



Policy Analysis

Justice in Global Distribution of mRNA Vaccine Technology

Ines Mendes^{1*}, Zsafia Lindqvist² and Nils Ramirez¹

¹Center for Medical Ethics and Law, Jutland University Centre for Bioethics, Denmark

²Center for Medical Ethics and Law, Douro Institute of Bioethics, Portugal

³Department of Bioethics, Jutland University Centre for Bioethics, Denmark

ABSTRACT

The mRNA vaccine platform reached clinical use with unprecedented speed during COVID-19, but its benefits reached the world unevenly, and this review asks what justice requires in the distribution of the technology itself rather than only its finished doses.

We examine the pooled-procurement mechanism COVAX and the evidence that donor-dependent charity models were structurally outcompeted by bilateral advance purchase agreements between wealthy governments and manufacturers.

We then trace the intellectual-property debate over the TRIPS waiver and compulsory licensing, where scholarship is divided over whether patent law or the tacit manufacturing know-how behind mRNA production was ever the binding constraint on access.

A more recent literature turns to manufacturing capacity and technology-transfer hubs as the deeper structural issue, arguing that durable regional production capability, not faster donation, is the metric that should define a just distribution.

We conclude that public-goods arguments grounded in donor self-interest are too fragile to support a lasting distributive framework, and that the arrangements built during this pandemic for sharing manufacturing capability will set the precedent for whichever platform technology follows mRNA.

Keywords: global health justice; mRNA vaccines; vaccine equity; TRIPS waiver; technology transfer

Citation: Mendes I, Lindqvist Z and Ramirez N (2026) Justice in Global Distribution of mRNA Vaccine Technology. *Bioethics*. 1(2):01-05.

Corresponding Author: Ines Mendes

E-mail Address: i.mendes@jucb.dk

Article History: Received 28 June 2026 | Accepted 02 October 2026 | Published 23 December 2026

Copyright: © 2026 Ines Mendes, et al. This is an open access article distributed under the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited (<https://creativecommons.org/licenses/by/4.0/>).

INTRODUCTION

The mRNA platform arrived in clinical use with genuinely unusual speed, and it arrived unevenly. Within a year of the first COVID-19 mRNA vaccines receiving emergency authorization, high-income

countries had secured enough doses to cover their populations several times over, while many low- and middle-income countries were still waiting for a first shipment large enough to matter [1]. That gap did not close quickly, and the reasons it persisted turned out

to have less to do with global goodwill than with who owned the manufacturing knowledge, the patents, and the production capacity behind a genuinely novel vaccine technology. This paper asks what justice requires in the distribution of a platform technology whose value extends well past the pandemic that made it famous -- mRNA vaccines are already being adapted for influenza, respiratory syncytial virus, and a growing list of other targets, so the distributive arrangements settled on during COVID-19 are effectively setting precedent for the next several decades of vaccine access.

Most public debate about vaccine equity during the pandemic focused on dose donation: how many vaccines wealthy countries pledged to give away, and how quickly they delivered on those pledges. That framing is not wrong, but it is narrow. A growing body of scholarship argues that donation-based mechanisms address a symptom -- insufficient doses in a given country at a given moment -- without addressing the underlying structural problem, which is that the capacity to manufacture mRNA vaccines was concentrated in a handful of firms and countries from the outset [2]. This review surveys three overlapping strands of that literature: the performance and limits of the multilateral procurement mechanism built to manage the pandemic, COVAX; the intellectual-property debate over the TRIPS waiver and compulsory licensing; and the newer, harder question of whether justice in vaccine access requires redistributing the underlying manufacturing capability itself, not just the finished product.

COVAX AND THE LIMITS OF A CHARITY-BASED DISTRIBUTION MODEL

COVAX was designed as a pooled-procurement mechanism that would let wealthier "self-financing" participants fund doses for lower-income "advance market commitment" countries through a shared purchasing pool, avoiding the bidding war that bilateral deals between manufacturers and individual governments would otherwise produce. In practice, the mechanism was outcompeted by exactly the bilateral deals it was meant to prevent: wealthy governments signed advance purchase agreements directly with manufacturers well before COVAX had comparable purchasing power, leaving the facility dependent on donated doses that arrived later, in smaller volumes, and often close to expiry [3]. Analyses of the resulting governance gap describe COVAX's difficulty less as a design flaw in the pooling concept itself and more as a predictable consequence of asking a voluntary, donor-dependent facility to compete against sovereign purchasing power in a genuine scarcity market.

The downstream effects of that competitive mismatch are visible in delivery-level research. A study of vaccine rollout in the Philippines found that even once doses arrived, an equity lens applied to distribution surfaced further disparities in how efficiently different

regions and population groups were reached, meaning that supply-side equity at the international level does not automatically translate into equitable uptake once doses land in-country [4]. Public attitudes research conducted in a high-income country -- a nationally representative survey in Aotearoa New Zealand -- found that a majority of respondents supported more aggressive redistribution of surplus doses to lower-income countries even at some cost to domestic booster timelines, suggesting that donor-country publics were, at least rhetorically, more willing to prioritize global equity than their governments' actual procurement behavior reflected [5]. A related strand of work on the endgame of the pandemic supply chain has examined the opposite failure mode: doses donated too late, in mismatched formulations, or without cold-chain and administration support, meaning that wasted surplus in donor countries and functional scarcity in recipient countries occurred simultaneously rather than being genuinely substitutable [6]. Attention to gender-differentiated access has added a further layer to this picture, showing that even within recipient countries, policy design for specific populations such as pregnant people varied enormously and was rarely coordinated at the global level in the way dose allocation nominally was [7].

Table 1. Four mechanisms proposed or used to distribute mRNA vaccine access during COVID-19, compared by primary lever and main limitation discussed in the literature.

Mechanism	Primary lever	Main strength	Main limitation
COVAX pooled procurement	Donor-funded shared purchasing pool	Rapid mobilization once funded; avoids duplicative bidding	Outcompeted by bilateral advance purchase agreements; donor-dependent
TRIPS waiver / compulsory licensing	Suspension or override of patent enforcement	Removes a formal legal barrier to local production	Does not transfer tacit know-how or supply-chain access on its own
Voluntary licensing agreements	Patent holder licenses production to named manufacturers	Faster to negotiate than a multilateral waiver	Limited to firms the patent holder chooses; scope decided unilaterally
mRNA technology transfer hub	Open, reverse-engineered process shared regionally	Builds durable local manufacturing capacity	Slow to establish; depends on sustained governance and funding

Figure 1. Schematic comparison of four mRNA vaccine distribution mechanisms on emergency responsiveness versus durable manufacturing-capacity building. Illustrative ranking derived from the qualitative comparisons in the reviewed literature, not from a single quantitative study.

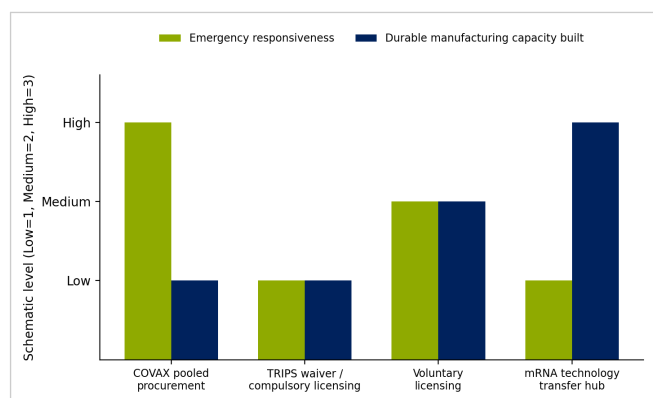


Table 1 lays out four distribution mechanisms discussed in this literature side by side, and Figure 1 places the same four mechanisms on two dimensions that recur across the studies cited above: how quickly a mechanism can move doses in an emergency, and how much it does to build durable manufacturing capacity in the countries it is meant to serve. The pattern the figure is meant to make visible is that COVAX-style pooled donation scores well on the first dimension and poorly on the second, which is precisely the criticism levelled against it by scholars who see capacity-building, not faster charity, as the more defensible long-run target [8].

INTELLECTUAL PROPERTY, THE TRIPS WAIVER, AND COMPULSORY LICENSING

If COVAX represents the distribution debate at the level of finished doses, the TRIPS waiver debate represents it at the level of the underlying knowledge. In October 2020, India and South Africa proposed a temporary waiver of World Trade Organization intellectual-property obligations under the TRIPS Agreement for COVID-19 vaccines, therapeutics, and diagnostics, arguing that patent protection was itself an obstacle to the diversified manufacturing base a genuinely global response would require [9]. The proposal split WTO membership along fairly predictable lines, with most high-income countries hosting the relevant manufacturers opposing a broad waiver and most low- and middle-income countries supporting it, and it took roughly two years of negotiation to reach a narrowed compromise limited to vaccines and criticized by supporters of the original proposal as too little, too late [10].

The scholarly assessment of that outcome has been largely unflattering to the compromise, though not uniformly so. Several analyses argue that patent waivers alone would not have solved the access problem even had they been adopted immediately, because mRNA manufacturing depends on tacit know-how, specialized reagents, and quality-controlled supply chains that a waiver of patent enforcement

does nothing to transfer -- the "recipe" argument, in other words, understates how much of the relevant knowledge is not written down in a patent at all [11]. Others have pushed back on this framing as convenient for incumbent manufacturers, arguing that a genuine, broad waiver combined with mandatory technology transfer would have done considerably more to close the gap than the diplomatic half-measure actually adopted, and that the pharmaceutical industry's warnings about innovation-chilling effects were overstated relative to the scale of profits already realized on COVID-19 vaccines [12]. An assessment focused specifically on the pharmaceutical industry's own response found that firms treated the waiver largely as a reputational and negotiating problem to be managed rather than as a substantive obstacle to their existing distribution plans, which supports the view that the waiver's practical bite was always going to be limited without accompanying capacity transfer [13].

National case studies add useful texture here. An ethico-legal analysis of Australia's position -- a high-income country that was itself a net importer of mRNA vaccine technology during the pandemic -- found that its government's stance on the TRIPS waiver shifted over time in ways that tracked its own changing vaccine security rather than a stable ethical position on global access, which is a useful reminder that "donor country" and "recipient country" are not fixed identities in this debate [14]. Diplomatic-history accounts of India and South Africa's joint advocacy situate the waiver proposal within a longer tradition of post-colonial health diplomacy, arguing that framing the dispute purely in technical trade-law terms obscures its continuity with older arguments about unequal access to essential medicines, from HIV antiretrovirals onward [15]. A broader review of the underlying inequity has argued that the international system's slowness to resolve the waiver dispute reflects a structural unwillingness to treat vaccine manufacturing capacity as a global public good rather than a competitive national asset, whatever the rhetoric offered in multilateral forums [16].

MANUFACTURING CAPACITY AND TECHNOLOGY TRANSFER AS THE DEEPER JUSTICE PROBLEM

A third and more recent strand of the literature has shifted attention away from both dose donation and patent law and toward the question of who actually has the physical and technical capacity to manufacture mRNA vaccines. A comparative review of six distinct vaccine-innovation models used during the pandemic -- ranging from voluntary licensing agreements to the World Health Organization-backed mRNA technology transfer hub established in South Africa -- found substantial variation in how much genuine manufacturing know-how each model transferred to recipient-country institutions, with voluntary licensing

generally transferring less than initiatives explicitly designed around open-technology sharing [17]. The South African hub model is particularly relevant to the mRNA-specific justice question this paper is concerned with: rather than negotiating access to any single company's patents, the hub attempted to reverse-engineer an mRNA vaccine from published sequence information and make the resulting process openly available to manufacturers across Africa and other regions without relying on the cooperation of the original patent holders, a strategy that sidesteps the TRIPS debate rather than resolving it.

Systematic review evidence on the public-private partnerships that funded and organized pandemic-era vaccine manufacturing has found that governance alignment between funders, manufacturers, and recipient-country health systems was the single strongest predictor of whether a given manufacturing partnership actually produced usable regional capacity, more so than the amount of funding committed [18]. This is a meaningful finding for how the next platform technology gets distributed: it suggests that justice-oriented reform efforts focused narrowly on funding levels or patent rules, without parallel attention to the governance relationships between the parties actually running a manufacturing facility, are likely to under-deliver on capacity even when they succeed on paper. Work reframing vaccine access explicitly through a health-equity lens argues that these governance and capacity questions, not the more visible dose-donation numbers, are the metric by which the pandemic's vaccine-distribution record should ultimately be judged, precisely because manufacturing capacity persists after any single outbreak ends while donated doses do not [8].

THEORIZING THE OBLIGATION: BEYOND A PUBLIC-GOODS FRAMEWORK

Much of the initial ethical argument for equitable vaccine access during COVID-19 was made in the language of global public goods -- the claim that a vaccine against a pandemic pathogen benefits everyone, including wealthy countries, by suppressing transmission and the emergence of new variants, and that this shared interest grounds an obligation to share doses widely. That argument has come under sustained criticism for being both empirically fragile and normatively too thin. One influential critique argues that the public-goods framing quietly smuggles in a self-interested justification for equity -- "share vaccines because it protects you too" -- that collapses as soon as a wealthy country's own risk from a given variant falls, and that a framework grounded in fairness or human rights would not have that vulnerability, because it would not depend on continued self-interest for its force [2]. This is not a minor point for the mRNA platform specifically: a public-goods argument may hold reasonably well for a pandemic pathogen with international transmission dynamics, but it holds much

less obviously for the growing list of non-pandemic applications -- seasonal influenza, RSV, potentially even non-infectious disease targets -- to which the same manufacturing base and platform technology are now being applied, and where the self-interested case for sharing with lower-income countries is correspondingly weaker.

The implication is that any distributive framework built to last beyond the acute pandemic emergency needs a normative foundation sturdier than mutual self-interest. Several of the sources above gesture toward that foundation without fully building it out: appeals to health equity as an end in itself [8], to post-colonial continuity in essential-medicines advocacy [15], and to manufacturing capacity as a global public good in a stronger, non-instrumental sense than the pandemic-specific public-goods argument supplies [16]. None of these fully displaces the public-goods framing on its own, but together they point toward the same conclusion: that a defensible account of what wealthy countries and manufacturers owe the rest of the world regarding platform vaccine technology cannot be contingent on how much a given pathogen still threatens the donor.

CONCLUSION

The mRNA vaccine story is often told as a story about speed -- how quickly a genuinely new technology moved from sequence data to authorized product. The distributive story is closer to the opposite: how slowly the infrastructure, legal permissions, and manufacturing capacity needed to make that technology available everywhere actually moved, and how much of that slowness reflected structural choices rather than unavoidable technical limits. COVAX addressed the visible symptom of dose scarcity without building the underlying capacity to prevent its recurrence. The TRIPS waiver debate exposed a genuine disagreement about whether intellectual-property law was the binding constraint at all, and the compromise eventually reached satisfied few of the scholars who had studied the question closely. The more recent turn toward technology-transfer hubs and manufacturing-capacity analysis suggests that the field has, belatedly, converged on the more structurally serious diagnosis: that justice in mRNA vaccine access is a question about who can make the vaccine, not only about who receives it. Whatever platform arrives after mRNA will confront the same distributive choices, and the arrangements built -- or left unbuilt -- during this pandemic are the precedent it will inherit.

DECLARATIONS

Acknowledgements

The authors thank colleagues in their respective centers for medical ethics and law and departments of bioethics for helpful conversations that sharpened the

scope and argument of this review.

Funding

This review received no external funding.

Conflict of Interest

The authors declare no conflicts of interest relevant to this work.

Author Contributions

Ines Mendes conceived the review, structured the argument, and drafted the initial manuscript. Zsofia Lindqvist performed the literature synthesis on intellectual property, the TRIPS waiver, and compulsory licensing, and critically revised the manuscript. Nils Ramirez contributed the analysis of manufacturing capacity, technology transfer, and the theoretical discussion of distributive justice frameworks, and provided final approval of the submitted version. All authors read and approved the final manuscript.

Ethics Statement

As a literature review synthesizing previously published, publicly available research and policy analysis, this article did not involve new data collection from human participants and did not require institutional ethics committee approval.

Data Availability

No new data were generated or analyzed for this review. All sources discussed are cited in the reference list and are publicly available through their respective publishers.

REFERENCES

1. Borowicz J, et al. (2022) Vaccine equity in COVID-19: a meta-narrative review. *BMJ Global Health*, PMID:36524409.
2. Saksena N (2021) Global justice and the COVID-19 vaccine: limitations of the public goods framework. *Global Public Health*, PMID:33764847.
3. Bhuiyan S (2022) COVID-19 vaccine equity in doldrums: Good governance deficits. *Public Administration and Development*, PMID:36718258.
4. Zhao J, et al. (2024) Vaccine equity implementation: exploring factors influencing COVID-19 vaccine delivery in the Philippines from an equity lens. *BMC Public Health*, PMID:39501210.
5. Kolandai K, et al. (2024) Public opinion on global COVID-19 vaccine procurement and distribution policies: a nationally representative survey in Aotearoa New Zealand 2022. *Vaccine*, PMID:38326132.
6. Greenhalgh S, Alva ML (2026) Reimagining COVID vaccine distribution: reflecting on waste and equity. *Population Health Metrics*, PMID:41673889.
7. Zavala E, et al. (2025) Gender equity and COVID-19 vaccine policies for pregnant people: a global analysis. *International Journal for Equity in Health*, PMID:40336086.
8. Harrison EA (2024) Reimagining vaccine access for health equity. *Journal of Law, Medicine & Ethics*, PMID:39435932.
9. Chattu VK, et al. (2021) COVID-19 vaccine, TRIPS, and global health diplomacy: India's role at the WTO platform. *BioMed Research International*, PMID:34485525.
10. Kohler J, et al. (2022) Improving access to COVID-19 vaccines: an analysis of TRIPS waiver discourse among WTO members, civil society organizations, and pharmaceutical industry stakeholders. *Health and Human Rights*, PMID:36579316.
11. McGivern L (2023) Trade-related aspects of intellectual property rights flexibilities and public health: implementation of compulsory licensing provisions into national patent legislation. *Milbank Quarterly*, PMID:37646392.
12. Amin T, et al. (2022) A global intellectual property waiver is still needed to address the inequities of COVID-19 and future pandemic preparedness. *Inquiry*, PMID:36124939.
13. Chaudhary T, et al. (2021) TRIPS waiver of COVID-19 vaccines: impact on pharmaceutical industry and what it means to developing countries. *Journal of World Intellectual Property*, PMID:34908905.
14. Scheibner J, et al. (2022) An ethico-legal assessment of intellectual property rights and their effect on COVID-19 vaccine distribution: an Australian case study. *Journal of Law and the Biosciences*, PMID:35855401.
15. Singh B, et al. (2023) COVID-19 and global distributive justice: "health diplomacy" of India and South Africa for the TRIPS waiver. *Journal of Asian and African Studies*, PMID:37461426.
16. Ba Z, et al. (2024) Vaccine inequity-induced COVID-19 dilemma: time to sober up. *Legal Medicine (Tokyo)*, PMID:38104356.
17. Alonso Ruiz A, et al. (2024) Which roads lead to access? A global landscape of six COVID-19 vaccine innovation models. *Globalization and Health*, PMID:38532484.
18. Qi X (2025) A systematic review of global COVID-19 vaccine public-private partnerships: drivers and barriers to governance alignment. *Frontiers in Public Health*, PMID:41409701.