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Vaccine equity in COVID-19: a meta-narrative review

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ABSTRACT

The topic of inequitable vaccine distribution has been widely discussed by academics, journalists and policy-makers in the context of the COVID-19 pandemic. However, research into perceptions of vaccine equity has been particularly neglected, resulting in a lack of universal understanding of vaccine equity. To address this, we conducted a meta-narrative review on COVID-19 vaccine equity according to the Realist And MEta-narrative Evidence Syntheses: Evolving Standards (RAMESES) publication standard. The review included articles published between January 2020 and September 2021. It aims to (1) identify research traditions that have considered this topic and investigate how it has been conceptualised; (2) explore any potential differences in understandings of the concept of vaccine equity adopted by distinct research groups; and (3) investigate the angles from which authors based their recommendations on how vaccine equity can be achieved. Five meta-narratives from the literature across various research traditions are identified, contextualised and discussed: frameworks and mechanisms for vaccine allocation, global health law, vaccine nationalism, ethics and morality, and reparative justice. Our findings indicate the need for a comparative review of existing global COVID-19 allocation frameworks, with a focus on explicating understandings of vaccine equity. COVID-19 will not be the last health crisis the world confronts. Heterogeneity in the academic literature is part of the way concepts are debated and legitimised, but in the interests of global public health policy-making, it is desirable to reach a consensus on what constitutes progress on equitable development, production, distribution and research.

WHAT IS ALREADY KNOWN ON THIS TOPIC

⇒ The COVID-19 pandemic led to the development of a number of frameworks promoting vaccine equity. Despite the ongoing discussion concerning global COVID-19 vaccine distribution, there is little attention to how vaccine equity is defined and conceptualised. This has implications for the quality of vaccine research and its applications to global vaccination.

WHAT THIS STUDY ADDS

⇒ This study evaluates different attitudes towards vaccine equity and summarises the ways in which it has been perceived and investigated by various research groups.

HOW THIS STUDY MIGHT AFFECT RESEARCH, PRACTICE OR POLICY

⇒ This study provides further guidance for research, practice and policy concerning vaccine equity in the context of pandemics and public health crises, including the need for rigour in the ways researchers define and explain their understandings of the term in their published outputs.

INTRODUCTION

The COVID-19 pandemic is the latest in a series of debates about vaccine equity in the context of a global health. Throughout past public health crises such as the influenza H5N1 and H1N1 outbreaks[1] and retroviral crisis in Africa in 2000–2005,[2] a common trend emerged: vulnerable low-income countries often suffer from inequitable access to health resources such as medication, tests, vaccines and treatments, and are often last to receive these interventions. Initiatives were established to address issues concerning global vaccination, including, in 2014, the Global Vaccine and Immunization Research Forum.[3] Despite these efforts, there is limited research and guidance on the concept of vaccine equity.

When COVID-19 was declared a pandemic by the WHO in March 2020, efforts were launched to facilitate the development of COVID-19 vaccines and prepare for their deployment, including Operation Warp Speed by the US Government[4] and the Access to COVID-19 Tools (ACT) Accelerator partnership by the WHO and partners.[5] Notably, the COVID-19 Vaccines Global Access (COVAX) Facility, one of the ACT Accelerator pillars, aimed to provide guidance for achieving global COVID-19 vaccine equity and to support low-income and middle-income countries (LMICs) with vaccine purchase and deployment.[6] A number of frameworks were proposed to guide vaccine allocation.[7–9] However, owing to varied interpretations of

the concept of vaccine equity, consensus on a unified allocation approach has proved elusive. When approved COVID-19 vaccines reached the market, vaccine nationalism took its toll on LMICs: in April 2021, 1 in 4 people in high-income countries had received a COVID-19 vaccine, whereas in LMICs it was 1 in 500.[10]

Issues of vaccine equity and distribution became very newsworthy during the COVID-19 pandemic across a plethora of platforms including journalism (eg, commentaries and opinion pieces),[10–12] peer-reviewed literature,[13] global think tank reports[14] and international and governmental policy documents.[8 14] While vaccine equity is often described as a 'shared vision' (see, eg, Dzau *et al*,[15]) critical scholars of political economy have exposed how the norms of neoliberal economies, along with structural racism and colonialism, have undermined the capacities of states and systems to protect health. Sparke and Williams, for example, elaborate a pathogenic metaphor ('neoliberal disease') to argue that plans, policies and practices advanced in the name of promoting wealth have been disastrous in protecting health.[16] Harman *et al* call for a reparative justice movement to confront and overturn colonial legacies that underlie vaccine apartheid.[17]

Despite media and academic interest, how vaccine equity is conceptualised in the literature has yet to be comprehensively reviewed. There has been no definitive understanding of this concept used in establishing the ethical and practical frameworks for global COVID-19 vaccine allocation. Such inconsistency and lack of a streamlined conceptualisation have important implications, not only for the quality of vaccine research but also for policy-making, public opinion and the state of global vaccination.

In this meta-narrative review, we align ourselves with a critical discourse perspective that maintains that entities achieve and maintain legitimacy through discourse. We follow Fairclough[18] in considering discourse to be relational, dialectic and transdisciplinary—concepts are made understandable through their interconnectivity with, among others, objects, persons, institutions, fields of inquiry and power relations. In so doing, we recognise that vaccine equity is an ideological construct: it is inextricably entangled with interests, aspirations and politics, not all of which are made explicit in the way the term is wielded in discourse. For this reason, we consider it imperative to map the narrativisation of the concept with a view to better understanding the real-world impacts of notions of vaccine equity.

To this end, we explore the concept of vaccine equity in the context of COVID-19. The review objectives are: (1) to summarise the research traditions that considered this topic and how it is conceptualised; (2) to explore differences in the concepts of vaccine equity by different research groups; and (3) to investigate the angles from which the included papers considered their recommendations on how vaccine equity can be achieved. Our study contributes to mapping the complexity of the issue and to the identification of possible consequences of its heterogeneity.

METHODS

The meta-narrative approach

A meta-narrative review is a method of systematic review that analyses a heterogeneous concept by synthesising the multidisciplinary ways in which researchers have studied the topic.[19] Originally proposed and developed by Greenhalgh *et al*,[20 21] the meta-narrative approach summarises overarching themes with a scope broader than that of conventional systematic reviews, and furthermore provides interpretation and critique.[22] A meta-narrative approach was chosen for its appropriateness in making sense of a complex, heterogeneous concept, such as vaccine equity, in the context of real-world decision-making. This form of review allows for an interpretive engagement with discourse that is more flexible than conventional systematic reviews. It puts the findings from papers that bring different disciplinary perspectives into conversation with each other, and identifies points of convergence and divergence. In keeping with reflexivity as a guiding principle of meta-narrative review, the authors of this review brought a range of their own disciplinary perspectives to the review. JB and ZZ are medical students who collaboratively embarked on this review as part of their commitment to reducing health inequalities as a shared professional value, GD is a medical humanities educationalist with an interest in moral evaluations of healthcare provision, and MPdC is a clinical academic with an interest in health services research.

The review was conducted in accordance with the Realist And MEta-narrative Evidence Syntheses: Evolving Standards (RAMESES) publication standards for the reporting of meta-narrative reviews.[19] Figure 1 summarises the searching, screening and synthesis process.

Scoping and searching the literature

An overview of the concept of vaccine equity in the global COVID-19 pandemic was established through a preliminary search of a variety of databases as a form of 'territory mapping'[19] exercise. Four databases—MEDLINE, Embase, CINAHL and Web of Science—were selected for systematic searches. MEDLINE contains journal articles in the life sciences and biomedicine. Embase is an extensive biomedical and pharmacological database. CINAHL is the authoritative source for nursing and allied health literature. Web of Science was selected as it accesses multiple databases that reference cross-disciplinary research.

Key concepts from which the search terms were derived were 'COVID-19', 'vaccine equity' and the 'global' context (see online supplemental material 1). A starting date of 1 January 2020 was chosen to coincide with the bringing to public attention of the COVID-19 on 31 December 2019, when the WHO Country Office in China first received notification of a cluster of viral

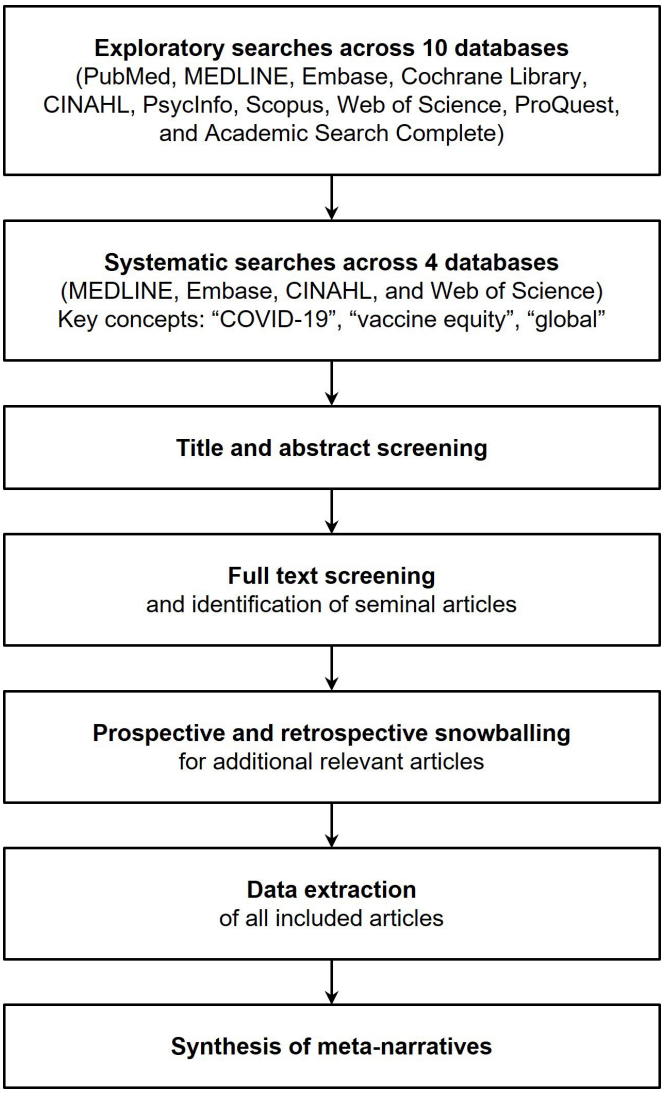

Figure 1 Summary of the searching, screening and synthesis process.

pneumonia cases in Wuhan[23]. Given that debates about vaccine equity are ongoing, and there are pragmatic limits on how many papers can be reviewed, a suitable end date for the review was less easily identifiable. The date of 1 September 2021 was chosen as it marked the rollover of COVID-19 vaccine booster shots in a number of high-income countries, in opposition to advice from WHO that unvaccinated people in low-income countries should be prioritised for vaccines.[24]

Selection and appraisal of documents

From the four databases, 2360 records were identified. Only articles published in English were included. Following duplicate removal, 1523 articles were screened (figure 2). Titles and abstracts of identified papers were independently screened by two reviewers according to the following inclusion criteria: (1) the article explores vaccine equity as a concept and (2) the article addresses vaccine equity in the context of global COVID-19 vaccination. Exclusion criteria were: (1) non-English language articles; (2) non-peer reviewed articles; and (3) letters, conference or panel abstracts, news articles or interviews.

A high interobserver agreement was found (98.6%). Then, 301 full-text articles were screened independently by both reviewers. In case of disagreement, a third reviewer was involved in making the final decision regarding inclusion. Through the screening process, it became clear that certain articles may discuss vaccine equity, but not as a central focus. Therefore, an additional inclusion criterion was applied: vaccine equity is a central theme or focus of the article. This aligns with the iterative process of selection and refining in conducting a meta-narrative review.

From the 301 articles, 29 articles were identified as seminal articles (conceptual, theoretical or empirical articles that have explored the concept of vaccine equity in the context of COVID-19 vaccination). Further, snowballing searches were conducted, which resulted in the addition of four relevant articles. A total of 33 articles were ultimately included in the review.

Data extraction

The following information was extracted: first author, year and month of publication, title, journal name, country, type of publication (perspective/opinion/commentary, editorial or policy document), research tradition(s), whether the article was written pre introduction or post introduction of vaccines, and the concept of vaccine equity and recommendations on how it can be achieved.

Analysis and synthesis processes

Research traditions, or fields of study, for each included article, were determined according to the backgrounds of the articles' authors, the lens through which they considered the concept of vaccine equity and each article's disciplinary alignment. Articles were categorised under one or more of the following research traditions: ethics, law, philosophy and public health/medicine.

Findings from the included articles were synthesised into over-arching narratives by considering holistically the research tradition, the disciplinary orientation, the focus, prominent themes, as well as key findings or recommendations of each article. The meta-narratives were arrived at through independent analysis by two reviewers initially, following which a thorough process of discussion and review between all authors was undertaken to refine the list of potential meta-narratives. Each article was mapped to one or more meta-narratives.

Patient and public involvement

Patients were not involved in the design and conduction of this study.

RESULTS

Characteristics of selected articles

The included publications comprised 23 perspective/opinion or commentaries, 4 editorials, 3 policy

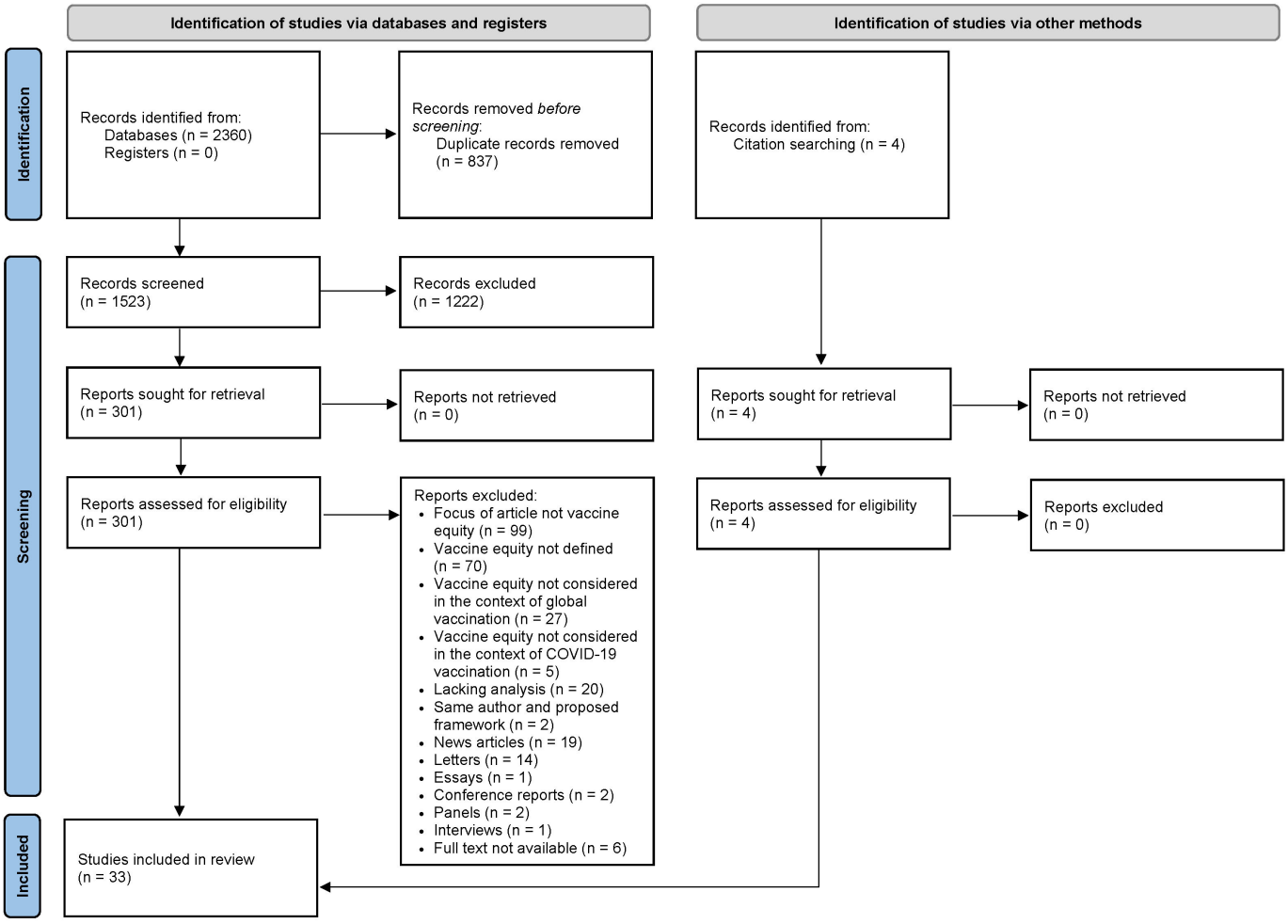

Figure 2 Realist And MEta-narrative Evidence Syntheses: Evolving Standards–Preferred Reporting Items for Systematic Reviews and Meta-Analyses diagram.

documents, 2 reviews and 1 book chapter. In terms of research tradition(s), 23 articles were categorised under 'public health/medicine', 15 under 'ethics', 12 'law' and 3 'philosophy'. The countries of origin were diverse, including authors from 27 different countries. Notably, 17 articles (51.5%) had author(s) from high-income countries only, 12 (36.4%) had representation from both high-income countries and LMICs and only 1 was solely from an LMIC.

Online supplemental material 2 summarises the unfolding storylines and their conceptualisation of vaccine equity, in chronological order of publication. By publication date, the articles span the period from June 2020 to September 2021. Overall, 11 of the 33 articles (33.3%) were written before the introduction of approved COVID-19 vaccines and the other 22 (66.7%) after.

Definition of vaccine equity

Most of the articles did not state an explicit definition of the term 'vaccine equity'. Two articles published in August 2021 gave an implicit definition of equity, both referring to equity as means of minimising disparities.[25 26] One article published in May 2021 referred to equity as proportionality but did not give its explicit definition.[27] In the context of worldwide vaccination in a global pandemic, vaccine equity was generally implied to refer to equitable vaccine coverage across high-income countries and LMICs. This was a notion that was widely and uncritically adopted. Each article regarded equity using a distinct disciplinary approach, on the basis of which the author(s) based their recommendations on how vaccine equity could be accomplished. The five interconnected meta-narratives are discussed below and illustrated in figure 3.

Meta-narrative 1: frameworks and mechanisms for vaccine allocation

In 11 articles included in this meta-narrative, the issue of vaccine equity is considered in the context of the need for an effective and equitable global distribution mechanism.[7–10 13 28–32] These authors attempted to propose solutions—either new frameworks or suggestions to strengthen existing ones—for the global distribution of COVID-19 vaccines. Such propositions appeared in the published literature from August 2020, while COVID-19 vaccines were still in development and before any had been approved by regulators.[9] The WHO published

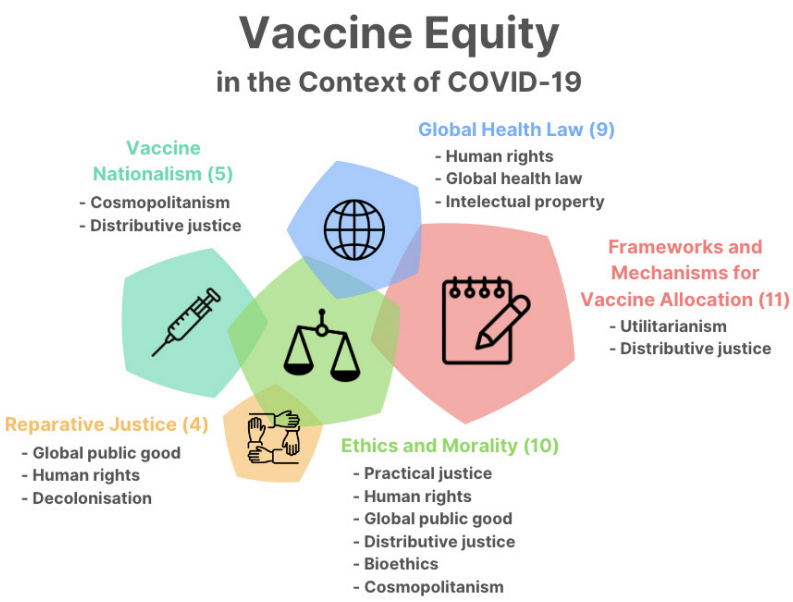

Figure 3 Meta-narratives (the number of articles assigned to the meta-narrative) and the corresponding subthemes on vaccine equity in the context of the COVID-19 pandemic. Meta-narratives (the number of articles assigned to the meta-narrative) and the corresponding subthemes on vaccine equity in the context of the COVID-19 pandemic.

its proposal of the COVAX Facility mechanism on 9 September 2020.[8] Early consideration of this matter, particularly from a logistical standpoint, reflects the overall cognizance that without a predefined set of principles and mechanisms in place, equitable distribution among countries of this life-saving intervention in a global pandemic was unlikely to be achieved.

The awareness of logistical difficulties stems from past experiences in the management of public health crises. The need to equitably distribute medical and public health resources, including medications, treatments, tests and vaccines, has been a recurring theme in global health before COVID-19 vaccination came into the picture. Delayed distribution of antiretroviral treatment cost 330 000 lives in South Africa between 2000 and 2005.[2] Efforts to expand access to influenza H5N1 and H1N1 vaccines were embroiled in protracted negotiations.[1] A common trend is that the vulnerable in low-income countries are often the last to receive these interventions. Experiences during these crises meant that, once COVID-19 became widespread enough to warrant the development of a vaccine, the WHO prioritised working pre-emptively towards a global distribution mechanism. Academics, most prominently in the fields of public health/medicine,[7 9 10 28–32] began to devise relevant recommendations.

Liu *et al*[9] propose a 'multivalue ethical framework', which stratifies countries into groups based on three guiding principles: ability to provide care, ability to implement and reciprocity. This was the only selected article published prior to WHO's introduction of the COVAX mechanism.[8] The COVAX framework proceeds in two stages: phase 1 focuses on proportional allocation for all countries once 20% of population per country is covered; phase 2 expands access using weighted allocation based on risk assessment. In close succession, Emanuel *et al*[7] published the Fair Priority Model to supplement COVAX. The model proceeds in three phases: (1) reducing premature deaths; (2) reducing serious economic and social deprivations; and (3) returning to full functioning. Prioritisation at each of these stages is based on a specific metric, namely: (1) standard expected years of life lost (SEYLL) averted; (2) SEYLL averted, reduction in absolute poverty and declines in gross national income averted; and (3) transmission rates. The authors argue for prioritising countries that are more severely affected, rather than pure proportional distribution. This view is echoed by Garfinkel *et al*,[28] who highlight that the rigid geographical distribution key of COVAX fails to take into account optimal global health impact and the respective medical or economic needs of member countries.

Sharma *et al*[30] compared COVAX's allocation mechanism with a targeted allocation based on need (eg, the Fair Priority Model). They concluded that although, in theory, a targeted distribution in proportion to a country's need would be more morally justifiable, when political realities are taken into account, an equal distribution seems more likely to avert a greater number of deaths and reduce disparities.

Similar to Sharma *et al*,[30] later published papers (post introduction of approved COVID-19 vaccines) do not propose a novel framework, but evaluate existing

frameworks (mainly COVAX) and/or offer recommendations for implementation, which may extend beyond the allocation mechanism to aspects such as healthcare delivery. Most advocate maintaining commitments to global cooperation through COVAX.[10 29 33] Herlitz *et al*[29] offer three suggestions to strengthen existing proposals for fair vaccine allocation. Such proposals should: address health problems for individuals; explicitly focus on both direct and indirect health effects of COVID-19; and assist countries with their vaccine distribution, production and consumption. Binagwaho *et al*[10] further recommend sharing of technologies by pharmaceutical companies and ensuring logistical capacity for mass vaccination. According to Asundi *et al*,[32] the first step should be the redistribution of surplus in some high-income countries, while true global vaccine equity will require a long-term, global effort to expand vaccine production capability, facilitate technology transfer and develop regulatory systems that support vaccine innovation. Once COVID-19 vaccination was underway, more emphasis was placed on the emerging inequalities in global vaccination. Wouters *et al* highlight national procurement strategies (ie, purchasing vaccines directly from developers and not via COVAX, a practice which began with high-income countries) as one of the most significant threats to equitable allocation.[13] In this way, the concept of vaccine equity centres on the disparities in global distribution, particularly between high-income countries and LMICs.

In summary, papers included in this meta-narrative focused on the proposed mechanisms for global vaccine distribution, as well as the pragmatic aspects of achieving equitable allocation. Three frameworks emerged: the multivalue ethical framework,[9] the WHO's COVAX Facility[8] and the Fair Priority Model.[7] COVAX (proportional allocation in the initial stage) and the Fair Priority Model (need-based allocation from the outset) represent the two most prominent schools of thought. Other papers review these frameworks or evaluate other actionable recommendations.[10 28–32 34] Papers in this meta-narrative tended to envisage the world as divided into high-income countries and LMICs.

Meta-narrative 2: global health law

Although public health has always involved international cooperation, global health law as a field has expanded significantly in response, in part, to the need for international legal cooperation to address emerging global health threats such as pandemics.[35] The nine included articles broach the topic of vaccine equity in COVID-19 by considering the concept of global health law and governance.[25 28 36–42] These authors have academic backgrounds predominantly in law or foreign relations.[36–38]

Gostin *et al*[37] explore the global health law reforms necessary to the progressive realisation of universal vaccine access. This will require: facilitating funding and benefit sharing, easing intellectual property (IP) protections and harmonising national vaccine regulations. A key issue arising from such discourse in the context of COVID-19 vaccination is that of intellectual property. Vanni[38] argues that the development discourse often touted by developed nations to help countries in the Global South 'catch up' is empty when essential medicines are deliberately denied and weaponised, and calls for an overhaul of the 'dysfunctional global IP system'. Frequently invoked in the debate is the World Trade Organization's Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS Agreement). The United Nations Committee on Economic, Social and Cultural Rights (CESCR),[40] for one, urges member states to maximise the production and equitable deployment of vaccines using flexibility of TRIPS agreements internally as well as voluntary licensing, technology pools and waivers. Various authors also suggest that a temporary IP waiver is essential but not sufficient; this must be further supplemented by knowledge and technology transfer.[39 42] Overall, there is widespread agreement that 'global IP rules must not stand in the way of research, production, technology transfer or equitable access to essential health tools, and in context of pandemics to achieve increased manufacturing without discouraging innovation.'[25]

Other concepts in the discourse include global health security[39] and access to medicines.[41] Krikorian *et al* argue that the current health innovation and access ecosystem is ill-suited to provide equitable access to life-saving medical interventions. They call for the current market-based innovation policies to be replaced by public–private collaboration for the public interest.[41] Šehović *et al* broach the concept of global health security, which they note has no unified definition, but rather can be considered from 'two perspectives that operate in tension: that of state security prioritising individual national(s) safety and security, and that of human security-centred population security that also applies beyond borders'.[39] Such discussions tend to arise post development of approved COVID-19 vaccines, as the focus shifts towards future pandemic preparedness and the improvement of overarching systems of governance.

Invariably, global health law is not considered in isolation, but in tandem with closely interrelated themes of vaccine nationalism and human rights. Aspirations to global governance and multilateralism runs counter to the phenomenon of vaccine nationalism. Gostin *et al*,[37] as previously noted to be focusing on vaccination access through global governance, also examine the human rights foundations of global health law, conceptualising vaccination access as a universal human right. Šehović *et al*[39] also call for advancing the human rights front, including through international human rights law and International Health Regulations. The CESCR similarly frames vaccine equity in view of the UN Sustainable Development Goals and human rights obligations.[40]

In essence, articles in this meta-narrative considered vaccine equity through the lens of global health law. A key issue in this regard is the IP system, wherein there arises a mismatch in the policy design of IP protection and the policy requirements of an effective pandemic response.

Global health law was also discussed in conjunction with vaccine nationalism and human rights.

Meta-narrative 3: vaccine nationalism

Five included articles discussed vaccine nationalism.[27 33 43–45] 'Vaccine nationalism' is a term frequently used in the press and research when discussing COVID-19 vaccine distribution.[46 47] It is directly related to the ethical dilemmas arising from the pandemic and stems from the self-interest of nation states. In essence, it describes the situation in which countries take on responsibilities solely concerning the situation within their borders. It is often contrasted with the position of 'vaccine cosmopolitanism'.[45]

According to Tandon,[45] vaccine nationalism and cosmopolitanism originate from different political ideologies. Vaccine nationalism stems from communitarianism as it is shaped by the idea that belonging to different communities informs moral obligations. In contrast, vaccine cosmopolitanism relies on utilitarianism, which measures the outcome of vaccination by general global well-being without division into separate parties.[45] However, other authors challenge definitions that are based solely on utilitarian perspectives. Two articles included in this meta-narrative pair it with the term 'distributive justice'.[27 43] Ferguson and Caplan[43] define vaccine cosmopolitanism as a view in which community membership (eg, citizenship) is irrelevant in achieving distributive justice. This relates directly to the distribution of vaccines distinguishing between what is equitable and what is equality. According to Bolcato *et al*,[27] 'equitable' in the context of distributive justice refers to proportionate distribution according to need, hence it refers to the process itself and priorities must be set in proportion to the reduction of risk for the greatest number of people in a given population at a given time. Equality (vaccine administration for all) is defined as guaranteeing the entire population equal protection against infection through vaccination campaigns that take into account equitable access in line with needs of populations, communities and individuals.[27]

Three articles included in this meta-narrative were published post-COVID-19 vaccine deployment[27 44 45] and relate to the current state of COVID-19 vaccination. The two included articles published before COVID-19 vaccine distribution[33 43] sought to find the middle ground between vaccine nationalism and cosmopolitanism. Furthermore, they validate vaccine nationalism as an instinctive response and urge research and political bodies to recognise these conflicting agendas when designing the ethical framework for just vaccine allocation. Ferguson and Caplan[43] point out that some research groups and policy-makers condemn vaccine nationalism as an obstacle. However, the authors argue that governmental bodies have certain justice-based obligations towards their citizens, which cannot be dismissed in the discussion on global vaccine distribution. Lie and Miller[33] adopt a similar view, criticising the Fair Priority Model for its ineffectiveness in the real world. They contend that COVAX provides the right balance between national and global responsibilities.

Bolcato *et al*[27] recognise the difficulties in the implementation of equitable vaccine distribution owing to differing perceptions of equity and opinions on ways of adopting it, and because vaccine nationalism applies chiefly to the policies of rich nations. The authors also define equity as proportionality according to individual countries' needs that, when applied to vaccine distribution in a time-sensitive manner, helps to accomplish equality.[27] They also recognise the need for change in the predominant vaccine nationalism culture in rich countries as do other publications.[44 45] Katz *et al*[44] discuss the existing organisations such as COVAX and emphasise the need for multilateral partnerships. Tandon[45] proposes scrutiny of the reasons that underpinned the widespread adoption of vaccine nationalism.

The articles in this meta-narrative construct the concept of vaccine equity around two opposing concepts: vaccine nationalism and cosmopolitanism. The authors envision a world that faces the COVID-19 pandemic through these two ideologies often dividing the globe into two groups: developed countries which thrive on vaccine nationalism and LMICs which fall victim to it. The authors tend to be based in the Global North and have legal/public health academic backgrounds. Some of them give a direct opinion on the negative aspects of vaccine nationalism and find solutions in cosmopolitanism.[27 44 45] Those authors often refer to the state of global vaccination listing its possible current and future consequences. Articles were mostly published once the vaccines were approved and deployed. Two articles published prior to vaccine development[33 43] acknowledged the inevitability of vaccine nationalism and argued that to achieve equitable distribution, vaccine nationalism should be recognised and partially incorporated by the global allocation frameworks. Overall, the articles in this narrative focus on the consequences of vaccine nationalism and they view vaccine equity through the lens of purchase and distribution of vaccines.

Meta-narrative 4: ethics and morality

Ten articles included in this review consider the issue of equitable COVID-19 vaccine distribution from a moral point of view, justifying the need for it.[11 26 30 37 44 48–52] These considerations often stem from human rights, with reference to the 1948 Universal Declaration of Human Rights[53] and the WHO Constitution (1948) that envisaged 'the highest attainable standard of health as a fundamental right of every human being'.[54] Pinpointing numerous failures of humanity to execute this idea (eg, influenza H1N1,[48] antiretroviral treatment for HIV in the early 2000s[1]), researchers also highlight the practical importance of equitable vaccine distribution in ending the COVID-19 pandemic.

Identification and analysis of the values underpinning the moral obligation to strive for COVID-19 vaccine equity were published during the vaccine discovery phase and

predeployment in September 2020. The WHO Strategic Advisory Group of Experts on Immunization (SAGE) values framework[49] recognised six values-informed principles for guidance in the global vaccine allocation process. Similarly, an article published postdeployment of vaccine identifies a set of moral values that underpin the universal notion of vaccine equity—Adejumo *et al*[26] refer to Sustainable Development Goals and the principle of Universal Health Coverage, and define vaccine equity as a process of 'striving to eliminate disparities in health between more and less-advantaged social groups occupying different positions in the social hierarchy'. The WHO SAGE framework[49] also highlights that the global vaccine allocation needs to consider special epidemic risks of each country individually to address the human rights claims to vaccines. It also specified the need for special attention to LMICs and considered COVID-19 vaccine a public good.

The idea of a COVID-19 vaccine being recognised as a global public good was widely adopted in the months leading up to and following vaccine deployment.[11 55 56] Smith *et al*[57] in 2004 concluded that global public goods could offer 'guidance in improving collective action at the international level' regarding communicable diseases control. Two articles[11 49] suggested that the concept of COVID-19 vaccine as a global public good will be necessary in ensuring its equitable distribution, whereas Gostin *et al*[37] recognised its role in the global health law reforms as crucial to the progressive realisation of universal vaccine access. Despite referring to COVID-19 vaccines as global public goods,[11 37 49] articles often failed to give a definition of this term. According to a previously established definition by Musgrave and Samuelson, a global public good must fulfil two criteria: non-rivalry and non-excludability.[57] Persad and Emanual argue that the attention focused on the fair distribution of available COVID-19 vaccines confirms that they are not global public goods because they are rival (when one person receives it, another is denied it) and excludable (countries can decide to vaccinate only citizens and residents).[58] They argue that if COVID-19 vaccines were really global public goods, the focus would be on maximal production. They advocate for understanding vaccines as a humanitarian entitlement rather than a global public good.

Another issue that arises from the discourse on moral obligations in COVID-19 vaccine distribution is the juxtaposition of fair and feasible distribution. Many articles give ethical reasons for prioritising LMICs. Jecker and Atuire[50] draw on African ethics and the characterisation of COVID-19 crisis. They introduced ethical criteria to guide global distribution, arguing that the difficulties that LMICs face in obtaining vaccines mean that they should be prioritised. Emanuel *et al*[7] also adopted the view that, given the gravity of the pandemic and the number of lives at stake, it is not possible to justify the self-interest of nation states and lack of global responsibility. Sharma *et al*,[30] however, argue that fair distribution might not be the best solution in terms of political feasibility. A morally defensible vaccine allocation mechanism would involve distributing doses to those whose need is greatest. It should ensure the greatest reduction in harm and disparities which they classify as a main goal for global COVID-19 vaccination. However, the authors claim that targeted distribution based on countries' needs might not yield the desirable result due to its political unfeasibility. As one of the articles published post vaccine deployment in March 2021, it criticises the WHO's failure to acknowledge the reality of current vaccine distribution and the self-interestedness that guides the current allocation process. This resonates with the meta-narrative of 'vaccine nationalism' considered in meta-narrative 3.

There is another aspect to COVID-19 vaccine equity mentioned in three articles[48–50] that are aligned with several meta-narratives including 'ethics and morality' and 'reparative justice'. Ogbogu *et al*[48] discuss equity at each level of vaccine development including open access to research outputs, distribution of benefits and burdens of the research, and access to research resources in biotechnology. This extends the responsibility of states to ensuring progress towards global equitable distribution of biotechnology resources and research. Such a shift towards practical justice could lead to minimising the divide between theory and policies in the real world. Jecker and Atuire[50] also extend vaccine equity beyond distribution as they argue, on utilitarian and deontological grounds, for waiving IP protections.

In articles included in this meta-narrative, researchers approached vaccine equity from an ethical perspective, examining the reasons that should guide government bodies and global entities in the process of vaccine allocation. The definition of vaccine equity is often implied, and is characterised as a means to relieve the most suffering and minimise disparities. The authors come from different countries and are experts in various fields including law, ethics, philosophy and public health which results in heterogeneous reasons used to justify the need for equity. Some referred to human rights and moral obligations,[11] while others emphasised the practicality of the desired solution[30] or the multifaceted nature of the issue.[48] COVID-19 vaccine as a global public good is also a recurrent theme. Despite the similarities in the approach to the issue, there is little consistency in agreement on the morality of vaccine equity.

Meta-narrative 5: reparative justice

Four articles were identified under this meta-narrative.[25 49 59 60] The three that were published post-vaccine deployment both examine a similar side of the COVID-19 vaccination issue that arose after the first months of vaccines rollout.[25 59 60] All three articles were published in global health-related journals and included researchers with ethical and law backgrounds. They bring up reparative justice, which entails a different side of equity. This concept seeks to repair harm that has been done to the victims considering the reality they live in and

the nature of the harm. Saksena[60] argues that in a similar way, the vaccine allocation process needs to account for historical inequities when distributing vaccines. The authors propose the idea of setting up quotas for LMICs, resembling the national allocation framework by the US National Academies of Sciences, Engineering and Medicine, which prioritises racial minorities. The article also criticises patent monopolies that create artificial scarcity. The second article also considers COVID-19 vaccination through reparative justice but applies this concept beyond vaccines. Sekalala *et al*[61] argue that true equity lies in power not distribution, and to achieve that, human rights must be freed from colonial ideology. The authors criticise charitable initiatives such as COVAX and focus their attention, similarly to Saksena,[60] on the lack of attention to human rights by corporations holding patents to the vaccine. Sekalala *et al*[61] also point out how IP system protection coerces countries in the Global South to agree to participate in the unjust global economic systems and reinforces colonially established power dynamics. Despite the African Union's criticism of IP law protection, LMICs were pushed to participate in the charitable model of the COVAX scheme and due to the lack of bargaining power they often could not obtain competitive rates for the COVID-19 vaccines.

Hotez *et al*[25] also apply an expansive meaning of equity that goes beyond distribution. The authors of the article, who come from a range of countries and academic backgrounds, provide a comprehensive set of recommendations that can support LMICs in striving for COVID-19 equity. The article raises the important issue of research of COVID-19 vaccines, including the need for transfer of technology and manufacturing as well as participation of LMICs in randomised control trials. Similarly, the WHO SAGE values framework[49] also offers guidance on the COVID-19 vaccine equity on a broader scope than just distribution. It recognises constant change as an inherent element of the pandemic and proposes values that need to be acknowledged to mitigate the consequences of a dynamic situation.

Overall, the articles in this meta-narrative evaluate the concept of equity in COVID-19 from a broader perspective and often refer to the global inequity of power, that in its implications, goes beyond solely the distribution of COVID-19 vaccines. The authors are based in various countries (including LMICs), have diverse academic backgrounds and offer a comprehensive set of guidelines and recommendations that should be introduced in the pursuit of equity to minimise disparities and free LMICs from colonially entrenched power dynamics.

DISCUSSION

Summary of findings

Some themes feature prominently across meta-narratives. The articles drew on the pre-existing literature, often referring to crucial events for the development of the COVID-19 pandemic (eg, vaccine deployment) and citing work by Emanuel *et al*[5 7] and the WHO.[8 14 49] The themes examined different aspects from various research groups' perspectives including law, ethics, global/public health and pharmaceutical production. Certain themes were prominent: 'practical frameworks', 'vaccine cosmopolitanism', 'global health law' and 'human rights'. They were explored as reasons for achieving equity and/or factors that contribute to the process of global vaccine distribution. Events influenced the meta-narratives' development (eg, deployment of vaccines, funding of COVAX). Under 'vaccine nationalism', articles published before the deployment of vaccine recognised it as a part of justice, while those published after criticised it. Secondly, the publication of the three ethical frameworks in 2020[7–9] witnessed a shift in the literature from framework creation to critiques of published frameworks. The academic publishing framework should be acknowledged as influencing which authors and themes are prominent in the peer-reviewed literature. Like vaccines, knowledge production, distribution and access are also inequitable across the globe.[62 63]

Comparisons with existing literature

Literature reviews on the topic of COVID-19 vaccines have usually focused on mechanisms of achieving global health equity. COVID-19 vaccine equity is linked to global health equity because it throws into sharp relief that inequality-sustaining processes put everyone at risk when faced with a highly infectious disease caused by a deadly, mutable virus. This requires decision-making processes to be decoupled from structures that have depended on inequitably distributed knowledge, wealth, power and resources. Geiger and McMahon[64] and Van De Pas *et al*[65] give useful timelines of events that influenced the storyline of the COVID-19 pandemic, giving an overview of the current state of the vaccine distribution mechanisms. These articles do not examine the core concept of vaccine equity, but they still recognise the need for a global multilateral partnership that draws on previously proposed frameworks. Geiger and McMahon[64] notice, similarly to this review, the variety of perspectives from which the frameworks stem. Instead of criticising their lack of homogeneity, the authors proclaim the advantages of combining framework strengths. Moreover, similarly to this review, they urge for a clear, decisive and coordinated action from all stakeholders.

Vaccine equity is not merely about distribution. It encompasses other matters from vaccine development to deployment and uptake. Some of these issues have been systematically investigated including the uptake of vaccines by different communities or access to the vaccines by certain minority groups.[66 67]

Strengths and limitations

To our knowledge, this is the first meta-narrative review on COVID-19 vaccine equity. Our methodology was rigorous, following the RAMESES publication guidelines and employing clearly defined inclusion and exclusion

criteria to capture a representative set of articles enabling a balanced review of the concept of vaccine equity in COVID-19. Strength-of-evidence criteria was not applied because included articles considered relevant to this review were theoretical and could not be appropriately assessed with strength-of-evidence grading.

This review has limitations. First, the search was limited to English-language articles and a specified date range. With the dynamic COVID-19 situation and enhancement of vaccination efforts, further pertinent articles will have been published after September 2021. Additionally, while the search was broad, potentially, there may be relevant articles published in journals not encompassed by the databases we searched. Meta-narratives are constructed rather than emergent from the source material. We offer our interpretation as part of an ongoing discourse on the issue of vaccine equity—particularly in the global context—rather than a definitive account.

Implications of findings for policies, practice and research

'Vaccine equity' is a concept that is instantiated and legitimised in the way it is used in discourse. Our meta-narratives show that its usages in the period we studied coalesce around logistics of allocation and distribution, global health law, governance, nationalism, ethics and morality, and reparative justice. Many of these concentrate on vaccine distribution, but, as van der Graaf *et al* have pointed out, there is scope for a model of vaccine equity that extends to the full vaccine life cycle, taking production and health systems contexts into account so that equity is seen as more than 'needles in arms'.[68]

Overall, the terminology used in the literature and the media is heterogeneous and used inconsistently. Papers rarely articulate the sociopolitical contexts in which their arguments are situated, although these are integral to concepts of equity. Because articles in our review did not engage with clear definitions or contexts of equity, it became clear that what is at stake is not a debate about a unified concept around which organisations could strategise, but a complex network of theories, models and underlying assumptions. A consensus on what constitutes equity is perhaps unrealistic given the heterogeneity of circumstances and experiences, of individuals, nation states, healthcare providers and researchers seeking to learn lessons from COVID-19. But it is imperative that researchers should attend to demonstrating rigour about the ways in which they define and explain their understandings of the term in their published outputs.

In the interests of following our own advice, and informed by the process of conducting this meta-narrative review, we articulate our definition of vaccine equity as follows. Vaccine equity attends to the arrangement of the full vaccine life cycle including vaccine research, production, distribution, IP and administration. Those facing issues of greater magnitude on a national and international scale are supported adequately to their needs. Disparities regarding power, social status, income, gender, race and ethnicity are minimised, and, once short-term goals of disease containment have been met, structural injustices are addressed in the interests of reparative justice.

Our review provides a foundation for more systematic studies. Authors discussing this topic should state their understanding of the term 'equity' before providing the reader with sociopolitical context, opinions, solutions and/or conclusions. Considering the possibility of future pandemics, we also recommend conducting a comparative review of the three most cited mechanisms of the global vaccine distribution which includes those proposed by Emanuel *et al*,[7] the WHO[8] and Liu *et al*[9] with regard to their understanding of equity, how it was applied in their proposal and the real-life consequences of their adopted definition on the COVID-19 vaccine distribution.

We observed trends in how usages of 'vaccine equity' influenced the authors' recommendations. Implicit definitions that revolved around distribution[7–10 13 28–32] advocated policies that centred around charity-like donation models (eg, COVAX) to achieve equity of distribution. While providing localised, short-term amelioration of vaccine shortages, donation models do not address the structural inequalities that entrench health inequalities. Articles that raised important issues regarding vaccine equity that went beyond the distribution and included vaccine research and production were more likely to acknowledge the need for systematic reform in country-level health systems and international governance. The most ambitious papers called for reparative justice to be factored into policies that seek to promote equity.[25 49 59 60] These entail a reimagining of priorities and frameworks that demands unprecedented transnational cooperation and accountability.

Heterogeneity in the academic literature on the way 'equity' is used points to a plurality of views and positionings. But for policy formation, a consensual definition of 'equity' is desirable if stakeholders are to achieve agreement on what constitutes successful vaccine equity. By pre-emptively conducting further research and undertaking multidisciplinary discussions on the topic of equity concerning medical resources, we can possibly improve current and/or avoid future inequitable distribution of resources, also promote greater equity in vaccine development, production and research on effects.

CONCLUSIONS

COVID-19 will not be the last health crisis the world confronts. In an era of globalisation marked by increasing connectivity, we must ensure that medical advances reach all populations in the timeliest manner—particularly in cases of infectious diseases with widespread impact. Understanding vaccine equity and building on experience—including the most recent COVID-19 response—to synthesise key principles will better enable the establishment of a fair and just allocation mechanism for equitable distribution of potentially life-saving medical interventions such as COVID-19 vaccines.

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