Emerging and Re-Emerging Diseases

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Since the days of the cave man,
the Earth has never been a Garden of Eden,
but rather a Valley of Decision
where resilience is essential to survival…

to grow in the midst of dangers is the
fate of the human race.

Rene Dubos
"Mirage of Health"
1901 -1982
Microbiologist, Environmentalist

THE GARDEN OF EDEN

Our grandparents and great grandparents lived their daily lives with the constant threat of an untimely death due to a host of deadly infectious diseases. Epidemics and their attendant losses were a reality of life for them.

Current generations have grown unaccustomed to human loss due to any cause and have found it very difficult to accept the threat of any global pandemic (even that of HIV) and, as a result, tend to not prepare.

Learning Objectives

1. Define emerging and re-emerging diseases.

2. Review recent Emerging Diseases and the epidemiologic factors that contribute to Emerging Diseases.

3. Review the social and economic impact of Emerging Diseases and the current mitigation approaches.

THREE TRUTHS OF INFECTIOUS DISEASES

1. Epidemics are normal and natural.
2. Infectious diseases have had a major influence on human history.
3. Our collective memory of disease Is short despite mankind's long association with infectious diseases.

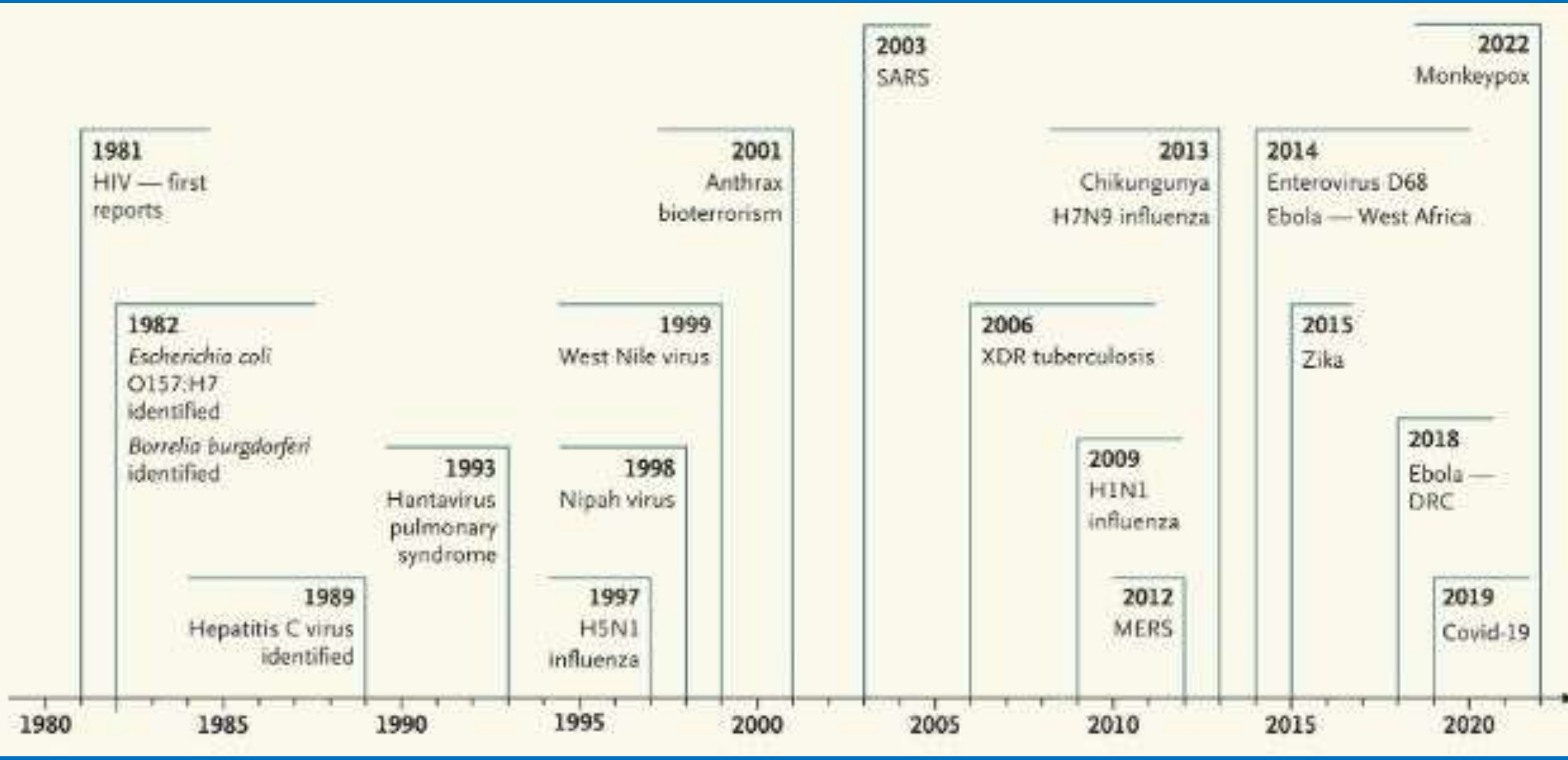
Most recent Pandemics with a large human "Die off"

- Spanish Flu (Global 40 Million Deaths/ USA 675,000 over 5 Months in 1918
- COVID-19 (Global 6.7 Million Deaths / USA 1 million over 3 years (2020 – 2022)

TOP TEN THREATS TO GLOBAL HEALTH WHO 2019

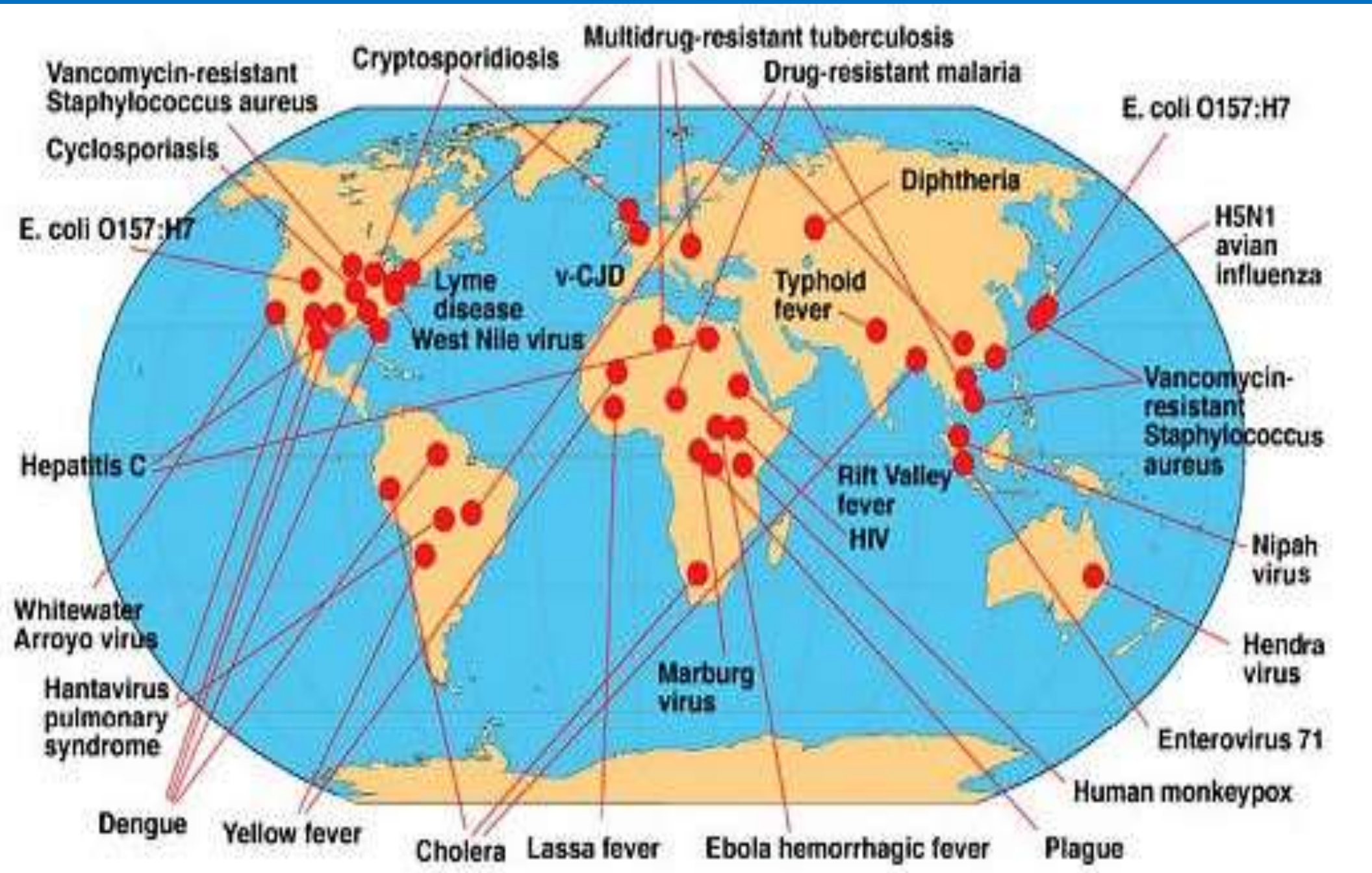
- Air Pollution and Climate Change
- Non-communicable diseases (DM, HD, Cancer)
- Global Influenza pandemic
- Fragile and vulnerable settings (Disaster, Refugee)
- Antimicrobial resistance
- Weak primary health care
- Vaccine Hesitancy
- Dengue
- HIV
- Ebola and other high—threat pathogens (HF, Zika, Nipah, MER, SAR, and Disease X (i.e. zoonotic infection)

EMERGING DISEASES CHRONOLOGY



Ref: Fauci, A, It Ain't Over Till It's Over . . . but It's Never Over — Emerging and Reemerging Infectious Diseases; 12-1-2022, NEJM. 387; 22

GLOBAL EMERGING DISEASES



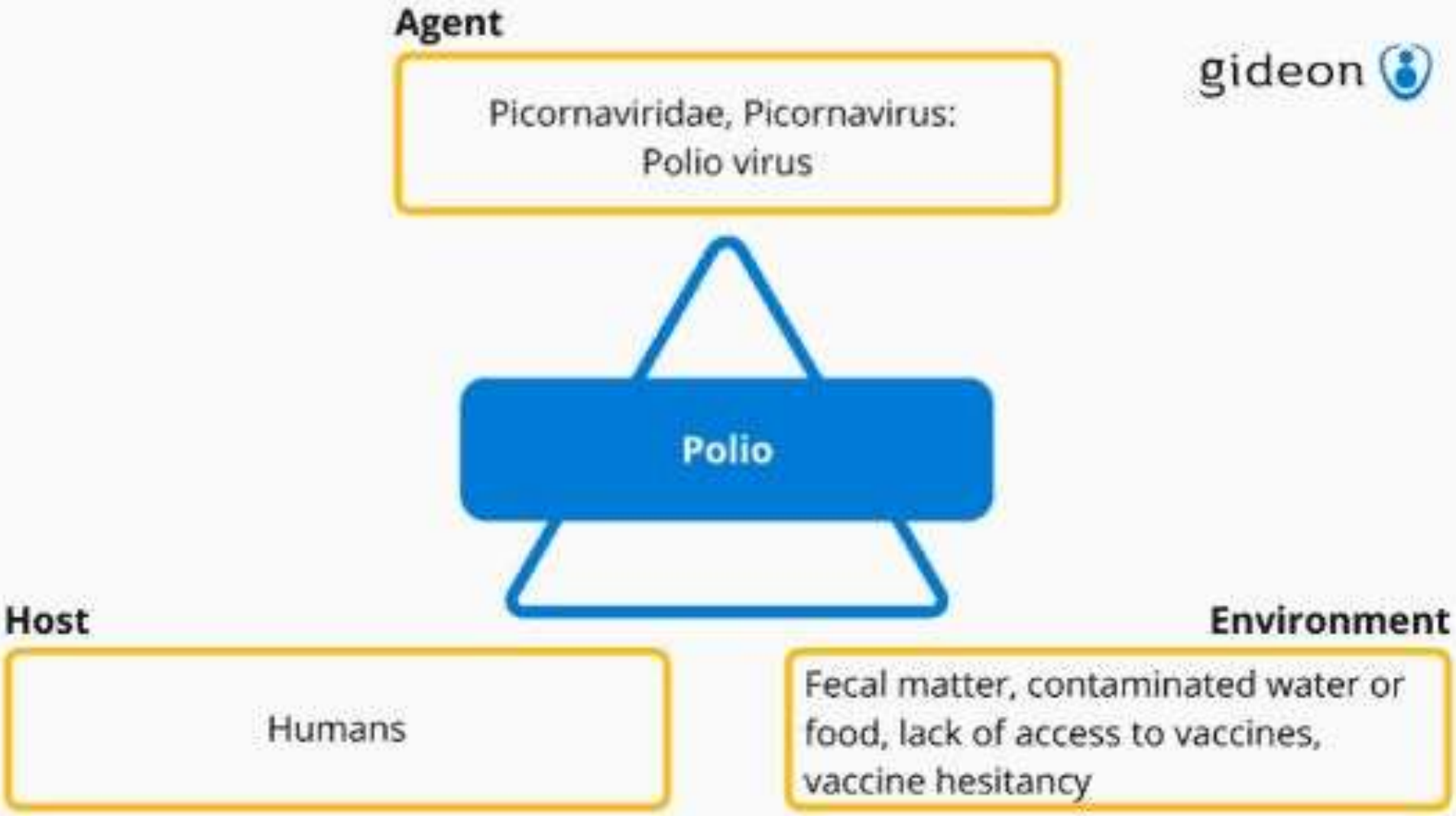
FACTORS CONTRIBUTING TO EMERGING AND RE-EMERGING INFECTIOUS DISEASES

1. Agent (Microbial Hazard)

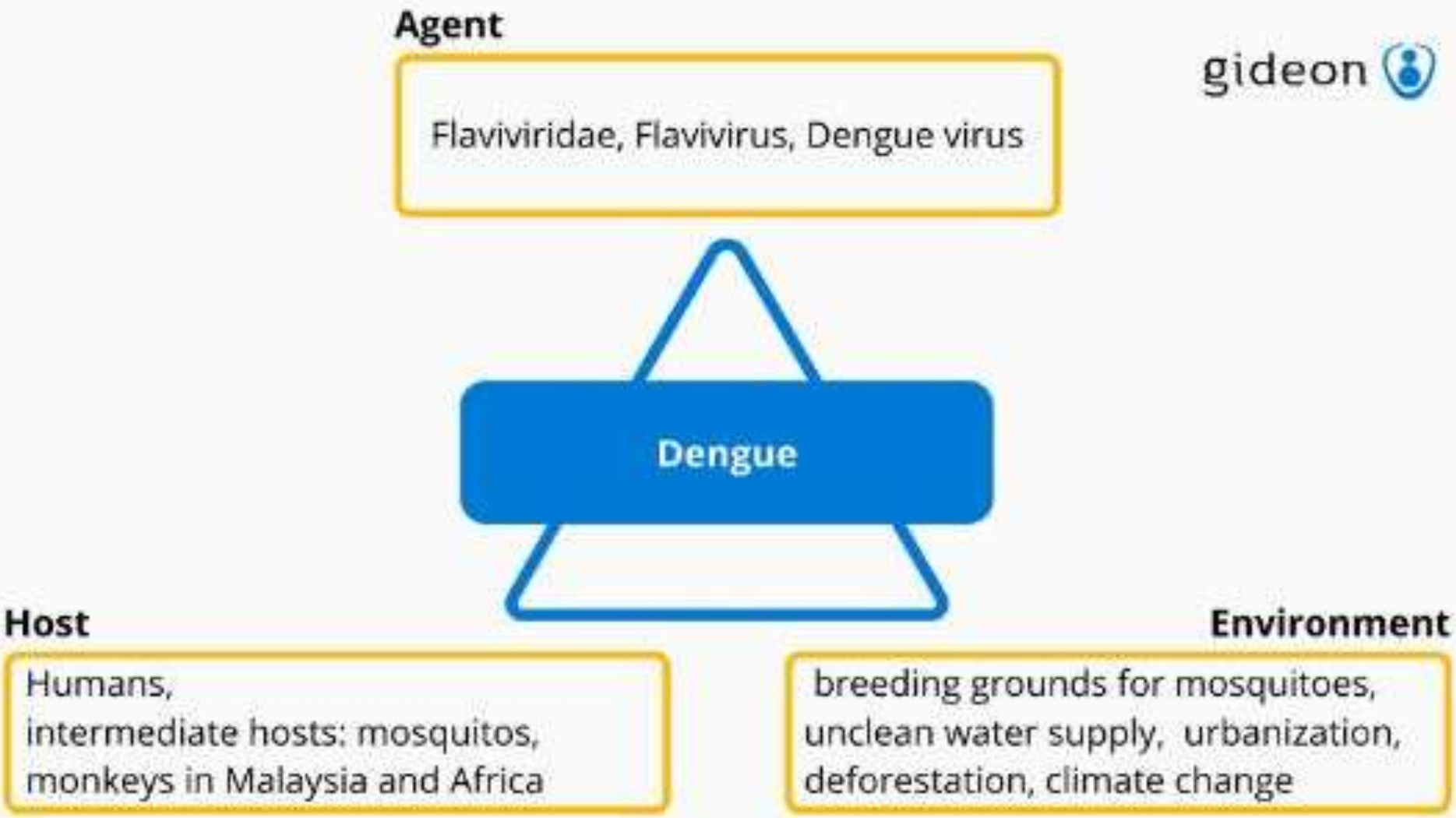
2. Host (Human Vulnerability)

3. Environment (Human Exposure)

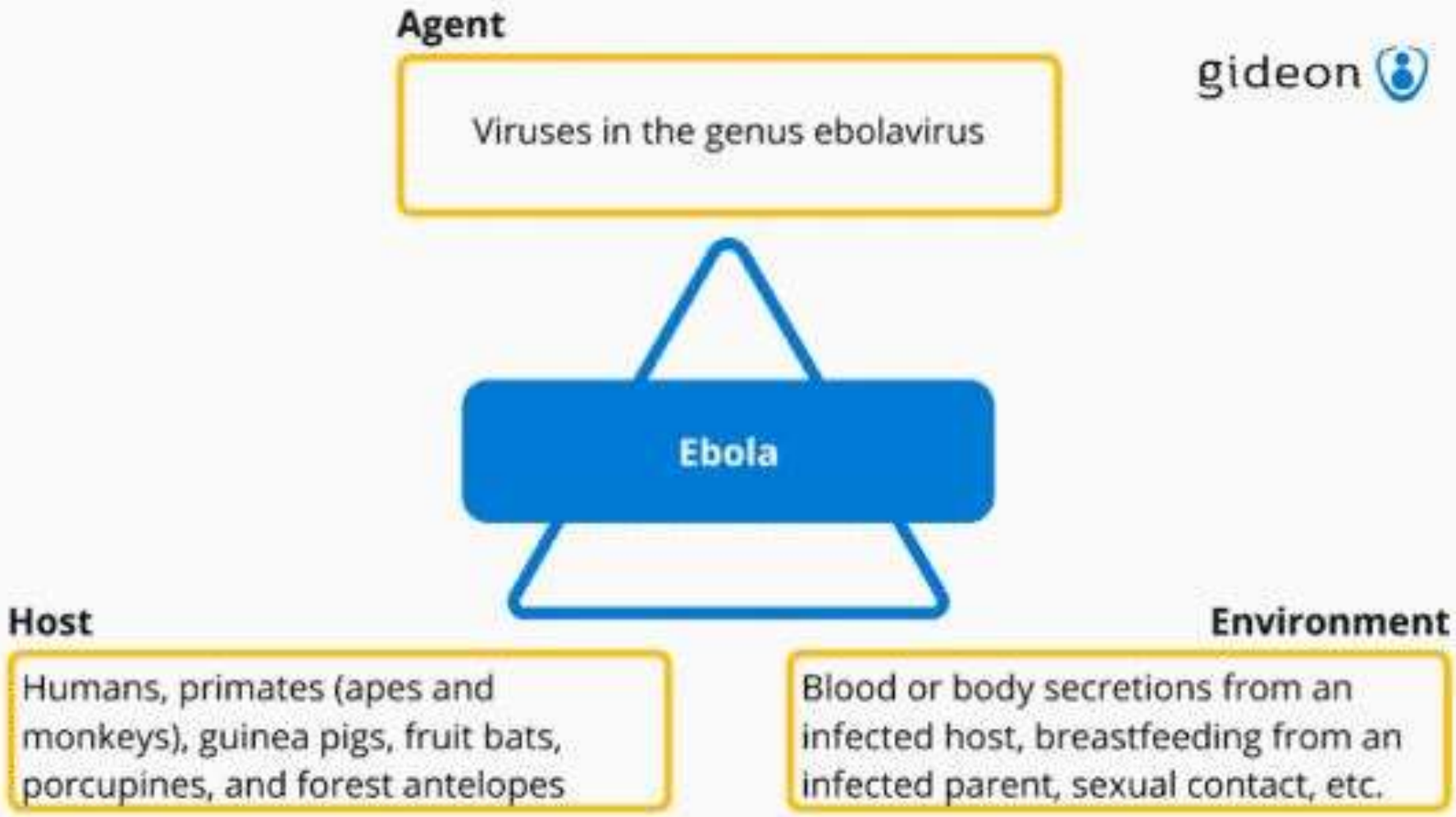
POLIO


Agent
Picornaviridae, Picornavirus:
Polio virus
gideon
Polio
Host
Humans
Environment
Fecal matter, contaminated water or food, lack of access to vaccines, vaccine hesitancy

DENGUE


Agent
Flaviviridae, Flavivirus, Dengue virus
gideon
Dengue
Host
Humans,
intermediate hosts: mosquitos,
monkeys in Malaysia and Africa
Environment
breeding grounds for mosquitoes,
unclean water supply, urbanization,
deforestation, climate change

EBOLA


Agent
Viruses in the genus ebolavirus
gideon
Ebola
Host
Humans, primates (apes and monkeys), guinea pigs, fruit bats, porcupines, and forest antelopes
Environment
Blood or body secretions from an infected host, breastfeeding from an infected parent, sexual contact, etc.

FACTORS CONTRIBUTING TO EMERGING AND RE-EMERGING INFECTIOUS DISEASES

1. Microbial Agents (Hazard)

Increase in Virulence (Severity)

Increase in Infectivity (Spread)

Adapting to new host (HIV)

Route of Entry (iatrogenic/nosocomial)

Development of antibiotic resistance

Strain variation

Mutation / reassortment (influenza, Mpox)

Polymicrobial Disease

FACTORS CONTRIBUTING TO EMERGING AND RE-EMERGING INFECTIOUS DISEASES

2. The Human Host (Vulnerability)

Increasing Human Susceptibility (older, immunocompromised)

International Air Travel (especially ecotourism)

Global Sex Industry and MSM Population

Food preference (e.g. raw milk, bush meat, animal markets)

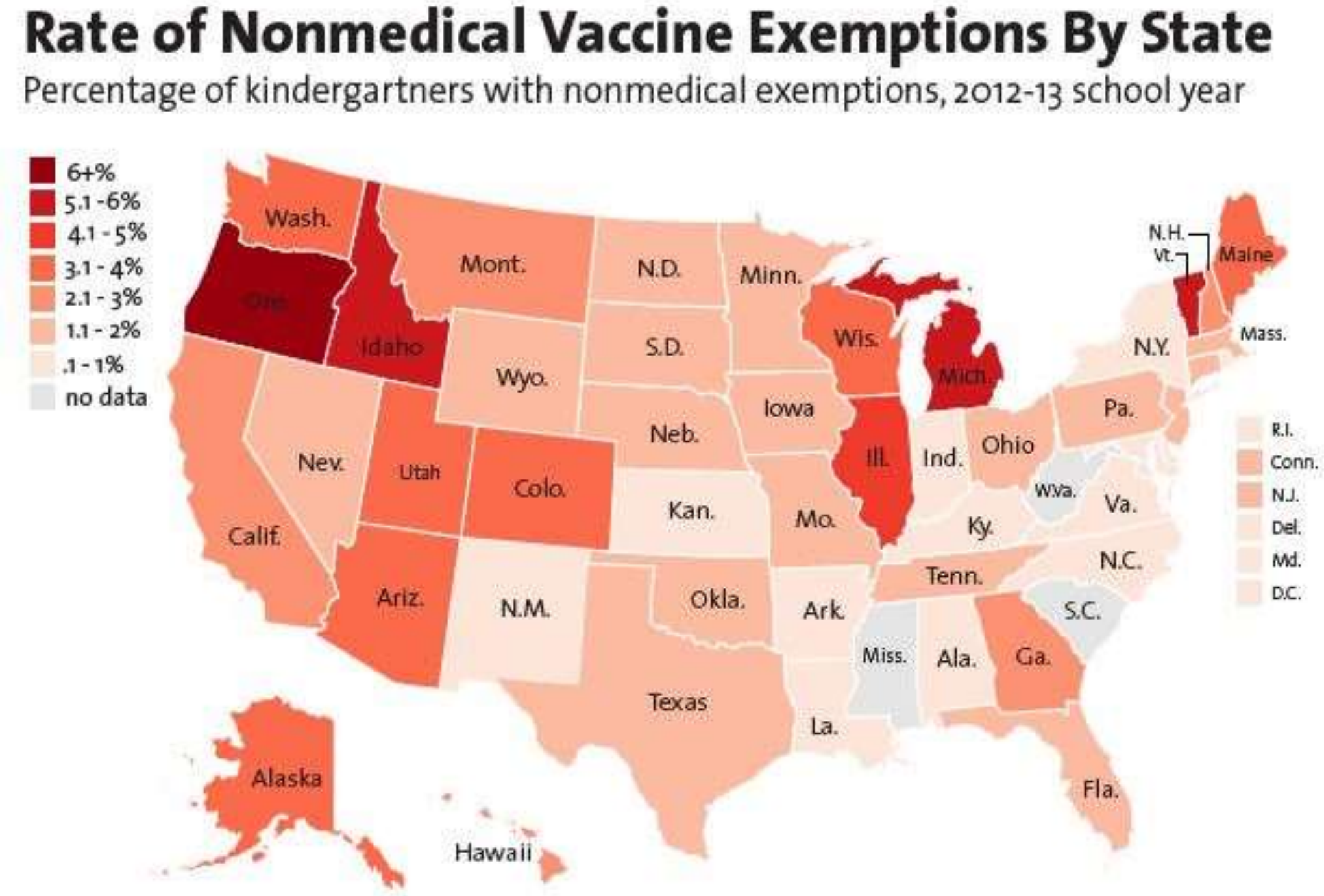
Disease Amplification in large “open” poultry production units in SEA and animal megafarms in developed countries

Inappropriate use of antibiotic in animal feed

Increasing Non-compliance w/ recommended prevention measures

Bioterrorism (intent to harm)

RATE OF NON-MEDICAL VACCINE EXEMPTIONS BY STATE, USA - 2012-2013



FACTORS CONTRIBUTING TO EMERGING AND REEMERGING INFECTIOUS DISEASES

3. The Human Environment (Exposure)

Climate change and changing ecosystems

Encroachment of sylvatic environments and their endemic diseases

Megacities, Poverty and Social Inequality

Lack of Public Health Services

War, Displace Populations, and Famine

Potential Mass Casualty events (Olympics, Marathons, Hajj, etc.)

Entry through borders of unscreened aliens (Leishmaniasis, WNV, Leprosy, Leptospirosis, Typhus, Chagas, Malaria, etc.)

Environmental pollution with various metals which promote bacterial growth from the proliferation of weapons and military equipment (boron, barium, antimony lead, nickel, mercury, chromium, copper); The Mosul Syndrome; AA Fayad, BMJ,2023)

GLOBAL TRAVEL STATISTICS

In 1997, 30-35 million persons traveled annually to developing countries from industrialized countries

80% were tourists

Origin of Travel:

- 50% travel from Europe to Africa and Asia
- 40% travel from US and Canada to Mexico and Caribbean
- 10% travel from Australia, New Zealand, & Japan

Source: Dupont, HL and Steffen, R, "Textbook of Travel Medicine and Health," 1997, BC Decker, Inc.

By 2015, ICAO projected 2.5 billion passengers will travel by air annually

Outlook for Air Transport to the year 2015,, Montreal, Intl. Civil Aviation Org. (ICAO), 2004, (Circular 304 AT/127, 2004)

AIR TRAVEL STATISTICS (USA)
(in Millions)

Type of Travel	1994	2005	2019
All Airline trips	480	660 (2006)	1005
Departures to Foreign country	20	86	230
Arrivals into USA	18	18 (2003)	37
Cruise trip	5	10	32
Immigration into USA	1	1	0.7

Sources: US DOT Transportation Statistics Annual Report 2020
Bureau of Transportation Statistics, T-100 International Market and Segment, March 2004
Plunkett's Airline, Hotel & Travel Industry Almanac 2007
2005 and 2021 Yearbook of Immigration Statistics, Homeland Security
U.S. Department of Commerce, ITA, Office of Travel and Tourism Industries: Statistics Canada; & Secretaria de Turismo (Mexico)

ONE DAY OF GLOBAL AIR TRAVEL

37 million arrivals into USA yearly

GLOBAL URBANIZATION

Nearly half of the world's population now live in urban centers. The number of cities with a population greater than 1 million (agglomerations) has increased sharply over the past half century.

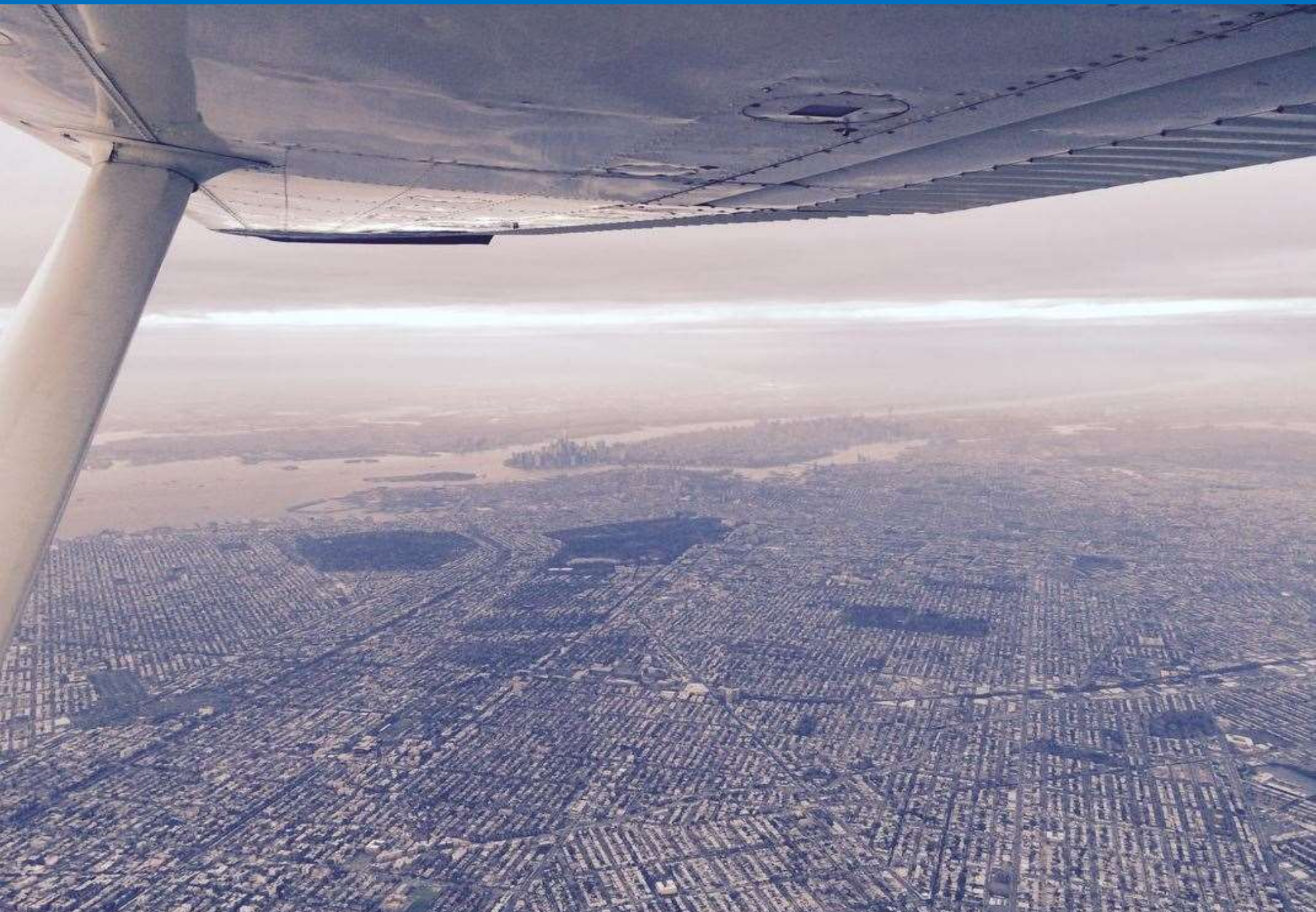
	1955	1995	2014	2020
# of Agglomerations (> 1M)	90 (26% Pop)	336 (36% Pop)	(50% Pop)	358

# of Agglomerations	1970	1996	2020
In Developed Countries	82	115	(276 ?)
In Developing Countries	83	221	(82 ?)

	1950	1995	2001	2015	2020
Megacities (> 10 M)	1	11	18	21	35

Sources:
United Nations Population Division: World urbanization prospects: the 1999 revision. Key Findings. UN, New York 2001.
World Health Organization: Life in the 21st century: A vision for all. World Health Organization, Geneva 1998
Melinda Moore, Philip Gould, Barbara S. Keary, 2003, Int. J. Hyg. Environ. Health 206, 269 ± 278 (2003)
Wikipedia Megacity and Agglomeration 2022

NEW YORK CITY



DEFINITIONS

Emerging disease => **new location**

Chikungunya and ZIKA in the West. Hemisphere

Ebola in West Africa

Dengue (SW USA)

Chagas and Leishmaniasis in USA

Re-emerging Diseases => **new time (>35 yrs hiatus)**

e.g. Measles Epidemic in USA 2015 (started in Disneyland from a Filipino tourist)

Polio Outbreak in NYC suburbs 2022

CRITICAL QUESTIONS THAT NEED TO BE ASKED ABOUT ANY POSSIBLE EMERGING DISEASE

- Why is this case important as an emerging infection?
- What is the causative agent?
- What is the frequency of occurrence?
- How is it transmitted?
- What are the clinical manifestations?
- How is the diagnosis made?
- How do you differentiate this from similar entities?
- What is the therapeutic approach?
- What are the preventive measures?

THE VARIOUS PRESENTATIONS OF EMERGING INFECTIOUS DISEASE

- A newly identified disease caused by a known pathogen
  - Group A Streptococcus and Toxic Shock Syndrome
- A newly identified disease caused by a previously unknown pathogen
  - HIV
- A known disease caused by an unknown infectious pathogen
  - Helicobacter pylori and peptic ulcer disease
- A new infection that results from mutations in a known pathogen changing its virulence
  - Escherichia coli O157:H7 strain (HUS);
- A previously unrecognized infection that is appearing in areas where the habitat is changing (e.g deforestation, etc)
  - Lyme borreliosis; Plasmodium knowlesi; Clostridium difficile NAP1/BI/027; Enterohemorrhagic Escherichia coli

THE VARIOUS PRESENTATIONS OF EMERGING INFECTIOUS DISEASE

- Newly identified reservoirs of “old” infection
  - Trypanosoma brucei rhodesiense (Sleeping Sickness) in cattle
  - SARS in Civets; MERS-CoV in Camels
- “Old” infections that have reemerged and have become resistant to antimicrobial agents
  - Multidrug-resistant tuberculosis; New Delhi metallo-beta-lactamase 1 producers, malaria, vaccine-preventable disease, MDR C. difficile; VRE, MRSA
- “Old” infections that have reemerged as a result of a break down in public health initiatives / infrastructure
  - Childhood Diseases (Measles, Pertussis, Polio, Diphtheria)
  - Malaria resurgence due to cancelled programs
  - Leishmania mexicana and infantum in Southern USA 2023

THE VARIOUS PRESENTATIONS OF EMERGING INFECTIOUS DISEASE

- "Old" infection that has emerged due to advances in medical technology
  - Acinetobacter; Exserohilium rostratum
- A recognized infection spreading to a new area, species or populations.
  - West Nile Disease Chikungunya; Zika virus in the Western Hemisphere
  - Rift Valley Fever; Ebola Virus Disease in West Africa
- "Old" infection deliberately altered to cause intentional harm
  - Bacillus anthracis 2001

CHRONOLOGY OF EMERGING INFECTIOUS DISEASES IN THE PAST 100 YEARS IN THE USA

- 1900 -1950's Waterborne Diseases (e.g. Cholera)
  - Tuberculosis
  - Influenza
  - Rheumatic Fever
  - MMR, DPT, and Polio
- 1950's
  - Staph Infections in Neonates
- 1960's
  - Hong Kong Flu
  - German Measles

CHRONOLOGY OF EMERGING INFECTIOUS DISEASES IN THE PAST 100 YEARS IN THE USA

- 1970's
  - "Infectious diseases will be eliminated from the World"
  - Swine Flu Fiasco
  - Hidden Epidemic of Hepatitis C and HSV
  - MDR Syphilis and Gonorrhea
  - Ebola Virus Disease (1976)
- 1980's
  - HIV Pandemic spreads from Africa
  - Tick-borne diseases start to spread down the Eastern Seaboard

CHRONOLOGY OF EMERGING INFECTIOUS DISEASES IN THE PAST 100 YEARS IN THE USA

- 1990's
  - 1992 IOM report—*Emerging Infections: Microbial Threats to Health in the United States*
  - Foodborne Outbreaks in USA due to imported food products
  - Cholera Pandemic in the Western Hemisphere
  - H5N1 Avian Flu (1997)
  - WNV introduced into the USA
- 2000's
  - SARS (Coronavirus = coV) (2003)
  - H1N1 Pandemic Flu
  - MRSA (Community Acquired)

CHRONOLOGY OF EMERGING INFECTIOUS DISEASES IN THE PAST 100 YEARS IN THE USA

- 2010's

  Ebola Virus Disease in West Africa

  MERS-COV in the Arabian Peninsula (Republic of Korea, etc.)

  Chikungunya in the Caribbean

  Zika Virus in Indonesia and So. America

  MDR and XDR Tuberculosis

  Avian Influenza strains worldwide

  Multi-drug resistance enteric infections ESBL Enterobacteraciae (KPC, NDM-1, Acinetobacter, MDR C. Difficile, etc.)

  Vaccine preventable disease epidemics (Polio, Measles & Pertussis)

  Undiagnosed Hemorrhagic Fever in Sudan Refugee Camps

  Louse-borne relapsing fever in asylum seekers in Italy

  Sandfly-borne Leishmaniasis in Syrian Refugees and Iraq veterans

  Invasive Mosquitos in Greece and California (Asian Tiger) that can easily spread Dengue Chikungunya

CHRONOLOGY OF EMERGING INFECTIOUS DISEASES IN THE PAST 100 YEARS IN THE USA

- **2015+**

  Severe Fever with Thrombobytopenia Syndrome (SFTS) Bunyavirus

  Bas-Congo Virus (Rhabovirus, Acute Hemorrhagic Fever)

  Hantavirus Infections

  Lassa Fever

  Alkhurma Hemmorrhagic Fever

  Rift Valley Fever

  Lujo Virus Hemorrhagic Fever

  Toscana Virus Infection

  Ebola Virus Disease

  Crimean-Congo Hemorrhagic Fever

  Phelbotomus Fever – Sandfly Fever

  Chikungunya Fever

  Nipa Virus Disease

  Middle East Respiratory Syndrome – Coronavirus Infection (MERS-CoV)

CHRONOLOGY OF EMERGING INFECTIOUS DISEASES IN THE PAST 100 YEARS IN THE USA

- 2015+
  - Buruli Ulcer (Atypical Mycobacteria)
  - Human Bocavirus
  - Norovirus Gastroenteritis
  - Enterohmorrhagic E.col (EHEC): Hemmorrhagic Colitis and Hemolytic Uremic Syndrome (HUS)
  - Emerging Clostridium difficile Infections
  - Multidrug- Resistant Tuberculosis
  - Acinetobacter Infections
  - Infections due to NDM-1 Producers
  - The Exserohilum rostratum Incident: Compounding Pharmacy
  - Mucormycosis
  - Lyme Borreliosis
  - Plasmodium Knowlesi
  - Measles
  - Pertussis
  - Zika Virus
  - Avian Flu
  - COVID-19

INSTITUTE OF MEDICINE'S 2002 LIST OF CANDIDATE INFECTIOUS AEROSOLS FOR BIOLOGICAL TERRORISM/WARFARE (INITIALLY 20 "SELECT AGENTS," NOW 67)

Smallpox

Monkeypox

Nipah (*Paramyxovirus)*

ArboViral encephalitis (VEE, WEE, Chikungunya)

Tick-borne encephalitis

"Eradicated" wild-type polio and rubeola virus

Influenza A 1918 strain (Avian Flu)

Hong Kong H5N1

Others (Plague, Q Fever, Anthrax, Brucella)

All "Select Agents" require BSL 3 or 4 containment and require a Biosurety or Personnel Reliability Program

NIAID EMERGING INFECTIOUS DISEASES/PATHOGENS AS OF 7-26-18

This list was created for the purpose of extramural and intramural program management within the NIAID biodefense/EID mission and does not represent the complete scope of biodefense and emerging infectious disease.

This list excludes research on sexually transmitted organisms (unless the resistance is newly emerging)

e.g. Bacterial vaginosis, *Chlamydia trachomatis*, cytomegalovirus, *Granuloma inguinale*, *Hemophilus ducreyi*, hepatitis B virus, hepatitis C virus, herpes simplex virus, human immunodeficiency virus, human papillomavirus, *Treponema pallidum*, *Trichomonas vaginalis*

Ref: https://www.niaid.nih.gov/research/emerging-infectious-diseases-pathogens

NIAID EMERGING DISEASES CATEGORIES

Category A pathogens: organisms/biological agents that can be **easily disseminated** or transmitted from person to person, have **high mortality rates** and high potential for major public health impact, can cause public panic and social disruption, and require special action for public health preparedness.

Category B pathogens : moderately **easy to disseminate**, have **moderate morbidity rates,** low mortality rates and require specific enhancements for diagnostic capacity and enhanced disease surveillance.

Category C pathogens : include emerging pathogens that **could be engineered for mass dissemination** in the future because of availability, ease of production and dissemination, potential for high morbidity and mortality rates and major health impact.

CATEGORY A PRIORITY PATHOGENS

Bacillus anthracis (anthrax)
Clostridium botulinum toxin (botulism)
Yersinia pestis (plague)
Variola major (smallpox) and other related pox viruses
Francisella tularensis (tularemia)
Viral hemorrhagic fevers
- Arenaviruses
  - Junin, Machupo, Guanarito, Lassa, Chapare & Lujo (new in FY14)
- Bunyaviruses
  - Hantaviruses, Rift Valley Fever, Crimean Congo HF
- Flaviviruses
  - Dengue
- Filoviruses
  - Ebola and Marburg viruses

CATEGORY B PRIORITY PATHOGENS

Burkholderia pseudomallei (melioidosis)
Coxiella burnetii (Q fever)
Brucella species (brucellosis)
Burkholderia mallei (glanders)
Chlamydia psittaci (Psittacosis)
Ricin toxin (Ricinus communis)
Epsilon toxin (Clostridium perfringens)
Staphylococcus enterotoxin B (SEB)
Typhus fever (Rickettsia prowazekii)
Mosquito-borne viruses

West Nile virus	(WNV)
LaCrosse encephalitis	(LACV)
California encephalitis	
Venezuelan equine encephalitis	(VEE)
Eastern equine encephalitis	(EEE)
Western equine encephalitis	(WEE)
Japanese encephalitis virus	(JE)
St. Louis encephalitis virus	(SLEV)
Yellow fever virus	(YFV)
Chikungunya virus	
Zika virus	

CATEGORY B PRIORITY PATHOGENS

Food- and waterborne pathogens

Bacteria

- Diarrheagenic E.coli
- Pathogenic Vibrios
- Shigella species
- Salmonella
- Listeria monocytogenes
- Campylobacter jejuni
- Yersinia enterocolitica

Viruses

- Caliciviruses
- Hepatitis A

Protozoa

- Cryptosporidium parvum
- Cyclospora cayatanensis
- Giardia lamblia
- Entamoeba histolytica
- Toxoplasma gondii
- Naegleria fowleri **(new in FY14)**
- Balamuthia mandrillaris **(new in FY14)**

Fungi

- Microsporidia

CATEGORY C PRIORITY PATHOGENS

Nipah and Hendra viruses
Additional hantaviruses
Tickborne hemorrhagic fever viruses
- Bunyaviruses
  - Severe Fever with Thrombocytopenia Syndrome virus (SFTSV), Heartland virus
- Flaviviruses
  - Omsk HF virus, Alkhurma virus, Kyasanur Forest virus

Tickborne encephalitis complex flaviviruses
- Tickborne encephalitis viruses
- European subtype
- Far Eastern subtype
- Siberian subtype
- Powassan/Deer Tick virus

Tuberculosis, including drug-resistant TB
Influenza virus
Other Rickettsias
Rabies virus
Prions
Coccidioides spp.
SARS-CoV), MERS-CoV, and COVID-19 **(new in FY14)**

CATEGORY C PRIORITY PATHOGENS

- Research on antimicrobial resistance, excluding research on sexually transmitted organisms, unless the resistance is newly emerging
  - Research on mechanisms of antimicrobial resistance
  - Studies of the emergence and/or spread of antimicrobial resistance genes within pathogen populations
  - Studies of the emergence and/or spread of antimicrobial-resistant pathogens in human populations
  - Research on therapeutic approaches that target resistance mechanisms
  - Modification of existing antimicrobials to overcome emergent resistance
    Antimicrobial research, as related to engineered threats and naturally occurring drug-resistant pathogens, focused on development of broad-spectrum antimicrobials
- Immunological Research that advance our understanding of host defenses applicable to the biodefense effort, for example: Adjuvants, Innate Immunity. Adaptive Immunity, Mucosal Immunity

CATEGORY C PRIORITY PATHOGENS

Additional Emerging Infectious Diseases/Pathogens
Acanthamebiasis
Australian bat lyssavirus
Babesia, atypical
Bartonella henselae
Ehrlichiosis
Enterovirus 71
Human herpesvirus 6
Human herpesvirus 8
JC virus (new in FY14)
Streptococcus, Group A
Additional Emerging Infectious Diseases/Pathogens *added since FY14*
Anaplasmosis
BK virus
Bordetella pertussis (**new in FY15**)
Borrelia mayonii (**new in FY18)**
Borrelia miyamotoi
Enterovirus 68 (**new in FY15)**
Hepatitis C
Hepatitis E
Leptospirosis
Mucormycosis
Poliovirus (**new in FY15)**
Rubeola (measles) (**new in FY14)**

SURVEILLANCE

- Legally Mandated sources (WHO IHR) 1969
  - Plague Cholera and Yellow fever (previously also smallpox, relapsing fever and typhus).
- WHO "Network of Networks" since 1995 includes 191 WHO Member States http://www.who.int/csr/don/en/
- Formal sources of information
  - CDC, UK Public Hlth Lab Svc, Pasteur Inst., Public Health Schools, TEPHINET, DoD-GEIS
- CDC National Center of Infectious Diseases (NCID)
  - http://www.cdc.gov/ncidod/diseases/eid/
- CDC Travel Notices
  - http://wwwnc.cdc.gov/travel/notices

SURVEILLANCE

- Informal sources of information
  - PACNET (Pacific Health Care Network), GPHIN (Global Public Health Intelligence Network), SEAICRN (Southeast Asia Infectious Disease Clinical Research Network)
  - NGOs (Red Cross, Red Crescent Societies, Medecins sans Frontieres, Medical Emergency, Relief International (Merlin), Christian Religious Orgs)
- Infectious Diseases Society of America (IDSA) provider-based emerging infections sentinel network since 1995: the Emerging Infections Network (IDSA EIN)
  - http://ein.idsociety.org/
- PROMED (Program for Monitoring Emerging Diseases); established 1994; the largest public forum (75,000 members/185 Countries) and a program of the International Soc. Inf. Dis. (ISID)
  - http://www.promedmail.org/

CDC TRAVEL NOTES

Level 1: Watch (Outbreak or Event)

Malaria in Venezuela, Brazil

Cholera in Tanzania

Measles in Ethiopia, DR Congo, Bosnia, Germany, Kyrgyzstan

Chikungunya in Central /South America, Senegal, Pacific, Caribbean,

Dengue in Panama, Malaysia, Brazil

MERS CoV in Republic of Korea

Avian Flu in Egypt (H5N1) and China (H7N9)

Olympics in London

Earthquake in Nepal

Implications:

Follow usual precautions, limited impact to traveler

Ref: http://wwwnc.cdc.gov/travel/notices

CDC TRAVEL NOTES

Level 2: Alert (Outbreak or Event)

Ebola in Sierra Leone

Polio in Madagascar , Ukraine, Guinea, Laos

Yellow Fever in Brazil

Zika Virus in Central/South America, Caribbean

Flooding in El Salvador

Implications:

Increased risk to travelers (defined setting / risk factor)

Follow **ENHANCED** precautions for this destination

Ref: http://wwwnc.cdc.gov/travel/notices

CDC TRAVEL NOTES

Level 3: Warning (Outbreak or Event)

Ebola in Guinea

MERS in Saudi Arabia

SARS in Asia

Earthquake in Haiti

Implications:

High risk to travelers

Avoid all non-essential travel to this destination

Ref: http://wwwnc.cdc.gov/travel/notices

CURRENT "GLOBAL CAPACITY" AGAINST EMERGING INFECTIOUS DISEASES (WHO, 2016)

Good

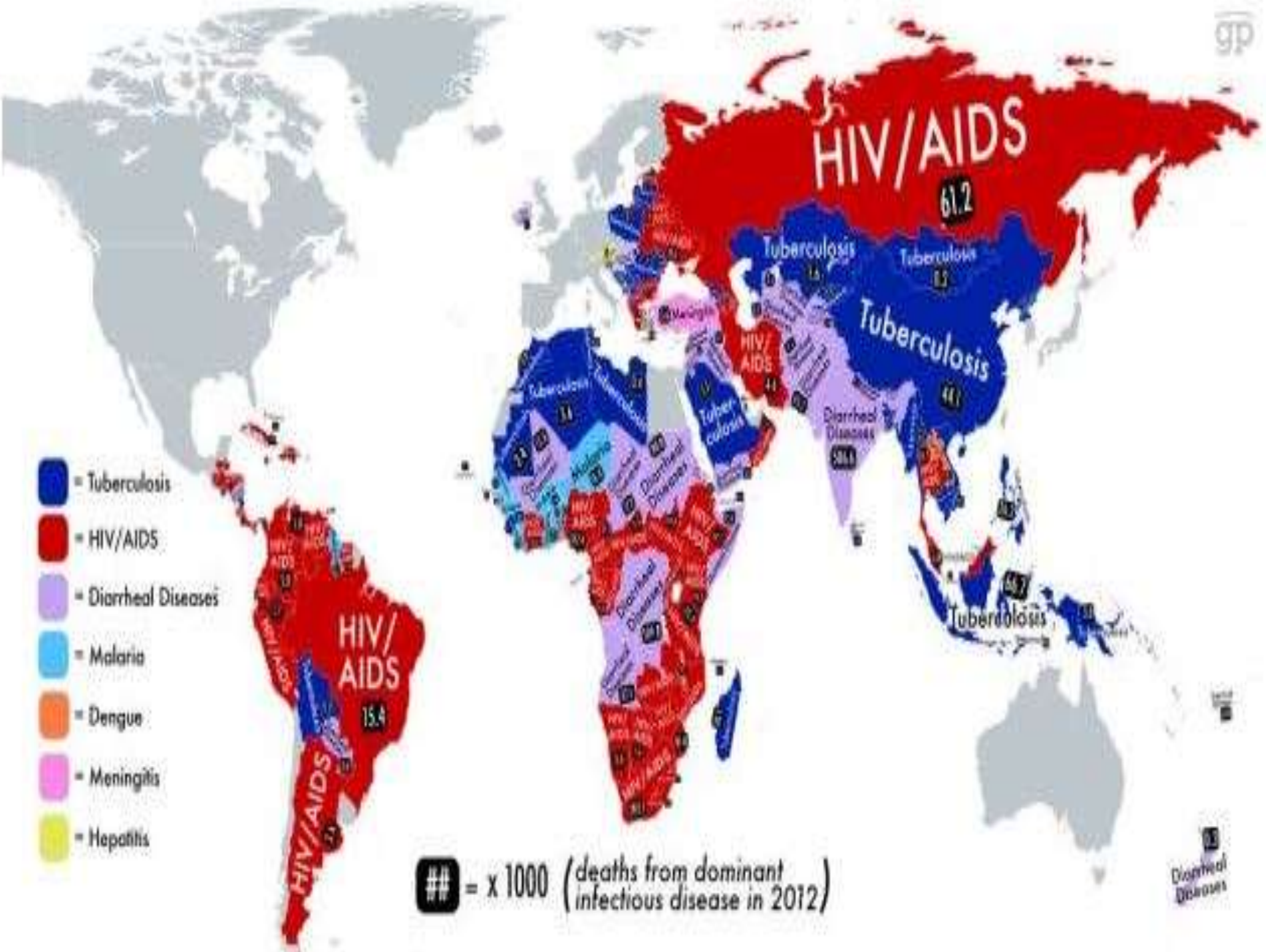
- SAR
- Measles
- Chikungunya
- Zika

Fair

- Influenza
- MERS

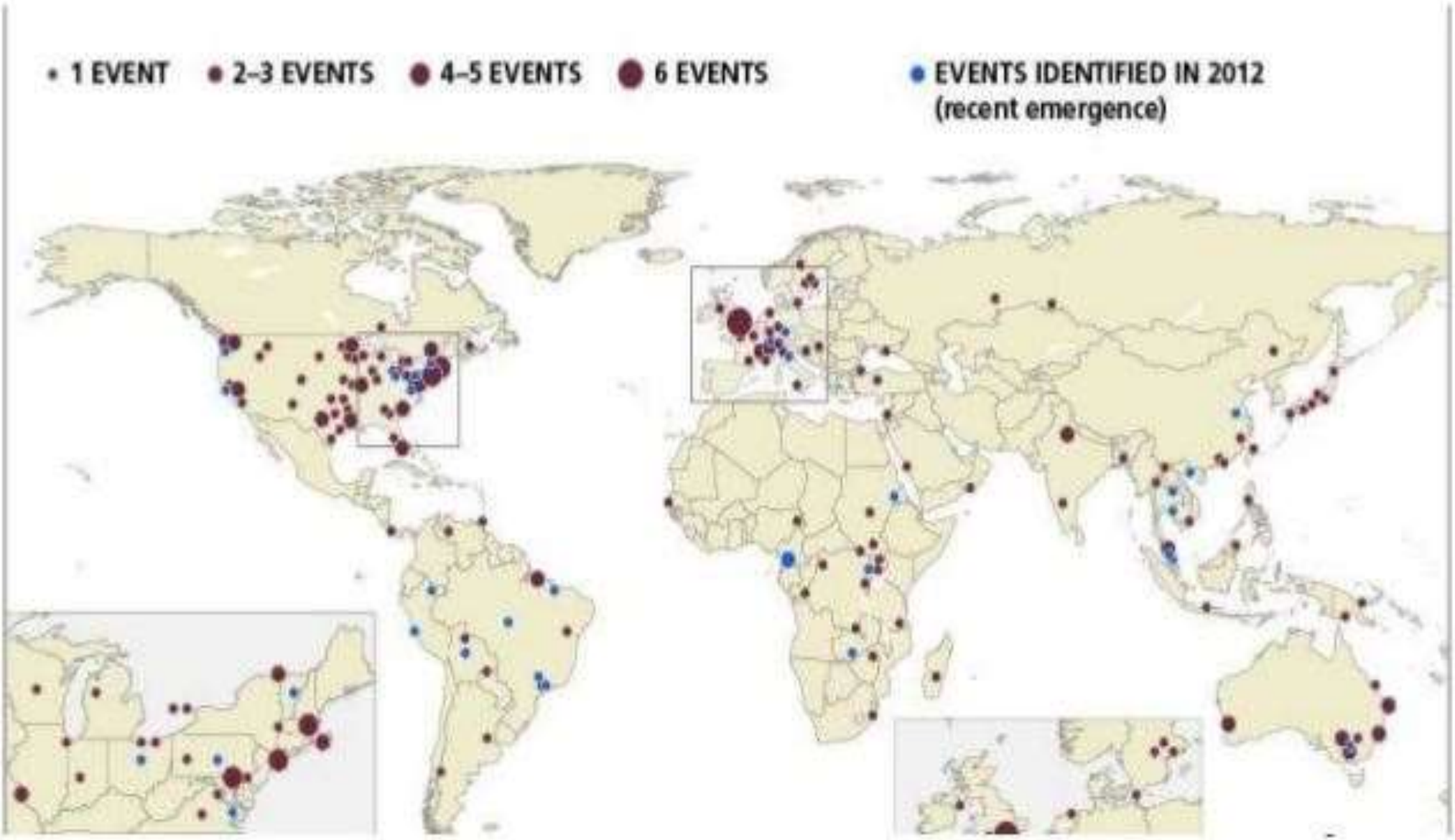
Poor

- Ebola


HIV/AIDS
61.2
Tuberculosis
Tuberculosis
Tuberculosis
Tuberculosis
HIV/AIDS
15.4
HIV/AIDS
HIV/AIDS
Diarrheal Diseases
Diarrheal Diseases
Tuberculosis
= Tuberculosis
= HIV/AIDS
= Diarrheal Diseases
= Malaria
= Dengue
= Meningitis
= Hepatitis
= x 1000 (deaths from dominant infectious disease in 2012)

Emerging infectious diseases 1940-2012

Zoonoses make up 75% of EIDs and cost 6.7 billion a year

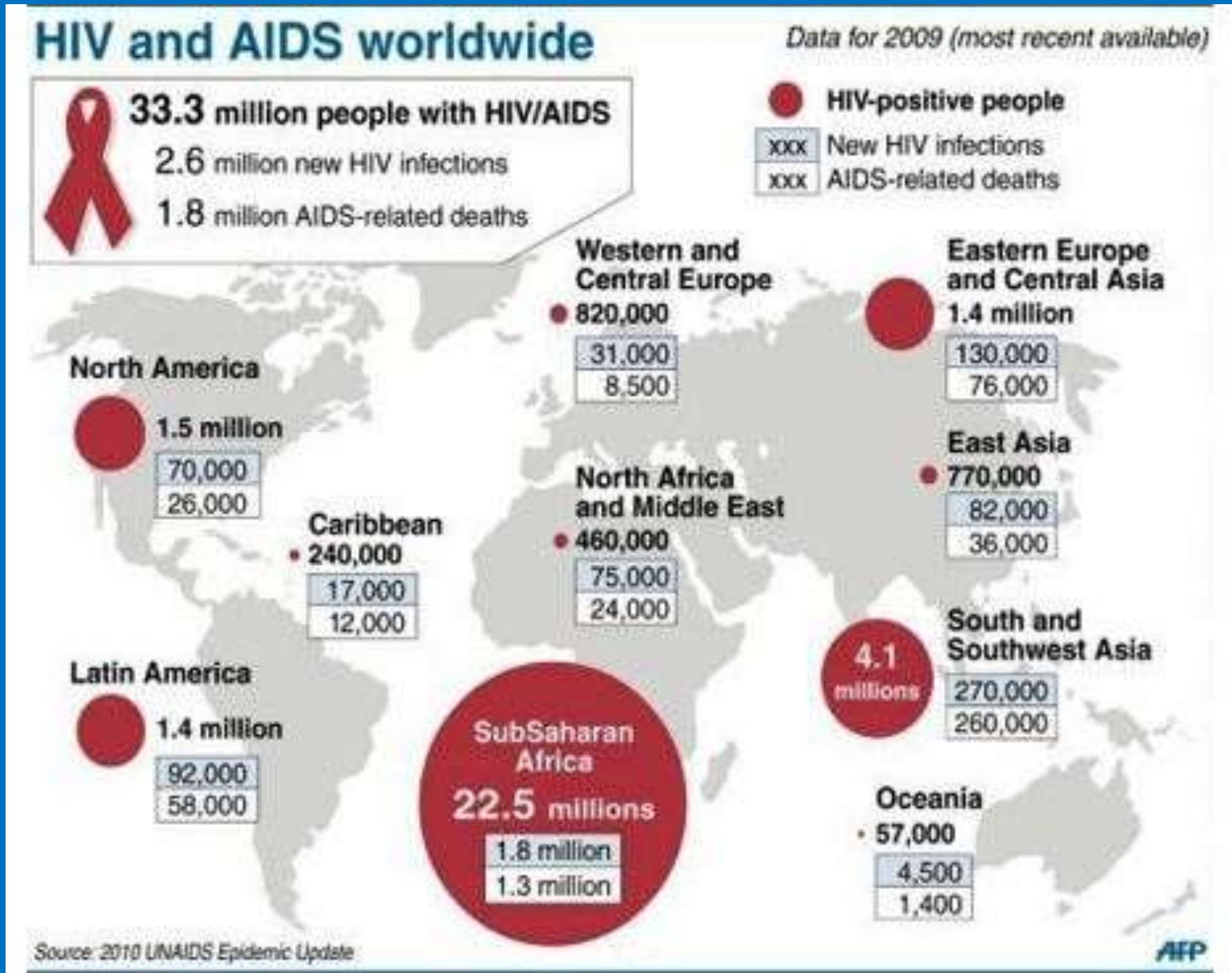


ZOONOTIC DISEASES

HIV Pandemic and the "Perfect Storm"

- HIV originated in the Cameroon in NHP and jumped to humans in the early 20th Century on multiple occasions through the custom of eating bush meat.
- Virus arrives to Kinshasa, DRC as a result of massive social change and industrialization in Africa between 1920-50'.
- The development of railways resulted in millions of male laborers transiting Kinshasa (DRC)
- Males outnumber female citizens creating a sex industry
- Medical practices less sanitary and HIV/AIDS proliferates largely unnoticed in Kinshasa, DRC
- African independence in 1960's lead to infected people bringing the disease to other areas of the world.
- The earliest known case of HIV-1 infection in human blood is from a sample taken in 1959 from a man who'd died in Kinshasa in what was then the Belgian Congo.
- To date, AIDS has killed 40M and HIV currently infects 35M worldwide (~1 million deaths annually since 1981).

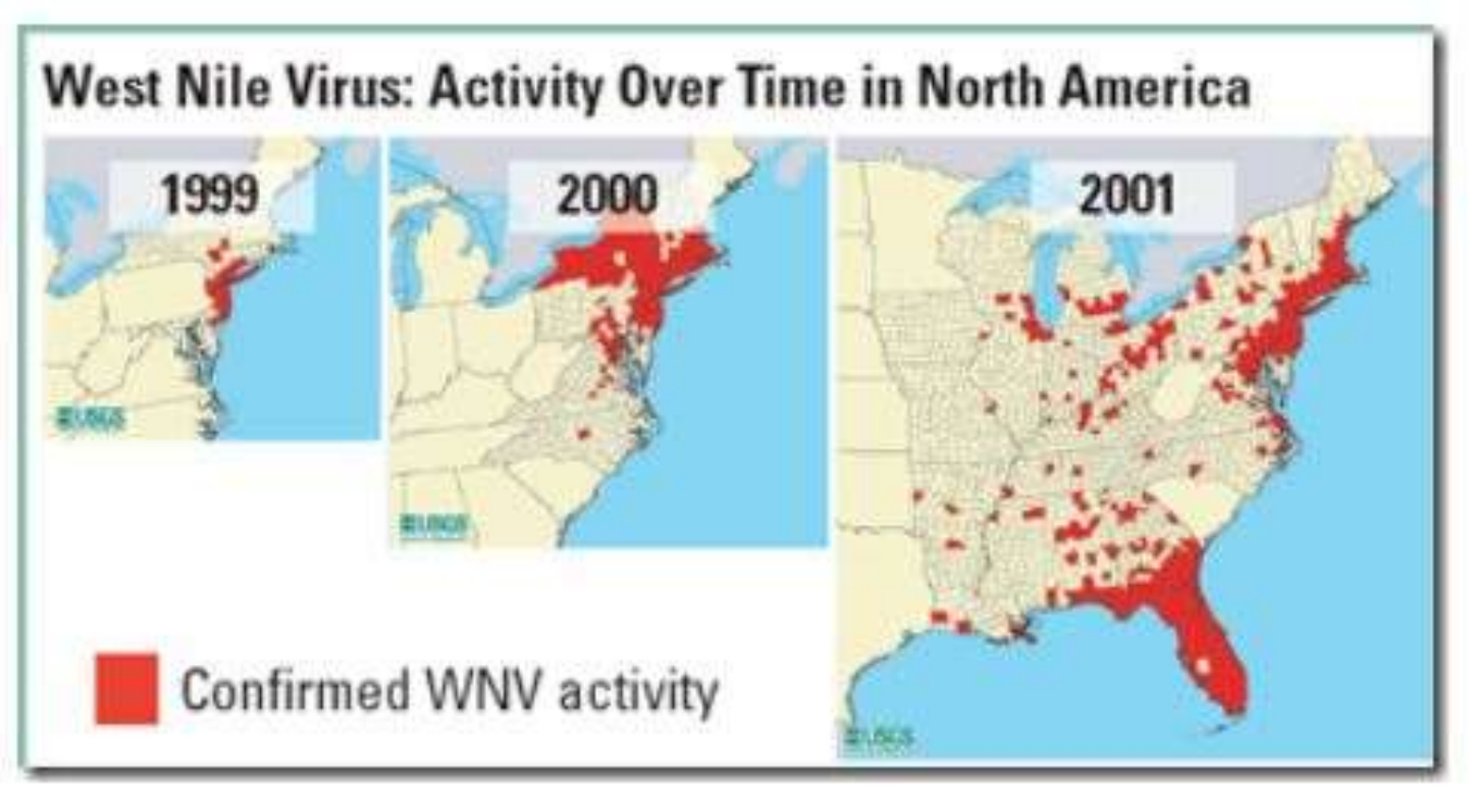
HIV AND AIDS WORLDWIDE



BOSNIA REFUGEES TO USA 1999 (10,000 UNSCREENED REFUGEES)

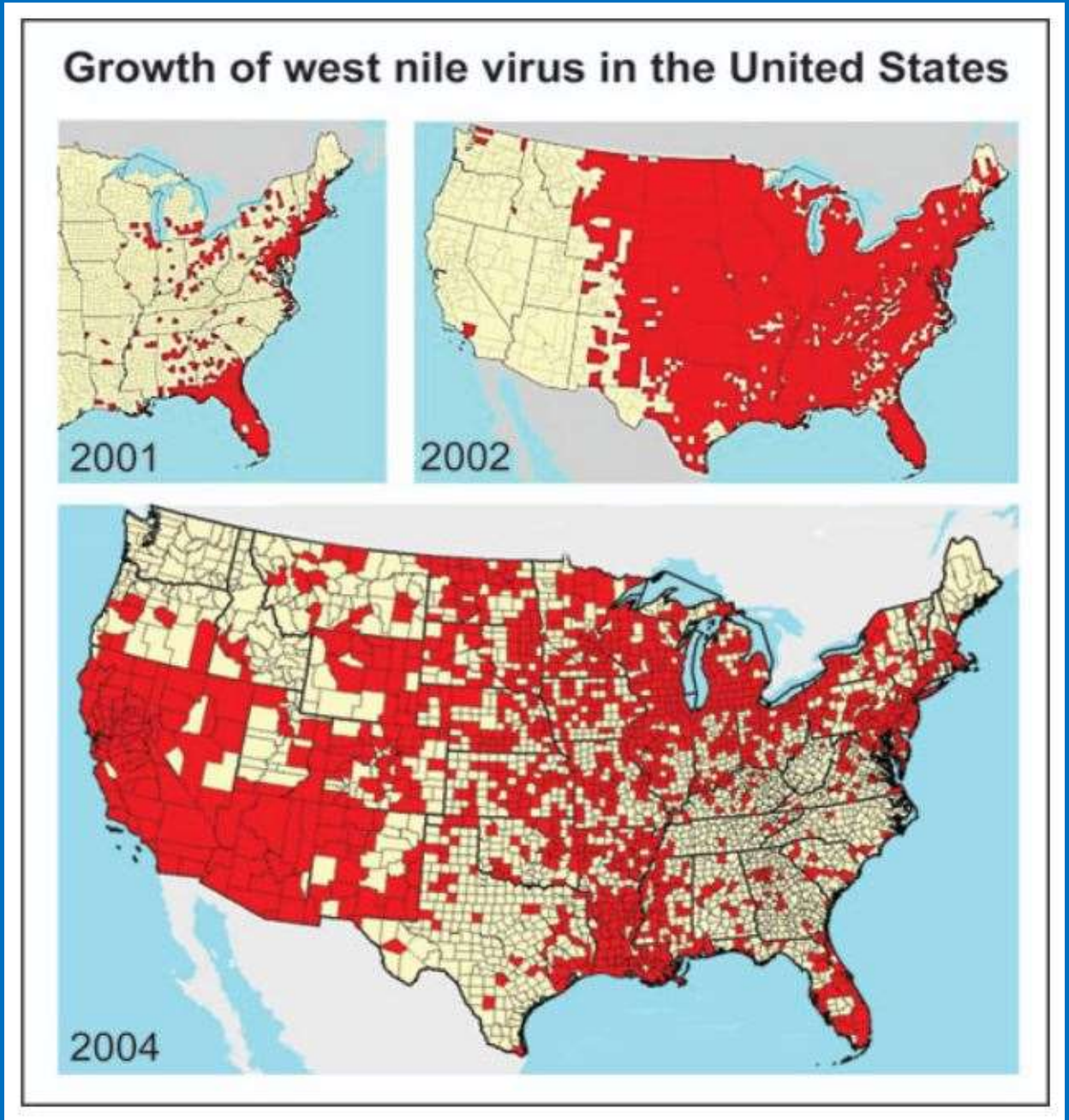
WEST NILE VIRUS (WNV) ENDEMIC AREAS IN EUROPE

SPREAD OF WEST NILE VIRUS IN THE USA 1999 TO 2001



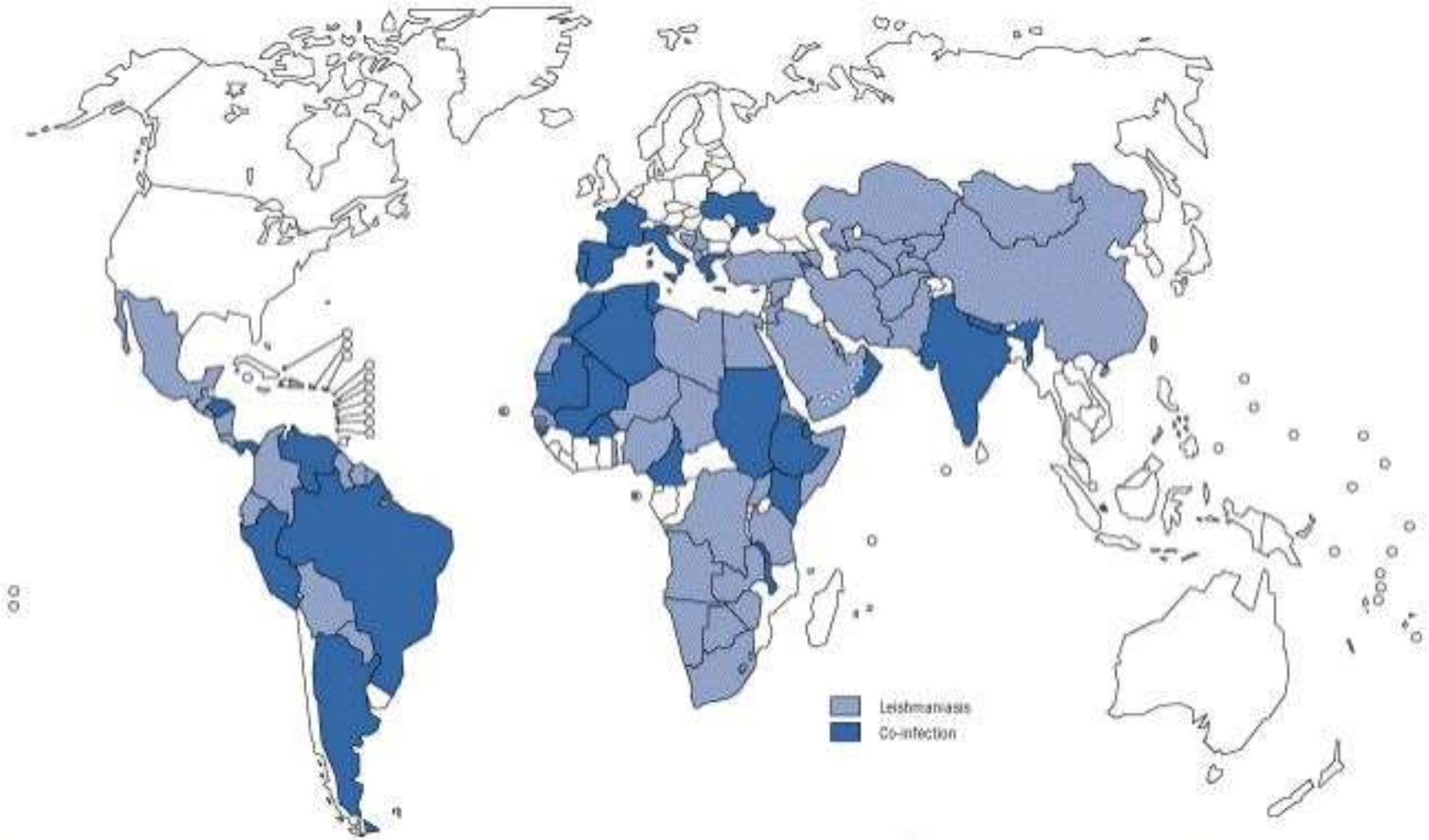
Note: 10,000 unscreened Bosnian Refugees flown to Brooklyn in 1999;
3 months later the first dead birds due to WNV were found in NYC

WNV IN USA
2001 TO 2004



LEISHMANIASIS

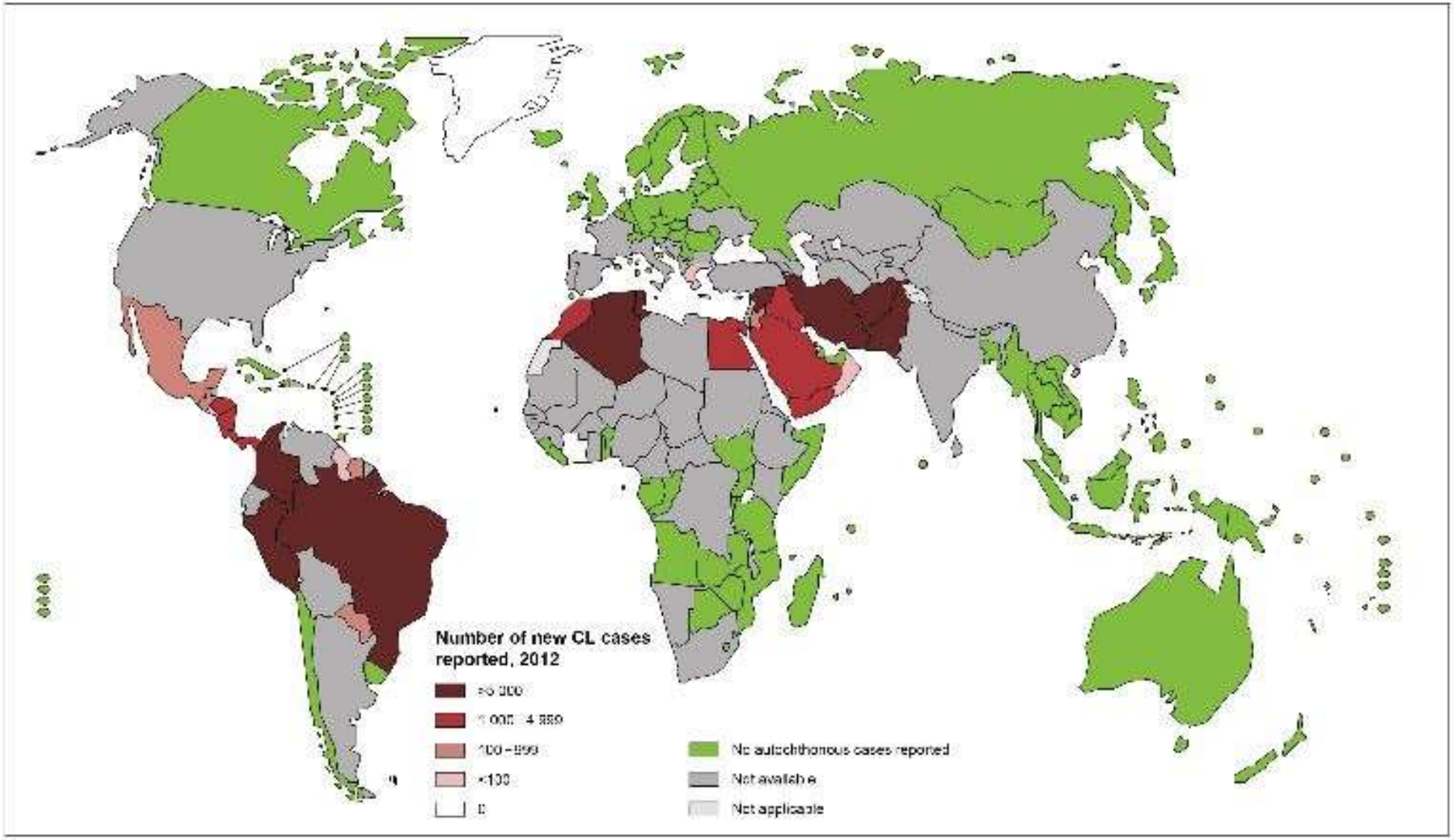
Map 10.1 Global distribution of reported cases of leishmaniasis and Leishmania/HIV co-infection, 1990-1998



Map 10.1 Global distribution of reported cases of leishmaniasis and Leishmania/HIV co-infection, 1990-1998

LEISHMANIASIS

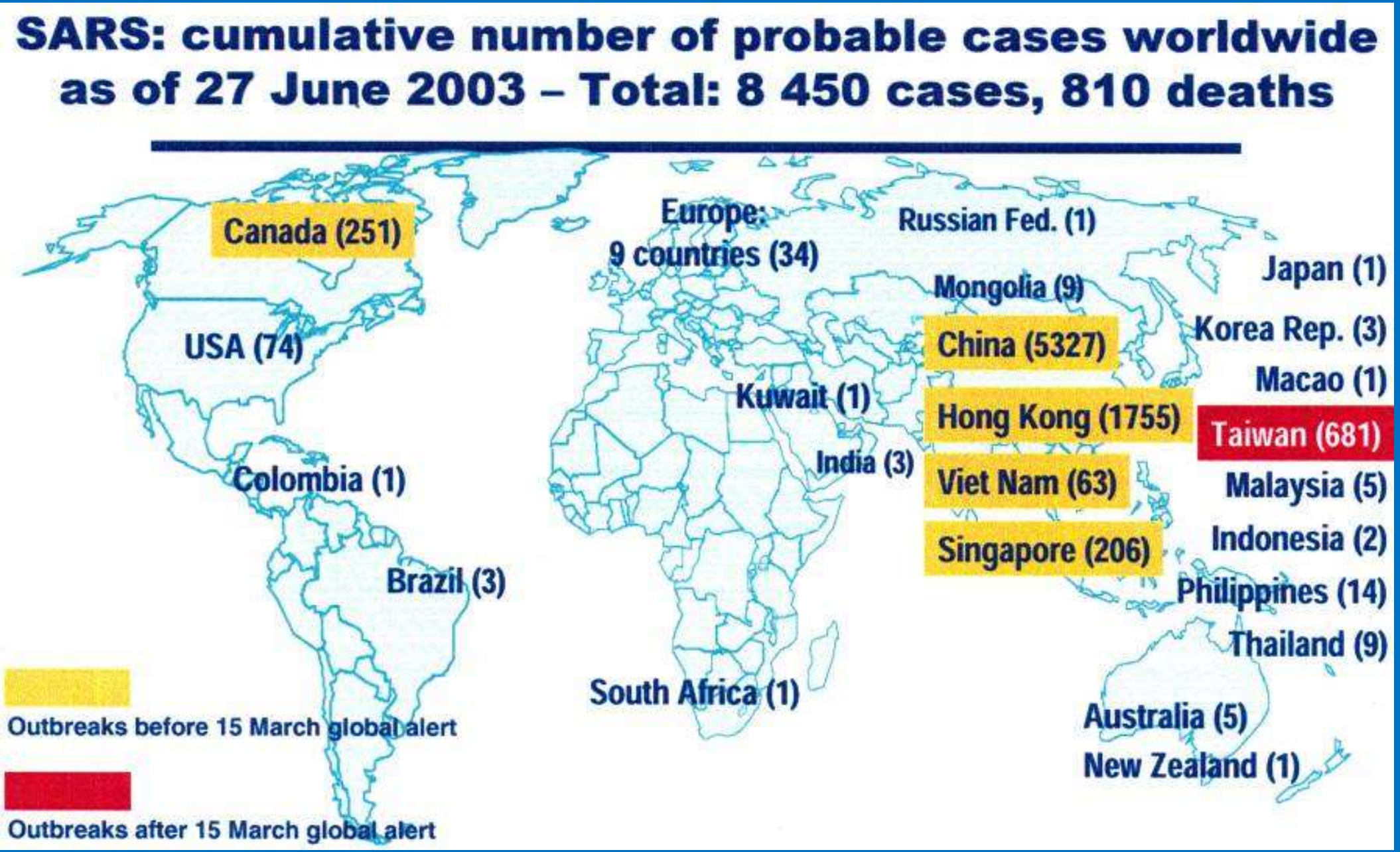
Status of endemicity of cutaneous leishmaniasis, worldwide, 2012



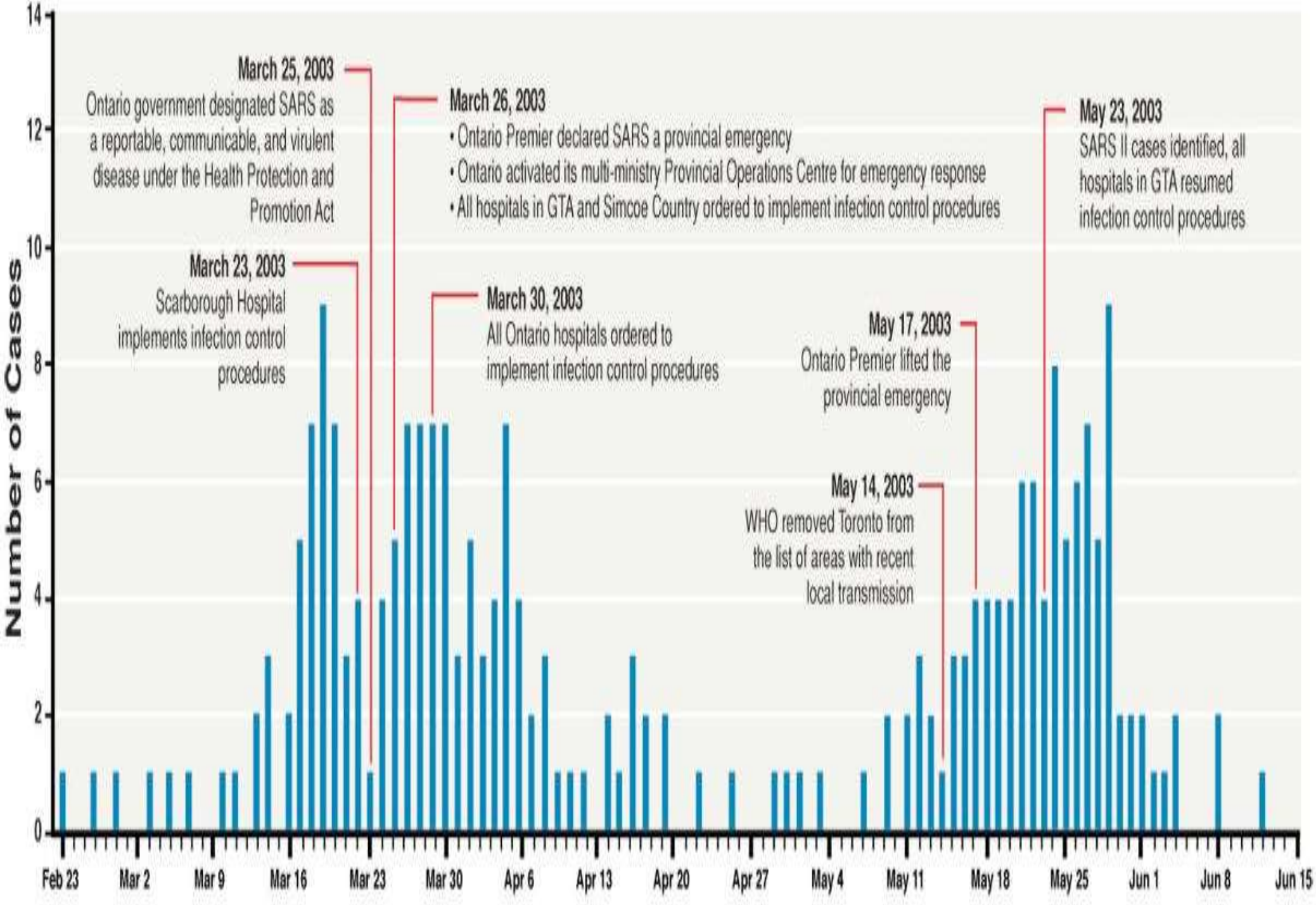
Data Source: World Health Organization
Map Production: Control of Neglected Tropical Diseases (NTD)
World Health Organization

World Health Organization

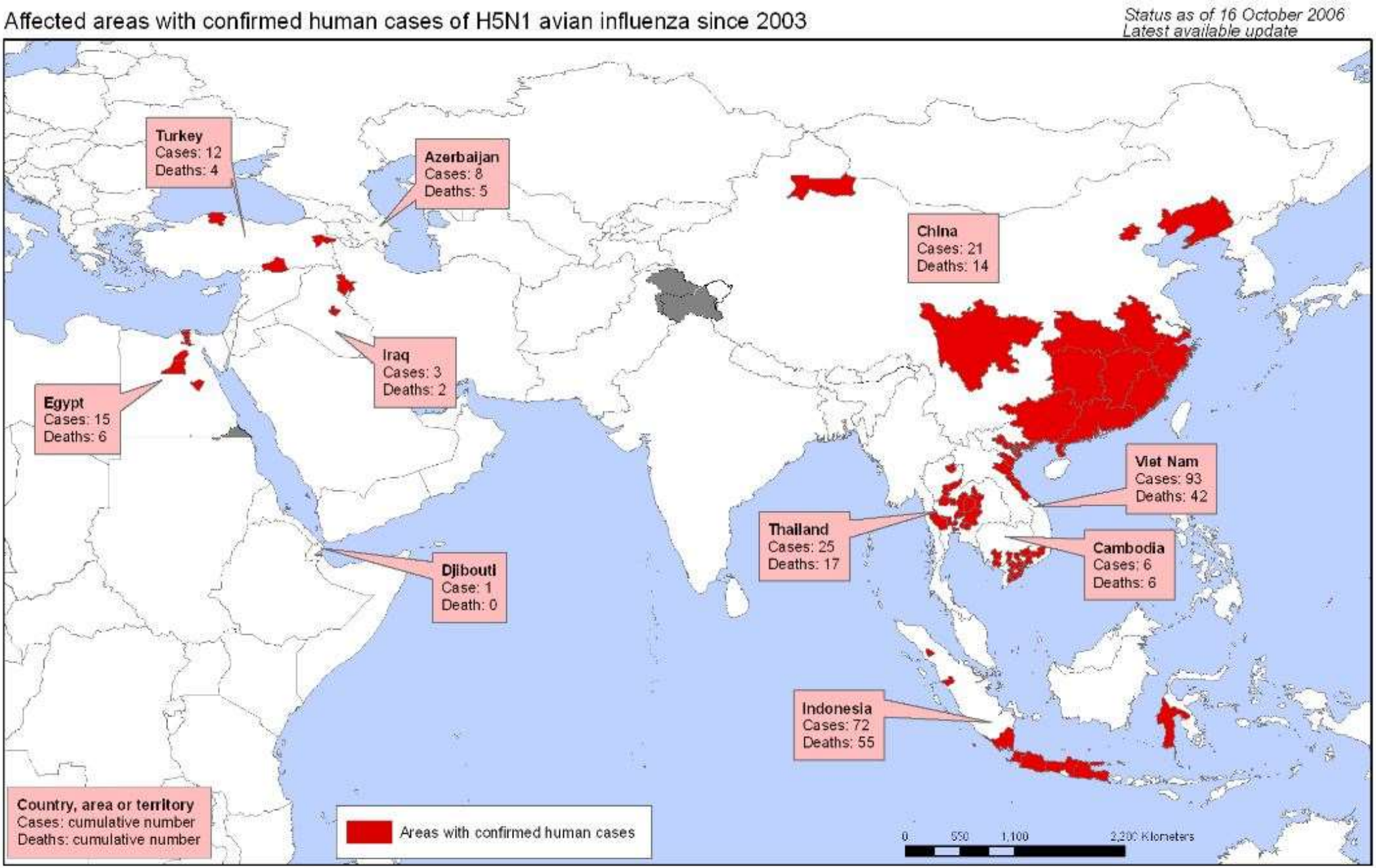
CUMULATIVE CASES OF SARS 2003



Timeline of Public Health Interventions During the 2003 SARS Epidemic in Toronto



H5N1 AVIAN FLU 2003 - 2013

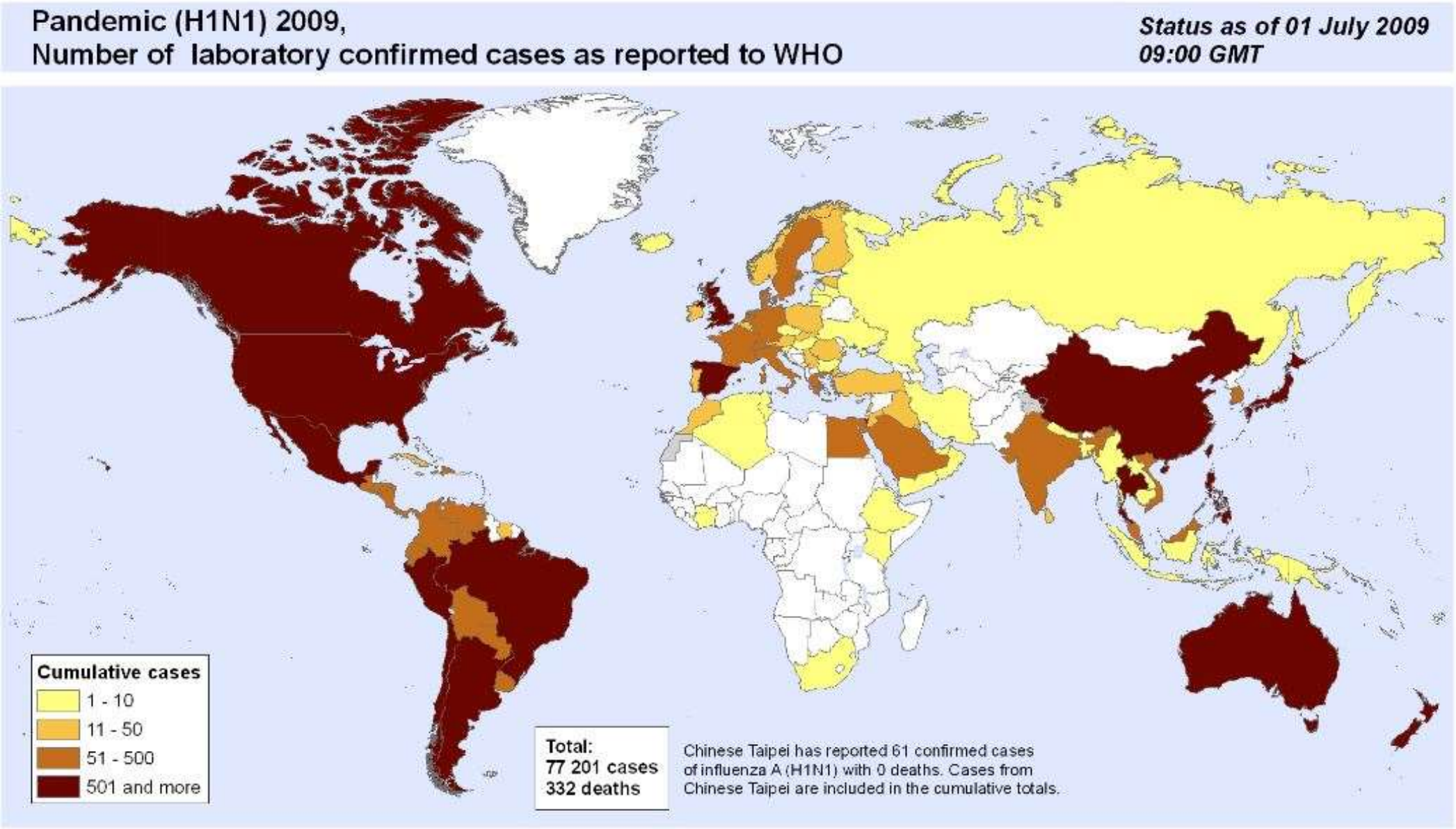


World Health Organization

The boundaries and names shown and the designations used on this map do not imply the expression of any opinion whatsoever on the part of the World Health Organization concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries. Dotted lines on maps represent approximate border lines for which there may not yet be full agreement.

Data Source: WHO / Map Production: Public Health Mapping and GIS
Communicable Diseases (CDS) World Health Organization

H1N1 PANDEMIC FLU 2009



The boundaries and names shown and the designations used on this map do not imply the expression of any opinion whatsoever on the part of the World Health Organization concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries. Dotted lines on maps represent approximate border lines for which there may not yet be full agreement.

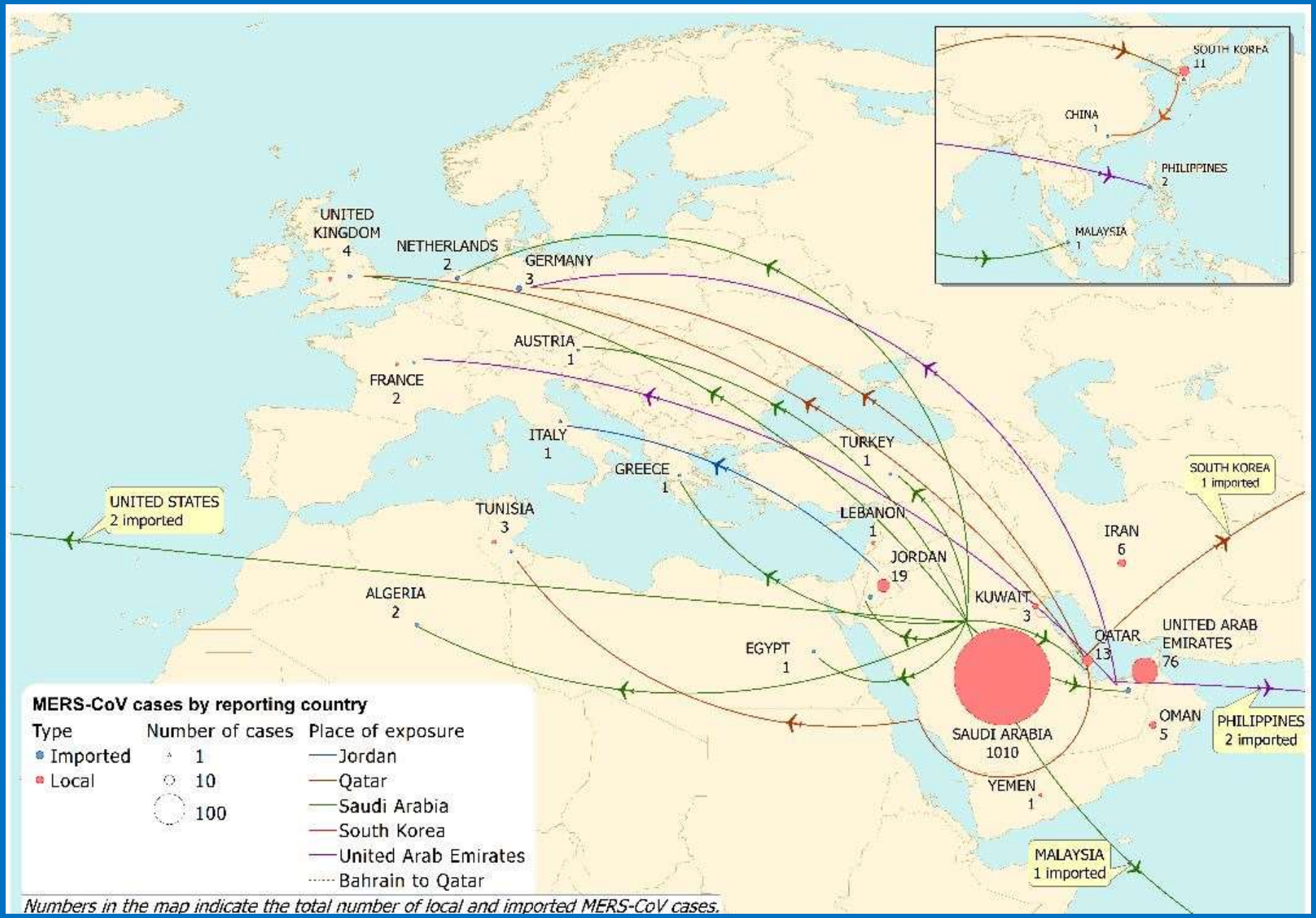
Data Source: World Health Organization
Map Production: Public Health Information and Geographic Information Systems (GIS)
World Health Organization

World Health Organization

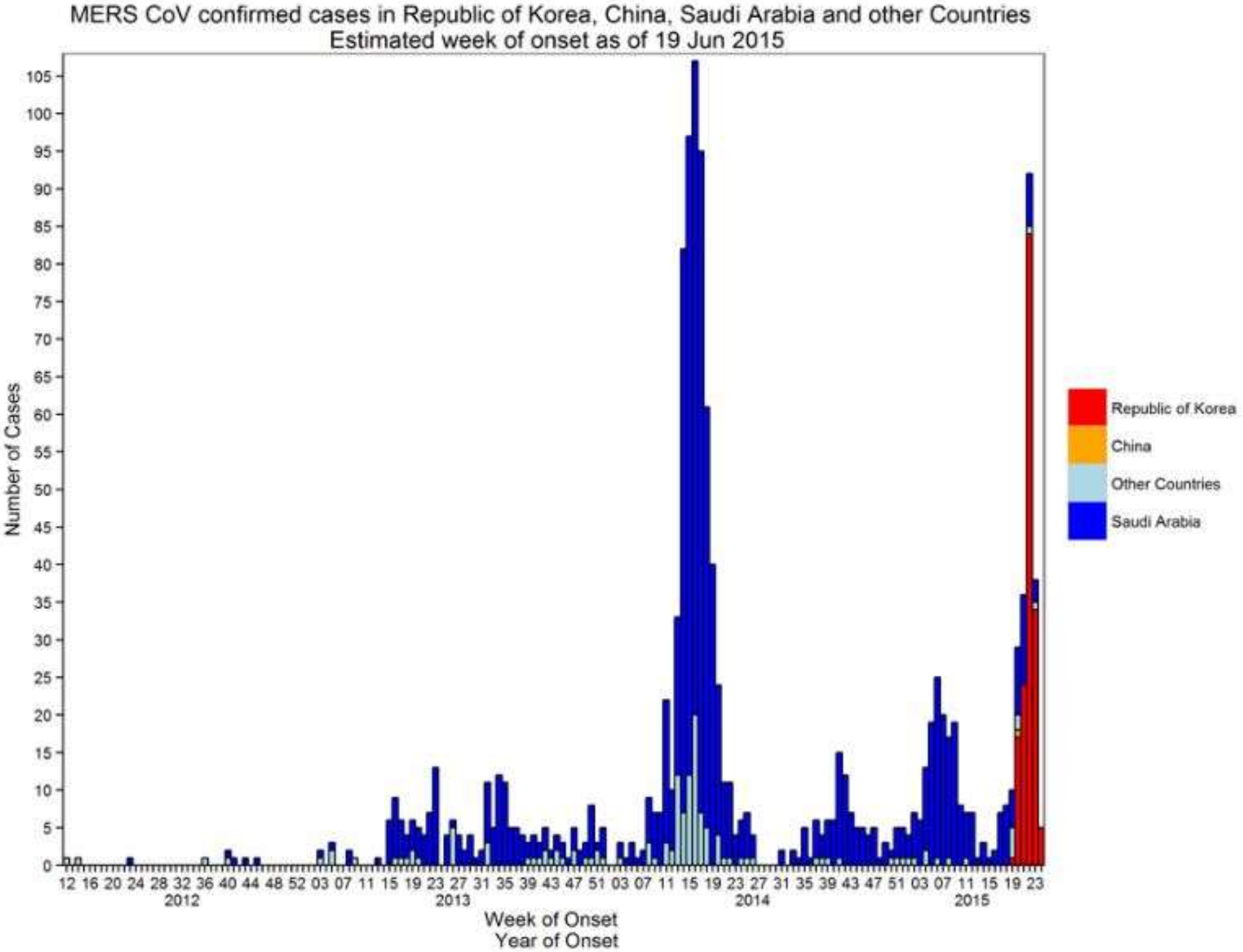
Map produced: 01 July 2009 11:38 GMT

N7N9 AVIAN FLU 2015

MERS CoV IN ARABIAN PENINSULA



MERS CoV IN SOUTH KOREA



Please note that the underlying data is subject to change as the investigation is ongoing. Source: WHO

VECTOR-BORNE EMERGING DISEASES

EFFECT OF CLIMATE CHANGE'S ON ARTHROPOD-BORNE VIRUSES

Aedes aegypti and albopictus ("Asian Tiger")

Dengue, Chikungunya, Yellow Fever, Zika

Anopheles spp

Malaria, Filiariasis, O'nyongnyong Fever

Culex spp.

West Nile Virus, Japanese Encephalitis, EEE, WEE, St. Louis Encephalitis

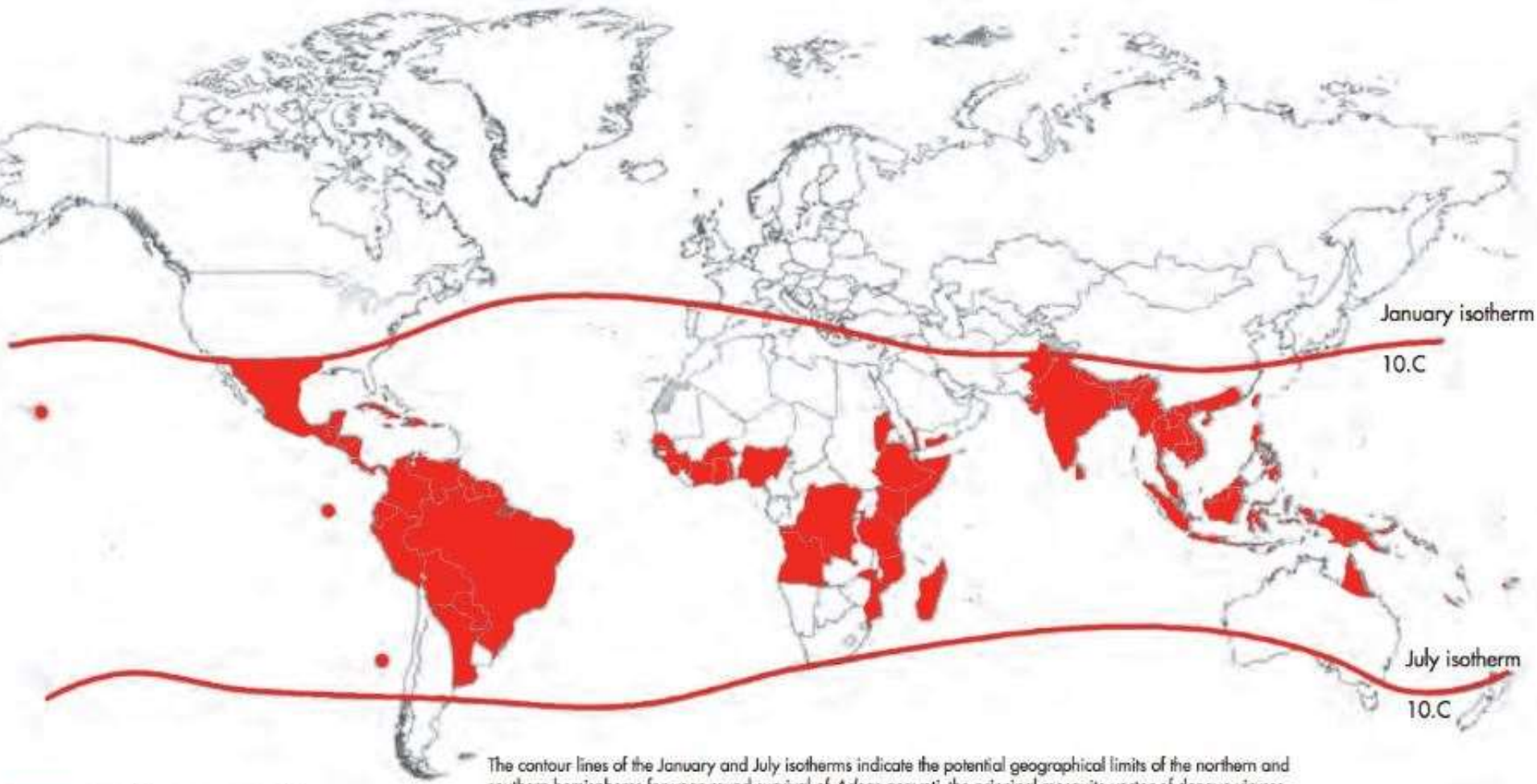
Ticks

Babesiosis, RMSF, Lyme Disease, TBE, Anaplasmosis, alphaGal Syndrome , Kyasamer Forest disease virus

AEDES AEGYPTI

DFV AND LIMIT OF AEDES AEGYPTI

Figure 1.1 Countries/areas at risk of dengue transmission, 2008

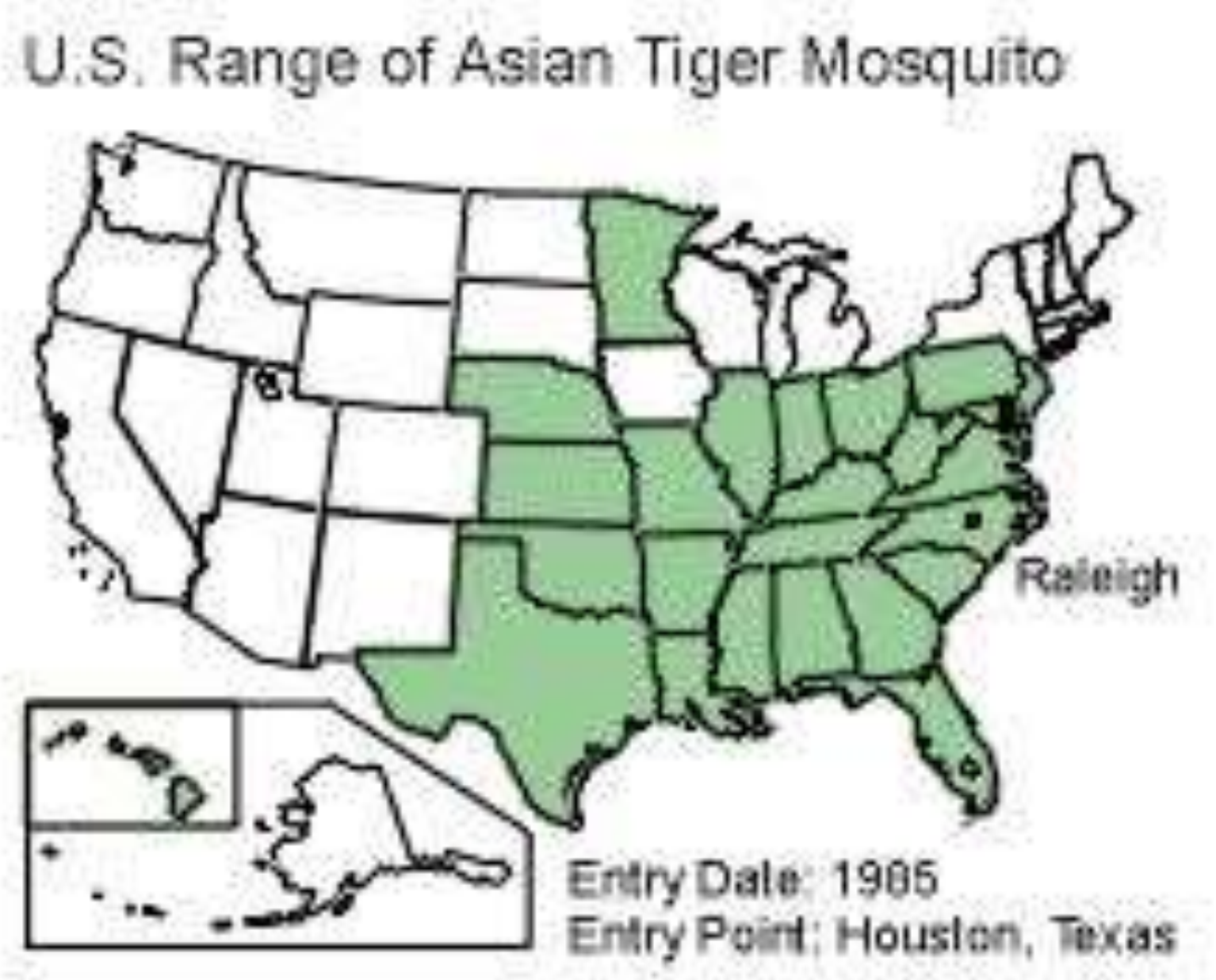


Data Source: World Health Organization Map Production: Public Health Information and Geographic Information Systems (GIS) World Health Organization

World Health Organization

AEDES AEGYPTI

AEDES ALBOPECTUS (ASIAN TIGER))



ARBOVIRUSES (ARTHROPOD-BORNE VIRUSES)

Family Flaviviridae (+ polarity) 67 Animal and Human Viruses

Mosquito-borne viruses

- Dengue virus (DENV)
- Japanese encephalitis virus (JEV)
- Murray Valley encephalitis virus (MVEV)
- St. Louis encephalitis virus (SLEV)
- West Nile virus (WNV)
- Zika virus (ZIKV)
- Yellow fever virus (YFV)

Tick-borne viruses

- Kyasamer Forest disease virus (KFDV)
- Tick-borne encephalitis virus (TBEV)

ARBOVIRUSES (ARTHROPOD-BORNE VIRUSES)

Family Togaviridae (+ polarity)

- Eastern Equine Encephalitis virus (EEE)
- Ross River virus (RRV)
- Venezuelan equine encephalitis virus (VEE)
- Western Equine Encephalitis virus (WEE)
- **Chikungunya virus (CHIKV)**

Family Bunyaviridae (- polarity; utilize RNA Polymerase

- **Crimean–Congo hemorrhagic fever virus (CCHF); Hantavirus**
- California encephalitis virus
- La Crosse encephalitis virus (LACV)
- Rift Valley Fever virus (RVFV)

Family Reoviridae (dsRNA; replicating in the cytoplasma only)

- African Horse Sickness virus (AHSV)
- Colorado Tick Fever virus (CTFV)

Family Asfarviridae (dsDNA ; replicating in the cytoplasma only)

- African Swine Fever virus (AWFV)

POLARITY OF RNA VIRUSES

A basis for classifying viruses and expected treatment approaches

Positive-polarity (sense) FNA Viruses

Positive-polarity (5' to 3') viral RNA genome can be considered mRNA. Positive-polarity viruses (e.g. Flaviviruses: YF, ZIKA,Dengue, SARS, Hep C, WNV) **can be directly and immediately be translated** into the desired viral proteins. Consequently, control and prevention has been historically limited to **vaccines**.

Negative-polarity (sense) RNA Viruses

Negative-polarity (3' to 5') viral RNA is complementary to mRNA and, therefore, cannot be translated into protein directly, but must be first transcribed into a positive-sense RNA that can then act as an mRNA with the help of an RNA-dependent RNA polymerase. Negative polarity viruses (flu (Orthomyxovirus), Ebola (Filovirus), Hantavirus (Bunyavirus), Rabies (Rhabdovirus), Lassa virus (Arenavirus) **must carry an RNA polymerase** inside the virion or hijack the cell's enzyme in order to replicate. Consequently, control and prevention of these virus types can ALSO include **antiviral therapies** (e.g. Tamiflu, polymerase inhibitors)

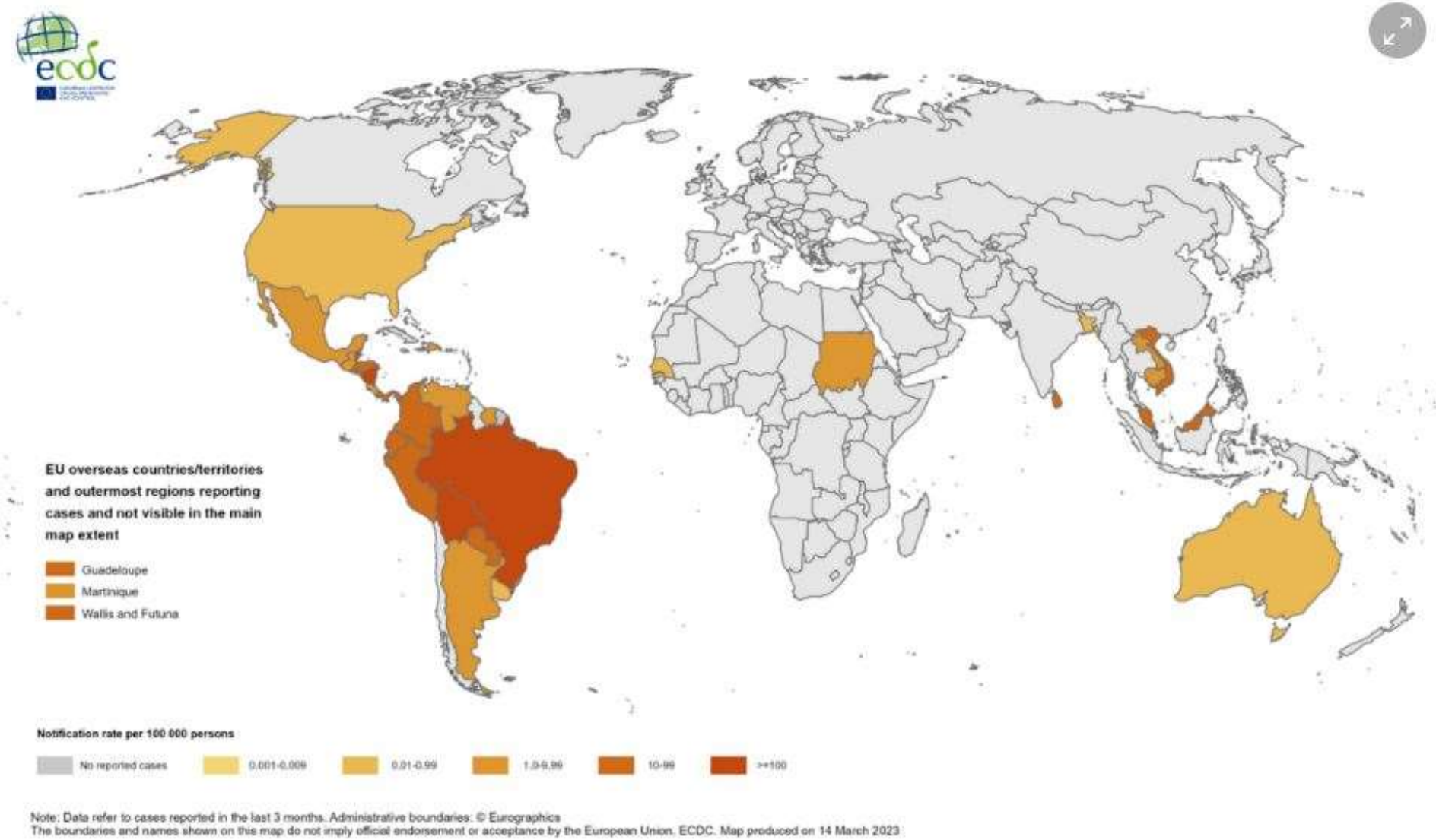
GEOGRAPHIC DISTRIBUTION OF AEDES AEGYPTI

Figure 1.1 Countries/areas at risk of dengue transmission, 2008

Data Source: World Health Organization Map Production: Public Health Information and Geographic Information Systems (GIS) World Health Organization

World Health Organization

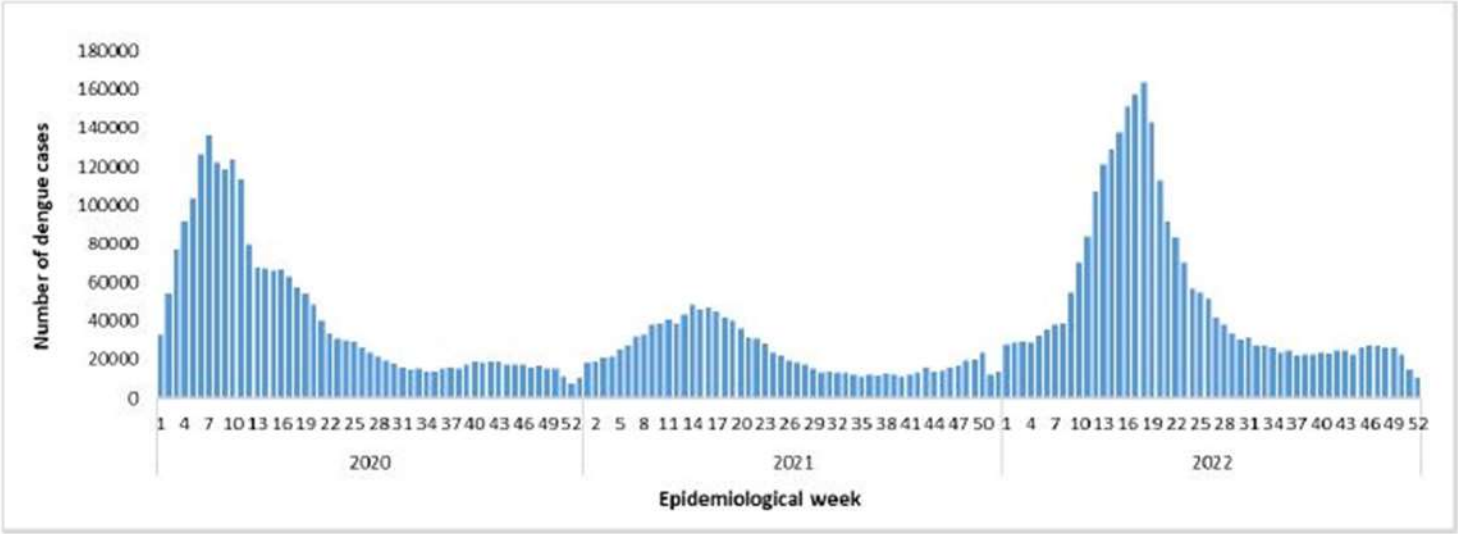
Three-month dengue virus disease case notification rate per 100 000 population, January-March 2023



Geographical distribution of dengue cases reported worldwide

DENGUE IN THE AMERICAS

Figure 2. Distribution of dengue cases by epidemiological week (EW), Region of the Americas, 2020-2022 (up to EW 52 of 2022).

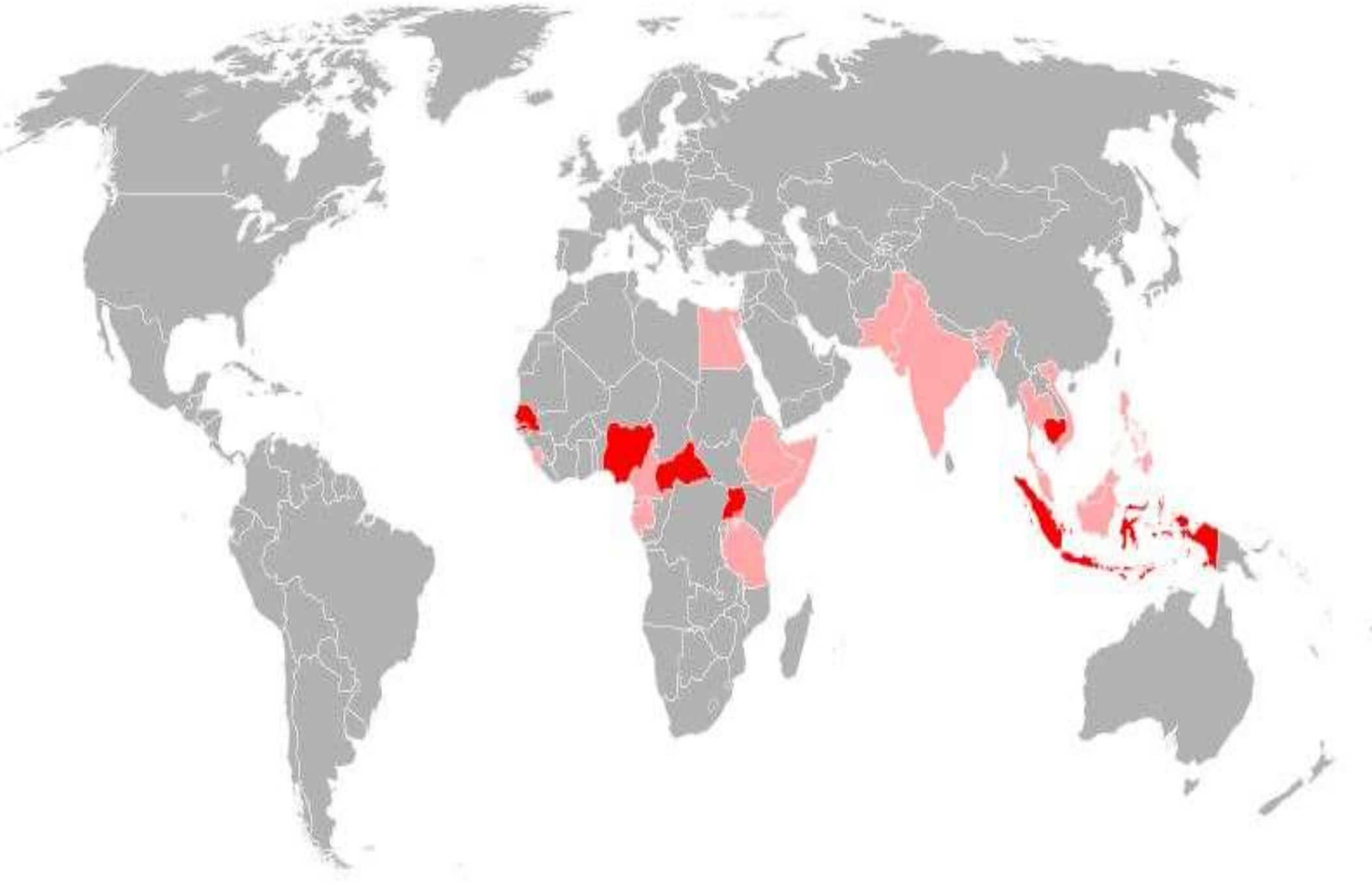


Source: Data entered into the Health Information Platform for the Americas (PLISA as per its acronym in Spanish, PAHO / WHO) by the Ministries and Institutes of Health of the countries and territories of the Region. Available at: https://www.paho.org/data/index.php/en/. Accessed on 17 January 2023.

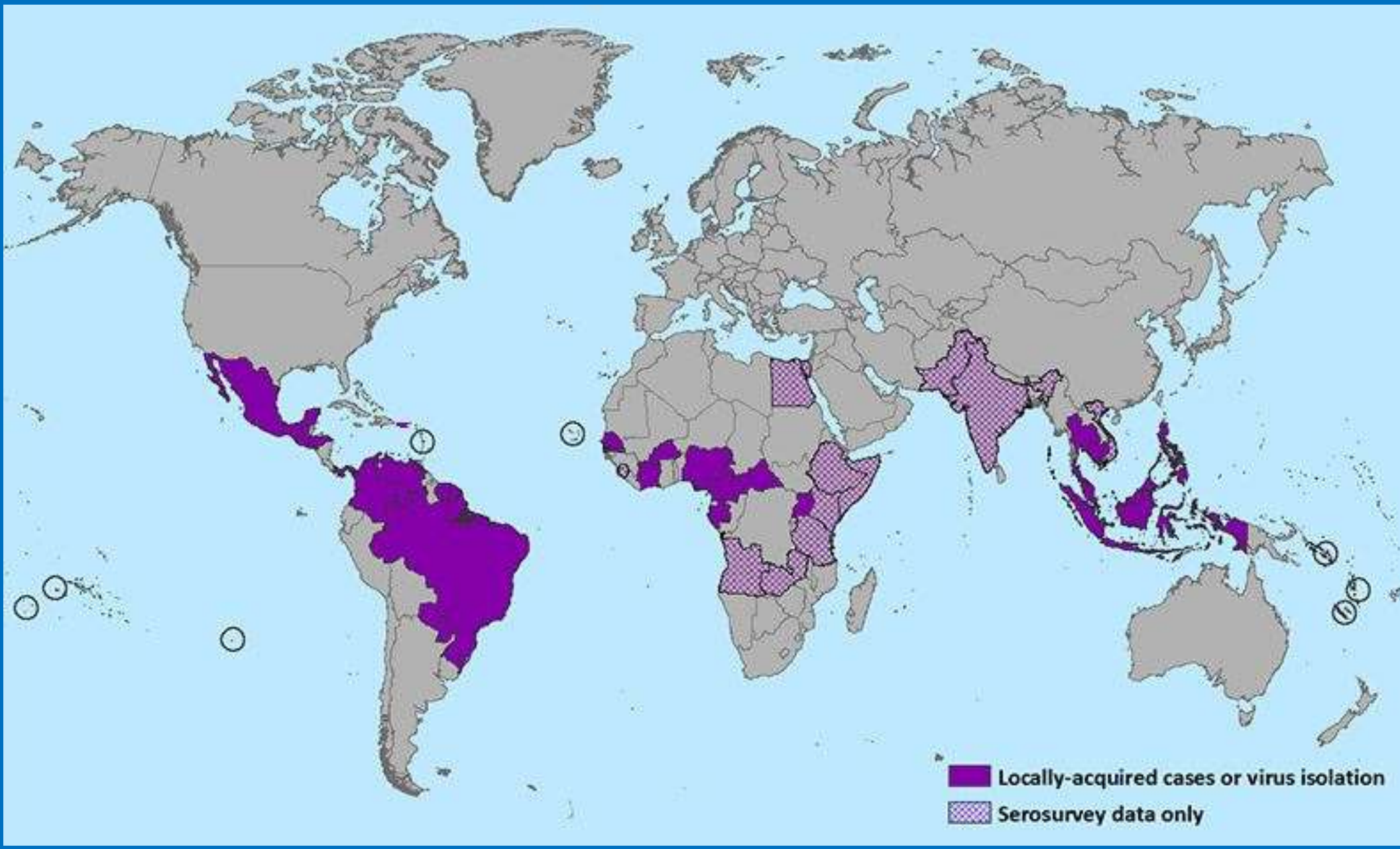
ZIKA VIRUS

- A member of the Flaviviridae virus family and is related to dengue, yellow fever, West Nile and Japanese encephalitis.
- A relatively mild disease, but its true potential as a virus and as an agent of disease is currently unknown (?microcephaly, ?GB).
- Transmitted by mosquitoes and has been isolated from a number of species in the genus *Aedes* (e.g. *Aedes aegypti*).
- The pathogenesis of the virus is hypothesized to first infect dendritic cells near the site of inoculation, and then spread to lymph nodes and the bloodstream and can be sexually transmitted between humans.
- From its discovery in 1947 until 2007, confirmed cases of Zika virus infection from Africa and Southeast Asia were rare.
- However, in 2007, it has caused major epidemics in Micronesia, Polynesia, Easter Island, the Cook Islands and New Caledonia.
- In 2015, it was identified for the first time in the Western Hemisphere in Brazil.

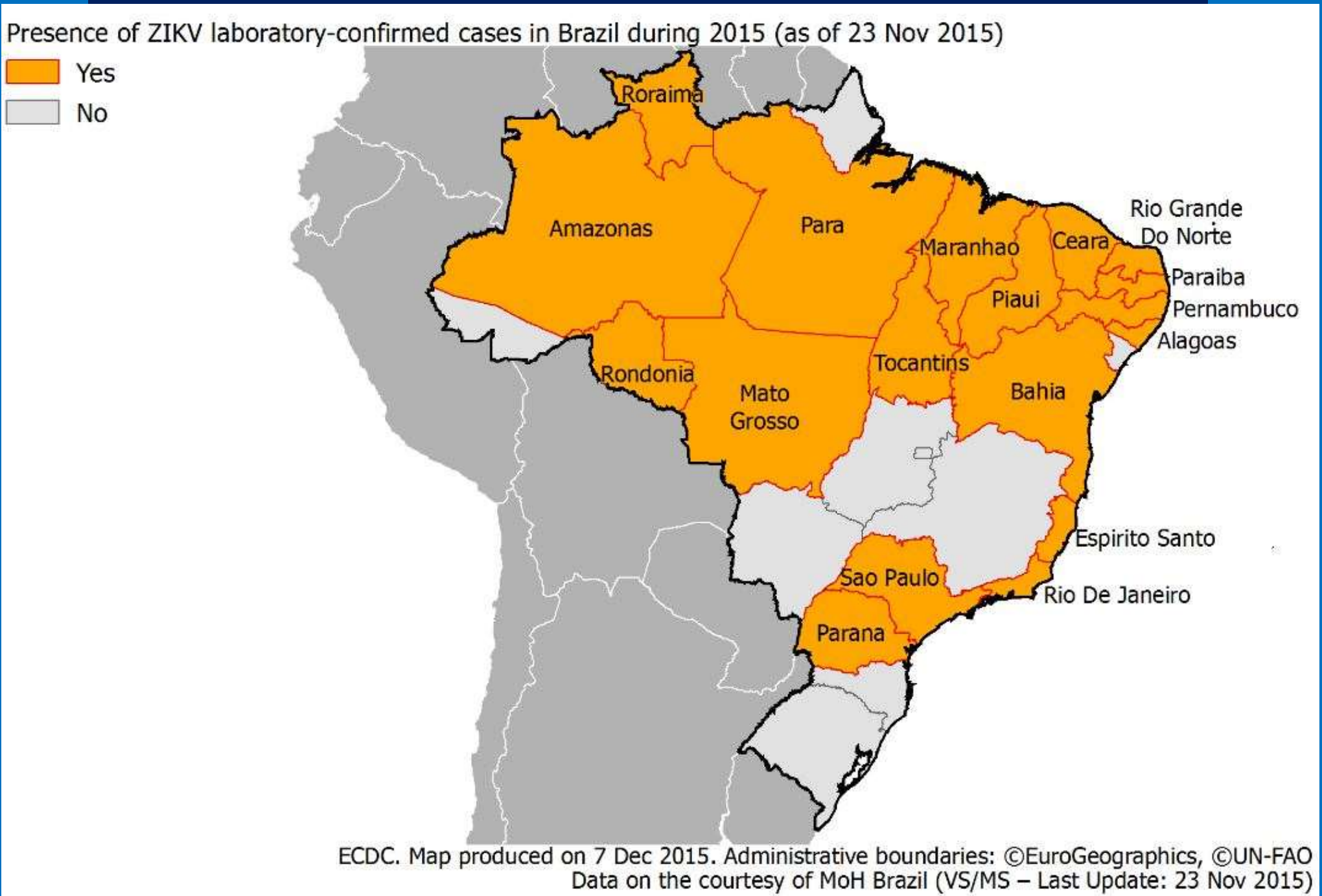
ZIKA VIRUS 2014



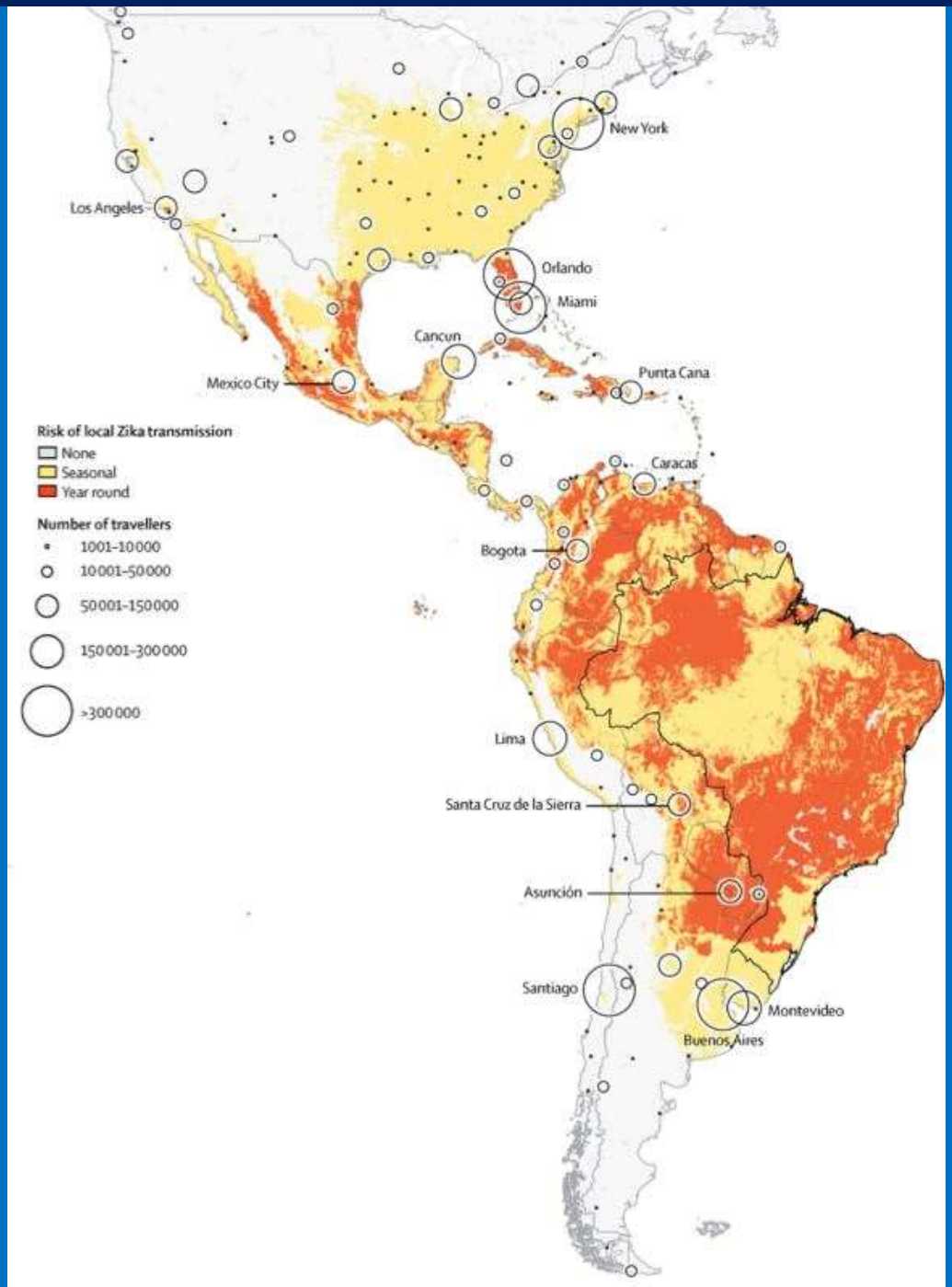
ZIKA VIRUS 2015



ZIKA VIRUS 2015

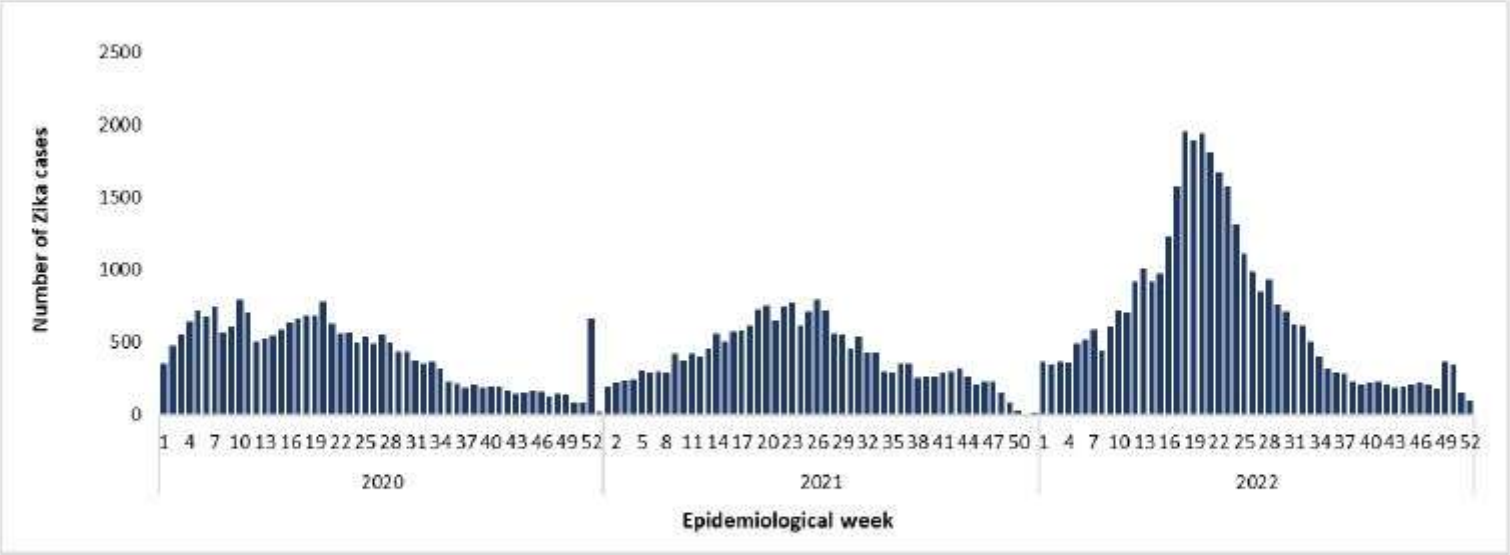


ZIKA VIRUS 2016



ZIKA VIRUS IN THE AMERICAS

Figure 5. Distribution of reported cases of Zika by epidemiological week of onset of symptoms. Region of the Americas, 2020-2022 (up to EW 52 of 2022).

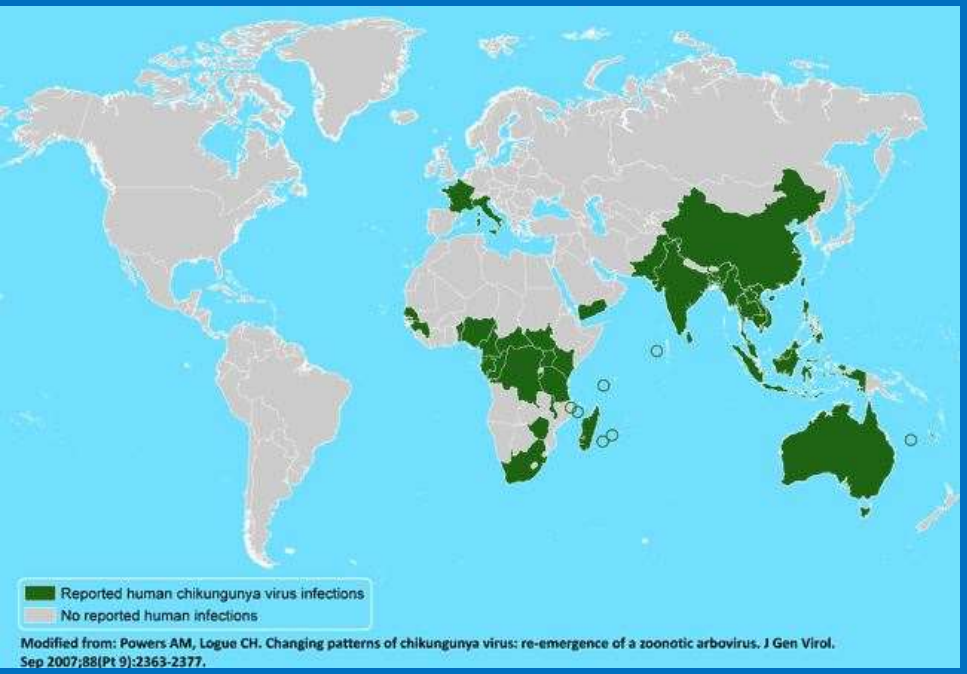


Source: Data entered into the Health Information Platform for the Americas (PLISA as per its acronym in Spanish, PAHO / WHO) by the Ministries and Institutes of Health of the countries and territories of the Region. More detailed information by country can be found at: https://bit.ly/2BFupAp. Accessed 17 January 2023.

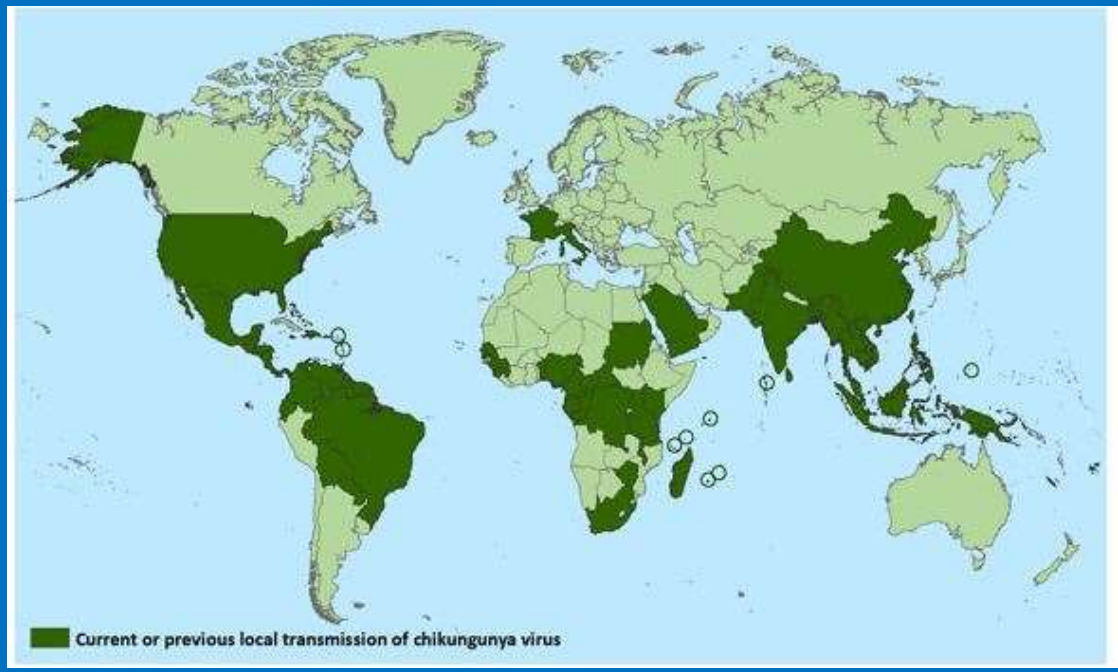
CHIKUNGUNYA

- *Togaviridae* family. It is an RNA virus with a positive-sense single-stranded genome of about 11.6kb.
- It is a member of the Semliki Forest virus complex and is closely related to Ross River virus, O'nyong'nyong virus, and Semliki Forest virus.
- Outbreaks have occurred in countries in Africa, Asia, Europe, and the Indian and Pacific Oceans.
- In late 2013, chikungunya virus was found for the first time in the Americas on islands in the Caribbean and since then there have been 1.2 milliion cases in Central American, Caribbean Islands, USA, and Canada. Only 183 confirmed deaths.

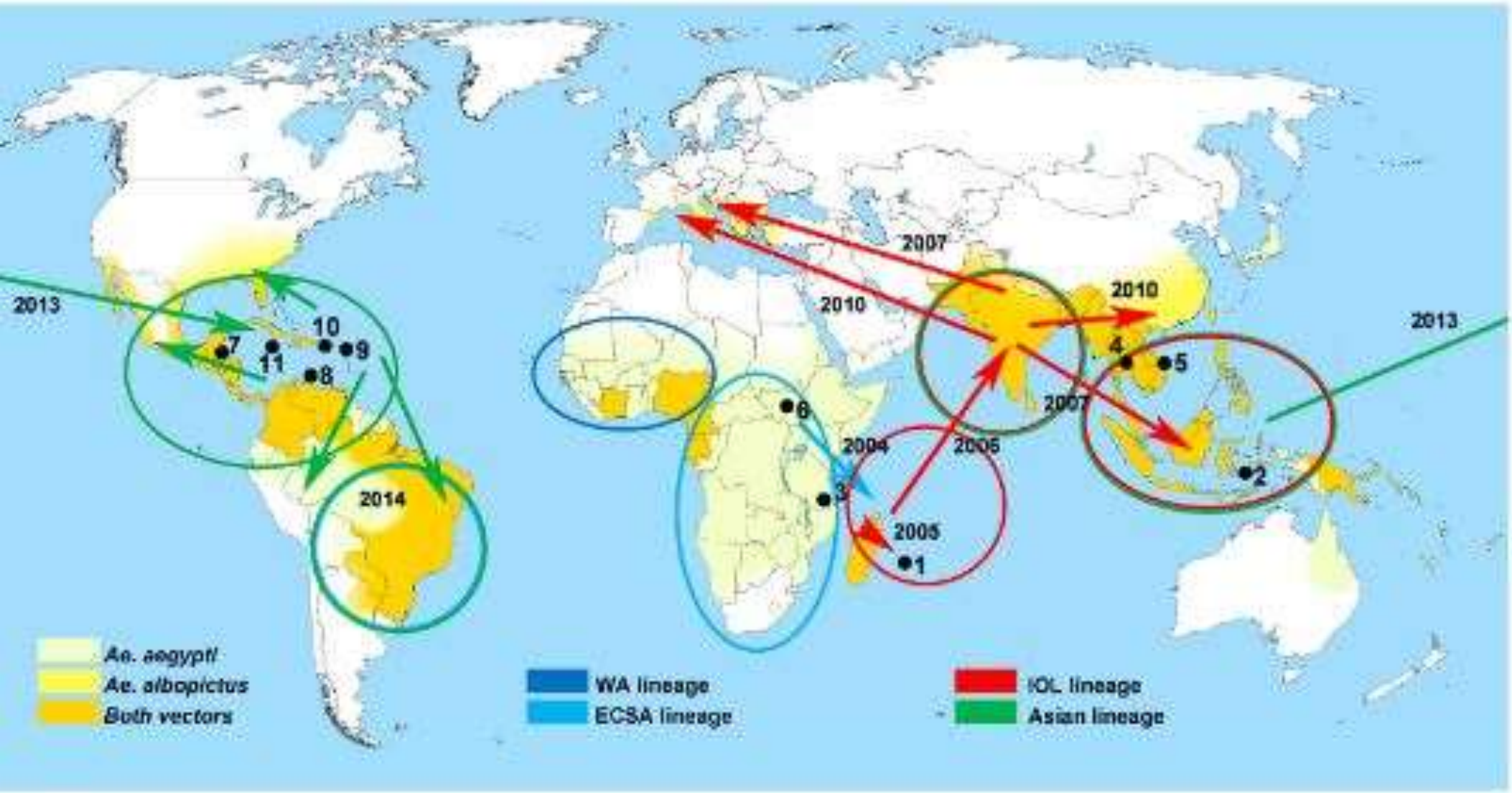
CHIKUNGUNYA 2007



CHIKUNGUNYA 2015

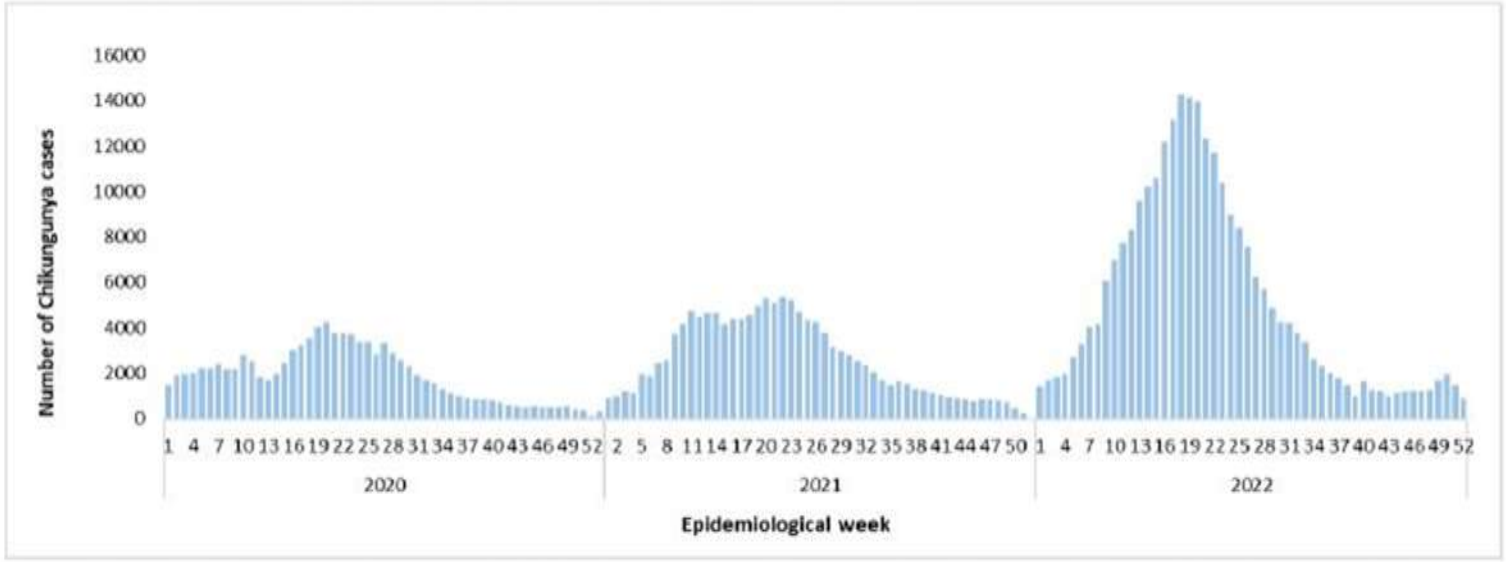


CHIKUNGUNYA VIRUS



CHIKUNGUNYA IN THE AMERICAS

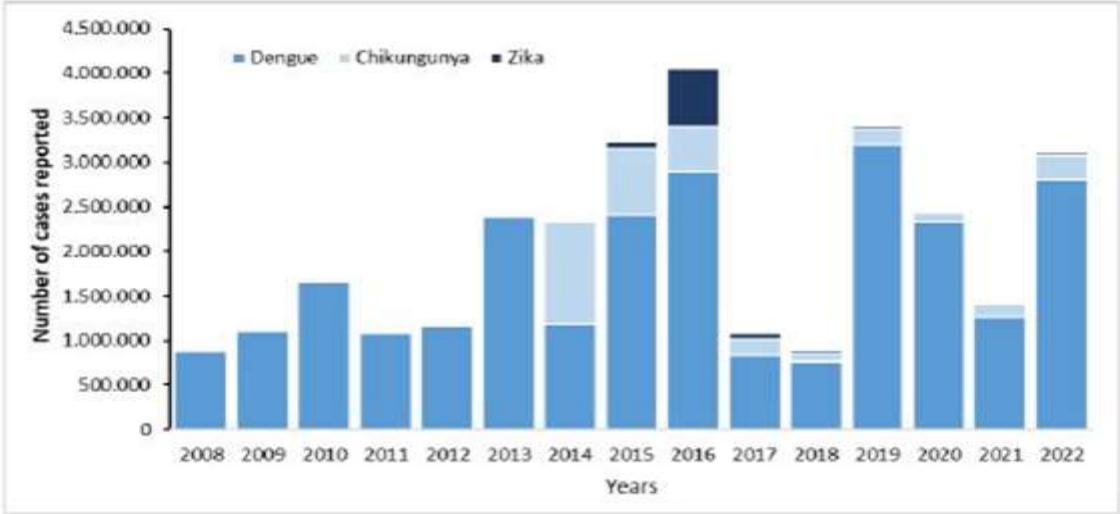
Figure 3. Distribution of chikungunya cases by epidemiological week of onset of symptoms. Region of the Americas, 2020-2022 (up to EW 52 of 2022).



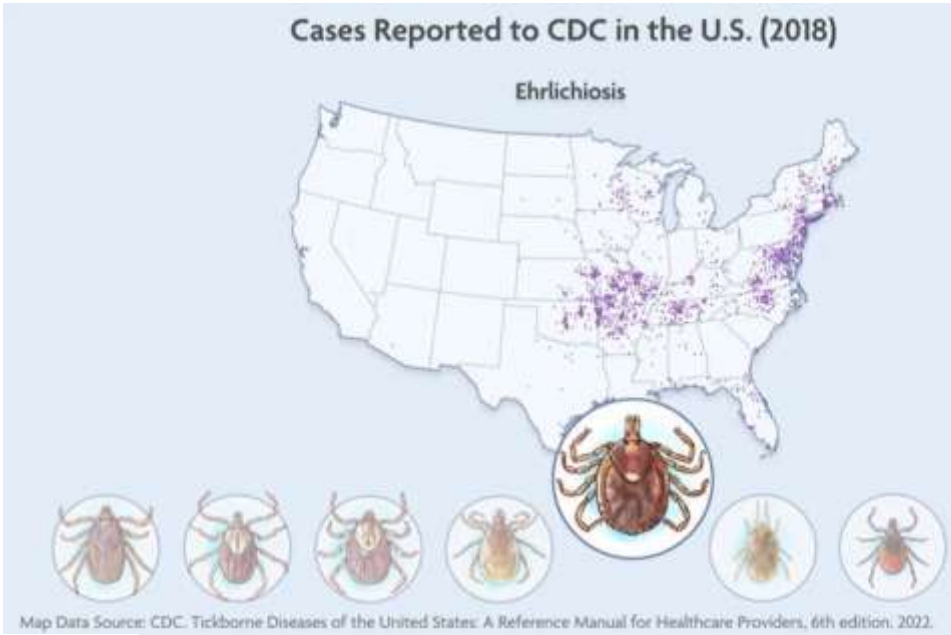
Source: Data entered into the Health Information Platform for the Americas (PLISA as per its acronym in Spanish, PAHO / WHO) by the Ministries and Institutes of Health of the countries and territories of the Region. More detailed information by country can be found at: https://bit.ly/37byBn6. Accessed on the 17 January 2023.

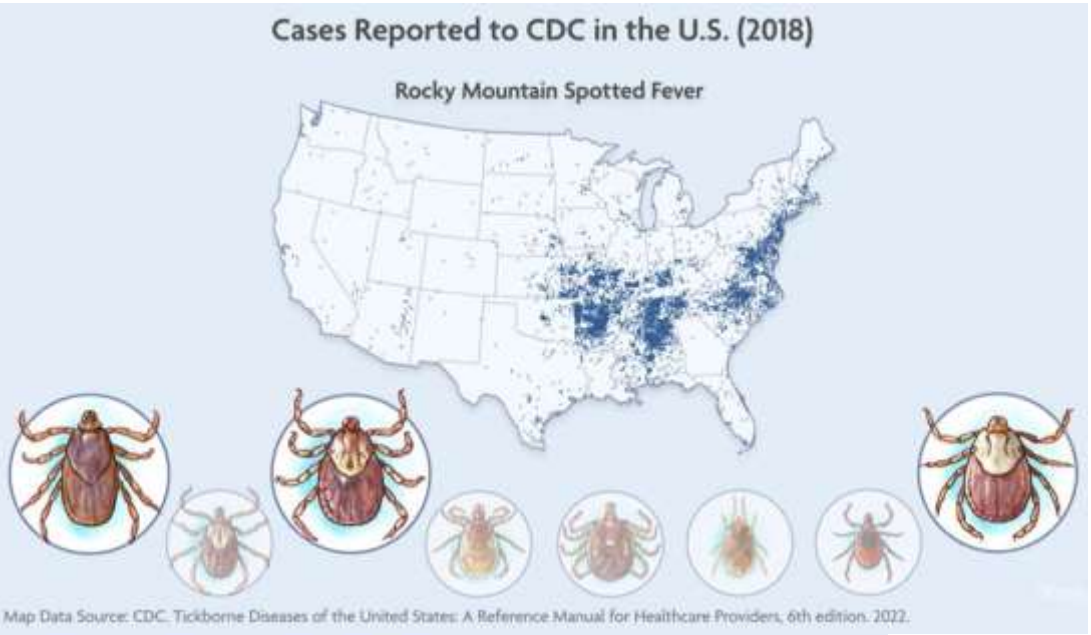
DFV, ZIKA, & CHIKUNGUNYA IN THE AMERICAS

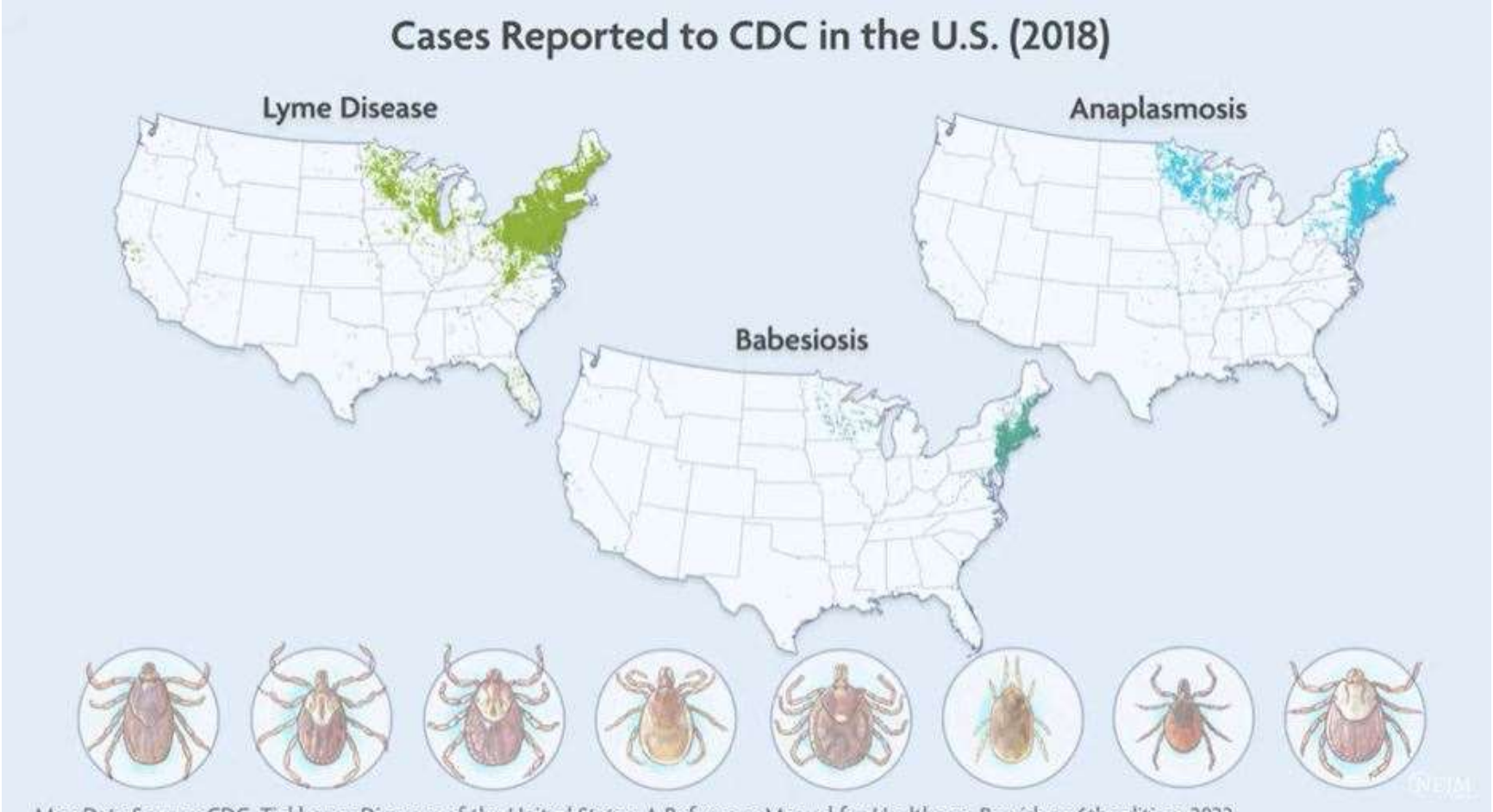
Figure 1. Distribution of reported cases of dengue, chikungunya, and Zika by year of report. Region of the Americas, 2008-2022 (up to EW 52 of 2022).



Source: Data entered into the Health Information Platform for the Americas (PLISA per its acronym in Spanish, PAHO / WHO) by the Ministries and Institutes of Health of the countries and territories of the Region. Available at: https://www.paho.org/data/index.php/en/. Accessed on 17 January 2023.

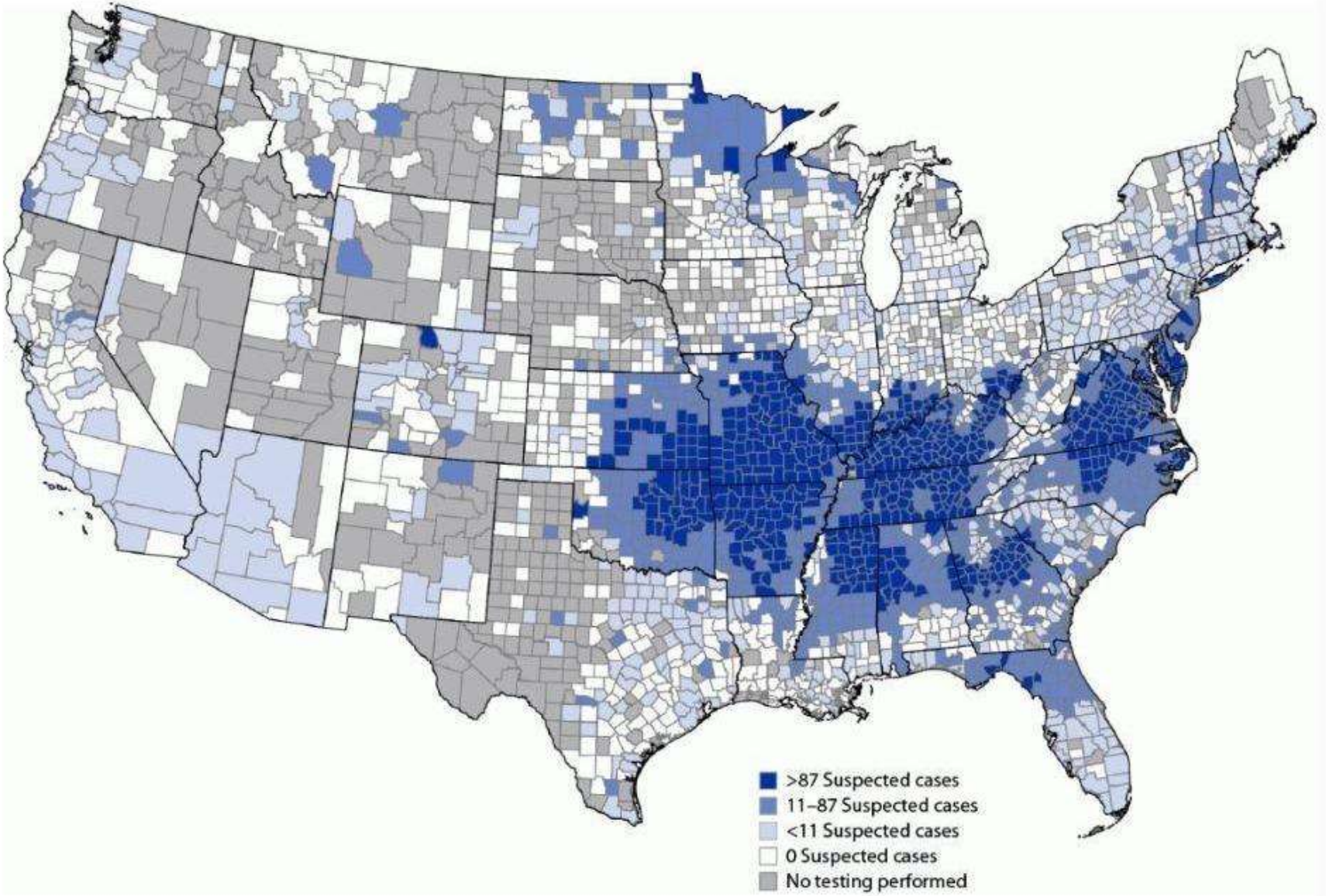

Cases Reported to CDC in the U.S. (2018)
Ehrlichiosis
Map Data Source: CDC. Tickborne Diseases of the United States: A Reference Manual for Healthcare Providers, 6th edition. 2022.


Cases Reported to CDC in the U.S. (2018)
Rocky Mountain Spotted Fever
Map Data Source: CDC. Tickborne Diseases of the United States: A Reference Manual for Healthcare Providers, 6th edition. 2022.


Cases Reported to CDC in the U.S. (2018)
Lyme Disease
Anaplasmosis
Babesiosis

LONE STAR TICK
ALPHA GAL SYNDROME (MEAT ALLERGY)

FIGURE. Geographic distribution of suspected alpha-gal syndrome cases* per 1 million population per year — United States, 2017–2022



CLIMATE CHANGE ASSOCIATED EMERGING DISEASES - 2023

- Dengue Fever Outbreak in Jamaica July 2023; Arizona 2022; Argentina 5-11-23; Peru 6-2-23
- Autochthonous Malaria in Florida and Gulf States 6-1-23; Washington DC 8-6-23, and Arkansas 10-4-23
- Vibrio vulnificus in Long Island Sound
- Cholera in Wes Hemisphere 1990; Haiti 12-2-21 = Perfect storm
- Warming trends bolstering of mosquito populations and causing WNV sporadic surges in USA
- Coccidioidomycosis in SW USA 8-4-23
- Murray Valley and Japanese encephalitis SEA 3-9-23
- Tick borne diseases in USA; and TBE in U.K. and Slovakia
- Tick associated Alpha GAL Syndrome Meat Allergy USA 7-28-23
- Chikungunya in Paraguay 2023 (from Uruguay and Argentina)

Recurring/Expanding Established Diseases - 2023

- Polio (PV2) in NYC and worldwide (WPV1) 8-1-23
- Hanson's Disease (Leprosy) in Miami 8-1-23 (possibly soil reservoir)
- Foodborne illness in USA; Cyclospora outbreak USA 8-5-23; Salmonella Outbreak Belgium 4-5-23; Fish processing plant USA 10-5-23
- Measles in various states in the USA
- Legionnaires Disease in the wake of COVID Pandemic
- MDR TBC Worldwide and Tuberculosis in USA 2021
- Acinetobacter baumannii –War in Iraq 2003
- Reoccurring Emerging or Persisting (REP) Enteric Bacterial Strains 2023 CDC
- MDR Enteric Pathogens and the "silent epidemic" 3-16-23, leading to the Post-Antibiotic Era (WHO, 2020) ; Shigella MDR USA 3-3-23
- Metallo-beta-lactamases (MBL) exhibit a pan-resistant phenotype are increasingly detected. Initially MBLs were detected in Ps. aeruginosa, Acinetobacter baumannii, Kleb. pneumoniae and other Enterobacteriaceae.
- Nipa Virus Malaysia (1998) and spread to India and SEA (9-14-23)

Recurring/Expanding Established Diseases - 2023

- Dengue and Chikungunya Expansion in the Americas 3-23-23 and 6-12-23; Central / South America 8-3-23; Dengue in Jamaica 9-25-23
- Melioidosis in Mississippi 10-13-22, 3-21-23 and 6-4-23
- Mad Cow Disease in Brazil 3-3-23
- Bulkholderii cepacian in Chile (antiseptic product 2-5-23
- MDR Shigella infection among MSM USA and Europe (4-2023)
- Malaria (P. knowlesi from Philippines to Canada 2-2023
- Seizures by waring parties of Sudan of Public Health lab pathogens 4-25-23
- Leptospirosis in Malaysia Borneo; Philippines 2022; Wyoming 9-15-23 (similar to the introduction of Giardia in Colorado by European skiers in the 1970s)
- COVID-19 (USA 108M Cases, 1.2M deaths, and 19M Long COVID?) (World 698M Cases, 6.9M deaths, and >100M Long COVID?)

Recurring/Expanding Established Diseases - 2023

- Avían Flu in SEA N5N1 and H1N1; USA Swine Flu A(H1N2)v) 2023; Cambodia 2-34-23; UK 8-10-23
- Flea borne Typhus in LA (endemic 2010, spike in 2022); also Texas and Hawaii
- Mpox, Tinea metagrophytes (Zoophlic STD since 2005), Salmonella epidemics in MSM Population (8-2-23)
- Malaria in Africa – Perfect Storm (permethrin resistant to bed net insecticide permthrin); Mosquitoes developed antimalarial drug resistance (decreased efficacy); Invasion of urban resistant An. Stephensi; Mosquitoes shifting to daytime/outdoor feeding; Disasters and civil war disrupting public health programs, decrease funding to fight malaria; warming temps bolstering mosquito population
- Artemisinin-Resistant in 2006 Mekong region of SEA 2006 and Uganda 2016
- Artemisinin- Resistance and Histamine Rich Protein (HRP) - Negative malaria parasites in Eritrea / Ethiopia 2017 and recently in SEA, East Africa, and Peru/Colombia 2019

CONTROL MEASURES CLASSIC

- Consolidated Pest Control
- Mass Vaccination/prophylaxis programs (Jynneos, Praziquantel, etc)
- Culling domestic animal reservoirs (Avian Flu, Mad cow Disease, swine fever, etc.)
- Public Health surveillance of immigrants entering our borders
- Elimination the addition of antibiotics to animal feed
- Public Health education to reduce the transmission of disease (e.g., combat vaccine hesitancy)

CONTROL MEASURES NOVEL

- Using Dengue as a surrogate marker of an increase in mosquito-borne diseases (e.g. Zika, Yellow Fever, Chikungunya, Malaria)
- Surveillance of human wastewater (e.g. polio, COVID, etc.)
- The use of “Artificial Nose” could detect disease and cancer in patients 2023 (volatile organic compounds in stomach)
- AI monitoring of recent Deforrestation to predict future epidemics of Ebola Virus in DRC/Nigeria

Artificial Intelligence using Satellite Images of New Forest Loses to predict future Ebola outbreaks in the DRC

The model looks at factors like how patchy the area had become in the previous two years and how much "edge" has been created.

New patches of forest loss

Edge regions

CONTROL MEASURES
NOVEL

- Anti-static clothing to thwart tick bites
- Ivermectin-laced corn in deer feed to kill ticks
- DNA Fingerprinting - epidemic investigation of strain's inc. virulence, MDR, inc. transmissibility
- iCHIP to mine the bacterial dark matter of the environment (soil, oceans) for future therapies
- Development of a "universal" vaccine (e.g.NIAID's FluMos-v2 (9-27-23), Next Gen nOPV2; and highly --attenuated live vaccines (Jynneos, Cholera, Plague, Rabies, JE, etc.)
- mRNA "vaccines" against future emerging diseases

SOCIAL AND ECONOMIC COST OF EMERGING DISEASES

ECONOMIC COSTS (USD) OF EMERGING DISEASES

Rotavirus	2 billion 2016
Cholera	3 Billion 2016
Chagas	7 Billion 2016
Avian Flu	7 billion (US Poultry Exports deficits) 2023
Dengue	8 Billion 2016 (Global)
Tuberculosis	10.9 billion 2021 (10.1M cases; 1.6M deaths)
Malaria	12 Billion 2021 (119M cases; 435,000 deaths)
Zika	20 billion (Western Hemisphere) 2016
HIV	20.2 billion 2017
SARS 2003	40 billion
Ebola Outbreak	53 Billion in West Africa 2014
Chikungunya	130 Million (Western Hemisphere) 2014-2015
COVID-19 China	382.29 Billion Quarantine cost
1918 Spanish Flu	490 billion
COVID USA	14 Trillion

COST OF SEASONAL INFLUENZA VS "SPANISH FLU" PANDEMIC

Annual Seasonal Flu results in 111 million lost work days and a loss of $57 billion in revenue; reduces global economic output by 4.8% or (>$1.3 trillion dollars)

A global Influenza pandemic on the scale of the Spanish Flu 1918 outbreak which killed 3 - 5 per cent of the world's population at that time, would kill 33 million people in 250 days (primarily the world's poorest) and wipe out between 5 to 10 per cent of GDP of the global economy (i.e. €7.56 trillion; equivalent to about four-fifths of China's economy.

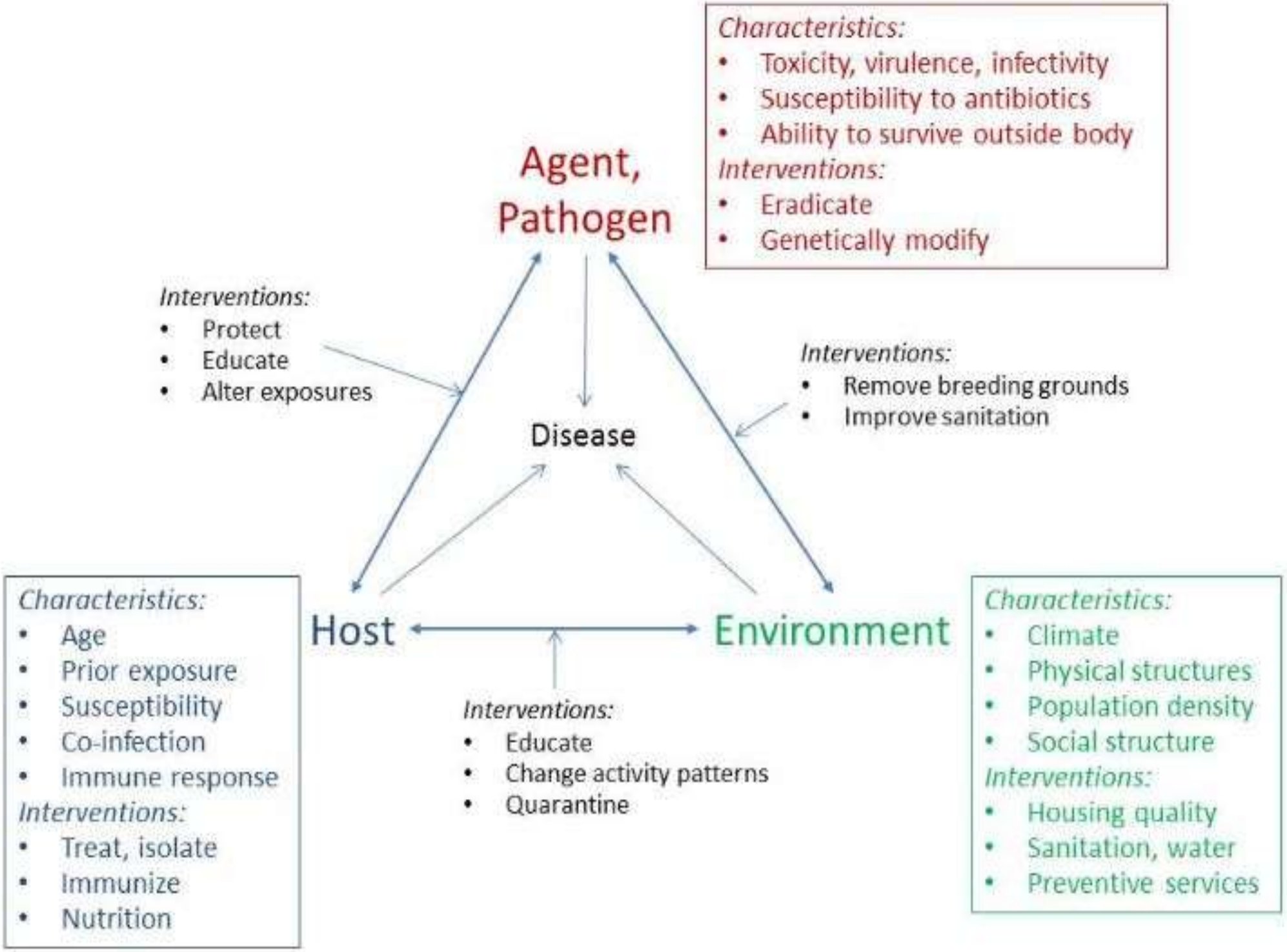
Ref: World Bank Predictions, 2015

Global Pandemic of COVID-19 reduced global economic output by 8.2% in 2020 (~$6.9 trillion dollars)

https://www.worldbank.org/en/news/press-release/2022/01/11/global-recovery-economics-debt-commodity-inequality

https://www.economist.com/finance-and-economics/2021/01/09/what-is-the-economic-cost-of-covid-19?utm_medium=cpc.adword.pd&utm_source=google&ppccampaignID=17210591673&ppcadID=&utm_campaign=a.22brand_pmax&utm_content=conversion.direct-response.anonymous&gclid=EAIaIQobChMI2vPt5_Wo_AIVGeDICh38hgCxEAAYAyAAEgKWFvD_BwE&gclsrc=aw.ds

PREPARING FOR FUTURE PANDEMICS AND PUBLIC HEALTH EMERGENCIES


Characteristics:
• Toxicity, virulence, infectivity
• Susceptibility to antibiotics
• Ability to survive outside body
Interventions:
• Eradicate
• Genetically modify
Agent, Pathogen
Interventions:
• Protect
• Educate
• Alter exposures
Interventions:
• Remove breeding grounds
• Improve sanitation
Disease
Characteristics:
• Age
• Prior exposure
• Susceptibility
• Co-infection
• Immune response
Interventions:
• Treat, isolate
• Immunize
• Nutrition
Host
Environment
Interventions:
• Educate
• Change activity patterns
• Quarantine
Characteristics:
• Climate
• Physical structures
• Population density
• Social structure
Interventions:
• Housing quality
• Sanitation, water
• Preventive services

EMERGING INFECTIOUS DISEASES (GLOBAL BUSINESS DISRUPTERS)

- Uprooting and changing how we do business day to day
- Innovation and disruption are similar in that they are both makers and builders
- Disruption takes a left turn by literally uprooting and changing how we think, behave, do business, learn and go about our day-to-day.
- It is at once destructive and creative.
- Emerging Diseases result in aversion behavior due to fear of contagion

Ref: “Business Disrupters” coined by Harvard Business School professor, Clayton, 1997, *The Innovator’s Dilemma*

PUBLIC RESPONSE IN THE USA TO EBOLA VIRUS DISEASE (EVD)

Fear (stoked by the Main Stream Media)

e.g. Elizabeth Cohen CNN incorrectly interpreting that "mutation" potential of RNA viruses to mean Ebola virus can change its mode of transmission and go "airborne".

Shunning of HCWs and their families (e.g. Day Care, Schools, NYC Hair Dressers refusing to service Bellevue HCWs).

Shunning of returning volunteer HCW.

Shunning of West Africans.

Shunning Businesses that serviced EVD Victims (e.g. Dallas Funeral ; Wedding Dress; NYC Pizza store) .

Etc. ….

Public response similar to how HIV infected victims were treated in the 1980's – 1990's

SARS EPIDEMIC 2003

THE BAD

- China stayed silent about their SARS epidemic for months
- 50% decrease in Las Vegas Tourism
- Airlines lost $6 billion in Asia and $1 billion in N. America
- Oil demand dropped by 300,000 barrels /day

THE GOOD

- Resulted in a binding International agreement on 6-15-07 that required 196 nations to report certain disease outbreaks and public health events to WHO.

MERS CoV

- MERS emerging in the ME with over 1,000 deaths
- Suddenly spread to Republic of Korea

  186 cases and 36 deaths; >2,500 quarantined;

  > 2,600 schools closed

  Almost immediate 3.36% decline in the KOSPI (Korean Stock Exchange) Index with the announcement of the first death of MERSCoV in the Republic of Korea
- Asiana Airlines stock crashed (brought the index case from Hong Kong) as did Korean Airlines and Hana Tour Service when Chinese tourists cancelled trips to the Republic of Korea.

EBOLA VIRUS OUTBREAK 2014

Fear (stoked by elected officials)

"There are thousands of EBV infected people from West Africa trying to get into the USA"

- Congressmen calling for a ban on air travel to and from West Africa
- Gov. Chris Christie and Gov. Andrew Cuomo
  - Requesting quarantine of all medical workers caring for EBV patients 10-24-14
  - Quarantine of volunteer HCW Ms. Kaci Hickox 10-24-14
  - Dr. Craig Spencer 10-13-14 bowling in NYC -> Bellevue Hospital

Final Tally:

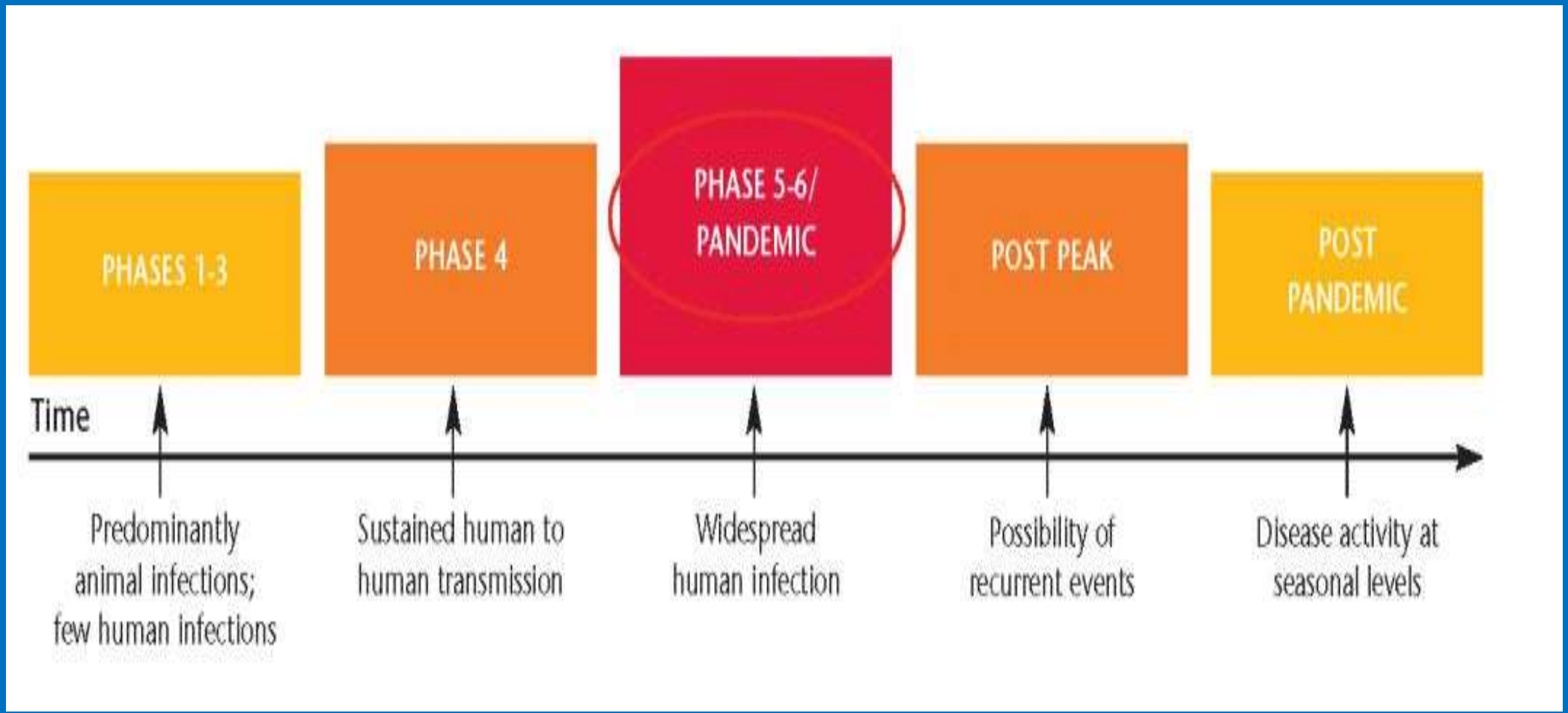
Only 28 Ebola Patients Treated After US Spends $1.4 Billion

ZIKA VIRUS EPIDEMIC 2016

- Realization that ZIKA is a benign infections (microcephaly)
  - Routine surveillance for microcephaly in pregnant women who travelled to Zika Virus active areaS
  - Increased Mosquito Control Programs in Gulf Coast of USA and Puerto Rico
- Drop in Tourism to the Caribbean and Central and South America
- Decreased attendance at Olympic Games in Rio de Jainero Summer 2016 and the concern of further global spread of Zika by returning attendees
- Increased use of Birth Control in Catholic Countries (with or without Papal Approval)
- Renewed controversy about use of insecticides (Brazil, Argentina)

WHO PANDEMIC PREPAREDNESS PLAN

- Phase 1-3 Preparedness
- Phase 4, 5, and 6 Mitigation Response
- Post Peak and Post Pandemic Recovery Efforts



WHEN IS A PANDEMIC OVER?

WHO Epidemiologic Criteria: no confirmed or probable cases are reported for a period of twice the maximun incubation period of the agent in question

A Pragmatic, Sociopolitical and Economic Criteria:

(historically used for all prior pandemics: Black Plague, Smallpox, Spanish Flu, Tbc, Cholera, Malaria, HIV)

where the government determines that the social, economic, and political costs of saving a life exceeds the benefits of doing so.

“Endemicization“ of disease = the critical point when the value of a human life becomes a variable of actuarial significance

and the public health crisis is no longer a threat to the economic productivity of a society or to the global economy.

RECOMMENDATIONS FOR GLOBAL RESPONSE TO FUTURE EMERGING DISEASES
HARVARD-LSHTM PANEL LANCET 11-22-15

- Preventing Major Outbreaks
  1. Develop a global strategy to invest in, monitor and sustain national core capacities
  2. Strengthen incentives for early reporting of outbreaks and science-based justifications for trade and travel restrictions
- Responding to major outbreaks
  3. **Create a united WHO Center for Emergency Preparedness and Response**
  4. Broaden responsibility for emergency declarations to a Standing Emergency Committee
  5. Institutionalize accountability by creating an independent Accountability Commission
- Research producing and sharing data, knowledge and technology
  6. Develop rules to enable, govern and ensure access to the benefits of research
  7. Establish a global facility to finance, accelerate and prioritize research and development
- Governing the global system
  8. Sustain high-level political attention via a Global Health Committee in the Security Council
  9. A new deal for a more focused, appropriately financed WHO
  10. Good governance of WHO through decisive, time bound reform and assertive leadership

PREPARING FOR FUTURE PANDEMICS AND PUBLIC HEALTH EMERGENCIES AMERICAN COLLEGE OF PHYSICIANS 2023

Position paper outlines recommendations to enhancing the significant gaps in the US federal, state, and local preparedness for future pandemic and public health emergencies.

- Distribution of vaccinations and resources
- Conditions to resume economic & social activity
- Efforts to protect the health and well-being of medical professionals, among others.

Serhen, J, etal, Preparing for Future Pandemic and Public Health Emergencies: An American College of Physicians Policy Position Paper, 7-25-23; https://doi.org/10.7326/M23-0768

WHO PROPOSED REMEDIES

- Negotiations on new rules with a target date of May 2024 for the adoption by the UN's 194 member countries of a legally binding agreement to expand WHO ability to investigate global pandemics (not just regional outbreaks).
- Proposal by the US to overhaul the 2005 International Health Regulations (adopted after the 2002/2003 SARS Outbreak) to improve transparency and grant WHO quicker access to outbreak sites.

WHITE HOUSE PANDEMIC OFFICE

On 7-24-23, President Biden established the Office of Pandemic Preparedness and Response Policy, under the direction of Dr. Paul Friedrich, USAF Maj Gen, (ret).

Mission:

Leading, coordinating, and implementing actions related to preparedness for, and response to, known and unknown biological threats or pathogens that could lead to a pandemic or to significant public heath-related disruptions in the United States.

CONCLUSIONS

- Epidemics are normal and natural.
- Infectious diseases have had a major influence on human history.
- Our collective memory of disease Is short despite mankind's long association with infectious diseases.
- Clinicians may recognize a new disease entity, but this will only be the first step of an enormous scientific effort.
- Combating emerging infectious diseases require a collaborative effort including the basic sciences, clinicians from medical and veterinary fields, public health experts, politicians, and the media.
- Gaps in knowledge of the mechanism of transmission and/or treatment of emerging diseases will undoubtedly create panic.
- However, elucidation often result in revolutionary discoveries that have improved future clinical practice and public health.

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...AND WHAT ARE YOU SUPPOSED TO BE?
UNDER QUARANTINE.