



GLOBAL HEALTH CENTRE WORKING PAPER NO. 26 | 2021

ALWAYS FIGHTING THE LAST WAR?: POST-EBOLA REFORMS, BLINDSPOTS & GAPS IN COVID-19

Anna Bezruki and Suerie Moon

Global Health Centre

Graduate Institute of International and Development Studies
Chemin Eugène-Rigot 2 | Case Postale 1672
1211 Geneva 21 | Switzerland

Tel +41 22 908 4558
Fax +41 22 908 4594
Email globalhealth@graduateinstitute.ch

 [**graduateinstitute.ch/globalhealth**](https://graduateinstitute.ch/globalhealth)

EXECUTIVE SUMMARY

Covid-19 has exposed anew glaring gaps in the global system for preventing, detecting, and responding to potential pandemics. After each major crisis, the international community has engaged in a flurry of analysis and selective reforms, before reverting back to business as usual. As attention turns again to reforming the international system, it is critical to ask – what have we learned?

The last significant effort to strengthen preparedness globally followed the 2014–16 West African Ebola crisis. In this paper, we identify key reforms that were and were not implemented post-Ebola, then offer an initial assessment of how these changes and lingering gaps have affected the global Covid-19 response. We also highlight the post-Ebola blindspots that Covid-19 has exposed, and the implications for the post-Covid reform agenda.

Post-Ebola, the focus of reforms was on increasing national preparedness in developing countries and buttressing the international safety-net (e.g., funding, technical assistance, humanitarian aid) for when an outbreak overwhelmed a country's national capacities. Some of these reforms have proven critical in the response to Covid-19, including an increase in attention to, investment in, and external assessment of preparedness in some countries, and a substantial increase in the rapid sharing of some scientific and technical knowledge and data during outbreaks.

However, there were gaps and blindspots in the post-Ebola reforms. Despite the creation of new funding vehicles, unstable and inadequate funding continued for national preparedness, the WHO, and countermeasure R&D. National preparedness remains insufficient in many countries, and the accountability mechanisms for IHR compliance are inadequate. Blindspots revealed by Covid-19 include the need for a far broader set of arrangements for international cooperation during outbreaks, including ensuring equitable access to countermeasures; the need for preparedness measures to anticipate and mitigate a lack of political will to take necessary measures in an outbreak; and the need to maintain or regain public trust in countries of all income levels.

Covid-19 has provided a stark reminder, not only that many wealthy nations suffer from significant weaknesses in national preparedness, but also that international arrangements are patchy, weak, and wholly inadequate in scope and strength. Without far-reaching reforms at national and global levels, future crises will hit hard. However, it is likely that the post-Covid reform process will suffer

from its own blindspots and only a few major reforms will likely be implemented. The selection of those reforms will not be a purely technocratic process, but a political one. Therefore, it is critical that arrangements for robust monitoring, and regular revision of existing arrangements are put in place, that will allow for periodic reforms to the system as we inevitably switch from fighting the last war to confronting new outbreaks.

TABLE OF CONTENTS

EXECUTIVE SUMMARY	3
1 INTRODUCTION	9
2 COUNTRY COMMITMENTS UNDER THE IHR (2005)	13
2.1 National surveillance and health system capacities	13
2.2 International outbreak reporting	15
2.3 Trade and travel restrictions	16
2.4 Science, technology, and knowledge-sharing	17
2.4.1 Knowledge generation and sharing	17
2.4.2 Health technology research, development, and deployment	19
3 INTERNATIONAL HEALTH AND HUMANITARIAN SYSTEM	27
3.1 World Health Organization	27
3.2 The broader humanitarian aid system	29
4 FINANCING	31
5 LEADERSHIP, MONITORING, AND ACCOUNTABILITY	35
5.1 Leadership – questioning of science, mistrust of authority	35
5.2 Monitoring and accountability	37
6 CONCLUSION	39
BIBLIOGRAPHY	41

Abbreviations

ACT Accelerator	Access to Covid-19 Tools
CEPI	Coalition for Epidemic Preparedness and Innovations
CFE	Contingency Fund for Emergencies
EID	Emerging Infectious Disease
EMA	European Medicines Agency
GPMB	Global Preparedness Monitoring Board
GSD	Genomic Sequencing Data
IDA	International Development Association
IHR	International Health Regulations (2005)
IFRC	International Federation of Red Cross and Red Crescent Societies
IMF	International Monetary Fund
IOAC	Independent Oversight and Advisory Committee
IOM	International Organization for Migration
IPPR	Independent Panel for Pandemic Preparedness and Response
JEE	Joint External Evaluation
LMICs	Low- and Middle-Income Countries
NAPHS	National Action Plan(s) for Health Security
NGOs	Nongovernment Organizations
OCHA	Office for the Coordination of Humanitarian Affairs
PEF	Pandemic Emergency Financing Facility
PHEIC	Public Health Emergency of International Concern
PPE	Personal Protective Equipment
R&D	Research & Development

Abbreviations

SARS	Severe Acute Respiratory Syndrome
UNDP	UN Development Programme
US NIH	US National Institutes of Health
UNFPA	UN Population Fund
UNICEF	UN Children's Fund
WFP	World Food Programme
WHE Programme	World Health Emergencies Programme
WHO	World Health Organization
WTO	World Trade Organization

1 | INTRODUCTION

The proverb that “generals are always fighting the last war” reminds us we are more likely to focus on “what has happened rather than what will happen” [1].

Covid-19 has exposed anew glaring gaps in the global system for preventing, detecting, and responding to potential pandemics. After each major crisis, the international community has engaged in a flurry of analysis and selective reforms, before reverting back to business as usual. As attention turns again to reforming the international system, it is critical to ask – what have we learned? The last significant effort to strengthen preparedness globally followed the 2014–16 West African Ebola crisis. (In this paper, we use “post-Ebola” for brevity to refer to the follow-up to the West African crisis; the subsequent 2018–2020 Ebola outbreaks in the Democratic Republic of the Congo did not spur major reform efforts.)

While there were many post-Ebola reviews (at least 40), taking multiple approaches, a synthesis of seven major reports found strong overall agreement on the priorities for reform [2]. The dominant framing of most analyses was that outbreak preparedness was a development issue – that is, the priority was to strengthen capacities in poorer countries on the logic that a weak link in the chain posed risks to the entire global community. Subsequently, the focus of reforms was on increasing national preparedness in developing countries and buttressing the international safety-net (e.g., funding, technical assistance, humanitarian aid) for when an outbreak overwhelmed a country’s national capacities. This focus was understandable given the specifics of the West African crisis, but it also neglected key issues.

Covid-19 has shown the limitations of this narrow framing. Some lower-income countries deemed unequipped to address a serious outbreak have proven swift and nimble responders to SARS-CoV-2, while some higher-income countries previously considered exemplars in terms of preparedness and capacity have made numerous missteps and suffered profound health, economic and social harm. In addition, the national-level post-Ebola focus neglected the importance of strengthening transnational arrangements for pandemic preparedness and response, such as agreements to share information, better govern trade and travel restrictions, or ensure access to scarce medical goods across countries.

In this paper we revisit each of five areas targeted for post-Ebola reforms:

1. Country commitments under the International Health Regulations (IHR 2005)
2. Science, technology, and knowledge sharing
3. The international health and humanitarian system
4. Financing
5. Leadership, monitoring, and accountability

For each of these themes, we identify key reforms that were and were not implemented post-Ebola; then we offer an initial assessment of how these changes and lingering gaps have affected the global Covid-19 response. We also highlight the post-Ebola blindspots that Covid-19 has exposed, and the implications for the post-Covid reform agenda.

A note on terminology: we define “blindspots” in this paper as those issues that were not widely recognized as weaknesses in global preparedness and response or as priority areas for reform post-Ebola – in other words analytical blindspots. These blindspots can be distinguished from those gaps that had been identified in numerous post-Ebola reviews, but for which subsequent action was inadequate or non-existent.

Table 1: Summary of Post-Ebola reforms, gaps, and blindspots

	Post-Ebola Reforms	Remaining Gaps	Blindspots
Country commitments under the IHR	→ Increased attention to, investment in, and external assessment of preparedness in some countries. → Some new institutions created, such as the Africa CDC.	→ Inadequate accountability mechanisms for IHR compliance. → Insufficient mechanisms to incentivize rapid outbreak reporting for all states, or to manage travel and trade restrictions. → Newly developed metrics for measuring preparedness not adequately predictive.	→ Severity of preparedness weaknesses in high-income countries.
Science, Technology and Knowledge Sharing	→ New coordinating and funding mechanisms for R&D for outbreaks, including the WHO Blueprint and Coalition for Epidemic Preparedness Innovations (CEPI). → Increase in the rapid sharing of some knowledge and data during outbreaks.	→ Unstable and inadequate funding for countermeasures R&D. → Need for funding for a greater number of pathogens, and for therapeutics and diagnostics in addition to vaccines. → Few efforts to strengthen sharing of clinical trial data, or of pathogen samples and genomic sequencing data.	→ Lack of arrangements to ensure equitable access to countermeasures.
International Health & Humanitarian System	→ Renewed prioritization of funding and institutional arrangements for outbreak response at the WHO. → Strengthening of humanitarian aid system as a safety net.	→ Unstable and inadequate funding for the WHO. WHO's very limited ability to hold Member States accountable.	→ The safety net offered by the humanitarian aid system is wholly inadequate in the event of a truly global pandemic. Need for much broader and more robust arrangements for international cooperation during pandemics, across a wide set of issues, such as finance, trade, food security, and migration, among others.
Financing	→ New funding mechanisms, including CEPI and initiatives through the World Bank and WHO. → Increases in research funding for emerging infectious disease.	→ Unstable and inadequate funding for national preparedness, the WHO, and countermeasures R&D. → Need for more countries to contribute. → Difficult to track financing.	→ Outbreaks can precipitate urgent financial needs in countries of all income levels.
Leadership, Monitoring, and Accountability	→ New mechanisms for monitoring and accountability, including GPMB and IOAC.	→ Overall, accountability for global preparedness still insufficient.	→ Some national governments lack the political will to take necessary measures to control outbreaks. → Deliberate misinformation and lack of public trust.

2 | COUNTRY COMMITMENTS UNDER THE IHR (2005)

Under the International Health Regulations (2005), countries are expected to ensure national surveillance and health system capacities to detect and respond to outbreaks; to report outbreaks rapidly to the WHO; and to refrain from imposing trade and travel restrictions on directly affected countries unless justified by scientific or public health principles.

2.1 National surveillance and health system capacities

The West African Ebola epidemic underscored weaknesses in national surveillance and health system capacities and brought attention to a lack of metrics to evaluate national and global preparedness. Post-Ebola reports recommended that governments increase investments to strengthen core health systems capacities and, to verify IHR compliance, a form of external assessment to verify countries' self-assessments [2].

Post-Ebola recommendations to increase preparedness were only partially realized in scattered improvements to national and regional preparedness. Multiple initiatives were launched to help countries develop core outbreak response capacities. For example, the US dedicated 1 billion USD in capacity building activities in 31 countries, and at the 2015 G7 Summit, health ministers matched this commitment, pledging to support at least 60 countries [3], [4]. In addition, the WHO provided support to 15 priority countries in Africa, and according to WHO assessments; these countries saw substantial improvements in their preparedness for Ebola outbreaks [5]. The countries most heavily affected by the 2014–16 epidemic – Guinea, Liberia, and Sierra Leone – took significant steps after the outbreak to build their capacities [6]–[8]. Some of these programs have led to substantial improvements in just a few years [6], [9], [10]. However, gaps remain, and the fact that some of these gains rely on external funding raises questions about long-term sustainability [6]. There were also regional initiatives to improve capacity, such as the establishment of the Africa Centres for Disease Control (Africa CDC) in 2016 by the African Union. Launched in January 2017, it was first conceptualized in 2013 and formalized following the Ebola outbreak as a partnership to build national preparedness across the continent [11], [12].

In 2016, the WHO's Joint External Evaluation process was established as a voluntary external assessment of a country's progress in achieving targets set out in the IHR (2005) [13]. By March 2021, 97 (or approximately half) of all WHO Member States had undergone the JEE process [13]. The JEEs have consistently found low levels of preparedness and capacity across countries of all income levels [14]–[16]. Sixty countries are reported to have taken the next step after the JEE – completion of a National Action Plan for Health Security (NAPHS). However, only 13 countries have published these plans with the WHO and only 11 of these are costed [17], [18]. It is not clear how far countries had implemented their NAPHS before Covid-19.

Other measurements – including the Global Health Security Index (GHSI) and the Epidemic Preparedness Index (EPI) – were also launched post-Ebola, providing new ways to assess outbreak response capacity and to raise awareness of persistent gaps in preparedness. The GHSI found in 2019 that no country was fully prepared for epidemics or pandemics. The average country score was 40.2 out of a possible 100; high-income countries had an average score of just 51.9 [19]. In addition, EPI, which ranked 188 countries, found an average score of 63 out of 100 [20].

In the response to Covid-19, we can see the effects of these (incomplete) reforms. The scattered improvements in national and regional capacities appear to have borne fruit in the Covid-19 pandemic. Early reports suggest that Liberia and Sierra Leone were relatively better prepared for Covid-19, but that significant gaps still remained [21], [22]. The Africa CDC has emerged as a regional leader in the Covid-19 pandemic. It has, among other actions, produced guidance documents and shared statistics on Covid-19; offered webinar trainings for clinical providers and laboratory staff; launched the Africa COVID-19 Response Fund; created a platform to pool orders for diagnostics and medical countermeasures; and succeeded in securing a significant volume of vaccines in a context of very constrained global supply [23]–[25].

Despite these bright spots, the Covid-19 pandemic has shown that many countries were ill-prepared, including many high-income countries whose preparedness had largely gone unquestioned. Surveillance systems in multiple countries – including France and the US – failed to detect ongoing Covid-19 transmission for weeks at the beginning of the pandemic, allowing the disease to spread unchecked and hindering later containment efforts [26]–[28]. Healthcare systems across the world, including in the US [29], [30], India [31], China [32], and across Europe [33], faced severe shortages of medical equipment and personal protective equipment (PPE) early in the pandemic due to a reliance on last-minute and complex supply chains and insufficient stockpiles. Eleven months into the pandemic, shortages continued to be reported in some locations, including the US [34], [35] and Australia [36]. Healthcare systems, emergency response services, and coroner services were overwhelmed in hard-hit locations [37]–[39].

In addition, Covid-19 has revealed limitations in the metrics for global preparedness that were introduced post-Ebola. While useful for increasing awareness, it has become clear that these metrics provide an incomplete and not necessarily accurate picture of readiness. Countries with high scores in capacity and preparedness measurements have not necessarily fared better in the Covid-19 pandemic: the US received a much higher score on the GHSI than New Zealand (83.5 vs 54.0), but as of March 2021 the US had suffered 161.77 deaths per 100,000 people compared to 0.53 in New Zealand [19], [40], [41]. Current measurements do not fully capture relevant political (or other) factors that can affect outbreak response, and therefore have limited predictive capacity [42].

The pandemic has made clear that significant improvements to many nations' preparedness need to be made, and that existing metrics for measuring preparedness are not adequately predictive. There are growing calls for amendments to the IHR (2005) to improve assessments of IHR compliance and national capacities, as well as proposals to develop new legal frameworks that could extend far beyond the scope of the IHR (2005) [18], [42], [43].

2.2 International outbreak reporting

While states are obligated to report outbreaks under the IHR (2005), post-Ebola reports, echoing post-H1N1 reports, noted that this obligation is both too general and unenforceable [2], [44], [45]. In addition, states face strong economic disincentives to report [2], [44]. Recommendations included incentivizing reporting by ensuring rapid support for countries reporting outbreaks, disincentivizing delays by having WHO publicize such delays, and destigmatizing reporting by having WHO produce daily or weekly lists of outbreaks with the potential to become an international threat [2], [46].

One notable post-Ebola development was the creation of the World Bank's Pandemic Emergency Financing Facility (PEF). It was envisioned to provide a financial incentive for the world's poorest countries (those eligible for the World Bank's IDA lending) to report outbreaks early by offering rapid financing for response activities [47]. However, it was largely irrelevant in Covid-19: one reason is that China was ineligible because it is not part of the IDA lending group. Even if it were, it is not clear that the timing or size of the PEF's financial payout would have changed decision-making within China. The time lapsed from initial detection to international reporting was significantly shorter in Covid-19 than in the 2002 SARS outbreak, in which China took more than two months before alerting the WHO to hundreds of cases of an unknown disease [48]–[50]. However, China's initial response to Covid-19 was still criticized for a delay between case detection and international reporting, delays in sharing additional relevant information with the international community, internal censorship, and what has been characterized as an initial downplaying of the potential severity of the virus [48], [51], [52]. As of March 2021, it had not been clearly determined when, where, or

how the virus first began circulating in China; the internationally-agreed WHO mission to investigate the zoonotic origins of the virus took place after several delays in January 2021, though it had been agreed in May 2020 in World Health Assembly resolution 73.1 [53], [54].

In April 2020, the World Bank announced that the PEF would disburse 195.84 million USD to 64 low-income countries with reported cases of Covid-19 to assist with their response [55]. But the process for eligible countries to receive funds was criticized as being too little, too late [42], [56]. The World Bank has announced it will not be pursuing a second round of pandemic bonds [47].

Thus, despite ongoing calls for timely reporting [57], (dis)incentives regarding outbreak reporting for a majority of countries remained largely unchanged post-Ebola. Strengthening international rules and incentives to ensure the fastest possible reporting of outbreaks by all countries remains a critical gap in the global system.

2.3 Trade and travel restrictions

During the West African crisis, many companies and governments restricted trade and travel to affected countries, despite a lack of scientific or public health justifications in many instances and against the recommendations of the WHO [58], [59]. These measures were criticized as potentially violating the IHR (2005) [60]–[62], and post-Ebola reviews noted how these restrictions hindered aid from reaching affected regions and intensified the economic toll of the epidemic [2]. However, no new initiatives or guidelines were announced to encourage states and/or private companies to refrain from imposing unwarranted restrictions during outbreaks.

Through February 2020, WHO did not recommend any travel or trade restrictions on China, either before or after the January 30 declaration of Covid-19 as a PHEIC, noting in February that such restrictions are “ineffective in most situations and may divert resources from other interventions” [63]–[65]. Nevertheless, by the end of March, 142 countries and territories (covering over 90% of the world’s population) had imposed travel restrictions [66]. At a peak in May 2021, 162 countries and 22 territories had completely or partially closed their borders, and scheduled flights by global airlines had dropped 69% below their 2019 levels [67], [68]. Robust debate continues on the relative efficacy of travel restrictions for limiting epidemic spread, and some may prove to be more or less justified on scientific or public health grounds [69], [70]. Further research to understand the impact of various types of travel restrictions and additional institutional arrangements is needed to govern such restrictions in an effective and coordinated manner [71], [72].

Similarly, despite calls in April 2020 by the World Trade Organization (WTO) and the International

Monetary Fund (IMF) to lift all trade restrictions on medical supplies and food, as of March 2021, 144 countries, territories and economic blocs had passed 350 trade measures related to Covid-19, including 167 liberalizing measures (primarily those making it easier to import essential goods), and 183 restrictive [73]–[75].

These developments have highlighted the insufficiency of the current IHR (2005) for governing outbreak-related travel and trade restrictions [18]. In addition, the legality of the various restrictions under the IHR (2005) remains unclear because, as of November 2020, no cases have been brought using the dispute settlement process included in the IHR (2005) that could “help clarify the limits of lawful behavior” [76].

Concrete measures to encourage states to minimize travel and trade restrictions during outbreaks to those based on scientific and public health grounds are still needed, as is further clarity on what is legally permissible, and the ultimate intended and unintended impacts of such restrictions [72].

2.4 Science, technology, and knowledge-sharing

The timely sharing of research and data among academic researchers, states, NGOs, and private businesses is critical to accelerate scientific understanding of a pathogen, its effects, and measures to control it. While states are expected to share at least some information with the WHO regarding outbreaks under the IHR (2005), data sharing remains largely ungoverned at the international level.

2.4.1 Knowledge generation and sharing

During the West African Ebola outbreak, there were numerous problems with information and data sharing, including insufficient data sharing between health workers, health ministries and the WHO early on; insufficient direct data sharing among the governments of Guinea, Sierra Leone, and Liberia; and non-disclosure of clinical trial data and epidemiological data to all relevant stakeholders [77], [78]. These data sharing failures have been cited as one of the barriers to timely containment of the epidemic [77]. Post-Ebola reports recommended measures for increasing data and sample sharing [2].

Numerous policies and platforms were created, particularly in response to the Zika epidemic in 2015. Principles on data sharing in public health emergencies were released by both the WHO (2015) and GloPID-R (2018) [79], [80]. Data sharing improved measurably between the Ebola epidemic and the 2015–16 Zika epidemic [81]. Scientists published an increased number of preprints in advance of journal publication [82] and multiple repositories for Zika-related data were created [83]–[85]. In

addition, scientific journals agreed to make outbreak-related content available free of charge and encouraged authors to submit their data to online repositories in advance of publication [86], [87].

During the Covid-19 pandemic, there has been widespread and rapid sharing of many kinds of scientific and epidemiologic data, representing a dramatic acceleration in the post-Ebola trend toward more and faster data sharing in outbreaks. During Ebola and Zika, approximately 2.7% and 3.8% of all relevant peer-reviewed journal articles, respectively, appeared originally as preprints [82]. In Covid-19, preprint usage exploded: between January and April 2020, preprints accounted for approximately 40 percent of all published English-language Covid-19 scientific work, and preprints are estimated to account for 17–30 percent of all Covid-19 research papers published in 2020 as a whole, depending on the database used [88]–[91]. In addition, numerous Covid-19 data sharing portals have been created, including the EMBL-EBI’s Covid-19 Data Portal [92] and the US NIH’s iSearch Covid-19 Portfolio [93]. However, the sustainability of these efforts is unclear and there are risks associated with the publication of raw data and/or preliminary results which may be flawed or incomplete [91].

Furthermore, a range of researchers, media organizations, and institutions have been posting their data sources and methodologies open source, including the *New York Times* [94], Johns Hopkins University [95], and the *Economist* [96]. Finally, as was seen in Zika, numerous scientific and medical journals lifted their paywalls for Covid-19-related publications [97], [98].

However, an important area where there has been little change to date is in sharing of clinical trial data generated in the development of health technologies such as drugs and vaccines. (Though important steps forward have been made in transparency with the publication of some clinical trial protocols for Covid-19 vaccine development.) Given the large-scale R&D efforts, urgency and breadth of clinical trials taking place, open sharing of data could accelerate scientific progress, better detect safety signals, improve overall efficiency, facilitate regulatory cooperation across countries and increase public trust in the technologies being developed [99], [100].

The widespread and rapid sharing of scientific and epidemiological data has been a bright spot in the Covid-19 pandemic. Changes in rules and incentives are still needed to ensure rapid sharing of clinical trial data.

SHARING OF PATHOGEN AND GENOMIC SEQUENCING DATA

The timely sharing of physical pathogen samples and genomic sequencing data is critical to characterize pathogens and to accelerate the development of countermeasures. However, there are no explicit requirements under the IHR (2005) for states to share pathogen samples [101]. The sharing

of physical pathogen samples and genomic sequencing data is often complicated by disagreements about what constitutes adequate compensation (i.e., benefits sharing) between parties; these benefits may range from co-authorship of any resultant publications to royalties to access to any resultant countermeasures [102].

During the West African Ebola epidemic, pathogen sample movement was not comprehensively tracked or regulated during the initial stages of the epidemic, and some samples were reportedly taken to other countries in the absence of arrangements to ensure adequate compensation for the originating countries [102]. In addition, some researchers delayed putting genomic sequencing data on the virus in publicly accessible databases, leaving an incomplete picture of the virus's evolution [103]. Despite these challenges, the sharing of pathogen samples and GSD in outbreaks was not the subject of reform efforts after the epidemic.

Questions surrounding physical sample sharing have not yet figured prominently in the Covid-19 pandemic. Chinese researchers publicly shared GSD data on SARS-CoV-2 in early January; since then, hundreds of thousands of sequences of the virus have been uploaded to publicly available databases [104], [105]. Early in the outbreak, there were some reports of scientists having trouble acquiring physical samples of SARS-CoV-2, and criticisms of China for not sharing (and for later reportedly destroying) some physical samples [106]–[108]. However, as the outbreak spread, and researchers gained access to local samples, this appears to have become less of a concern.

The sharing of GSD garnered increased attention at the start of 2021 as new variants of the virus associated with greater transmissibility, worse outcomes, and reduced vaccine efficacy began to appear and spread, and the ability to track their spread gained newfound urgency. The lack of clear international governance arrangements to ensure more reliable pathogen and benefit sharing may pose a problem in future outbreaks. In addition, some countries may be less willing to share physical pathogen samples and GSD in the future if arrangements for equitable access to vaccines, diagnostics or therapeutics for Covid-19 are not realized [109].

2.4.2 Health technology research, development, and deployment

Preventing and containing outbreaks requires appropriate health tools, yet for many high-risk pathogens, adequate diagnostics, vaccines, or therapeutics do not exist. The unpredictability of outbreaks means private investments in R&D are highly risky, and therefore usually inadequate. The consequences of this were seen in the West African Ebola epidemic. Despite the disease having been identified nearly 40 years prior and having caused dozens of smaller outbreaks in the intervening years, at the beginning of the outbreak in 2014, there were no approved vaccines to prevent its spread, no effective treatments to reduce mortality, and no rapid, point of care diagnos-

tics tests to easily track the spread of the virus [110]–[113]. Post-Ebola reviews pointed to this clear failure to invest adequately in vaccines, diagnostics, and therapeutics for Ebola prior to 2014 – and recommended increased and sustained investments in R&D for high-risk pathogens [2].

This call was partially heeded with increased investments, particularly into vaccine R&D for Ebola and other priority pathogens. Emerging infectious disease R&D increased from 2014–2018, reaching an estimated pre-Covid-19 peak of 886 million USD in 2018 [114]. While some of these increases in global health R&D are partly attributable to outbreak response, some can also be attributed to investments in preparedness, particularly the creation and initial funding of the Coalition for Epidemic Preparedness Innovations (CEPI) [114].

Between 2014–2018, R&D for emerging infectious diseases (EID) was overwhelmingly concentrated on Ebola, with other priority disease families, including coronaviruses, Crimean-Congo hemorrhagic fever, Lassa fever, Nipah, and Rift Valley fever each receiving less than 5 percent of EID R&D [114]. Ebola’s disproportionate position in funding for EID R&D points to a clear risk: that the focus will be on the pathogen that caused the last big outbreak, which may not be the one that causes the next.

A small number of countries are the primary funders for EID R&D, with the US consistently providing “more funding than any other entity for every single priority pathogen family” from 2014–18, accounting for 61% of the total [114]. Notably, the UK, France, and Germany increased their funding in 2017 and 2018 [114], and Covid-19 has prompted major public R&D outlays worldwide. Nevertheless, given the outsize role of the US, any significant reduction in US funding would heavily impact worldwide EID R&D.

Another notable overarching post-Ebola reform was the creation of the WHO’s R&D Blueprint in 2016 [115]. The Blueprint is intended to guide outbreak preparedness and to enable rapid and coordinated R&D during outbreaks by providing roadmaps and target product profiles for a list of priority diseases. It was used to help guide the response to the Zika epidemic and has also been used in Covid-19 where it has developed a host of guidance documents, including target product profiles for vaccines [116] and diagnostics [117].

VACCINES

Post-Ebola reviews recommended a substantial increase in investments for R&D for vaccines, both for Ebola and for other EID. These investments occurred: for Ebola, investment for new product development increased almost a thousand-fold, with the majority of that new spending focused on vaccine development [118]. From 2015–2018, vaccine R&D accounted for between 52 and 71 percent of all Ebola-related R&D [119]. These investments have resulted in several approved vaccines:

Merck received FDA approval, WHO prequalification, and EMA conditional market approval for its Ebola vaccine in 2019 [120], and Johnson & Johnson received EMA approval for its Ebola vaccine in July 2020 [121]. China and Russia have also each approved an Ebola vaccine [122].

To spur vaccine development for priority pathogens more broadly, CEPI was launched in 2017. Receiving funding from a mix of national governments and philanthropies¹, it was intended as a way to overcome market barriers to investment in vaccines for EID, given their unpredictability and the lengthy and risky process to bring a vaccine to market [124].

In the Covid-19 pandemic, vaccine development has become the priority of governments and the pharmaceutical industry, significantly shortening traditional timelines for developing vaccines. Vaccines have received at least 12.8 billion USD in investments (including both R&D and advance purchase commitments), with 10 billion USD of that associated with the US government's Operation Warp Speed [125]–[127]. This is likely a significant underestimate, given that investment data has been difficult to obtain and funding by some large countries known to be engaged in vaccine development, including China and Russia, is not included in these figures. While numbers vary, as of March 2021, it is estimated that more than 300 vaccines are in development [128], [129], with 81 currently in human testing, 16 in Stage 3 clinical trials, and 12 approved for early, limited, or full use [129], [130]. The rapid development of Covid-19 vaccines has been an impressive accomplishment involving governments, research funders, scientists, companies, regulators, and clinical trial volunteers around the world. Notably, while there was relatively little funding for research into coronaviruses post-Ebola, some of the research that did occur has proven transferable to Covid-19 vaccine development [114], demonstrating the value of continuing research into priority pathogens between outbreaks.

Access to countermeasures was not one of the primary concerns during the Ebola response; there were no safe, effective, and approved therapeutics or vaccines, and little attention was paid to access issues in post-Ebola reviews and reform efforts. In contrast, questions of equitable distribution and access have become a primary concern in the Covid-19 pandemic, revealing a blindspot in the post-Ebola reforms. There are multiple challenges to equitable access to an eventual vaccine in any pandemic, including but not limited to: inadequate global and national supplies; ensuring safety and efficacy; and ensuring affordable prices [109].

Although the WHO released guidelines for equitable allocation of Covid-19 vaccines, it is the interaction of states and manufacturers that largely determines who will get how many doses and when. Neither WHO nor any other entity can single-handedly enforce equitable allocation princi-

1 It receives funding from the Bill & Melinda Gates Foundation, the Wellcome Trust, the European Commission, and the governments of Australia, Belgium, Canada, Denmark, Ethiopia, Germany, Japan, Mexico, Norway, and the UK [123].

ples. The COVAX initiative is intended to ensure equitable access to vaccines for each participating country through pooling risk and procurement [123], [131]. CEPI, Gavi, and WHO jointly lead the COVAX initiative, the vaccine pillar of the Access to Covid-19 Tools (ACT) Accelerator [132]. COVAX has faced two major challenges: first, securing adequate volume of vaccines in direct competition with better-resourced countries seeking bilateral supply commitments with manufacturers; and persuading self-financing countries both to subsidize and share limited supply with 92 low- and lower middle-income countries. As of March 2021, COVAX had secured an estimated 2,250 billion vaccine doses, enough to fully vaccinate approximately 20 percent of the population of participating countries and territories [133], and 98 self-financing countries had signed commitment agreements for COVAX [134]. This widespread engagement is an important boost for multilateral efforts to make any Covid-19 vaccine available to all countries, regardless of ability to pay.

However, amidst concerns about a limited supply through at least 2021, multiple states with the means to do so looked beyond COVAX and pursued bilateral purchase arrangements with vaccine manufacturers (see Figure 1). These largescale preorders by a small group of nations scooped up the vast majority of limited global supply, leaving little left for large swaths of the global population, and limiting COVAX’s efficacy in the short term. For many countries, it remains highly uncertain when they will get access to which vaccines and at what volumes.

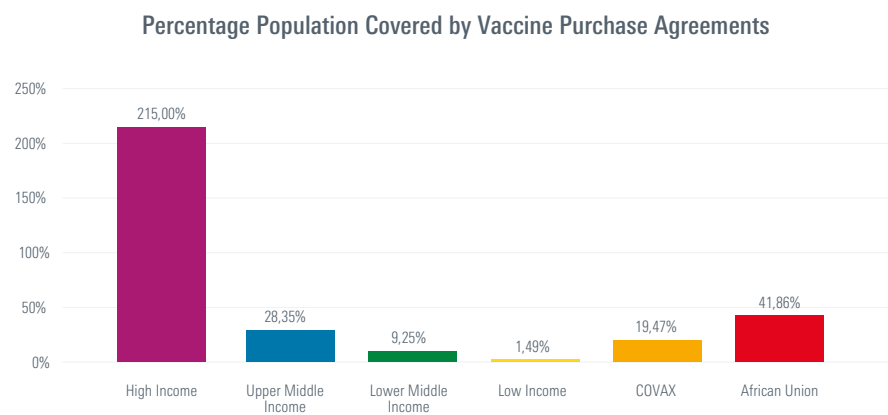


Figure 1 This figure displays the percentage of the population covered by vaccine purchase arrangements that have been publicly reported as of March 25, 2021, by country income level (as defined by the World Bank), taking into account whether the vaccines purchased require one or two doses. Multilateral purchases by the EU are included in the high income category, since all member states of the EU are classified as high income. Multilateral purchases by COVAX and the African Union are included separately, given the range of incomes represented by each, and the lack of information at time of writing on distribution and allocation. It is important to note that the middle income categories are likely significant underestimates, given that Russia, China, and India have not publicly stated how many vaccine doses they are purchasing for domestic use. Sources are government publications, pharmaceutical company statements, and media reports.

DIAGNOSTICS

Post-Ebola, there was recognition of the need for faster, easier, and less expensive diagnostic tests for Ebola and other priority diseases [113]. Despite some increased investments, diagnostics received less attention than vaccines post-Ebola and they were not the subject of significant reforms [135]. For example, CEPI did not explicitly include diagnostics (or therapeutics) within its scope despite similar challenges inducing private sector investment.

In Covid-19, diagnostics innovation has been rapid: by the end of 2020, more than 860 diagnostics were commercially available, 326 of which were rapid diagnostic tests – meaning they return results quickly at the point-of-care (rather than having to be sent to a laboratory), and can often be administered by those with minimal training [136], [137]. Despite these rapid innovations, access to diagnostics remains patchy, with many countries lacking adequate diagnostic supplies [138]. In the early months of the pandemic, some smaller and less wealthy countries were unable to procure diagnostics on the market, having been outbid by larger, wealthier countries [139], [140]. Testing has become highly politicized in some contexts, as expanded testing enables more accurate – and generally higher – case counts that political leaders may wish to obscure; for example, even nine months into the pandemic in the US limited testing capacity led to long waits to be tested or get results [141], [142]. According to the *Economist*, the diagnostics pillar of the ACT Accelerator had received pledges for approximately 947 million USD by March 2021 – or approximately 16 percent of the 6 billion USD it estimated it would need through March 2021 [96], [143]. Despite the funding shortfalls, in October, the ACT Accelerator announced arrangements for 120 million antigen rapid diagnostic tests by Abbott and SD Biosensor, priced at a maximum of 5 USD per test, to be provided to LMICs [137]. This was followed by an additional agreement in January 2021, for over 250 million antigen rapid diagnostics by Premier Medical Corporation, priced at a maximum of 2.50 USD per test [144]. The lack of access to diagnostics in some locations limits the understanding of the pandemic's spread. In addition, in low-income countries, disparities in testing capacity may lead to misallocated international assistance since the outbreak may artificially appear less severe in places with less testing.

THERAPEUTICS

Post-Ebola, there was recognition of the importance of investing in R&D for therapeutics for high risk diseases, both to decrease the mortality and long-term consequences of these diseases, and to control the effects of an outbreak when a vaccine is unavailable (or in the time it takes for a vaccine to be deployed) [135]. As with diagnostics, no initiative on the scale of CEPI was created to change the market dynamics for therapeutics post-Ebola. Nevertheless, some investments were made and the first therapeutic for Ebola received regulatory approval from the FDA in October 2020 [145].

In the Covid-19 pandemic, more than 1.3 billion USD has been invested in therapeutics development [125], but some have critiqued the process as disorganized [146]. While there are more than 323 therapeutics for Covid-19 in development – including antivirals, antibodies, cell-based therapies, and RNA-based treatments – as of March 2021, there are no therapeutics proven to prevent severe disease, though some products have shown limited benefits [147], [148]. If and when game-changing therapeutics are developed, major access challenges are looming.

The ACT Accelerator's therapeutics pillar remains underfunded and no broad global agreements to ensure equitable distribution of any therapeutics has been reached. As of March 2021, only 751 million USD had been provided to this pillar, which represents less than 11.4% of the funding call for 6.6 billion USD through the end of 2021 [96], [149]. The ACT Accelerator has nonetheless been engaged in efforts to reserve manufacturing capacity and volume for monoclonal antibodies in LMICs [150]. It is not yet clear how the approximately 4.3 billion USD in commitments announced by the G7 in February 2021 will be allocated among the three ACT Accelerator pillars [151].

CLINICAL TRIALS

During Ebola, there were heated ethical debates about who should receive access to limited quantities of experimental therapies and whether that access should only be provided as part of randomized controlled trials or also through compassionate use exceptions [152]–[155]. Questions of racism, colonialism, and access to care for the wealthy versus impoverished formed a backdrop to these discussions – a backdrop that has continued in discussions surrounding not only clinical trials in Covid-19, but access to vaccines and countermeasures more broadly [156], [157].

In Covid-19, there was robust ethical debate about vaccine trial design – including regarding the permissibility of human challenge trials [158]–[160] and the inclusion or exclusion of vulnerable populations (e.g., pregnant women) in placebo-controlled trials [161] – as well as accelerated regulatory approval [162] and the transparency of clinical trial results.

During the Covid-19 pandemic, thousands of trials have occurred and/or are ongoing around the world. According to one major database of clinical trials (Clinicaltrials.gov),² consulted in March 2021, of the 5,001 clinical interventional trials occurring for therapeutics or vaccines for Covid-19, approximately 65% trials had sites³ in North America and Europe [163]. There have been concerns

2 Clinicaltrials.gov is maintained by the US government. The database is not fully comprehensive, not all information is up to date, and there can be problems with data quality (duplicates, missing data fields, etc.). However, it is one of the largest databases and provides a rough picture of where trials are occurring.

3 Trials with sites in multiple regions are counted in each region.

raised about how to coordinate and combine data from this many disparate, simultaneously occurring trials around the world. Some coordinated multi-country trials were arranged, including the WHO’s SOLIDARITY trial, which investigated multiple potential treatments at trial sites in over 30 countries, including in Africa and Latin America, but was paused in January 2021 with no clear re-start plan as of March [164]–[166]. Although there were concerns raised early in the pandemic that trials would be concentrated in a few countries and, therefore, would produce products whose safety and efficacy are unknown in other populations [165], [167], multiple initiatives were launched to conduct trials in Africa, Latin America, and South and Southeast Asia [167]–[169].

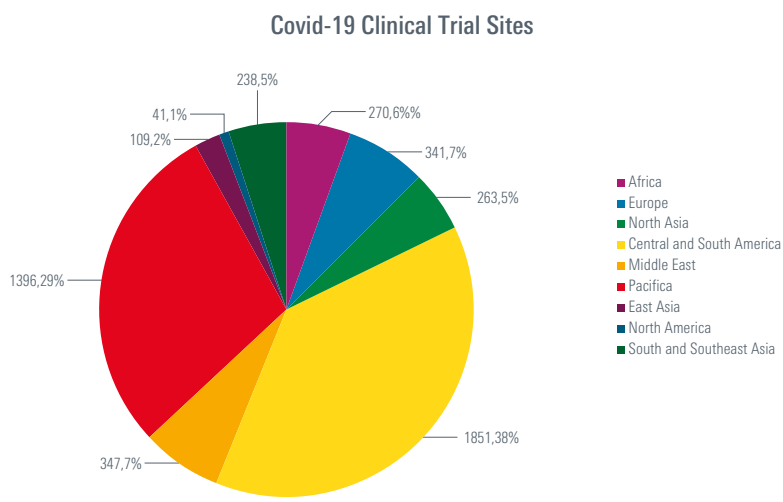


Figure 2 This figure is based on data from Clinicaltrials.gov, consulted in March 2021, on all current and past Covid-19 trials reported to the database. Trials with sites in multiple regions are counted in each region.

The absence of clear, agreed-upon rules for equitable access to countermeasures has prompted a scramble in the midst of the Covid-19 pandemic. This gap will undoubtedly be a focus of post-Covid reform debates, but given the political and economic challenges, it remains to be seen if effective arrangements can be put in place before the next public health emergency.

3 | INTERNATIONAL HEALTH AND HUMANITARIAN SYSTEM

The international health and humanitarian system performs two key functions: first, it provides a safety net to help countries when they are unable to respond to an outbreak alone, and second, it provides the rules, infrastructure and advocacy for cooperation between all countries. At the center of this system is the World Health Organization, which continues to play a unique role in convening and coordinating outbreak response, despite a proliferation of actors in global health over the past several decades.

3.1 World Health Organization

The World Health Organization was the subject of intense scrutiny following the West African crisis. At an operational level, it was criticized for having dismantled the organizational capacity to respond quickly to a fast-moving outbreak [170]. At an institutional level, its delay in declaring a PHEIC, hesitance to challenge its Member States, and poor coordination with other actors were seen as having significantly hindered the response [171]. Post-Ebola reviews emphasized the need for greater operational capacities, independence, and stronger accountability arrangements for WHO [2].

WHO became the focus of multiple reform efforts, mainly focused on strengthening its operational capacity. This included the creation of the Health Emergencies (WHE) Programme in 2016 to assist countries with outbreak preparedness and response, with a dedicated accountability mechanism in the Independent Oversight and Advisory Committee [172]. In 2019, outbreak preparedness became formalized as one of three priority “pillars” in WHO’s work, alongside universal health coverage and health promotion [173]. A Contingency Fund for Emergencies (CFE) was created so that funds would be readily available, allowing WHO to react quickly to emerging threats [174]. However, questions remained about whether these reforms would sufficiently improve WHO’s ability to manage political pressures from Member States.

WHO has been at the political and operational center of the global Covid-19 response. Since the earliest days of the outbreak in Wuhan, WHO has gathered and analyzed information, worked with authorities in China, briefed the media regularly, and exhorted the global community to cooperate. It has convened others involved in pandemic response and set priorities, for example, through the

R&D Blueprint and the ACT Accelerator. It has, among other actions, provided technical assistance and teams to affected countries, shipped PPE to 152 countries, provided biomedical equipment to 105 countries, and supported the establishment of treatment centers in 15 countries [175]. It has also rapidly published over 800 standards and guidelines to assist national governments, on everything from methods of community engagement to laboratory protocols to advice on when and how to open schools and businesses [175], [176]. Nevertheless, in May 2020, the IOAC noted that some delays in providing official guidance had contributed to uncertainty and recommended, both in May and November 2020, increased collaboration with outside experts in order to support faster generation and dissemination of technical recommendations [18], [177].

WHO has also provided guidance to national governments on trade and travel restrictions, but on this front has been strongly criticized. As a cascade of countries moved to impose travel and trade restrictions in the first months of the pandemic (see Section 3.3), WHO guidance was roundly ignored, and the organization did relatively little to insist otherwise. One analysis concluded WHO had withdrawn from providing travel-related guidance as the pandemic progressed, deferring instead to national governments [64], [178]. There have also been criticisms regarding how WHO has handled the investigation into the virus's origins in China [179], [180].

A frequent point of debate is where the limits of WHO's powers lie, and how much responsibility should realistically be accorded to individual governments or non-state actors rather than to WHO. Whether the issue is access to sensitive markets being granted by the Chinese government or access to patents granted by intellectual property-holders, WHO's tools of persuasion are usually limited to diplomacy and lack the teeth of hard law or financial incentives.

Indeed, WHO has faced unstable and inadequate financing both generally, and for outbreaks specifically, for the past few decades. The bulk of WHO's funding – more than 80 percent – now comes from voluntary contributions (rather than assessed contributions), which funders can withdraw or reduce at will [181]. Post-Ebola, Member States did not agree to significantly increase their obligatory assessed contributions to WHO [182], [183]. These funding challenges both limit WHO's operational and technical capacities, as well as the feasibility of overcoming one of the main problems identified post-Ebola: its limited ability to take actions opposed by a Member State even when in the broader interests of public health.

Funding was particularly slow to materialize in the first months of the Covid-19 pandemic. In March 2020, for the first time in its history, WHO appealed directly to private donors via the Covid-19 Solidarity Fund [184], a precursor to the WHO Foundation launched several months later and which had been under development prior to the outbreak to address the organization's perennial funding weaknesses [185]. The Fund has since raised more than 242 million USD [186]. After the initial de-

lays, funding from states picked up as the pandemic spread, and as of March 2021, it had received 1.92 billion USD [187]. The pledge by the Trump administration in the US to withdraw funding from the WHO in 2020 added uncertainty to response efforts and raised significant questions about WHO's continuing Covid-19 and other operations in 2021. While the Biden administration restored – and increased – funding, as well as maintained US membership in the WHO [188], the fact remains that the WHO relies disproportionately on a small number of funders. The US has consistently been the WHO's single largest funder; in 2018–2019, it provided more than twice as much as any other member state, amounting to 15 percent of the total funding [189], [190]. If the threatened US withdrawal had gone through, the Gates Foundation was poised to become the WHO's top funder, raising questions about the influence the private foundation would have over the global multilateral organization [191]. While France, Germany, Ireland, Finland, and the UK pledged funding increases to help fill the gap left by the threatened US withdrawal, up until the US election in November 2020, it appeared that the total increase in pledges would amount to approximately 471 million USD for a two-year funding cycle – a little more than half the 893 million USD the US provided in 2018–2019 [137], [189], [192]–[194].

The WHO's unstable and inadequate funding has long been recognized as a structural weakness limiting WHO's operational and technical capacities, as well as its political space to maneuver between the inevitably intense political pressures from Member States in outbreaks. Nevertheless, reform efforts to date have failed to address it.

3.2 The broader humanitarian aid system

The humanitarian aid system can play a critical role when outbreaks overwhelm local health actors or occur amidst ongoing humanitarian emergencies. Post-Ebola reviews recommended strengthening the capacity and coordination of the humanitarian aid system [135]. Some efforts were made to improve coordination and information sharing in health crises, including the development of an updated Emergency Response Framework to clarify roles and strengthen coordination by the WHO [195], and a new protocol linking the emergency capacities of the UN's main body for humanitarian aid with the WHO [196]. It is not clear to what extent these reforms have affected the Covid-19 response.

The UN has grouped its response to Covid-19 into three thematic plans: health (headed by WHO), humanitarian (headed by OCHA), and socioeconomic (headed by UNDP) [197]. All three plans (including the health plan, as noted in Section 3), continue to face significant funding shortfalls. The UN's Coordinated Humanitarian Response Plan, led by OCHA, encompasses proposed projects in 63 at-risk countries, and contains appeals from both UN and non-UN entities, including the IOM, UNDP, UNFPA, UNICEF, and the International Red Cross and Red Crescent Movement [197], [198].

It requested 9.50 billion USD for 2020, but received only 3.79 billion USD, or 39.9% [198]. Nevertheless, there has been a burst of activity in the humanitarian aid sector, and aid groups have been active in bringing assistance to conflict zones and vulnerable communities [199].

Already stretched thin by multiple complex humanitarian emergencies, Covid-19 multiplied both the number of places and people in need of aid, as well as added layers of complexity to the ongoing work of aid organizations [200]. High-income countries joined the list of countries in need of aid: for example, Médecins Sans Frontières dispatched response teams to help nursing homes in Western Europe and in parts of the US to address the pandemic [201]. Social distancing and hygiene measures recommended for Covid-19 are nearly impossible to implement in refugee or internally displaced persons camps, such as those in Yemen, Syria, and Bangladesh [202]. Due to the economic consequences of the pandemic, the World Food Programme predicted that the number of people suffering from food insecurity would more than double by the end of 2020 [200]. In addition, there is worrying evidence that disruptions in immunization campaigns, diagnosis, and care for other health conditions due to the Covid-19 pandemic may lead to stalled progress or even significant long-term setbacks in other areas [203]–[206].

Post-Ebola reforms focused on strengthening the international humanitarian system as a safety net for countries overwhelmed by an outbreak, and it has continued to play this role in Covid-19 for countries in armed conflict or with very limited resources. However, Covid-19 also revealed an important blindspot – that in a truly global pandemic, this safety net can at best act as a bandage – small, limited, and temporary. Reforms for global preparedness will need to look far beyond the humanitarian system and strengthen arrangements for international cooperation during pandemics across a much broader set of issues, such as finance, trade, food security and migration, among others.

4 | FINANCING

A lack of sustainable financing has marked outbreak preparedness and response for decades, including both before and after the West African Ebola epidemic. Funding for outbreaks has been characterized as following “cycles of panic and neglect” – with periods of robust international funding and attention during outbreaks, followed by rapid declines and unstable financing between them [207], [208]. The costs of outbreaks – such as the estimated 53 billion USD price tag of the West African crisis – dwarf the 4.5 billion USD per year estimated to be necessary to adequately improve global preparedness [46], [209].

Post-Ebola reports recommended more consistent and sustained funding for outbreak preparedness, building national capacities, and R&D into medical countermeasures for Ebola and other priority pathogens [2]. In response, new financing vehicles were launched, including CEPI, WHO’s CFE, and the World Bank’s PEF – all of which largely depend on contributions from the same small group of governments. The creation of these new vehicles did not guarantee adequate or sustained funding, however. For example, the CFE’s funding fluctuated after its creation in 2015 (ranging from 12.8 million USD in 2017 to 53.9 million USD in 2019), and did not reach its funding goals for the 2016–17 or 2018–19 biennia [135]. In Covid-19, the new financing vehicles developed post-Ebola have had mixed success (see Section 2.2 for a discussion of the PEF, Section 3.5 for a discussion of CEPI, and Section 4.1 for broader discussion of WHO financing).

One of the post-Ebola blindspots was an underlying assumption that, in the event of a public health emergency, it would be primarily lower-income countries in need of financial assistance. The Covid-19 pandemic has demonstrated that an outbreak can cause intense economic shocks strong enough to precipitate urgent financial needs in countries of all income levels. The financial toll of Covid-19 is staggering – the global economy is estimated to have contracted 4.3 percent in 2020 [210], triggering the deepest global recession since World War II, and an estimated additional 119 to 124 million individuals were pushed into extreme poverty (those living on under 1.90 USD per day) [211]. There are numerous ongoing efforts to estimate and meet funding needs for both the direct and indirect effects of the pandemic. Massive spending packages have been passed by governments in the Global North to boost faltering economies and provide aid for businesses and individuals negatively affected by the lockdowns, including multiple relief packages amounting to approximately 5.76 trillion USD in the US [212], [213] and a 1.8 trillion EUR package in the EU [214].

The World Bank has pledged to make up to 160 billion USD in financing available to countries and public companies over 15 months [215], including more than 12 billion USD for developing countries to finance the purchase and distribution of Covid-19 vaccines, tests and treatments [216], and 6 billion USD for 148 Covid-19 projects in 105 countries [217]. However, the World Bank has been criticized both for not disbursing this money fast enough [215] and for not ensuring this money is reaching marginalized groups [218]. The IMF has provided 107 billion USD of financial assistance to 85 countries and 488.7 million USD of debt relief to 29 other countries [219]. In response to a joint call for action by the World Bank Group and the International Monetary Fund (IMF), G20 finance ministers announced that IDA-eligible countries could request to suspend their debt service payments through 2020 [220]. In addition, there has been an influx of funding for specific issues and populations affected by the pandemic – including expanding food security [217] and protecting specific groups such as victims of domestic violence, the internally displaced, and persons with disabilities [221].

During and after the West African Ebola epidemic, there were significant problems with tracking aid money, including identifying all sources and recipients of funds, tracking differences between money pledged and eventually disbursed, and understanding impact [222]–[225]. Audits found millions of dollars that were misappropriated or not accounted for [226], [227]. Large-scale reforms at the international level to encourage greater accountability or transparency regarding funding for outbreaks were not undertaken post-Ebola. Nevertheless, some organizations undertook internal reforms to attempt to prevent future fraud and mismanagement [227].

In Covid-19, tracking of financing remains challenging; the opacity is particularly concerning given the unprecedented influx of funding, both within nations and internationally. At the international level, there is no single international aid database that is updated in or near real-time [228]. Policy Cures Research expanded to track Covid-19 R&D funding commitments as they were reported through October 2020; in addition, other trackers of international aid flows and financing for Covid-19 have been developed, including one by the Economist Intelligence Unit. However, just as in previous outbreaks, the tracking has been complicated by a lack of transparency on pledged funds versus disbursed; whether previously committed money is being reappropriated; unclear timeframes for announced spending; and a lack of clarity about what spending qualifies as for Covid-19 [228]. Spending by national governments on Covid-19 specifically, or on outbreaks and preparedness more broadly is even harder to track, in part because this spending does not necessarily have a single budget line and may be spread across different categories and government ministries [229].

The cycle of panic and neglect that has characterized outbreak financing for the past few decades will not be broken by Covid-19 unless longer-term financing arrangements are put in place. While substantial sums have materialized in response to Covid-19, it is unclear if there will be sustained investment in preventing more outbreaks in the future or if, after the pandemic has subsided, pre-

paredness will return to its usual neglected state. The Covid-19 pandemic has also revealed one of the blindspots post-Ebola – that high-income countries could have urgent financing needs in the event of an outbreak, along with low- and middle-income countries – and raises questions about how financial instruments for outbreaks may need to be reimagined in the future to adequately meet these needs.

5 | LEADERSHIP, MONITORING, AND ACCOUNTABILITY

We consider in this section three factors necessary for effective governance – leadership, monitoring and accountability – and consider the extent to which governance weaknesses were addressed post-Ebola.

5.1 Leadership – questioning of science, mistrust of authority

Covid-19 has highlighted a major blindspot in post-Ebola analyses: it was taken for granted that, in the event of a pandemic, national governments would take the necessary steps to control the outbreak, insofar as their resources and capacities permitted. Recommendations focused on building technical capacity to increase the speed, coordination, and competence of outbreak response and on maintaining political will between outbreaks; political will amidst an outbreak was taken as a given. Covid-19 witnessed political leaders in several nations, such as the US, the UK, Tanzania, and Brazil, refusing to implement economically- or politically-difficult measures necessary to control the epidemic.

In addition, some states have been less willing to cooperate internationally, leading to fragmented approaches to addressing the pandemic [42]. Forums such as the G7, G20, and UN Security Council were underutilized [42]. The UN Secretary-General, in a statement before the Security Council, noted that “The pandemic is a clear test of international cooperation – a test we have essentially failed” [230]. An inwardly focused Trump administration in the US contributed to an initial global leadership vacuum in 2020, and simmering geopolitical tensions between the US and China complicated stronger international cooperation throughout the first year of the pandemic [231].

During the West African crisis, the importance of public trust in authorities was made clear, as was the need for community engagement in disease-fighting efforts, from contact tracing to quarantine to respecting sanitary measures (e.g., hand washing and avoiding physical contact with the bodily fluids of sick or dead bodies) [232], [233]. Misinformation about the origins of the outbreak, the purposes of government interventions, and the nature of treatments and vaccines under clinical investigation spread widely, hampering response efforts [234], [235]. Public health measures were at times politicized, sowing confusion and further public distrust of government actions [236], [237]. Post-Ebola reports, however, generally did not frame the issue as one of public trust, but rather as a problem

of development. Mistrust or public non-cooperation was blamed on a lack of education; longstanding suspicions of the government, Western science, modern medicine and its healthcare workers; and a hesitancy to alter traditional practices. Framing the problem as one of development implied that this was an issue confined to poorer countries and carried with it at least a whiff of neocolonialism.

The Covid-19 pandemic revealed that countries at all levels of wealth struggled with public trust. The pandemic has tested governments' ability to communicate rapidly changing information clearly and effectively, and to mobilize public support for both pharmaceutical and non-pharmaceutical interventions that, while critical to preventing the spread of the virus, may also impose hardships. Public trust and willingness to follow government recommendations has, in some places, been harmed by mixed messaging and/or politicization of the outbreak response [238], [239]. In many places, longer-term trends of declining trust in traditional sources of authoritative information, including physicians and scientists, exacerbated an already difficult situation. Protests against government-imposed containment restrictions took place in more than two dozen countries [240]–[244]. Countries including the UK, France, and the US have struggled with low adherence rates with mask-wearing and social distancing [243], [245]. False information – particularly about the supposed efficacy or harms of vaccines, drugs and other technologies – have proliferated, fed in some cases by politicians [246].

The epidemic has become highly politicized in some countries, sowing confusion and further mistrust [247], [248]. Politicians have overruled or rejected the claims of their own public health authorities, advocating for policies that have been, at times, contradictory to scientific evidence [249]–[251]. Tensions between public health officials, medical professionals, and political figures about how best to manage the outbreak have at times publicly flared [238], [252]. It is not clear how this problem can best be addressed, beyond populations holding their politicians accountable for leadership failures.

There is a need to better understand how to mobilize public support for health measures, counter disinformation, and build public trust, taking lessons from countries that have been successful. There is a need for research and analysis to provide clearer answers on how to address the manipulation of epidemic responses for personal political gain. Perhaps most importantly, we do not have a solid understanding of how to prepare for the potential lack of political will to even try to control an outbreak. Much research, reflection and analysis remain to be done.

5.2 Monitoring and accountability

Post-Ebola, numerous mechanisms for monitoring and accountability of outbreak preparedness were put in place, including the Global Preparedness Monitoring Board (GPMB) and the Independent Oversight and Advisory Committee (IOAC) for the WHO Health Emergencies (WHE) Programme. The GPMB was given a broad mandate – to evaluate preparedness across the entire global system and assess whether it is receiving adequate financing [253]. It has garnered high-level participation, and its first two reports (2019 and 2020) delivered clear and strong messages on gaps in global preparedness and an early set of recommendations in response to Covid-19 [42], [207]. The IOAC, as noted above, has delivered rapid and regular public recommendations on how to strengthen the WHE.

However, Covid-19 has shown that no oversight mechanism or accountability arrangement was able to ensure global preparedness. As noted in Section 2.1, even the validity of metrics developed to measure preparedness have proven quite limited. Review processes have begun assessing the Covid-19 response, including the Global Preparedness Monitoring Board’s 2020 Report [42], the Lancet Covid-19 Commission “Statement on the occasion of the 75th session of the UN General Assembly” [248], and the IOAC’s May and November 2020 reports [18], [177]. There are four further accountability processes now underway: the IHR Review Committee, the GPMB 2021 report, the IOAC’s ongoing work, and the Independent Panel for Pandemic Preparedness and Response (Independent Panel), which was mandated by the May 2020 World Health Assembly. We can also expect many national review processes to be launched after a crisis of this magnitude. If past experience is any guide, there is likely to be agreement on the substance of many recommendations emerging from the international reviews. The question will soon turn to which recommendations will be prioritized and acted upon, and which will be forgotten until the next crisis.

6 | CONCLUSION

Post-Ebola reviews put forward a host of recommendations to improve global outbreak preparedness and response. A number of key reforms were made, and these have proven critical in the response to Covid-19, including: an increase in attention to, investment in, and external assessment of preparedness in some countries and the creation of new institutions, such as the Africa CDC. Other productive reforms include the creation of new mechanisms for the coordination and funding of countermeasure R&D, namely the WHO Blueprint and CEPI. There was also a substantial increase in the rapid sharing of some kinds of scientific and technical knowledge and data during outbreaks.

Reforms, however, were partial. Major remaining gaps that have been exposed anew by Covid-19 include continued unstable and inadequate funding for national preparedness, the WHO, and countermeasure R&D and access. There is a need for funding for a greater number of pathogens, for non-vaccine countermeasures, and for more countries to contribute. National preparedness remains insufficient in many countries, metrics for measuring preparedness post-Ebola have been shown to have limited validity, and the accountability mechanisms for IHR compliance are inadequate. Furthermore, incentives and rules for rapid outbreak reporting are insufficient, as is understanding and arrangements to better govern travel and trade restrictions. Measures are inadequate to ensure rapid sharing of pathogen samples and genomic sequencing data, and to provide fair benefits in return.

In addition, pre-Covid-19, there was a false assumption that national governments would take the necessary measures to protect their populations in the event of an outbreak, insofar as their resources allowed. There is a need for research to improve understanding of how to anticipate and mitigate such political inaction. Technical reforms in the health sector alone will have limited impact on political decision making within countries or on the related problems of misinformation and public mistrust.

The existence of these post-Ebola blindspots offers a cautionary tale to the numerous Covid-19 reviews already underway, and those that will surely come. But it seems unlikely we can entirely avoid fighting the last war. Rather, it is critical to recognize that the post-Covid reform agenda will reflect the specific challenges and problems that Covid-19 posed and exposed, and that it will both be subject to and engender analytical blindspots regarding which reforms should be pursued. In

addition, of the many reforms that will be proposed as part of post-Covid review processes, just a few will be implemented. The choice of priorities will not be a technocratic exercise, but a deeply contested political process.

In light of this iterative, political, and politicized reform process, we conclude that a key priority should be improving global monitoring, accountability, and review arrangements. A robust monitoring system would provide greater visibility over a complex system. Ongoing, regular feedback on the state of the system – and the impact of any reforms – would facilitate the types of adaptations that will undoubtedly be necessary as circumstances change, as gaps not first identified or prioritized in response to Covid-19 become apparent, and as political attention ebbs and flows. It is critical to address not only the gaps that have proven costly in Covid-19, but also the inherent shortcomings of the reform process itself – that is, the tendency to fight the last war.

BIBLIOGRAPHY

- [1] B. Popik, "'Generals always fight the last war' ('Economists fight the last depression')," *Barry Popik*, Dec. 26, 2010. https://www.barrypopik.com/index.php/new_york_city/entry/generals_always_fight_the_last_war (accessed Apr. 06, 2021).
- [2] S. Moon *et al.*, "Post-Ebola reforms: ample analysis, inadequate action," *BMJ*, vol. 356, p. j280, Jan. 2017, doi: 10.1136/bmj.j280.
- [3] Congressional Research Service, "The Global Health Security Agenda (GHSA): 2020–2024," Congressional Research Service, Mar. 2020. [Online]. Available: <https://fas.org/sgp/crs/row/IF11461.pdf>.
- [4] G7 Health Ministers, "Declaration of the G7 Ministers," G7, Berlin, Germany, Oct. 2015. Accessed: Oct. 06, 2020. [Online]. Available: <http://www.g8.utoronto.ca/healthG8/2015-berlin.pdf>.
- [5] WHO (World Health Organization), "Progress in the Ebola response," *World Health Organization*, Mar. 2016. <http://www.who.int/csr/disease/ebola/response/infographic/en/> (accessed Oct. 06, 2020).
- [6] B. J. Marston *et al.*, "Ebola Response Impact on Public Health Programs, West Africa, 2014–2017," *Emerg. Infect. Dis.*, vol. 23, no. Suppl 1, pp. S25–S32, Dec. 2017, doi: 10.3201/eid2313.170727.
- [7] T. Nagbe *et al.*, "The implementation of integrated disease surveillance and response in Liberia after Ebola virus disease outbreak 2015–2017," *Pan Afr. Med. J.*, vol. 33, no. Suppl 2, May 2019, doi: 10.11604/pamj.supp.2019.33.2.16820.
- [8] T. Nyenswah, "Reflections on Leadership and Governance from the Incident Manager of Liberia's Ebola Response," *Health Secur.*, vol. 15, no. 4, pp. 445–449, Aug. 2017, doi: 10.1089/hs.2017.0040.
- [9] CDC (Centers for Disease Control and Prevention), "Motorcycles Help Speed Diagnosis in Liberia," *Centers for Disease Control and Prevention*, Apr. 29, 2019. <https://www.cdc.gov/globalhealth/healthprotection/fieldupdates/winter-2017/liberia-motorcycle.html> (accessed Aug. 13, 2020).
- [10] Prevent Epidemics, "Liberia Uses Motorcycle Transportation to Save Lives and Prevent Outbreaks," *Prevent Epidemics*, Jul. 22, 2019. <https://preventepidemics.org/stories/a-drive-for-better-health-how-riders-for-health-liberia-uses-motorcycle-transportation-to-save-lives-and-prevent-disease-outbreaks/> (accessed Aug. 13, 2020).

- [11] Africa CDC, "Our History," *Africa CDC*, n.d. <https://africacdc.org/about-us/our-history/> (accessed Oct. 06, 2020).
- [12] C. Manlan, "A CDC for Africa," *Scientific American*, Sep. 01, 2017.
- [13] WHO (World Health Organization), "Joint External Evaluation (JEE) mission reports," *WHO*. <http://www.who.int/ihr/procedures/mission-reports/en/> (accessed Mar. 11, 2021).
- [14] D. Samhoury *et al.*, "Analysis of Joint External Evaluations in the WHO Eastern Mediterranean Region," *East. Mediterr. Health J. Rev. Sante Mediterr. Orient. Al-Majallah Al-Sihhiyah Li-Sharq Al-Mutawassit*, vol. 24, no. 5, pp. 477–487, Jul. 2018, doi: 10.26719/2018.24.5.477.
- [15] V. Gupta *et al.*, "Analysis of results from the Joint External Evaluation: examining its strength and assessing for trends among participating countries," *J. Glob. Health*, vol. 8, no. 2, doi: 10.7189/jogh.08.020416.
- [16] A. Talisuna *et al.*, "Joint external evaluation of the International Health Regulation (2005) capacities: current status and lessons learnt in the WHO African region," *BMJ Glob. Health*, vol. 4, no. 6, p. e001312, 2019, doi: 10.1136/bmjgh-2018-001312.
- [17] WHO (World Health Organization), "National Action Plan for Health Security," *WHO*, 2020. <https://extranet.who.int/sph/country-planning> (accessed Sep. 22, 2020).
- [18] IOAC, "Interim report on WHO's response to COVID-19, January-April 2020," Independent Oversight and Advisory Committee for the WHO Health Emergencies Programme, Geneva, Switzerland, May 2020. Accessed: Oct. 26, 2020. [Online]. Available: https://www.who.int/about/who_reform/emergency-capacities/oversight-committee/IOAC-interim-report-on-COVID-19.pdf?ua=1.
- [19] JHU (Johns Hopkins University) and NTI (Nuclear Threats Initiative), "2019 Global Health Security Index," Johns Hopkins Bloomberg School of Public Health Center for Health Security (JHU)& the Nuclear Threat Initiative (NTI), developed with The Economist Intelligence Unit, 2019. [Online]. Available: <https://www.ghsindex.org/wp-content/uploads/2019/10/2019-Global-Health-Security-Index.pdf>.
- [20] B. Oppenheim *et al.*, "Assessing global preparedness for the next pandemic: development and application of an Epidemic Preparedness Index," *BMJ Glob. Health*, vol. 4, no. 1, p. e001157, 2019, doi: 10.1136/bmjgh-2018-001157.
- [21] A. Maxmen, "Ebola prepared these countries for coronavirus — but now even they are floundering," *Nature*, vol. 583, no. 7818, Art. no. 7818, Jul. 2020, doi: 10.1038/d41586-020-02173-z.
- [22] P. Wallace, "COVID-19 in Liberia: Learning From the Ebola Virus," *BORGEN*, Sep. 16, 2020.
- [23] A. U. Ordu, "The coming of age of the Africa Centers for Disease Control," *Africa in Focus*, *Brookings Institute*, Apr. 15, 2020. <https://www.brookings.edu/blog/africa-in-focus/2020/04/15/the-coming-of-age-of-the-africa-centers-for-disease-control/> (accessed Aug. 11, 2020).

- [24] N. Munshi, "African nations join forces to procure medical equipment," *Financial Times*, May 15, 2020.
- [25] Afreximbank, "African Union member states accelerates online pre-orders as AMSP adds 300 million Sputnik V doses to its COVID-19 vaccine portfolio," *African Export-Import Bank*, Feb. 19, 2021. <https://www.afreximbank.com/african-union-member-states-accelerates-online-pre-orders-as-ampsp-adds-300-million-sputnik-v-doses-to-its-covid-19-vaccine-portfolio/> (accessed Mar. 24, 2021).
- [26] A. Deslandes *et al.*, "SARS-CoV-2 was already spreading in France in late December 2019," *Int. J. Antimicrob. Agents*, vol. 55, no. 6, p. 106006, Jun. 2020, doi: 10.1016/j.ijantimicag.2020.106006.
- [27] R. Li *et al.*, "Substantial undocumented infection facilitates the rapid dissemination of novel coronavirus (SARS-CoV-2)," *Science*, vol. 368, no. 6490, pp. 489–493, May 2020, doi: 10.1126/science.abb3221.
- [28] V. Khosrawipour *et al.*, "Failure in initial stage containment of global COVID-19 epicenters," *J. Med. Virol.*, vol. 92, no. 7, pp. 863–867, 2020, doi: 10.1002/jmv.25883.
- [29] M. L. Ranney, V. Griffeth, and A. K. Jha, "Critical Supply Shortages — The Need for Ventilators and Personal Protective Equipment during the Covid-19 Pandemic," *N. Engl. J. Med.*, vol. 382, no. 18, p. e41, Apr. 2020, doi: 10.1056/NEJMp2006141.
- [30] D. Kamerow, "Covid-19: the crisis of personal protective equipment in the US," *BMJ*, vol. 369, Apr. 2020, doi: 10.1136/bmj.m1367.
- [31] I. Togoh, "Here's How Some Of The Countries Worst Hit By Coronavirus Are Dealing With Shortages Of Protective Equipment For Healthcare Workers," *Forbes*, Mar. 31, 2020.
- [32] X. Wang, X. Zhang, and J. He, "Challenges to the system of reserve medical supplies for public health emergencies: reflections on the outbreak of the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) epidemic in China," *Biosci. Trends*, vol. 14, no. 1, pp. 3–8, 2020.
- [33] V. Mallet, D. Dombey, and G. Chazan, "Europe fears the worst as coronavirus surge threatens to overwhelm hospitals," *Financial Times*, Oct. 23, 2020.
- [34] D. J. Finkenstadt, R. Handfield, and P. Guinto, "Why the U.S. Still Has a Severe Shortage of Medical Supplies," *Harvard Business Review*, Sep. 17, 2020.
- [35] Get Us PPE, "Get Us PPE Shortage Index: August 2020," Get Us PPE, Aug. 2020. Accessed: Sep. 28, 2020. [Online]. Available: <https://v9b3g8f2.stackpathcdn.com/wp-content/uploads/2020/09/Get-Us-PPE-Data-Shortage-Index-August-2020.pdf>.
- [36] J. Longbottom, R. Willingham, and R. Clayton, "Victoria's Chief Medical Officer fears state would 'burn through' PPE supplies if guidelines expanded," *ABC News*, Sep. 19, 2020.
- [37] A. McCann and L. Leatherby, "Europe's Covid-19 Hospital Crunch Grows More Dire, Surpassing Spring Peak - The New York Times," *The New York Times*, Nov. 06, 2020.

- [38] A. Remuzzi and G. Remuzzi, "COVID-19 and Italy: what next?," *The Lancet*, vol. 395, no. 10231, pp. 1225–1228, Apr. 2020, doi: 10.1016/S0140-6736(20)30627-9.
- [39] M. Santora and H. de Goeij, "Central Europe, Spared in the Spring, Suffers as Virus Surges," *The New York Times*, Oct. 14, 2020.
- [40] N. Haider *et al.*, "The Global Health Security index and Joint External Evaluation score for health preparedness are not correlated with countries' COVID-19 detection response time and mortality outcome," *Epidemiol. Infect.*, vol. 148, ed 2020, doi: 10.1017/S0950268820002046.
- [41] JHU (Johns Hopkins University), "Mortality Analyses," *Johns Hopkins Coronavirus Resource Center*, Oct. 06, 2020. <https://coronavirus.jhu.edu/data/mortality> (accessed Oct. 06, 2020).
- [42] GPMB (Global Preparedness Monitoring Board), "A World in Disorder. Global Preparedness Monitoring Board Annual Report 2020.," Global Preparedness Monitoring Board, Geneva, Switzerland, Sep. 2020. Accessed: Jul. 30, 2020. [Online]. Available: [https://www.who.int/publications-detail-redirect/global-surveillance-for-human-infection-with-novel-coronavirus-\(2019-ncov\)](https://www.who.int/publications-detail-redirect/global-surveillance-for-human-infection-with-novel-coronavirus-(2019-ncov)).
- [43] European Council, "Statement of the members of the European Council, 25–26 February 2021." Feb. 26, 2021, Accessed: Mar. 24, 2021. [Online]. Available: <https://www.consilium.europa.eu/en/press/press-releases/2021/02/26/statement-of-the-members-of-the-european-council-25-26-february-2021/>.
- [44] L. O. Gostin and E. A. Friedman, "A retrospective and prospective analysis of the west African Ebola virus disease epidemic: robust national health systems at the foundation and an empowered WHO at the apex," *The Lancet*, vol. 385, no. 9980, pp. 1902–1909, May 2015, doi: 10.1016/S0140-6736(15)60644-4.
- [45] WHO Director-General, "Implementation of the International Health Regulations (2005): Report of the Review Committee on the Functioning of the International Health Regulations (2005) in Relation to Pandemic (H1N1) 2009," World Health Assembly, Geneva, Switzerland, WHA Doc A64/10, May 2011. [Online]. Available: https://apps.who.int/gb/ebwha/pdf_files/WHA64/A64_10-en.pdf.
- [46] National Research Council, *The Neglected Dimension of Global Security: A Framework to Counter Infectious Disease Crises*. Washington, D.C.: The National Academies Press, 2016.
- [47] World Bank, "Fact Sheet: Pandemic Emergency Financing Facility," *World Bank*, Apr. 27, 2020. <https://www.worldbank.org/en/topic/pandemics/brief/fact-sheet-pandemic-emergency-financing-facility> (accessed Aug. 03, 2020).
- [48] S. L. Myers, "China Created a Fail-Safe System to Track Contagions. It Failed.," *The New York Times*, Apr. 17, 2020.
- [49] Y. Huang, "The SARS Epidemic and its Aftermath in China: a Political Perspective," in *Learning from SARS: Preparing for the Next Disease Outbreak -- Workshop Summary*, Washington, D.C.: National Academies Press, 2004, p. 10915.

- [50] WHO (World Health Organization), "Update 95 - SARS: Chronology of a serial killer," WHO, 2003. https://www.who.int/csr/don/2003_07_04/en/ (accessed Oct. 21, 2020).
- [51] H. Davidson, "First Covid-19 case happened in November, China government records show - report," *The Guardian*, Mar. 13, 2020.
- [52] J. Belluz, "China hid the severity of its coronavirus outbreak and muzzled whistleblowers — because it can," *Vox*, Feb. 10, 2020. <https://www.vox.com/2020/2/10/21124881/coronavirus-outbreak-china-li-wenliang-world-health-organization> (accessed Oct. 21, 2020).
- [53] M. Guenot, "The WHO team probing the origins of the coronavirus in Wuhan is scrapping its interim report. Critics say China never gave them a real chance to investigate.," *Business Insider France*, Mar. 05, 2021. <https://www.businessinsider.fr/us/wuhan-who-team-axes-planned-report-critics-never-real-access-2021-3> (accessed Mar. 12, 2021).
- [54] Seventy-Third World Health Assembly, "COVID-19 Response," Geneva, Switzerland, WHA73.1, May 2020. Accessed: Mar. 24, 2021. [Online]. Available: https://apps.who.int/gb/ebwha/pdf_files/WHA73/A73_R1-en.pdf.
- [55] World Bank, "PEF Allocates US\$195 Million to More than 60 Low-Income Countries to Fight COVID-19," *World Bank*, Apr. 27, 2020. <https://www.worldbank.org/en/news/press-release/2020/04/27/pef-allocates-us195-million-to-more-than-60-low-income-countries-to-fight-covid-19> (accessed Aug. 03, 2020).
- [56] D. Clarke, "Opinion: Now is not the time for the World Bank to step back on pandemic financing," *Devex*, Aug. 04, 2020. <https://www.devex.com/news/sponsored/opinion-now-is-not-the-time-for-the-world-bank-to-step-back-on-pandemic-financing-97837> (accessed Sep. 30, 2020).
- [57] J. Nkengasong, B. Djoudalbaye, and O. Maiyegun, "A new public health order for Africa's health security," *Lancet Glob. Health*, vol. 5, no. 11, pp. e1064–e1065, Nov. 2017, doi: 10.1016/S2214-109X(17)30363-7.
- [58] WHO (World Health Organization), "Statement on the 8th meeting of the IHR Emergency Committee regarding the Ebola outbreak in West Africa," *WHO*, Dec. 18, 2015. <http://www.who.int/mediacentre/news/statements/2015/ihr-ebola-8th-meeting/en/> (accessed Oct. 23, 2020).
- [59] S. Otsuki and H. Nishiura, "Reduced Risk of Importing Ebola Virus Disease because of Travel Restrictions in 2014: A Retrospective Epidemiological Modeling Study," *PLOS ONE*, vol. 11, no. 9, p. e0163418, Sep. 2016, doi: 10.1371/journal.pone.0163418.
- [60] R. Pattani, "Unsanctioned travel restrictions related to Ebola unravel the global social contract," *CMAJ Can. Med. Assoc. J.*, vol. 187, no. 3, pp. 166–167, Feb. 2015, doi: 10.1503/cmaj.141488.
- [61] A. Tejpar and S. J. Hoffman, "Canada's Violation of International Law during the 2014–16 Ebola Outbreak," *Can. Yearb. Int. Law/Annuaire Can. Droit Int.*, vol. 54, pp. 366–383, Oct. 2017, doi: 10.1017/cyl.2017.18.

- [62] W. Rhymer and R. Speare, "Countries' response to WHO's travel recommendations during the 2013–2016 Ebola outbreak," *Bull. World Health Organ.*, vol. 95, no. 1, pp. 10–17, Jan. 2017, doi: 10.2471/BLT.16.171579.
- [63] WHO (World Health Organization), "WHO advice for international travel and trade in relation to the outbreak of pneumonia caused by a new coronavirus in China," World Health Organization, Geneva, Switzerland, Jan. 2020. Accessed: Oct. 01, 2020. [Online]. Available: <https://www.who.int/news-room/articles-detail/who-advice-for-international-travel-and-trade-in-relation-to-the-outbreak-of-pneumonia-caused-by-a-new-coronavirus-in-china>.
- [64] WHO (World Health Organization), "Updated WHO recommendations for international traffic in relation to COVID-19 outbreak," World Health Organization, Geneva, Switzerland, Feb. 2020. Accessed: Oct. 01, 2020. [Online]. Available: <https://www.who.int/news-room/articles-detail/updated-who-recommendations-for-international-traffic-in-relation-to-covid-19-outbreak>.
- [65] WHO (World Health Organization), "Statement on the second meeting of the International Health Regulations (2005) Emergency Committee regarding the outbreak of novel coronavirus (2019-nCoV)," World Health Organization, Geneva, Switzerland, Jan. 2020. Accessed: Oct. 01, 2020. [Online]. Available: [https://www.who.int/news-room/detail/30-01-2020-statement-on-the-second-meeting-of-the-international-health-regulations-\(2005\)-emergency-committee-regarding-the-outbreak-of-novel-coronavirus-\(2019-ncov\)](https://www.who.int/news-room/detail/30-01-2020-statement-on-the-second-meeting-of-the-international-health-regulations-(2005)-emergency-committee-regarding-the-outbreak-of-novel-coronavirus-(2019-ncov)).
- [66] P. Connor, "More than nine-in-ten people worldwide live in countries with travel restrictions amid COVID-19," *Fact Tank, Pew Research Center*, Apr. 01, 2020. <https://www.pewresearch.org/fact-tank/2020/04/01/more-than-nine-in-ten-people-worldwide-live-in-countries-with-travel-restrictions-amid-covid-19/> (accessed Oct. 01, 2020).
- [67] OAG Aviation Worldwide, "Global Scheduled Flights Change Year-Over-Year," *OAG*, Sep. 28, 2020. <https://www.oag.com/coronavirus-airline-schedules-data> (accessed Oct. 01, 2020).
- [68] UN WTO, "COVID-19 Related Travel Restrictions A Global Review for Tourism," UN WTO, Madrid, Spain, 4th Report, May 2020. Accessed: Mar. 11, 2021. [Online]. Available: <https://webunwto.s3.eu-west-1.amazonaws.com/s3fs-public/2020-05/TravelRestrictions%20-%2029%20May.pdf>.
- [69] M. Chinazzi *et al.*, "The effect of travel restrictions on the spread of the 2019 novel coronavirus (COVID-19) outbreak," *Science*, vol. 368, no. 6489, pp. 395–400, Apr. 2020, doi: 10.1126/science.aba9757.
- [70] A. Adekunle, M. Meehan, D. Rojas Alvarez, J. Trauer, and E. McBryde, "Delaying the COVID-19 epidemic in Australia: evaluating the effectiveness of international travel bans," *Aust. N. Z. J. Public Health*, vol. 44, no. 4, pp. 257–259, 2020, doi: <https://doi.org/10.1111/1753-6405.13016>.

- [71] K. Lee, C. Z. Worsnop, K. A. Grépin, and A. Kamradt-Scott, "Global coordination on cross-border travel and trade measures crucial to COVID-19 response," *The Lancet*, vol. 395, no. 10237, pp. 1593–1595, May 2020, doi: 10.1016/S0140-6736(20)31032-1.
- [72] G. Agostinis *et al.*, "FORUM: COVID-19 and IR Scholarship: One Profession, Many Voices," *Int. Stud. Rev.*, no. viab004, Mar. 2021, doi: 10.1093/isr/viab004.
- [73] IMF (International Monetary Fund), "WTO and IMF heads call for lifting trade restrictions on medical supplies and food," International Monetary Fund, Apr. 2020. Accessed: Oct. 02, 2020. [Online]. Available: <https://www.imf.org/en/News/Articles/2020/04/24/pr20187-wto-and-imf-joint-statement-on-trade-and-the-covid-19-response>.
- [74] ITC (International Trade Centre), "Covid-19 Temporary Trade Measures," *Market Access Map*, Sep. 16, 2020. <https://www.macmap.org/covid19> (accessed Mar. 11, 2021).
- [75] WTO (World Trade Organization), "COVID-19: Measures affecting trade in goods," Sep. 18, 2020. https://www.wto.org/english/tratop_e/covid19_e/trade_related_goods_measure_e.htm (accessed Oct. 01, 2020).
- [76] G. L. Burci, "The Outbreak of COVID-19 Coronavirus: are the International Health Regulations fit for purpose?," *EJIL: Talk!*, Feb. 27, 2020. <https://www.ejiltalk.org/the-outbreak-of-covid-19-coronavirus-are-the-international-health-regulations-fit-for-purpose/> (accessed Oct. 01, 2020).
- [77] GLOPID-R, "Data Sharing during the West Africa Ebola Public Health Emergency: Case Study Report," GLOPID-R, Nov. 2018. [Online]. Available: <https://www.glopid-r.org/wp-content/uploads/2019/07/data-sharing-during-west-africa-ebola-public-health-emergency-case-study-report-georgetown.pdf>.
- [78] S. Abramowitz *et al.*, "Data Sharing in Public Health Emergencies: Anthropological and Historical Perspectives on Data Sharing during the 2014–2016 Ebola Epidemic and the 2016 Yellow Fever Epidemic: Final Report," Wellcome-DfId joint initiative on epidemic preparedness, Nov. 2018. Accessed: Jun. 19, 2020. [Online]. Available: <https://www.glopid-r.org/wp-content/uploads/2019/07/data-sharing-in-public-health-emergencies-yellow-fever-and-ebola.pdf>.
- [79] WHO (World Health Organization), "Developing global norms for sharing data and results during public health emergencies. Statement arising from a WHO Consultation held on 1–2 September 2015.," World Health Organization, Geneva, Switzerland, 2015. [Online]. Available: https://www.who.int/medicines/ebola-treatment/blueprint_phe_data-share-results/en/.
- [80] GLOPID-R Data Sharing Working Group, "Principles of data sharing in public health emergencies," GLOPID-R, 2018. [Online]. Available: <https://www.glopid-r.org/wp-content/uploads/2018/06/glopid-r-principles-of-data-sharing-in-public-health-emergencies.pdf>.
- [81] C. J. Haug, M. P. Kieny, and B. Murgue, "The Zika Challenge," *N. Engl. J. Med.*, vol. 374, pp. 1801–1803, May 2016, doi: <https://doi.org/10.1056/NEJMp1603734>.

- [82] M. A. Johansson, N. G. Reich, L. A. Meyers, and M. Lipsitch, "Preprints: An underutilized mechanism to accelerate outbreak science," *PLOS Med.*, vol. 15, no. 4, p. e1002549, Apr. 2018, doi: 10.1371/journal.pmed.1002549.
- [83] University of Oxford, "Zika Online Data-sharing Platform," University of Oxford. <https://www.wrh.ox.ac.uk/research/zika-online-data-sharing-platform/form> (accessed Feb. 14, 2019).
- [84] J.-P. Chretien, C. M. Rivers, and M. A. Johansson, "Make Data Sharing Routine to Prepare for Public Health Emergencies," *PLOS Med.*, vol. 13, no. 8, p. e1002109, Aug. 2016, doi: 10.1371/journal.pmed.1002109.
- [85] Bulletin of the World Health Organization, "Zika Open," *WHO*, 2016. http://www.who.int/bulletin/online_first/zika_open/en/ (accessed Oct. 02, 2020).
- [86] Wellcome Trust *et al.*, "Statement on data sharing in public health emergencies." Feb. 01, 2016, Accessed: Apr. 13, 2020. [Online]. Available: <https://wellcome.ac.uk/press-release/statement-data-sharing-public-health-emergencies>.
- [87] A. Hufton, "Call for submissions: Zika virus related datasets," *Scientific Data Updates*, Jan. 20, 2016. <http://blogs.nature.com/scientificdata/2016/01/20/call-for-submissions-zika-virus-related-datasets/> (accessed Feb. 13, 2020).
- [88] N. Fraser *et al.*, "Preprinting the COVID-19 pandemic," *bioRxiv*, vol. [Preprint], p. 2020.05.22.111294, Sep. 2020, doi: 10.1101/2020.05.22.111294.
- [89] K. Kupferschmidt, "WHO unveils global plan to fairly distribute COVID-19 vaccine, but challenges await," *Science | AAAS*, Sep. 21, 2020. <https://www.sciencemag.org/news/2020/09/who-unveils-global-plan-fairly-distribute-covid-19-vaccine-challenges-await> (accessed Sep. 23, 2020).
- [90] F. Lachapelle, "COVID-19 Preprints and Their Publishing Rate: An Improved Method," *medRxiv*, vol. [Preprint], Sep. 2020, doi: 10.1101/2020.09.04.20188771.
- [91] H. Else, "How a torrent of COVID science changed research publishing — in seven charts," *Nature*, vol. 588, no. 7839, Art. no. 7839, Dec. 2020, doi: 10.1038/d41586-020-03564-y.
- [92] EMBL-EBI, "COVID-19 Data Portal," *COVID-19 Data Portal*, 2020. <https://www.covid19data-portal.org/> (accessed Oct. 02, 2020).
- [93] NIH (National Institutes of Health), "iSearch COVID-19 Portfolio," 2020. <https://icite.od.nih.gov/covid19/search/> (accessed Nov. 12, 2020).
- [94] The New York Times, "Coronavirus Case Data for Every U.S. County," *The New York Times*, Mar. 28, 2020.
- [95] L. Gardner, "Mapping COVID-19," *Johns Hopkins Whiting School of Engineering*, Jan. 23, 2020. <https://linkinghub.elsevier.com/retrieve/pii/S1473309920301201> (accessed Oct. 06, 2020).
- [96] The Economist Intelligence Unit, "The COVID-19 Health Funding Tracker," *The COVID-19 Health Funding Tracker*, Oct. 05, 2020. <https://covidfunding.eiu.com/> (accessed Oct. 05, 2020).

- [97] E. Callaway, "Will the pandemic permanently alter scientific publishing?," *Nature*, vol. 582, no. 7811, Art. no. 7811, Jun. 2020, doi: 10.1038/d41586-020-01520-4.
- [98] Wellcome, "Coronavirus (COVID-19): sharing research data," 2020. <https://wellcome.org/coronavirus-covid-19/open-data> (accessed Oct. 07, 2020).
- [99] P. Doshi, "Will covid-19 vaccines save lives? Current trials aren't designed to tell us," *BMJ*, vol. 371, Oct. 2020, doi: 10.1136/bmj.m4037.
- [100] Nature Editorial, "COVID vaccines: the world's medical regulators need access to open data," *Nature*, vol. 588, no. 7837, pp. 195–195, Dec. 2020, doi: 10.1038/d41586-020-03458-z.
- [101] D. P. Fidler, "Who Owns MERS?," *Foreign Affairs*, Jun. 06, 2013.
- [102] A. Rizk, A. Bezruki, G. L. Burci, and S. Moon, "'Everybody knows this needs to be done, but nobody really wants to do it': Governing Pathogen- and Benefit-Sharing (PBS)," Global Health Centre, Graduate Institute of International and Development Studies, Geneva, Switzerland, Working Paper 23, Dec. 2020. [Online]. Available: <https://www.graduateinstitute.ch/library/publications-institute/everybody-knows-needs-be-done-nobody-really-wants-to-do-it-governing>.
- [103] N. L. Yozwiak, S. F. Schaffner, and P. C. Sabeti, "Data sharing: Make outbreak research open access," *Nat. News*, vol. 518, no. 7540, p. 477, Feb. 2015, doi: 10.1038/518477a.
- [104] GISAID, "EpiCoV," *GISAID*, 2020. <https://www.epicov.org/epi3/frontend#413f3b> (accessed Apr. 21, 2020).
- [105] NCBI Virus, "NCBI Virus," *NCBI Virus*, 2020. https://www.ncbi.nlm.nih.gov/labs/virus/vssi/#/virus?SeqType_s=Nucleotide&VirusLineage_ss=SARS-CoV-2,%20taxid:2697049 (accessed Nov. 12, 2020).
- [106] M. Rourke, M. Eccleston-Turner, A. Phelan, and L. Gostin, "Policy opportunities to enhance sharing for pandemic research," *Science*, vol. 368, no. 6492, pp. 716–718, May 2020, doi: 10.1126/science.abb9342.
- [107] L. Caly *et al.*, "Isolation and rapid sharing of the 2019 novel coronavirus (SARS-CoV-2) from the first patient diagnosed with COVID-19 in Australia," *Med. J. Aust.*, vol. 212, no. 10, pp. 459–462, 2020, doi: 10.5694/mja2.50569.
- [108] J. Chin, "China Told Labs to Destroy Coronavirus Samples to Reduce Biosafety Risks," *Wall Street Journal*, May 17, 2020.
- [109] S. Moon, A. Bezruki, G. L. Burci, T. Sunyoto, and M. Vieira, "The Global Governance of Access to Countermeasures," Global Health Centre, Graduate Institute of International and Development Studies, Geneva, Switzerland, Commissioned Report for the Global Preparedness Monitoring Board, Aug. 2020. [Online]. Available: https://apps.who.int/gpmb/assets/thematic_papers_2020/tp_2020_2.pdf.
- [110] WHO (World Health Organization), "Ebola virus disease," *WHO*, Feb. 10, 2020. <https://www.who.int/news-room/fact-sheets/detail/ebola-virus-disease> (accessed Nov. 12, 2020).

- [111] WHO (World Health Organization), "Interim Guidance: Potential Ebola therapies and vaccines," World Health Organization (WHO), Geneva, Switzerland, Nov. 2014. Accessed: Oct. 23, 2020. [Online]. Available: https://apps.who.int/iris/bitstream/handle/10665/137590/WHO_EVD_HIS_EMP_14.1_eng.pdf;jsessionid=6470DC8A9ADF34BA17E9F27BE3A2AC-0D?sequence=1.
- [112] J. Kaner and S. Schaack, "Understanding Ebola: the 2014 epidemic," *Glob. Health*, vol. 12, no. 1, Sep. 2016, doi: 10.1186/s12992-016-0194-4.
- [113] WHO (World Health Organization), "Urgently needed: rapid, sensitive, safe and simple Ebola diagnostic tests," *WHO*, Nov. 18, 2014. <https://www.who.int/mediacentre/news/ebola/18-november-2014-diagnostics/en/> (accessed Oct. 07, 2020).
- [114] N. Chapman *et al.*, "G-Finder 2020: Landscape of Emerging Infectious Disease Research and Development: Preventing the Next Pandemic," Policy Cures Research, Sep. 2020. [Online]. Available: <https://www.policycuresresearch.org/analysis>.
- [115] WHO (World Health Organization), "An R&D Blueprint Action to Prevent Epidemics: Plan of Action May 2016," World Health Organization, Geneva, Switzerland, May 2016. Accessed: Oct. 06, 2020. [Online]. Available: https://www.who.int/blueprint/about/r_d_blueprint_plan_of_action.pdf?ua=1.
- [116] R&D Blueprint, "WHO R&D Blueprint Novel Coronavirus: WHO Working Group - Target Product Profiles for COVID-19 Vaccines," World Health Organization, Geneva, Switzerland, Apr. 2020. Accessed: Oct. 02, 2020. [Online]. Available: <https://www.who.int/publications/m/item/who-working-group-target-product-profiles-for-covid-19-vaccines>.
- [117] R&D Blueprint, "COVID-19 Target product profiles for priority diagnostics to support response to the COVID-19 pandemic v.1.0," World Health Organization, Geneva, Switzerland, Sep. 2020. Accessed: Oct. 02, 2020. [Online]. Available: <https://www.who.int/publications/m/item/covid-19-target-product-profiles-for-priority-diagnostics-to-support-response-to-the-covid-19-pandemic-v.0.1>.
- [118] J. R. Fitchett *et al.*, "Ebola research funding: a systematic analysis, 1997–2015," *J. Glob. Health*, vol. 6, no. 2, 2016, doi: 10.7189/jogh.06.020703.
- [119] Policy Cures Research, "G-FINDER." [Online]. Available: <http://gfinder.policycuresresearch.org/>.
- [120] WHO (World Health Organization), "Safety of Ebola Virus Vaccines," *WHO*, Jul. 12, 2019. http://www.who.int/vaccine_safety/committee/topics/ebola/Jul_2019/en/ (accessed Oct. 06, 2020).
- [121] Johnson & Johnson, "Johnson & Johnson Announces European Commission Approval for Janssen's Preventive Ebola Vaccine," *Johnson & Johnson*, Jul. 01, 2020. <https://www.jnj.com/johnson-johnson-announces-european-commission-approval-for-janssens-preventive-ebola-vaccine> (accessed Oct. 23, 2020).

- [122] A. Liu, "China approves domestic Ebola vaccine developed from recent outbreak," *Fierce-Pharma*, Oct. 24, 2017. <https://www.fiercepharma.com/vaccines/china-approves-self-developed-ebola-vaccine-from-2014-outbreak-virus-type> (accessed Oct. 06, 2020).
- [123] CEPI (Center for Epidemic Preparedness and Innovations, "Who we are," *CEPI*, 2020. <https://cepi.net/about/whoweare/> (accessed Oct. 04, 2020).
- [124] D. Gouglas, M. Christodoulou, S. A. Plotkin, and R. Hatchett, "CEPI: Driving Progress Toward Epidemic Preparedness and Response," *Epidemiol. Rev.*, Nov. 2019, doi: 10.1093/epirev/mxz012.
- [125] Policy Cures Research, "COVID-19 R&D Tracker Analysis," *Policy Cures Research*, Sep. 10, 2020. <https://www.policycuresresearch.org/vaccines-clinical-trial-results-summary> (accessed Mar. 11, 2021).
- [126] H. Branswell, M. Herper, L. Facher, E. Silverman, and N. Florke, "Operation Warp Speed pledged to do the impossible. How far has it come?," *STAT*, Sep. 08, 2020. <https://www.statnews.com/2020/09/08/operation-warp-speed-promised-to-do-the-impossible-how-far-has-it-come/> (accessed Oct. 04, 2020).
- [127] HHS (Health and Human Services), "Fact Sheet: Explaining Operation Warp Speed," *Health and Human Services (HHS)*, Aug. 12, 2020. <https://www.hhs.gov/coronavirus/explaining-operation-warp-speed/index.html> (accessed Oct. 23, 2020).
- [128] Milken Institute and First Person, "COVID-19 Vaccine Visualization," *Covid-19 Vaccine Tracker*, Mar. 09, 2021. <https://www.covid-19vaccinetracker.org/> (accessed Mar. 11, 2021).
- [129] London School of Hygiene and Tropical Medicine, "COVID-19 vaccine tracker," Mar. 01, 2021. https://vac-lshtm.shinyapps.io/ncov_vaccine_landscape/ (accessed Mar. 11, 2021).
- [130] J. Corum, S.-L. Wee, and C. Zimmer, "Coronavirus Vaccine Tracker," *The New York Times*.
- [131] WHO (World Health Organization), "Fair allocation mechanism for COVID-19 vaccines through the COVAX Facility. Final Working Version.," World Health Organization, Geneva, Switzerland, Sep. 2020. Accessed: Oct. 05, 2020. [Online]. Available: <https://www.who.int/publications/m/item/fair-allocation-mechanism-for-covid-19-vaccines-through-the-covax-facility>.
- [132] WHO (World Health Organization), "172 countries and multiple candidate vaccines engaged in COVID-19 vaccine Global Access Facility," *WHO*, Aug. 24, 2020. <https://www.who.int/news-room/detail/24-08-2020-172-countries-and-multiple-candidate-vaccines-engaged-in-covid-19-vaccine-global-access-facility> (accessed Oct. 04, 2020).
- [133] GAVI The Vaccine Alliance, "COVAX Global Supply Forecast," Mar. 2021. Accessed: Mar. 26, 2021. [Online]. Available: <https://www.gavi.org/sites/default/files/covid/covax/COVAX%20Supply%20Forecast.pdf>.

- [134] WHO (World Health Organization), "COVAX ANNOUNCES ADDITIONAL DEALS TO ACCESS PROMISING COVID-19 VACCINE CANDIDATES; PLANS GLOBAL ROLLOUT STARTING Q1 2021," Dec. 18, 2020. <https://www.who.int/news/item/18-12-2020-covax-announces-additional-deals-to-access-promising-covid-19-vaccine-candidates-plans-global-rollout-starting-q1-2021> (accessed Mar. 12, 2021).
- [135] J. Leigh, S. Moon, E. Garcia, and G. Fitzgerald, "Is Global Capacity to Manage Outbreaks Improving? An Analysis," Graduate Institute of International and Development Studies, Global Health Centre, Working Paper 17, 2018.
- [136] FIND, "SARS-CoV-2 diagnostic pipeline," *FIND*. <https://www.finddx.org/covid-19/pipeline/> (accessed Sep. 08, 2020).
- [137] WHO (World Health Organization), "Global partnership to make available 120 million affordable, quality COVID-19 rapid tests for low- and middle-income countries," *WHO*, Sep. 28, 2020. <https://www.who.int/news-room/detail/28-09-2020-global-partnership-to-make-available-120-million-affordable-quality-covid-19-rapid-tests-for-low-and-middle-income-countries> (accessed Oct. 04, 2020).
- [138] T. Dzinamarira, M. Dzobo, and I. Chitungo, "COVID-19: A perspective on Africa's capacity and response," *J. Med. Virol.*, vol. 92, no. 11, pp. 2465–2472, 2020, doi: <https://doi.org/10.1002/jmv.26159>.
- [139] J. Bradley, "In Scramble for Coronavirus Supplies, Rich Countries Push Poor Aside," *The New York Times*, Apr. 09, 2020.
- [140] M. Peplow, "Developing countries face diagnostic challenges as the COVID-19 pandemic surges," *Chemical & Engineering News*, Jun. 26, 2020. <https://cen.acs.org/analytical-chemistry/diagnostics/Developing-countries-face-diagnostic-challenges/98/i27> (accessed Nov. 12, 2020).
- [141] G. Lopez, "Trump asked for fewer Covid-19 tests. Now the CDC is recommending less testing.," *Vox*, Aug. 26, 2020. <https://www.vox.com/2020/8/26/21403000/trump-covid-coronavirus-testing-cdc-hhs> (accessed Oct. 26, 2020).
- [142] H. Chwe *et al.*, "The State of the Nation: 50-State COVID-19 Survey. Report #17: COVID-19 Test Results," Northeastern University, Harvard University, Rutgers University, and Northwestern University, Oct. 2020. [Online]. Available: <http://www.kateto.net/covid19/COVID19%20CONSORTIUM%20REPORT%2017%20TEST%20OCT%202020.pdf>.
- [143] FIND and The Global Fund, "Access to COVID-19 Tools (ACT) Accelerator Diagnostics Partnership," ACT Accelerator Diagnostics Partnership, May 2020. Accessed: Oct. 04, 2020. [Online]. Available: https://www.finddx.org/wp-content/uploads/2020/05/ACT-A-Dx_Investment-Case_FINAL.pdf.
- [144] FIND, "Cost of rapid COVID-19 tests halved as global investment ensures availability of high volumes for low- and middle-income countries," *FIND*, Jan. 22, 2021. <https://www.finddx.org/newsroom/pr-22jan21/> (accessed Mar. 12, 2021).

- [145] FDA, "FDA Approves First Treatment for Ebola Virus," *FDA*, Oct. 15, 2020. <https://www.fda.gov/news-events/press-announcements/fda-approves-first-treatment-ebola-virus> (accessed Nov. 12, 2020).
- [146] M. Herper and E. Riglin, "Data show panic, disorganization dominate the study of Covid-19 drugs," *STAT*, Jul. 06, 2020. <https://www.statnews.com/2020/07/06/data-show-panic-and-disorganization-dominate-the-study-of-covid-19-drugs/> (accessed Oct. 05, 2020).
- [147] Milken Institute and First Person, "Milken Institute's COVID-19 Treatment and Vaccine Tracker tracks the development of treatments and vaccines for COVID-19," *Covid-19 Tracker*, Mar. 10, 2021. https://covid-19tracker.milkeninstitute.org/#treatment_antibodies (accessed Mar. 11, 2021).
- [148] J. Corum, K. J. Wu, and C. Zimmer, "Coronavirus Drug and Treatment Tracker," *The New York Times*, Sep. 18, 2020.
- [149] ACT Accelerator, "Urgent Priorities and Financing Requirements at 10 November 2020: Averting the deepening human & economic crisis due to COVID-19," World Health Organization (WHO), Geneva, Switzerland, Nov. 2020. [Online]. Available: <https://www.who.int/docs/default-source/coronaviruse/act-accelerator/act-a-urgent-priorities-financing-requirements-final-single-11nov20.pdf>.
- [150] ACT Accelerator Therapeutics Partnership, "Investment case summary for monoclonal antibodies and small molecules," World Health Organization, Geneva, Switzerland, 2020. Accessed: Nov. 12, 2020. [Online]. Available: https://unitaid.org/assets/ACT-Accelerator-Therapeutics-Partnership_investment-case-summary-for-monoclonal-antibodies-and-small-molecules.pdf.
- [151] WHO (World Health Organization), "G7 leaders commit US\$ 4.3 billion to finance global equitable access to tests, treatments and vaccines in 2021," Feb. 19, 2021. <https://www.who.int/news/item/19-02-2021-g7-leaders-commit-us-4.3-billion-to-finance-global-equitable-access-to-tests-treatments-and-vaccines-in-2021> (accessed Mar. 25, 2021).
- [152] A. Rid and E. J. Emanuel, "Ethical considerations of experimental interventions in the Ebola outbreak," *The Lancet*, vol. 384, no. 9957, pp. 1896–1899, Nov. 2014, doi: 10.1016/S0140-6736(14)61315-5.
- [153] C. Adebamowo *et al.*, "Randomised controlled trials for Ebola: practical and ethical issues," *The Lancet*, vol. 384, no. 9952, pp. 1423–1424, Oct. 2014, doi: 10.1016/S0140-6736(14)61734-7.
- [154] E. Cox, L. Borio, and R. Temple, "Evaluating Ebola Therapies — The Case for RCTs," <http://dx.doi.org/10.1056/NEJMp1414145>, Dec. 17, 2014. <https://www.nejm.org/doi/10.1056/NEJMp1414145> (accessed Oct. 24, 2020).
- [155] WHO (World Health Organization), "Ethical considerations for use of unregistered interventions for Ebola virus disease (EVD)," *WHO*, Aug. 12, 2014. <http://www.who.int/mediacentre/news/statements/2014/ebola-ethical-review-summary/en/> (accessed Oct. 24, 2020).

- [156] J. Farrar, D. L. Heymann, and P. Piot, "Experimental Medicine in a Time of Ebola," *Wall Street Journal*, Aug. 07, 2014.
- [157] T. McConnell, "How the Ebola outbreak turned into a racism and responsibility debate," *The World from PRI*, Aug. 07, 2014.
- [158] J. P. Kahn, L. M. Henry, A. C. Mastroianni, W. H. Chen, and R. Macklin, "Opinion: For now, it's unethical to use human challenge studies for SARS-CoV-2 vaccine development," *Proc. Natl. Acad. Sci.*, vol. 117, no. 46, pp. 28538–28542, Nov. 2020, doi: 10.1073/pnas.2021189117.
- [159] G. O. Schaefer, C. C. Tam, J. Savulescu, and T. C. Voo, "COVID-19 Vaccine Development: Time to Consider SARS-CoV-2 Challenge Studies?," Social Science Research Network, Rochester, NY, SSRN Scholarly Paper ID 3568981, Mar. 2020. doi: 10.2139/ssrn.3568981.
- [160] S. K. Shah *et al.*, "Ethics of controlled human infection to address COVID-19," *Science*, vol. 368, no. 6493, pp. 832–834, May 2020, doi: 10.1126/science.abc1076.
- [161] R. Farrell, M. Michie, and R. Pope, "Pregnant Women in Trials of Covid-19: A Critical Time to Consider Ethical Frameworks of Inclusion in Clinical Trials," *Ethics Hum. Res.*, vol. 42, no. 4, pp. 17–23, 2020, doi: <https://doi.org/10.1002/eahr.500060>.
- [162] M. J. Smith, E. J. Emanuel, B. Thomé, and R. E. G. Upshur, "Ethical conditions for accelerating COVID-19 vaccine research," *Wellcome Open Res.*, vol. 5, no. 249, 2020, [Online]. Available: <https://wellcomeopenresearch.org/articles/5-249>.
- [163] NIH (National Institutes of Health), "Clinicaltrials.gov COVID-19 trials," *Clinicaltrials.gov*, 2020. <https://clinicaltrials.gov/ct2/results?cond=COVID-19>.
- [164] WHO (World Health Organization), "'Solidarity' clinical trial for COVID-19 treatments," *World Health Organization*, Oct. 15, 2020. <https://www.who.int/emergencies/diseases/novel-coronavirus-2019/global-research-on-novel-coronavirus-2019-ncov/solidarity-clinical-trial-for-covid-19-treatments> (accessed Mar. 12, 2021).
- [165] V. S. Balakrishnan, "Increasing accessibility in COVID-19 clinical trials," *Lancet Microbe*, vol. 1, no. 1, p. e13, May 2020, doi: 10.1016/S2666-5247(20)30015-X.
- [166] K. Kupferschmidt, "International megatrial of coronavirus treatments is at a standstill," *Science | AAAS*, Mar. 03, 2021. <https://www.sciencemag.org/news/2021/03/international-megatrial-coronavirus-treatments-standstill> (accessed Mar. 12, 2021).
- [167] A. Roussi and A. Maxmen, "African nations missing from coronavirus trials," *Nature*, Apr. 2020, doi: 10.1038/d41586-020-01010-7.
- [168] African Union, "African Union Commission launches Consortium for COVID-19 Vaccine Clinical Trial," *Africa CDC*, Jul. 09, 2020. <https://africacdc.org/news-item/african-union-commission-launches-consortium-for-covid-19-vaccine-clinical-trial/> (accessed Oct. 05, 2020).
- [169] M. Makoni, "COVID-19 vaccine trials in Africa," *Lancet Respir. Med.*, Sep. 2020, doi: 10.1016/S2213-2600(20)30401-X.

- [170] A. Kamradt-Scott, "Responding to Health Emergencies: The Ethical and Legal Considerations for Militaries," in *Infectious Diseases in the New Millennium: Legal and Ethical Challenges*, M. Eccleston-Turner and I. Brassington, Eds. Cham: Springer International Publishing, 2020, pp. 43–63.
- [171] S. Moon *et al.*, "Will Ebola change the game? Ten essential reforms before the next pandemic. The report of the Harvard-LSHTM Independent Panel on the Global Response to Ebola," *The Lancet*, vol. 386, no. 10009, pp. 2204–2221, Nov. 2015, doi: 10.1016/S0140-6736(15)00946-0.
- [172] WHO (World Health Organization), "WHO Health Emergencies Programme," *World Health Organization*, n.d. <https://www.who.int/westernpacific/about/how-we-work/programmes/who-health-emergencies-programme> (accessed Oct. 07, 2020).
- [173] WHO (World Health Organization), "WHO unveils sweeping reforms in drive towards 'triple billion' targets," Mar. 06, 2019. <https://www.who.int/news/item/06-03-2019-who-unveils-sweeping-reforms-in-drive-towards-triple-billion-targets> (accessed Oct. 24, 2020).
- [174] WHO (World Health Organization), "Contingency Fund for Emergencies," *WHO*, 2020. <https://www.who.int/emergencies/funding/contingency-fund-for-emergencies> (accessed Aug. 04, 2020).
- [175] WHO Director-General, "COVID-19 Response," World Health Organization, Geneva, Switzerland, EB148/16, Jan. 2021. Accessed: Mar. 12, 2021. [Online]. Available: https://apps.who.int/gb/ebwha/pdf_files/EB148/B148_16-en.pdf.
- [176] WHO (World Health Organization), "Country & Technical Guidance - Coronavirus disease (COVID-19)," *WHO*, 2020. <https://www.who.int/emergencies/diseases/novel-coronavirus-2019/technical-guidance> (accessed Oct. 05, 2020).
- [177] IOAC, "Looking back to move forward, IOAC report to the resumed WHA73/10," Independent Oversight and Advisory Committee for the WHO Health Emergencies Programme, Geneva, Switzerland, Nov. 2020. Accessed: Nov. 12, 2020. [Online]. Available: <https://www.who.int/publications/m/item/looking-back-to-move-forward-ioac-report-to-the-resumed-wha73-10>.
- [178] G. Ren, "Patchwork Of Traveler Testing & Quarantine Policies Cause Confusion; WHO Says Travelers Should Be Prepared For Sudden Changes," *Health Policy Watch*, Aug. 07, 2020. <https://healthpolicy-watch.news/governments-take-different-approaches-to-detecting-imported-infections-as-borders-open-up/> (accessed Oct. 24, 2020).
- [179] D. Sevastopulo and D. P. Mancini, "US raises 'deep concerns' over WHO report on Covid's Wuhan origins," *Financial Times*, Feb. 14, 2021.
- [180] G. Shih, "As WHO coronavirus mission leaves empty-handed, China claims propaganda win," *Washington Post*, Taipei, Taiwan, Feb. 10, 2021.

- [181] WHO (World Health Organization), "How WHO is funded," *World Health Organization*, May 29, 2020. <https://www.who.int/about/planning-finance-and-accountability/how-who-is-funded> (accessed Oct. 26, 2020).
- [182] J. L. Ravelo, "Margaret Chan attempts one last WHO funding boost," *Devex*, Nov. 03, 2016. <https://www.devex.com/news/sponsored/margaret-chan-attempts-one-last-who-funding-boost-89064> (accessed Nov. 12, 2020).
- [183] J. L. Ravelo, "WHO's budget and the tasks for the next director-general," *Devex*, May 30, 2017. <https://www.devex.com/news/sponsored/who-s-budget-and-the-tasks-for-the-next-director-general-90385> (accessed Nov. 12, 2020).
- [184] A. D. Usher, "WHO launches crowdfund for COVID-19 response - The Lancet," *The Lancet*, vol. 395, no. 10229, p. P1024, Mar. 2020.
- [185] Swissinfo, "WHO launches fundraising foundation in Geneva," *Swissinfo*, May 28, 2020.
- [186] WHO (World Health Organization), "COVID-19 Solidarity Response Fund for WHO," *COVID-19 Solidarity Response Fund*, 2020. <https://covid19responsefund.org/en/> (accessed Mar. 12, 2021).
- [187] WHO (World Health Organization), "COVID-19 contributions tracker," *World Health Organization*, Sep. 21, 2020. <https://www.who.int/emergencies/diseases/novel-coronavirus-2019/donors-and-partners/funding> (accessed Sep. 25, 2020).
- [188] M. Godoy, "Biden Said He'd Walk Back Trump's WHO Walkout. Can All The Damage Be Undone?," *Goats and Soda*, Nov. 09, 2020. <https://www.npr.org/sections/goatsandsoda/2020/11/09/932065656/biden-said-hed-walk-back-trump-s-who-walkout-can-all-the-damage-be-undone> (accessed Nov. 09, 2020).
- [189] E. Wolfson, "Trump Said He Would Terminate the U.S. Relationship With the W.H.O. Here's What That Means," *Time*, Jun. 04, 2020.
- [190] P. Huang, "Trump And WHO: How Much Does The U.S. Give? What's The Impact Of A Halt In Funding?," *Goats and Soda*, Apr. 15, 2020. <https://www.npr.org/sections/goatsandsoda/2020/04/15/834666123/trump-and-who-how-much-does-the-u-s-give-whats-the-impact-of-a-halt-in-funding> (accessed Sep. 25, 2020).
- [191] C. Cheney, "'Big concerns' over Gates foundation's potential to become largest WHO donor," *Devex*, Jun. 05, 2020. <https://www.devex.com/news/sponsored/big-concerns-over-gates-foundation-s-potential-to-become-largest-who-donor-97377> (accessed Nov. 12, 2020).
- [192] IrishCentral Staff, "Ireland to quadruple its WHO contribution after US 'halts' funding," *IrishCentral.com*, Apr. 16, 2020. <https://www.irishcentral.com/news/politics/ireland-who-contribution> (accessed Oct. 26, 2020).
- [193] News Now Staff, "Finland pledges 5.5 million more to help cover Donald Trump's WHO funding gap | *News Now Finland*," *News Now Finland*, Apr. 15, 2020.

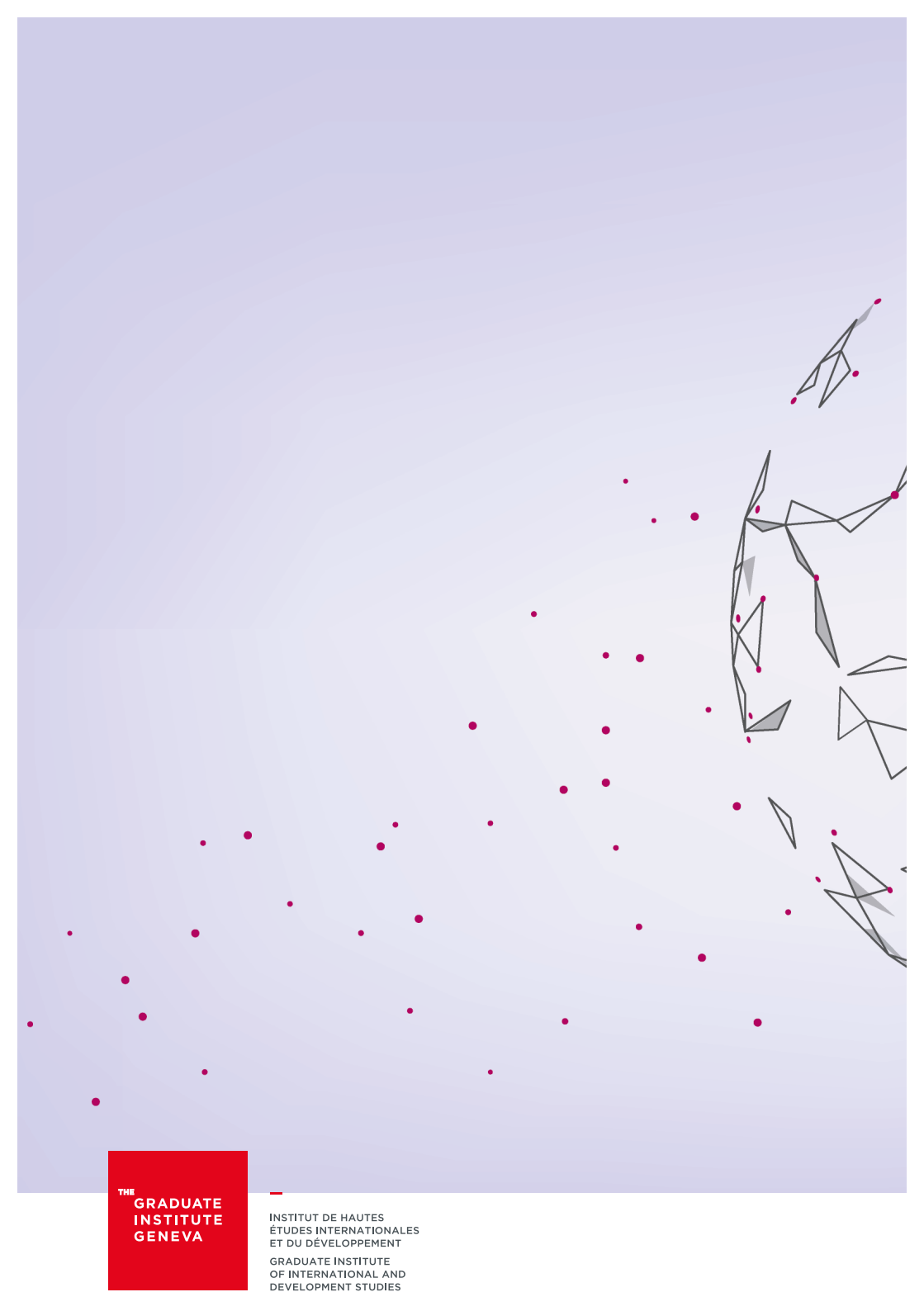
- [194] C. Gallardo, "UK to increase funding for WHO by 30 percent," *POLITICO*, Sep. 25, 2020. <https://www.politico.eu/article/uk-to-increase-funding-for-who-by-30-percent/> (accessed Sep. 28, 2020).
- [195] WHO, "Emergency Response Framework - 2nd Edition," World Health Organization, Geneva, Apr. 2017. [Online]. Available: <http://apps.who.int/iris/bitstream/10665/258604/1/9789241512299-eng.pdf?ua=1>.
- [196] Inter-Agency Standing Committee, "Level 3 (L3) Activation Procedures for Infectious Disease Events," World Health Organization, Geneva, 2016. Accessed: Feb. 14, 2019. [Online]. Available: <https://interagencystandingcommittee.org/principals/documents-public/final-iasc-system-wide-level-3-l3-activation-procedures-infectious>.
- [197] B. Parker, "UN prepares unprecedented COVID-19 appeal," *The New Humanitarian*, Jul. 14, 2020. <https://www.thenewhumanitarian.org/news/2020/07/14/UN-10-billion-covid-appeal> (accessed Oct. 05, 2020).
- [198] Financial Tracking Service UNOCHA, "COVID-19 Global Humanitarian Response Plan (Humanitarian response plan)," *UN OCHA*, 2020. <https://fts.unocha.org/appeals/952/summary> (accessed Mar. 12, 2021).
- [199] UNOCHA, "In the battle against COVID-19, aid groups are achieving results for vulnerable communities," UNOCHA, Apr. 2020. Accessed: Oct. 06, 2020. [Online]. Available: <https://reliefweb.int/report/world/battle-against-covid-19-aid-groups-are-achieving-results-vulnerable-communities-enar>.
- [200] UN Security Council, "Conflict Zone Populations Face Gravest Threat of Hunger amid COVID-19, Aid Experts Tell Security Council, Warning Food Insecurity Worldwide Expected to Double by Year's End," *United Nations*, Sep. 17, 2020. <https://www.un.org/press/en/2020/sc14308.doc.htm> (accessed Oct. 06, 2020).
- [201] MSF, "MSF brings COVID-19 support to Houston nursing homes," *Doctors Without Borders - USA*, Sep. 10, 2020. <https://www.doctorswithoutborders.org/what-we-do/news-stories/news/msf-brings-covid-19-support-houston-nursing-homes> (accessed Oct. 06, 2020).
- [202] R. Ratcliffe, L. Ford, L. McMullan, P. Gutierrez, and G. Blight, "Cox's Bazar refugee camps: where social distancing is impossible," *The Guardian*, Jun. 29, 2020.
- [203] Bill and Melinda Gates Foundation, "Covid-19 A Global Perspective: 2020 Goalkeepers Report," Bill and Melinda Gates Foundation, Sep. 2020. Accessed: Oct. 26, 2020. [Online]. Available: <https://www.gatesfoundation.org/goalkeepers/report/2020-report/>.
- [204] WHO (World Health Organization), "WHO and UNICEF warn of a decline in vaccinations during COVID-19," *WHO*, Jul. 15, 2020. <https://www.who.int/news/item/15-07-2020-who-and-unicef-warn-of-a-decline-in-vaccinations-during-covid-19> (accessed Oct. 26, 2020).
- [205] A. B. Hogan *et al.*, "Potential impact of the COVID-19 pandemic on HIV, tuberculosis, and malaria in low-income and middle-income countries: a modelling study," *Lancet Glob. Health*, vol. 8, no. 9, pp. e1132–e1141, Sep. 2020, doi: 10.1016/S2214-109X(20)30288-6.

- [206] The Global Fund, "Global Fund Partnership Has Saved 38 Million Lives – but COVID-19 Could Wipe Out Progress," *The Global Fund to Fight AIDS, Tuberculosis, and Malaria*, Sep. 14, 2020. /en/news/2020-09-14-global-fund-partnership-has-saved-38-million-lives/ (accessed Oct. 26, 2020).
- [207] GPMB (Global Preparedness Monitoring Board), "A World at Risk: Annual report on global preparedness for health emergencies," Global Preparedness Monitoring Board, Geneva, Switzerland, 2019. Accessed: Nov. 12, 2020. [Online]. Available: https://apps.who.int/gpmb/assets/annual_report/GPMB_Annual_Report_English.pdf.
- [208] World Bank, "From panic and neglect to investing in health security : financing pandemic preparedness at a national level," The World Bank, Washington, D.C., Working Paper 115271, May 2017. Accessed: May 11, 2020. [Online]. Available: <http://documents.worldbank.org/curated/en/979591495652724770/From-panic-and-neglect-to-invest-in-health-security-financing-pandemic-preparedness-at-a-national-level>.
- [209] C. Huber, L. Finelli, and W. Stevens, "The Economic and Social Burden of the 2014 Ebola Outbreak in West Africa," *J. Infect. Dis.*, vol. 218, no. Supplement_5, pp. S698–S704, Nov. 2018, doi: 10.1093/infdis/jiy213.
- [210] World Bank Group, "Global Economic Prospects," World Bank Group, Washington, D.C., Jan. 2021. Accessed: Mar. 12, 2021. [Online]. Available: <https://www.worldbank.org/en/publication/global-economic-prospects>.
- [211] C. Lakner, N. Yonzan, D. G. Mahler, R. A. Castaneda Aguilar, and H. Wu, "Updated estimates of the impact of COVID-19 on global poverty: Looking back at 2020 and the outlook for 2021," Jan. 11, 2021. <https://blogs.worldbank.org/opendata/updated-estimates-impact-covid-19-global-poverty-looking-back-2020-and-outlook-2021> (accessed Mar. 12, 2021).
- [212] IMF (International Monetary Fund), "Policy Responses to COVID19," *IMF*, Jan. 2021. <https://www.imf.org/en/Topics/imf-and-covid19/Policy-Responses-to-COVID-19> (accessed Mar. 12, 2021).
- [213] A. Zurcher, "Covid stimulus: Biden signs \$1.9tn relief bill into law," *BBC News*, Mar. 11, 2021.
- [214] European Commission, "Recovery plan for Europe," *European Commission - European Commission*, 2020. https://ec.europa.eu/info/strategy/recovery-plan-europe_en (accessed Mar. 12, 2021).
- [215] J. Duggan, S. Morris, J. Sandefur, and G. Yang, "New Data Show the World Bank's COVID Response Is Too Small and Too Slow," *Center For Global Development*, Oct. 12, 2020. <https://www.cgdev.org/blog/new-data-show-world-banks-covid-response-is-too-small-too-slow> (accessed Nov. 06, 2020).

- [216] World Bank, "World Bank Approves \$12 Billion for COVID-19 Vaccines," *World Bank*, Oct. 13, 2020. <https://www.worldbank.org/en/news/press-release/2020/10/13/world-bank-approves-12-billion-for-covid-19-vaccines> (accessed Oct. 26, 2020).
- [217] World Bank, "World Bank Group's Operational Response to COVID-19 (coronavirus) – Projects List," *World Bank*, Jul. 31, 2020. <https://www.worldbank.org/en/about/what-we-do/brief/world-bank-group-operational-response-covid-19-coronavirus-projects-list> (accessed Aug. 03, 2020).
- [218] M. Igoe, "Is World Bank fast-track COVID-19 funding reaching the most vulnerable?," *Devex*, Oct. 12, 2020. <https://www.devex.com/news/sponsored/is-world-bank-fast-track-covid-19-funding-reaching-the-most-vulnerable-98292> (accessed Nov. 06, 2020).
- [219] IMF (International Monetary Fund), "COVID-19 Financial Assistance and Debt Relief," *International Monetary Fund*, Oct. 02, 2020. <https://www.imf.org/en/Topics/imf-and-covid19/COVID-Lending-Tracker> (accessed Oct. 08, 2020).
- [220] E. Rucaj, N. Hamadeh, and H. Fu, "Understanding global debt: Relieving the COVID-19 impact on the most vulnerable," *Data Blog, World Bank Blogs*, Jul. 08, 2020. <https://blogs.worldbank.org/opendata/understanding-global-debt-relieving-covid-19-impact-most-vulnerable> (accessed Oct. 05, 2020).
- [221] EEAS (European External Action Service), "Coronavirus: news on EU action, Team Europe support, disinformation, repatriation and solidarity stories," *EEAS - European External Action Service - European Commission*, 2020. https://eeas.europa.eu/headquarters/headquarters-homepage/76341/coronavirus-news-eu-action-team-europe-support-disinformation-repatriation-and-solidarity_en (accessed Nov. 12, 2020).
- [222] A. Glassman and S. Raghavan, "How Much Is Actually Being Spent on Ebola?," *Center For Global Development*, Oct. 27, 2014. <https://www.cgdev.org/blog/how-much-actually-being-spent-ebola> (accessed Oct. 06, 2020).
- [223] A. Glassman, "After Ebola -- Finance & Development," *Finance Dev.*, vol. 53, no. 2, Jun. 2016, Accessed: Oct. 06, 2020. [Online]. Available: <https://www.imf.org/external/pubs/ft/fandd/2016/06/glassman.htm>.
- [224] B. McKay, "Ebola Funds Pledged for Recovery Are Slow to Come," *Wall Street Journal*, Mar. 20, 2018.
- [225] A. Grabowski, "Transparency is more than dollars and cents: An examination of informational needs for aid spending in Sierra Leone and Liberia," *Oxfam*, Sep. 2017. doi: 10.21201/2017.0377.
- [226] U. Fofana, "Where are Sierra Leone's missing Ebola millions?," *BBC News*, Freetown, Jan. 23, 2017.
- [227] R. Root, "After Ebola funds fiasco, IFRC is 'confident' corruption won't get COVID-19 money," *Devex*, Apr. 06, 2020. <https://www.devex.com/news/sponsored/after-ebola-funds-fiasco-ifrc-is-confident-corruption-won-t-get-covid-19-money-96876> (accessed Oct. 06, 2020).

- [228] B. Parker, "Keeping track of COVID-19 aid," *The New Humanitarian*, Jun. 03, 2020.
- [229] S. Moon and R. Vaidya, "Investing for a rainy day: Challenges in financing preparedness for outbreaks," Global Health Centre, Graduate Institute of International and Development Studies, Geneva, Switzerland, 2018. [Online]. Available: https://repository.graduateinstitute.ch/record/296613?_ga=2.6766514.1858297292.1605199605-2032977844.1605199605.
- [230] UN Security Council, "Secretary-General Highlights 'Essential' Failure of International Cooperation, in Address to Security Council Meeting on Post-Coronavirus Global Governance," UN Security Council, New York, USA, Sep. 2020. Accessed: Oct. 01, 2020. [Online]. Available: <https://www.un.org/press/en/2020/sc14312.doc.htm>.
- [231] The Editors, "Dying in a Leadership Vacuum," *N. Engl. J. Med.*, vol. 383, no. 15, pp. 1479–1480, Oct. 2020, doi: 10.1056/NEJMe2029812.
- [232] R. A. Blair, B. S. Morse, and L. L. Tsai, "Public health and public trust: Survey evidence from the Ebola Virus Disease epidemic in Liberia," *Soc. Sci. Med.*, vol. 172, pp. 89–97, Jan. 2017, doi: 10.1016/j.socscimed.2016.11.016.
- [233] T. Yamanis, E. Nolan, and S. Shepler, "Fears and Misperceptions of the Ebola Response System during the 2014–2015 Outbreak in Sierra Leone," *PLoS Negl. Trop. Dis.*, vol. 10, no. 10, Oct. 2016, doi: 10.1371/journal.pntd.0005077.
- [234] B. Jones and N. Elbagir, "Are myths making the Ebola outbreak worse?," *CNN*, Aug. 25, 2014.
- [235] WHO (World Health Organization), "Busting the myths about Ebola is crucial to stop the transmission of the disease in Guinea," *Features*, 2014. <https://www.who.int/features/2014/ebola-myths/en/>.
- [236] International Crisis Group, "The Politics Behind the Ebola Crisis," International Crisis Group, Brussels, Belgium, Africa Report Number 232, Oct. 2015. Accessed: Oct. 07, 2020. [Online]. Available: <https://d2071andvip0wj.cloudfront.net/232-the-politics-behind-the-ebola-crisis.pdf>.
- [237] T. K. Sell, D. Hosangadi, and M. Trotochaud, "Misinformation and the US Ebola communication crisis: analyzing the veracity and content of social media messages related to a fear-inducing infectious disease outbreak," *BMC Public Health*, vol. 20, no. 1, p. 550, May 2020, doi: 10.1186/s12889-020-08697-3.
- [238] British Medical Association, "BMA says Government is still sending mixed messaging to the public about Covid - BMA media centre," *British Medical Association*, Jul. 31, 2020. <https://www.bma.org.uk/bma-media-centre/bma-says-government-is-still-sending-mixed-messaging-to-the-public-about-covid> (accessed Oct. 02, 2020).
- [239] C. Farr, "Brazil turned the coronavirus into a political football, with devastating results," *CNBC*, Jul. 22, 2020.
- [240] A. Rettman, "Anti-mask protesters pose challenge for EU authorities," *EUobserver*, Sep. 24, 2020.

- [241] I. Kershner, "Israel's Coronavirus Lockdown Fuels Protests, Violence and Confusion," *The New York Times*, Oct. 05, 2020.
- [242] BBC News, "Germany coronavirus: Hundreds arrested in German 'anti-corona' protests," Aug. 30, 2020.
- [243] M. Tracy, "Anti-Lockdown Protesters Get in Reporters' (Masked) Faces," *The New York Times*, May 13, 2020.
- [244] Reuters, "Video: 'It Doesn't Make Sense': Madrid Residents Protest Lockdown," *The New York Times*.
- [245] "Covid-19: Anti-maskers mock French government call for mandatory mask-wearing," *RFI*, Aug. 05, 2020. <https://www.rfi.fr/en/france/20200805-covid-19-anti-maskers-mock-french-government-call-for-mandatory-mask-wearing-health> (accessed Oct. 07, 2020).
- [246] S. Evanega, M. Lynas, J. Adams, and K. Smolenyak, "Coronavirus misinformation: Quantifying sources and themes in the COVID-19 'infodemic,'" Cornell University, Sep. 2020. [Online]. Available: <https://allianceforscience.cornell.edu/wp-content/uploads/2020/09/Evanega-et-al-Coronavirus-misinformationFINAL.pdf>.
- [247] P. S. Hart, S. Chinn, and S. Soroka, "Politicization and Polarization in COVID-19 News Coverage," *Sci. Commun.*, vol. 42, no. 5, Aug. 2020, Accessed: Nov. 12, 2020. [Online]. Available: <https://journals.sagepub.com/doi/full/10.1177/1075547020950735>.
- [248] C. Funk and A. Tyson, "Partisan Differences over the Pandemic Response Are Growing," *Scientific American Blog Network*, Mar. 30, 2020. <https://blogs.scientificamerican.com/observations/partisan-differences-over-the-pandemic-response-are-growing/> (accessed Nov. 12, 2020).
- [249] A. Mandavilli, "C.D.C. Testing Guidance Was Published Against Scientists' Objections," *The New York Times*, Sep. 17, 2020.
- [250] U. Friedman, "The Coronavirus-Denial Movement Now Has a Leader," *The Atlantic*, Mar. 27, 2020. <https://www.theatlantic.com/politics/archive/2020/03/bolsonaro-coronavirus-denial-brazil-trump/608926/> (accessed Oct. 07, 2020).
- [251] A. L. Dahir, "Tanzania's President Says Country Is Virus Free. Others Warn of Disaster," *The New York Times*, Aug. 04, 2020.
- [252] D. Sevastopulo and P. Wells, "Donald Trump criticises Anthony Fauci and calls him 'a disaster,'" *Financial Times*, Oct. 19, 2020.
- [253] UN News, "New health board aims to break 'cycle of panic and neglect' on pandemics," *UN News*, May 24, 2018.
- [254] The Lancet Covid-19 Commissioners, Task Force Chairs, and Commission Secretariat, "Lancet COVID-19 Commission Statement on the occasion of the 75th session of the UN General Assembly," *The Lancet*, Sep. 2020, doi: 10.1016/S0140-6736(20)31927-9.



THE
GRADUATE
INSTITUTE
GENEVA

INSTITUT DE HAUTES
ÉTUDES INTERNATIONALES
ET DU DÉVELOPPEMENT
GRADUATE INSTITUTE
OF INTERNATIONAL AND
DEVELOPMENT STUDIES