

BMJ Open Success and challenges of health systems resilience-enhancing strategies for managing Public Health Emergencies of International Concerns (PHEIC): A systematic review protocol

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To cite: Rajapaksha RMNU, Khatri RB, Abeysena C, *et al.* Success and challenges of health systems resilience-enhancing strategies for managing Public Health Emergencies of International Concerns (PHEIC): A systematic review protocol. *BMJ Open* 2022;**12**:e067829. doi:10.1136/bmjopen-2022-067829

► Prepublication history and additional supplemental material for this paper are available online. To view these files, please visit the journal online (<http://dx.doi.org/10.1136/bmjopen-2022-067829>).

RMNUR and YAA are joint first authors.

Received 30 August 2022
 Accepted 03 November 2022



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ABSTRACT

Introduction Health systems resilience is the ability to prepare, manage and learn from a sudden and unpredictable extreme change that impacts health systems. Health systems globally have recently been affected by a number of catastrophic events, including natural disasters and infectious disease epidemics. Understanding health systems resilience has never been more essential until emerging global pandemics. Therefore, the application of resilience-enhancing strategies needs to be assessed to identify the management gaps and give valuable recommendations from the lessons learnt from the global pandemic.

Methods The systematic review will be reported using the Preferred Reporting Items for Systematic Review and Meta-analysis (PRISMA-P) protocols guideline. Reporting data on World Health Organization (WHO) health system building blocks and systematic searches on resilience enhancing strategies for the management of Public Health Emergencies of International Concerns (PHEIC) after the establishment of International Health Regulations (IHR) in 2007 will be included. The search will be conducted in PubMed, Scopus, Web of Science and Google Scholar

Ethics and dissemination Ethics approval and safety considerations are not applicable. Pre-print of the protocol is available online, and the screening of the articles will be done using Rayyan software in a transparent manner. The findings will be presented at conferences and the final review's findings will be published in a peer-reviewed international journal and will be disseminated to global communities for the application of successful management strategies for the management of future pandemics.

PROSPERO registration number CRD42022352612; https://www.crd.york.ac.uk/prospero/display_record.php?ID=CRD42022352612

STRENGTHS AND LIMITATIONS OF THIS STUDY

- ⇒ The systematic review will be reported using the Preferred Reporting Items for Systematic review and meta-analysis protocols guideline.
- ⇒ We intend to include all studies in English.
- ⇒ Resilience-enhancing strategies published in peer-reviewed journals for the management of PHEIC after establishment of IHR will be analysed.
- ⇒ Collaboration between Asia-Pacific researchers with different backgrounds.
- ⇒ May not be possible to conduct a meta-analysis due to nature of the selected scope of the research and inclusion of qualitative studies.

INTRODUCTION

Health systems resilience is defined as 'the ability to prepare, manage and learn from a sudden and unpredictable extreme change which impacts on health systems'.¹ It focuses on the health system preparedness and response to an emergency and coping capacity for changes following a crisis in view of absorbing, adapting and transforming.^{1,2} However, the focus of the health system resilience was broadened with the improving number of literatures around health systems resilience, which extends to focus on vulnerability, system strains and everyday resilience.² Understanding health system resilience has never been more essential until emerging global pandemics. Health systems globally have recently been affected by a number of catastrophic events, including natural disasters, infectious disease epidemics such as Ebola outbreak, novel COVID-19 pandemic. Due to the new emergence and rapid transmission of the COVID-19 since late 2019, global health

systems are severely affected. As stated by the WHO, all the organisations, institutions, resources and people whose primary purpose is to improve health is included in the health system. Moreover, efforts to influence determinants of health and direct health-improvement activities are considered as the component of the health system. A health system delivers preventive, promotive, curative and rehabilitative interventions combined with public health actions and the pyramid of healthcare facilities that provide personal healthcare by multi-stakeholders.³ A health system needs human resources, health finances, information, supplies, transport, communications, overall guidance and direction to provide a quality service. Each area of the health system needs to be strengthened to address the key constraints. Therefore, the WHO described six building blocks of the health system framework which include health service delivery, health workforce, health information systems, access to essential medicines/vaccines, health financing, leadership and governance. These building blocks are targeted to achieve impacts, including improved health outcomes, equity, social and financial risk protection, responsiveness, and efficiency, which contribute to strengthening health systems to provide sustainable quality, efficient and effective health services.³ Furthermore, the need for understanding of governing of health systems is highlighted following catastrophic events occurring over the last decade. The majority of low and middle-income countries were highly affected by the emergence of infectious diseases (eg, Ebola, COVID-19) and armed conflicts.⁴⁻⁶ Moreover, managing the crises, national responses across the globe were varied, some focus on the transmission of diseases and prevention of deaths. Importantly, the countries having established good health systems also struggled to cope with the exponentially accelerating number of cases.⁷ With the exponential increase of pandemics, the International Health Regulations (IHR) was established in 2007 for governing the global health security. The IHR declared Public Health Emergencies of International Concern (PHEIC). Six events of PHEIC were documented between 2007 and 2020, including 'H1N1 influenza pandemic (2009), Ebola (West African outbreak 2013–2015, outbreak in Democratic Republic of Congo 2018–2020), poliomyelitis (2014 to present), Zika (2016) and COVID-19 (2020 to present)'. Among them Poliomyelitis is the longest PHEIC, and Zika was the first PHEIC for arboviral disease. Even though the public health impact of the event was considered serious and associated with a potential for international spread, several other emerging diseases were not declared as PHEIC.⁶ Further, Monkey pox is declared as a PHEIC by WHO on 23 July 2022 due to clear risk of further international spread.⁸ Moreover, response measures following a crisis, improving surge capacity and planning for further action to minimise vulnerability can be identified when assessing the health systems' resilience.⁹ The purpose of assessing resilience and its interpretation depends on multiple contextual factors that need to be evaluated for better understanding. The well-assessed areas can be used as a starting point and encourage policymakers to adopt an appropriate strategy in a particular country. Furthermore,

policymakers need to regularly review their health systems to assess their resilience.¹⁰ In addition, the application of resilience-enhancing strategies is new. The concept has become relevant and more researched with societal response to health emergencies during the past two decades.¹¹

Justification (rationale)

Health system resilience is key to coping with catastrophic events, such as the economic crisis and COVID-19 pandemic. However, there is confusion about the meaning of resilience, strengthening it and assessing it.¹ Furthermore, health system resilience research has reached a crucial point; health system interventions have only partly been followed by empirical research and concrete applications.¹² Therefore, the application of resilience-enhancing strategies with existing frameworks needs to be assessed to identify the management gaps and give valuable recommendations from the lessons learnt from the global pandemic. Importantly, improving resilience could help the health system respond to a pandemic like COVID-19. However, most of the research has so far remained primarily theoretical. Therefore, applied research towards a cohesive set of goals needs to be identified and promoted to develop and implement strategies to strengthen systems. Furthermore, strengthening health system resilience can be addressed during the pandemic and future disasters if the issues are correctly addressed during research and interpretation of findings.¹² Therefore, there is a need to analyse the implementation of resilience-enhancing strategies to draw lessons from health systems that have proved more successful at dealing with the past crisis and offer evidence on best practices for health systems under strain. Moreover, it will invariably help improve the level of preparedness and response to similar public health emergencies in the future.

Objectives

The objectives of this systematic review are:

1. To identify and describe the implemented health system resilience-enhancing strategies for managing PHEIC globally (including national, regional and global levels).
2. To identify success, and challenges, and provide recommendations towards successful management of PHEIC in future pandemics.

Review question

What are the success strategies, and challenges toward health system resilience for managing PHEIC globally?

METHODS AND ANALYSIS

Type and method of review and reporting

Health systems resilience: A systematic review

The systematic review will be reported using the Preferred Reporting Items for Systematic review and Meta-analysis Protocols guideline (PRISMA-P) (refer online supplemental file 1).

Study period

30 March 2022 to 30 November 2022.

Anticipated or actual start date for the review

15 July 2022.

Anticipated or completion date

30 November 2022.

Eligibility criteria

Inclusion criteria

We intend to include all studies in English with qualitative design that can be included under one or more six building blocks of health systems that adhered to resilience-enhancing strategies for the management of PHEIC after the establishment of IHR in 2007. All qualitative studies in peer-review journals will be included. Also, reference checking of detected peer-review studies and hand searching of related journals will be conducted and relevant studies will be included after assessing quality.

Exclusion criteria

Empirical studies that did not mention health system resilience strategies for pandemic/epidemic management, editorials, letter to editor, and conference proceedings will be excluded.

Source of information and search strategies

WHO's six building blocks of health systems³ were included as the keywords. Boolean operators ('AND' or 'OR') and asterisk search operators will be applied. The complete search strategies for all databases are presented in a table. To avoid duplication and for citation purposes, references will be collected from each database and stored in EndNote desktop V.20. The search will be restricted to the peer-reviewed literature related to the management of declared PHEIC after 2007 according to the IHR for global health security.⁶ Screening, reference checking of detected studies and hand searching of related journals were conducted from 30 May to 15 July 2022. Electronic databases (PUBMED, EMBASE, SCOPUS, Web of Science) and Google scholar search engine, which were published in peer-reviewed journals after declaration of PHEIC will be used to describe the related management strategies and lesson learnt. The relevant keywords under the main three themes listed in table 1 will be used to create a comprehensive search strategy. The search terms will be filtered by a combination of different keywords, Medical Subject Headings (MeSH), Emtree terms,

SCOPUS and WOS search strategies as in the online supplemental file 2.

Condition and domain being studies

Global implementation of health system resilience strategic analysis combined with PHEIC management will be studied to provide recommendation for future pandemic preparedness.

Population

Global studies managing PHEIC which describe health system resilience strategies will be taken as the study population.

Intervention(s)/exposure(s)

Global health system resilience-enhancing strategies for the management of pandemics that were declared as PHEIC will be included to identify success and challenges and provide recommendations towards successful management of public health emergencies.

Context

National, regional and global health system resilience-enhancing strategies for the management of PHEIC and implementation will be assessed.

Main outcome(s)

Application of resilience-enhancing strategies for the improvement of managing PHEIC in all six areas of the health system,³ (including governance/leadership, healthcare financing, healthcare service delivery, health workforce, health information system and access to medicine/vaccine) towards better management of pandemic.

Additional outcome(s)

Success and challenges towards the management of PHEIC will be identified in view of constructing recommendations for the management of future pandemic situations. The impact of strong health system resilience-enhancing strategies on reducing morbidity and mortality due to proper management of pandemic will be described.

Data management

Data extraction

The initial search was performed by reviewers using pre-determined search terms and strategies from chosen

Table 1 The applicable keywords and/or phrases under the main three themes

Theme 1	Theme 2	Theme 3
Health system	Resilience, ^{1,2}	Pandemic/PHEIC, ⁶
Health system building blocks, ³ "Service delivery" OR "Health Resource*" OR "Health workforce" OR "Health information system*" OR "Health Product*" OR Vaccine* OR Medicine* Or Diagnostic* OR "Health Financing" OR "Health Leadership" OR "Health Governance"	AND Resilien* OR Robust OR Anti-fragil* OR Adaptab* OR Transformat* OR Preserv*	AND "Public Health Emergencies of International Concerns" OR "PHEIC" OR Pandemic OR Outbreak OR Epidemic OR COVID-19 OR Ebola OR H1N1 OR "Influenza Pandemic" OR Zika OR Poliomyelitis OR "Monkey pox"

databases. After the removal of the duplications, the titles, abstracts and keywords were screened for relevance and eligibility criteria. The two reviewers will then extract the data from the studies selected for inclusion using a predesignated extraction form. We will use a Microsoft Excel spreadsheet format for data extraction. It will be done by two research team members (RMNUR and NP) independently to reduce the bias. We also conduct a double check-up and verification of the extracted information by the supervisory senior author (YA). The data extraction form consists of the details about the title of the study, author, publication year, study question/objectives, study setting/country, study design, analysis methods, exposure/main results (strategic area of six building blocks),³ challenges/weaknesses, success and study limitations (refer online supplemental file 3). Two reviewers (RMNUR and RBK/AE/NP/GDS) will be independently coded and tabulated on the findings. Adapting from the WHO Six Building blocks, we use the six key areas of the health system, as a guiding theme for the reporting of findings.

Risk of bias (quality) assessment

All retrieved studies were initially imported into the Rayyan software to assist in removing duplicates. After removing the duplicates, it was shared among collaborators for independent screening of articles by title and abstract based on eligibility criteria. A three-stage screening process will be used to eliminate non-relevant articles at the stage of title, abstract and full-text screening. The studies that would have the two or more reviewers agreed on will be subjected to a full-text review. The two reviewers will independently review the full text of all eligible studies that meet the inclusion criteria and will be retained for the final synthesis (RMNUR and NP). All eligible retrieved articles will undergo a quality assessment process during the synthesis of results and will be done by four independent reviewers (YA, RMNUR, RBK, AE). The two independent reviewers (RMNUR and NP) will use the Joanna Briggs Institute's critical appraisal checklist for the qualitative research assessment. When there will be a disagreement between the two reviewers, the senior team member (YA) and senior collaborators (CA, MSDW, TKT) will be engaged and a discussion along with the two reviewers will be made to resolve the differences.

Strategies for data synthesis

Double check-up and verification of the extracted information will be done by the senior reviewers (YA, CA, MSDW, TKT). Two team members (RMNUR and NP/GS) will be independently coded and tabulated the findings on the thematic areas (six core areas of the WHO health system) of the review and will map out common codes, concepts and categories. Adapting from the WHO framework, we use the six core areas of the health system, as a guiding theme for the reporting of findings. The key findings will be collated under those core areas of the health system including Governance/leadership, Healthcare

financing, Healthcare service delivery, Health workforce, Health information system and access to medicine/vaccine. The investigators initially discussed the analytical themes/framework independently and then collectively as a group to minimise the bias. Thus, the senior authors (YA, CA, MSDW, TKT) cross-validate and resolve any discrepancies. The four main team members (RMNUR, RK, AE, NP) will also be regrouped as successes, challenges and strategies to realise the management of the pandemic. All the reviewers will initially generate the analytical themes independently and then collectively as a group to minimise the bias. This framework offers a detailed list of likely factors that could contribute to the possible strategies for the attainment of six building blocks for enhancing the health system for pandemic management. The senior team members (CA, YA, MSDW, TT) built on the five team members' work by categorising and synthesising applicable and emergent codes into final relevant themes, cross-validate all synthesised findings, and resolving any discrepancies. Meta aggregation of the data will be done.

Analysis of subgroups or subsets

The successes and challenges of health system resilience strategies on the management of pandemics Public Health Emergencies of International Concerns with regard to the context of achieving impacts, including improved health outcomes, equity, social and financial risk protection, responsiveness and efficiency, which contribute to strengthening health systems to provide sustainable quality, efficient and effective health services will be assessed.

Patient and public involvement

None.

DISCUSSION

Health systems resilience is key to coping with catastrophic events, such as the economic crisis and COVID-19 pandemic. The mapping of available literature towards the application of resilience-enhancing strategies with existing frameworks needs to be assessed to identify the successful strategies, management gaps and give valuable recommendations from the lessons learnt from the global pandemic to improve the level of preparedness and response to similar public health emergencies in the future.

Language

English.

Country

Australia and Sri Lanka.

Stage of review

Review ongoing.

ETHICS AND DISSEMINATION

Ethics approval and consent to participate: Not applicable.

Databases that require an institutional license will be accessed through the library at Postgraduate Institute of Medicine (PGIM), University of Colombo Sri Lanka and The University of Queensland Australia.

DISSEMINATION

Pre-print of the protocol is available on <https://www.medrxiv.org/content/10.1101/2022.06.14.22276386v4>

The screening of the articles was done using Rayyan software in a transparent manner. All included and excluded articles are on the system with reasons.

The findings will be presented at conferences at The University of Queensland in Australia, PGIM, University of Colombo Sri Lanka and other locations around the world.

Finally, the review's findings will be published in a peer-reviewed international journal and will be disseminated to global communities for the application of successful management strategies for the management of future pandemics.

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Contributors Conceptualisation: NUR, YA, CA, MSDW, RBK; draft the protocol: NUR; review the protocol and feedback: YA, CA, MSDW, RBK, TKT, AE, RR, GDS, NP, MF; editing and preparation of the final protocol: NUR.

Funding The authors have not declared a specific grant for this research from any funding agency in the public, commercial or not-for-profit sectors.

Competing interests None declared.

Patient and public involvement Patients and/or the public were not involved in the design, or conduct, or reporting, or dissemination plans of this research.

Patient consent for publication Not applicable.

Provenance and peer review Not commissioned; externally peer reviewed.

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PRISMA-P (Preferred Reporting Items for Systematic review and Meta-Analysis Protocols) 2015 checklist: recommended items to address in a systematic review protocol*

Section and topic	Item No	Checklist item
ADMINISTRATIVE INFORMATION		
Title:		
Identification	1a	Identify the report as a protocol of a systematic review
Update	1b	If the protocol is for an update of a previous systematic review, identify as such
Registration	2	If registered, provide the name of the registry (such as PROSPERO) and registration number
Authors:		
Contact	3a	Provide name, institutional affiliation, e-mail address of all protocol authors; provide physical mailing address of corresponding author
Contributions	3b	Describe contributions of protocol authors and identify the guarantor of the review
Amendments	4	If the protocol represents an amendment of a previously completed or published protocol, identify as such and list changes; otherwise, state plan for documenting important protocol amendments
Support:		
Sources	5a	Indicate sources of financial or other support for the review
Sponsor	5b	Provide name for the review funder and/or sponsor
Role of sponsor or funder	5c	Describe roles of funder(s), sponsor(s), and/or institution(s), if any, in developing the protocol
INTRODUCTION		
Rationale	6	Describe the rationale for the review in the context of what is already known
Objectives	7	Provide an explicit statement of the question(s) the review will address with reference to participants, interventions, comparators, and outcomes (PICO)
METHODS		
Eligibility criteria	8	Specify the study characteristics (such as PICO, study design, setting, time frame) and report characteristics (such as years considered, language, publication status) to be used as criteria for eligibility for the review
Information sources	9	Describe all intended information sources (such as electronic databases, contact with study authors, trial registers or other grey literature sources) with planned dates of coverage
Search strategy	10	Present draft of search strategy to be used for at least one electronic database, including planned limits, such that it could be repeated
Study records:		
Data management	11a	Describe the mechanism(s) that will be used to manage records and data throughout the review

Selection process	11b	State the process that will be used for selecting studies (such as two independent reviewers) through each phase of the review (that is, screening, eligibility and inclusion in meta-analysis)
Data collection process	11c	Describe planned method of extracting data from reports (such as piloting forms, done independently, in duplicate), any processes for obtaining and confirming data from investigators
Data items	12	List and define all variables for which data will be sought (such as PICO items, funding sources), any pre-planned data assumptions and simplifications
Outcomes and prioritization	13	List and define all outcomes for which data will be sought, including prioritization of main and additional outcomes, with rationale
Risk of bias in individual studies	14	Describe anticipated methods for assessing risk of bias of individual studies, including whether this will be done at the outcome or study level, or both; state how this information will be used in data synthesis
Data synthesis	15a	Describe criteria under which study data will be quantitatively synthesised
	15b	If data are appropriate for quantitative synthesis, describe planned summary measures, methods of handling data and methods of combining data from studies, including any planned exploration of consistency (such as I^2 , Kendall's τ)
	15c	Describe any proposed additional analyses (such as sensitivity or subgroup analyses, meta-regression)
	15d	If quantitative synthesis is not appropriate, describe the type of summary planned
Meta-bias(es)	16	Specify any planned assessment of meta-bias(es) (such as publication bias across studies, selective reporting within studies)
Confidence in cumulative evidence	17	Describe how the strength of the body of evidence will be assessed (such as GRADE)

*** It is strongly recommended that this checklist be read in conjunction with the PRISMA-P Explanation and Elaboration (cite when available) for important clarification on the items. Amendments to a review protocol should be tracked and dated. The copyright for PRISMA-P (including checklist) is held by the PRISMA-P Group and is distributed under a Creative Commons Attribution Licence 4.0.**

From: Shamseer L, Moher D, Clarke M, Ghersi D, Liberati A, Petticrew M, Shekelle P, Stewart L, PRISMA-P Group. Preferred reporting items for systematic review and meta-analysis protocols (PRISMA-P) 2015: elaboration and explanation. BMJ. 2015 Jan 2;349(jan02 1):g7647.

Supplementary file 2. Success and Challenges of Health System Resilience-enhancing Strategies for Managing Public Health Emergencies of International Concerns (PHEIC): A Systematic Review Protocol

Database	Search Strategy	Document Results
PubMed	<p>"Health System" OR "Service delivery" OR "Resources/Health workforce" OR "Health information systems" OR "Access to essential medicines" OR "Financing" OR "Leadership/governance" AND "Resilience" OR "Robust" OR "Antifragile" OR "Adaptable" OR "Transformative" OR "Suppleness" OR "Pliancy" OR "Suppleness" OR "Ability to bounce back" OR "Perseverance" OR "Workability" OR "Ductility" OR "Malleability" AND "Pandemic" OR "Global" OR "Worldwide" OR "Universal" OR "Widespread" OR "Planetary" OR "Prevalent" OR Pervasive OR Rampant OR Outbreak OR Epidemic OR COVID-19 OR Ebola OR H1N1 OR "Influenza Pandemic" OR Zika OR Poliomyelitis OR "Monkey pox"</p> <p>Mesh Terms: "Health Services"[Mesh] OR "Delivery of Health Care"[Mesh] OR "Health Resources"[Mesh] OR "Health Workforce"[Mesh] OR "Health Facilities"[Mesh] OR "Health Communication"[Mesh] OR "Healthcare Financing"[Mesh] OR "Medical Informatics"[Mesh] (Pandemic* OR Epidemic* OR Outbreak* OR "Public Health Emergencies of International Concerns") AND (Management OR "Infection control" OR "Outbreak Control") OR "Pandemics"[Mesh] OR "Disease Outbreaks/prevention and control"[Mesh]</p>	
Embase	(resilient:ti OR resilience:ti) AND (framework:ab,ti OR model:ab,ti OR program:ab,ti OR indicator:ab,ti OR index:ab,ti) AND (system:ab,ti OR organization:ab,ti OR organizational:ab,ti OR theory:ab,ti OR strategies:ab,ti)	
Scopus	(<i>resilience</i> OR <i>resilient</i>) AND (<i>system</i> OR <i>model</i> OR <i>framework</i> OR <i>theory</i> OR <i>organiz*</i> OR <i>organis*</i> OR <i>concept</i> OR <i>program</i> OR <i>indicator</i>) AND ("health system" OR "health sector")	
WOS	(Resilience OR resilient) AND (System OR model OR framework OR theory OR organiz* OR organis* OR concept OR Strategies) AND (Epidemic OR "Epidemic" OR "health system" OR "health sector")	

Supplementary file 2. Success and Challenges of Health System Resilience-enhancing Strategies for Managing Public Health Emergencies of International Concerns (PHEIC): A Systematic Review Protocol

Supplementary file 3: Data extraction form for the systematic review

Title	Author /Year	Study question/ Objectives	Study area (Period)	Study design/type of study	Measurement/ Analytical approach	Source of data	Main results including strategic areas (Six building blocks)	Success/challenges/weaknesses, opportunities/Limitations	Comment