COVID-19
What were the most important research priorities?

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World Health Organization

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Powering research to prevent epidemics

Two undisputed goals

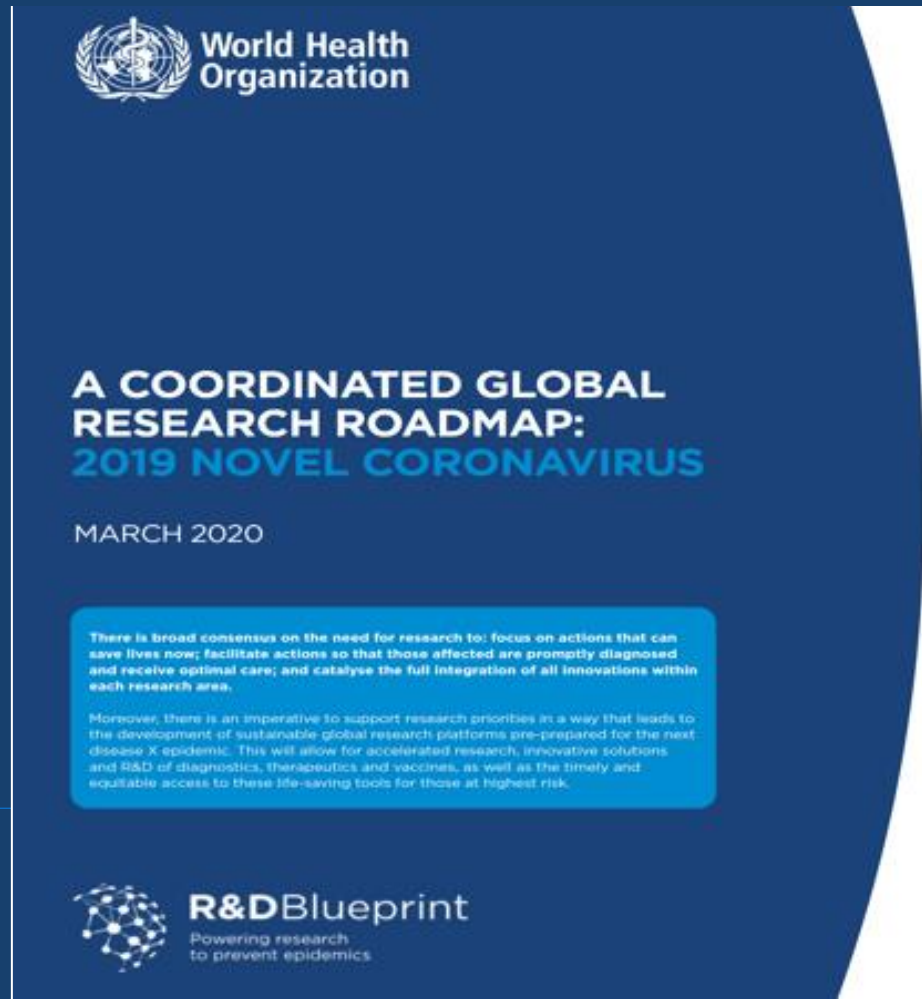
Two defined challenges for science

FOR THE PANDEMIC

To accelerate innovative research to help contain the spread of the virus and provide care for those affected.

FOR FUTURE EPIDEMICS

To support the development of global research platforms and, to build on the knowledge from the current pandemic to do better next time



Identified knowledge gaps (Feb 2020)

Human-animal interface

1. Animal species of origin of the virus
2. Animal species involved in spill over to humans: reservoir/ intermediate host
3. Modalities of transmission between animals and humans
4. Risk factors due to animal trade and consumption

Clinical considerations

1. Spectrum of clinical disease
2. Groups at high risk of severe disease
3. Pathophysiology of severe disease
4. Clinical prognosis associated with viral loads and immunomarkers
5. Potential for antibody dependent enhancements to disease/infection
6. Adequate animal models that can mimic human disease characteristics

Vaccine

1. Strength, duration of immunity, cellular immunity
2. Possibility of enhanced disease after vaccination
3. Animal models for prioritizing vaccines
4. Animal models for evaluating potential for vaccine-enhanced disease
5. Assays to evaluate immune response to vaccines
6. Design of late phase vaccine clinical trials

Behaviors and educations

1. How to address drivers of fear, anxieties, rumours, stigma
2. How to promote acceptance, uptake, adherence to public health measures and implement ethics, R&D innovations into education

Transmission

1. Modes/duration of person-to-person transmission, role of different age groups
2. Importance of pre-/asymptomatic transmission
3. Surrogate markers for infectivity
4. Environmental stability of the virus and conditions associated with increased transmission
5. Virus compartments of replication, duration shedding
6. Risk factors due to animals

Therapeutics

1. Optimal strategies for supportive care interventions
2. Role of host-targeted therapies
3. Safety and efficacy of candidate therapeutics and their combinations
4. Context for post-exposure prophylaxis trials conduct

Healthcare workers

1. Risks factors for healthcare workers' exposure
2. Approaches to support healthcare workers' health/ psychosocial needs
3. Perception/compliance to infection prevention and control measures
4. Isolation, quarantine, optimal pathways to deliver care safely

Ethical considerations

1. Ethics questions around the inclusion of vulnerable populations in research
2. Best methods to involve and sensitize communities regarding their participation in research

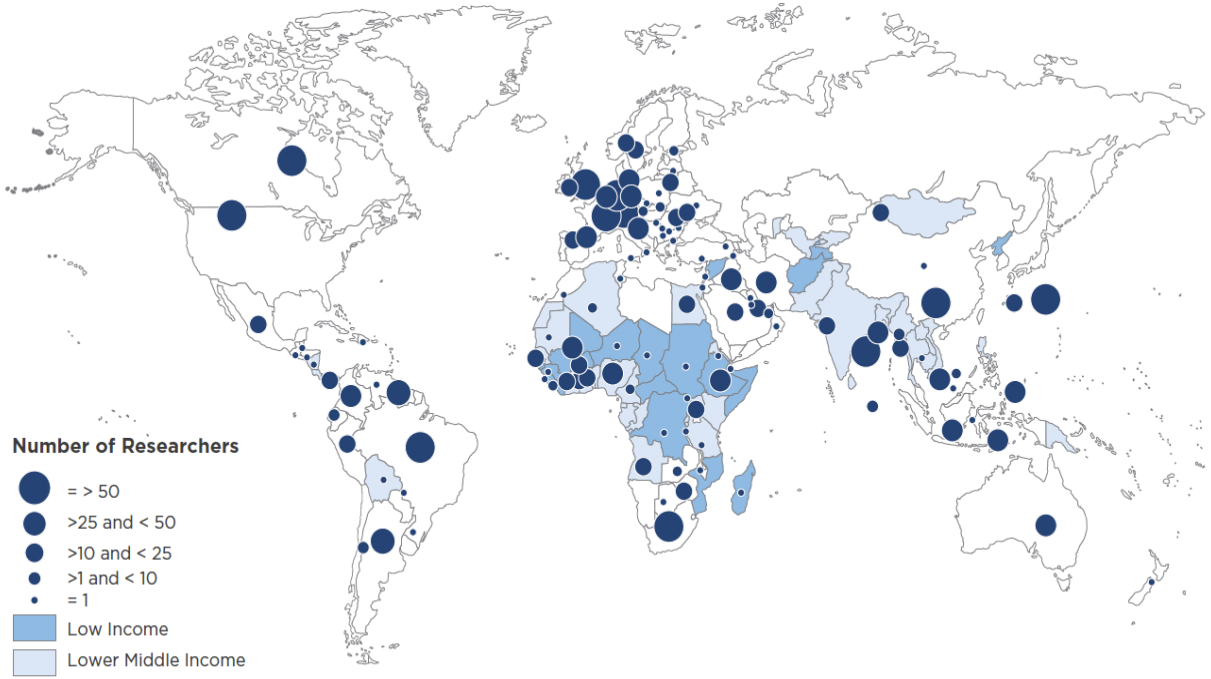
An inclusive multidisciplinary global network

facilitated open global contributions and scientific debate

COVID-19 Research and Innovation Collaborative Platform

Over 3,000 researchers from 134 countries

collaborating on the research priorities defined in the roadmap (40% from LLMICs)



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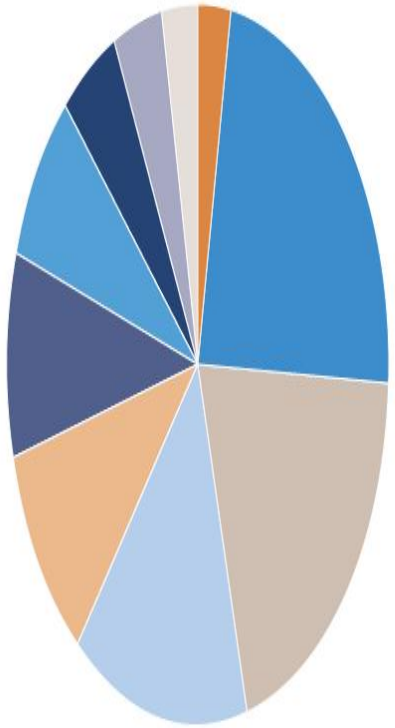
COVID-19 Research and Innovation Collaborative Platform

Over 1,000 Institutions

a multidisciplinary perspective to implementation of the research roadmap



- **23%** University /University Hospitals Researchers
- **20%** International Org. (WHO, UNF, FAO, WFP, other)
- **15%** Industry and Private Sector Researchers
- **10%** Intergovernmental (Centers for Disease Control, National Institutes of Health, National reasearch Councils, Government funded Research...etc)
- **9%** Independent Research Institutes
- **8%** Government Institutions (Ministry of Health and other branches of Government including Defense)
- **5%** WHO Member States (as Observers)
- **4%** Partnerships (Alliances, Foundations, Bilateral Donors, GloPID-R, Other)
- **3%** Regualtors and Regulatory Authorities
- **3%** Non State Actors

An inclusive process involving researchers around the world

Example: Global research & innovation forum 2021

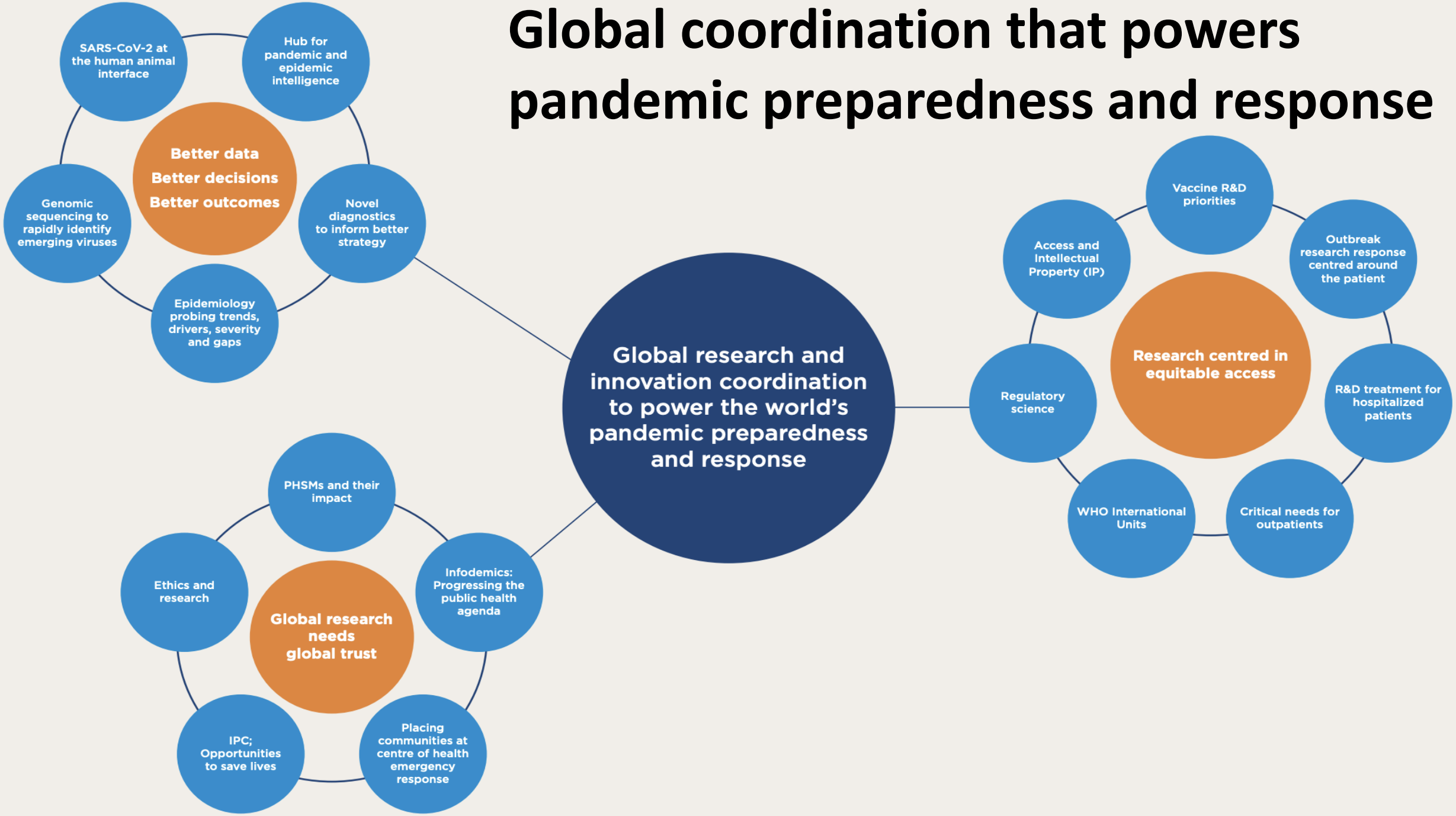
Researchers from all around the world

- 5,000 connected via zoom plus
- 29,000 unique IP users connected via livestream

8 immediate research actions accomplished

Research actions	Started?	When?
1. Mobilize research on rapid point of care diagnostics for use at the community level	✓	02/2020
2. Immediately assess available data to learn what standard of care approaches from China & elsewhere are the most effective	✓	02/2020
3. Evaluate as fast as possible the effect of adjunctive & supportive therapies	✓	03/2020
4. Optimize use of personal protective equipment & other infection prevention and control measures in health care and community settings	✓	03/2020
5. Review all evidence available to identify animal host(s), to prevent continued spill over and to better understand the virus transmissibility, the severity of disease and who is more susceptible to infection	✓	02/2020
6. Accelerate the evaluation of therapeutics & vaccines by using CORE protocols	✓	02/2020
7. Maintain a high degree of communication & interaction among funders so that critical research is implemented	✓	02/2020
8. Broadly & rapidly share virus materials, clinical samples & data for immediate public health purposes	✓	03/2020

Global coordination that powers pandemic preparedness and response



1. Strengthening global research capability for future pandemics

> "The benefit-cost ratio of ensuring that everybody in the world has vaccines is enormous: it would cost us a few tens of billions of dollars to ensure that everybody has the vaccines. The benefit would be in the trillions of dollars."

Professor Joseph E. Stiglitz, Nobel Laureate.
Columbia University

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2. Better data, better decisions, better outcomes

Many different forms of research data and evidence have been important in tracking and countering the pandemic. But we must build on successes to create a global evidence base and world-class data.

This chapter assesses four key R&D areas, highlighting knowledge gaps and research priorities for the future.

> "Pandemic preparedness ... [needs]... to address key research gaps in top viral families to accelerate the development of vaccines, therapeutics and diagnostics for both priority pathogens and prototype pathogens."

Dr Anthony S. Fauci, Director National Institute of Allergy and Infectious Diseases (NIAID), National Institutes of Health (NIH)

3. Global research needs global trust

Global trust — at all levels of society — is fundamental to the success of research. Building that trust among publics, communities, policy-makers and scientists must be integral to how we develop our research.

This chapter assesses five key R&D areas, highlighting knowledge gaps and research priorities for the future.

> **Global research depends upon global trust. We need to build trust between scientists in all countries and to build trust between scientists and policy-makers, politicians and the public.**
>
> **Richard Horton, Editor-in-Chief, the Lancet**

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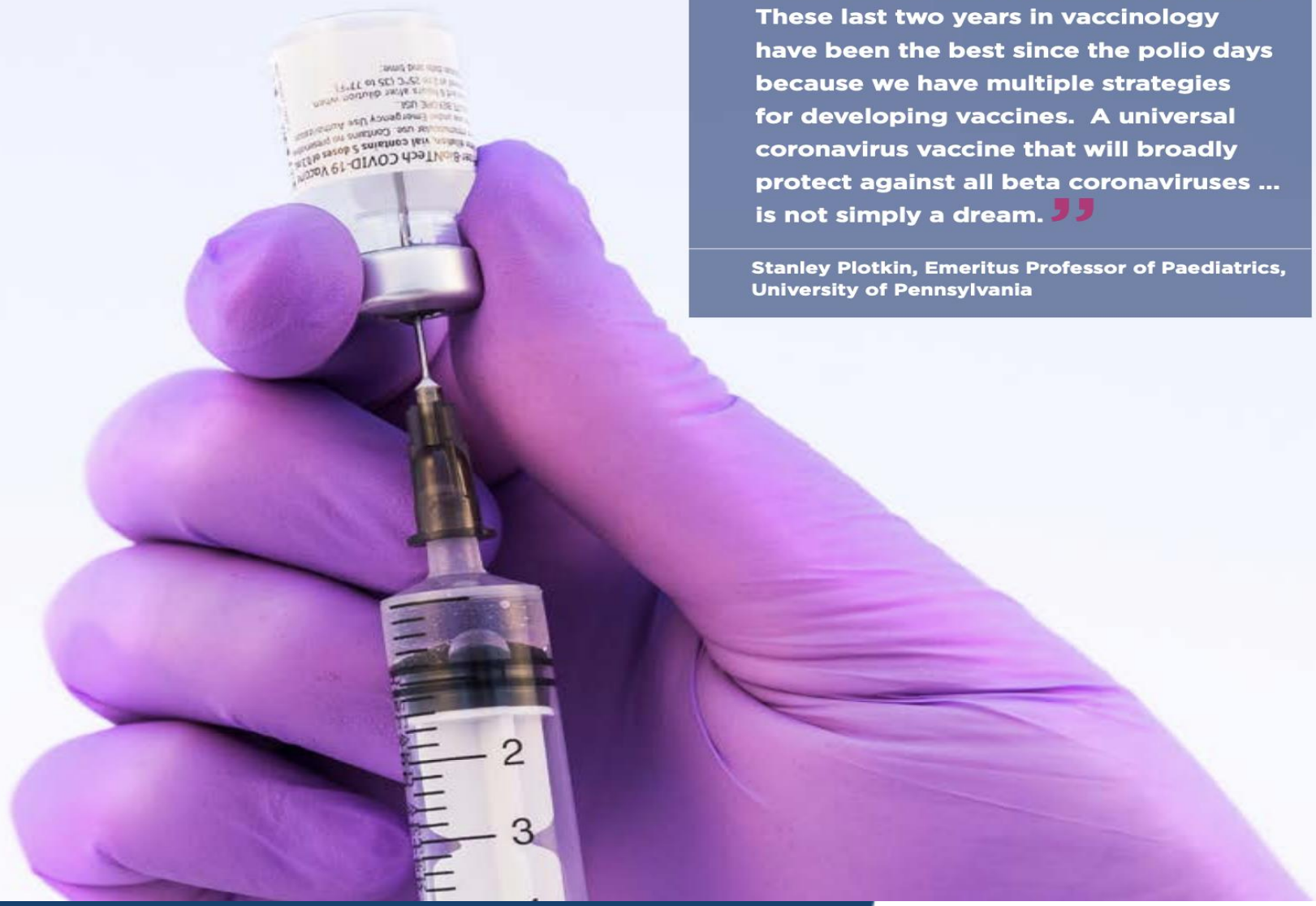
4. Research centred in equitable access

The pandemic response has been a moment for research but the benefits have not been available to everyone. Equity — and access for those at highest risk — must be central in the next research phase.

This chapter assesses six key R&D areas, highlighting knowledge gaps and research priorities for the future.

> "All pandemics start within communities and with people and that is where we must refocus our attention and demonstrate by our actions that we are not just going to do the science but we are going to make sure that science is available to everybody."
>
> **Sir Jeremy Farrar, Director, Wellcome Trust**



> "Aside from warfare the greatest threat to the human race is pandemic disease. These last two years in vaccinology have been the best since the polio days because we have multiple strategies for developing vaccines. A universal coronavirus vaccine that will broadly protect against all beta coronaviruses ... is not simply a dream."
>
> **Stanley Plotkin, Emeritus Professor of Paediatrics, University of Pennsylvania**

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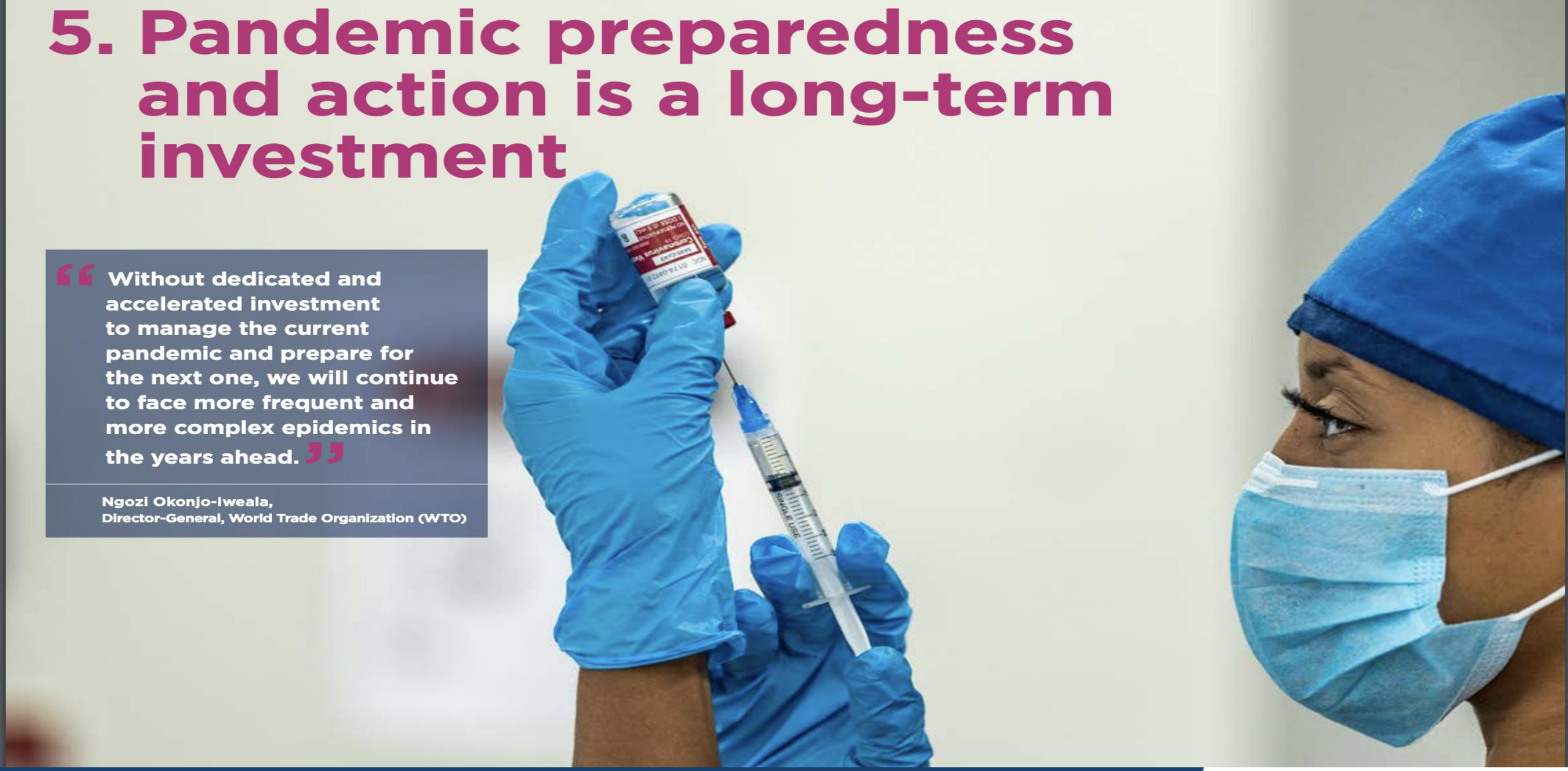
5. Pandemic preparedness and action is a long-term investment



> “Without dedicated and accelerated investment to manage the current pandemic and prepare for the next one, we will continue to face more frequent and more complex epidemics in the years ahead.”

Ngozi Okonjo-Iweala,
Director-General, World Trade Organization (WTO)

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WHO R&D Blueprint for epidemics

Progress across disease/pathogen areas

DISEASE	Generic methodology	CCHF	Ebola & Marburg	Lassa fever	MERS-Cov & SARS	Nipah & henipavirviruses	Rift valley fever	Zika virus	Plague	Chikungunya	Pathogen X	COVID-19
R&D Roadmap	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓
Target Product Profile (TPP) vaccines	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	G	✓
Target Product Profile (TPP) therapeutics	✓		✓	✓								✓
Target Product Profile (TPP) diagnostics	✓	✓	✓	✓		✓		✓				✓
Regulatory pathways	✓	✓	✓	✓		✓		✓				✓
Vaccines trials design	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	G	LST
Therapeutics trials design	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓
Decision tree for trials design	✓											
Trial simulator	✓											
Innovative analysis	Accumulating evidence during outbreaks and hybrid trial designs											
Good Participatory Practice for Clinical Trials of emerging pathogens (GPP-EP)	✓		✓									✓

✓ In progress ✓ Done G Generic LST Large Simple Trials

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On research with fair and equitable access in mind….

- Research should include **questions important for public health** and help **reduce uncertainty** on issues that will help inform public health actions
- Studies whose results will contribute to **fair and equitable access** should be prioritized
- Research agreements should include **defined access clauses**
- **Scaling up of manufacturing** should be part of initial planning
- Issues related to **IP and technology transfer** should not be afterthoughts

On investments on priorities…

- Coordination of research funders and **alignment with globally defined priorities** must continue.
- Reliable global financing to ensure **end to end** approaches should be earmarked with a long-term outlook.
- **“Access to opportunities”** vs capacity building
- Building on global platforms rather than on “boutique” efforts

On Clinical trials…

Emerging consensus that platform trials addressing public health questions need to become the preferred approach

- Large simple trials can provide reliable estimates on even moderate effects
- Provide opportunities to engage existing capacity from all countries
- Trials should become an integral part of response actions, including during deployment of vaccines with remaining uncertainties
- The global pool of researchers worldwide must continue to lay the foundations for fair and equitable access

Now is the time to expand the scope, update priorities & maintain focus

- Continue and expand close collaborations with expert groups and partners
- Promote multi-country platform trials (in and outpatients)
- Support global monitoring efforts to address the challenges associated with emergence of variants
- Strengthen areas of identified weaknesses
- **Further consolidate the integration of research and innovation, with equity, into the new architecture to respond to pandemics**

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Thank you

We should thank the hundreds of thousands of patients and volunteers and their families who participated in all the studies and the thousands of staff and researchers who conducted the studies and cared for the study participants.

We should also acknowledge the critical role of the national institutions and research centres across the globe who provided critical support in the implementation of priority research.