

97039: Global Health, Antimicrobial Drugs and Vaccines

Module 3: Antibiotic and diagnostic test availability, affordability and access: Lessons from the COVID-19 pandemic

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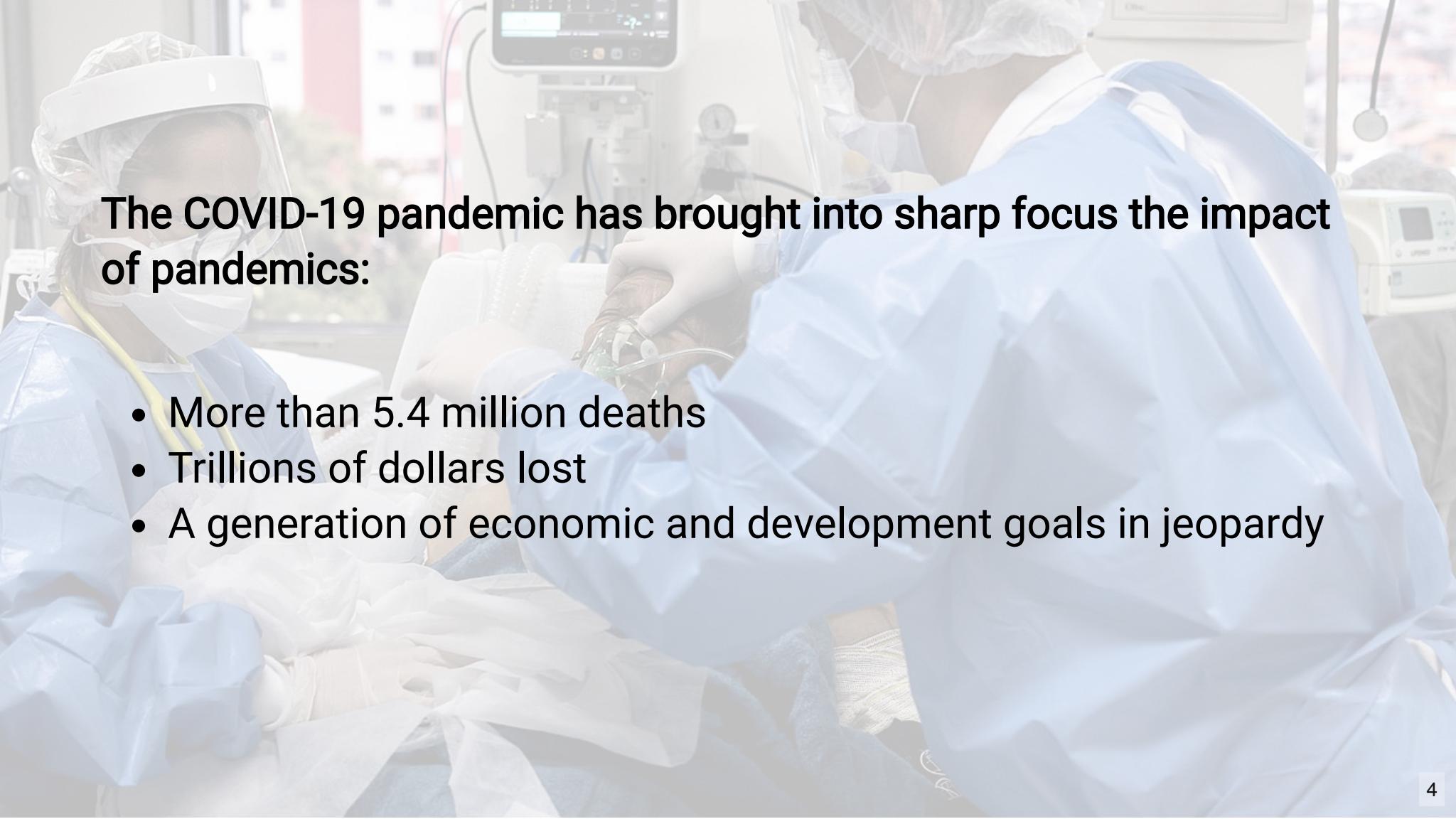


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Learning objectives

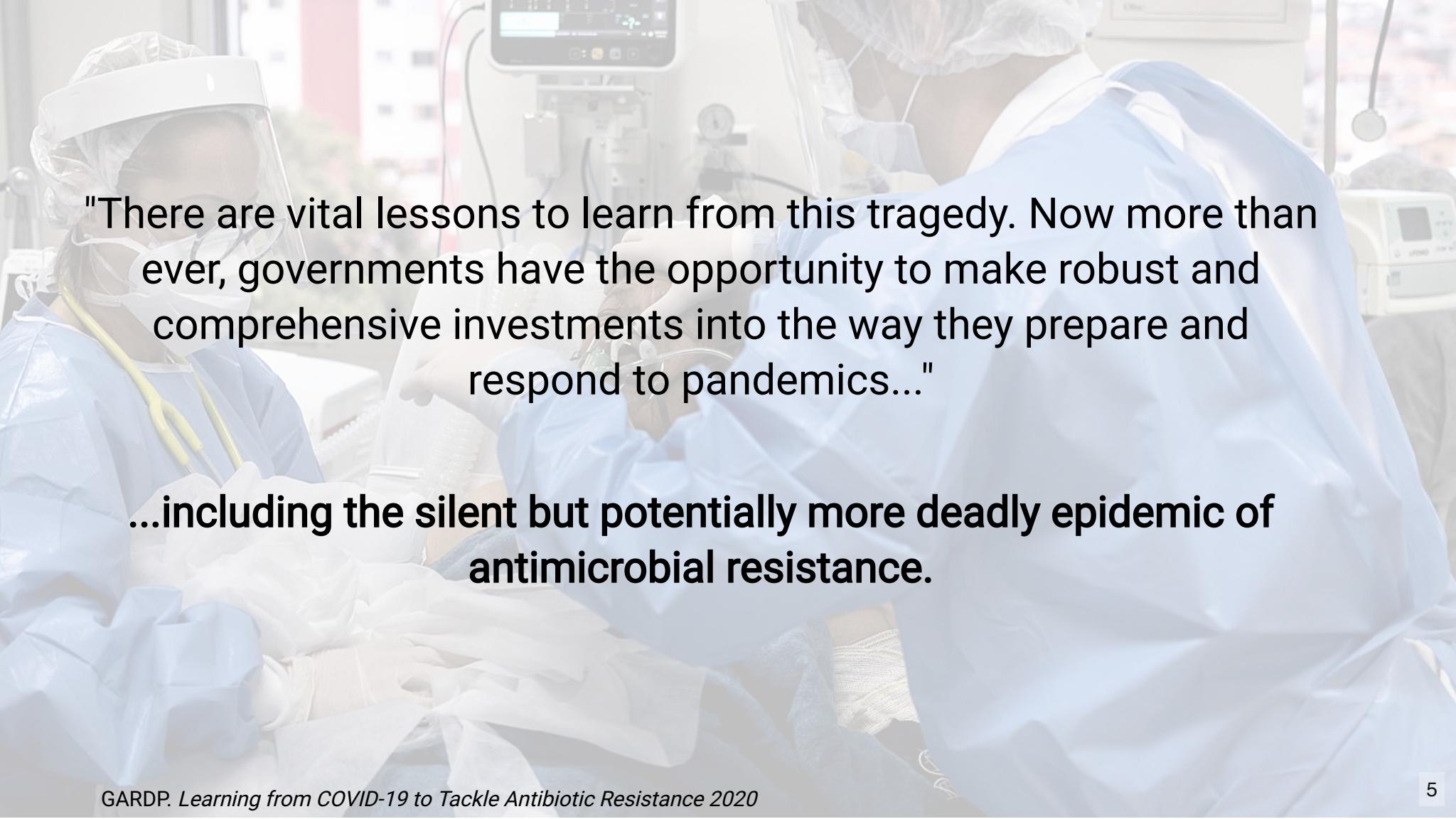
- Current access challenges of COVID-19 vaccine, therapeutics and diagnostic access in LMICs
- Strategies used to improve vaccine and therapeutics access in LMICs
- The problems of counterfeit medications in LMICs
- Applying lessons learned from COVID-19 thusfar to the epidemic of antimicrobial resistance





The COVID-19 pandemic has brought into sharp focus the impact of pandemics:

- More than 5.4 million deaths
- Trillions of dollars lost
- A generation of economic and development goals in jeopardy



"There are vital lessons to learn from this tragedy. Now more than ever, governments have the opportunity to make robust and comprehensive investments into the way they prepare and respond to pandemics..."

...including the silent but potentially more deadly epidemic of antimicrobial resistance.

Current COVID-19 Situation

<https://covid19.who.int/>

Collateral effects of COVID-19

- Tuberculosis deaths also climbed worldwide for the first time in a decade
- Measles outbreaks may be more likely in the near future, after the number of infants missing their first vaccination jumped by 3 million last year—the largest increase in 20 years.
- Malaria's 241 million cases and 627,000 deaths in 2020 reflect increases of 14 million and 69,000 respectively—both were largely attributed to pandemic disruptions

WHO Global Tuberculosis Report 2021; WHO Interim Guidance for Country Validation of Hepatitis Elimination;

WHO Global Progress Report on HIV, Viral Hepatitis and Sexually Transmitted Infections, 2021

A medical professional wearing a white coat, a blue surgical mask, and blue gloves is holding a clear glass vial of vaccine. They are looking down at the vial. In the background, another person in a white coat and mask is visible.

**11 billion people worldwide must
be vaccinated against SARS-CoV-2**

Currently, just over half have received the vaccine

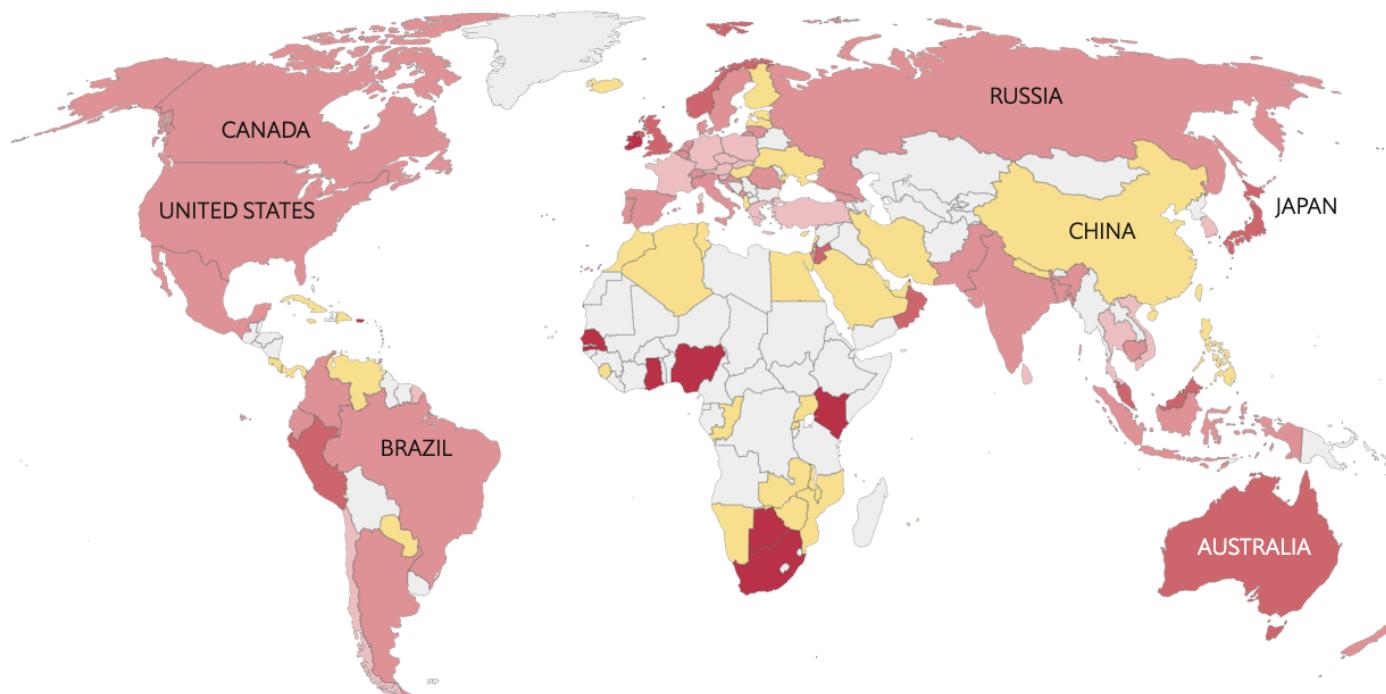
Ten countries account for 77% of administered vaccines

[https://ourworldindata.org/grapher/covid-vaccination-doses-per-capita?
tab=map&time=latest](https://ourworldindata.org/grapher/covid-vaccination-doses-per-capita?tab=map&time=latest)

Emergence of SARS-CoV-2 Omicron Variant

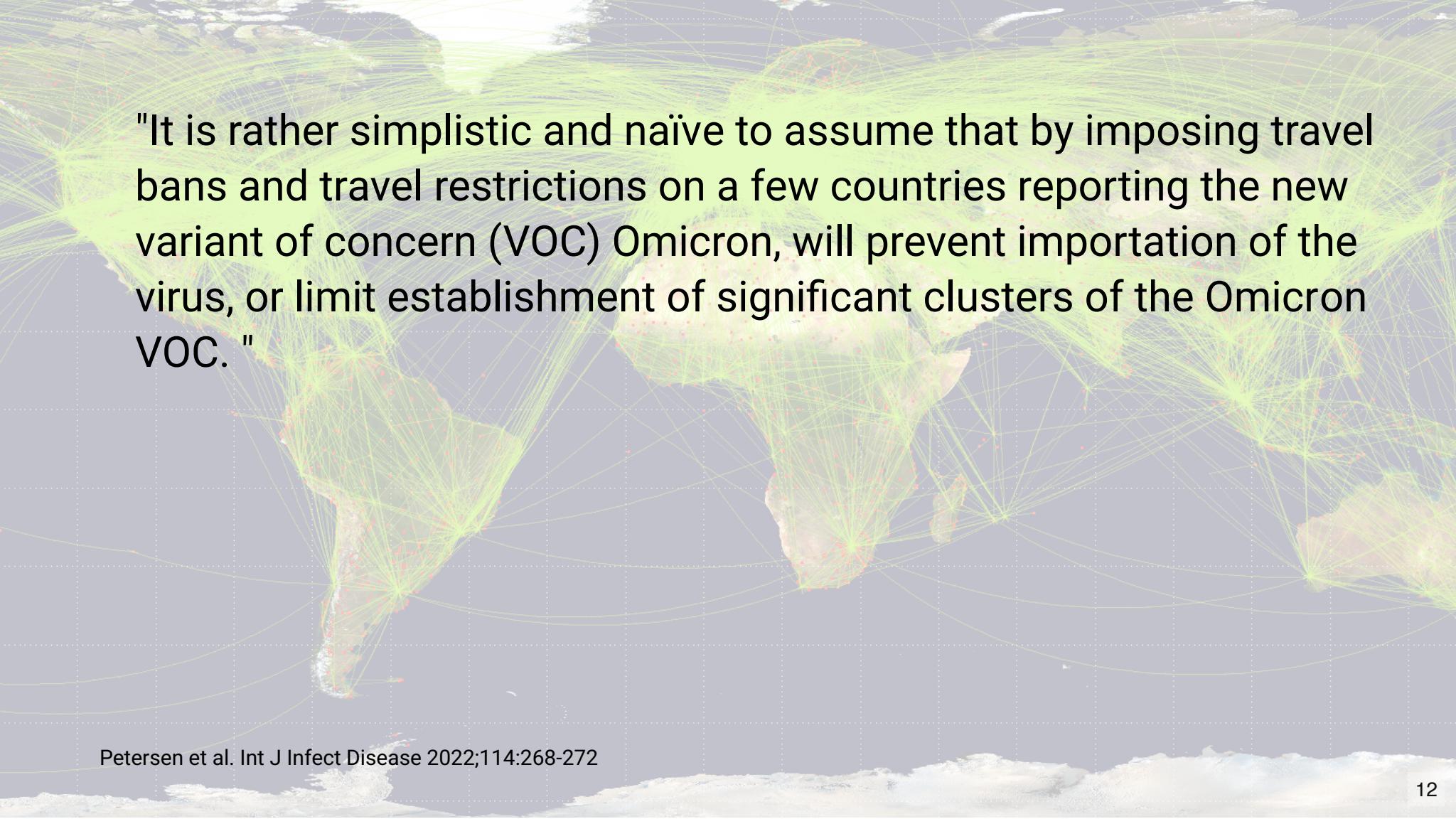
Omicron mutations, % of samples

in the past four weeks

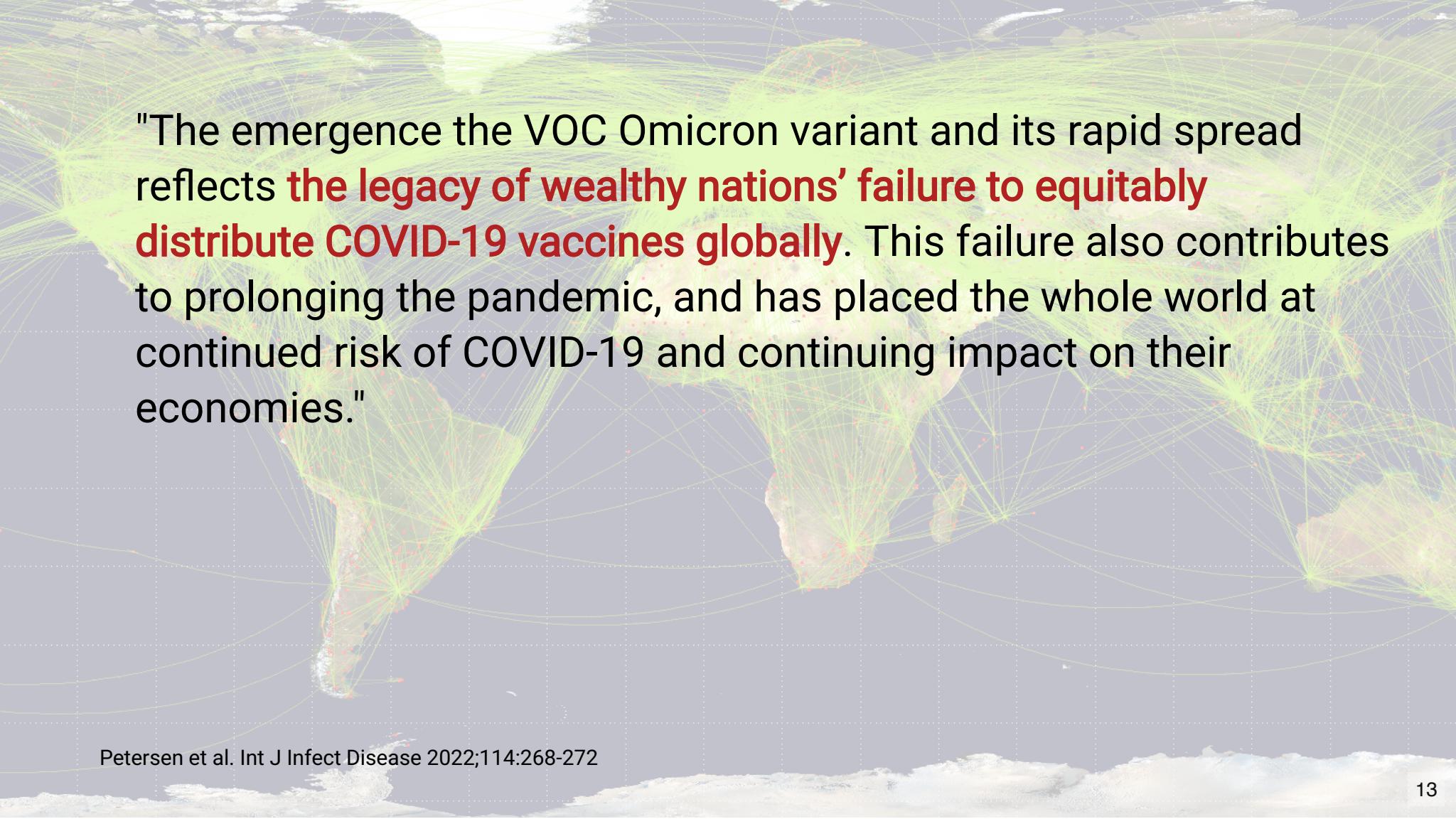


*Fewer than 20 sequenced SARS-CoV-2 variants submitted to GISAID in the past four weeks





"It is rather simplistic and naïve to assume that by imposing travel bans and travel restrictions on a few countries reporting the new variant of concern (VOC) Omicron, will prevent importation of the virus, or limit establishment of significant clusters of the Omicron VOC."



"The emergence the VOC Omicron variant and its rapid spread reflects **the legacy of wealthy nations' failure to equitably distribute COVID-19 vaccines globally**. This failure also contributes to prolonging the pandemic, and has placed the whole world at continued risk of COVID-19 and continuing impact on their economies."

COVID-19 Vaccines Global Access Facility



COVAX

With a fast-moving pandemic, no one is safe, unless everyone is safe

COVAX is co-led by [CEPI](#), [Gavi](#) and WHO, alongside key delivery partner [UNICEF](#). In the Americas, the PAHO Revolving Fund is the recognized procurement agent for COVAX.

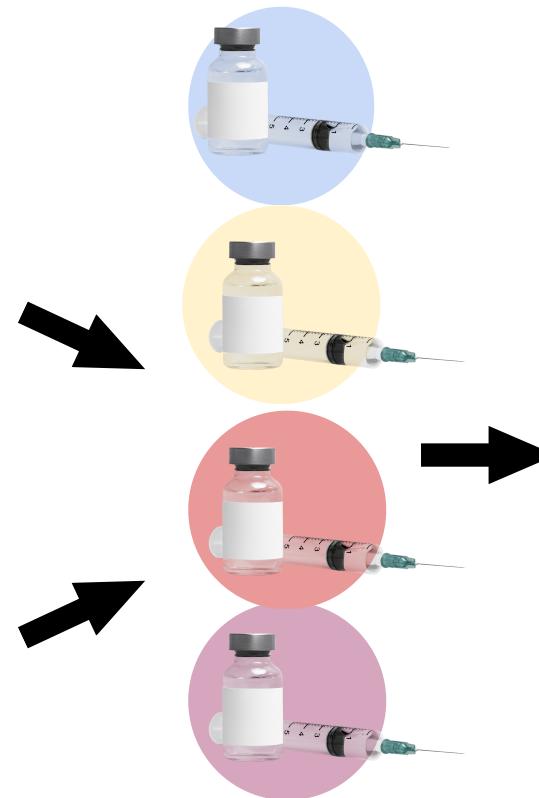
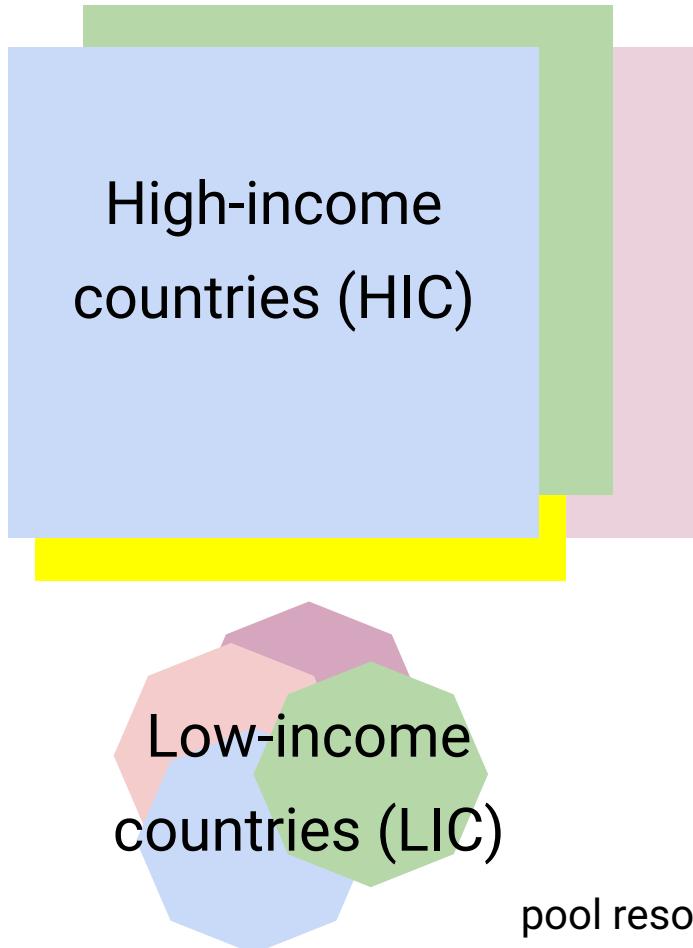
CEPI

Gavi
The Vaccine Alliance

unicef

World Health Organization

COVID-19 Vaccines Global Access Facility (COVAX)



HICs subsidize vaccine
manufacturing

Initial COVAX goals

- Doses for at least 20% of countries' populations
- Diverse and actively managed portfolio of vaccines
- Vaccines delivered as soon as they are available
- End the acute phase of the pandemic
- Rebuild economies

How did COVAX fare during the first phases of the pandemic?

- To reach 20% vaccination target, 100 million doses of COVID-19 vaccine were required by the end of March 2021
 - This goal was not reached until 6 July 2021. By mid-August of 2021, COVAX delivered 200 million vaccine doses to nearly 140 countries instead of the 600 million doses initially projected.
- Currently, less than 10% of population of sub-Saharan Africa are still vaccinated against COVID-19 (25% in South Africa)
- In some regions, health officials are still struggling to receive enough vaccines to protect workers on the front lines of the pandemic

UN Dashboard for Global Vaccine Equity

<https://data.undp.org/vaccine-equity/>

COVAX problems

COVAX problems cont.

What can be done to address COVID-19 vaccine dose inequity?

- Bilateral donation of COVID-19 vaccine (e.g., U.S.A. → Haiti)
- Multilateral donation of COVID-19 vaccine (e.g., U.S.A, E.U., Australia → Gavi, WHO, COVAX)
- Creation of manufacturing capacity in LMICs (e.g., Africa)
 - Temporary intellectual property waiver from producer
- Improvements in allocation and vaccine delivery infrastructure



Other SARS-CoV-2 Challenges in LMICs



Diagnostic testing



Personal protective equipment (PPE)

Social distancing/restrictions



Dense urban housing in Mumbai, India
(73% of households reported living in two rooms)



Subsistence farmers, or high percentages of workers who must work "no matter what" to survive

Hospital beds and medical professionals: LMIC vs. HICs



- 0.8-2.3/1000 people in LMICs vs. 30-80/1000 in HIC
- 90% of LICs have fewer than 10/10,000 people vs. 5% of HICs.
- Up to 93% of LICs have fewer than 40/10,000 people vs. 19% of HICs

Source: WHO Hospital beds (per 10 000 population)

Intensive Care LMIC vs. HICs



- Beds per 1 million inhabitants:
 - Africa: 5 beds
 - Europe: 4000 beds
- Equipment in LMICs often older, may not have appropriate service or lack oxygen or medical gas
- Long distances and high transportation costs may delay arrival to ICU

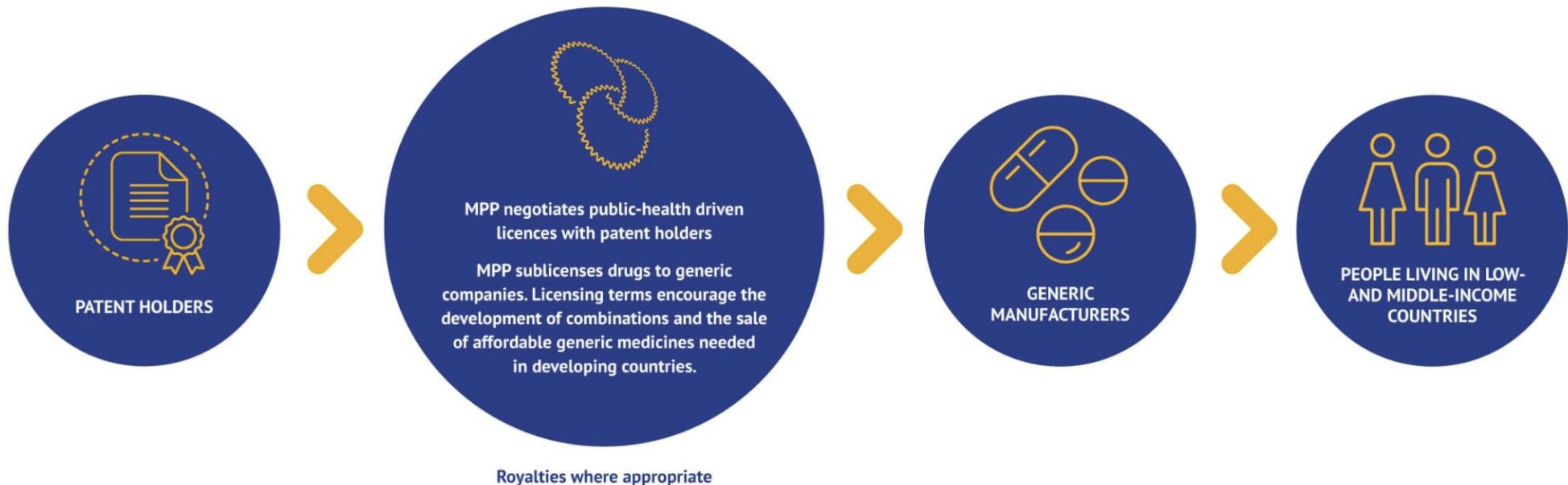
LMIC access to COVID-19 Therapeutics: (oxygen, antiviral therapies, IL-6 inhibitors, MoAb)

COVID-19 Tools Accelerator (ACT)



COVID-19 therapeutics availability in LMICs

- **Corticosteroids:** Dexamethasone, budesonide (**available**)
- **Antivirals:** Remdesivir, molnupiravir, ritonavir/nirmatrelvir (**not available**)
- **IL-6 pathway inhibitors:** (e.g., tocilizumab) (**not available**)
- **JAK inhibitors** (e.g., baricitinib) (**not available**)
- **Anti-SARS-CoV-2 monoclonal antibodies and convalescent plasma** (**not available**)
- **Other agents** with less data (e.g., fluvoxamine)



Pharmaceutical company/
patent holder (innovator)

Manufacturing in
LMIC

Distribution

Image:Medicines Patent Pool

Medicines patent pool-Advantages

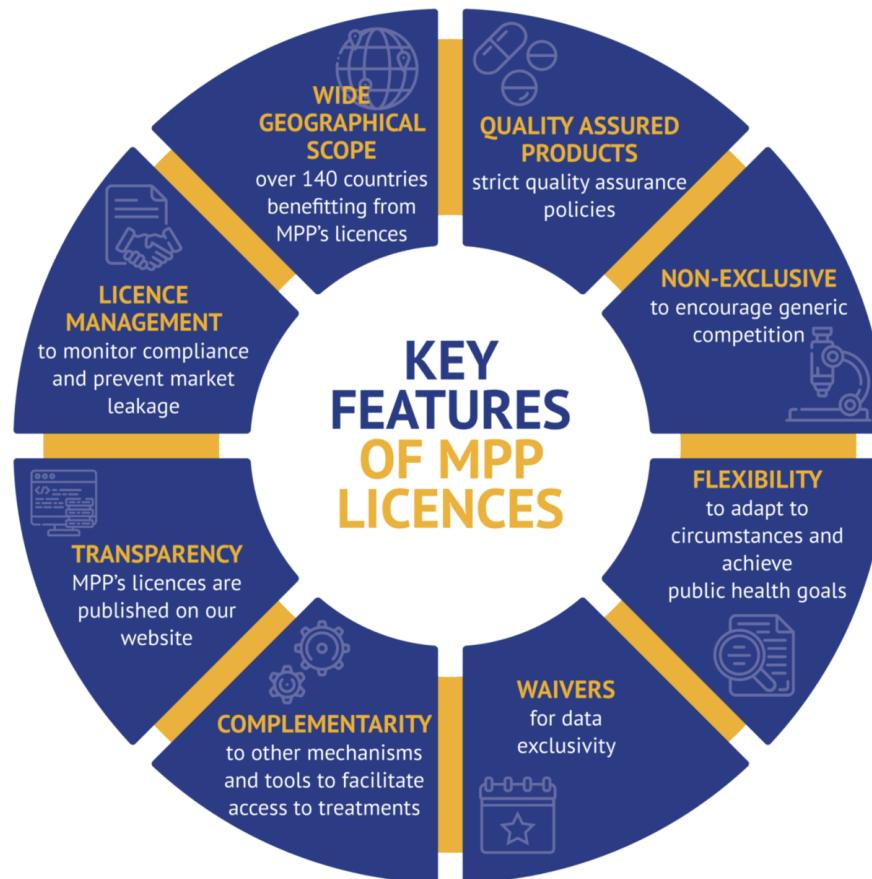


Image:Medicines Patent Pool

MPP-COVID-19

- mRNA Vaccine Technology Transfer Hub initiated in July 2021.
- The first COVID-19 mRNA vaccine technology transfer hub has been established in South Africa.
- The MPP has also entered into license agreements for:
 - Merck's molnupiravir
 - Pfizer ritonavir/nirmatrelvir oral COVID-29 therapies
 - ELISA technology platforms for diagnostics

MPP-Other therapeutic areas

- HIV/AIDS
 - One-third of the people requiring treatment for HIV/AIDS have access to therapy.
 - The MPP has signed agreements with 10 patent holders for 13 HIV antiretrovirals and a technology for injectable long-acting HIV drug combination technology.

MPP- Hepatitis B (HBV) & Hepatitis C (HCV)

MPP- Hepatitis B (HBV) & Hepatitis C (HCV)

- MPP signed licence agreements for three HCV treatments: daclatasvir (DAC) in 2015, ravidasvir (RAV) in 2017 and glecaprevir/pibrentasvir (G/P) in 2018.
- Licenses also secured for tenofovir disoproxil fumarate (TDF) and tenofovir alafenamide (TAF) for patients with HIC and chronic HBV infection

MPP- Tuberculosis

- To meet these targets, faster acting, better therapies to treat TB are urgent, particularly for multidrug-resistant TB (MDR-TB).

MPP- Tuberculosis

- The MPP's focus is to secure access to new treatments for MDR-TB and drug-susceptible tuberculosis.
- The MPP also facilitates the development of new regimens by licensing TB drugs that are still under development.
 - In early 2017, MPP signed its first agreement with the Johns Hopkins University to facilitate the clinical development of sutezolid, a promising investigational treatment for tuberculosis.
 - It was followed by a second agreement with Pfizer in October 2019 to access Pfizer's preclinical, phase I and phase IIa clinical study data and results on sutezolid.

Is the Medicines Patent Pool Working?

MPP in Numbers

13 patent holders with MPP signed agreements

25 generic manufacturers and product developers have sublicenses from MPP

18.55 Bn
doses of treatment supplied (Jan 2012 - Dec 2020)


US\$920 Mn
dollars saved through MPPS licences (Jan 2012 - Dec 2020)


By 2030
US\$3.5 Bn
projected dollars saved

148

countries have benefited from access to MPP-licence products

49.71 Mn

patient-years of treatment through MPPs generic partners (Jan 2012 - Dec 2020)

11,000

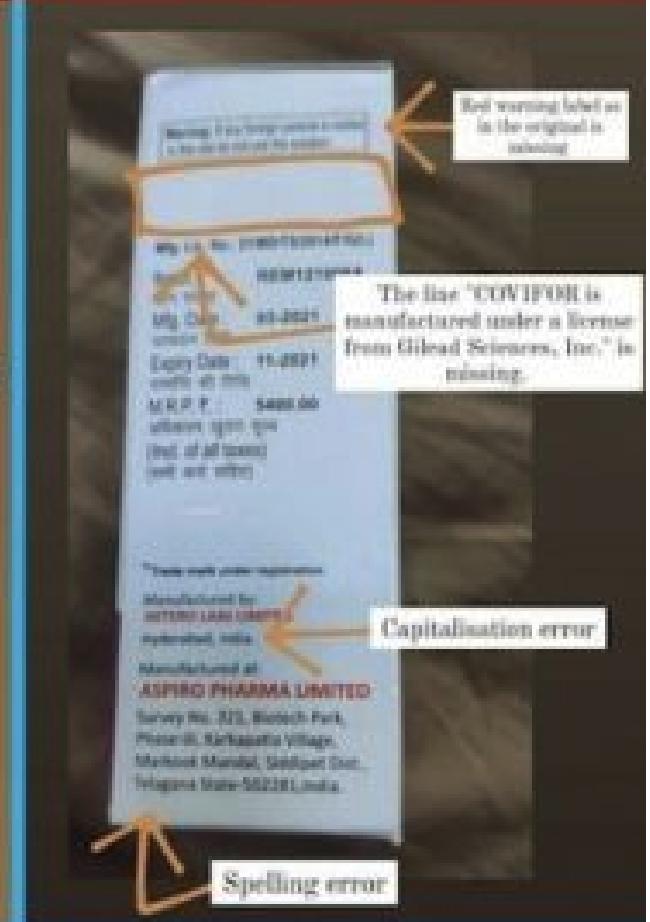
deaths averted (Jan 2012 - Dec 2020)

By 2030
170,000
deaths averted

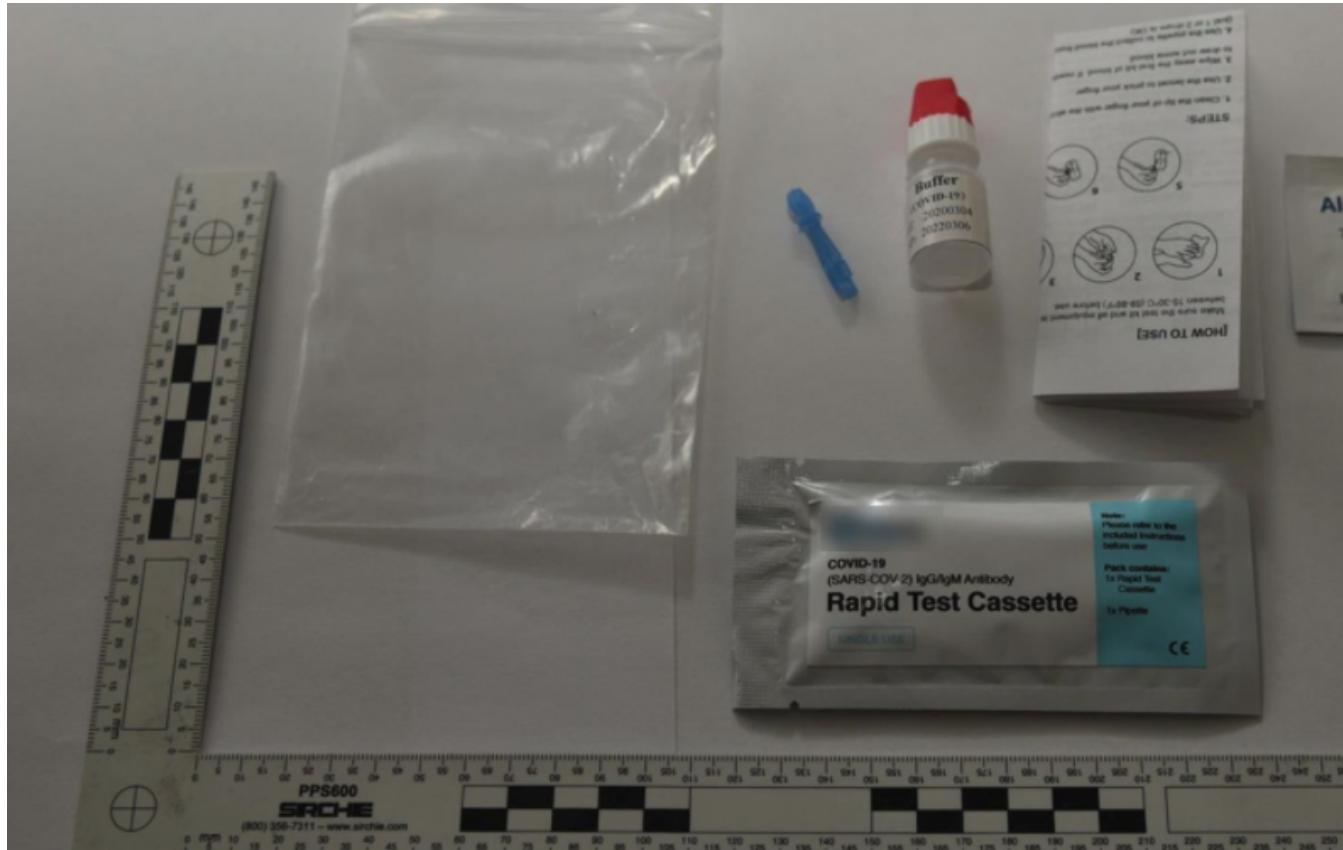
ORIGINAL



FAKE



"38-year-old man in Birmingham has been arrested in connection with the sale of fake COVID-19 testing kits which were sold online."



source: SkyNews UK

"There is a growing online trend of fake websites that mimic real pharmaceutical websites where COVID-19 vaccines are sold up to \$1000 and vaccine certificates for \$200"



Source: BBC news

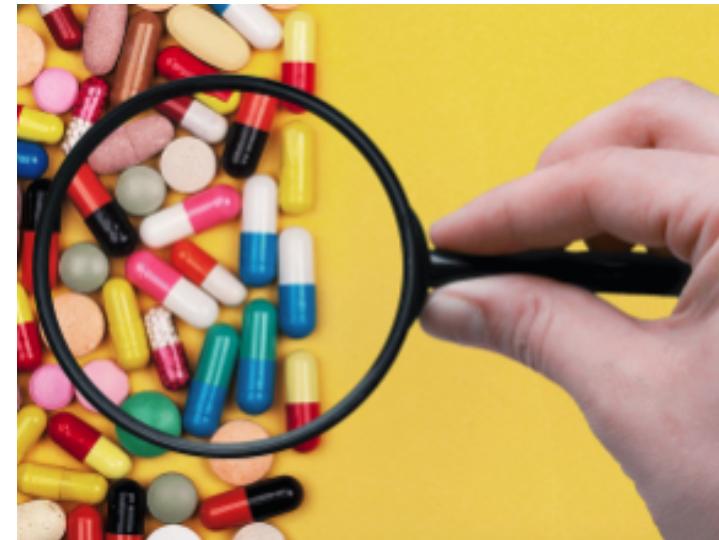
What is a counterfeit medication?

According to Interpol:

- Contains too much or too little of one or more ingredients, or containing different ingredients
- Claiming to have different properties or side effects
- Having a different shape, size, taste, or colour
- Being not correctly labelled or not labelled at all
- Having an out-of-date or missing expiry date
- Not including information on how to store the medicine
- Having packaging that looks poorly constructed, is labelled with spelling or grammar errors, or appears to have been interfered with

How common are counterfeit medications?

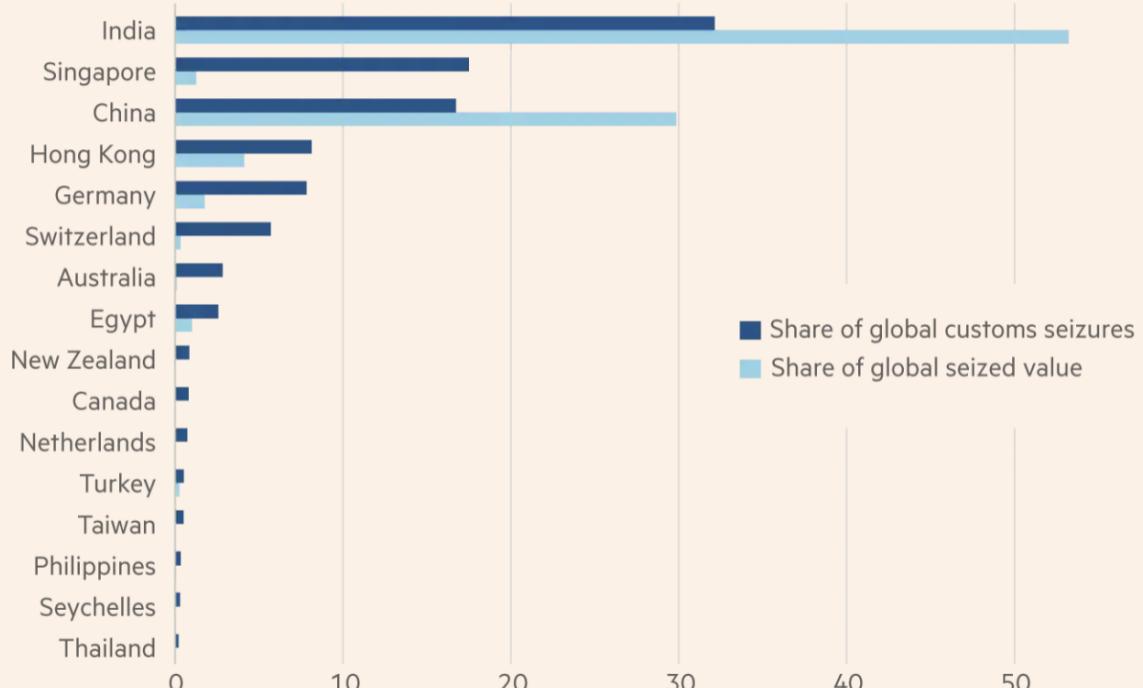
- Limited data suggest estimated prevalence HICs: 1% vs. LMICs: 10%; however data are limited
- Nearly 170,000 children die annually of pneumonia from falsified antibiotics worldwide
- Substandard or fake anti-malarial medications are estimated to cause 116,000 deaths annually in sub-Saharan Africa
- **Antibiotics are the most commonly counterfeited medications - account for 28% of seized medications**



Where do counterfeit medications come from?

Where fake drugs come from

Top provenance economies for counterfeit pharmaceuticals, 2014-16 (%)



Source: OECD/EUIPO
© FT

Figure source: Financial Times

What is the motive for selling counterfeit medications?



Specific problems for antibiotics

- Typically "older" antibiotics from the WHO essential medicines list; beta-lactams, tetracyclines, trimethoprim, sulfamethoxazole, chloramphenicol
- Increased risk of adverse effects because of different active ingredients, toxic chemicals or contaminants
- Increased risk of resistance if counterfeit antibiotic has expired or inadequate drug concentrations



An agent stands next to a container full of illegal and false drugs seized by Ivorian authorities in Abidjan, Ivory Coast November 6, 2018. Picture taken November 6, 2018. REUTERS/Luc Gnago

How is the problem of counterfeit medications being addressed?

- Guidance for legal reforms in heavily impacted countries
- Implementation of new regulations for improving control, tracking, procedures
- Coordination with international policing and customs
- Development of new technology for tracking and monitoring drug supply chains, traceability and verifications (i.e. RFID tags)- now mandated by new European Medicines Agency regulations
- Medicrime convention-multinational judicial organization that prosecutes drug counterfeiting

Summary: COVID-19 and lessons for the AMR crises

- Invest and prepare now for future crises
- Collaboration and international coordination are critical
- We cannot rely on markets to ensure global access to medical treatment, vaccines and diagnostic tests
- Equitable and affordable access to medical therapies is an essential element of a pandemic response

