Health Talk Series (HeTS)

Siri Bicara Kesihatan

Faculty of Medicine & Health Sciences

UNIMAS
UNIVERSITI MALAYSIA SARAWAK
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COVID-19:
Facts vs Myths

LIVE

Cisco webex

YouTube

The Science Behind Public Health Control of COVID-19

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Presented (online) at the 1st Health Talk Series on COVID-19: Facts and Myths
Faculty of Medicine and Health Sciences UNIMAS
26 Nov 2020

Objective of Presentation:

Explain some of the science that guide the public health management of the COVID-19 pandemic

What science knows about COVID-19

1. What SARS-CoV-2, the novel coronavirus that causes COVID-19 is.
2. How it spreads through the human population.
3. How to:
   - fight it,
   - treat it, and
   - minimize the death rate from it.

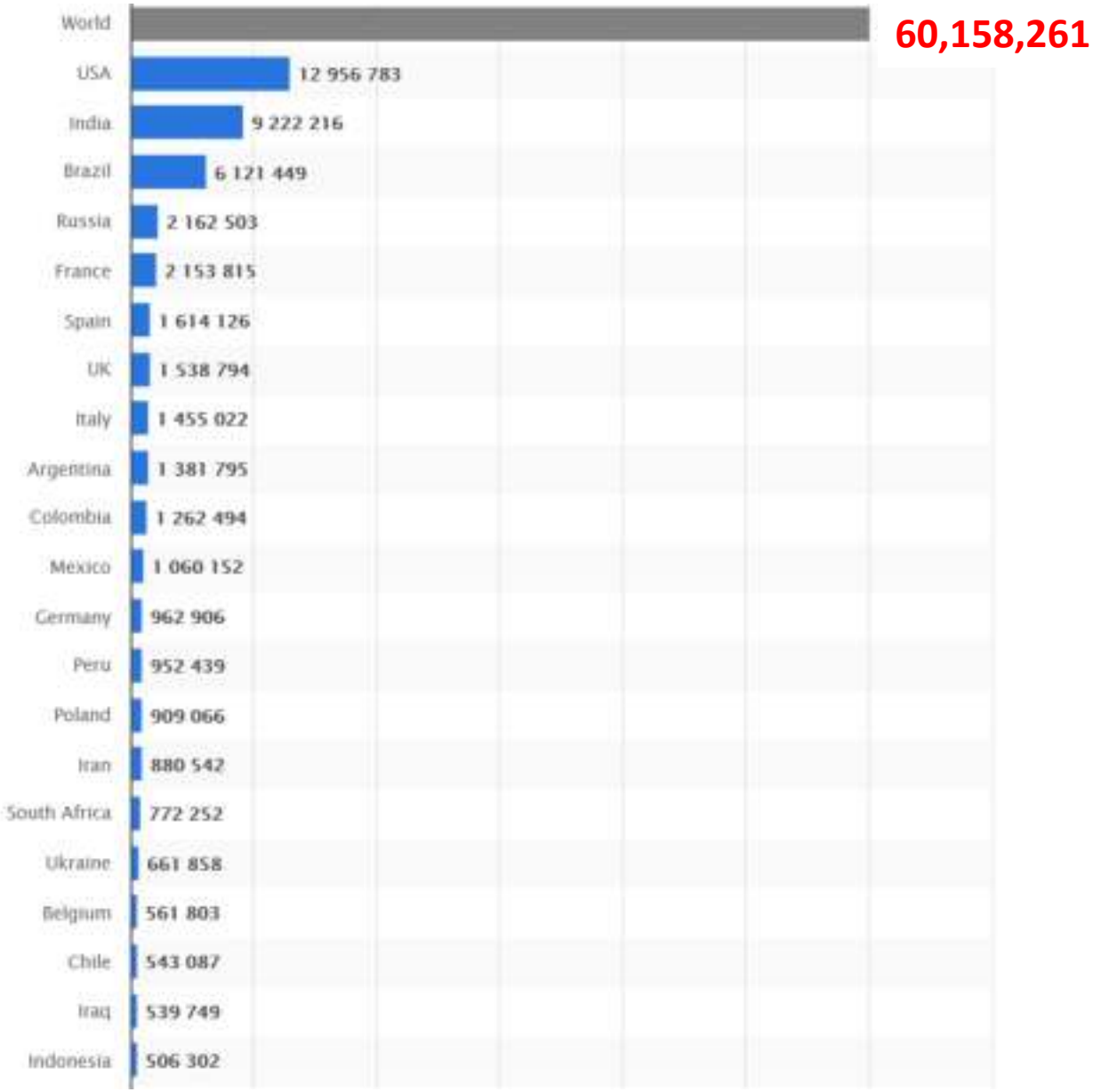
Why COVID-19 is hard to contain

1. High proportion of the population in some countries who do not believe in science
2. The system is overwhelmed by the speed of spread, resulting in too many cases, that have to be dealt with over a very short period of time
3. The spread of the virus continues to occur because the community is just getting used to the new norms and they are not fully internalised yet; thus needs enforcement
4. We need to balance the health costs of the pandemic with the economic and social cost

https://www.forbes.com/sites/startswithabang/2020/04/07/the-3-ways-science-will-get-us-through-the-covid-19-pandemic/?sh=4474291d2fc3
https://www.mckinsey.com/business-functions/organization/our-insights/a-leaders-guide-communicating-with-teams-stakeholders-and-communities-during-covid-19#

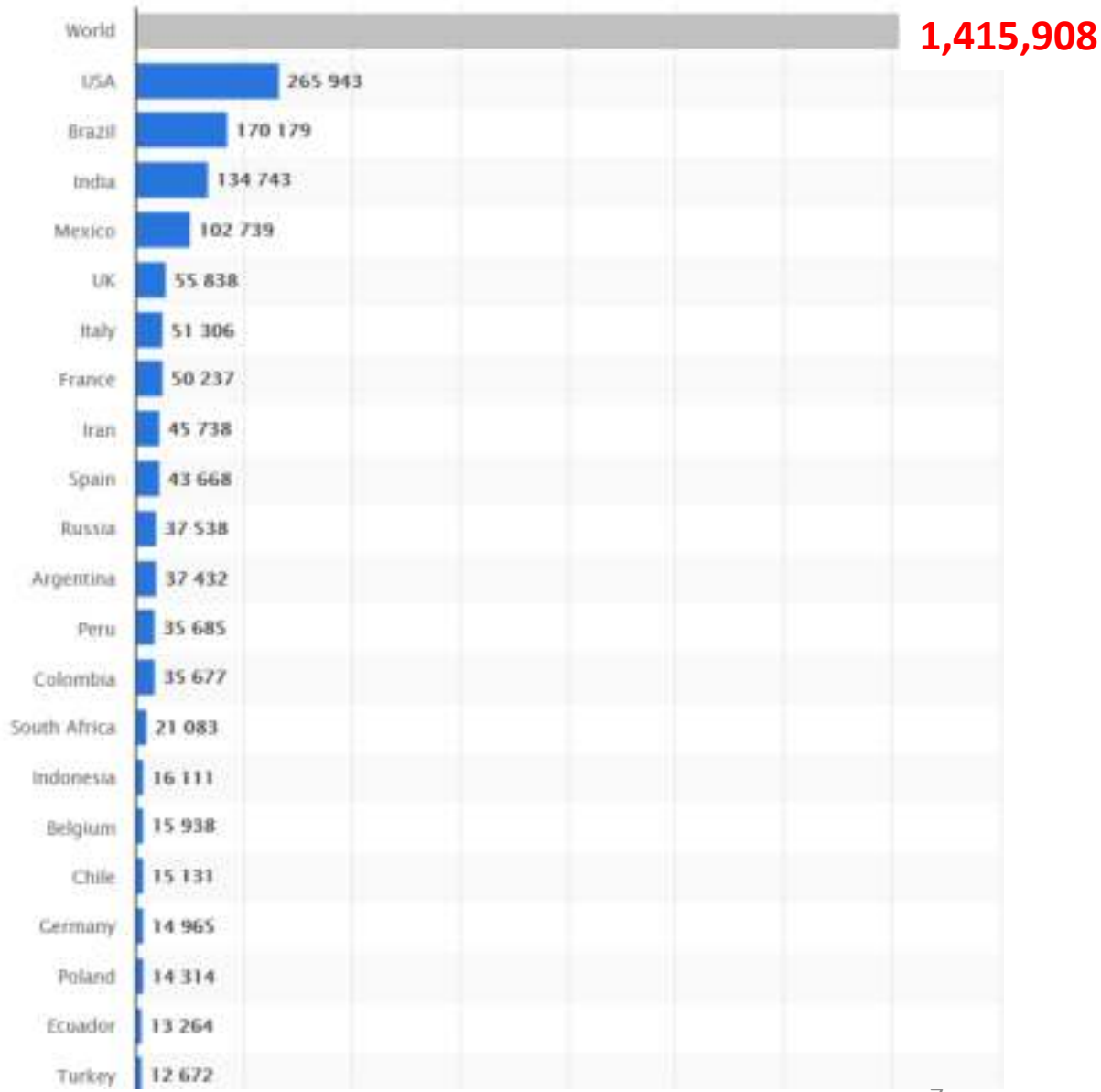
1. Why Bother?

Number of coronavirus (COVID-19) **cases** worldwide as of November 25, 2020, by country



https://www.statista.com/statistics/1043366/novel-coronavirus-2019ncov-cases-worldwide-by-country/

Number of novel coronavirus (COVID-19) **deaths** worldwide as of November 25, 2020, by country

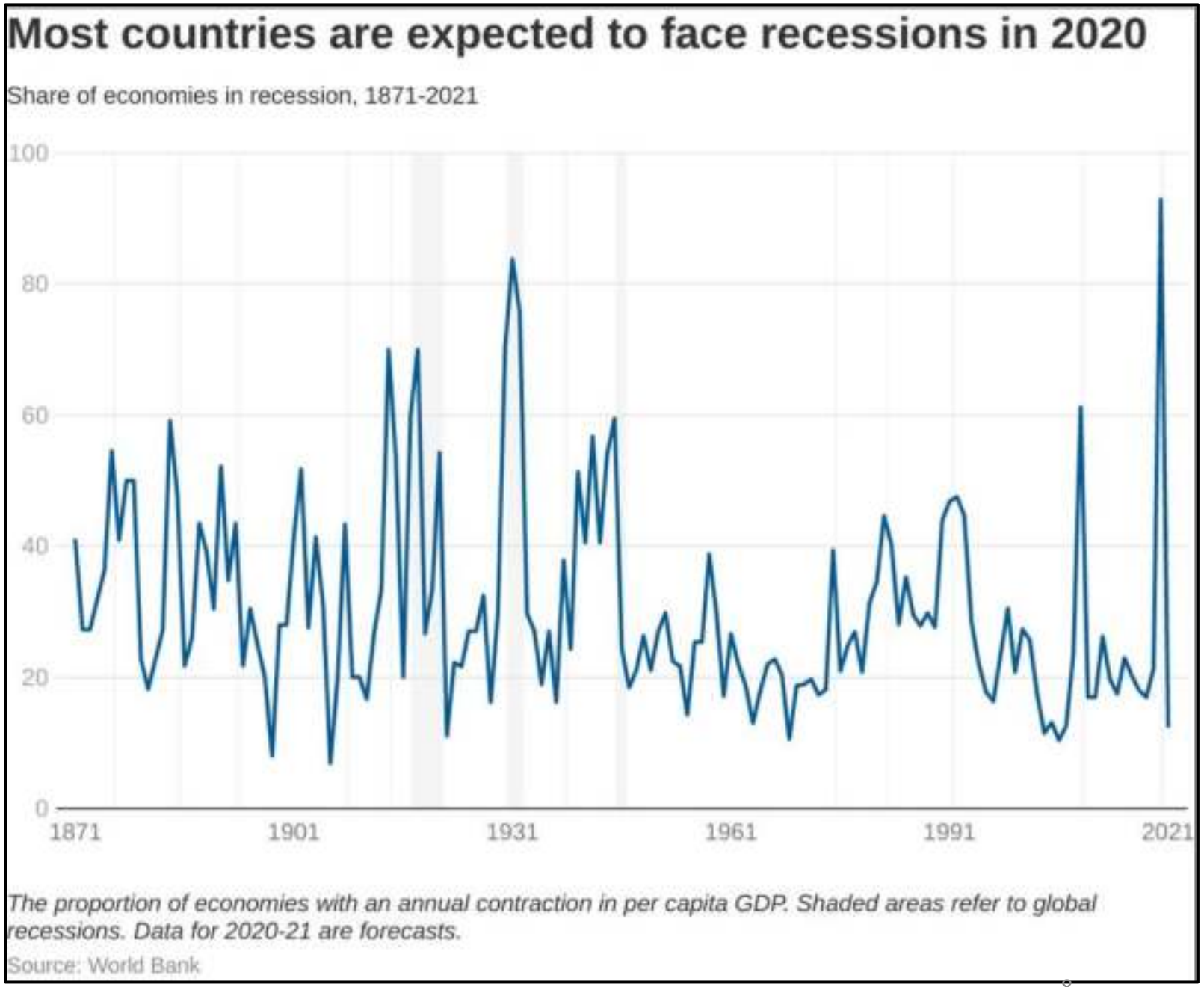


https://www.statista.com/statistics/1093256/novel-coronavirus-2019ncov-deaths-worldwide-by-country/

THE WORLD BANK
IBRD • IDA

The Global Economic Outlook During the COVID-19 Pandemic: A Changed World (8 June 2020)

- The pandemic is expected to plunge most countries into recession in 2020, with per capita income contracting in the largest fraction of countries globally since 1870.
- Advanced economies are projected to shrink by 7 percent.
- Emerging market and developing economies, are projected to shrink by 2.5 percent
  - This would represent the weakest showing by this group of economies in at least sixty years.



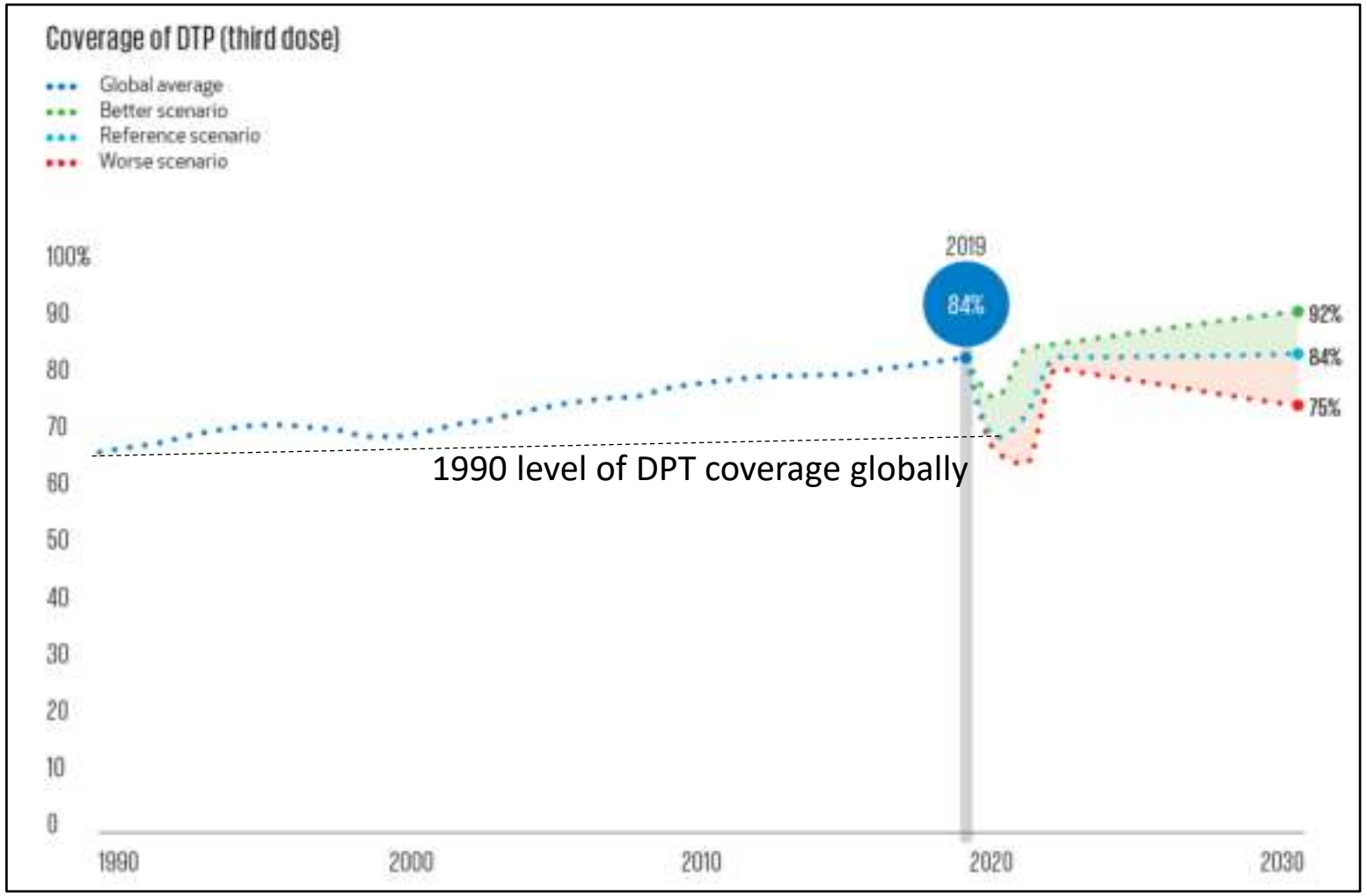
https://www.worldbank.org/en/news/feature/2020/06/08/the-global-economic-outlook-during-the-covid-19-pandemic-a-changed-world

COVID-19 Pandemic Effects on Global Health (September 2020)

- Because of COVID-19, extreme poverty has increased by 7%.

- Vaccine coverage,
  - a good proxy measure for how health systems are functioning,
  - is dropping to levels last seen in the 1990s,
  - setting global health back about 25 years in 25 weeks.

- (Vaccination coverage of children globally:
  - 1970s: only about 5 percent of
  - 2019: over 80 percent and prevented more than 2 million deaths.)

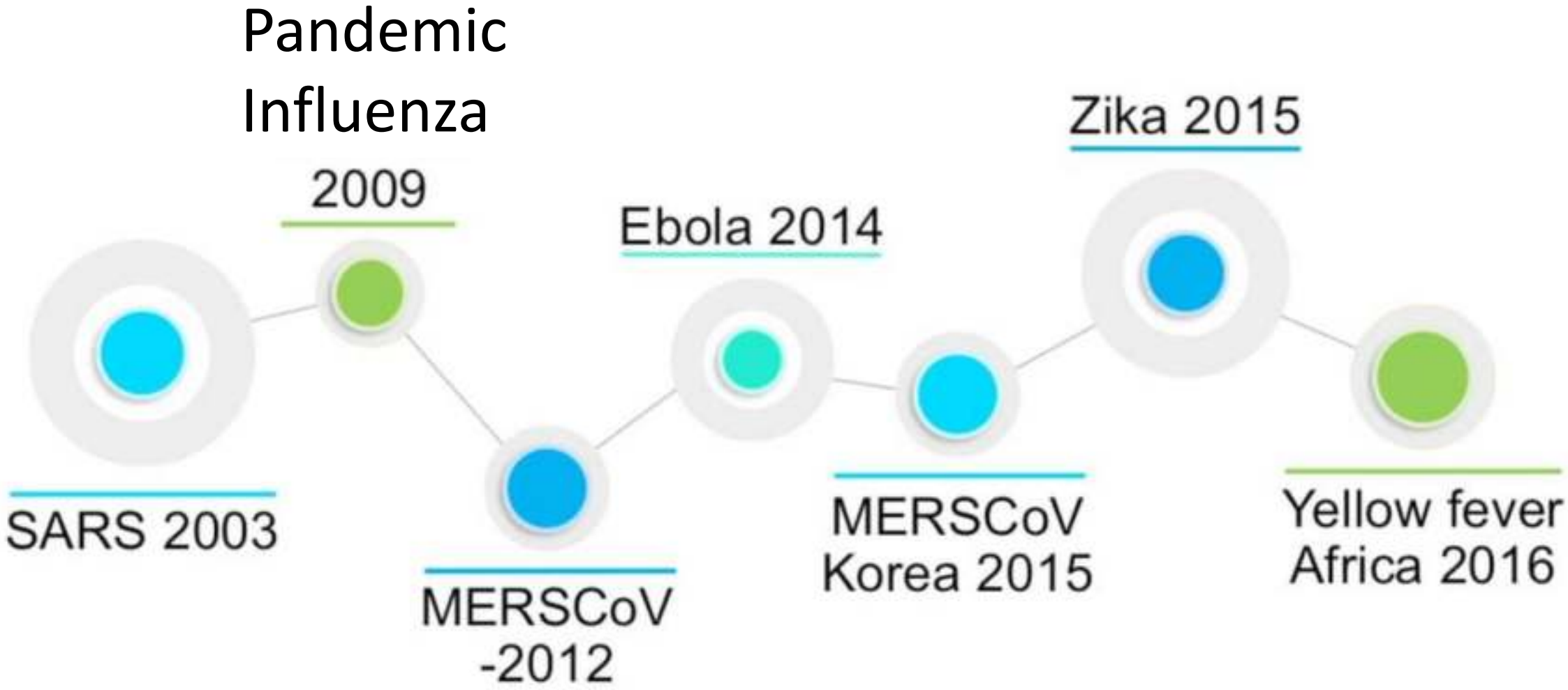


Bill and Melinda Gates Foundation (2020 Sep). COVID-19 A Global Perspective. 2020 Goalkeepers Report. https://www.gatesfoundation.org/goalkeepers/downloads/2020-report/report_a4_en.pdf

https://mackaycartoons.net/2020/03/18/wednesday-march-11-2020/

2. COVId-19 is an Emerging Infectious Disease

Examples of Major Emerging Infectious Diseases Over the Past 20 Years



75% of the emerging infectious diseases are zoonoses

https://openwho.org/courses/public-health-interventions/items/ff79c3db-5c0f-4fb5-aee6-d4cfb6f4ec33

Un-balanced Human-Animal-Environment Interface Such as this are Conducive to Emergence of Infectious Diseases

Forest Trends (2014). Consumer goods and deforestation. https://www.forest-trends.org/wp-content/uploads/imported/for168-consumer-goods-and-deforestation-letter-14-0916-hr-no-crops_web-pdf.pdf

3. The Importance of Wildlife Markets in Infectious Disease Emergence

Bats as Reservoirs of Viruses

https://www.pinterest.com/pin/779967229186529836/

- Researchers analysed strains of SARS virus circulating in horseshoe bats, such as this one (*Rhinolophus sinicus*), in a cave in Yunnan province, China.Credit: Libiao Zhang/Guangdong Institute of Applied Biological Resource
- https://www.nature.com/articles/d41586-017-07766-9

Alice Latinne, et al. (2020-05-31). Origin and cross-species transmission of bat coronaviruses in China. https://www.biorxiv.org/content/10.1101/2020.05.31.116061v1.full.pdf

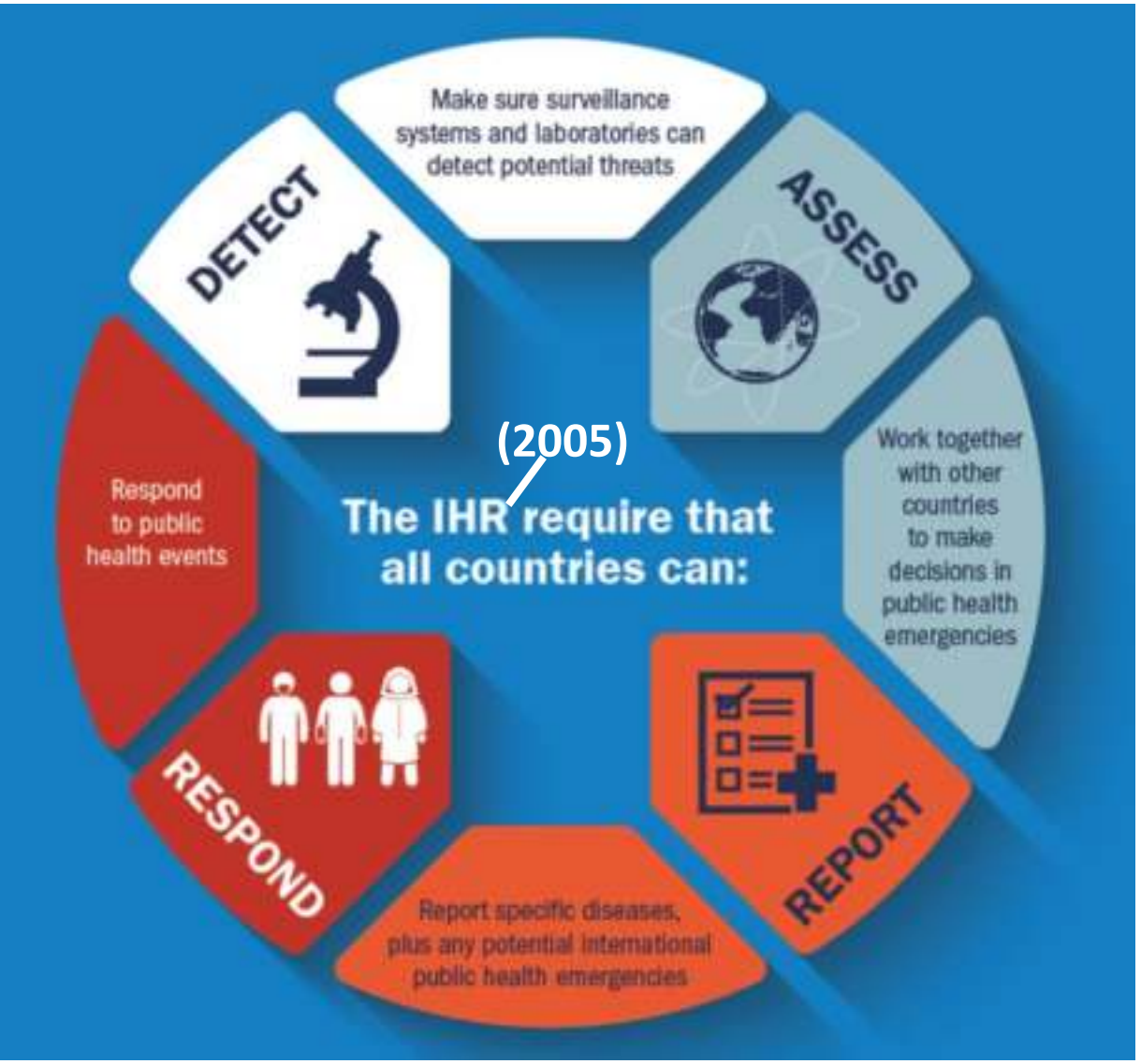
Limit or Ban Wildlife Markets, Especially Those Selling Live Wildlife to Prevent the Emergence of Zoonoses

A vendor sells bats at the Tomohon meat market in Sulawesi, Indonesia, on Feb. 8. Ronny Adolof Buol/AFP via Getty Images
https://foreignpolicy.com/2020/02/25/virus-bats-pangolins-wild-animals-coronavirus-zoonotic-diseases/

A man looks at caged civet cats in a wildlife market in Guangzhou, capital of south China's Guangdong Province, China, Jan. 5, 2004.
https://im-media.voltron.voanews.com/Drupal/01live-166/styles/sourced/s3/2020-01/AP_20022421073725.jpg?itok=JU5vuEsm

4. Preparing to Deal with EID Through Global Health Security

Pandemic Preparedness Plan and Global health Security



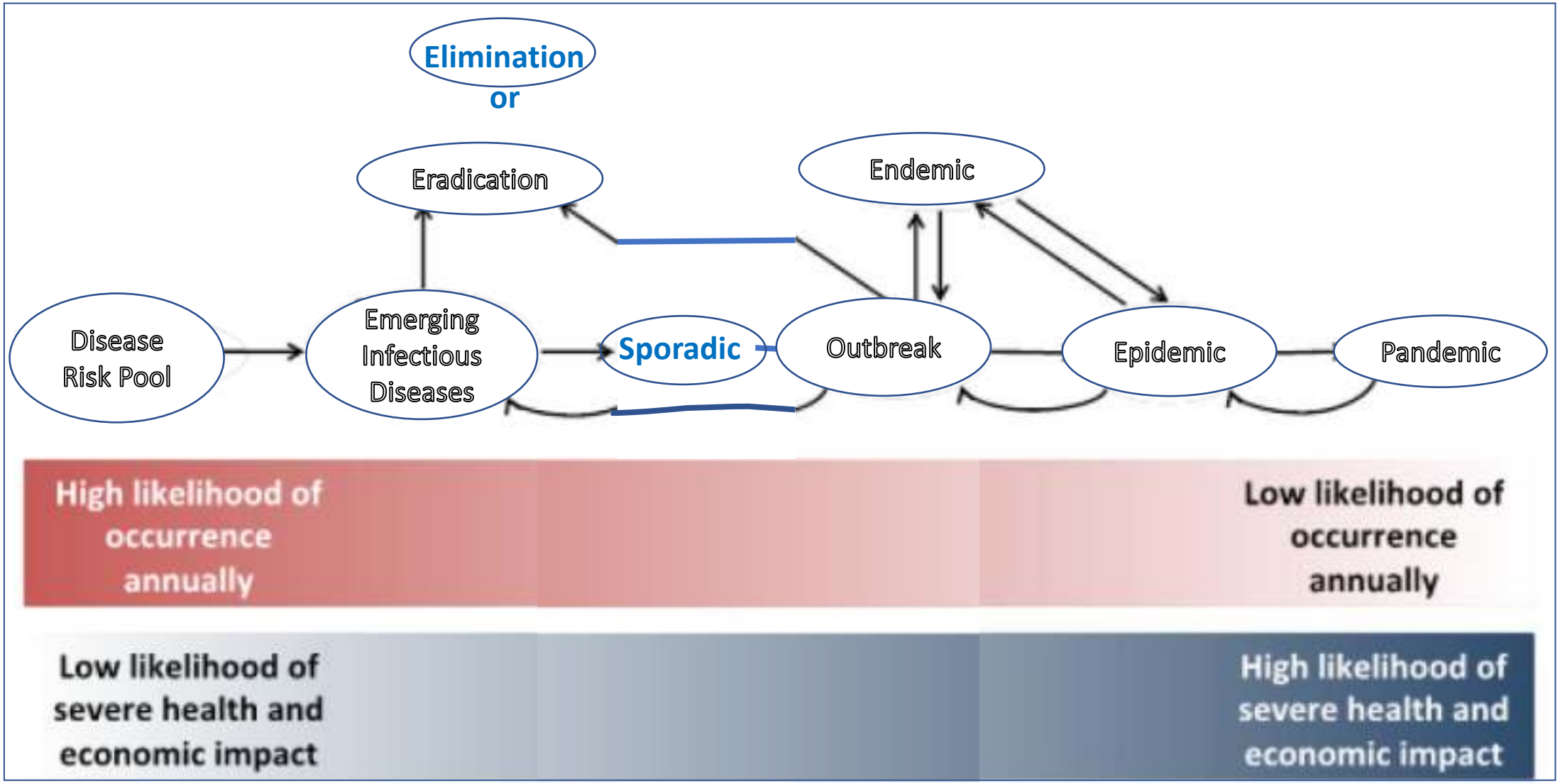
https://www.cdc.gov/globalhealth/infographics/global-health-security/ihr.htm

https://www.msh.org/sites/default/files/ghsa-action-packages.pdf

5. Preventing the Spread of EIDs

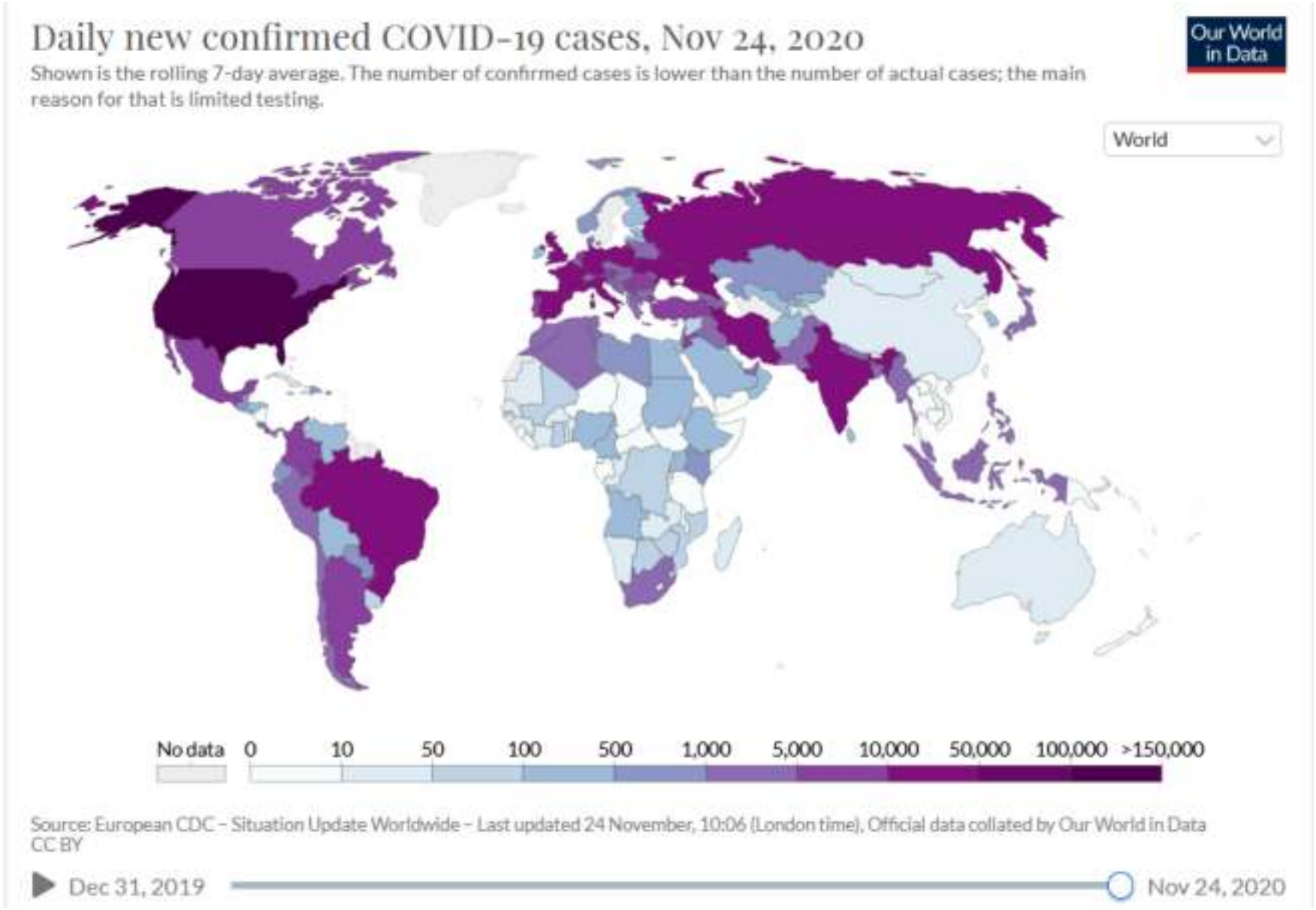
Progression From Zero Case to Pandemic

Eradication



National Research Council 2016. *The Neglected Dimension of Global Security: A Framework to Counter Infectious Disease Crises*. Washington, DC: The National Academies Press. p18 https://doi.org/10.17226/21891.

6. Pandemics due to Global Travel and Inter-connected World

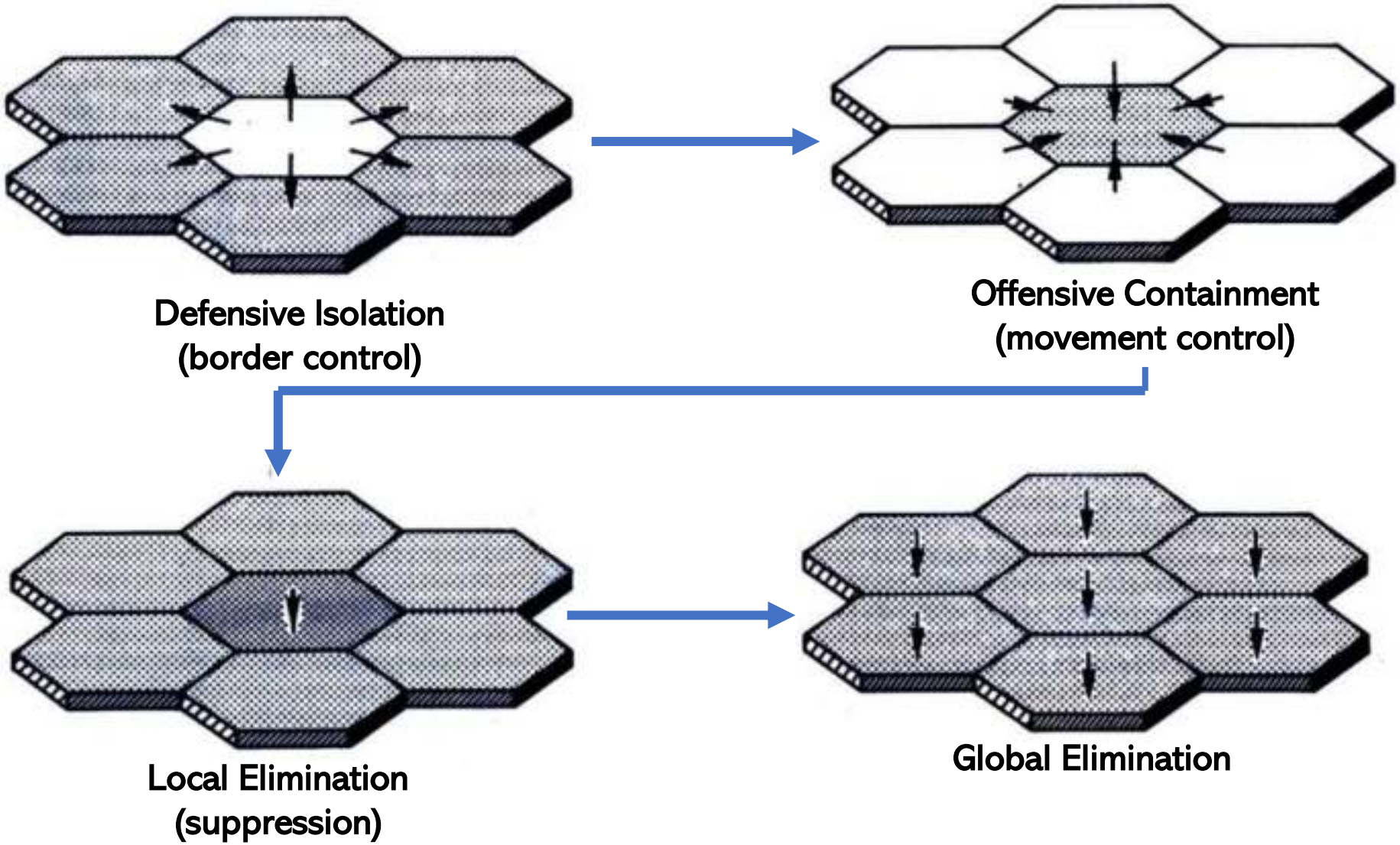


We are not safe so long as COVID-19 is not controlled in every country of the world.
It can easily spread and be imported via global travel

Source of map: https://ourworldindata.org/coronavirus/country/malaysia?country=~MYS

7. Preventing the Exportation and Importation of Pandemic Organisms

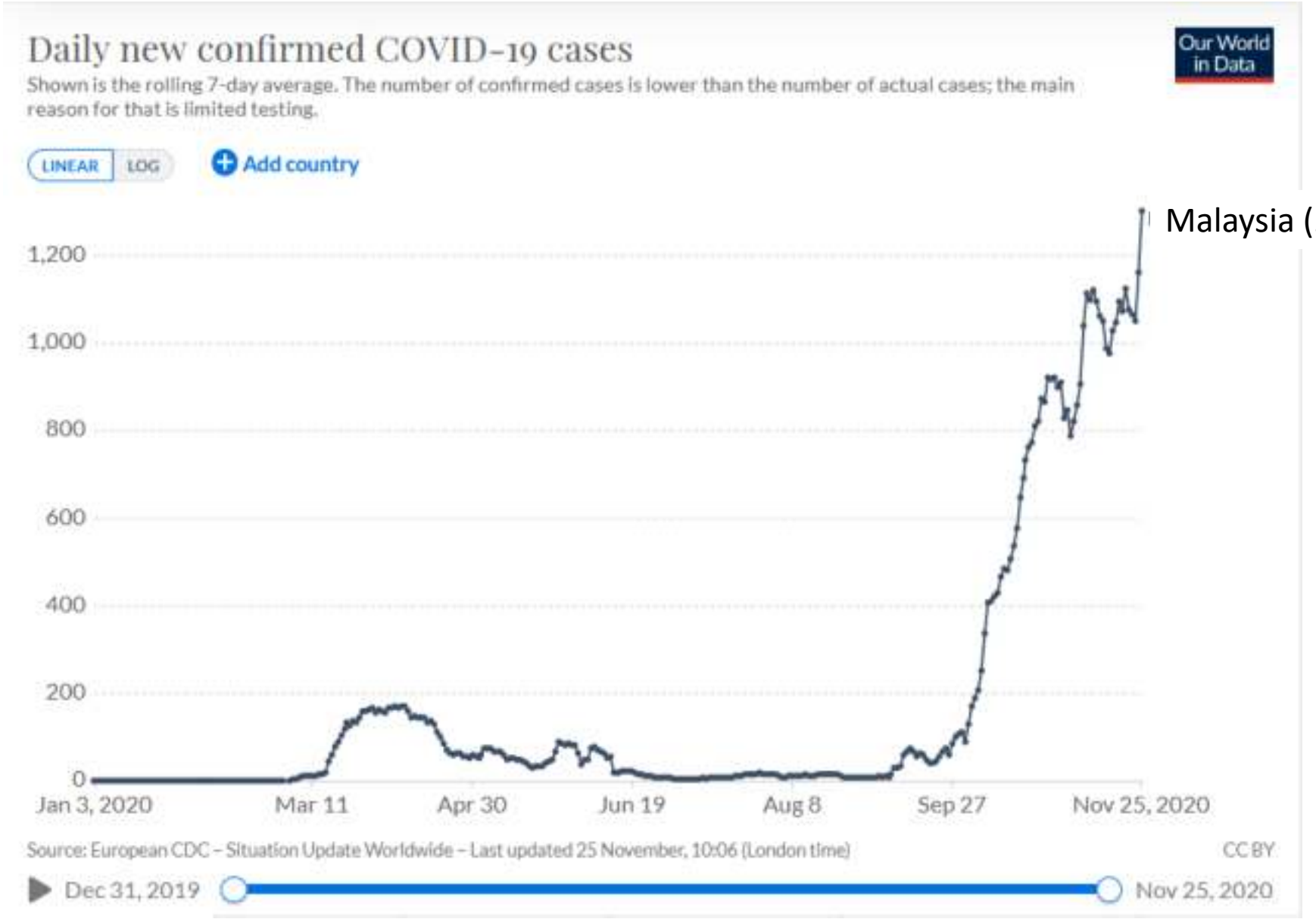
Border Control and Inter-state/district Travel Control (Spatio-temporal Control of Infectious Diseases)



Source: Cliff AD, Haggett P, Smallman-Raynor M. Measles: an Historical Geography of a Major Human Viral Disease from Global Expansion to Local Retreat. 1840-1990. Oxford: Blackwell. 1993, figure 16.9. p.423, quoted in Communicable Disease Epidemiology and Control. Edited by Norman Noah and Mary O'Mahony.John Wiley and Sons. Chichester, England 1998. p 26

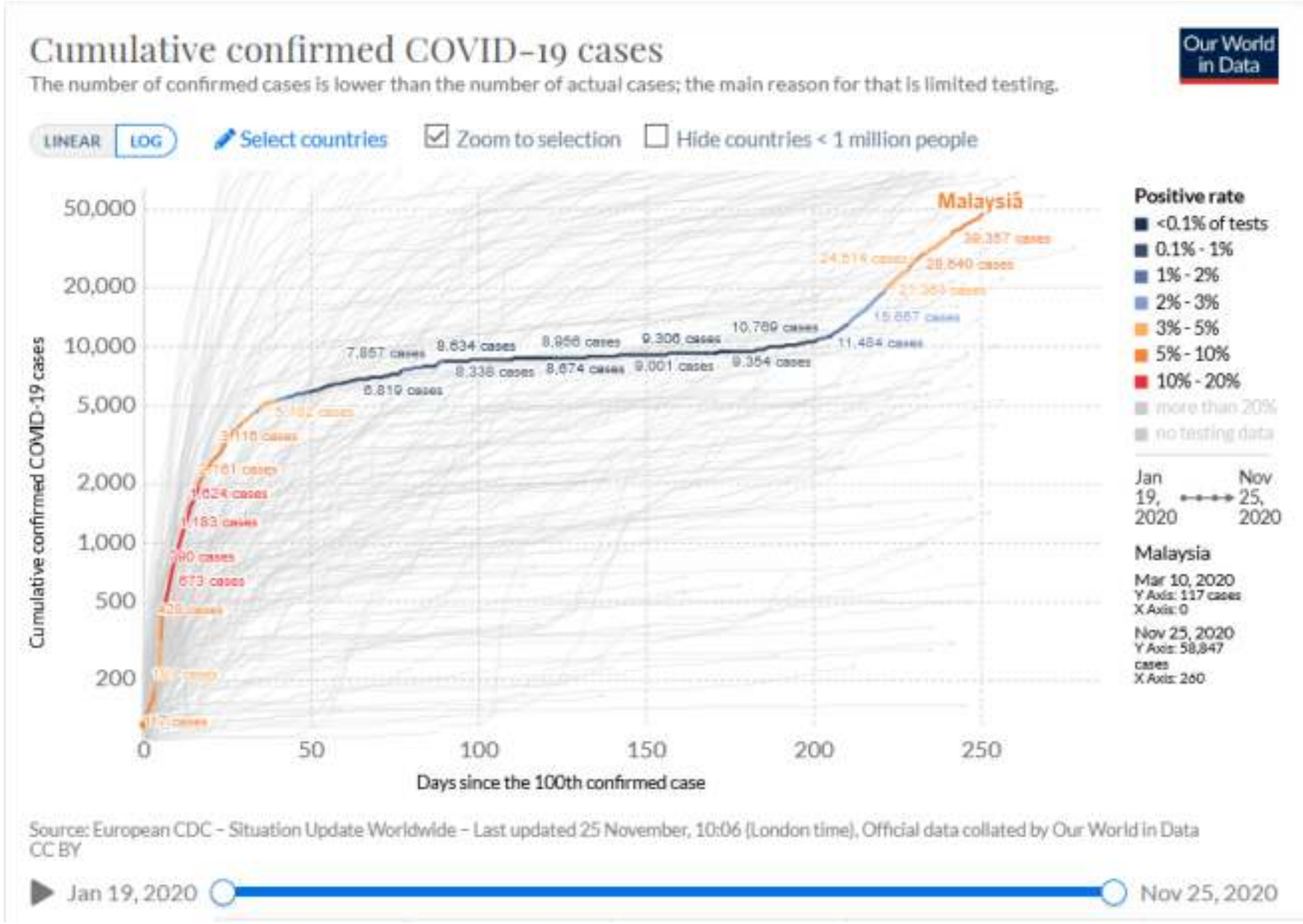
8. Nip the Outbreak in the Bud to Prevent it from Reaching its Tipping Point

Malaysia: What is the daily number of confirmed cases?



https://ourworldindata.org/coronavirus/country/malaysia?country=~MYS

Malaysia has not bent the curve of the third wave



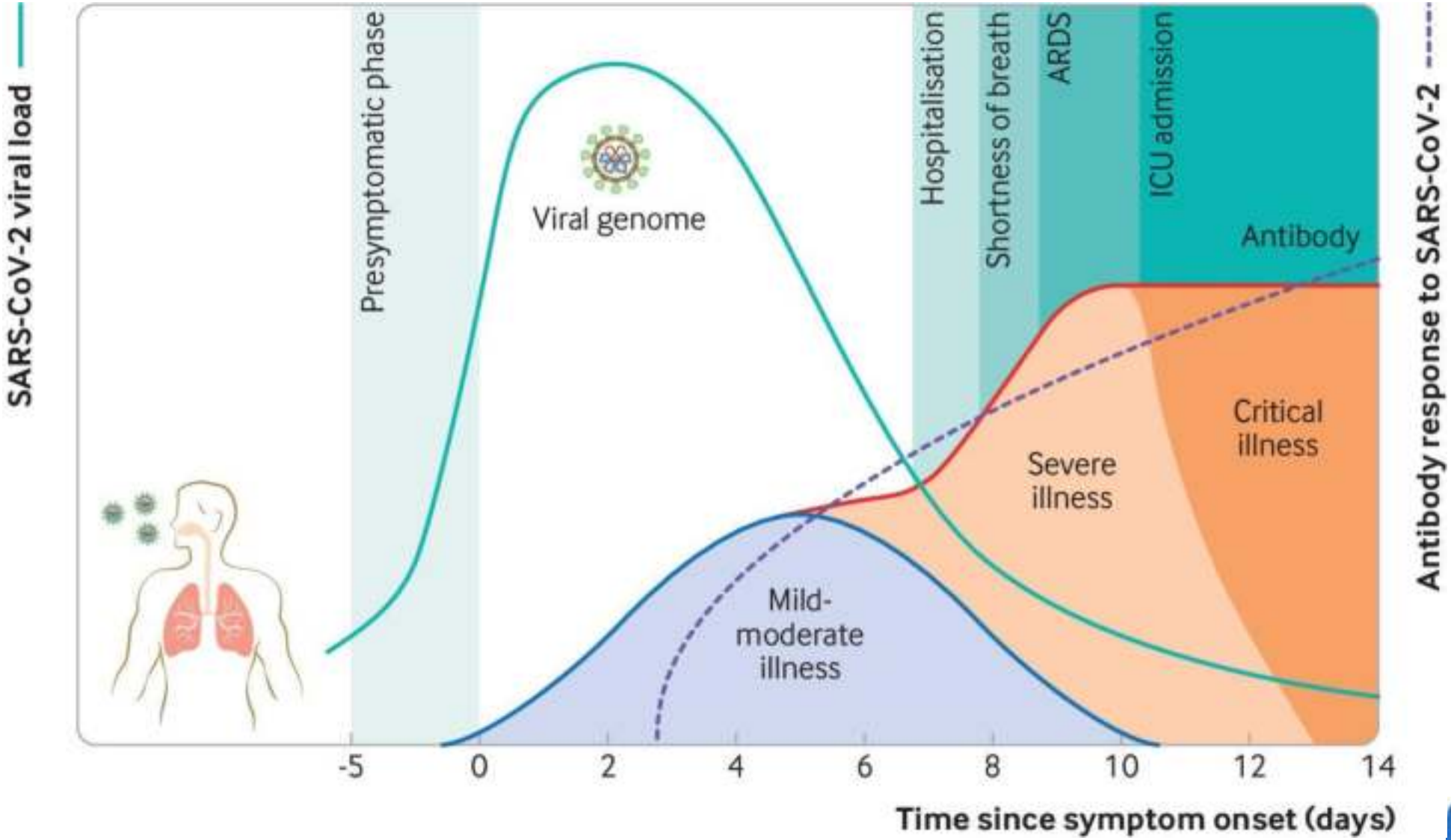
https://ourworldindata.org/coronavirus/country/malaysia?country=~MYS

9. Why Does SARS-CoV-2 Spread Faster and to the Whole World Compared to SARS-CoV-1 in 2003?

9. Characteristics of the SARS-CoV-2 that make it More Infectious and Difficult to Control Compared to SARS in 2003

- SARS-CoV-2 has shorter incubation period, and thus the epidemic develops faster
- SARS-CoV-2 is infectious even before the infected person develop symptoms whereas SARS in 2003 was infectious only during the symptomatic phase
- SARS-CoV-2 has a higher transmissibility, R_0
- SARS-CoV-2 has a higher percentage of cases who do not develop symptoms and yet are able to spread the infection to other people

After the initial exposure, patients typically develop symptoms within 5-6 days (incubation period).
They are infectious even before they develop symptoms.
Thus it is very important to trace, test and quarantine close contacts of cases



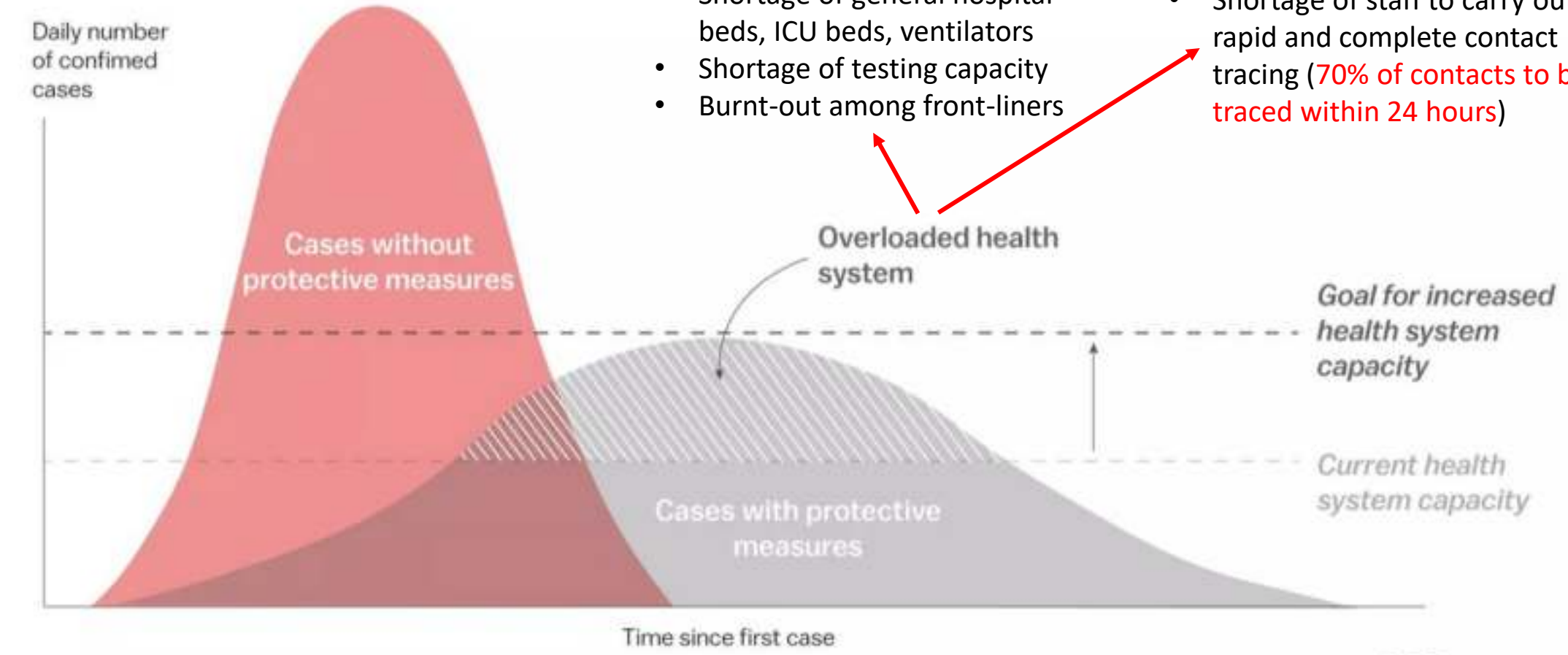
Muge Cevik et al. (2020-10-23). *Virology, transmission, and pathogenesis of SARS-CoV-2.* BMJ 2020;371:bmj.m3862
https://www.bmj.com/content/371/bmj.m3862

10. Importance of Flattening the Epidemic Curve

Flatten the Curve and Increase Health System Capacity

- Shortage of PPEs
- Shortage of general hospital beds, ICU beds, ventilators
- Shortage of testing capacity
- Burnt-out among front-liners

- Shortage of quarantine centres
- Shortage of staff to carry out rapid and complete contact tracing (70% of contacts to be traced within 24 hours)



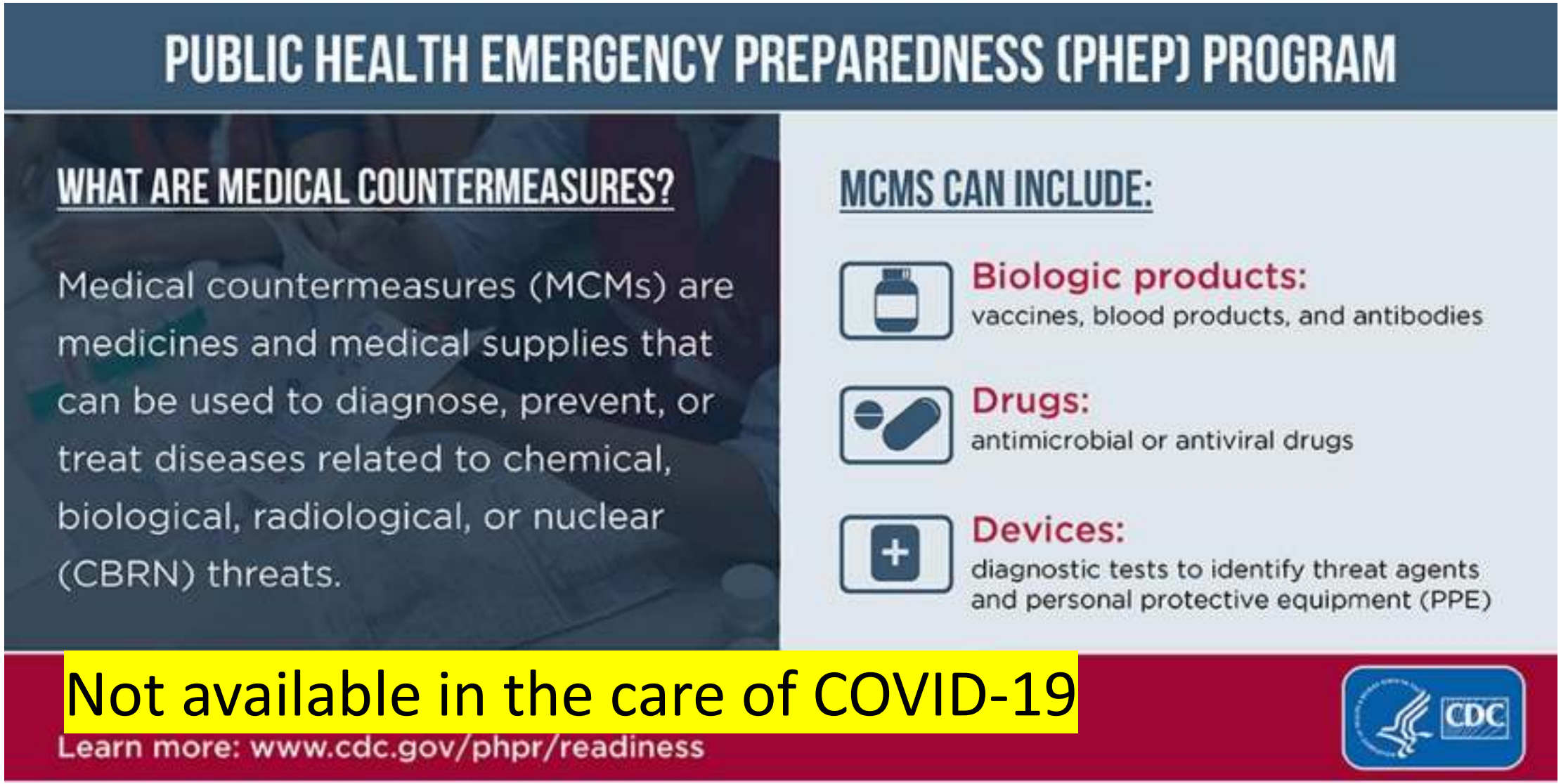
Source: Adapted from CDC and Kumar Rajaram, UCLA

Vox

Eliza Barclay, Dylan Scott, and Christina Animashaun (2020-04-07). The US doesn't just need to flatten the curve. It needs to "raise the line." https://www.vox.com/2020/4/7/21201260/coronavirus-usa-chart-mask-shortage-ventilators-flatten-the-curve

11. Flattening the Epidemic Curve through Pharmaceutical Intervention

Medical Countermeasures or Pharmaceutical Interventions



https://www.cdc.gov/cpr/readiness/mcm2-508.html Page last reviewed: October 5, 2020, 05:05 PM

12. Flattening the Epidemic Curve Through Non-Pharmaceutical Interventions (NPIs)

Objectives of Non-Pharmaceutical Interventions

1. Limit international spread of the virus	**2. Reduce spread within national and local populations**	**3. Reduce an individual person's risk for infection,**
a) Travel screening b) Travel restrictions	a) isolation and treatment of ill persons; b) monitoring and possible quarantine of exposed persons; c) social distancing measures: • cancellation of mass gatherings, and • closure of schools;	a) hand hygiene; b) wearing face masks; c) communicate risk to the public.

World Health Organization Writing Group (2006). Nonpharmaceutical Interventions for Pandemic Influenza, International Measures. *Emerging Infectious Diseases*. 2006;12(1):81-87. doi:10.3201/eid1201.051370.

Non-Pharmaceutical Interventions

- NPIs include:
  - compulsory measures underwritten by public health orders, such as
    - closures of various services and establishments,
    - quarantine/isolation and
    - restrictions on movement;
  - voluntary measures, supported by health promotion, such as
    - disinfection of hands and surfaces,
    - mask use
    - working from home and
    - maintaining a physical distance from other.

- In some settings these measures are
  - voluntary,
  - whereas in others they are now enforced (such as, via fines and/or jail time).

Seale, H., et al. (2020). Improving the impact of nonpharmaceutical interventions during COVID-19: examining the factors that influence engagement and the impact on individuals. BMC Infectious Diseases (2020) 20:607 . https://doi.org/10.1186/s12879-020-05340-9

Avoid the Three Cs

World Health Organization
Western Pacific Region

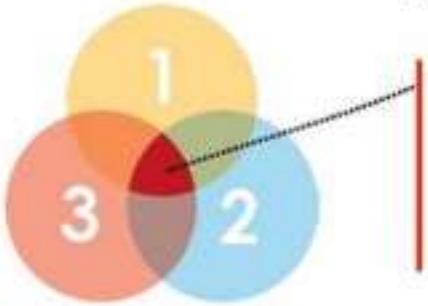
Be aware of different levels of risk in different settings.

There are certain places where COVID-19 spreads more easily:

1 Crowded places
with many people nearby

2 Close-contact settings
Especially where people have close-range conversations

3 Confined and enclosed spaces
with poor ventilation



The risk is higher in places where these factors overlap.

Even as restrictions are lifted, consider where you are going and #StaySafe by avoiding the Three Cs.

WHAT SHOULD YOU DO?

Avoid crowded places and limit time in enclosed spaces

Maintain at least 1m distance from others

When possible, open windows and doors for ventilation

Keep hands clean and cover coughs and sneezes

Wear a mask if requested or if physical distancing is not possible

If you are unwell, stay home unless to seek urgent medical care.

https://www.who.int/images/default-source/wpro/countries/malaysia/infographics/three-3cs/final-avoid-the-3-cs-poster.jpg?sfvrsn=638335c1_2

https://kpkesihatan.com/2020/06/04/kenyataan-akhbar-kpk-4-jun-2020-situasi-semasa-jangkitan-penyakit-coronavirus-2019-covid-19-di-malaysia/

1. Wear a mask,
2. Wash your hands,
3. Wipe down surfaces,
4. Watch your distance

https://www.stamfordhealth.org/healthflash-blog/infectious-disease/covid-cold-flu/

https://covid19.ncdhhs.gov/materials-resources/know-your-ws-wear-wait-wash

Operationalisation of the Non-pharmaceutical Interventions

Through

- Alert Levels
- Standard Operating Procedures

Stages of alert for New Zealand

ALERT LEVEL ONE: PREPARE
Covid-19 in NZ, but contained

- Activate border measures
- Contact tracing
- Cancel mass gatherings of more than 500 people
- Stay at home if sick and report flu-like symptoms
- Intensive testing for Covid-19
- Physical distancing encouraged

ALERT LEVEL TWO: REDUCE
Contained but risk of community transmission growing

- Entry border measures maximised
- Further restrictions on mass gatherings
- Physical distancing on public transport
- Limit non-essential travel around country
- Employer to begin alternative ways of working if possible (shift work, working from home etc)
- Business contingency plans activated
- High risk people to remain at home (over 70s, people with existing conditions)

ALERT LEVEL THREE: RESTRICT
Heightened risk that disease not contained

- Travel in areas of community transmission limited
- Affected educational facilities closed
- Mass gatherings cancelled
- Public venues closed
- Alternative ways of working required and some non-essential businesses closed
- Non-face-to-face primary care consultations
- Elective surgeries and procedures deferred and healthcare staff reprioritised

ALERT LEVEL FOUR: ELIMINATE
Likely that disease not contained

- People to stay at home
- Educational facilities closed
- All non-essential businesses closed
- Rationing of supplies and requisitioning of facilities
- Severe travel restrictions
- Major reprioritisation of healthcare services

https://goodyfeed.com/new-zealand-covid19-2nd-outbreak/

https://mlgh.sarawak.gov.my/modules/web/pages.php?mod=download&sub=download_show&id=374

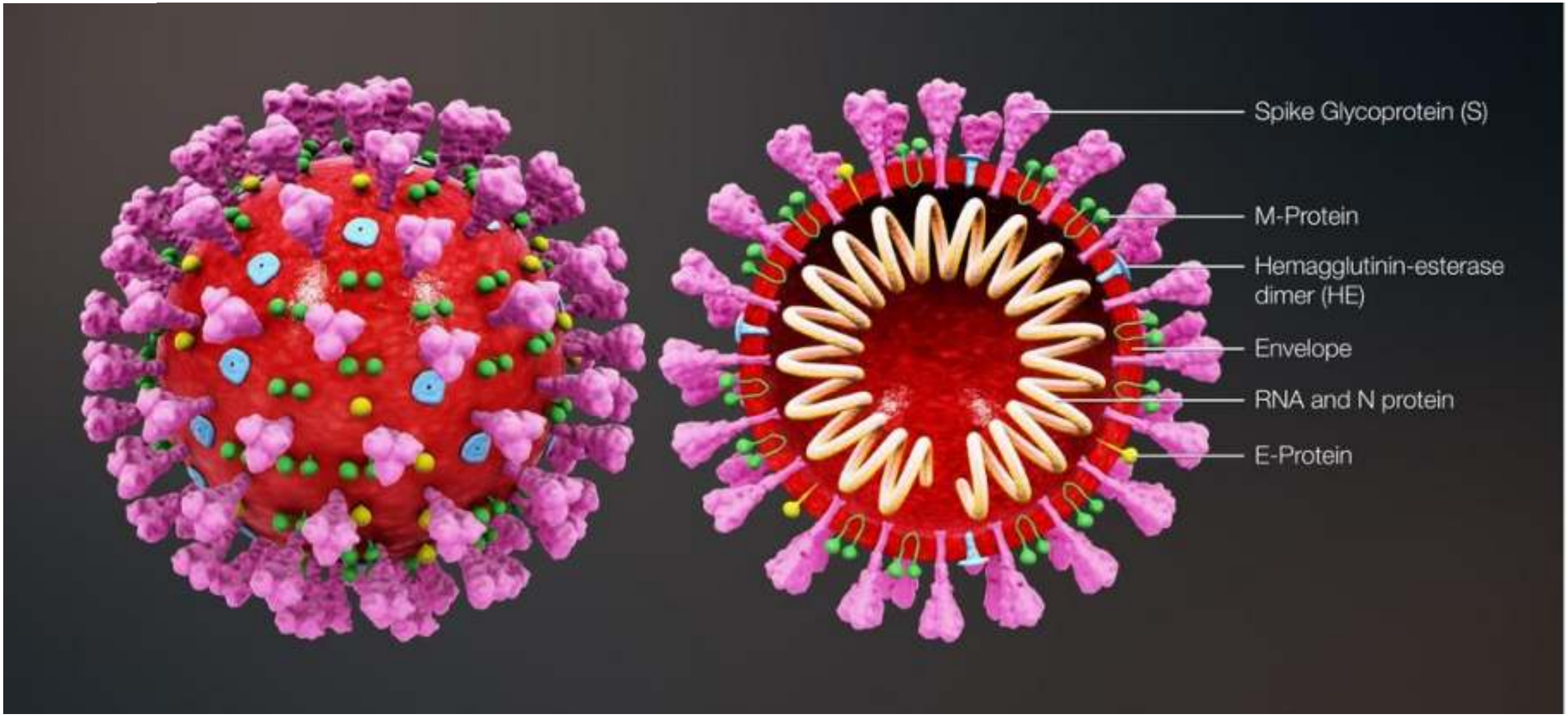
13. Characteristics of the SARS-CoV-2 That Make it Possible to Prevent its Transmission Through the NPIs

Carmen Ang (2020-10-10). Zooming In: Visualizing the Relative Size of Particles. https://www.visualcapitalist.com/visualizing-relative-size-of-particles/

Droplet Transmission Through Face Masks.

Pictures of face masks under investigation. We tested 14 different face masks or mask alternatives and one mask material. Photo credit: Emma Fischer, Duke University.

https://advances.sciencemag.org/content/advances/6/36/eabd3083.full.pdf

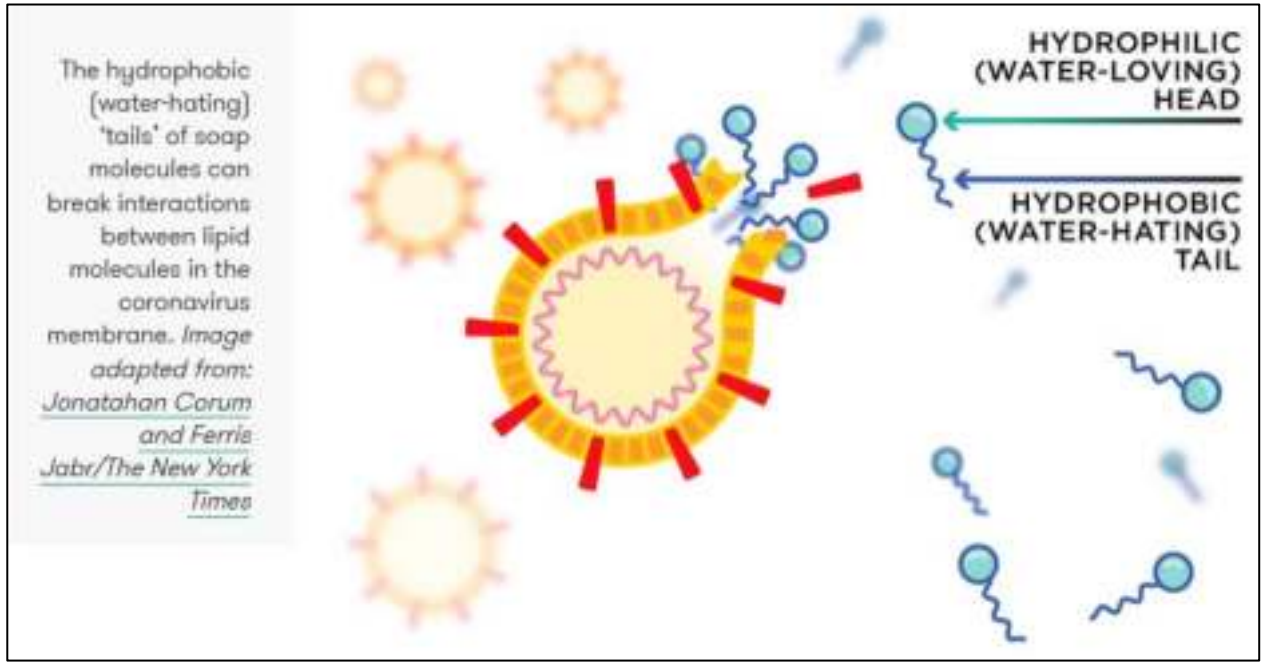


Ian Fenna (2020-03-23). SARS-CoV-2 (2019-nCoV) Proteins. https://www.biovendor.com/sars-cov-2-2019-ncov-proteins?utm_source=google&utm_medium=organic

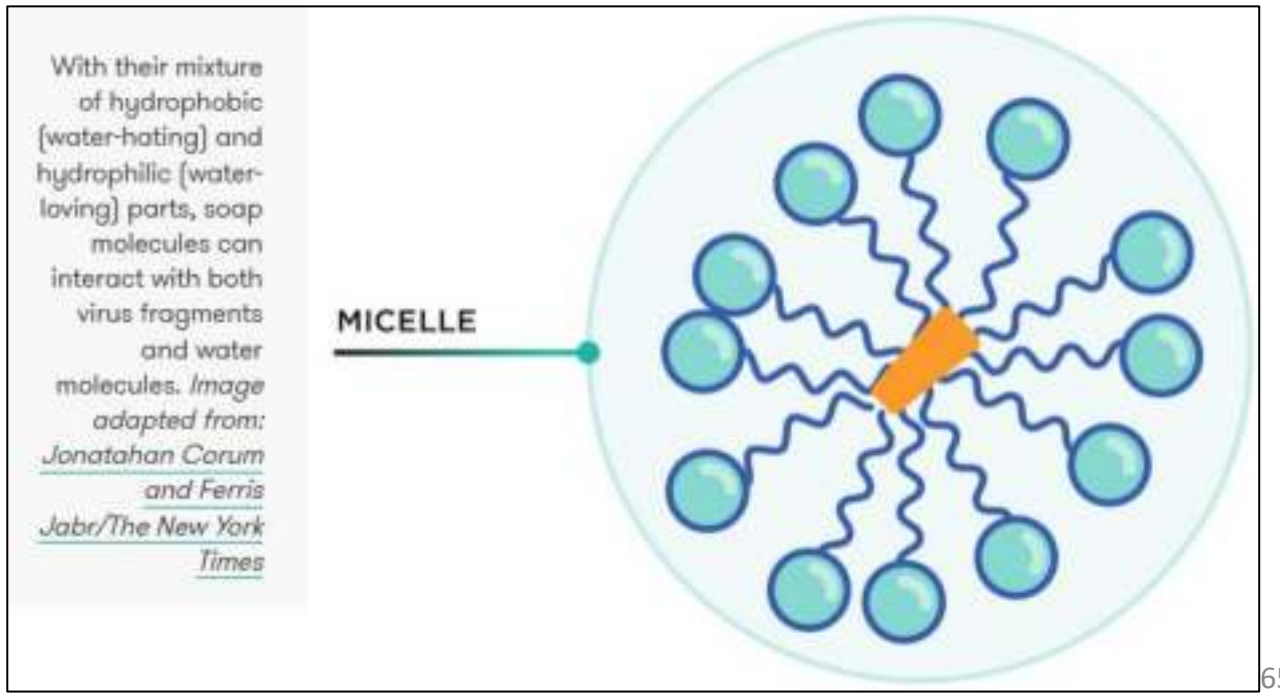
- Soap molecules have two chemically distinct parts:
  - a hydrophilic (water-loving) ‘head’ and a
  - hydrophobic (water-hating) ‘tail’.
- The head helps the soap mix with water, while the tail can interact with other hydrophobic molecules like lipids.

- The soap’s tail can disrupt the weak interactions between lipid molecules in the membrane, tearing it apart.

- If the virus is broken up before it has safely sheltered in a host cell, it will no longer be able to do its infectious job



The hydrophobic (water-hating) ‘tails’ of soap molecules can break interactions between lipid molecules in the coronavirus membrane. *Image adapted from: Jonatahan Corum and Ferris Jabr/The New York Times*



With their mixture of hydrophobic (water-hating) and hydrophilic (water-loving) parts, soap molecules can interact with both virus fragments and water molecules. *Image adapted from: Jonatahan Corum and Ferris Jabr/The New York Times*

https://www.science.org.au/curious/people-medicine/hand-sanitiser-or-soap-making-informed-choice-covid-19

Soap and Water to Kill the Virus

Washing your hands thoroughly with soap for at least 20 seconds is key to killing the coronavirus. *Image adapted from: Nathan Dumlao/Unsplash; CC0*

https://www.science.org.au/curious/people-medicine/hand-sanitiser-or-soap-making-informed-choice-covid-19

FOUR WAYS TO DESTROY CORONAVIRUS

THE ANATOMY OF THE VIRUS

Coronaviruses are a group of viruses. The specific coronavirus that causes COVID-19 is called SARS-CoV-2.

SARS-CoV-2 is a new virus, so there's currently no treatment for it. By cleaning hands and surfaces we can stop it spreading.

1 SOAP AND WATER

HANDS ✓ HARD SURFACES ✓

SOAP MOLECULES

WASH HANDS FOR A MINIMUM OF 20 SECONDS

HOW DOES IT DESTROY THE VIRUS?

Soap molecules dissolve the fatty outside layer of the virus. Any type of soap is effective, so it doesn't matter what type you use.

2 ALCOHOL HAND SANITISER

HANDS ✓ HARD SURFACES ✓

MIN. 60% ALCOHOL (HANDS) OR 70% (SURFACES)

HOW DOES IT DESTROY THE VIRUS?

Alcohol molecules dissolve the fatty outside layer of the virus and damage the structures of virus proteins.

3 BLEACH SOLUTION

HANDS ✗ HARD SURFACES ✓

NaClO

SODIUM HYPOCHLORITE

Cl_2

Don't mix bleach with other cleaners. This can generate toxic chlorine gas.

MINIMUM CONCENTRATION OF 0.1% HYPOCHLORITE

HOW DOES IT DESTROY THE VIRUS?

Bleach oxidises and destroys virus proteins and genetic material. It should be left on surfaces for at least 10 minutes.

4 HYDROGEN PEROXIDE

HANDS ✗ HARD SURFACES ✓

H_2O_2

HYDROGEN PEROXIDE

Don't mix peroxide with vinegar. This makes corrosive peracetic acid.

MINIMUM CONCENTRATION OF 0.5% PEROXIDE

HOW DOES IT DESTROY THE VIRUS?

Peroxide oxidises and destroys virus proteins and genetic material. It should be left on surfaces for at least 10 minutes.

https://www.compoundchem.com/2020/03/31/destroy-coronavirus/

14. How to Prevent Transmission and Protect Ourselves from Getting Infected

College of Arts & Sciences
UMass Dartmouth

https://www.umassd.edu/directory/ebromage/

Erin Bromage
Associate Professor
Biology

Successful Infection = Exposure to Virus x Time

- Infectious dose:
  - as few as 1000 SARS-CoV2 infectious viral particles are sufficient to cause infections
- Infection could occur through:
  - 1000 infectious viral particles you receive in one breath or from one eye-rub, or
  - 100 viral particles inhaled with each breath over 10 breaths, or
  - 10 viral particles with 100 breaths.

- ‘We don't have a number for SARS-CoV-2 yet, but we can use influenza as a guide.
- We know that a person infected with influenza releases about 3 - 20 virus RNA copies per minute of breathing.’

Erin Bromage (2020-05-20). **The Risks - Know Them - Avoid Them.** https://www.erinbromage.com/post/the-risks-know-them-avoid-them

A Toilet flush: Without a seat to close, a single flush releases ~8,000 droplets into the air.

A single cough releases about 3,000 droplets and droplets travels at 50 miles per hour

A single sneeze releases about 30,000 droplets, with droplets traveling at up to 200 miles per hour

If a person is infected, the droplets in a single cough or sneeze may contain as many as 200,000,000 (two hundred million) virus particles

- A single breath releases 50 - 5000 droplets.
- the respiratory droplets released from breathing only contain low levels of virus.
- *Studies have shown that a person infected with influenza can releases up to 33 infectious viral particles per minute.*
- Even if every virus ended up in your lungs (which is very unlikely), you would need 1000 viral particles divided by 30 per minute = 30 minutes.

- Speaking releases 10 times more droplets than breathing, i.e., 500 – 50,000 droplets
- it would take about 5 minutes of speaking face-to-face to receive the required dose.

- Anyone you spend greater than 10 minutes with in a face-to-face situation is potentially infected.
- Anyone who shares a space with you (say an office) for an extended period is potentially infected.

Erin Bromage (2020-05-20). **The Risks - Know Them - Avoid Them.** https://www.erinbromage.com/post/the-risks-know-them-avoid-them

Distance, Time, Activity, Environment

Brian Resnick (2020-06-18). 6 feet away isn't enough. Covid-19 risk involves other dimensions, too. Distance, time, activity, environment: 4 ways to think about Covid-19 risk. https://www.vox.com/science-and-health/2020/5/22/21265180/cdc-coronavirus-surfaces-social-distancing-guidelines-covid-19-risks

https://www.dreamstime.com/coronavirus-infographic-lifetime-covid-virus-infection-different-surfaces-materials-dangerous-pneumonia-precaution-image184849393

15. Family Bubbles

Family Bubbles and Extended Bubbles

- The concept of a COVID-19 “germ bubble” refers to close contacts with whom we don’t practise mask use or keep physical distancing.
- In strict lockdown, this generally means just the members of your own household.
- But several countries, have experimented with bubbles larger than a single household.
- A support bubble should be with another local household to avoid unnecessary travel
- Bubbles must be "exclusive".
    - Once in one, you can't switch and start another with a different household.

https://www.hackensackmeridianhealth.org/HealthU/2020/08/26/how-to-create-a-covid-bubble-and-why-you-should-consider-one/

Michelle Roberts (2020-11-02). Support bubbles: How do they work and who is in yours? BBC https://www.bbc.com/news/health-52637354

16. Mass Testing versus Targeted Testing

Test, Isolate Cases, Trace and Quarantine Contacts

- Alongside the use of the non-pharmaceutical interventions, there is the critical need to
  - test all people with suspected infection as quickly as possible,
  - to promptly isolate cases, and
  - trace and quarantine their contacts.

A photograph by the state-run newspaper China Daily showing an isolation ward in Wuhan on Thursday. China Daily, via Reuters

https://www.nytimes.com/2020/02/11/world/asia/coronavirus-china.html

Seale, H., et al. (2020). Improving the impact of nonpharmaceutical interventions during COVID-19: examining the factors that influence engagement and the impact on individuals. BMC Infectious Diseases (2020) 20:607 https://doi.org/10.1186/s12879-020-05340-9

WHO head: 'Our key message is: test, test, test'

World Health Organisation head Tedros Adhanom Ghebreyesus says there has not been an urgent enough escalation in testing, isolation and contact tracing, which should be the "backbone" of the global response.

16 March 2020

https://www.bbc.com/news/av/world-51916707

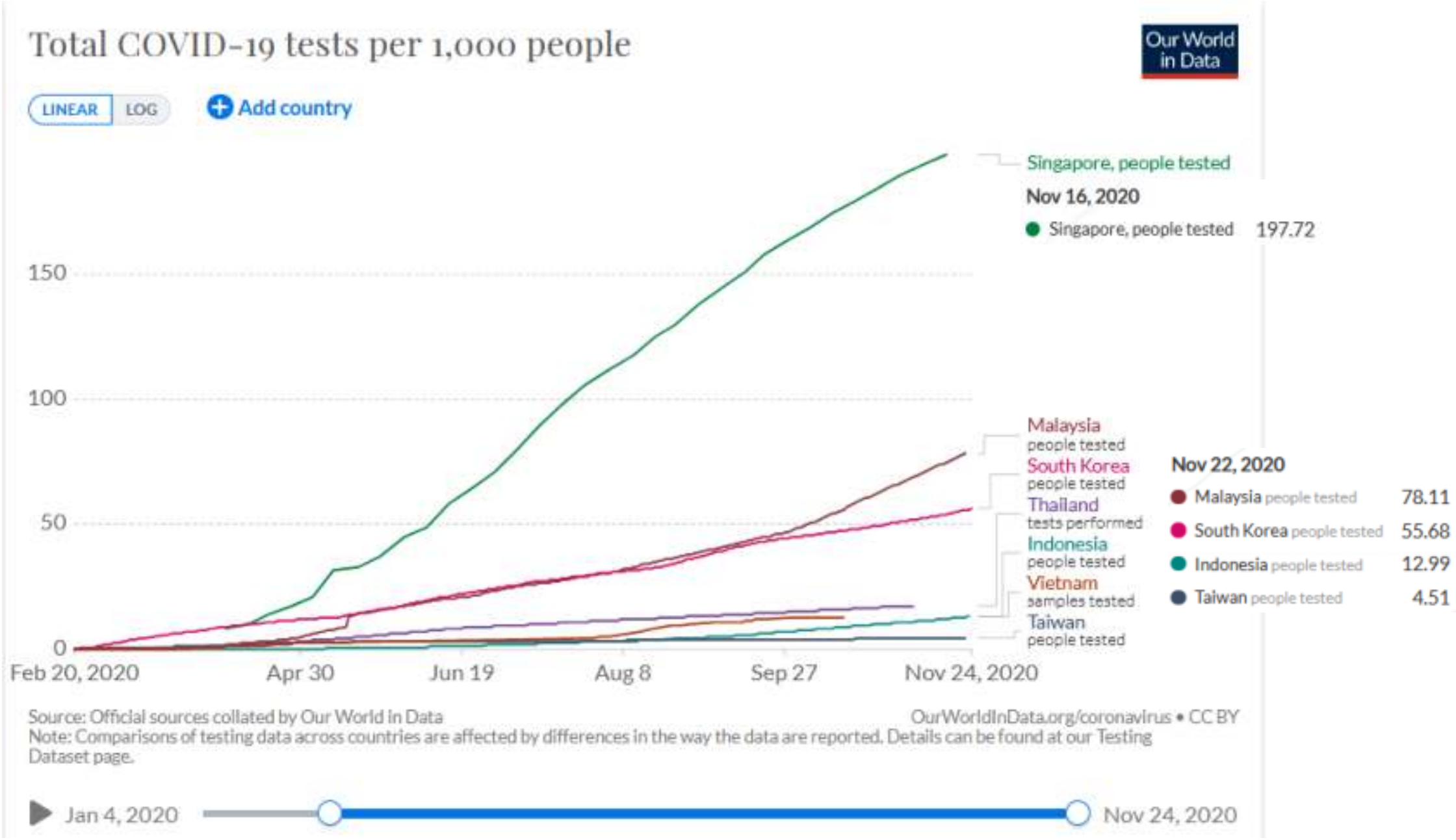
Health DG says no to mass Covid-19 testing

THE EDGE MARKETS
MAKE BETTER DECISIONS

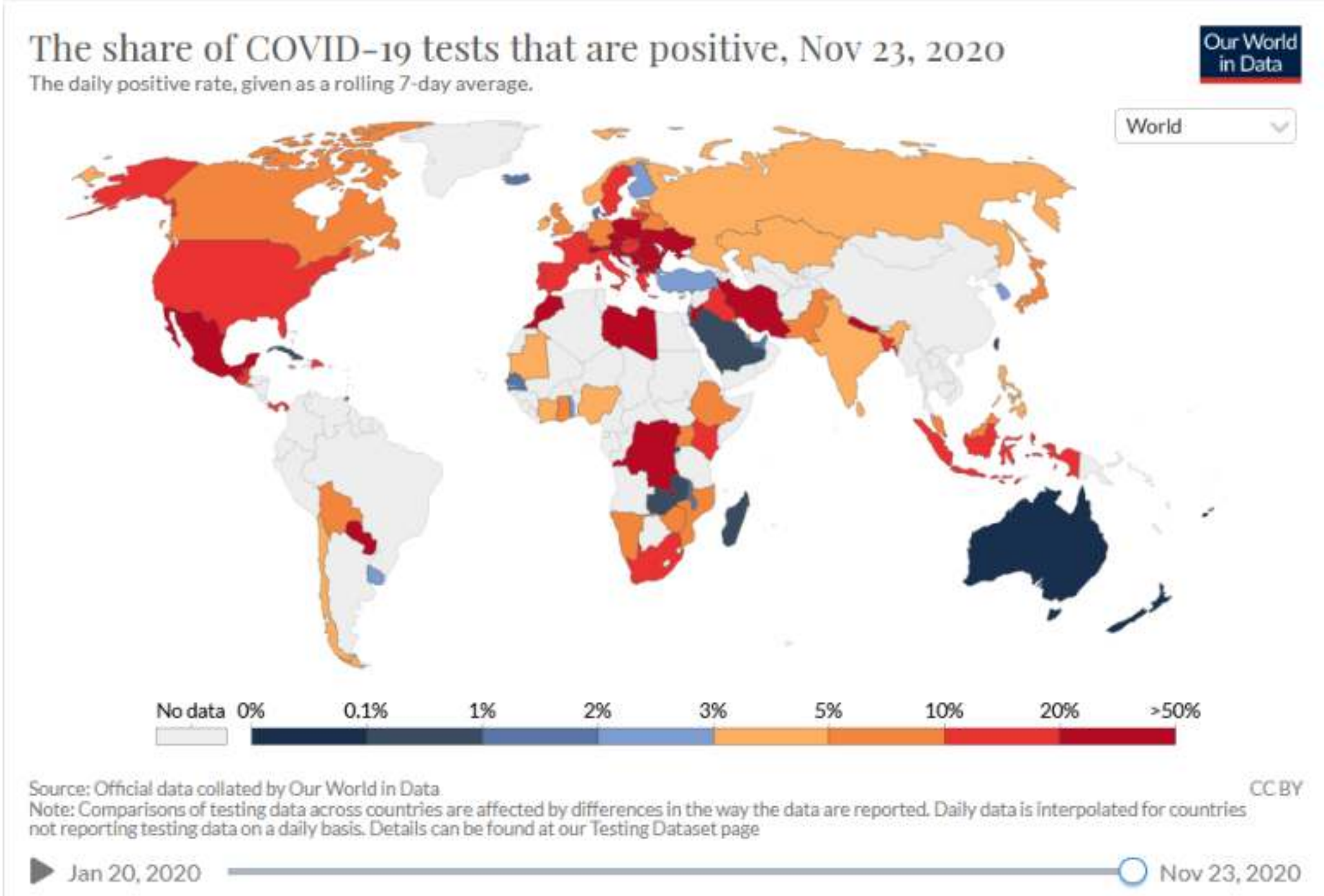
The 4 Ts: 'Target, Test, Trace, Treat'

- PUTRAJAYA (May 14): Health director-general Datuk Dr Noor Hisham Abdullah has dismissed calls for mass-scale Covid-19 testing across the country, saying it could prove ineffective as the people who have undergone the test would still be exposed to the virus in their community.
- "This is where we look into high impact, reasonable cost and good outcome; this is our strategy, rather than test, test, test everyone and not know how frequently we want to test them.

https://www.theedgemarkets.com/article/health-dg-says-no-mass-covid19-testing



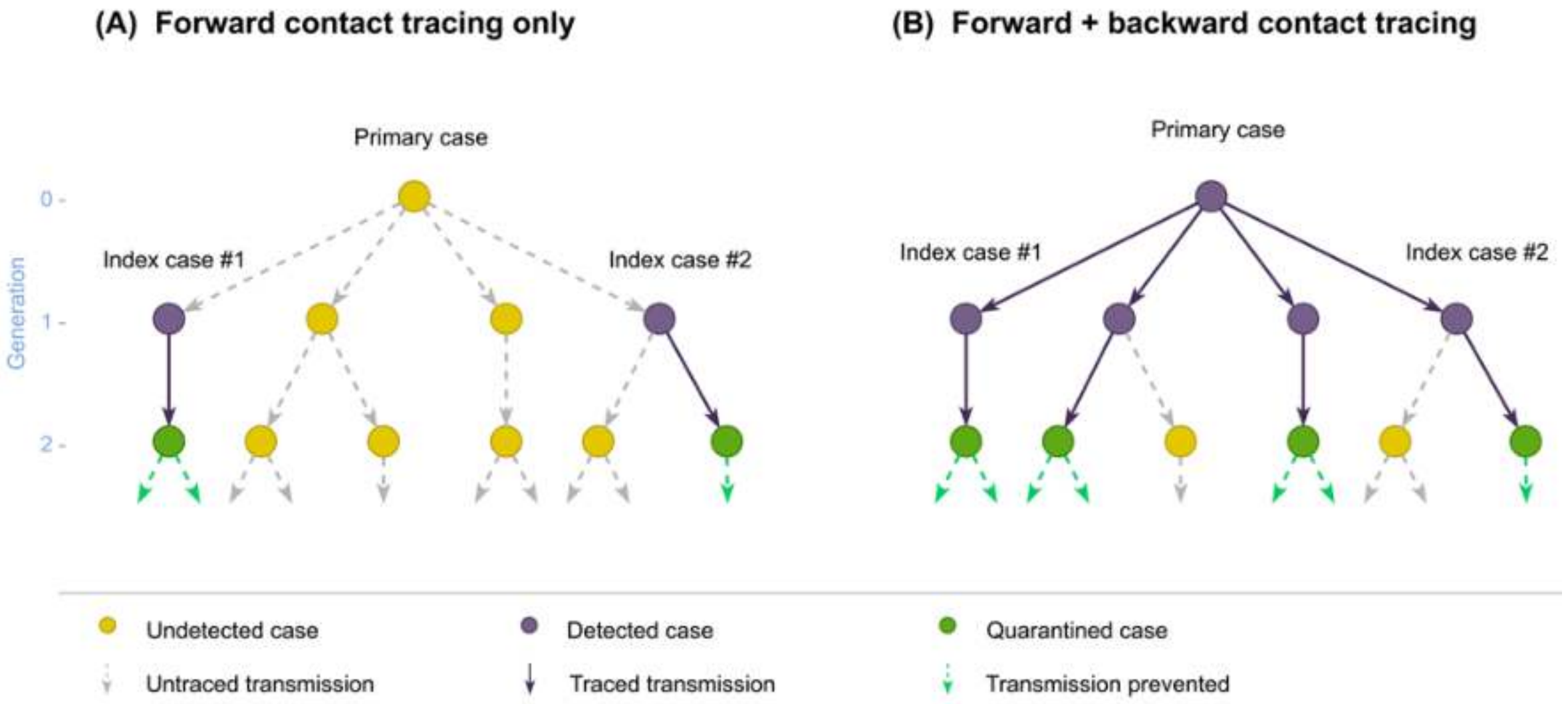
https://ourworldindata.org/grapher/full-list-cumulative-total-tests-per-thousand?time=2020-02-20..latest&country=IDN~MYS~Singapore%2C%20people%20tested~THA~KOR~VNM~TWN



https://ourworldindata.org/coronavirus-testing

17. The Importance of Forward and Backward Contract tracing

Figure 1. Schematic illustration of forward and backward contact tracing.

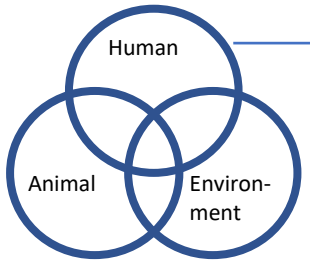


Wellcome Open Research

Endo A, Centre for the Mathematical Modelling of Infectious Diseases COVID-19 Working Group, Leclerc QJ et al. Implication of backward contact tracing in the presence of overdispersed transmission in COVID-19 outbreaks [version 1]. Wellcome Open Res 2020, 5:239 (doi: 10.12688/wellcomeopenres.16344.1)

18. Summary

Balance Human, animal and environment interface



Emergence of Infectious Diseases - Zoonoses

- Bats
- Wildlife markets

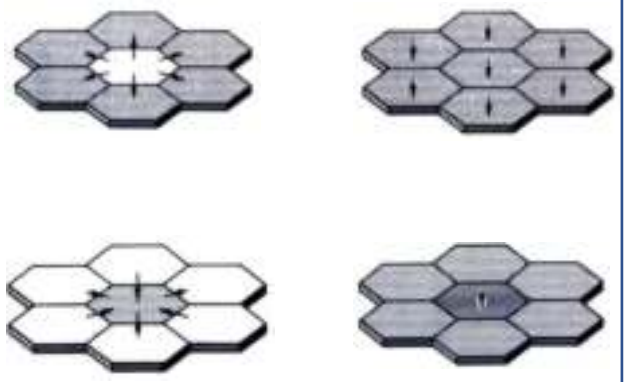
Local emergence

- Die out
- Epidemic
- Endemic

Global Pandemic

- Global health security
- International health Regulations (2005)
- Public health Emergency of International Concern

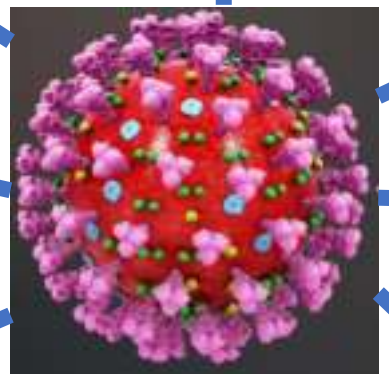
Spatial Strategies for Disease Control



Why Bother

- COVID-19 is not 'just like seasonal flu'
- Individuals and families
  - Morbidity & mortality
- Community
  - Disruption of everyday life – New normal
- Healthcare system
  - Overwhelmed
- Globally
  - Global health pushed back by 25 years
  - USD 12 trillion loss to the global econ0my

Pharmaceutical Interventions
(Medical Interventions)



SARS-CoV-2

Characteristics

WHO – Test, Test , Test
Target, Test, Treat, Trace

Non-Pharmaceutical Interventions

Forward contact tracing
Backward contact tracing