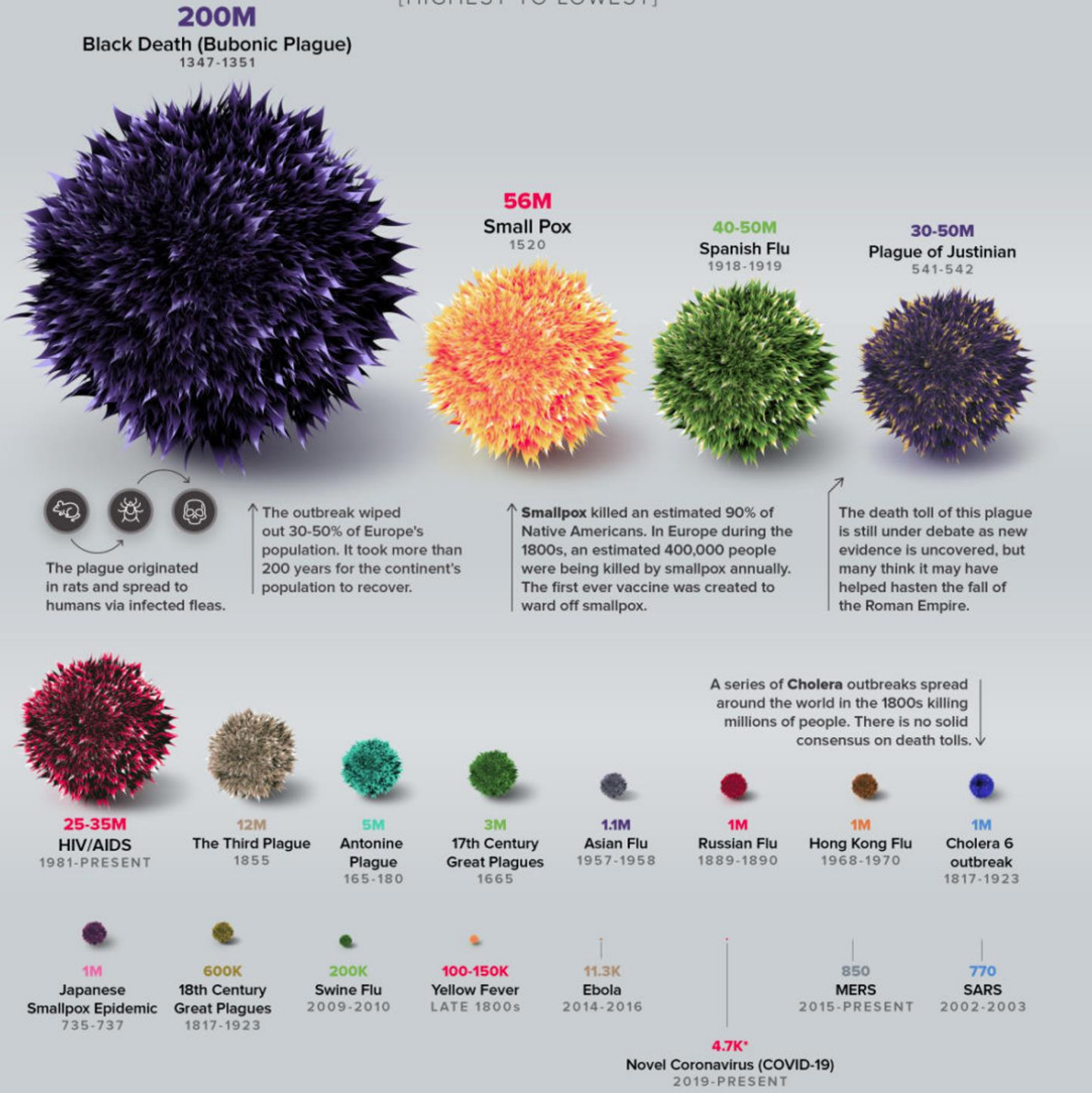
Death Toll

Major Pandemics
(High to Low)

- Graphic – March 2020

- WHO (July 23, 2021)
  - Cases: 192,284,207 (confirmed)
  - Deaths: 4,136,518 (confirmed)
  - Vaccine doses (3,646,968,156)

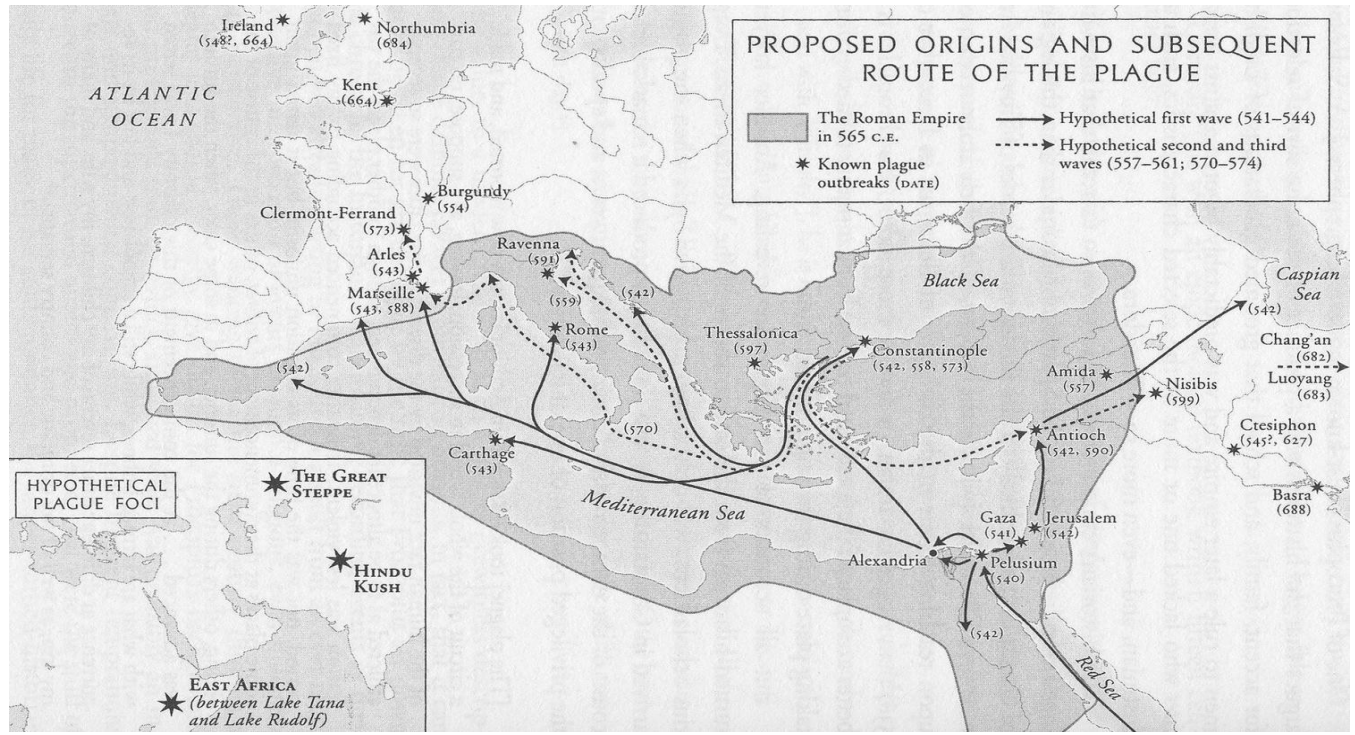




HISTORY

The Plague of Athens, Michiel Sweerts, c. 1652-1654

The angel of death striking a door during the plague of Rome; Source: https://wellcomeimages.org/indexplus/image/V0010664.html



By Josse Lieferinxe - Unknown source, Public Domain, https://commons.wikimedia.org/w/index.php?curid=539827

The Chronicles of Gilles Li Muisis (1272-1352), abbot of the monastery of St. Martin of the Righteous, Bibliothèque royale de Belgique, MS 13076-77, f. 24v.

Pieter Bruegel the Elder, *Triumph of Death*, c. 1562, Museo del Prado, Madrid.

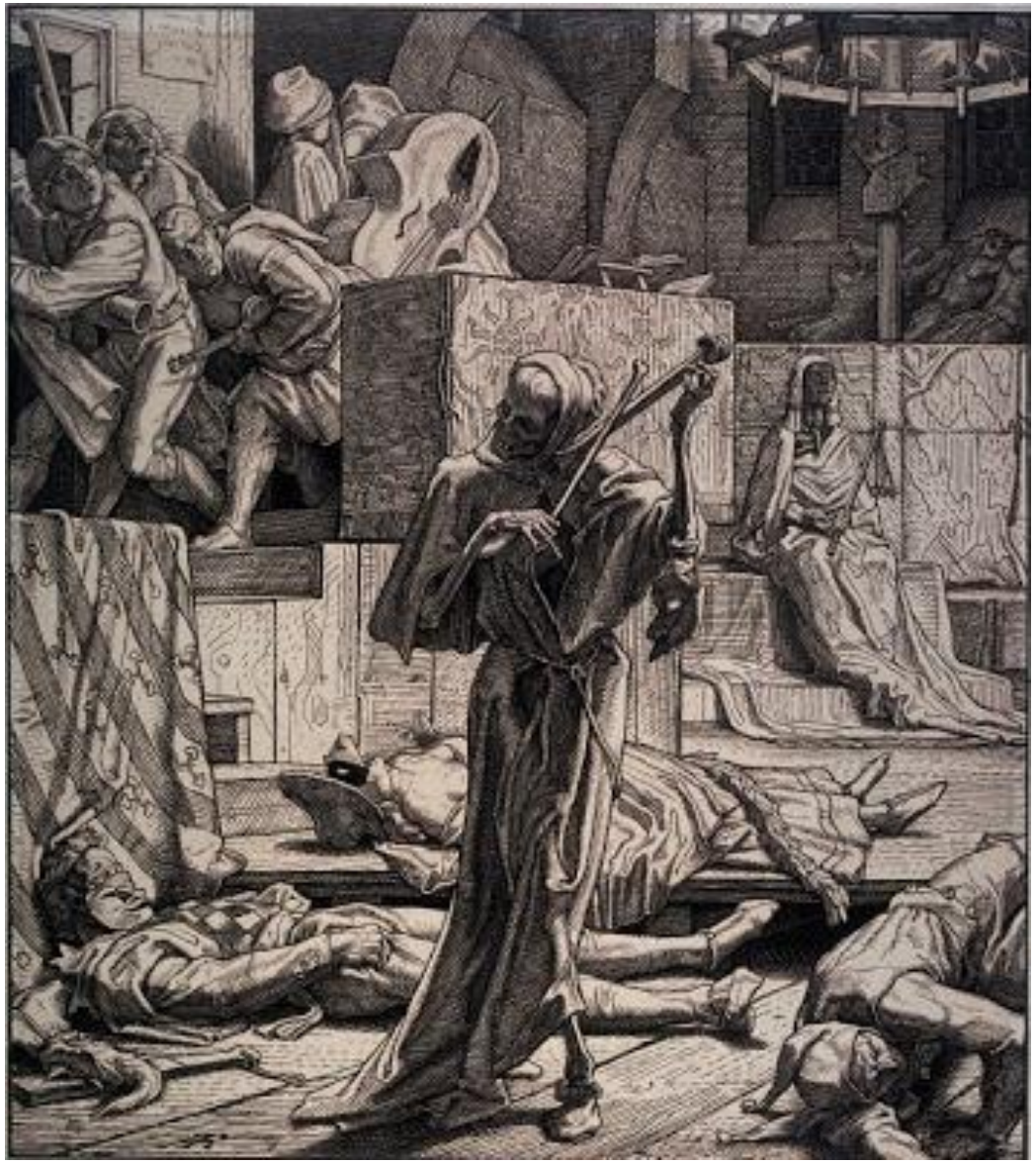
"That night, the balls were more crowded than ever; hilarious laughter all but drowned the louder music; one grew hot in the chahut [dance], and gulped all kinds of ices and other cold drinks—

when suddenly the merriest of the harlequins felt a chill in his legs, took off his mask, and to the amazement of all revealed a violet-blue face.

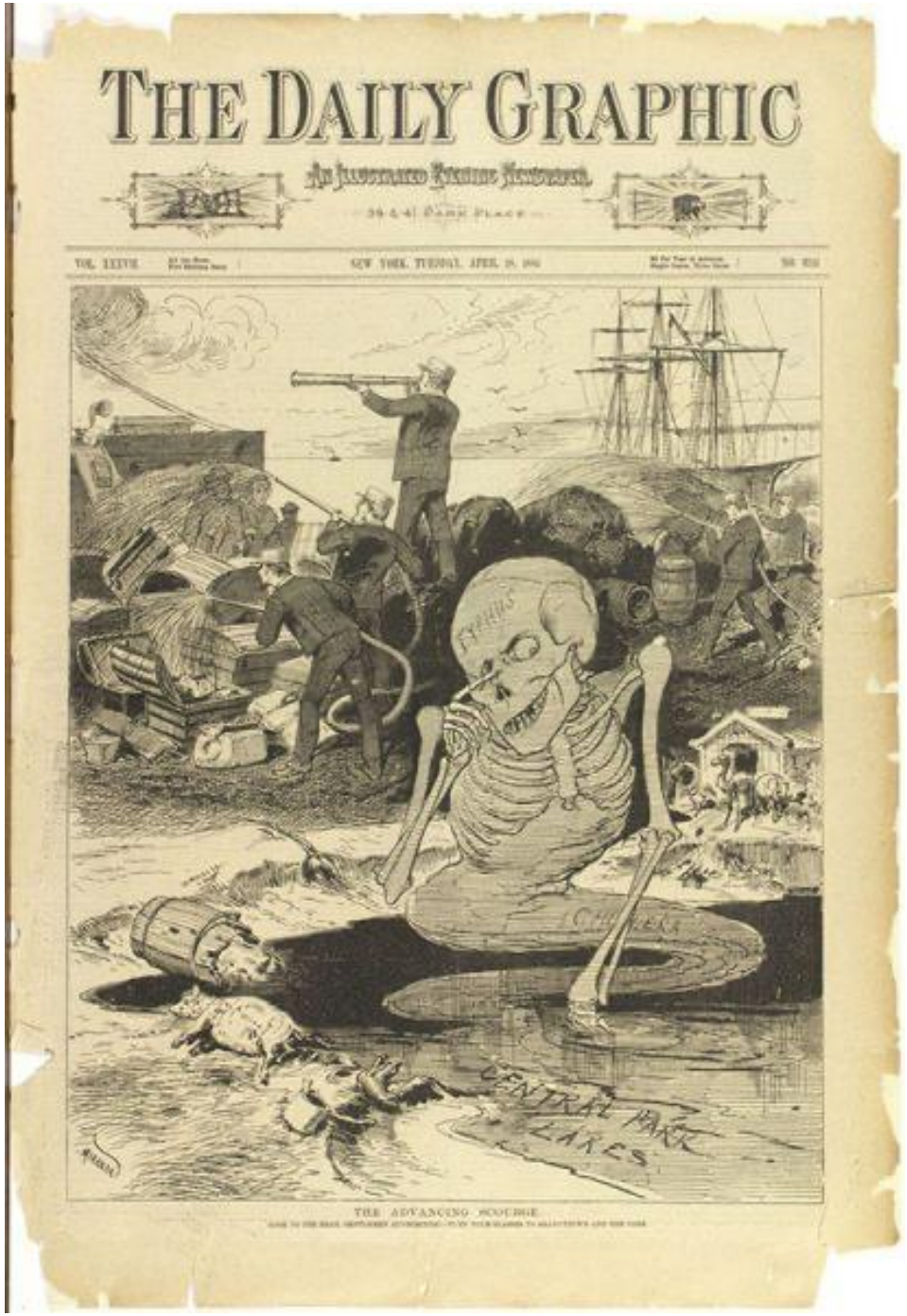
It was soon discovered that this was no joke; the laughter died, and several wagon loads were driven directly from the ball to the Hotel-Dieu, the main hospital, where they arrived in their gaudy fancy dress and promptly died, too...

[T]hose dead were said to have been buried so fast that not even their checkered fool's clothes were taken off them; and merrily as they lived they now lie in their graves.

~ Heinrick Heine, 1832



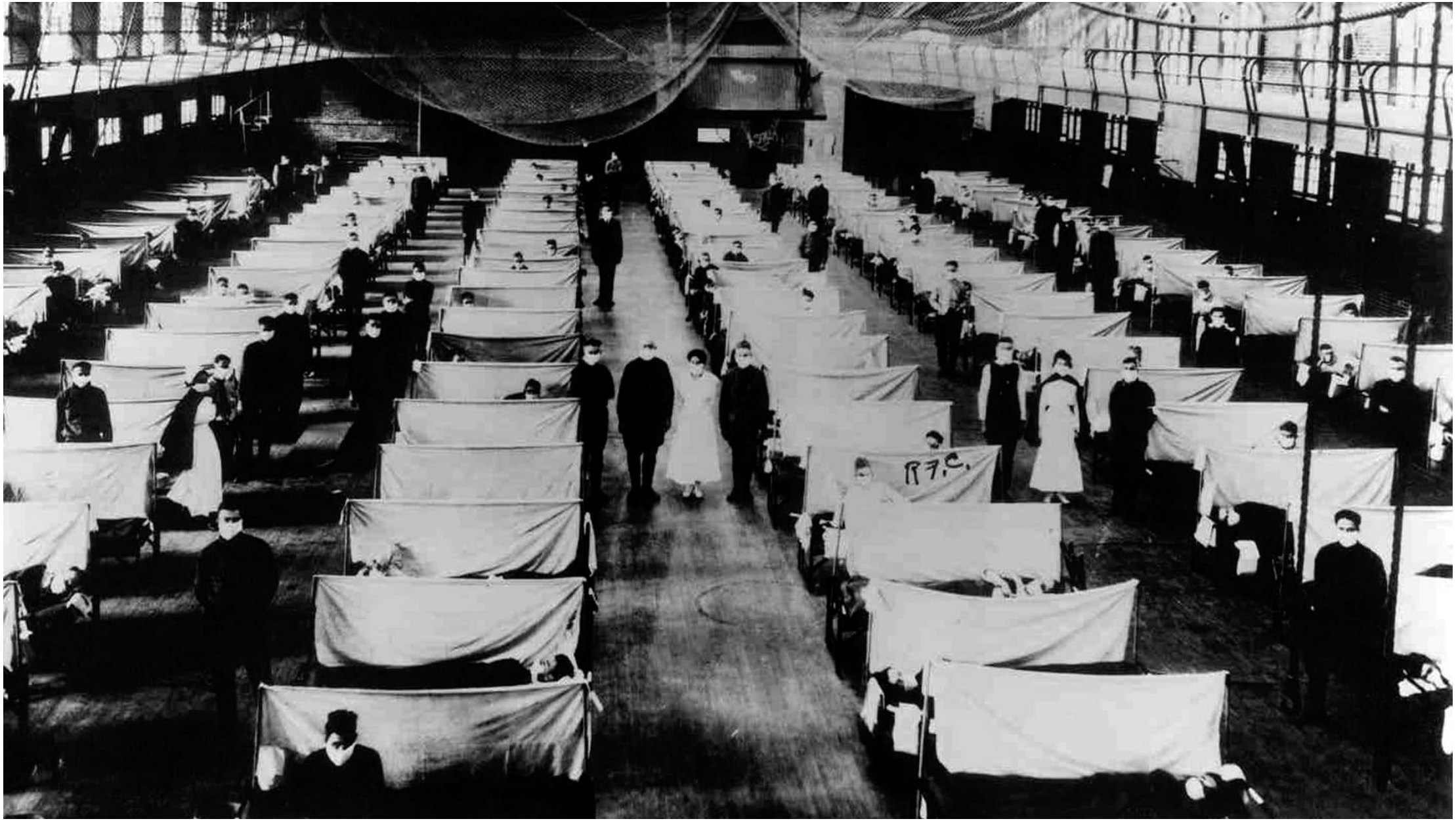
Rethel, Alfred “Death as Cutthroat” (1851)



Central Park Lake
New York, 1885

"The Advancing Scourge," from The Daily Graphic, April 28, 1885.

Year (s)	Pathogen	Geographic Location	Cases/mortality	Other Notes
1918-1920	Influenza (Spanish Flu)	Worldwide	500 million cases / ~ 50 million deaths	The Spanish flu claimed the lives of 2-5% of the world's population, far exceeding the death toll of WWI.
1957-1958	Influenza (Asian flu)	Worldwide	1 to 2 million deaths	Accelerated development of a vaccine limited the spread of the responsible influenza strain
1968-1969	Influenza (Hong Kong flu)	worldwide	500,000 – 2 million deaths	The Hong Kong flu was the first virus to spread extensively due to air travel.
1961-present	Cholera	Worldwide	1.4-4 million annual cases / 21,000-143,000 annual deaths	The seventh cholera pandemic began in South Asia in 1961. Recent notable outbreaks include those in Zimbabwe from 2008 to 20099, Haiti from 2010 – present, and Yemen from 2016 - present
1974	Smallpox	India	130,000 cases / 26,000 deaths	One of the worst smallpox epidemics of the twentieth century occurred just 3 years before the disease was eradicated.
1981	HIV/AIDS	Worldwide	70 million cases / ~ 37 million deaths	HIV was first identified in 1981. the earliest known case came from a blood sample collected in 1959. *Ongoing Pandemic
1994	Plague	India	693 suspected cases / 56 deaths	The outbreak originated in Surat, India. Within days, hundreds of thousands of the city's 1.6 million residents fled, spreading the disease across five states.


R7.C.

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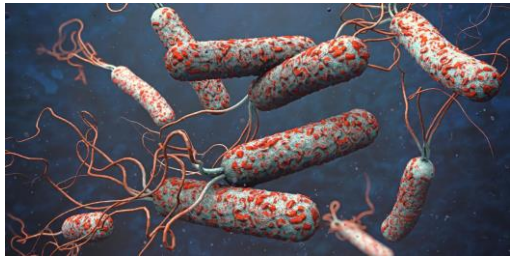
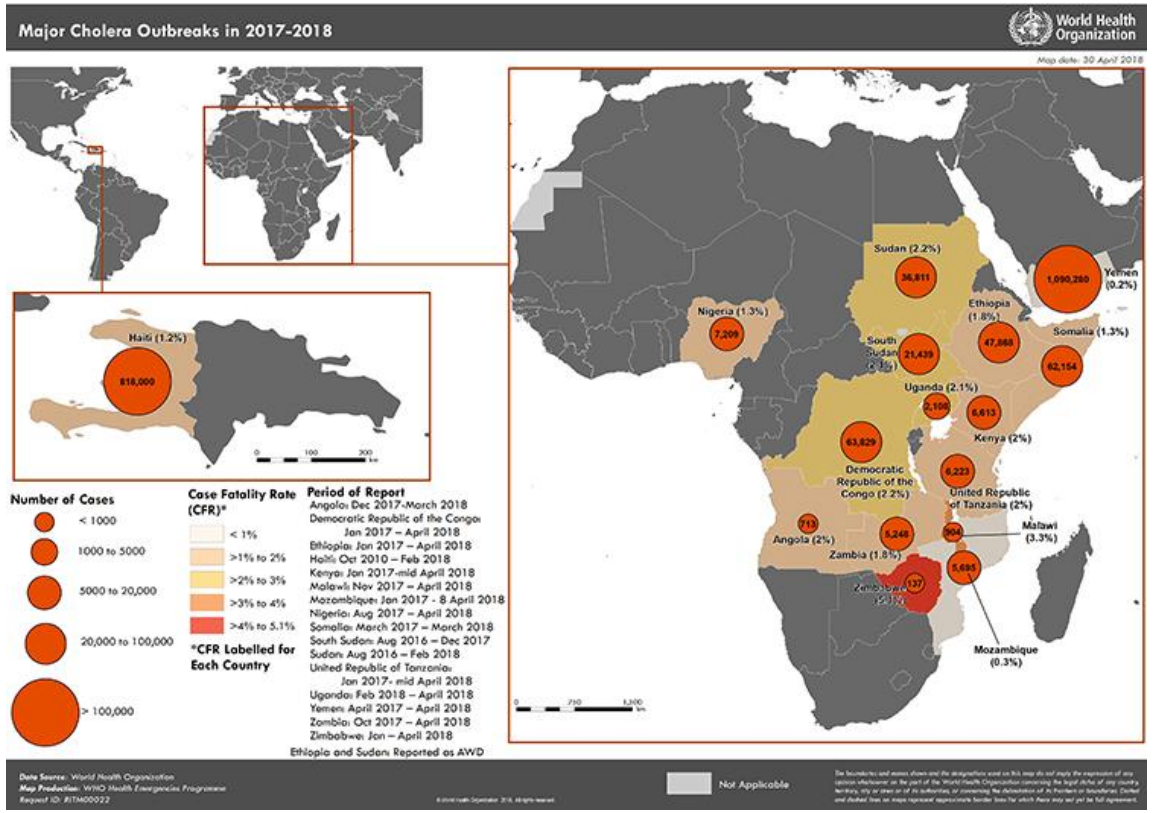
Cholera



- WHO
  - 78% of the populations in less developed countries is without clean water
  - 85% without adequate fecal waste disposal
- Calcutta, India, 1953
- South Vietnam, 1964 – 1967
- India, 1971
  - Bangladeshi refuges
  - 6500 deaths
- Peru, 1991



Year (s)	Pathogen	Geographic Location	Cases/mortality	Other Notes
2002-2003	SARS	Originated China, (37 countries)	8,098 cases / 813 deaths	International business travel allowed the SARS virus to spread quickly across the continents.
2009	Influenza H1N1 (Swine flu)	Worldwide	284,000 deaths	Many public and private facilities in Mexico closed to prevent the spread of “swine flu” during the early days of the epidemic. The pork industry also suffered losses, even though eating pork products posed no risk.
2014-2016	Ebola	West Africa	28,600 cases / 15,258 deaths	First recognized in 1976; 29 regional epidemics to 2020. 300,000 doses of an experimental Ebola vaccine were subsequently stockpiled
2015 – present	Zika	The Americans (Brazil)	Unknown number of cases and deaths (~1,000*))	The Zika epidemic has resulted in few, if any, deaths. However, birth defects resulting from infection in pregnant women occurred frequently, which prompted some governments to encourage delaying pregnancy for as long as 2 years.
2016	Dengue	Worldwide	100 million cases / 38,000 deaths	Dengue outbreaks occur periodically in affected regions. 2016 was notable for the unusual scale of outbreaks across the globe.
2017	Plague	Madagascar	2,417 cases / 209 deaths	Plague is endemic in Madagascar, but an increase in pneumonic plague. Which can be transmitted from human to human, was associated with the recent spike in cases.

THREATS & VULNERABILITIES

Newly Emerging Infectious Disease

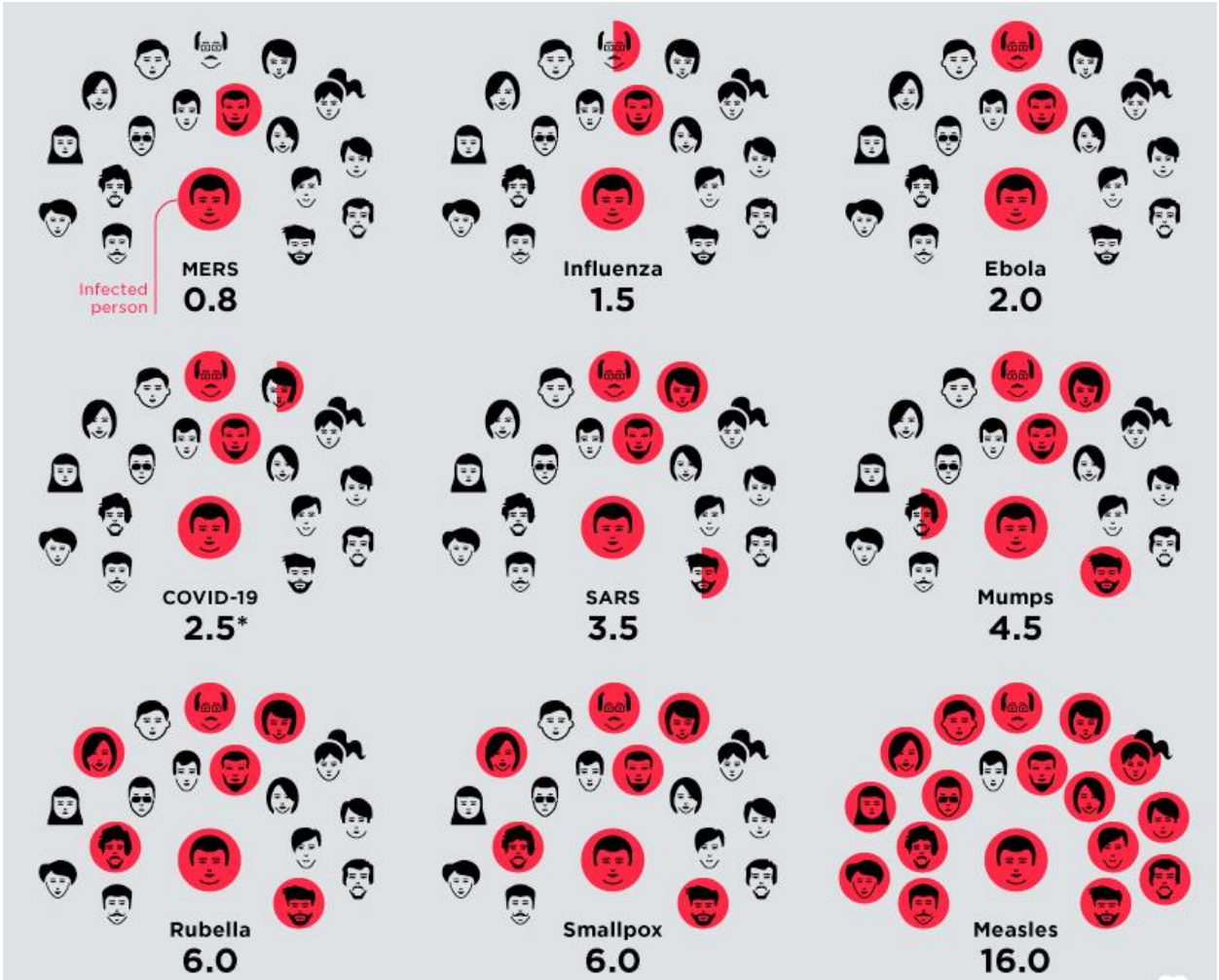
Key Elements

- Infection that does not infect humans in a sustained manner
- Effectively transmit person to person
- High level of morbidity and mortality

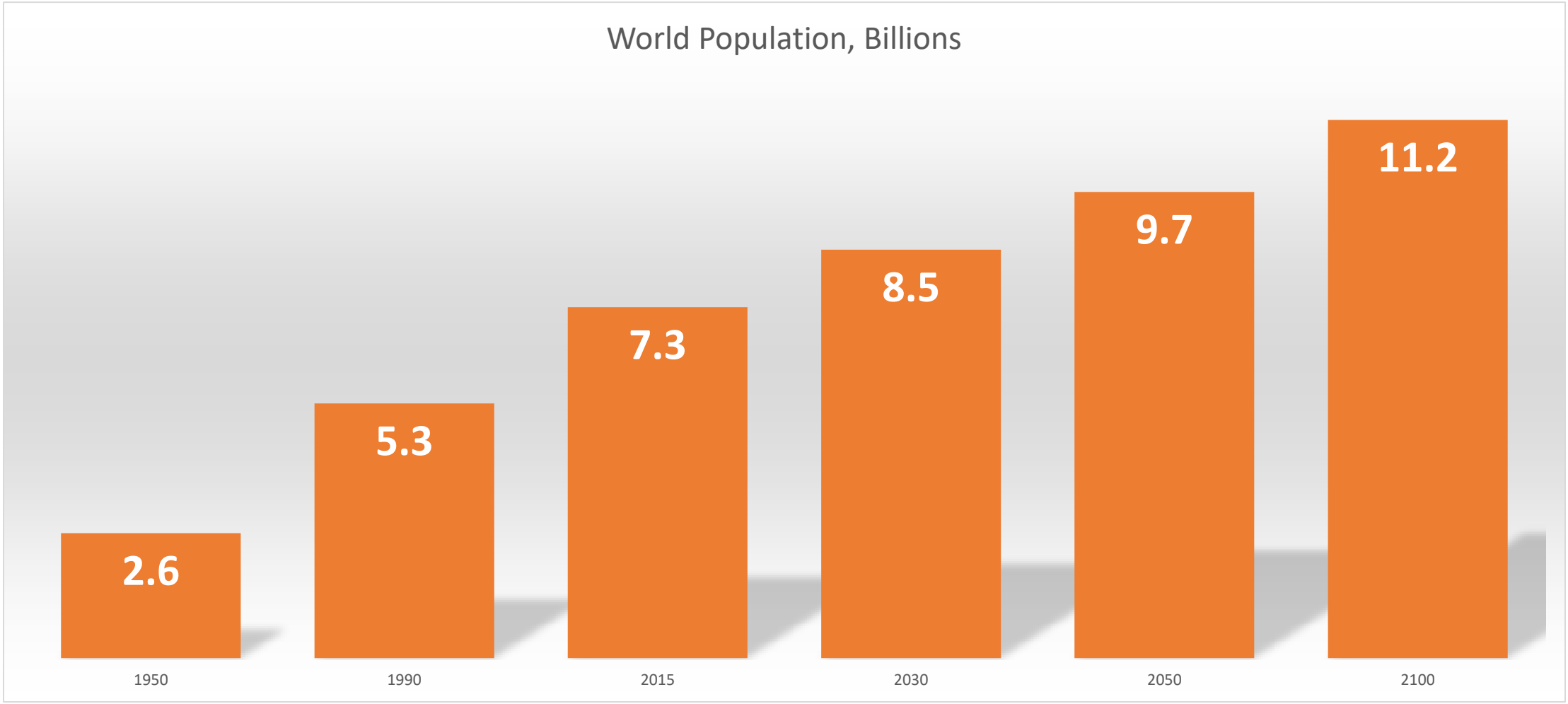
R0

Measure of how many people each sick person will infect on average.

- RO COVID-19 (March 2020) – 2.5
- R0 COVID-19 (March 2021) – 2.2
- RO COVID-19 (July 2021) – 2.7
- R0 COVID-19 (Delta Variant July 2021) – 6

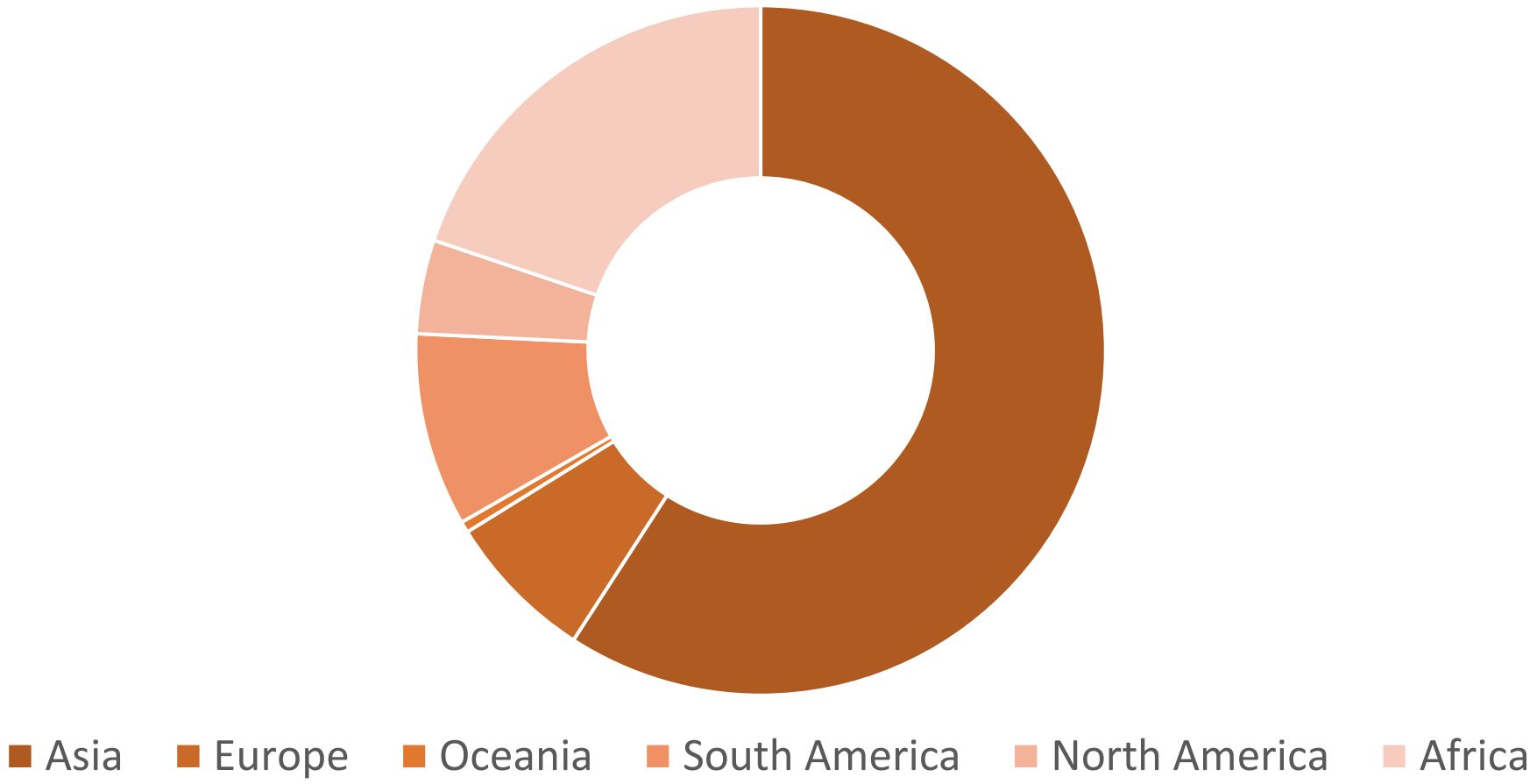


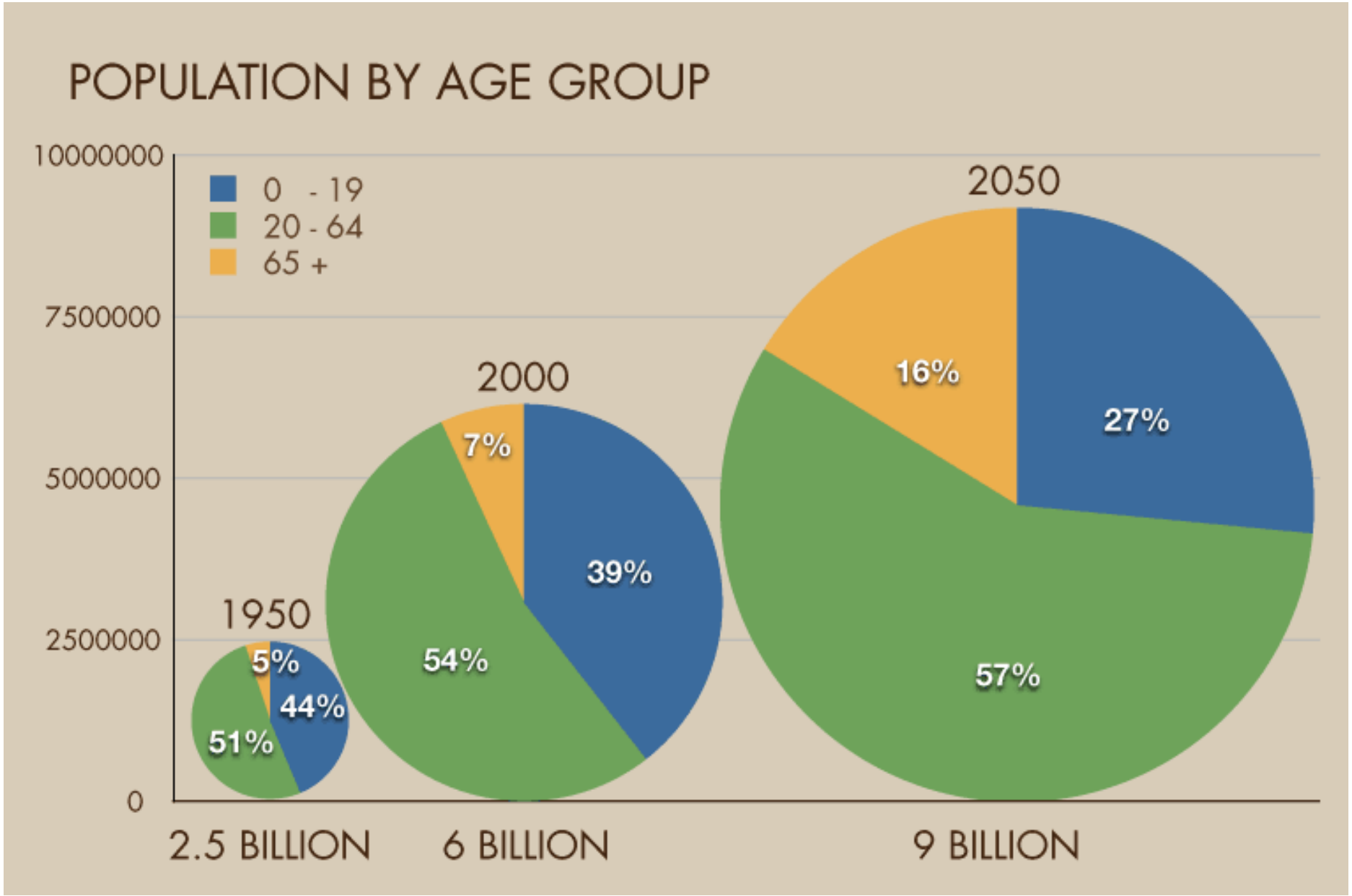
Global Population



Data Source: https://www.un.org/en/sections/issues-depth/population/index.html

World Population by Continents - Year 2050



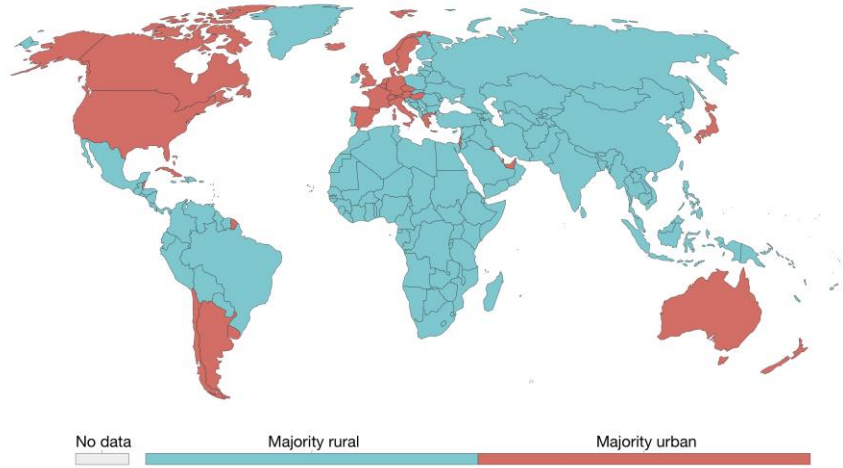


Source: Perry, Milly. (2015). Science and Innovation Strategic Policy Plans for the 2020s (EU,AU,UK): Will They Prepare Us for the World in 2050?. Applied Economics and Finance. 2. 10.11114/aef.v2i3.909.

Do more people live in urban or rural areas?, 1950

Our World in Data

Share of the population which live in urban versus rural areas. Here, 'majority urban' indicates more than 50 percent of the population live in urban centres; 'majority rural' indicates less than 50 percent. Urban populations are defined based on the definition of urban areas by national statistical offices. This is based on estimates to 2016, combined with UN projections to 2050.

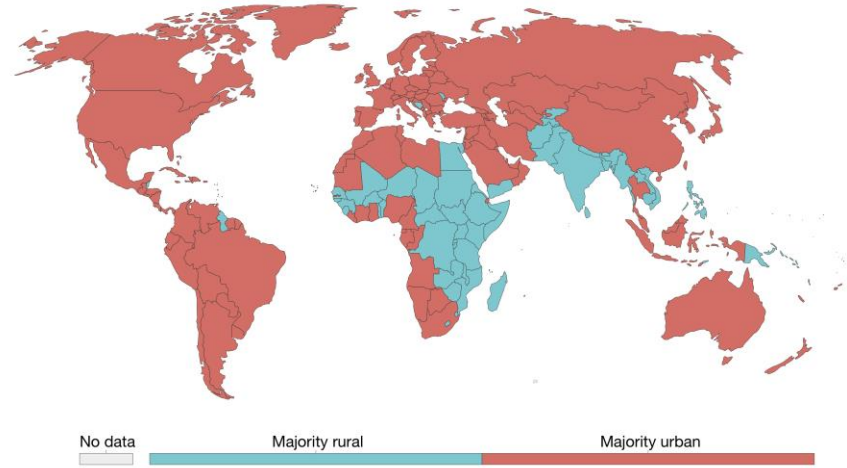


Source: OWID based on UN World Urbanization Prospects (2018) & Historical Sources (see Sources tab)
OurWorldInData.org/urbanization • CC BY

Do more people live in urban or rural areas?, 2020

Our World in Data

Share of the population which live in urban versus rural areas. Here, 'majority urban' indicates more than 50 percent of the population live in urban centres; 'majority rural' indicates less than 50 percent. Urban populations are defined based on the definition of urban areas by national statistical offices. This is based on estimates to 2016, combined with UN projections to 2050.



Source: OWID based on UN World Urbanization Prospects (2018) & Historical Sources (see Sources tab)
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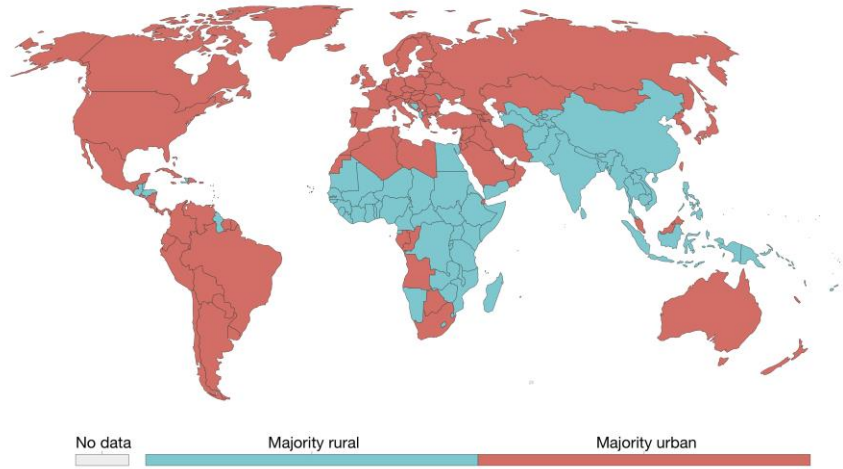
Do more people live in urban or rural areas?, 2000

Our World in Data

Share of the population which live in urban versus rural areas. Here, 'majority urban' indicates more than 50 percent of the population live in urban centres; 'majority rural' indicates less than 50 percent. Urban populations are defined based on the definition of urban areas by national statistical offices. This is based on estimates to 2016, combined with UN projections to 2050.



Source: OWID based on UN World Urbanization Prospects (2018) & Historical Sources (see Sources tab)
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Do more people live in urban or rural areas?, 2050

Our World in Data

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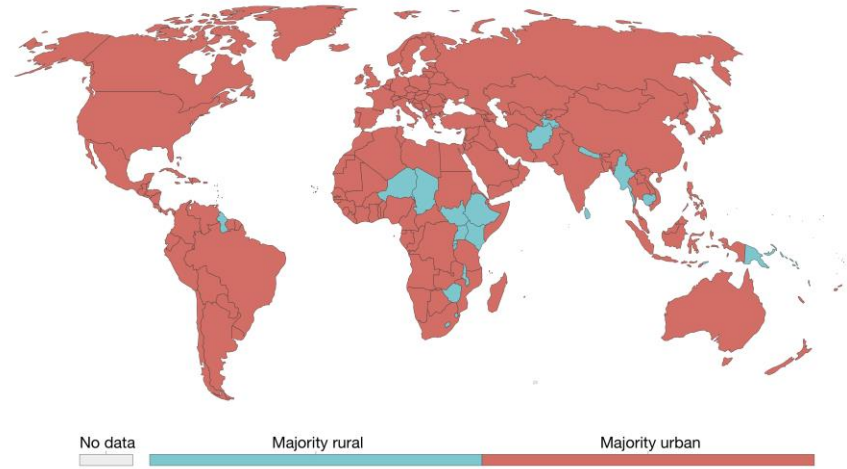

Source: OWID based on UN World Urbanization Prospects (2018) & Historical Sources (see Sources tab)
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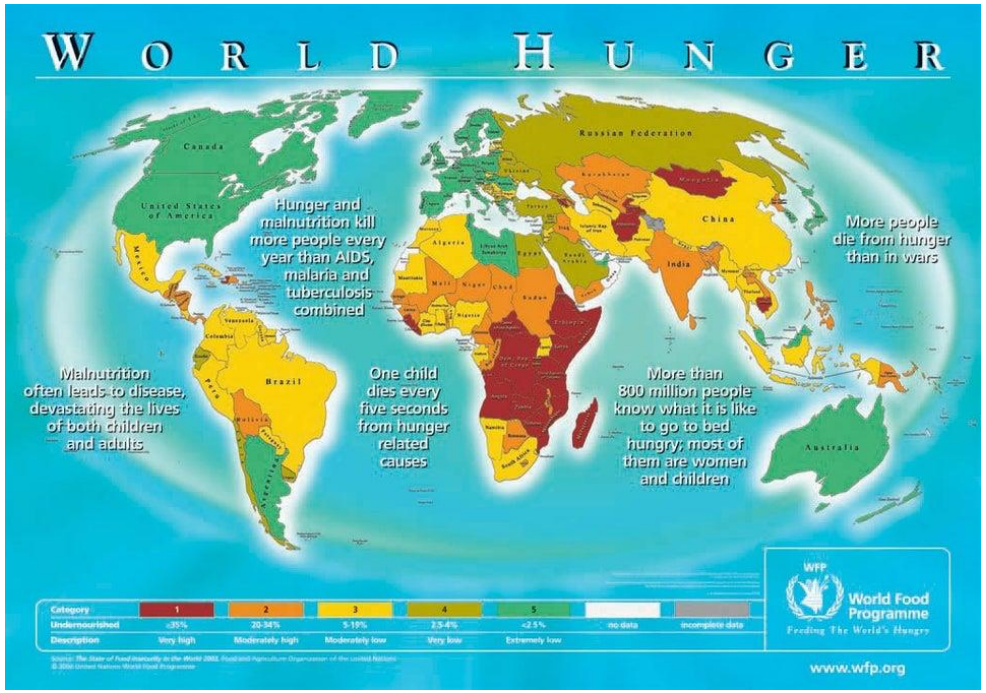
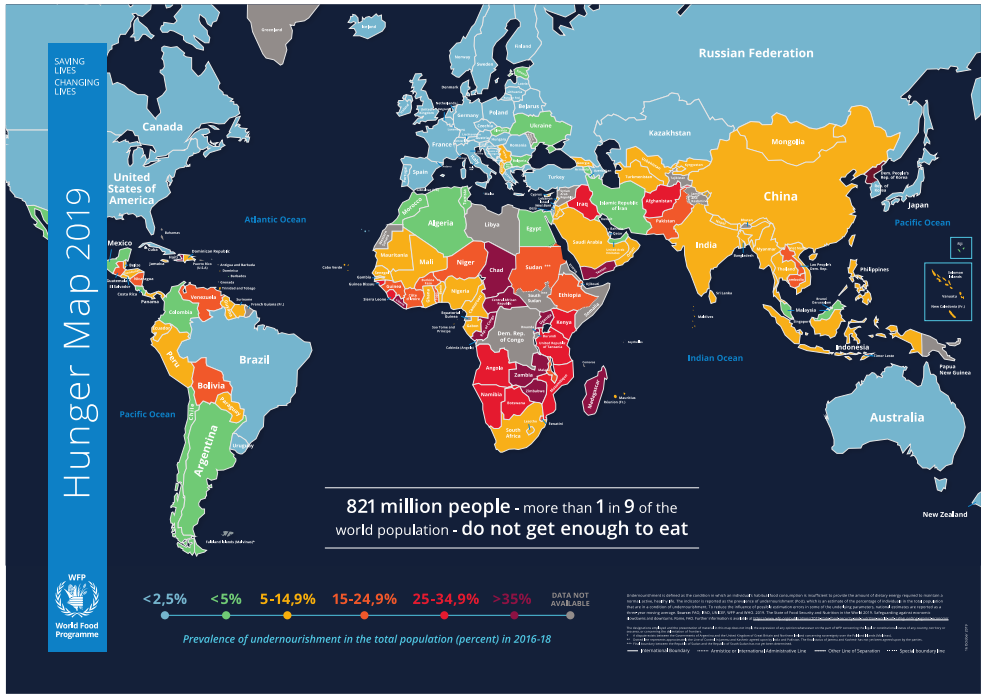
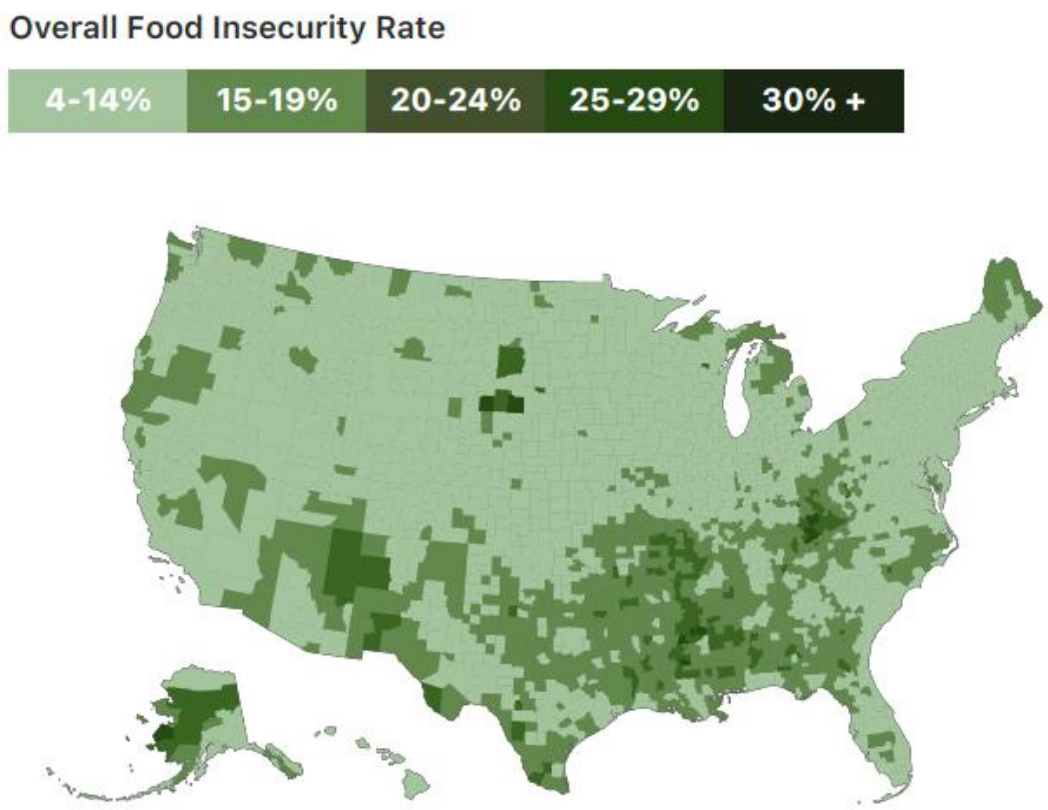
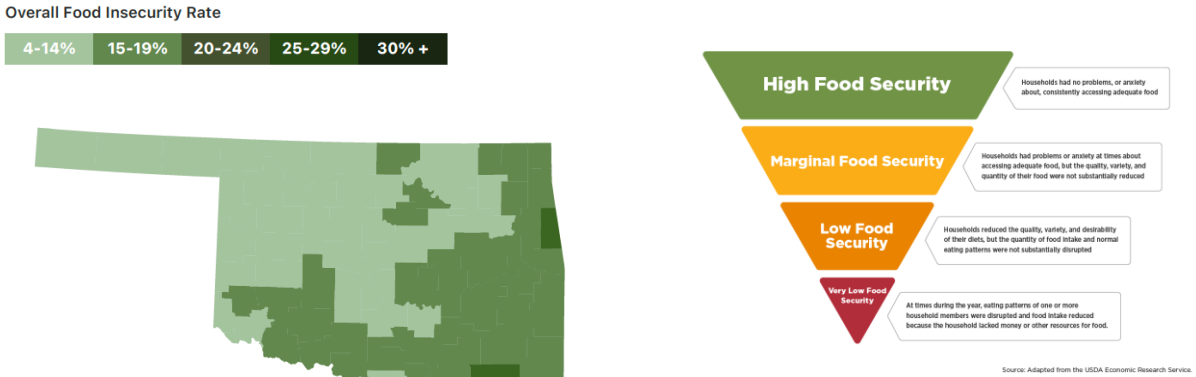
World Hunger



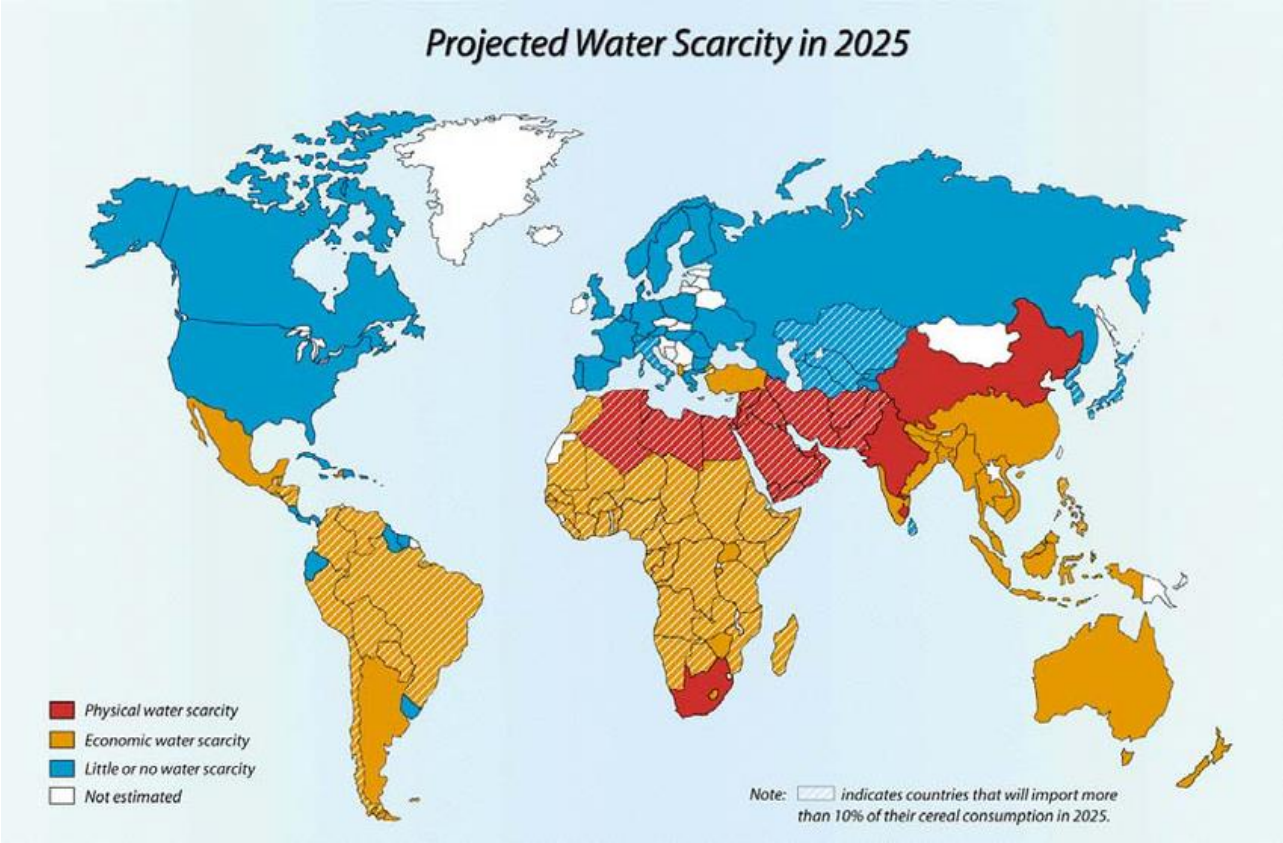


Food Insecurity





Water, 2025
Projected Water Scarcity in 2025



Biological Terrorism

Category A Agents

- Anthrax (*Bacillus anthracis)*
- Botulism (*Clostridium botulinum toxin)*
- Plague (*Yersinia pestis)*
- Tularemia (*Francisella tularensis)*
- Smallpox (*variola major)*
- Viral Hemorrhagic Fevers
  - Filoviruses (Ebola & Marburg)
  - Arenaviruses (Lassa Fever, Machupo)

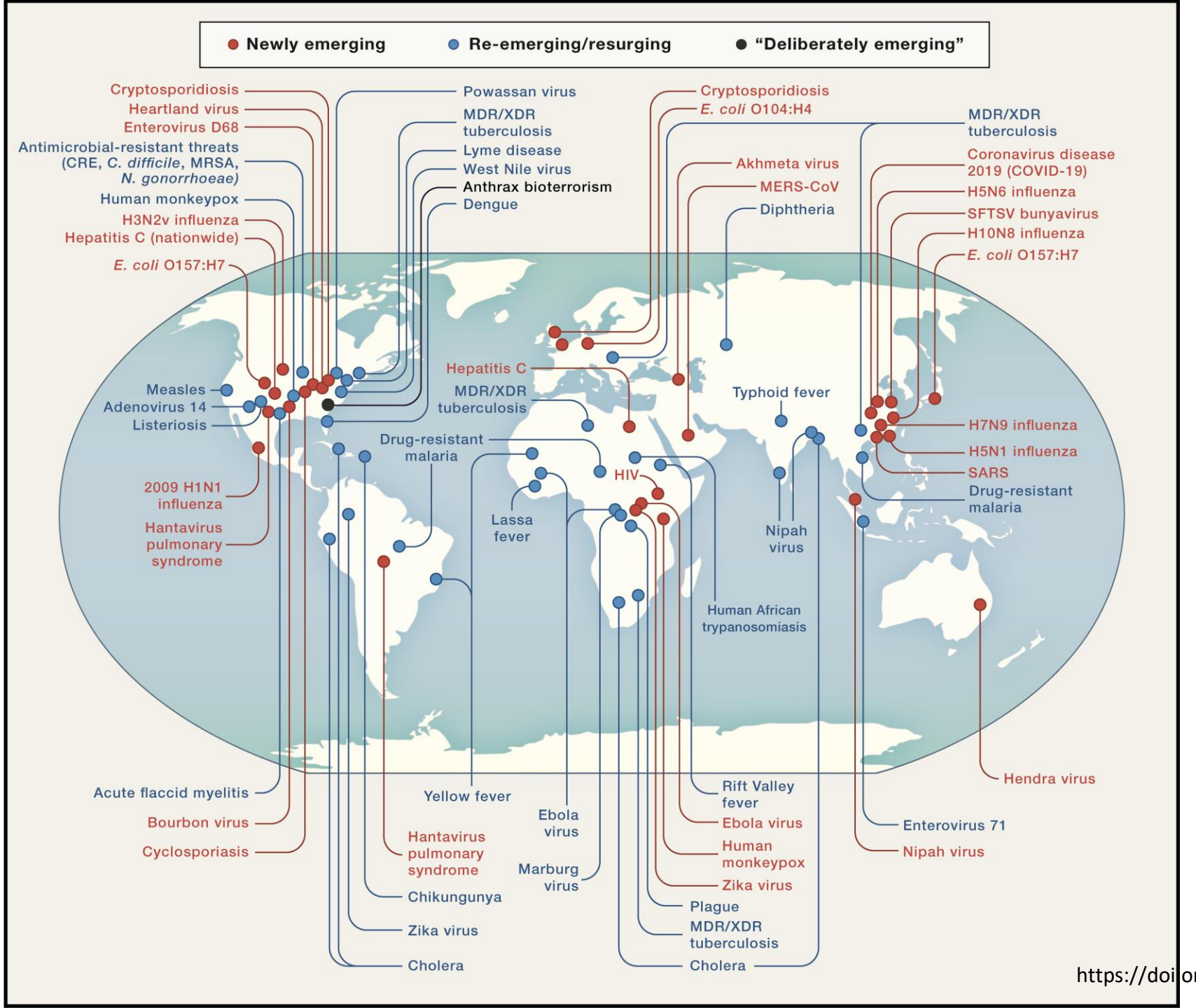
Source: https://emergency.cdc.gov/agent/agentlist-category.asp

Category A List (CDC)

- Easily Transmitted Person to Person
- High Mortality
- Potential for Panic & Social Disruption
- Requires Special Public Health Actions

Paulus Furst of Nuremberg, *Doctor Schnabel von Rom*, 1656, British Museum, London.

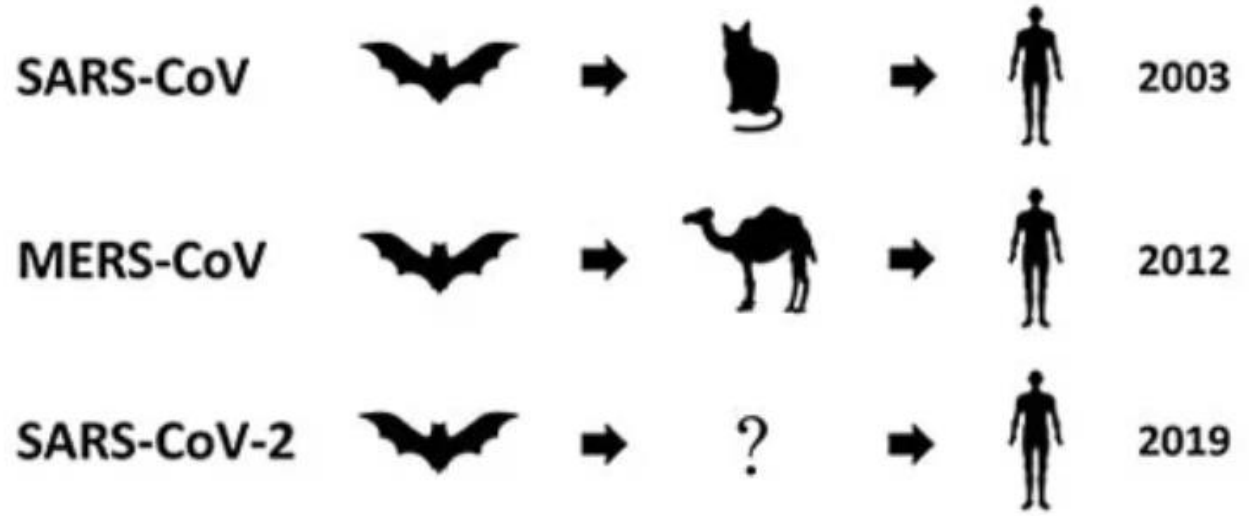
EMERGING INFECTIOUS DISEASES & PATHOGENS

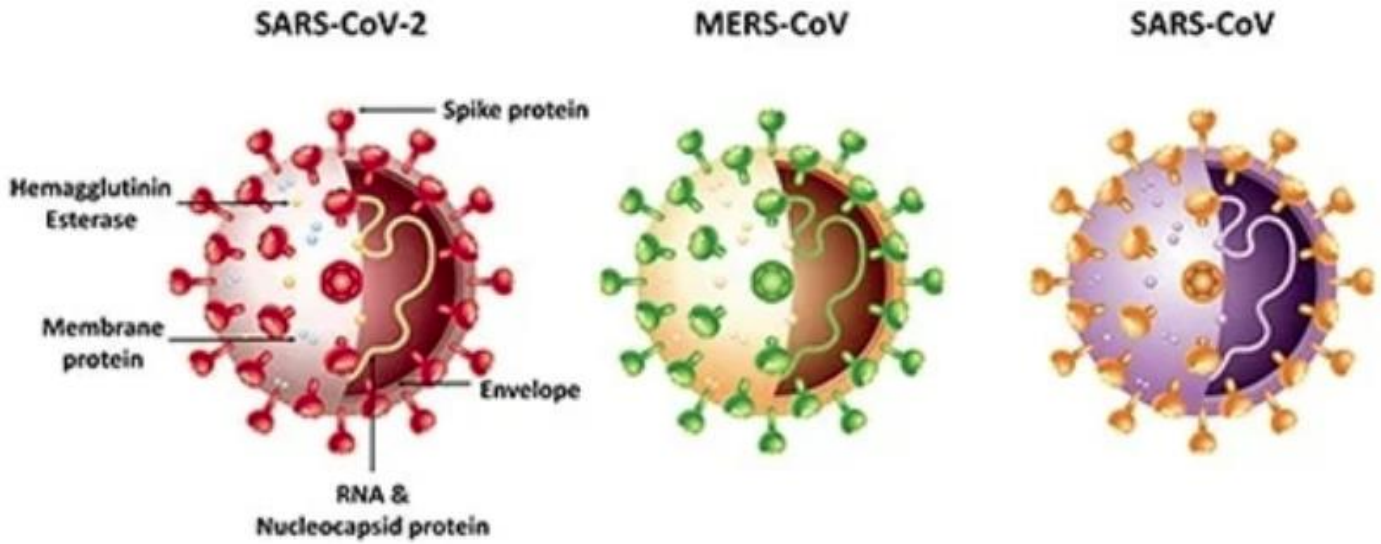


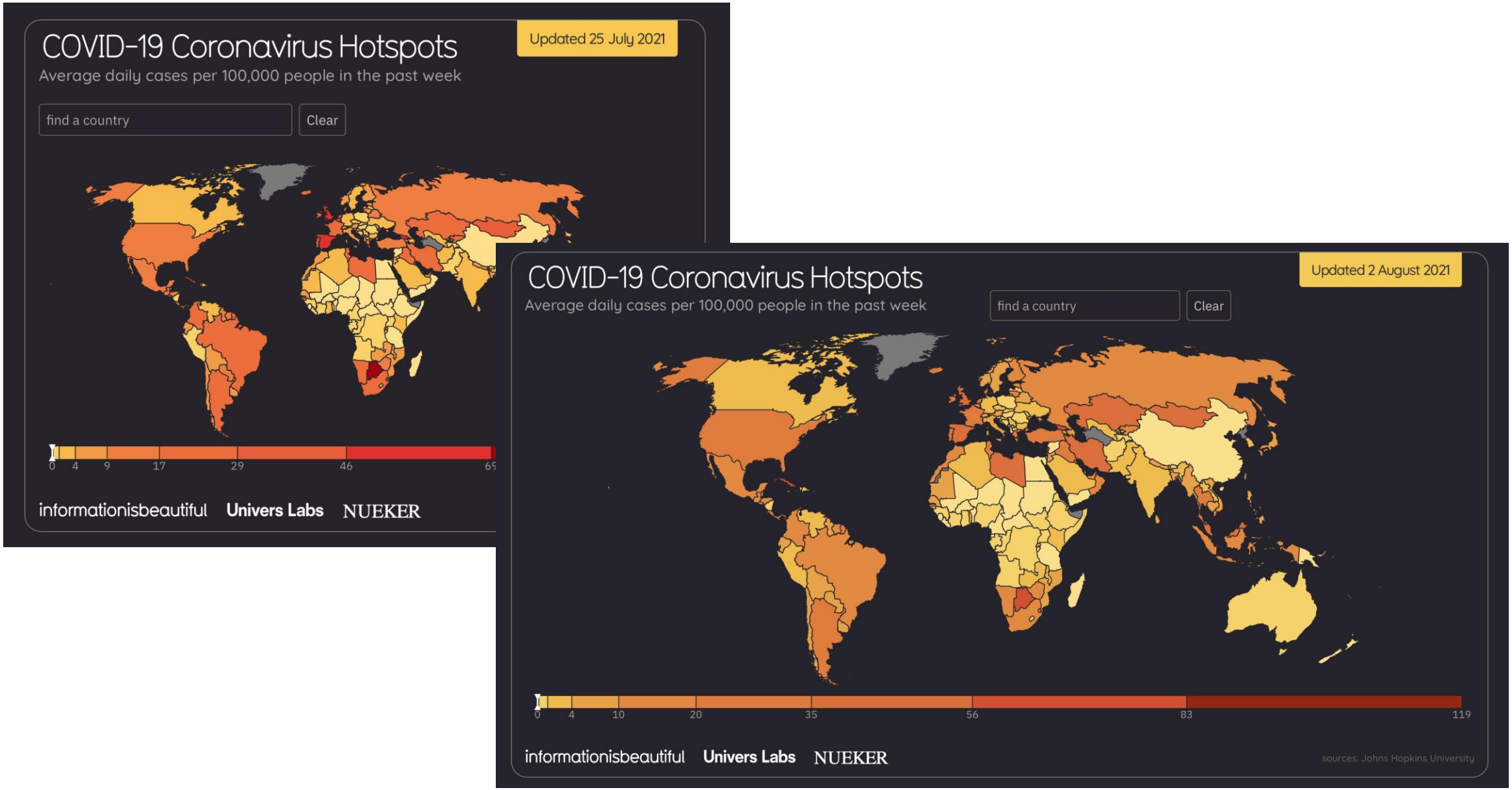
https://doi.org/10.1016/j.cell.2020.08.021

Coronaviruses

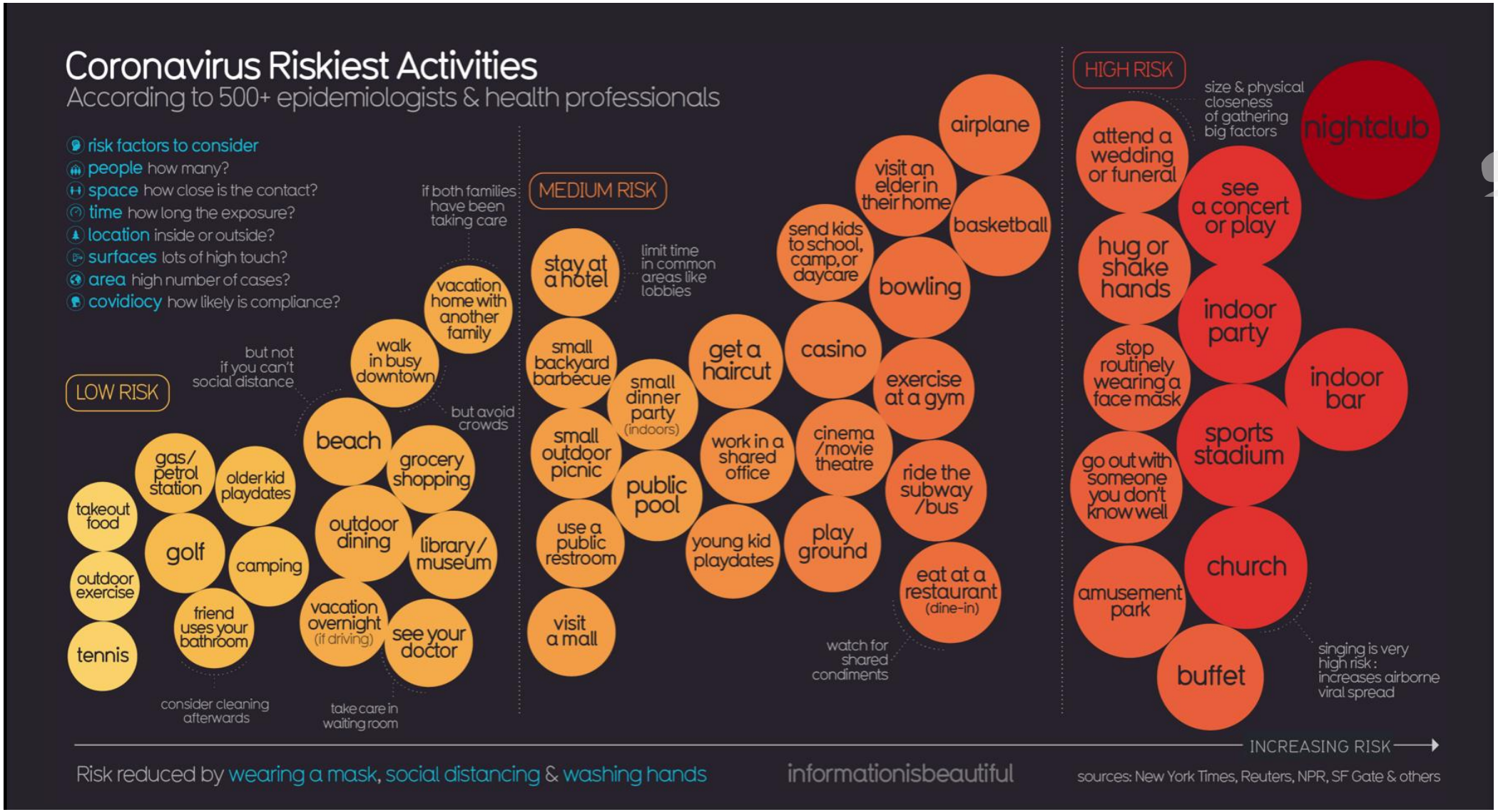
- SARS-CoV-2 (2019)
  - Enveloped (+)ssRNA virus
  - Upper & Lower Respiratory Infection
- SARS (2003)
  - 9.6% mortality
    - 8,098 cases; 774 deaths
- MERS (2012)
  - Lower Respiratory Infection
  - Fever, Cough, SOB
  - 35% mortality
    - 2,538 Cases; 871 Deaths

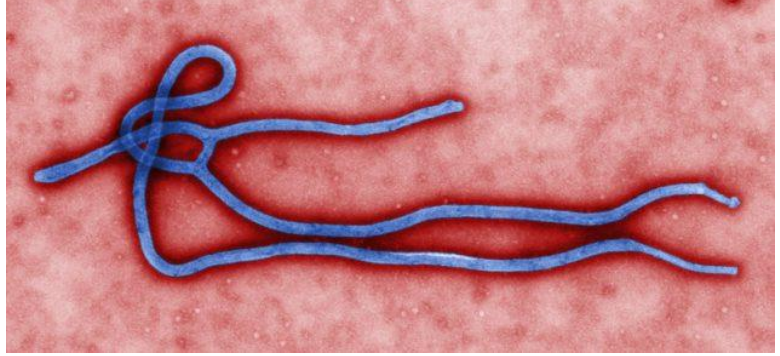






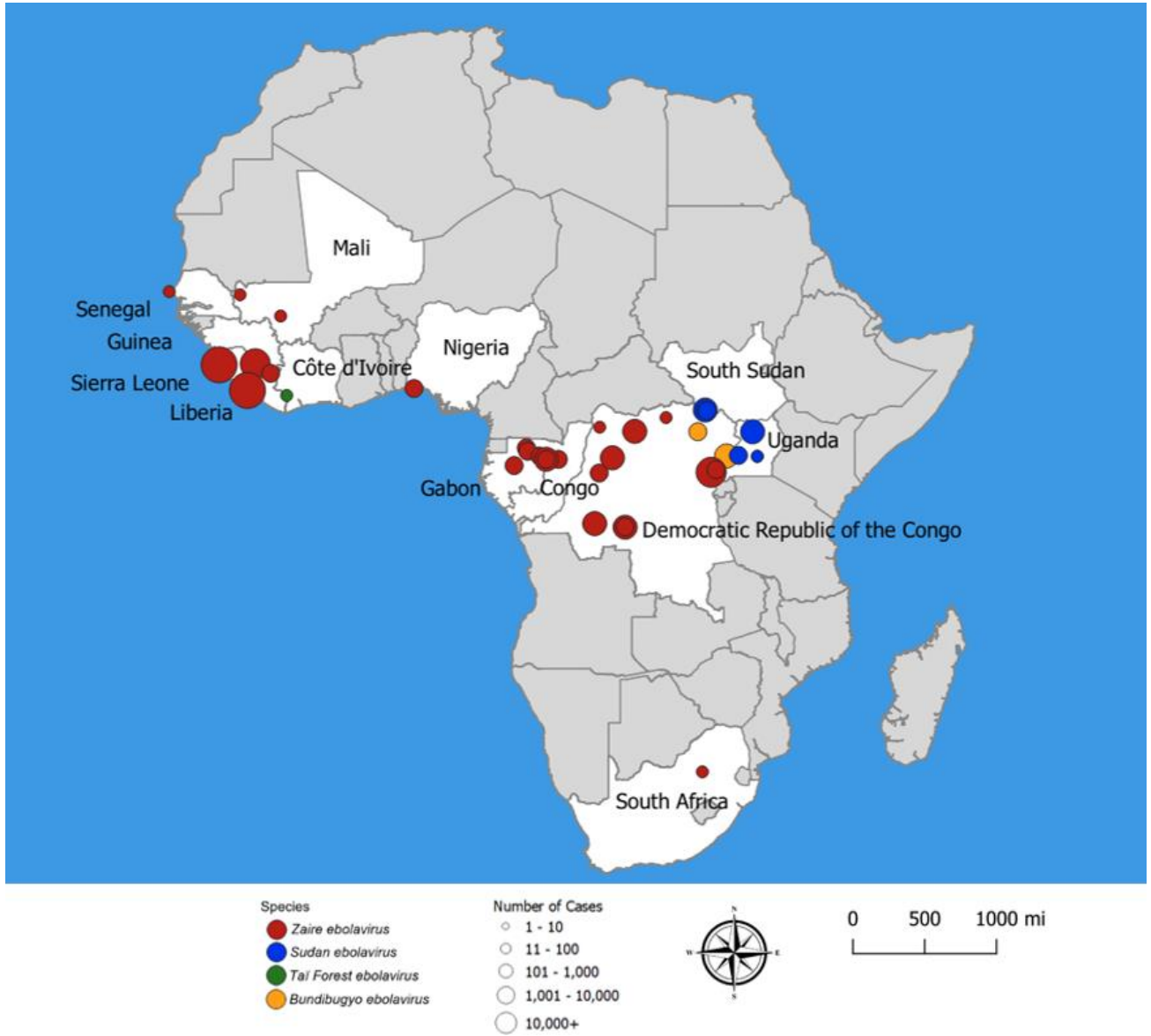
https://informationisbeautiful.net/visualizations/covid-19-coronavirus-infographic-datapack/


Coronavirus Riskiest Activities
According to 500+ epidemiologists & health professionals
risk factors to consider
people how many?
space how close is the contact?
time how long the exposure?
location inside or outside?
surfaces lots of high touch?
area high number of cases?
covidiocy how likely is compliance?
LOW RISK
takeout food
outdoor exercise
tennis
gas/ petrol station
golf
friend uses your bathroom
consider cleaning afterwards
older kid playdates
camping
but not if you can't social distance
walk in busy downtown
beach
outdoor dining
vacation overnight (if driving)
take care in waiting room
if both families have been taking care
vacation home with another family
but avoid crowds
grocery shopping
library/ museum
see your doctor
MEDIUM RISK
stay at a hotel
limit time in common areas like lobbies
small backyard barbecue
small outdoor picnic
use a public restroom
visit a mall
small dinner party (indoors)
public pool
get a haircut
work in a shared office
young kid playdates
casino
cinema /movie theatre
play ground
send kids to school, camp, or daycare
visit an elder in their home
airplane
basketball
bowling
exercise at a gym
ride the subway /bus
eat at a restaurant (dine-in)
watch for shared condiments
HIGH RISK
size & physical closeness of gathering big factors
attend a wedding or funeral
hug or shake hands
stop routinely wearing a face mask
go out with someone you don't know well
amusement park
buffet
see a concert or play
indoor party
sports stadium
church
nightclub
indoor bar
singing is very high risk : increases airborne viral spread
INCREASING RISK
Risk reduced by wearing a mask, social distancing & washing hands
informationisbeautiful
sources: New York Times, Reuters, NPR, SF Gate & others



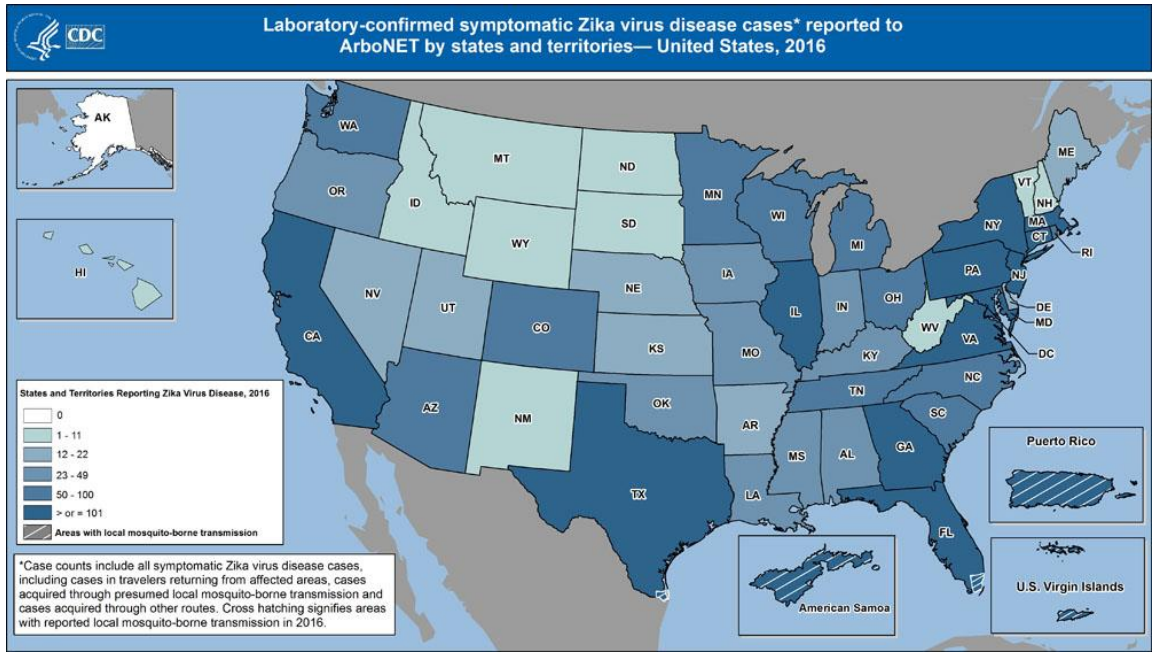
Filoviruses

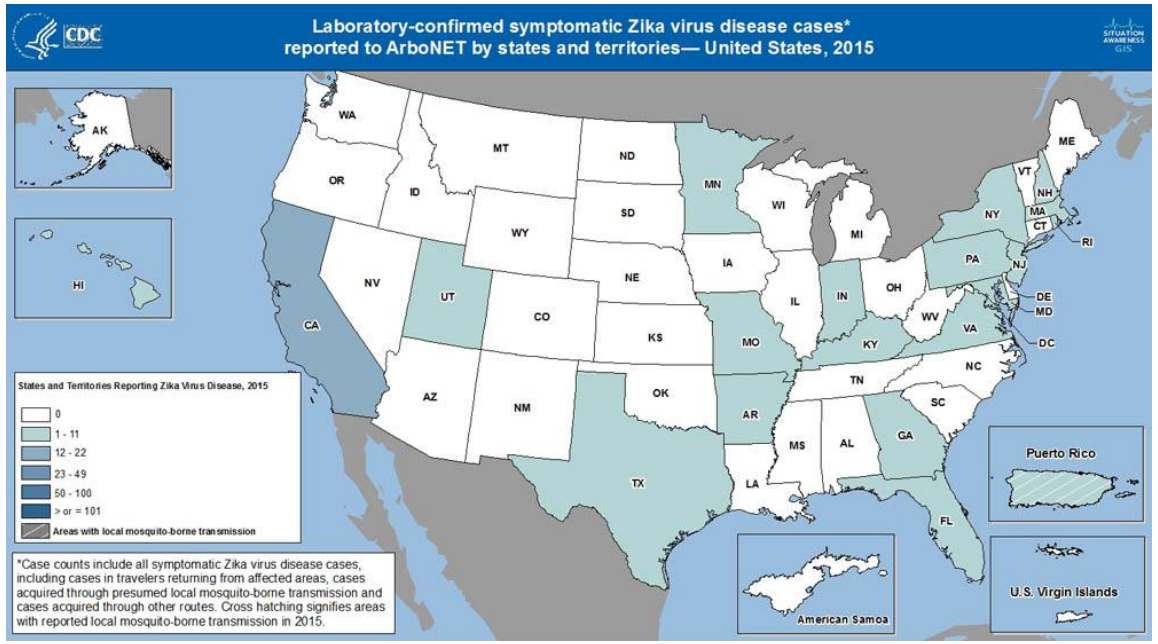
- Ebola
  - Fatal hemorrhagic fever
  - Population growth, encroachment into forested areas, direct interaction with wildlife contributed to spread
  - Natural Host: African fruit bats
- Marburg
  - Natural host: African fruit bat



Flaviviruses

- **<u>Mosquitoe-Transmitted</u>**
  - Yellow Fever
  - Dengue Fever*
  - Japanese Encephalitis
  - West Nile Virus
  - Zika Virus*
- **<u>Tick-Transmitted</u>**
  - Tick-borne Encephalitis
  - Kyasanur Forest Disease
  - Alkhurma Disease
  - Omsk Hemorrhagic Fever


CDC
Laboratory-confirmed symptomatic Zika virus disease cases* reported to ArboNET by states and territories— United States, 2016
AK
HI
WA
OR
CA
ID
NV
MT
WY
UT
AZ
CO
NM
ND
SD
NE
KS
OK
TX
MN
IA
MO
AR
LA
WI
IL
MS
MI
IN
KY
TN
AL
OH
WV
GA
FL
SC
NC
VA
PA
NY
ME
VT
NH
MA
CT
RI
NJ
DE
MD
DC
Puerto Rico
U.S. Virgin Islands
American Samoa
States and Territories Reporting Zika Virus Disease, 2016
0
1 - 11
12 - 22
23 - 49
50 - 100
> or = 101
Areas with local mosquito-borne transmission
*Case counts include all symptomatic Zika virus disease cases, including cases in travelers returning from affected areas, cases acquired through presumed local mosquito-borne transmission and cases acquired through other routes. Cross hatching signifies areas with reported local mosquito-borne transmission in 2016.


CDC
Laboratory-confirmed symptomatic Zika virus disease cases* reported to ArboNET by states and territories— United States, 2015
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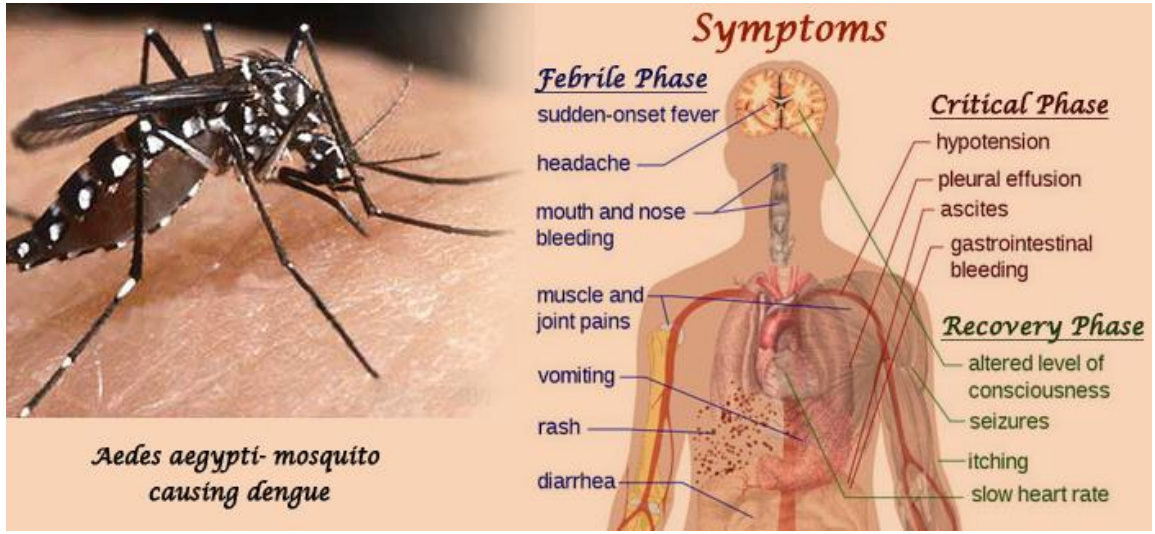
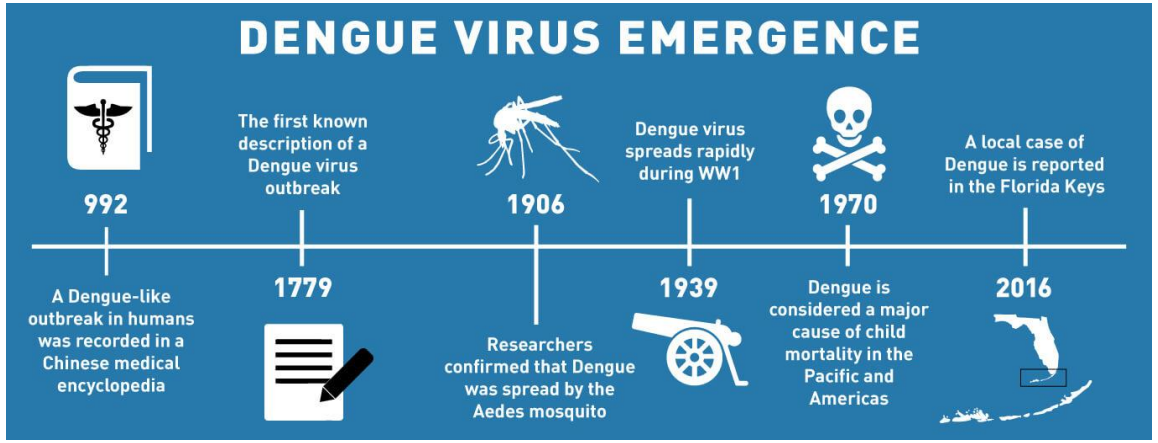
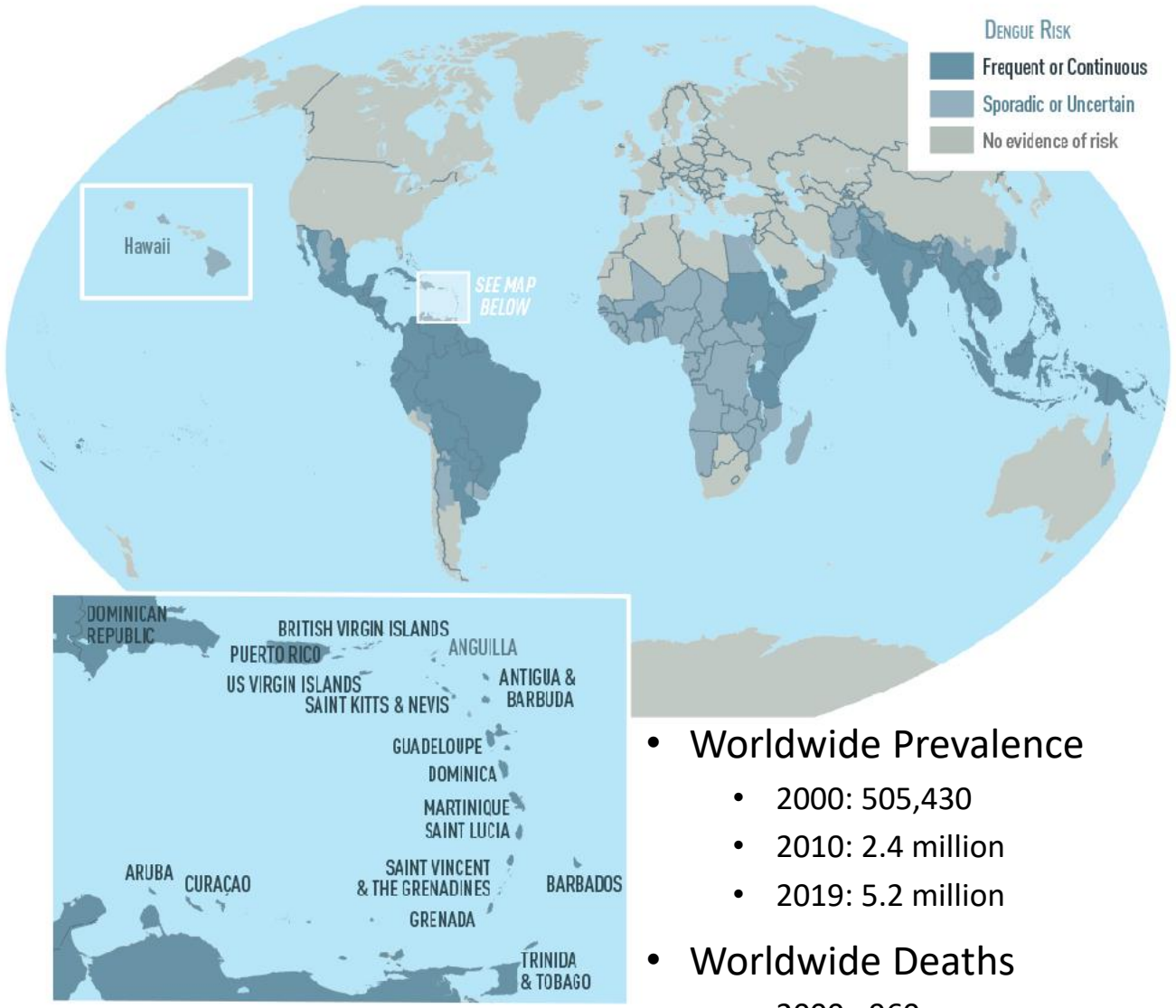
RI
NJ
DE
MD
DC
Puerto Rico
U.S. Virgin Islands
American Samoa
States and Territories Reporting Zika Virus Disease, 2015
0
1 - 11
12 - 22
23 - 49
50 - 100
> or = 101
Areas with local mosquito-borne transmission
*Case counts include all symptomatic Zika virus disease cases, including cases in travelers returning from affected areas, cases acquired through presumed local mosquito-borne transmission and cases acquired through other routes. Cross hatching signifies areas with reported local mosquito-borne transmission in 2015.

Zika Virus

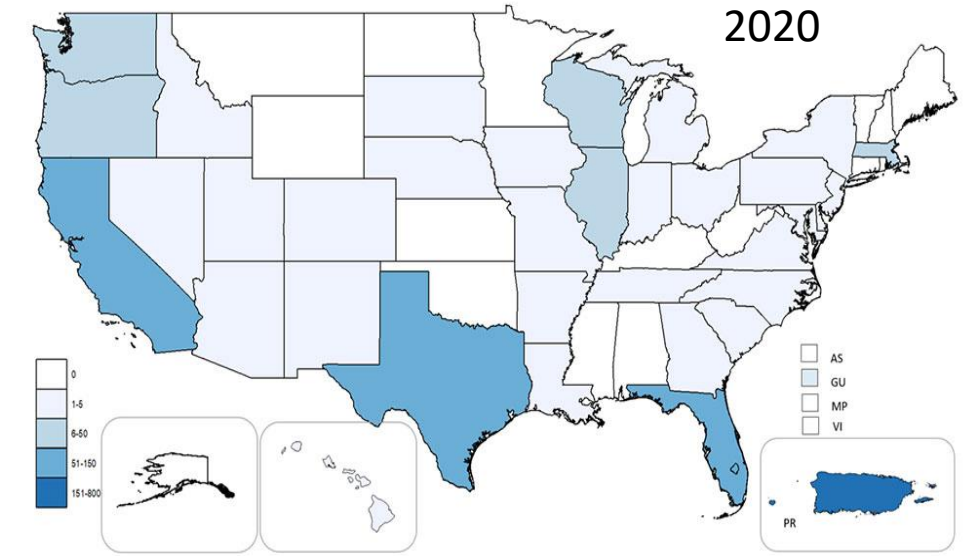


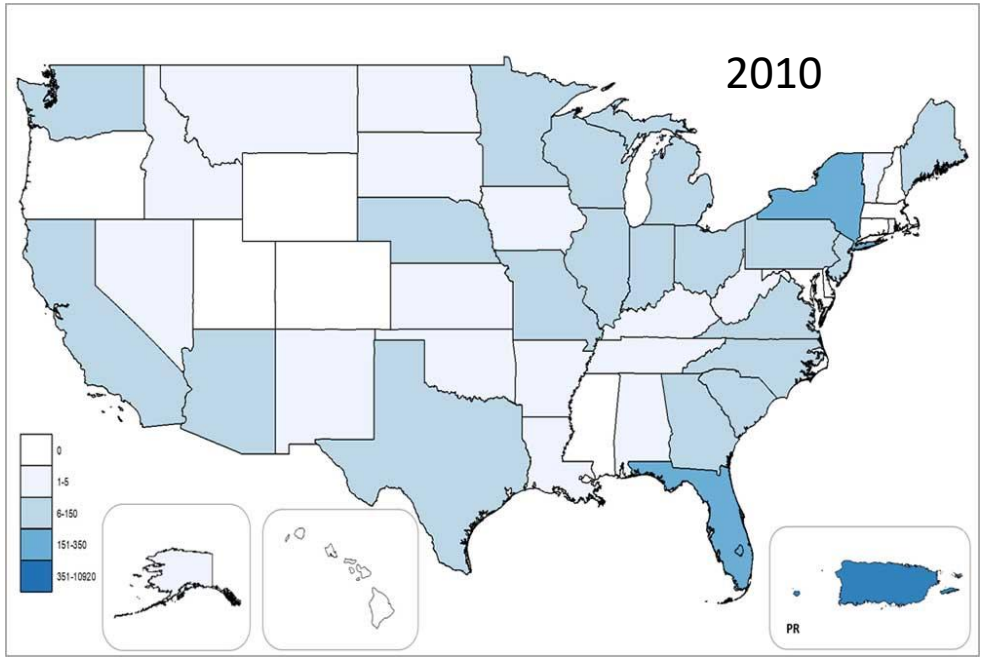


Dengue Fever



- Worldwide Prevalence
  - 2000: 505,430
  - 2010: 2.4 million
  - 2019: 5.2 million
- Worldwide Deaths
  - 2000 : 960
  - 2015: 4,032

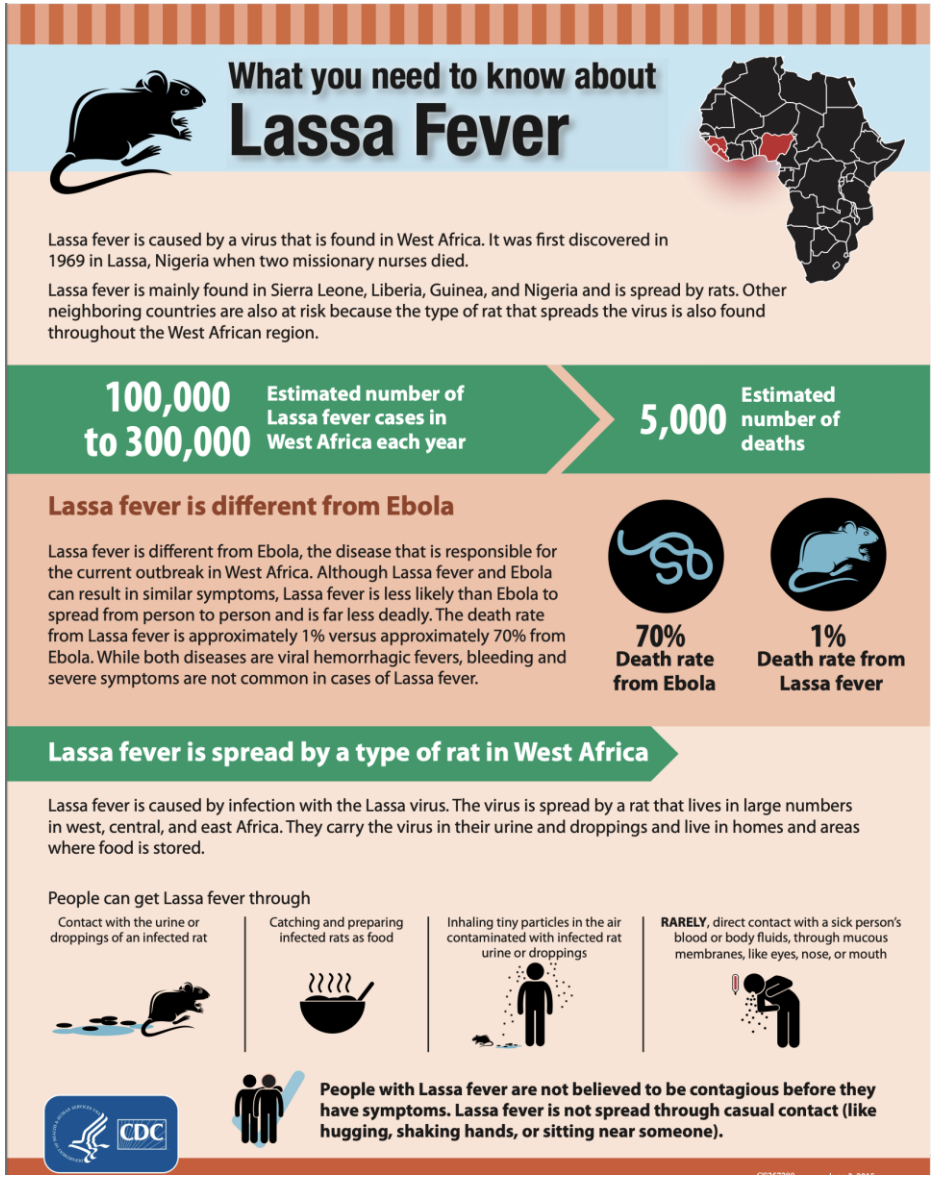




Source: https://www.cdc.gov/dengue/areaswithrisk/around-the-world.html

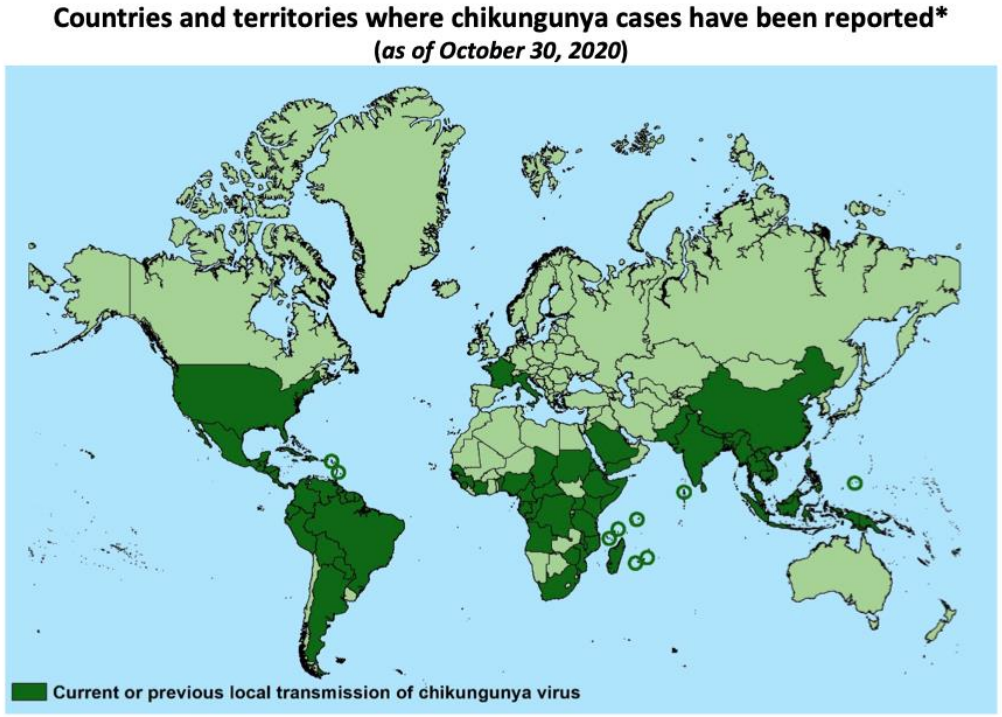
Bunyavirales

- Crimean-Congo Hemorrhagic Fever
- Lassa
- Rift Valley Fever



Additional Pathogens of Interest

- Chikungunya – *Togaviride* virus family
- Nipah – *Paramyxoviridae* virus family
- Influenza



Principles & Preparation of Pandemic Response

Principles

- Keep the Science Straight
- Realistically evaluate threats & assets
- Rationally develop specific plans
- Identify needs
  - Doctrine
  - Organization
  - Communications
  - Equipment
  - Training
  - Speak with one voice

Action Phases: *Readiness*

1. Prevention
   - Shape the Battlefield
2. Preparation
   - CONOPS, Assets & Infrastructure
3. Surveillance
   - Scope, Sensitivity, Reliability, Security, & Cycle Time
4. Identification
   - Specificity, Confidence, Immediacy

Prevention: Shape the Battlefield

- Psychological Injury Management
- Public Health
- WMD -
  - Biological / Chemical / Radiological
- Risk Communication
- Education
  - Government Officials & Community Leaders
  - Responders
  - Population at Large

Prevention

Vs.

Preparation

- PREVENTION focuses on building a resistant and resilient environment.
- PREPARATION focuses on developing the capability for a coordinated, timely, and effective response.

PREPARATION

- **Assets**
  - Personnel
    - Numbers and Training
  - Equipment
  - Supplies
- **Infrastructure**
  - Authority
  - Command, Control, Communications, & Intelligence
  - Logistics

Medical Preparation

- Preparation
  - Planning
  - Facilities
  - People
  - Training Equipment
  - Communications
- Public Education
- Community Contacts

Medical Preparation

- **Control of disease/injury**
  - Limit exposure
    - Individual. Protection
    - Mass protective measures
      - Evacuation
      - Quarantine
  - Early identification of population at risk
  - Effective communication
    - Authorities
    - Population of Responders
    - Population at Risk
    - Population at Large

Medical Preparation

- Decontamination
- Isolation as indicated
- Quarantine as necessary
- Prompt vaccination & prophylaxis
- Engineering

- Treatment of Victims
  - Surgical & Medical Emergencies
  - Specific threat-related care
    - External & Internal Decontamination
    - Antidote/Medical Therapy
  - Isolation
  - Medical evacuation
- Care of displaced Individuals / Refugees
- Continuing care of emergency workers
- Continuing care of population at large
  - Ongoing Care
  - Preventive Measures
  - Psychological Consequences

SURVEILLANCE

- Scope
- Sensitivity
- Specificity
- Reliability
- Security
- Cycle Time

MAY
THE ODDS
BE EVER
IN YOUR
FAVOR


#GETVACCINATED

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