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Financing for pandemic preparedness and response measures: a systematic scoping review

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Abstract

Objective To obtain insights into reducing the shortfall in financing for pandemic preparedness and response measures and reducing the risk of another pandemic with social and economic costs comparable to those of the coronavirus disease.

Methods We conducted a systematic scoping review using the databases ScienceDirect, Scopus, JSTOR, PubMed® and EconLit. We included articles published in any language until 1 August 2023, and excluded grey literature and publications on epidemics. We categorized eligible studies according to the elements of a framework proposed by the World Health Organization Council on the Economy of Health for All: (i) root/structural causes; (ii) social position/foundations; (iii) infrastructure and systems; and (iv) communities, households and individuals.

Findings Of the 188 initially identified articles, we included 60 in our review. Most (53/60) were published after 2020, when academic interest had shifted towards global financing mechanisms. Most (37/60) addressed two or more of the Council framework elements. The most frequently addressed element was infrastructure and system (54/60), discussing topics such as health systems, financial markets and innovation ecosystems. The roots/structural causes were discussed in 25 articles; communities, households and individuals in 22 articles; and social positions/foundations in 11.

Conclusion Our review identified three important gaps: a formal definition of pandemic preparedness and response, impeding the accurate quantification of the financing shortfall; research on the extent to which financing for pandemic preparedness and response has been targeted at the most vulnerable households; and an analysis of specific financial instruments and an evaluation of the feasibility of their implementation.

Introduction

The coronavirus disease (COVID-19) pandemic has been one of the deadliest emergencies in modern history, with a global death toll exceeding 14.9 million people.¹ Beyond the tragic loss of life, the pandemic has wrought staggering economic damage. Some studies estimate its impact at 16 trillion United States dollars (US\$) in the United States of America alone.²

To reimagine the relationship between economics and health, the World Health Organization (WHO) Council on the Economics of Health for All was established during the COVID-19 pandemic in November 2020 by the WHO Director-General. The Council was tasked with recommending specific policy approaches to bring Health for All to the heart of government decision-making, public–private alliances and global collaboration.³ The Council acknowledge the complexity of health and its interdependence on a diverse array of factors – including economic, social, environmental and financial dimensions – and proposed a framework that is based on measuring the value of health and well-being as opposed to measuring the price of everything.^{4,5} Built on a foundation of theoretical and policy research that has explored the interplay between economic factors, health and the determinants of health,^{6–8} this framework is based on the elements: (i) roots/structural causes; (ii) social positions/foundations; (iii) infrastructure and systems; and (iv) communities, households and individuals (a schematic figure of the framework has been published elsewhere).⁴

During the period of the Council’s research, the World Bank and WHO identified an annual investment need of US\$ 31.1 billion for a global pandemic preparedness and response system.⁹ Understanding financing for pandemic preparedness and response at a global level is now more urgent than ever. However, a comprehensive literature synthesis on the mechanisms to prepare, adapt and respond to the economic demands of a pandemic is needed, and the international community has yet to establish a comprehensive financing framework to manage future outbreaks.¹⁰

We therefore undertook a systematic scoping review of the academic literature to characterize evidence on the strategies, successes, challenges and opportunities to address pandemics from a financial standpoint.¹¹ Our aim was to obtain insights into reducing the shortfall in financing for pandemic preparedness and response, and the risk of another pandemic with social and economic costs comparable to those of COVID-19. Because pandemics are characterized for their long-term consequences and their complex, multidimensional, multifaceted nature that extends beyond the

immediate reach of the health sector,¹² we adopt the Council's framework to characterize the academic literature on financing pandemic preparedness and response measures.

Method

Database search

We registered our review on the International Platform of Registered Systematic Review and Meta-analysis Protocols (INPLASY202380111),¹³ and followed Preferred Reporting Items for Systematic Reviews and Meta-Analyses guidelines for Scoping Reviews.^{14,15}

We conducted a three-stage search for relevant publications across ScienceDirect, Scopus, JSTOR, PubMed® and EconLit, focusing on the keywords: “pandemic”, “preparedness”, “response”, “financing”, “finance” and “funding”. In ScienceDirect, Scopus and JSTOR, we targeted research articles, review articles and discussions with the strategies: (i) “pandemic preparedness and response” AND (“financing” OR “finance” OR “funding”); and (ii) “pandemic prevention preparedness and response” AND (“financing” OR “finance” OR “funding”). We also ran these search strategies in French and Spanish, but without the financing and related keywords filter. For PubMed, we included all papers found without applying finance-related filters. The database EconLit required a more flexible search strategy, in which keywords were sought in any order of appearance.

Eligibility criteria

Our search was restricted to articles published from 1900 until 1 August 2023, with no language restrictions. We focused on peer-reviewed research articles on the financing of pandemic preparedness and response measures at the global and regional levels, excluding grey literature such as reports, policy documents, working papers, newsletters, government documents, speeches, book chapters, letters, white papers, guidelines and protocols. We also excluded studies focused solely on single countries. Because of the qualitative difference between pandemics and epidemics, we also excluded studies describing financing for epidemic preparedness and response.

Data extraction

We created a spreadsheet database to record the bibliographical details of each paper and copied the abstract of each paper into the spreadsheet. One author read the full text of each paper to assess eligibility, determining whether the focus was financing for pandemic preparedness and response and

whether the geographical eligibility criteria were met. The same author copied specific sentences of high relevance from each paper into the spreadsheet.

We used the consolidated criteria for reporting qualitative research checklist to assess the quality and relevance of the study to our research question (how has scientific literature addressed the multifaceted aspects of financing for pandemic preparedness and response at the global level?).¹⁶ To ensure objectivity and accuracy, all four authors independently reviewed the quality assessment of each article. To assess the quality of the journal the articles were published in, we used the Scimago journal and country rank tool (Scimago, Granada, Spain).¹⁷

We then analysed the general characteristics of each study; one author studied the full-text documents, focusing on the discussion sections, to extract the primary findings of each paper. The same author used these data to classify the studies according to one or more of the elements of the preliminary framework proposed by the WHO Council on the Economics of Health for All.⁴ Another author independently reviewed the eligibility criteria and initial classifications for each author, referencing the database and summary tables; another author provided oversight and feedback on the results. Where we considered the database and summary tables to lack sufficient depth, we re-examined the full text of the paper. We resolved disagreements with regards to framework element classification by majority consensus.

Results

We identified 188 records: 97 in ScienceDirect, 31 in JSTOR (articles and reviews), 21 in SCOPUS, 24 in PubMed and 15 in EconLit. After excluding duplicates, we identified 149 unique publications (Fig. 1). Our final review considered 60 articles (Table 1).^{18–77} We assessed the quality of the journals (average h-score of 147),⁷⁸ 56 (93.3%) articles were published in Q1 journals and 4 (6.7%) articles in Q2 journals.

We identified only seven articles published before 2020, which focused primarily on financial assistance to low-income countries, vaccine funding, and legal aspects of funding pandemic preparedness and response. The remaining 53 articles were published post-2020, after the start of COVID-19, when academic interest had shifted towards global financing mechanisms, including 20 studies on initiatives such as the Pandemic Fund and the establishment of new financial architectures under the WHO Pandemic Treaty negotiations. The scope of the post-2000 literature is generally limited to discussing specific elements of ongoing proposals, or analysis of policy or technical

principles that underpin the strategy of financing for pandemic preparedness and response. Although the literature offers best practices supported by evidence and theory, objective assessments of the technical aspects, political viability, implementation feasibility and actual results are absent.

We identified 26 papers (Table 1) that propose or discuss specific pandemic preparedness and response financing instruments, including public policy tools, public–private partnerships and common good investment funding. Notably, discussions of proposals are mainly focused on two global funding mechanisms: the Pandemic Fund and the Access to COVID-19 Tools Accelerator. Five reviewed publications explore the relationship between universal health coverage (UHC) and global health security.^{30,36,42,44,65}

With regards to the four elements of the framework proposed by the WHO Council on the Economics of Health for All, most reviewed publications (37; 61.7%) addressed two or more of these; the remainder (23; 38.3%) addressed a single element. The most frequently addressed element was infrastructure and system (54; 90.0%), followed by roots/structural causes (25; 41.7%), communities, households and individuals (22; 36.7%) and finally social positions/foundations (11; 18.3%). We discuss each of these below, as well as the issue of a lack of consistency in the literature in terminology.

Infrastructure and system

Within this element of the Council framework, addressed by 54 of the reviewed publications, topics such as health systems, financial markets and innovation ecosystems were frequently discussed (Table 1). The reviewed publications examine innovation, vaccine research and development, manufacturing, funding and capacity-building, emphasizing the need for a multifaceted approach towards strengthening global health systems and the pivotal role of governments in vaccine markets. The literature highlights a pressing need to reform global financial institutions and develop robust, adaptable financial frameworks. Central to these discussions is a call for increased investment in health systems to bolster resilience, coupled with the critical importance of effective risk communication strategies. The literature identifies significant obstacles (e.g. funding limitations and differences in organizational culture) that obstruct efficient collaboration between various stakeholders. Research suggests that an integrated approach is necessary, one that combines public institutes and private businesses.

Root/structural causes

The 25 publications addressing this element of the Council framework discussed topics such as governance, politics and economics; 19 of these articles also explored aspects of the infrastructure and system element, although with a different focus (Table 1). For example, the discussion of new global collaboration mechanisms such as the Pandemic Fund is centred on governance. Other key topics discussed in the reviewed literature include the importance of sustainable development and robust financing for global health security (which involves navigating the challenge of competing demands between health and climate finance), financing pandemic preparedness and response in low-income countries, the role of international development agencies, and financial solutions for zoonotic disease research and mitigation.

Communities, households and individuals

The most frequently discussed topics within the 22 publications addressing this element were access to services and resources, and equity in access (Table 1). The literature is focused on the need for cohesive and equitable strategies in pandemic preparedness and response, highlighting the importance of integrating global health security into UHC with an emphasis on human rights, equity and social determinants of health. A crucial topic is the need to understand the treatment of pandemic technologies, such as vaccines, as common goods, focusing on equity and knowledge sharing. Notably, 19 of these 22 articles also discuss topics within the infrastructure and system element. This overlap includes discussions on financing systems and structures, public–private partnerships in research and development, and global health systems and security.

Social position/foundations

Our review revealed that this framework element was the least addressed in the literature (11/60), and only as a method of differentiating policies between countries of different levels of income (Table 1). There has been no research undertaken to analyse, for example, the distribution of financing for pandemic preparedness and response between individuals of different income levels in any given population. Only two articles discussed the educational dimension of financing for pandemic preparedness and response;^{44,48} education is a key sector that can play a crucial role in such systems, and a sector that was greatly affected by COVID-19 quarantines. Only one publication explored the effect of sex and gender on the receipt of finance for pandemic preparedness and response;⁵⁵ the effect of occupation, ethnicity, race and financial literacy remain absent from the literature. Although equity

in access to pandemic preparedness and response measures is an essential target, discussions on access by particularly vulnerable groups are not available in the literature.

Terminology

Although the literature often refers to financing for pandemic preparedness and response, there is no unified definition of this wording. Of all 60 reviewed publications, only six attempt to define concepts before engaging in analysis and discussion.^{20,27,30,56,62,67} One publication deals with the definition of cooperative surveillance,⁵⁶ which is only one element of pandemic preparedness and response, and others list the elements of a global public health system,^{20,27,30,62,67} potentially providing the basis for a definition. Our review also revealed a lack of consistency in the terminology. Both “pandemic preparedness and response” and “pandemic prevention, preparedness and response” have been widely used by international organizations and policy-makers in the COVID-19 response. Neither of these expressions have been officially ratified, and their meaning can vary with context.^{79–81}

Discussion

Our review has emphasized the need for a robust, equitable and sustainable global financial framework for pandemic preparedness and response, extending beyond the advocacy of a Pandemic Fund. The literature also highlights the importance of a comprehensive One Health approach and enhanced disease surveillance systems for early detection and effective management of health emergencies. The reviewed publications advocate strengthening health systems, particularly in low- and middle-income countries, through increased investment as well as the integration of UHC and equity in access to health systems.

The literature highlights the need for improved collaborative models and global governance in pandemic preparedness and response, addressing barriers such as organizational cultural differences and funding constraints. Financial sustainability and equity remain central themes, with discussions on the necessity of mandatory contributions to global health funds and the development of new financing facilities. Our review also emphasizes the importance of legal and regulatory frameworks in pandemic response, and the need for continued investments in research and development (e.g. vaccine research and antimicrobial resistance).

A strength of our review is our demonstration that the framework proposed by the WHO Council on the Economics of Health for All is instrumental in characterizing relevant literature,

highlighting a focus on financing health systems and UHC, vaccine development and manufacture, and surveillance systems. However, such a focus is to the detriment of advancing knowledge on crucial health dimensions, including equity, access, and distributional impacts on minority or vulnerable groups.

Our review had three main limitations. First, although the aim of our review is to improve our understanding of the international financial architecture for responding to future pandemics, the reviewed literature focuses on the terms that were broadly used in the COVID-19 response. This focus is a direct result of the key finding that the majority of existing academic literature on financing for pandemic preparedness and response was published in response to COVID-19. Authors may have referred to financing for pandemic preparedness and response using different terminology, especially in nonmedical literature and works published before 2020, potentially introducing biases. Furthermore, our review does not examine the well-established literature on health financing and sustainable development goal budgeting for health, which will include investments to mitigate the risks and costs of pandemics.

Second, we excluded grey literature from our review. Although grey literature can provide valuable insights and inform decisions, concerns exist regarding the quality of the review process for grey literature, its accessibility and potential biases.^{82–84} The pandemic rapidly increased the volume and diversity of grey literature with unstable internet addresses, extending beyond traditional sources such as official reports to include journalistic pieces.⁸⁵ The inclusion of grey literature would necessitate adapting existing protocols to address its unique characteristics, a task that falls outside the scope of this work. By focusing on peer-reviewed publications, we have followed an approved review process with a standardized quality evaluation based on journal rankings. Another advantage of only including peer-reviewed publications in our review is the existence of established retraction mechanisms for correcting inaccuracies. We recommend further research to allow the existing grey literature to be characterized and included in future reviews.

Third, we excluded literature on financing epidemics from our review. We acknowledge that omitting articles on epidemic preparedness may overlook strategies that are applicable to pandemics, even though they are distinct phenomena. Financing an epidemic, which typically presents a partial equilibrium challenge, can often be managed with traditional risk management approaches.⁸⁶ In contrast, pandemics pose a significant threat to global health security with long-term consequences.^{12,76}

The required investment in global commons encompasses shared international structures that enhance global health security, including aspects of trade, transportation, the environment and access to medicines, particularly for developing countries during emergencies.⁸⁷ Pandemics have widespread effects that complicate the basic assumptions used in simpler economic models, which typically assume that all other economic conditions remain unchanged.^{88,89}

Our review has identified three important gaps in the literature: an accurate quantification of the financing shortfall is impeded by the lack of a formal definition of pandemic preparedness and response; although policy papers suggest that the COVID-19 pandemic disproportionately affected vulnerable households, there are currently no publications analysing the extent to which financing for pandemic preparedness and response has been targeted at such households;⁹⁰ and there is currently no analysis of specific financial instruments except for those proposed by international financial institutions such as the World Bank and International Monetary Fund,^{80,91} and no evaluation of the political and administrative feasibility of their implementation. Addressing these gaps in future research is an important step towards achieving adequate global financing instruments for pandemic preparedness and response measures.

Competing interests

None declared.

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Table 1. Properties of reviewed publications on global financing for pandemic preparedness and response measures, categorized according to the four elements of the framework proposed by the World Health Organization (WHO) Council on the Economics of Health for All⁴

Author/year	Article type	Study aim	Element of framework proposed by the WHO Council on the Economics of Health for All ⁴			
			Root/ structural causes (25 articles)	Social position/ foundations (11 articles)	Infrastructure and system (54 articles)	Communities, households and individuals (22 articles)
Daems et al., 2005 ¹⁸	Research	To identify challenges in pandemic vaccine development, including planning and coordination, and propose public–private partnership models ^a	No	No	Yes	Yes
Gostin & Berkman, 2007 ¹⁹	Research	To identify the legal and regulatory aspects of pandemic preparedness and response measures, including financial aspects such as liabilities and compensations derived from such measures	No	No	Yes	No
Ijsselmuiden et al., 2008 ²⁰	Discussion	To examine global investments in health research, and the spending gap between developed and developing nations, and propose new research priorities in health, including pandemic preparedness, climate change and sustainable financing	Yes	No	No	Yes
Ortu et al., 2008 ²¹	Research	To examine the legal aspects of pandemic preparedness and response measures, including insurance and workers' compensation	No	No	Yes	No
Yen et al., 2015 ²²	Review	To highlight the role of funding in vaccine stockpiles and discuss public policy measures for emergencies	No	No	Yes	No
Katz & Seifman, 2016 ²³	Discussion	To highlight the importance of sustained support for pandemic preparedness, especially in low-income countries, and identify funding mechanisms ^a	Yes	Yes	No	Yes
Leigh et al., 2018 ²⁴	Research	To examine existing international funding mechanisms, such as the WHO Contingency Fund for Emergencies and Coalition for Epidemic Preparedness and Innovations, and highlight the importance of adequate funding in pandemic preparedness and response measures planning	No	No	Yes	No
Babu et al., 2021 ²⁵	Review	To examine the importance of investment in resilient health systems in Afghanistan, Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan and Sri Lanka, as well as planning and best-practice adoption	No	No	Yes	No
Charani et al., 2021 ²⁶	Review	To examine investment and policies related to antimicrobial resistance, in terms of both government and the private sector	Yes	No	Yes	No
Duff et al., 2021 ²⁷	Review	To investigate the need for a renewed framework for global collective action that ensures conformity with international regulations, and promotes effective prevention and response to pandemic infectious diseases; to propose recommendations to strengthen global public health governance ^a	No	No	Yes	No

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Giersing et al., 2021 ²⁸	Review	To highlight the importance of financial incentives and stakeholder collaboration in vaccine innovations	No	No	Yes	No
Kleinert & Horton, 2021 ²⁹	Discussion	To highlight the rapid need for diagnostic capacity and testing, and for equitable access to diagnostics	No	No	Yes	No
Lal et al., 2021 ³⁰	Review	To examine the fragmented governance in pandemic response with separate funding streams and varying priorities; to call for integration of global health security into UHC ^a	Yes	No	Yes	Yes
Lurie et al., 2021 ³¹	Review	To highlight the importance of a global research and development financing system in pandemic preparedness, including political challenges	Yes	No	Yes	No
Sirleaf & Clark, 2021 ³²	Discussion	To highlight the importance of funding in addressing gaps and preventing future disease outbreaks; to recommend the establishment of an International Pandemic Financing Facility	No	No	Yes	No
Agarwal & Reed, 2022 ³³	Research	To analyse COVID-19 vaccine advance purchase agreements, and propose financial alternatives to absorb risk and strengthen the financing of pandemic preparedness and response measures ^a	No	Yes	Yes	Yes
Akenroye et al., 2022 ³⁴	Research	To analyse the main drivers of and barriers to the effective implementation of a collaborative model of pandemic preparedness and response	Yes	No	Yes	No
Bollyky et al., 2022 ³⁵	Research	To highlight the importance of investments in risk communication strategies to foster public confidence	Yes	No	Yes	No
Carlson & Phelan, 2022 ³⁶	Review	To investigate the need for capacity-building and investment to support the broader One Health approach to disease surveillance and outbreak prevention, including financing and technology transfer	No	Yes	Yes	No
Cernuschi et al., 2022 ³⁷	Research	To examine government intervention in vaccine markets and the possibility of regional shared manufacturing facilities, as well as improved access and affordability for all countries	No	No	Yes	Yes
Clark et al., 2022 ³⁸	Discussion	To highlight the benefits of stronger international leadership and increased financing for the Access to COVID-19 Tools Accelerator; to emphasize the importance of transparent financing and agreements to ensure equitable distribution of vaccines and other medical tools ^a	No	No	Yes	No
Frenk et al., 2022 ³⁹	Discussion	To emphasize the importance of sustainable development and robust financing for global health security, and propose mandatory contributions by Member States	Yes	No	No	No
Gwenzi et al., 2022 ⁴⁰	Review	To examine financial tools for local funding in low-income countries for zoonotic disease research and mitigation, proposing specific instruments such as taxes and industry-specific levies in areas of livestock and wildlife tourism ^a	Yes	No	No	No
Hayman et al., 2022 ⁴¹	Research	To investigate vaccine manufacturing aspects, challenges, investments in research and development, technology and multistakeholder coordination ^a	No	No	Yes	No

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Lal et al., 2022 ⁴²	Review	To emphasize the need to integrate investments in health systems to strengthen both global health security and UHC; to propose a Pandemic Fund ^a	No	No	Yes	Yes
Meier et al., 2022 ⁴³	Review	To examine international legal reforms and new treaties related to pandemic preparedness and response measures, focusing on financing mechanisms, equity, social justice and human rights in the global health system ^a	Yes	No	Yes	Yes
Moeti et al., 2022 ⁴⁴	Review	To highlight the importance of investing in research, development and preparedness for health emergencies, stressing the importance of equitable distribution of vaccines as well as synergy between the various global health agendas ^a	No	Yes	Yes	Yes
Olliaro & Torreele, 2022 ⁴⁵	Review	To examine the limitations in research and development, and emphasize the shift towards treating health interventions as a common good and the need for public investments to overcome market failures	No	No	Yes	Yes
Reid-Henry et al., 2022 ⁴⁶	Discussion	To propose a global public investment for international finance, focusing on transparency, coordination, co-creation and consultation, to reimagine pandemic preparedness and response measures ^a	No	Yes	Yes	Yes
Ren et al., 2022 ⁴⁷	Research	To highlight the importance of access to antibiotics in pandemics, emphasizing the need for coordinated financing mechanisms and equitable resource allocation, including incentives for research and development, transparent markets and global partnerships	No	Yes	Yes	Yes
Rosa et al., 2022 ⁴⁸	Research	To emphasize the importance of research investments in palliative care in low- and middle-income countries, and call for the removal of various barriers to health care	Yes	Yes	Yes	No
Sachs et al., 2022 ⁴⁹	Review	To highlight the need for a Global Health Fund aligned with WHO to expand existing health funds, providing financing for disease control and health system strengthening in low- and middle-income countries ^a	No	No	Yes	Yes
Saxenian et al., 2022 ⁵⁰	Research	To investigate sustainable financing for immunization, and to emphasize the need to prioritize adequate funding, efficient service delivery and the right combination of revenue-raising strategies; to highlight the role of governments and development partners in strengthening public financial management ^a	Yes	No	Yes	No
Sekalala & Rawson, 2022 ⁵¹	Research	To examine the pandemic treaty as a potential opportunity to address effective and equitable access to medical countermeasures by creating conditions for government-funded research and development	No	No	Yes	Yes
Solomon, 2022 ⁵²	Discussion	To reflect on a global agreement for pandemic preparedness measures and emphasize pragmatic, creative solutions within limited timeframes ^a	No	No	Yes	No
Tacconelli et al., 2022 ⁵³	Review	To examine the challenges and recommendations for improving global pandemic preparedness and response financing by examining collaborative research projects, highlighting the need for alternative funding formats and coordination	No	No	Yes	No

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Williamson et al., 2022 ⁵⁴	Discussion	To examine proposals to improve global governance in pandemic preparedness and response measures, proposing the Financial Intermediary Fund (later Pandemic Fund) and potential changes to IHR ^a	Yes	No	Yes	No
Akselord et al., 2023 ⁵⁵	Discussion	To advocate increased health system investment and financing for equity, resilience and sustainability, highlighting UHC, global health architecture, gender equality and transformative change ^a	Yes	Yes	Yes	No
Archer et al., 2023 ⁵⁶	Discussion	To emphasize the importance of enhancing disease surveillance and intelligence during public health emergencies; to propose financing to facilitate sustainable preparedness and the creation of National Investment Plans	No	No	Yes	No
Bochner et al., 2023 ⁵⁷	Research	To examine the performance of health emergency systems, and propose increased investments at health facility and intermediate public health levels	No	No	Yes	No
Boyce et al., 2023 ⁵⁸	Research	To examine emerging concerns about the Pandemic Fund, comparing it with the Pandemic Emergency Financing Facility ^a	No	No	Yes	No
Byanyima et al., 2023 ⁵⁹	Discussion	To examine financing systems for community-led organizations, emphasizing the importance of overcoming funding barriers and integrating community data	No	No	Yes	Yes
Elnaiem et al., 2023 ⁶⁰	Review	To highlight underinvestment in pandemic preparedness and response measures; to call for targeted investments in various areas, including climate change mitigation	Yes	No	Yes	No
Ford et al., 2023 ⁶¹	Review	To emphasize the importance of public-private partnerships, funding for research and development, regional vaccine manufacturing and community engagement ^a	No	No	Yes	Yes
Gallo-Cajiao et al., 2023 ⁶²	Review	To examine the need for funding to establish governance structures and propose a Global Pandemic Financing Facility to reduce the risk of future pandemics ^a	Yes	No	Yes	No
Gostin et al., 2023 ⁶³	Review	To advocate the incorporation of human rights into health emergency preparedness and response, emphasizing global health and rights architecture	Yes	No	Yes	Yes
Helldén et al., 2023 ⁶⁴	Review	To analyse current funding trends for digital initiatives related to pandemic preparedness and response measures across major donors and development partners	No	No	Yes	No
Hiroshima G7 Global Health Task Force, 2023 ⁶⁵	Discussion	To examine investments, public policy for health resilience, long-term research and development investments, and policy measures connecting health, resilience and climate change; to call for the integration of pandemic preparedness and response measures within UHC ^a	Yes	Yes	Yes	No
Kasaeva et al., 2023 ⁶⁶	Discussion	To advocate the inclusion of One Health principles in the negotiations for a global Pandemic Instrument and to discuss the direction of the Pandemic Fund ^a	Yes	No	Yes	No

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Katz, 2023 ⁶⁷	Discussion	To emphasize funding challenges for pandemic preparedness and advocate standardized reporting; to propose considerations in the design of the Pandemic Fund	No	No	Yes	No
Khosla et al., 2023 ⁶⁸	Discussion	To highlight issues in a Pandemic Accord draft, emphasize equitable financing, and raise concerns about power imbalance and the need for human rights and global health pathways ^a	No	No	Yes	No
Lee, 2023 ⁶⁹	Discussion	To highlight issues around state-centric paradigms in the Pandemic Accord draft; to advocate inclusive decision-making and the rebuilding of trust in science and politics ^a	Yes	No	Yes	Yes
Micah et al., 2023 ⁷⁰	Research	To examine the amount of development aid given for pandemic preparedness and response measures during the first 2 years of the COVID-19 pandemic, focusing on disparities between high- and low-income countries; to assess global health expenditure, development assistance and the ongoing necessity to maintain funding for essential global health functions	Yes	Yes	No	Yes
Morris, 2023 ⁷¹	Research	To consider the challenge of competing demands on World Bank resources to finance climate change and pandemic preparedness and response measures	Yes	No	No	No
Müller et al., 2023 ⁷²	Discussion	To highlight the importance of surveillance as an evidence-based tool to understand population immunity and track viral transmission; to highlight the need for financing and investment in research infrastructure and data collection	No	No	Yes	Yes
Nardi et al., 2023 ⁷³	Research	To address the role of financing, including regional organizations and financial institutions, in bolstering pandemic preparedness and response, particularly in low- and middle-income countries in the WHO Region of the Americas; to highlight challenges related to vaccine procurement and collaborative financial support and policy guidance	No	No	Yes	No
Saxena et al., 2023 ⁷⁴	Review	To emphasize the relevance of good governance of the Pandemic Accord to guarantee equitable access to therapeutics and vaccines; to analyse the crucial role of investment in the development of research and development systems that reward pharmaceuticals while ensuring the availability of intellectual property rights ^a	Yes	No	Yes	No
Stubbs et al., 2023 ⁷⁵	Review	To examine the challenge of securing increased national health budgets in low- and middle-income countries in the face of austerity measures driven by external debt, highlighting the need to change global rules on debt recovery and the importance of domestic resource mobilization	Yes	Yes	Yes	No
Torreele et al., 2023 ⁷⁶	Discussion	To advocate the viewing of pandemic preparedness technologies as common goods, focusing on equity and knowledge sharing	Yes	No	Yes	Yes
Torreele et al., 2023 ⁷⁷	Discussion	To emphasize the need for financing designed for health impact, proposing pre-negotiated agreements involving various sectors ^a	No	No	Yes	Yes

COVID-19: coronavirus disease; IHR: International Health Regulations; UHC: universal health coverage; WHO: World Health Organization.

^a Paper proposed or discussed specific pandemic preparedness and response financing instruments.

Fig. 1. Selection of publications for inclusion in systematic scoping review on financing of pandemic preparedness and response measures

