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RESEARCH ARTICLE

Taking Systems Thinking to the Global Level: Using the WHO Building Blocks to Describe and Appraise the Global Health System in Relation to COVID-19

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Abstract

Adequately preparing for and containing global shocks, such as COVID-19, is a key challenge facing health systems globally. COVID-19 highlights that health systems are multilevel systems, a continuum from local to global. Goals and monitoring indicators have been key to strengthening national health systems but are missing at the supranational level. A framework to strengthen the global system—the global health actors and the governance, finance, and delivery arrangements within which they operate—is urgently needed. In this article, we illustrate how the World Health Organization Building Blocks framework, which has been used to monitor the performance of national health systems, can be applied to describe and appraise the global health system and its response to COVID-19, and identify potential reforms. Key weaknesses in the global response included: fragmented and voluntary financing; non-transparent pricing of medicines and supplies, poor quality standards, and inequities in procurement and distribution; and weak leadership and governance. We also identify positive achievements and identify potential reforms of the global health system for greater resilience to future shocks. We discuss the limitations of the Building Blocks framework and future research directions and reflect on political economy challenges to reform.

1 | THE NEED FOR GLOBAL HEALTH SYSTEM THINKING

The effect of COVID-19 on health systems, the global economy, and human life has been profound. Preparing for and containing pandemics such as COVID-19 represents just one of many collective action problems in global health (Soucat, 2019), with health risks such as antimicrobial resistance (AMR; Institute of Medicine, 2014), the financing of healthcare for refugees (High-Level Panel on Humanitarian Financing, 2016), and the health effects of climate change representing similar challenges for national health systems. National health systems acting alone are unable to tackle these challenges owing to externalities (Soucat, 2019); their resolution requires cooperation and effective action at the global level. A tangled form of collective action exists at the global level in the form of the global health system (Frenk & Moon, 2013). The global health system has been

defined as including 'the transnational actors that have a primary intent to improve health and the polylateral arrangements for governance, finance, and delivery within which these actors operate', involving arrangements for service delivery, financing, and governance (Hoffman & Cole, 2018).

However, the global health system has been found lacking in dealing with transnational challenges requiring collective action, (e.g. Hoffman et al., 2015; Moon et al., 2015) and remains underfunded (Yamey et al., 2019). Consequently, the need for reform of the global health system has been recognised for some time (Frenk & Moon, 2013; Moon et al., 2015; Smith & Lees, 2017), with COVID-19 now dramatically highlighting the shortcomings of the existing global health system (Global Preparedness Monitoring Board, 2020; Gostin et al., 2020; Paul et al., 2020). Moreover, COVID-19 has strongly increased attention given to this issue by government officials and agencies, with calls for greater coordination in health at the global level and enhanced mutual support and solidarity between countries (Elliot, 2020; Foreign Commonwealth & Development Office, 2021; G7, 2021; Independent Panel for Pandemic Preparedness & Response for the WHO Executive Board, 2021; Pan-European Commission on Health & Sustainable Development, 2021).

An important first step towards reforming the global health system is addressing the normative question of what the goals and functions of the system should be. Nonetheless, to date, relatively limited attention has been given to this issue. Key functions for the global health system that have been proposed include production of global public goods, mobilisation of global solidarity, management of externalities across countries, and stewardship (Frenk & Moon, 2013). However, metrics to track the global health system often remain focused on assessing the degree of protection of high-income countries from public health threats originating in low- and middle-income countries, rather than improving health globally (El Bcheraoui et al., 2020). To date, there has been neither a holistic assessment of the global health system nor the use of a health-system framework to guide thinking in this area. Recognition is growing of the importance of 'systems thinking' for country health systems, and the application of these methods has helped improve health-system performance (Durski et al., 2020). We argue that such an approach could be applied to the global health system to provide insights into key system constraints and identify potential reform options, enabling health-system knowledge at national and subnational levels to be leveraged to further our understanding of the global health system and to establish a framework for monitoring progress towards strengthening the global system (De Savigny & Adam, 2009).

Policy Implications

- Viewing the global health system as a 'health system' is key to improving our understanding of the system and reforming it in meaningful ways. This is particularly important in the face of COVID-19 response failures.
- The WHO Building Blocks framework provides a clear set of capacities and goals that can be used to study and appraise the global health system, helping to identify strengths, gaps, and potential areas for reform. It also lays the groundwork for the development of indicators adapted to the global level to monitor progress across each of the Building Blocks.
- The Building Blocks framework highlights areas of potential reform for the global health system, including (financing) increasing compulsory financing to ensure predictable and adequate funds to support global governance functions; (financing) greater pooled international funding, with consistent prioritisation and resource allocation systems; (human resources) greater enforcement of the implementation of the Code of Practice; (human resources) encourage more countries to offer emergency medical teams with skills in non-communicable diseases (NCDs) or public health; (medicines) increase transparency on prices and ensure that pricing of global common goods is negotiated in the interest of countries globally and remove barriers to production.
- Governance is a critical function underpinning and intersecting each of the Building Blocks. Although the diversity of actors and diverging interests could limit the global community's ability to reform the global health system, the costs and risks associated with COVID-19 and future pandemics could mobilise collective action for renewed solidarity in global health.
- Complexity science methods can and should complement the use of the Building Blocks to better understand the structure of the global health system, the interactions between system components, the relative weighting and importance of different Building Blocks, together with the potential consequences of reform options, to guide decision-making.

One entry point to better understand the global health system is the World Health Organization (WHO) Building Blocks framework, which sets goals and

provides a monitoring and evaluation framework for national health systems and enhances health-system performance (WHO, 2010). The WHO framework describes health systems in terms of six components or Building Blocks: (i) financing, (ii) health workforce, (iii) information systems, (iv) medical products and technologies, (v) leadership/governance, and (vi) service delivery. The WHO Building Blocks framework has been used widely to study and describe national health systems and their performance in a variety of countries (e.g. Manyazewal, 2017; Marx et al., 2018; Mounier-Jack et al., 2014; Mutale et al., 2013), and to evaluate the effects of reform initiatives on health systems (Obermann et al., 2016; Rakmawati et al., 2019). However, to date, there has not been an attempt to apply this framework heuristically to the global health system. The benefit of applying a widely known health-system framework to study the global health system is that it would enable goal setting at the global level and the future monitoring of progress towards these goals.

In this article, we illustrate how the WHO Building Blocks framework can be applied to describe and appraise the global health system, to identify goals and functions as a starting point to monitor progress towards strengthening the global health system. We use the experience of COVID-19 as an illustration of the constraints and opportunities of the global health system and as a means to contain the scope of the paper.

2 | MATERIALS AND METHODS

We used the WHO Building Blocks to identify the goals and functions of a health system. We then undertook a rapid scoping review of published and grey literature using keyword searches related to the term global, and terms related to the goals and functions of each of the Building Blocks. Over the period March 2020–March 2021, we also scanned a variety of news outlets for relevant articles. We retained evidence relating to the global health-system functioning in relation to the Building Blocks. Although the search was not restricted, we prioritised evidence pertaining to the COVID-19 response to contain the scope of the paper. The search was not intended to be systematic, as the purpose of the paper is to illustrate the application of the Building Blocks framework to the global health system and to introduce a potentially useful research agenda. In the rest of the paper, we consider each of the Building Blocks in turn, reflecting on their respective goals and functions. We then use this as a benchmark against which to appraise current global systems for health, drawing on the collated evidence, using COVID-19 as an example.

3 | RESULTS

3.1 | Health financing

Health financing refers to the 'the mobilization, accumulation and allocation of money to cover the health needs of the people, individually and collectively' (WHO, 2007). The goal of health financing is to ensure universal health coverage (UHC) or affordable access to care for all. There are three core financing functions: revenue collection, pooling, and purchasing. To achieve UHC, compulsory contributions, which are progressive (i.e. the rich pay a relatively larger share of their income than the poor), are recommended (McIntyre & Kutzin, 2016), together with pooling of resources at the highest level possible to maximise efficiency and redistribution. Funds should support a minimum benefit package for all, with payment to maximise health-system performance or strategic purchasing.

When considered against these functions, health financing at the global level has some strengths. In terms of revenue collection, the global system has demonstrated some ability to rapidly mobilise funds to respond to COVID-19. Almost 16 billion euros were committed in June 2020 by the G7 and others to support the Coronavirus Global Response (https://ec.europa.eu/commission/presscorner/detail/en/qanda_20_1216), with the highest commitments ever pledged by the World Bank Group to support low income countries (World Bank, 2020). As of March 2021, the funding committed to combating COVID-19 had exceeded USD 21.3 trillion (Cornish, 2021). Commitments to the Access to COVID-19 Tools (ACT) Accelerator, which supports the development and equitable distribution of tests, treatments, and vaccines for COVID-19, were estimated at almost USD 11 billion as of April 2021 (WHO, 2021).

In recognition of the substantial burden that COVID-19 places on household budgets, together with the imperative of accessing testing and treatment to contain the virus spread, WHO encouraged countries to suspend user fees and provide free vaccinations, testing, and care for COVID-19, regardless of a person's insurance, citizenship, or residence status (WHO, 2020). Numerous countries have since adapted their financing arrangements, enhancing progress towards universal coverage (Gaffney et al., 2020; Kluge et al., 2020; Ridde et al., 2020).

However, a number of weaknesses in the global health system are also notable, undermining the UHC goal of health financing. Contributions to global health are largely voluntary and, as a result, highly concentrated among a few donors. For example, 78% of funding for common goods for health (such as supporting global public goods, managing cross-border externalities, and global governance) came from just five international funders (the US, the Bill and Melinda Gates Foundation, the Global Alliance for Vaccines

and Immunization [GAVI], and the UK; Schäferhoff et al., 2019). Three countries provided half of the total commitments to the ACT Accelerator (WHO, 2021). Three-quarters of WHO's budget comes from voluntary contributions, most of which are earmarked for specific activities by the donor. Voluntary contributions mean funding flows can be volatile and subject to changing political priorities (Clift & Røttingen, 2018). The US giving notice of its withdrawal from the WHO, and its suspension of funding to the organisation (Peel et al., 2020), is a good example of this and would have severely affected the WHO budget, which was already short of USD 1.2 billion to fulfil its mission. Furthermore, despite substantial commitments, a reliance on voluntary contributions can make it difficult to leverage sufficient funding to meet needs. As of April 2021, the WHO COVID-19 appeal had only received USD 455 million, with an estimated USD 1.5 billion still needed (WHO, 2021). Equally, as of February 2021, the ACT Accelerator, had met only 20% of its estimated need, with the health-system connector receiving only 5% of funds required and a USD 27 billion funding gap (WHO, 2021).

International financing for health is also highly fragmented, with a proliferation of actors involved in development assistance for health (Moon & Omole, 2017) and hundreds of channels of delivering aid (Spicer et al., 2020). For COVID-19 alone, a multiplicity of funding initiatives supports the COVID-19 response. In addition to the Coronavirus Global Response, other initiatives include the Coalition for Epidemic Preparedness Innovations (CEPI), the WHO Contingency Fund for Emergencies, the WHO COVID Solidarity Fund, the ACT Accelerator, and the Pandemic Emergency Financing Facility (PEFF), which has now been abandoned (Hodgson, 2020). COVID-19 has led to the establishment of new condition- and population-specific pools of funds, adding to the existing set of global funding pools (e.g. Global Fund, GAVI, the President's Emergency Plan for AIDS Relief [PEPFAR]), whereas the use of different financing pools to serve different populations is discouraged within national health systems (Mathauer et al., 2019), and contributes to inefficiencies (Mathauer et al., 2020).

In terms of purchasing, 23% of Official Development Assistance (ODA) has been estimated to support global health-system functions, with this amount declining over time (Schäferhoff et al., 2019). Although there is no agreed target level of ODA needed to address global health functions, the falling levels are concerning given the rise in global level challenges facing health systems. Global level allocations are based on gross national income or disease burden trends rather than the broader criteria used to determine resource allocations in national planning (Soucat & Kickbusch, 2020) and fail to consider inequities within countries. Furthermore, there is a lack of alignment across international donor funding agencies in terms of prioritisation and resource allocation for global health (Ottersen, Elovainio, et al., 2017; Ottersen, Kamath, et al., 2017; Ottersen, Moon, et al., 2017), including COVID-19. With regards to the allocation of COVID-19 vaccines under the COVAX scheme, which we describe further below, although the aim is to enhance equity by offering free doses to low- and middle-income countries (LMIC)—and requiring financial contributions from high-income countries—the initial allocation across LMIC is based on population size rather than any needs-based considerations (Herzog et al., 2021).

3.2 | Health workforce

According to the WHO, the health workforce can be defined as 'all people engaged in actions whose primary intent is to enhance health' (WHO, 2010). These human resources include clinical staff, management, and support staff. The availability of adequately trained health personnel in sufficient numbers to deliver care to the population is an essential pillar of a functioning health system and its ability to deliver UHC. A health system is responsible for matching up the supply and skills of health workers to the needs of its population (WHO, 2016). At the global level, activities have centred on tackling the global distribution and shortage of health workers and creating a global health workforce.

In relation to this goal, the global health system counts a number of achievements. The WHO Code of Practice on the international recruitment of health workers (2010) establishes ethical norms and attempts to regulate health-worker migration globally. The integration of migrant and refugee health workers into local health systems has been put forward as a strategy to boost the global supply of health workers (Ehiri et al., 2014). Since COVID-19, governments across Europe and the US have relaxed restrictions to allow the employment and practice of health workers with refugee and asylum-seeker status which, if sustained, would provide a lasting boost to health-worker numbers (McVeigh & Jones, 2020). WHO also manages a global health emergency workforce in the form of emergency medical teams (EMT), which provide surge support to national health systems, delivering emergency care following an outbreak or disaster. WHO maintains a global roster of quality-assured EMT, with each team comprising 50 staff, plus 500–1000 who can be deployed for rotation. In relation to COVID-19, numerous teams have been mobilised to lend support to areas struggling to manage the virus (Malteser International, 2020; WHO, 2020; Xinhua, 2020). At the European level, guidelines were established to promote greater cooperation in the delivery of healthcare across borders, including providing access to appropriately trained

medical professionals and sharing medical knowledge (European Commission, 2020).

However, despite progress, the global health system still struggles to effectively align supply and demand of health workers globally. As of 2019, only 62% of WHO member states had designated a national authority responsible for reporting on the implementation of the Code of Practice (WHO, 2019), and key signatory countries, such as the UK, continue to violate the Code. The main challenge has been the non-binding nature of the Code, the difficulty of coordinating the multiplicity of actors involved in health-worker recruitment within countries, and the tension between global and domestic healthcare priorities and needs (Tam et al., 2016).

Furthermore, to date only a limited number of countries have signed up to offer EMT. As of 2016, there were estimated to be just over 64 EMT from 25 countries (Burkle, 2016) with the US, for example, failing to provide an EMT. In addition, because of their focus on emergency/disaster management, the teams are weighted towards surgical/clinical care with less knowledge of other health areas such as NCDs, or public health, which may be more relevant to pandemic control (El-Khani et al., 2019).

Key to aligning the distribution of the global health workforce with global needs are adequately staffed global health institutions such as the WHO. Although benchmarks of need at this level are currently lacking, there has been a recent increase in global staffing, although falling staff numbers in Africa and Southeast Asia are potentially concerning (WHO, 2021).

3.3 | Information systems

Reliable information is key to decision-making across the health-system Building Blocks. As stated by the WHO, it is 'essential for policy development and implementation, governance and regulation, health research, human resources development, health education and training, service delivery and financing'. According to the Building Blocks, health information systems have four key functions: (i) data generation, (ii) compilation, (iii) analysis and synthesis, and (iv) communication and use.

A nascent strength of the current global health system includes efforts to standardise how national governments and international organisations collect, collate, and report general population health data as well as significant interface improvements between the platforms used to share information. Global standardisation has allowed for the creation of additional and more reliable evidence bases, which have been used more effectively in the design and implementation of state and global health initiatives, such as baseline estimates associated with Sustainable Development Goal 3 (Fullman et al., 2015).

However, this growth in international data collection and compilation has also created positive and negative consequences in terms of its effective use and communication, particularly as it relates to COVID-19. As a positive, multifarious sources have allowed for increased data generation, analysis, and communication between scientists working on COVID-19. Given the novelty of the virus, a multiplicity of actors has increased the rapid availability of information (such as the viral genomes platform, GISAID) while creating more sources for scientific confirmation (Kupferschmidt, 2020). In March 2020, WHO initiated Solidarity I and II, which included an international clinical trial to test existing drugs against COVID-19 as well as a serologic blood test to better understand the development of antibodies to SARS-CoV-2 and to track the development of natural immune response (WHO, 2020; WHO, 2020). However, this has met with considerable resistance from key global actors, such as the US and Brazil, who promoted their own unproven treatments without a credible evidence base (Londoño, 2020; Vogel, 2020).

Despite pockets of organisation, the division of labour has, by and large, been uncoordinated, fragmented, at times competitive (Petersen et al., 2020), at times contradictory (such as with the effectiveness of facemasks (Martin et al., 2020), and without a single trusted source for information synthesis and guidance. One negative result has been higher informational transaction costs in reviewing and verifying evidence for policymakers and the general population, which has ripened the environment for confused messaging (Cushion et al., 2020), misinformation, and anti-science scepticism (Rodriguez, 2021).

In terms of 'communication and use', it is now widely accepted that the data reporting requirements of the 2005 International Health Regulations (IHRs), which are meant 'to help the international community and governments prevent and respond to acute public health risks that have the potential to cross borders and threaten people worldwide' (WHO, 2016), were not complied with as stipulated under Articles 3, 6, and 43 (as just a few examples; Habibi et al., 2020). The IHRs oblige states to notify the WHO of any event that may constitute a Public Health Emergency of International Concern (PHEIC) within 24 hours of a local public health assessment. In the case of outbreak response, in violation of Article 6, there is evidence to suggest that there was at least a two-week delay in China's first reporting of information to the WHO (Huang et al., 2020) and emerging evidence that SARS-CoV-2 was known as a potential threat months prior to reporting (Abazi, 2020; Fu & Zhu, 2020). This was compounded by the slow release of virus samples, impeding international analysis and information synthesis. Globally, only 45 countries reported COVID-19 travel restrictions as obliged under Article 43, and most countries failed to report how they were independently tackling the outbreak as directed

by Article 3. More generally, many countries continue to lack surveillance and monitoring capacities (Kutzin & Sparkes, 2016), and where these systems exist, they often remain poorly integrated at national, regional, and global levels (Kandel et al., 2020; Kluge et al., 2018; Solomon, 2019).

Despite improvements in data standardisation, there are still significant shortcomings in how global information systems operate as an integrated system, particularly as they relate to the four key functions articulated by WHO. For example, the WHO Code of Practice outlined earlier suffers from a lack of data on health-worker migration flows internationally, which has impeded the implementation of the Code and which has allowed signatories to sidestep or misrepresent their obligations. In terms of basic public health data and evidence, there are still significant shortcomings and underinvestments regarding the general reliability of national and global statistics. Although the Institute for Health Metrics and Evaluations (IHME) is dedicated to filling some of these gaps, it functions largely as a collation and synthesis hub, which does not address local problems associated with data quality and consistent reporting, which undermines the ability to sufficiently create reliable databases for global health policy-making. Equally, there are concerns that the global generation of metrics and indicators lacks transparency and is led by organisations based in high-income countries, with greater synergy needed between global and national health information system agendas (Shiffman & Shawar, 2020).

During COVID-19, social media has grown in importance as a tool for governments, organisations, and academics to communicate health information globally (Tsao et al., 2021), and in turn, it has become an even more powerful influence over people's perceptions and behaviours. However, as information provided through social media platforms is shared by users, there is a risk of misinformation, which is still only controlled to a limited extent by social media companies (Wardle & Singerman, 2021).

3.4 | Medical products and technologies

According to the WHO, a core goal of a health system is its ability to ensure equitable access to essential medical products, vaccines, and technologies that are safe, effective, and cost-effective. This goal should be underpinned by policies, standards, regulations, transparency on prices, quality assurance, and efficient procurement and distribution systems.

When considered against this goal, the global health system has some strengths. WHO have a number of Expert Committees that seek to harmonise standards and norms across countries on medicines, vaccines, and supplies. In response to COVID-19 specifically, the global health system has adapted to try and enhance equity in access to drugs, vaccines, and diagnostics. The 73rd World Health Assembly successfully negotiated a resolution calling for equitable access to and fair distribution of drugs, medical supplies, and equipment required to combat COVID-19 (WHO, 2020). In April 2020, governments, scientists, businesses, civil society, philanthropists, and global health organisations launched the ACT Accelerator, an unprecedented coordinated global effort to boost the development and equitable deployment of COVID-19 drugs, vaccines, and diagnostics worldwide. The ACT Accelerator supports research and development, undertakes procurement on behalf of countries, and supports countries with planning for in-country distribution, including investments in health-system strengthening, particularly in lower-income countries. A key pillar within the ACT Accelerator is COVAX (co-led by CEPI, GAVI, and WHO), which has emerged as the primary global vaccine response and distribution mechanism against COVID-19. Vaccine doses for 92 low- and lower middle-income countries are funded by the COVAX advance market commitment (AMC) with 2 billion doses secured for 2021. A similar number of higher income countries participate on a self-financing basis, committing to procure enough doses through the facility to vaccinate 20% of their population, (So & Woo, 2020). To enhance production and access to vaccines, some countries, such as Chile, Canada, and Germany, have issued compulsory licences. Moderna has also announced that it would not enforce patent rights related to its coronavirus vaccine during the pandemic (Irwin, 2021).

However, the global health system still faces challenges in relation to pricing, quality standards, procurement, and distribution. There is often a lack of transparency on prices, and the existence of confidential price discounts allows pharmaceutical companies to charge different prices to different payers, which often works to the detriment of LMICs (Ewen et al., 2019; Goldstein et al., 2017). The 2019 World Health Assembly Resolution on sharing net prices of health products is a positive development in this respect that needs follow-through from member states (WHO, 2019). In relation to the COVID-19 vaccine, pricing varies depending on the vaccine in question (from USD 6–8 for a course of the AstraZeneca vaccine to USD 64–74 for the Moderna vaccine), and the prices for a number of vaccines remain undisclosed (So & Woo, 2020). There is also a lack of transparency around the agreements between countries and manufacturers, the costs of research and development, and level of public sector financing of candidate vaccines (So & Woo, 2020).

The current system typically relies on each country's power to negotiate with companies, rather than using coordinated power and influence to reach agreement in the interest of countries globally and to determine a fair price (Moon et al., 2020). Prices are highly sensitive to

changes in global demand. For example, in relation to COVID-19, the price of surgical masks increased sixfold (Wood, 2020). The price of respirators trebled and that of gowns doubled (WHO, 2020). There is widespread market manipulation, and stocks are frequently sold to the highest bidder (Wood, 2020).

Although the agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS) has led to harmonisation of intellectual property and licensing (although with its own set of inequities and problems; Smith et al., 2009), there have been fewer moves to harmonise the regulation of quality standards for pharmaceuticals and other medical commodities (Pezzola & Sweet, 2016). Few countries have medicine regulatory authorities considered to be well functioning by WHO standards (Newton et al., 2020). For COVID-19, there were reports of the Netherlands receiving defective face masks from China, Turkey receiving substandard antigen kits (Peel et al., 2020), and the UK receiving substandard consignments of personal protective equipment (PPE) from Turkey (Rawlinson, 2020).

Ensuring that essential medical supplies are available where needed relies on adequate production together with a distribution system that is fair and responsive. Although the ACT Accelerator has been successful in overcoming some of these issues, the system is currently constrained by international law, vaccine nationalism (Callaway, 2020), and commercial interests. Global vaccine production efforts are undermined by TRIPS, which requires that patents be made available for health technologies, limiting the sharing of technology and resulting in a de facto rationing of global production. India and South Africa have called for the World Trade Organisation (WTO) to suspend certain intellectual property obligations (including patents; Usher, 2020); however, it has been blocked by a number of higher income countries, despite backing from more than 100 countries (Balibourse, 2021). In parallel, the COVID-19 Technology Access Pool (C-TAP) calls for the global community to voluntarily share knowledge and intellectual property related to COVID-19 technologies (WHO, 2021). However, only three of the 40 member states supporting the call are high-income countries (Luxembourg, Portugal, and Norway), and to date, not a single vaccine firm has licensed patents voluntarily through C-TAP (So & Woo, 2021). Compulsory licences are being pursued by some countries; however, these are limited in their ability to address global distribution goals, as they have to be initiated on a country-by-country basis, licensing laws and regulation processes vary across countries, and they are intended primarily for the supply to domestic markets rather than to facilitate global distribution (McMahon, 2020).

The COVAX scheme, which relies on pledges from key states to secure the financial resources necessary to negotiate affordable vaccines with pharmaceutical companies and scale up their distribution is undermined by the parallel pursuit of bilateral agreements with manufacturers in many high-income countries, despite WHO requests for a non-competition commitment (Donor Tracker, 2021). Some countries have resisted supporting COVAX, with the US only joining in February 2021, China refusing to contribute financially, and Russia not joining at all (Global Risks Insights, 2021). As a result, the distribution of vaccines remains heavily skewed, and as of March 2021, 70% of vaccine doses were secured by high- and upper middle-income countries (Irwin, 2021). Canada had reserved more than four vaccine courses per person, with Brazil and India having less than one course for every two people (So & Woo, 2020). Current production capacity for the vaccine and distribution systems that could mean effective coverage of the world's population will not be achieved for two or more years (Irwin, 2021).

Distribution is also hampered by countries imposing export controls on medical commodities (Evenett, 2020; World Trade Organization, 2020), and most recently, on vaccines (Irwin, 2021).

3.5 | Governance

According to the WHO, leadership and governance 'involve ensuring that strategic policy frameworks exist and are combined with effective oversight, coalition-building, regulation, attention to system design and accountability' (WHO, 2007). A key component of good governance is accountability, which helps to legitimate increased funding while requiring demonstrable results. Thus, accountable system governance can be understood as having both a procedural quality, the effective management of relationships between various stakeholders in health, and an output quality, the responsibility to monitor and deliver health outcomes.

The WHO suggests that accountable health-system governance should be measured against five criteria: (1) solidifying an understanding of how services are supplied; (2) financing to ensure that adequate resources are available to deliver essential services; (3) performance around the actual supply of services; (4) receipt of relevant information to evaluate or monitor performance; (5) enforcement, such as imposition of sanctions or the provision of rewards for performance. When current global health governance is measured against these criteria, a number of strengths and weaknesses are exposed.

In terms of strengths, existing global health governance structures and its mainstay the WHO have delivered a fairly consistent set of health policies aimed at solidifying understanding about what services should be supplied and how. In terms of norm diffusion and uptake, at the national level, the WHO has been able to construct and effectively communicate a

number of toolkits regarding health-system strengthening (Building Blocks), health goals (UHC), disease interventions (DOTS-Plus), financial management (strategic purchasing), service delivery (HIV testing and counselling), and information systems and reporting (e.g. Service Availability and Readiness Assessments). More importantly, these norms are often diffused horizontally, acting as unifying 'master norms' within treaty-based Bretton Woods institutions such as the World Bank as well as in informal governance settings such as the G7 and G20. At least on paper, most norms of global health policy interconnect and speak across institutions. Moreover, as described earlier, the WHO has traditionally fulfilled governance criteria associated with the collection and evaluation of global health information, thus acting as an authoritative source in global public health monitoring.

However, global leadership and governance remain insufficient. In relation to epistemic authority, the traditional role of the WHO as an information hub has in recent years been undermined or replaced by proliferation of information sources such as the Institute for Health Metrics and Evaluations, the Bill and Melinda Gates Foundation, and by prominent schools of public health. In relation to COVID-19, for example, most media outlets rely on daily statistics generated by John Hopkins University rather than the WHO, which is now a practice mirrored within most governmental COVID-19 response teams. In terms of an historical driver for global health governance and leadership, the G7 failed to find COVID-19 policy consensus in 2020 and was weak in 2021 (G.W., 2021), and the G20 summit 2020 remained a quagmire of geopolitics (Global Preparedness Monitoring Board, 2020).

The governance of global common goods for health is also significantly undermined by an inability to ensure that adequate resources are available to deliver essential services as well as a lack of ability to enforce compliance or sanction WHO member states. As outlined above, the WHO has suffered from an increasingly shrinking budget of which three-thirds of its funding is tied to donor interests. As outlined below under service delivery, there has been general underinvestment in health systems in both developing and developed countries, which has undermined disease prevention, preparedness, and response capacities.

In terms of compliance, in the case of COVID-19, the IHRs were not fully implemented, and many countries deliberatively violated the regulations in response to the outbreak as described above. This issue of poor compliance has become chronic, where according to the WHO's emergency preparedness report, only 47% of member states are fully compliant with the IHRs. This exposes that the WHO has no ability to sanction or enforce compliance even when it is a global good for it to do so. Given these shortcomings, there is clearly a need for institutional innovation in global governance (Smith & Lees, 2017).

Finally, voluntary coordination and unpredictable compliance have severely undermined governance and leadership as it relates to COVID-19, as corroborated in relation to the procurement and distribution of vaccines and other medical commodities discussed in the earlier section of the paper. Furthermore, governance of the global production and distribution of medical commodities, necessary to tackle COVID-19, is undermined by the patent system under international trade law, which grants a governance role to pharmaceutical companies as patent holders, allowing them to effectively control access to diagnostics, treatment and vaccines, and the terms of access (including price and licensing rights; McMahon, 2020; Phelan et al., 2020). At the end of the day, the overall effect of poor leadership and global health governance has been the perpetuation of massive inequities, an increase of brinkmanship and mistrust, policy fragmentation, unilateralism, increased global health insecurities, and poor global health outcomes (Patnaik, 2021).

3.6 | Service delivery

The WHO understands service delivery as 'an immediate output of the inputs into the health system, such as the health workforce, procurement and supplies, and financing' (WHO, 2007). According to the WHO, any well-functioning health system should contain eight key characteristics, which should be adapted to reflect specific contexts and needs. These include comprehensiveness, accessibility, coverage, continuity, quality, person centredness, participation, coordination, and accountability/efficiency.

In the recent past, at the global level, service delivery has focused mainly on accountability to donor funded programmes and vertical interventions, the promotion of UHC, and the removal of barriers to essential services (accessibility). As outlined above, the coalescing of global policy norms around UHC and increased access to medicines has helped improve service delivery while providing clear goals for national health systems toward positive population health outcomes. These efforts are undoubtably important foundations of the global health system.

Moreover, the relationship between overseas development for health ('inputs into the health system') and service delivery (outputs) demonstrates the complexities that exist between global agencies and local service delivery. For example, although the World Bank, Global Fund, and other international funding agents are often not directly involved in service delivery on the ground, they do contract INGOs, NGOs, and private-sector actors to manage and, in some cases, to provide, service delivery. For instance, the World Bank and Global Fund

(supported by the WHO and most national development aid agencies) are proponents of performance-based financing, which as a condition of this aid financing model, contract 'purchasing agents' to act as independent financial and programme managers between the funder, national governments, provincial agents, and facility-level actors. These purchasing agents can further subcontract other non-state actors as implementors in cases where the government is unwilling or unable to provide services associated with the funded programme. Moreover, the funders often determine (or strongly persuade) national programmes on what services should be provided as a condition of the funding and what indicators should be used to determine programme performance. Finally, the terms of contract determine if the funds can be used for procurement, the hiring of staff, and for demand-side interventions, all of which directly influence local service delivery and the care available (and quality).

Nevertheless, the practice of vertical donor interventions as the mainstay of development assistance for health has unfortunately not delivered strengthened national and regional health systems, which are the necessary foundations for localised coordination, coverage, quality, accountability, and efficiency. Failure here has knock-on effects at the global health-system level, because it increases the transaction costs for the provision of global common goods. These failures were recognised as a 'wake-up call' following the Ebola outbreak, with the G7 and G20 launching the Global Health Security Agenda. However, the global response remained muted with chronic underinvestment, a lack of political will, and policy practice that remained largely outside the WHO (Brown, 2015). In the case of COVID-19, failures to provide appropriate disease prevention, preparedness, and response have largely been the result of national-level policy shortcomings, underinvestments in key capacities, and an unwillingness to make connections between national health systems and global health security risks. This is true for both developed and developing countries. Therefore, in terms of service delivery, limited resource inputs at the global level, along with underinvestments in national health systems, have rendered a condition ready for pandemic spread and its corresponding costs. Investments through the ACT Accelerator in vaccine doses and strengthening the health system will go some way to supporting the delivery of vaccines at scale. However, the question remains as to whether funding levels will be adequate to overcome bottlenecks and be sustained over time. At the time of writing, commitments to the ACT-A pillars have remained wanting.

4 | DISCUSSION

We have applied the WHO Building Blocks to describe and appraise the global health system in relation to COVID-19. We have demonstrated that the Building Blocks framework can be readily used to study the global health system and is a useful starting point for reflecting on its goals and functions, while helping to identify strengths, gaps, and potential areas for reform. Although we do not provide an exhaustive list, we have shown that there are a number of existing system strengths regarding the rapid mobilisation and pooling of funds, the mobilisation of EMT, enhancement of global information systems, the promotion of more equitable supply chains, and procurement and norm diffusion. When examined in light of COVID-19, the global health system displayed pockets of coordination, cooperation, and effectiveness across each of the blocks. Yet, despite some successes, when viewed through the Building Blocks as a health system, a number of failures emerge such as the fragmented and voluntary global financing, weaknesses in pricing, quality standards, and inequities in the procurement and distribution of medicines and supplies. These are underpinned by acute failures in leadership and governance, information and communication, and general service delivery, in part the result of the non-binding nature of global treaties and agreements and the tension between national and global interests. Instead of promoting solidarity for the promotion of global common goods in the face of pandemic, the global health system quickly fragmented into unilateral action, ad hoc policy, inadequate disease response, nationally focused stimulus, and geopolitical brinkmanship.

The WHO Building Blocks have been widely used to describe health systems at the national and subnational levels, guide investments in strengthening the health system, including monitoring health-system progress at country level (Sharma et al., 2019; Shoman et al., 2017). The WHO Building Blocks offer a common language that is known among policymakers and health-system researchers globally. An advantage of using the WHO Building Blocks to describe the global health system is that they provide a clear set of global goals that are aligned with the goals of national health systems: improved health, responsiveness, social and financial protections, equity, and efficiency. Applying the WHO Building Blocks to the global health system provides a useful heuristic in which to map, analyse, and evaluate the system more holistically. The goals and functions of each of the Building Blocks can be readily applied to the global health system, although the monitoring indicators to track performance over time would need to be adapted through global consultation.

However, the Building Blocks have been critiqued for considering health-system inputs in 'silos', failing to view the system as a whole, or capture the complexity of health systems, including interactions between inputs and outputs or the different components within the system (Mounier-Jack et al., 2014; Palagyi et al., 2019). Clearly, there are interconnections between Building Blocks at the global level, as there are at the

national level. For example, the voluntary nature of revenue generation for global financing has undermined the funding of global governance functions, such as the WHO, and coordinated procurement and distribution mechanisms through the ACT Accelerator. Weak governance affects the transparency, reliability, and completeness of global information systems, which limits the monitoring of progress in relation to the flows of human resources for health, the pricing of medicines, and the global allocation of resources. Equally, the Building Blocks framework supports a static view of health systems, rather than considering the temporal dynamics in their response to external shocks or to reform options (Mounier-Jack et al., 2014).

The Building Blocks framework offers no weighting between the blocks, so all parts of the system are assumed to have equal importance (Olmen et al., 2012). However, governance is clearly a critical function underpinning each Building Block, essential to securing transparent and responsive information systems, as to reducing fragmentation of financing and achieving more equitable distribution of vaccines and human resources.

The Building Blocks framework focuses on resources and structures and less on the power relations between actors and institutions, which play an equally important role in defining health systems (Sheikh et al., 2011) and building resilience (Kruk et al., 2015). Indeed, research has shown that, in relation to the global health system, the quantity and spectrum of often diverging interests of global health actors and power struggles between them undermine efforts towards greater cooperation and coordination in global health (Spicer et al., 2020). The Building Blocks framework can be helpful in assessing performance and identifying areas for improvement or reform. However, the diversity of actors, power imbalances, and diverging interests could limit the global community's ability to implement reform to improve the functioning of the global health system. Unlike at the national level, there is no single global mechanism to mobilise collective action, such as a world parliament, and the global community lacks the fiscal instruments of nation states, which limits the capacity for global revenue collection. As a result, commitments to reform the global health system remain voluntary and treaty based which, under current governance structures, are gridlocked and unable to deliver consistent compliance (Brown & Held, 2017; Held et al., 2019). However, history has shown that self-interested considerations of risk can be transformed into mutual interests, promoting global common goods through seismic changes in global architecture (Beck, 1998). The costs and risks associated with COVID-19 provide an opportunity for renewed solidarity in global health, which is being recognised in the research (Gostin et al., 2020; Vervoort et al., 2021) and political communities alike (Kickbusch & Ruijter, 2021). For example, at the global level, there are several new policy initiatives aimed at creating global health solidarity and systems thinking. An unexhaustive list of these initiatives include negotiations on a new global pandemic treaty (governance; Taylor, 2021); agreement on revised IHRs to better facilitate threat monitoring and reporting (information systems; Labonté et al., 2021); an open access WHO dynamic preparedness matrix to provide member states with a real-time preparedness index that measures gaps between threats, vulnerabilities, and capacities (access and workforce; WHO Technical Working Group of Dynamic Preparedness Metric, [forthcoming]); the creation of new international research to examine the needs and financial requirements for adequate global and regional pandemic prevention and preparedness (finance; G20 High Level Independent Panel [HLIP] on Financing the Global Commons for Pandemic Preparedness and Response, 2021); the launch of the new WHO Health Systems for Health Security framework and associated toolkits, which position health-system improvements as having health security co-benefits and returns on investment (service delivery; WHO, 2021). In the case of the last, the emphasis is on using the Building Blocks to assess national health system and security needs, to pinpoint key priority areas, and to make sufficient health-system links with other sectors and policies (national, regional, and global). Although nascent, what these initiatives demonstrate is the motivational capacity associated with the pandemic, because it is arguable that these efforts would have been unlikely without the recognised failures of COVID-19 response.

Moving forward, we argue that the use of the Building Blocks is an entry point to further analysis of the global health system, as a health system, and to identifying goals and monitoring progress. Other research tools, such as complexity science methods (Borghi & Chalabi, 2017; Sturmberg & Martin, 2020; Sturmberg et al., 2020), and global system science more specifically (Dum & Johnson, 2017), can and should complement the use of the Building Blocks to better understand the structure of the global health system and how the interactions between agents in the system and with their environment affect system performance. Such an approach would provide a whole-system approach, considering system dynamics, the fact the global health system is evolving over time, enabling the prospective consideration of the potential consequences of reform options, and of potential adaptations and transformations to bolster resilience across health-system scales. Equally, political economy analysis is key to understanding how the global health system has evolved in the way it has, and potential constraints to, and opportunities for, reform (Spicer et al., 2020), including the role of the private sector (Williams, 2020). These understandings of power and structural constraints will be crucial, because global health policy is currently being

shaped by countervailing national and global interests, where mutual interests are often recognised but often politically denied.

Although the Building Blocks do not consider community within health systems and demand-side factors, extensions to the Building Blocks have been proposed to address this (Sacks et al., 2018), and the link between community and the global health system is more distal. However, with moves to ensure greater citizen engagement in global institutions, such as the world citizen initiative, it would be important to consider citizens and communities when assessing the global health system (https://www.worldcitizensinitiative.org/).

Our paper suffers from some limitations. As the intention was to illustrate the application of the Building Blocks to the global health system, and to contain the scope of the paper, we focused primarily on some of the ways in which system goals were met, with COVID-19 as a lens through which to view the system and its functioning. The Building Blocks framework can and should be applied to global health more broadly and to other health areas. A further limitation is that our paper draws on a scoping review that was not systematic but tried to offer a balanced perspective on strengths and weaknesses of the global health system in relation to each of the Building Blocks. Finally, owing to space limitations, we could only allude to the importance of understanding the global health system as being ultimately a series of overlapping, multilevel structures and Building Blocks. Unlike national health systems, the global health system is necessarily attached to, and reliant on, regional and national system interconnections and mutual policy reinforcement. Therefore, looking at these intersections would offer useful understandings, because there are promising examples of regional health cooperation and how participating members might pool knowledge, enhance provision, and gain efficiencies via new economies of scale (So & Woo, 2021).

The Building Blocks framework can be used as an entry point to thinking about areas of potential reform. However, a reform agenda should be informed by primary research examining political economy aspects and modelling of the system holistically in all its complexity. Toward this end, there are promising signs of global reflections on the state of global health policy, and there are numerous COVID-19 response reports and exercises that have been designed to examine key lessons from the pandemic (Elliot, 2020; Foreign Commonwealth & Development Office, 2021; G7, 2021; Independent Panel for Pandemic Preparedness & Response for the WHO Executive Board, 2021; Pan-European Commission on Health & Sustainable Development, 2021; Prime Minister's Office & Johnson, 2020). Ultimately, only time will tell whether these reflections will help us move beyond existing paradigms that restrict global health performance and promote the type of reimagining that we have begun to present here.

REFERENCES

Abazi, V. (2020) Truth Distancing? Whistleblowing as remedy to censorship during COVID-19. *European Journal of Risk Regulation*, 11, 375–381.

Balibourse, D. (2021) Waive COVID vaccine patents to benefit poor nations, activists say. *Reuters*, Available from: https://www.reuters.com/article/us-health-coronavirus-wto-idUSKBN2AW1VO

Beck, U. (1998) *World Risk Society*. Cambridge: Policy Press.

Borghi, J. & Chalabi, Z. (2017) Square peg in a round hole: Rethinking our approach to evaluating health system strengthening in low-income and middle-income countries. *BMJ Global Health*, 2(3), e000406.

Brown, G.W. (2015) The 2015 G7 summit: A missed opportunity for global health leadership. *Global Policy*.

Brown, G.W. (2021) The G7 is set to miss another opportunity for global health leadership. *International Health Policies*.

Brown, G.W. & Held, D. (2017) Gridlock and beyond in global health. In: Gridlock, B., Hale, T. & Held, D. (Eds.), *Global health: New leadership for devastating challenges*. Cambridge: Polity Press, pp. 162–183.

Burkle, F.M. (2016) The World Health Organization global health emergency workforce: What role will the United States play? *Disaster Medicine and Public Health Preparedness*, 10(4), 531–535.

Callaway, E. (2020) The unequal scramble for coronavirus vaccines—by the numbers. *Nature*, 584(7822), 506–507.

Clift, C. & Rottingen, J.A. (2018) New approaches to WHO financing: The key to better health. *BMJ*, 361, k2218.

Cornish, L. (2021) *Interactive: Who's funding the COVID-19 response and what are the priorities?* Available from: https://www.devex.com/news/interactive-who-s-funding-the-covid-19-response-and-what-are-the-priorities-96833 [Accessed 9 April 2021]

Cushion, S., Kyriakidou, M., Morani, M. & Soo, N. (2020) Coronavirus: fake news less of a problem than confusing government messages—new study. The Conversation.

De Savigny, D. & Adam, T. (2009) *Systems thinking for health systems strengthening*. Geneva: WHO.

Donor Tracker. (2021) ACT-A Facilitation Council announces funding gap of US$27.2 billion, asks countries not to compete with COVAX vaccine contracts. Available from: https://donortracker.org/policy-updates/act-facilitation-council-announces-funding-gap-us272-billion-asks-countries-not [Accessed 9 April 2021]

Dum, R. & Johnson, J. (2017) *Global system science and policy, in Non-equilibrium social science and policy* J. Johnson et al. (Eds.) Berlin: Springer.

Durski, K.N., Naidoo, D., Singaravelu, S., Shah, A.A., Djingarey, M.H., Formenty, P. & Ihekweazu, C. (2020) Systems thinking for health emergencies: use of process mapping during outbreak response. *BMJ Global Health*, 5(10), e003901.

Ehiri, J.E., Gunn, J.K.L., Center, K.E., Li, Y., Rouhani, M. & Ezeanolue, E.E. (2014) Training and deployment of lay refugee/internally displaced persons to provide basic health services in camps: a systematic review. *Glob Health Action*, 7, 23902.

El Bcheraoui, C., Weishaar, H., Pozo-Martin, F. & Hanefeld, J. (2020) Assessing COVID-19 through the lens of health systems' preparedness: Time for a change. *Globalization and Health*, 16(1), 112.

El-Khani, U., Ashrafian, H., Rasheed, S., Veen, H., Darwish, A., Nott, D. & Darzi, A. (2019) The patient safety practices of emergency medical teams in disaster zones: A systematic analysis. *BMJ Global Health*, 4(6), e001889.

Elliot, L. (2020) *Brown calls for global government to tackle coronavirus*. [Accessed 31 March 2020]

European Commission. (2020) *Guidelines on EU Emergency Assistance in Cross-Border Cooperation in Healthcare related*

to the COVID-19 crisis. Available from: https://ec.europa.eu/info/sites/info/files/guidelines_on_eu_emergency_assistance_in_cross-bordercooperationin_heathcare_related_to_the_covid-19_crisis.pdf

Evenett, S.J. (2020) Sicken thy neighbour: The initial trade policy response to COVID-19. *The World Economy*, 43(4), 828–839.

Ewen, M., Joosse, H.-J., Beran, D. & Laing, R. (2019) Insulin prices, availability and affordability in 13 low-income and middle-income countries. *BMJ Global Health*, 4(3), e001410.

Foreign Commonwealth and Development Office. (2021) *COVID-19 and Health Security*. Available from: https://committees.parliament.uk/work/703/global-health-security/publications/written-evidence/ [Accessed 9 April 2021]

Frenk, J. & Moon, S. (2013) Governance challenges in global health. *New England Journal of Medicine*, 368(10), 936–942.

Fu, K. & Zhu, Y. (2020) Did the world overlook the media's early warning of COVID-19. *Journal of Risk Research*, 23(7–8), 1047–1051.

Fullman, N., Flaxman, A., Leach-Kemon, K., Rajaratnam, J. & Lozano, R. (2015) *Measuring the World's Health: How Good are Our Estimates? in Global Health Policy*, G.W. Brown, G. Yamey, and S. Wamala, Editors. 2015, Willy-Blackwell

G20 High Level Independent Panel (HLIP) on Financing the Global Commons for Pandemic Preparedness and Response (2021) A global deal for our pandemic age: Report of the G20 High Level Independent Panel on Financing the Global Commons for Pandemic Preparedness and Response. Available from: https://pandemic-financing.org/report/foreword/

G7. (2021) *G7 Leaders' Statement*. Available from: https://www.gov.uk/government/news/g7-leaders-statement-19-february-2021 [Accessed 9 April 2021]

Gaffney, A., Himmelstein, D.U. & Woolhandler, S. (2020) COVID-19 and US Health Financing: Perils and Possibilities. *International Journal of Health Services*, 50(4), 396–407.

Global Preparedness Monitoring Board. (2020) *A world in disorder. Global preparedness monitoring board annual report 2020*. Geneva: World Health Organization.

Global Risks Insights. (2021) *Documents Leaked to Reuters Raise Concerns about COVAX*. Available from: https://globalriskinsights.com/2021/02/documents-leaked-to-reuters-raise-concerns-about-covax/ [Accessed 9 April 2021]

Goldstein, D.A., Clark, J., Tu, Y., Zhang, J., Fang, F., Goldstein, R. & Stemmer, S. (2017) A global comparison of the cost of patented cancer drugs in relation to global differences in wealth. *Oncotarget*, 8, 71548–71555.

Gostin, L.O., Moon, S. & Meier, B.M. (2020) Reimagining Global Health Governance in the Age of COVID-19. *American Journal of Public Health*, 110(11), 1615–1619.

Habibi, R., Burci, G.L., de Campos, T.C., Chirwa, D., Cinà, M., Dagron, S. & Eccleston-Turner, M. (2020) Do not violate the International Health Regulations during the COVID-19 outbreak. *The Lancet*, 395(10225), 664–666.

Held, D., Kickbusch, I., McNally, K., Piselli, D. & Told, M. (2019) Gridlock, innovation and resilience in global health governance. *Global Policy*, 10(2), 161–177.

Herzog, L.M., Norheim, O.F., Emanuel, E.J. & McCoy, M.S. (2021) Covax must go beyond proportional allocation of COVID vaccines to ensure fair and equitable access. *BMJ*, 372, m4853.

High-Level Panel on Humanitarian Financing. (2016) *Too important to fail—addressing the humanitarian financing gap, in Report to the UN Secretary-General*, Available from: https://reliefweb.int/sites/reliefweb.int/files/resources/%5BHLP%20Report%5D%20Too%20important%20to%20fail%E2%80%94addressing%20the%20humanitarian%20financing%20gap.pdf [Accessed 31 March 2020]

Hodgson, C. (2020) World Bank ditches second round of pandemic bonds. *Financial Times*.

Hoffman, S.J., Caleo, G.M., Daulaire, N., Elbe, S., Matsoso, P., Mossialos, E. et al. (2015) Strategies for achieving global collective action on antimicrobial resistance. *Bulletin of the World Health Organization*, 93(12), 867–876.

Hoffman, S.J. & Cole, C.B. (2018) Defining the global health system and systematically mapping its network of actors. *Globalization and Health*, 14, 38.

Huang, C., Wang, Y., Li, X., Ren, L., Zhao, J., Hu, Y.I. & Zhang, L. (2020) Clinical features of patients infected with 2019 novel coronavirus in Wuhan, China. *China. The Lancet*, 395(10223), 497–506.

Independent Panel for Pandemic Preparedness and Response for the WHO Executive Board. (2021) *Second Progress Report*. Available from: https://theindependentpanel.org/wp-content/uploads/2021/01/Independent-Panel_Second-Report-on-Progress_Final-15-Jan-2021.pdf

Institute of Medicine. (2014) *Antimicrobial resistance: A problem without borders*. Washington, DC: National Academies Press.

Irwin, A. (2021) What it will take to vaccinate the world against COVID-19. *Nature*, 592(7853), 176–178.

Kandel, N., Chungong, S., Omaar, A. & Xing, J. (2020) Health security capacities in the context of COVID-19 outbreak: An analysis of International Health Regulations annual report data from 182 countries. *The Lancet*, 395(10229), 1047–1053.

Kickbusch, I. & de Ruijter, A. (2021) How a European health union can strengthen global health. *The Lancet Regional Health – Europe*, 1, 100025.

Kluge, H.P., Jakab, Z., Bartovic, J., D'Anna, V. & Severoni, S. (2020) Refugee and migrant health in the COVID-19 response. *The Lancet*, 395(10232), 1237–1239.

Kluge, H., Martín-Moreno, J.M., Emiroglu, N., Rodier, G., Kelley, E., Vujnovic, M. & Permanand, G. (2018) Strengthening global health security by embedding the International Health Regulations requirements into national health systems. *BMJ Global Health*, 3(Suppl 1), e000656.

Kruk, M.E., Myers, M., Varpilah, S.T. & Dahn, B.T. (2015) What is a resilient health system? Lessons from Ebola. *The Lancet*, 385(9980), 1910–1912.

Kupferschmidt, K. 'A completely new culture of doing research.' Coronavirus outbreak changes how scientists communicate. *Science*, https://doi.org/10.1126/science.abb4761

Kutzin, J. & Sparkes, S.P. (2016) Health systems strengthening, universal health coverage, health security and resilience. *Bulletin of the World Health Organization*, 94(1), 2.

Labonté, R., Wiktorowicz, M., Packer, C., Ruckert, A., Wilson, K. & Halabi, S. (2021) A pandemic treaty, revised international health regulations, or both? *Globalization and Health*, 17(1), 128.

Londoño, E. (2020) Bolsonaro Hails Anti-Malaria Pill Even as He Fights Coronavirus. *The New York Times*. Available from: https://www.nytimes.com/2020/07/08/world/americas/brazil-bolsonaro-covid-coronavirus.html

Malteser International. (2020) *COVID-19: Malteser International sends its Emergency Medical Team to Cameroon*. [26/07/2020].

Manyazewal, T. (2017) Using the World Health Organization health system building blocks through survey of healthcare professionals to determine the performance of public healthcare facilities. *Archives of Public Health*, 75, 50.

Martin, G.P., Hanna, E., McCartney, M. & Dingwall, R. (2020) Science, society, and policy in the face of uncertainty: reflections on the debate around face coverings for the public during COVID-19. *Critical Public Health*, 30(5), 501–508.

Marx, M., Nitschke, C., Nafula, M., Nangami, M., Brodowski, M., Marx, I. & Prytherch, H. (2018) If you can't measure it- you can't change it—a longitudinal study on improving quality of care in hospitals and health centers in rural Kenya. *BMC Health Services Research*, 18(1), 246.

Mathauer, I., Saksena, P. & Kutzin, J. (2019) Pooling arrangements in health financing systems: a proposed classification. *International Journal for Equity in Health*, 18(1), 198.

Mathauer, I., Vinyals Torres, L., Kutzin, J., Jakab, M. & Hanson, K. (2020) Pooling financial resources for universal health coverage: options for reform. *Bulletin of the World Health Organization*, 98(2), 132–139.

McIntyre, D. & Kutzin, J. (2016) *Health financing country diagnostic: A foundation for national strategy development*. World Health Organization. https://www.who.int/health_financing/documents/country-diagnostic/en/

McMahon, A. (2020) Global equitable access to vaccines, medicines and diagnostics for COVID-19: The role of patents as private governance. *Journal of Medical Ethics*, 47(3), 142–148.

McVeigh, K. & Jones, S. (2020) 'The NHS needs them': UK urged to join countries mobilising migrant medics. *The Guardian*.

Moon, S., Mariat, S., Kamae, I. & Pedersen, H.B. (2020) Defining the concept of fair pricing for medicines. *BMJ*, 368, l4726.

Moon, S. & Omole, O. (2017) Development assistance for health: critiques, proposals and prospects for change. *Health Economics, Policy and Law*, 12(2), 207–221.

Moon, S., Sridhar, D., Pate, M.A., Jha, A.K., Clinton, C., Delaunay, S. & Edwin, V. (2015) 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*, 386(10009), 2204–2221.

Mounier-Jack, S., Griffiths, U., Closser, S., Burchett, B. & Marchal, B. (2014) Measuring the health systems impact of disease control programmes: A critical reflection on the WHO building blocks framework. *BMC Public Health*, 14, 278.

Mutale, W., Bond, V., Mwanamwenge, M.T., Mlewa, S., Balabanova, D., Spicer, N. & Ayles, H. (2013) Systems thinking in practice: The current status of the six WHO building blocks for health system strengthening in three BHOMA intervention districts of Zambia: A baseline qualitative study. *BMC Health Services Research*, 13, 291.

Newton, P.N., Bond, K.C., Adeyeye, M., Antignac, M., Ashenef, A., Awab, G.R. & Babar, Z. (2020) COVID-19 and risks to the supply and quality of tests, drugs, and vaccines. *The Lancet Global Health*, 8(6), E754–E755.

Obermann, K., Chanturidze, T., Richardson, E., Tanirbergenov, S., Shoranov, M. & Nurgozhaev, A. (2016) Data for development in health: a case study and monitoring framework from Kazakhstan. *BMJ Global Health*, 1(1), e000003.

van Olmen, J., Marchal, B., Van Damme, W., Kegels, G. & Hill, P.S. (2012) Health systems frameworks in their political context: Framing divergent agendas. *BMC Public Health*, 12, 774–810.

Ottersen, T., Elovainio, R., Evans, D.B., McCoy, D., Mcintyre, D.I., Meheus, F. & Moon, S. (2017) Towards a coherent global framework for health financing: Recommendations and recent developments. *Health Economics, Policy and Law*, 12(2), 285–296.

Ottersen, T., Kamath, A., Moon, S., Martinsen, L. & Røttingen, J.-A. (2017) Development assistance for health: what criteria do multi- and bilateral funders use? *Health Economics, Policy and Law*, 12(2), 223–244.

Ottersen, T., Moon, S. & Røttingen, J.A. (2017) Distributing development assistance for health: simulating the implications of 11 criteria. *Health Economics, Policy and Law*, 12(2), 245–263.

Palagyi, A., Marais, B.J., Abimbola, S., Topp, S.M., McBryde, E.S. & Negin, J. (2019) Health system preparedness for emerging infectious diseases: A synthesis of the literature. *Global Public Health*, 14(12), 1847–1868.

Pan-European Commission on Health and Sustainable Development. (2021) *Rethinking policy priorities in the light of pandemics: a call to action*. Available from: https://www.euro.who.int/en/health-topics/health-policy/european-programme-of-work/pan-european-commission-on-health-and-sustainable-development/multimedia/rethinking-policy-priorities-in-the-light-of-pandemics-a-call-to-action

Patnaik, P. (2021) COVID-19 Vaccine Governance: Sidelining Multilateralism. *People's Health Movement*. Available from: https://phmovement.org/wp-content/uploads/2021/01/Final_PHM_COVID-AND-GOVERNANCE-compressed.pdf

Paul, E., Brown, G.W. & Ridde, V. (2020) COVID-19: Time for paradigm shift in the nexus between local, national and global health. *BMJ Global Health*, 5(4), e002622.

Peel, M. et al. (2020) Countries reject China pandemic product batches. *Financial Times*.

Peel, M., Sevastopulo, D. & Manson, K. (2020) US triggers exit from World Health Organization. *Financial Times*.

Petersen, E., Wejse, C. & Zumla, A. (2020) Advancing COVID-19 vaccines—avoiding different regulatory standards for different vaccines and need for open and transparent data sharing. *International Journal of Infectious Diseases*, 98, 501–502.

Pezzola, A. & Sweet, C.M. (2016) Global pharmaceutical regulation: The challenge of integration for developing states. *Global Health*, 12, 85.

Phelan, A.L., Eccleston-Turner, M., Rourke, M., Maleche, A. & Wang, C. (2020) Legal agreements: barriers and enablers to global equitable COVID-19 vaccine access. *The Lancet*, 396(10254), 800–802.

Prime Minister's Office & Johnson, B. (2020) G7 Leaders' Statement on COVID-19, Editor. Available from: https://www.gov.uk/government/news/g7-leaders-statement-on-covid-19 [Accessed on 31 March 2020]

Rakmawati, T., Hinchcliff, R. & Pardosi, J.F. (2019) District-level impacts of health system decentralization in Indonesia: A systematic review. *The International Journal of Health Planning and Management*, 34(2), e1026–e1053.

Ridde, V., Aho, J., Ndao, E.M., Benoit, M., Hanley, J., Lagrange, S. & Fillol, A. (2020) Unmet healthcare needs among migrants without medical insurance in Montreal, Canada. *Global Public Health*, 15(11), 1603–1616.

Rodriguez, M.E. (2021) Trust in COVID vaccines is growing. *Nature*.

Rawlinson, K. (2020) Coronavirus PPE: All 400,000 gowns flown from Turkey for NHS fail UK standards. *The Guardian*.

Sacks, E., Morrow, M., Story, W.T., Shelley, K.D., Shanklin, D., Rahimtoola, M. & Rosales, A. (2018) Beyond the building blocks: integrating community roles into health systems frameworks to achieve health for all. *BMJ Global Health*, 3, e001384.

Schäferhoff, M., Chodavadia, P., Martinez, S., McDade, K.K., Fewer, S., Silva, S. & Dwomoh, D. (2019) International funding for global common goods for health: An analysis using the creditor reporting system and G-FINDER databases. *Health Systems & Reform*, 5(4), 350–365.

Sharma, A., Shankar, P. & Kumar, A. (2019) Comprehensive measurement of health system performance at district level in India: Generation of a composite index. *The International Journal of Health Planning and Management*, 34(4), e1783–e1799.

Sheikh, K., Gilson, L., Agyepong, I.A., Hanson, K., Ssengooba, F. & Bennett, S. (2011) Building the field of health policy and systems research: Framing the questions. *PLoS Med*, 8(8), e1001073.

Shiffman, J. & Shawar, Y.R. (2020) Strengthening accountability of the global health metrics enterprise. *The Lancet*, 395(10234), 1452–1456.

Shoman, H., Karafillakis, E. & Rawaf, S. (2017) The link between the West African Ebola outbreak and health systems in Guinea, Liberia and Sierra Leone: A systematic review. *Global Health*, 13(1), 1.

Smith, R.D., Correa, C. & Oh, C. (2009) Trade, TRIPS, and pharmaceuticals. *The Lancet*, 373(9664), 684–691.

Smith, R. & Lees, K. (2017) Global health governance: We need innovation not renovation. *BMJ Global Health*, 2(2), e000275.

So, A.D. & Woo, J. (2020) Reserving coronavirus disease 2019 vaccines for global access: cross sectional analysis. *BMJ*, 371, m4750.
So, A.D. & Woo, J. (2021) Achieving path-dependent equity for global COVID-19 vaccine allocation. *New York Medical Journal*, 2(4), 373–377.
Solomon, D. (2019) Brexit and health security: Why we need to protect our global networks. *Journal of Public Health Policy*, 40(1), 1–4.
Soucat, A. (2019) Financing common goods for health: Fundamental for health, the foundation for UHC. *Health Systems & Reform*, 5(4), 263–267.
Soucat, A. & Kickbusch, I. (2020) Global common goods for health: Towards a new framework for global financing. *Global Policy*, 11(5), 628–635.
Spicer, N., Agyepong, I., Ottersen, T., Jahn, A. & Ooms, G. (2020) 'It's far too complicated': Why fragmentation persists in global health. *Globalization and Health*, 16(1), 60.
Sturmberg, J.P. & Martin, C.M. (2020) COVID-19—How a pandemic reveals that everything is connected to everything else. *Journal of Evaluation in Clinical Practice*, 26(5), 1361–1367.
Sturmberg, J.P., Tsasis, P. & Hoemeke, L. (2020) COVID-19—An opportunity to redesign health policy thinking. *International Journal of Health Policy and Management*. https://doi.org/10.34172/ijhpm.2020.132
Tam, V., Edge, J.S. & Hoffman, S.J. (2016) Empirically evaluating the WHO global code of practice on the international recruitment of health personnel's impact on four high-income countries four years after adoption. *Globalization and Health*, 12(1), 62.
Taylor, L. (2021) World Health Organization to begin negotiating international pandemic treaty. *BMJ*, 375, n2991.
Tsao, S.F., Chen, H., Tisseverasinghe, T., Yang, Y., Li, L. & Butt, Z.A. (2021) What social media told us in the time of COVID-19: A scoping review. *The Lancet Digital Health*, 3(3), e175–e194.
Usher, A.D. (2020) South Africa and India push for COVID-19 patents ban. *The Lancet*, 396(10265), 1790–1791.
Vervoort, D., Ma, X. & Luc, J.G.Y. (2021) COVID-19 pandemic: A time for collaboration and a unified global health front. *International Journal for Quality in Health Care*, 33(1), 1–3.
Vogel, G. (2020) 'These are answers we need.' WHO plans global study to discover true extent of coronavirus infections. *Science*, https://doi.org/10.1126/science.abc0458
Wardle, C. & Singerman, E. (2021) Too little, too late: Social media companies' failure to tackle vaccine misinformation poses a real threat. *BMJ*, 372, n26.
WHO. (2019) Improving the transparency of markets for medicines, vaccines, and other health products (FOOTNOTE).
WHO. (2020) "*Solidarity II" global serologic study for COVID-19*. Available from: https://www.who.int/emergencies/diseases/novel-coronavirus-2019/global-research-on-novel-coronavirus-2019-ncov/solidarity-2-global-serologic-study-for-covid-19 [Accessed 9 April 2021]
WHO. (2020) "*Solidarity*" *clinical trial for COVID-19 treatments*. Available from: https://www.who.int/emergencies/diseases/novel-coronavirus-2019/global-research-on-novel-coronavirus-2019-ncov/solidarity-clinical-trial-for-covid-19-treatments [Accessed 9 April 2021]
WHO. (2021) *The Access to COVID-19 Tools (ACT) Accelerator*. Available from: https://www.who.int/initiatives/act-accelerator [Accessed 9 April 2021]
WHO. (2021) Available from: https://www.who.int/emergencies/diseases/novel-coronavirus-2019/donors-and-partners/funding [Accessed 9 April 2021]
WHO Technical Working Group of Dynamic Preparedness Metric. (forthcoming) Dynamic preparedness metric—A paradigm shift to measure and act on preparedness. *The Lancet*.
Williams, O.D. (2020) COVID-19 and private health: Market and governance failure. *Development*, 63, 181–190.
Wood, V. (2020) Coronavirus: WHO accuses medical suppliers of selling face masks at six times average price amid global crisis. *The Independent*.
World Bank. (2020) World Bank Group: 100 Countries Get Support in Response to COVID-19 (Coronavirus). 19 May 2020 [01/09/2020].
World Health Organization (WHO). (2007) *Everybody's business—Strengthening health systems to improve health outcomes: WHO's framework for action*. Geneva: WHO.
World Health Organization (WHO). (2010) *Monitoring the building blocks of health systems: A handbook of indicators and their measurement strategies*. Geneva: WHO.
World Health Organization (WHO). (2016) *International Health Regulations (2005)*. Geneva: World Health Organization.
World Health Organization (WHO). (2019) *WHO Global Code of Practice on the International Recruitment of Health Personnel: Third round of national reporting*. Available from: https://www.who.int/hrh/news/2019/EB-Code-report-Update-latest.pdf?ua=1 [1 September 2020]
World Health Organization (WHO). (2020) *Shortage of personal protective equipment endangering health workers worldwide*. 3 March 2020 [cited 1 April 2020 01/04/2020]
World Health Organization (WHO). (2020) *WHO Director-General's opening remarks at the media briefing on COVID-19*. Available from: https://www.who.int/dg/speeches/detail/who-director-general-s-opening-remarks-at-the-media-briefing-on-covid-19--3-april-2020 [Accessed 25 July 2020]
World Health Organization (WHO). (2020) *Chinese Emergency Medical Teams support COVID-19 response*. 2020 9 March 2020 [26/07/2020]
World Health Organization (WHO). (2020) *Covid-19 Response Resolution*.
World Health Organization (WHO). (2021) *Health systems for health security: a framework for developing capacities for International Health Regulations, and components in health systems and other sectors that work in synergy to meet the demands imposed by health emergencies*. Geneva: World Health Organization.
World Health Organization (WHO). (2021) *Human Resources: Annual Report*. World Health Assembly.
World Health Organization. (2016) *Global strategy on human resources for health: Workforce*. Geneva: World Health Organization.
World Trade Organization. (2020) *COVID-19: Trade and trade-related measures*. Available from: https://www.wto.org/english/tratop_e/covid19_e/trade_related_goods_measure_e.htm [Accessed 01 July 2020]
Xinhua. (2020) *Chinese medical team arrives in London to help fight COVID-19*. 29 March 2020 [26/07/2020]
Yamey, G., Jamison, D., Hanssen, O. & Soucat, A. (2019) Financing global common goods for health: When the world is a country. *Health Systems & Reform*, 5(4), 334–349.

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