Geopolitics of Vaccines in a Multipolar World: A World-Systems Analysis of Dependency, Agency, and Health Sovereignty in Kenya[1]

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Abstract:

This study employs Immanuel Wallerstein's world-systems theory to critically examine the structural inequities embedded within the global administration of vaccines. It argues that the political economy of immunisation, particularly in Kenya, reflects and extends a Euro-American biomedical hegemony, reinforcing a core-periphery dynamic in which high-income countries control production, intellectual property, and regulatory standards while low- and middle-income nations remain dependent importers. Through a case study of Kenya's immunisation program, the paper illustrates how this dependency is institutionalised via mechanisms such as the Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS), donor-driven funding from entities like Global Alliance for Vaccines and Immunisation (Gavi) and United States Agency for International Development (USAID), and the dominance of Northern NGOs in setting the global health agenda. However, the analysis also acknowledges the limitations of a rigid core-periphery model by highlighting the rising agency of semi-peripheral and peripheral states such as China, India, Cuba, and African Union initiatives like the Partnership for African Vaccine Manufacturing (PAVM), which are developing scientific autonomy and challenging entrenched hierarchies. The COVID-19 pandemic is presented not as the origin of these disparities, but as a revelatory moment that exposed existing vulnerabilities while simultaneously accelerating shifts toward a more multipolar global health order. The study concludes by calling for research and policies that support vaccine justice and recognise the growing capacity of the periphery to resist biomedical hegemony.

Keywords:

Vaccine Geopolitics; World-Systems Analysis; Multipolar World; Dependency; Agency; Health Sovereignty; Kenya.

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1. Introduction

This paper contends that the global architecture of vaccines' administration reflects the expansion of the asymmetrical nature of the capitalist world-system (Smith, 2012). And, that the political economy of immunisation, specifically in Kenya is an extension of an established western biomedical hegemony. Accordingly, the unequal global relations of power in science are theorized in this analysis along the ideas of the core-periphery model, primarily associated with Immanuel Wallerstein. Thus, Wallerstein ideas are subsequently used to explain three themes in world politics which are global inequality, dependency and the diminishing of state sovereignty through unequal exchange (Wallerstein, 1974). In this context, the COVID-19 pandemic becomes a testament to these pre-existing inequalities where high income countries secured most of the initial vaccines while low-income countries countered significant delays in accessing the vaccine doses. Moreover, the recent interruption in the United States foreign aid under President Donald Trump illustrates a real-time case study of how fiscal power can directly or indirectly obstruct healthcare systems in the periphery. This situation entrenches active forms of coercion, pushing peripheral states beyond passive dependency and further constraining their sovereignty (Wallerstein, 1974).

The centre-periphery distinction is often referenced in global science and public health discourse where new ideas and technologies remains profoundly concentrated in the centre while nations in the periphery and semi-periphery have been subjected to roles of imitation and consumption (Chinchilla-Rodriguez, Miguel, Perianes-Rodriguez, & Sugimoto, 2018; Olechnicka, Ploszaj, & Celinska-Janowicz, 2019; Marginson, 2021). However, this traditional landscape is continuously becoming more dynamic given the rapid rise in science and technology of emergent economies like China, India, Brazil and Cuba. For instance, China developed and exported more than two billion doses of its Sinopharm and Sinovac COVID-19 vaccines globally as part of its "Health Silk Road" diplomacy. Correspondingly, the role of India as the "Global South Pharmacy" was exemplified through the Serum Institute of India which became a vital supplier for the COVAX vaccines before its export ban thereby illustrating the instability of this dependency. Furthermore, Brazil has increasingly developed a sturdy national health innovative architecture, at the same time Cuba also realised a monumental success in developing its own Abdala and Soberana COVID-19 vaccines amidst the US-led imposed system of sanctions. Indeed, the Cuban case highlights the growing scientific autonomy within the periphery which highlights further the limitation of a stringent world-systems analysis. Thus, the aforementioned developments are a clear indictment of the ability of Wallerstein's world-systems theory to holistically account for the complex agency of semi-peripheral and peripheral actors. Rather than being viewed as merely passive consumers, these nations have become active agents who are building independent scientific autonomy, and exposing further the limitation of the hierarchy the theory describes (Marginson, 2021). Hence, this paper explores this complexity by employing Kenya's immunisation program as the primary case study, while also recognising the evolving constraints to the world-systems model.

2. Theoretical Framework World Systems Analysis of Global Health

This analysis is principally anchored in the centre-periphery model, which is of particular relevance to global health inequities. World-Systems theory as developed by Immanuel Wallerstein, provides not merely a theory but an analytical framework for examining broad historical and contemporary patterns within the contemporary capitalist system (Wallerstein, 2004). Central to this model is the relational dynamic between core and peripheral regions, where each is structured by mechanisms that systematically facilitate the flow of resources toward the core at the expense of the periphery, resulting to an asymmetry (Sorinel, 2010).

For Wallerstein this world-system is characterised by a multicultural territorial division of labour in which the production and exchange of basic goods and raw materials is necessary for the everyday life of its inhabitants. This division of labour refers to the forces and relations of production of the world economy as a whole. When trade between core-production and periphery production occurs, the core is in a strong position, while periphery is in a weak one. So, the core-periphery relation is unequal in favour of the centre, and this inequality is the root of the centre-periphery thesis. The world system has boundaries, structures, member groups, rules of legitimation, and coherence. This world-system is what Wallerstein terms a world economy, integrated through the market rather than a political centre, where two or more regions are interdependent with respect to necessities like food, fuel, and protection. Furthermore, two or more polities compete for domination without the emergence of one single centre forever (Sorinel, 2010).

Wallerstein (1974) proposes four different categories that include the core, semi-periphery, periphery, and external, into which all regions of the world can be placed. Of the four, two are of uttermost importance that is, the core and periphery. These are geographically and culturally different, with one focusing on labour-intensive, and the other on capital-intensive production. The core-periphery relationship is structural such that semi-peripheral states act as a buffer zone between core and periphery and has a mix of the kinds of activities and institutions that exist on them. Among the most important structures of the current world-system is a power hierarchy between the core and periphery, in which technology is a central factor in the positioning of a region in the core or the periphery. Hence, peripheral countries are structurally constrained to experience a kind of development that reproduces their subordinate status. For Wallerstein (2004), emphasis is on the world system and not on nation-states as the primary but exclusive unit of analysis. Nation-states are variables, elements within the system where states are used by class forces to pursue their interest, in the case of core countries.

The application of the centre-periphery model is timely and warranted. Health and disease are not just biomedical entities but are also shaped by the global economy (Brown, Cueto, & Fee, 2006; Farmer, 2004). Because the world is becoming increasingly interconnected, suffering is seldom divorced from the actions of the

powerful. Understanding health outcomes in the periphery requires analysis of not just what is happening in those countries but also of the global forces that influence (often by constraining) the actions that have been taken in those countries. From this perspective, to understand structural violence in one setting requires both a micro and macro analysis. Similarly, understanding these phenomena requires deep engagement with the history which manifests in contemporary power relations (Farmer, 2003).

The realm of global health mirrors the world-system power imbalances and systemic inequities that have roots in colonial histories. This includes the dominance of high-income countries in setting research agendas, funding priorities, and governance structures (Contractor, & Dasgupta, 2022). Therefore, understanding the political economy of the world-system provides a critical lens for analysing global health structures (Mehjabeen, Patel, & Jindal, 2025).

The asymmetrical impact of the World Trade Organization's Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS) offers a particularly clear example of this systemic complexity. While rooted in intellectual property regimes long established in Western market economies, TRIPS has often been criticized for exacerbating, rather than mitigating, the divide between core and peripheral nations. Many members of the WTO perceive the agreement as serving primarily—if not solely—the interests of the core, by safeguarding the patents and revenue streams of multinational corporations headquartered there (Cottier, 2005). In doing so, it institutionalizes a form of biomedical hegemony that shapes health outcomes for populations worldwide (Pemunta & Tabenyang, 2020).

In this context, the scientific debate and research on Global Health is dominated by North American and European universities, which play a vital role in this field and sustain Global North-South research gaps (Cash-Gibson, Rojas-Gualdrón, Pericàs, & Benach, 2028; Dalglish, 2020). Likewise, the political debate is strongly influenced by the meetings of the Heads of State and Government in the G7 and G20, which, incidentally, are not international organisations and have no politically legitimate mandate beyond the existing power relations. Nevertheless, they play a decisive role in determining the Global Health agenda and tend to push through the privatisation of basic health services (People's Health Movement, Medact, Third World Network, Health Poverty Action, Medico International, & Asociación Latinoamericana de Medicina Social. (2017).

However, the theoretical application of the World-Systems framework must also critically engage with its limitations. This paper will later expose how the model's macro-level focal point conceals the autonomy and resistance of actors in the semi-periphery and periphery (Ortiz, 2018). Furthermore, the emergent multipolarity due to the rise of powerful semi-peripheral states like China and India has challenged the centre-periphery dichotomy (Marginson, 2021). By acknowledging these dynamics, this paper is anchored on the World-Systems framework not as a rigid tool for analysis, but as a heuristic concept to highlight the political and economic nuances that underlie global vaccine inequity.

3. Overview of Vaccines' Administration Hegemony

Consider for instance that during the nineteenth century, scientists from the United States, Great Britain, France and Germany developed the foundational inactivated whole-cell vaccines against plague, typhoid and cholera. Correspondingly, this hegemony of the core in vaccine administration is a historical constant whose legacy persists. Today there are multinational corporations including but not limited to Pfizer, that were founded over a century ago, controlling approximately 90% of the global vaccine market (Ortiz-Prado, Espin, Vasconez, Rodriguez-Burneo, Kyriakidis, & Lopez-Cortes, 2021). This state of affairs points to vaccine-manufacturing industries that are driven primarily by developed countries and production-rated economies large enough for each country's needs. As a result, most low- and middle-income countries are subjected to structural dependency hence the need to import final products and the equipment necessary to produce quality vaccines (Plotkin, Robinson, Cunningham, Iqbal, & Larsen, 2017).

The World Health Organisation established the Expanded Program on Immunisation (EPI) in 1974 to develop and expand immunisation programs throughout the world. Accordingly, national vaccination programs, which grew out of the smallpox eradication initiative, have developed in many countries through the administrative, technical, and financial support of the United Nations Children's Fund (UNICEF), the World Health Organisation (WHO), and other bilateral or multilateral partner agencies (WHO & UNICEF, 1996). However, the international goal of bridging the gap by WHO due to structural dependency has often reinforced this dependency.

Nevertheless, the paradigm is shifting in that initiatives like the African Union's Partnership for African Vaccine Manufacturing (PAVM) intend to escalate local vaccine production to 60% by 2040 (African CDC, 2022). This directly confronts the historical dependency framework even though Africa currently imports over 99% of its vaccines (Gennari, Holt, Jordi, & Kaplow, 2021). Even so, there is still lack of equitable access to basic vaccines in the low-income and middle- income countries (Mihigo, Okeibunor, Cernuschi, & Petu, 2019). This deficiency in local vaccine production in Africa is an indictment of the chronic under-investment in local research and development, poor knowledge transfer, and a loss of investment to the African health sector estimated to be $2 billion annually due to "medical brain drain" (Mo Ibrahim Foundation, 2018; Groenhout (2012).

Generally, the COVID-19 pandemic profoundly revealed the unsustainability of this model. Furthermore, the dependency on a limited number of vaccine manufacturers also contributed to an unsustainable pandemic response as experienced during the 2009 H1N1 influenza pandemic and the 2014 Ebola virus disease outbreak (Khan, Ikram, & Hamza, 2021), which was magnified during COVID-19. Although high-income countries obtained billions of doses through direct bilateral agreements, the low- and middle-income countries were compelled to depend on the COVAX facility which had delivered over 1.9 billion doses worldwide. Still, these deliveries were

overtaken by the bilateral deals underpinning the hierarchy the model describes. This heightened further the vulnerability of peripheral nations due to severe delays which protracted the pandemic globally. Thus, it was a distinct illustration of surplus extraction from periphery to core.

4. The Mechanisms of Vaccines' Hegemony

To respond to this inequality, the same structures that sustain it have often been mobilised through Euro-American based Non-Governmental Organisations (NGOs), philanthropic organisations and public-private partnerships. Entities like Gavi, i.e. the Vaccine Alliance, the Bill and Melinda Gates Foundation (BMGF) and the Coalition for Epidemic Preparedness Innovations (CEPI) play a predominant role as chief agents of capacity building in vaccine development and deployment in the periphery (Kumraj, Pathak, Shah, Majumder, Jain, Bhati, Hanif, Mukherjee & Ahmed, 2022). Moreover, the institution responsible for regulating vaccines globally known as the United States Federal Drug Administration's (FDA) Centre for Biologics Evaluation and Research (CBER) is based in the core. Hence, the FDA sets standards that dictate the global market access (Ortiz-Prado et al., 2021).

Tied to this system is the American dollar hegemony whose benefit is contextualised incost-effective terms pegged on the US dollar, and global funding framework (Simoneau and Bliss, 2022). On this account, the US. has historically been the primary benefactor to Gavi since its inception. This financial supremacy also presents a powerful political tool for coercion which can have a direct impact on health outcomes in the periphery. This coercive capability is not just theoretical. For instance, the recent deadlock in the congressional budget discussions prompted the freezing on foreign aid allocations severely rendering the operational capacity of USAID as ineffective (Phelps, 2023). This impacted negatively on dependent nations due to constraints in vaccine supply chains, distribution networks and last-mile vaccination efforts. This is a clear indication of how quickly the important flow of resources can be disrupted by the domestic dispensation of the core (Lieberman & Iyer, 2024; Bussell & Chatzky, 2023), hence revealing the vulnerability inherent in this dependency relationship. Consequently, these proclivities correspond with and modernises Andre Gunder Frank's dependency theory, where exploitative relationships are maintained through control of international trade, the emergence of multinational corporations and the reliance of low- and middle-income countries on Western aid (Frank, 1966).

5. Case Study: Vaccination Services in Kenya

Kenya's immunisation history vividly illustrates the complexities of the core-periphery dynamic. Beginning in the early 1970s, compliance with international travel protocols required vaccinations against diseases such as cholera and yellow fever for outbound travellers. Initial coordination fell to the Nairobi City Council, which later ceded this responsibility to the national Department of Environmental Health. Operating through Port Health Services and in tandem with immigration authorities, this body managed

border health measures. Concurrently, in the late 1970s, the National Public Health Laboratories served a dual role: manufacturing vaccines for smallpox and cholera domestically while leading the investigation of significant disease outbreaks across the country (Kenya National Policy on Immunisation, 2013).

Given its central mandate in disease surveillance and outbreak response, the National Public Health Laboratories also assumed responsibility as the national repository for emergency vaccines, including those for cholera, hepatitis B, typhoid, and rabies, as well as anti-snake venom. Following the worldwide eradication of smallpox, the Laboratories discontinued production of the smallpox vaccine, though they retained their coordinating role for other emergency vaccines. One exception was the cholera vaccine, which was withdrawn from use in the 1980s following evidence of limited efficacy (Kenya National Policy on Immunisation, 2013).

Following the 1978 Alma-Ata declaration by the World Health Assembly *(World Health Organisation, 1978)*, Kenya embarked on the process of formalising its immunisation services (Ministry of Health, 2013). Kenya Ministry of Health established the Kenya Expanded Program on Immunisation (KEPI) in 1980. Hence, it moved from ad-hoc services mainly through primary schools and the larger health institutions and facilities to a structured program against six childhood diseases namely: Tuberculosis (BCG vaccine), polio (Oral Polio Vaccine), diphtheria (Diphtheria toxoid vaccine), whooping cough (whole cell Pertussis vaccine), tetanus and measles to all children in the country before their first birthday, and tetanus toxoid vaccination to all pregnant women (Kenya National Policy on Immunisation, 2013).

Having achieved the Universal Child Immunisation goals of immunising at least 80% of the target population in the 1990s, KEPI's focus changed to disease control, elimination and eradication. Since 2001, the Ministry of Health has endorsed the introduction of four new vaccines namely: Yellow fever in two counties of the country, Hepatitis B vaccine, and Haemophilus Influenza type B vaccine; Pneumococcal conjugate vaccine in 2011; and Rotavirus vaccine and measles second dose in 2013 (Kenya National Policy on Immunisation, 2013).

The Division of Vaccines & Immunisation (DVI) became effective from 1st July 2007 and currently oversees a wide-ranging set of responsibilities, organised around several key functions. Its mandate encompasses the national Expanded Program on Immunisation, which covers routine infant vaccines as well as tetanus vaccination for pregnant women and trauma cases. A second function involves targeted vaccination programs for specific populations, such as occupational risk groups, healthcare workers, prisoners, food handlers, and international travellers, in addition to managing emergency responses to outbreaks and bites from animals or snakes. The DVI also coordinates immunisation campaigns against diseases including polio, measles, meningitis, and emerging threats like influenza. Finally, it oversees the provision of specialised biological products, such as rabies immunoglobulins and anti-D sera for rhesus-negative pregnant women (Ministry of Health, 2013).

All KEPI vaccines are procured through UNICEF for Gavi. The Government of Kenya

and UNICEF work under a memorandum of understanding where UNICEF is contracted to procure Gavi funded vaccines as well as Kenya's co-payment of Gavi supported vaccines and traditional vaccines (MoH, 2013). The United States is the largest bilateral donor to the Global Alliance on Vaccines and Immunisation (GAVI). Since 2001, Kenya has received over $500 million from Gavi, introducing almost every vaccine the Alliance supports (Simoneau and Bliss, 2022). This dependency continued during the COVID-19 pandemic. By 2021, the U.S. had provided almost 4 million doses through COVAX partnership and invested $4.5 million in technical assistance to support Kenya's nationwide COVIID-19 vaccine rollout program (US Department of State, 2021). However, the recent aid freeze to USAID allocations has shown that this important support exists within an environment of vulnerability. Indeed, freezing aid to USAID has had a ripple effect on Kenya's health system, demonstrating the risks of this dependency. Reports indicate that USAID-funded programs for vaccine supply chain logistics, cold storage maintenance and community health worker mobilisation have faced crippling budget cuts and subsequent operational paralysis (Phelps, 2023).

The direct impact on Kenya's economy is reflected in the country's diminished capacity to distribute and administer existing vaccine stocks, including and not limited to just COVID-19 and for routine immunization (EPI). Consequently, USAID's annual commitments which had gradually increased to $40 million in 2018 for health programs, are now liable to the volatility of the core's political shifts (Habbema & Moon, 2024). Although the bilateral support from US to Kenya is a vital component for health programs in Kenya (Gavi, 2023), it nonetheless reflects the core-periphery framework. Moreover, it is an illustration of how health sovereignty is constrained by dependency on external funding. This mirrors critiques that the West's indulgence and zeal of the Cold War era is being manifested by its politicisation of vaccines. By exploiting vaccines as a geopolitical tool, the West has reproduced a world divided between two spheres of influence, such as countries inoculated with Chinese-Russian vaccines verses those with US-European ones (Wenwen, 2021).

6. Limitations of the Centre-Periphery Model in Understanding Vaccine Administration

The world-systems analysis provides a macro-sociological approach to understanding vaccine provision thereby obfuscating the micro-level materiality of vaccine accessibility for specific sub-populations like young mothers. This reiterates the exclusion of young mothers from Kenya's priority groups in the Kenya National Policy on Immunisation (2013). Most significantly, the centre-periphery model does not adequately account for the rapid growth of science in the semi-periphery as well as the autonomy and agency of nations and persons. Respectively, other emergent and middle-sized economies like China, South Korea, Iran and India have built national science systems that follow the semi-autonomous trajectories based on state investment, intensive national network building and international engagement without integrating tightly into the global duopoly (Marginson, 2021).

While the COVID-19 exposed entrenched hierarchies, it also precipitated shifts in the geo-political economy of vaccine administration. China become a major supplier of Covid-19 vaccines to low-income countries, exporting over 2 billion doses of its Sinopharm and Sinovac vaccines to South-East Asia, South America and North Africa as part of its "Health Silk Road" and subsequent vaccine diplomacy initiative (Bollyky and Bown, 2022). This state of affairs acted as a substitution for the Western-led vaccine supply and asserted China's geopolitical authority. Additionally, India, which is considered a semi-peripheral economy, emerged as the predominant vaccine manufacturer and the second largest exporter by volume (24.7 percent of total global exports) (Jeanrenaud, Poitiers and Veugelers, 2021). It initially supplied COVAX through its Serum Institute before the emergence of the Delta variant of SARS-CoV-2 in India in late 2020 which later became the dominant variant in the middle of 2021. This prompted the export ban of the Serum Institute COVID-19 vaccines in April 2021 resulting in substantial disruptions across Africa hence revealing the precarity of depending on a single semi-peripheral supplier (WHO, 2023).

Notably, the inception of African Union's Partnership for African Vaccine Manufacturing (PAVM) is a case in point of the periphery's active resistance to permanent subordination. The aim of PAVM is to produce 60% of Africa's vaccines by 2040 indicating a critical challenge to the biomedical core-periphery model. In South Africa, initiatives like the WHO mRNA vaccine technology transfer hub have been established suggesting counter measures toward this challenge (Africa CDC, 2022). Moreover, another peripheral nation like Cuba while facing a series of embargo, was able to develop and export its own Abdala and Soberana COVID-19 vaccines. This illustrates how a vital scientific autonomy is not readily accounted for in the traditional core-periphery structure.

7. Conclusion

In conclusion, the paper demonstrates that the global vaccines' administration is a potent reflection of the expansion of the capitalist world-system. Evidently, Wallerstein tiered system demarcates between the United States and Europe as producers and financiers of vaccines, and much of the Global South as importers and consumers.

The response to the inequalities in vaccines administration is channelled through the dollar-dominated aid by Euro-American based non-governmental organisations and charitable donor organisations. These multinational organisations have been linked to the perpetuation of neocolonial dependency as shown by Kenya's immunisation program. The recent aid freeze to the USAID allocations presents a current example of how financial hegemony can actively debilitate health systems, moving from dependency to coercion.

The rise of economies like India and China, and most importantly, the concerted effort by Africa's PAVM for self-reliance suggests a restructuring of the rigid core-periphery model and subsequent global health power dynamics. The COVID-19 pandemic did not produce these inequalities but rather exposed them while at the

same acting as an impetus for change. Future research should inform technical solutions that uphold vaccine justice by confronting the exploitative nature of world-system model and continue to track the agency of the periphery to challenge this sustained hegemony.

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During the preparation of this work the author(s) used DeepSeek AI in order to refine language, improve academic tone, and assist with the structural organisation of the manuscript. After using this tool/service, the author(s) reviewed and edited the content as needed and take(s) full responsibility for the content of the publication.

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