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Interagency Collaboration in Public Health Emergencies

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Interagency Collaboration in Public Health Emergencies

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An abstract of
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Abstract

Interagency Collaboration in Public Health Emergencies

By Saheedat Olatinwo

Interagency collaboration has been promoted to protect public health. During public health emergencies, this becomes crucial to prevent, detect, and achieve prompt and effective responses. It requires agencies and organizations from diverse sectors, including human and animal health and laboratories, nutrition, agriculture, trade, and travel. However, little is known about how to achieve this and the challenges and gaps of interagency collaboration. I conducted a systematic literature review to synthesize the evidence. Conducted across four databases that included seven studies in the final review, Covidence™ categorized the data based on the research questions.

The seven studies included collaborations for MERS-CoV in South Korea; COVID-19 in the United States; and Influenza in China. Overall, they reported enabling or inhibiting factors for collaboration during public health emergencies in six domains: agreements and guidelines; communication; resources and capacity; leadership and governance; trust, relationship, and culture; and monitoring and evaluation. These domains reflect key challenges for interagency collaboration (e.g., lack of integrated or interoperable information systems among agencies, unclear collaboration policies, poor communication among agencies, and different work cultures).

The benefits of collaboration are critical to global health security because one national-level agency cannot tackle public health threats. Understanding how agencies work and can work together is vital. The proper knowledge and tools to help form and strengthen interagency collaboration can support national-level prevention, detection, and response to future health crises.

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List of Abbreviations

AMR	Antimicrobial Resistance
AMU	Antimicrobial Use
CCC	Coordination, communication, collaboration
CDC	Centers for Disease Control and Prevention
COVID-19	Corona virus 2019
FAMDS	Framework Act on the Management of Disasters and Safety
FAO	Food and Agriculture Organization of the United Nations
FEMA	Federal Emergency Management Agency
GHSA	Global Health Security Agenda
HHS	United States Department of Health and Human Services
ICS	Incident Command System
IDCPA	Infectious Disease Control and Prevention Act
IHR	International Health Regulation
IOM	International Organization for Migration
IRB	Institutional Review Board
IRIS	Institutional Repository for Information Sharing
MERS-CoV	Middle East respiratory syndrome coronavirus
OIE	World Organization for Animal Health
PHEIC	Public Health Emergency of International Concern
SDG	Sustainable Development Goals
SPIDER	Sample, phenomenon of Interest, Design, Evaluation, and Research type or Problems
TZG	Tripartite Zoonoses Guide
UHC	Universal Health Coverage
UK-PHRST	United Kingdom’s Public Health Rapid Support Team
UNEP	United Nations Environment Programme
UNICEF	United Nations Children's Fund
WHO	World Health Organization

Chapter 1. Introduction

The core responsibility for protecting public health lies with national governments; in the United States, it is delegated to state health departments. It is true that the increasing interconnectedness of the global community through travel, trade, and technology has made public health issues in one country a concern for all. The (re)emergence of zoonotic diseases from wildlife to humans and the relationship among humans, animals, and the environment has led to the emerging field of One Health.[1] There is a fundamental need for multisectoral coordination, communication, and collaboration (CCC) to achieve One Health. One Health recognizes that the health of humans, animals, and ecosystems are interconnected; risks to health can emerge from various sources, and a multidisciplinary and cross-sectoral approach is critical to address them.[2]

During public health emergencies, it is essential for agencies (governmental and non-governmental) and organizations across multiple sectors to work together (coordinate, communicate, and collaborate) to protect and promote public health. An effective response requires strong CCC among all necessary agencies and at all levels (local, district, national) and internationally.[3]

Interagency CCC among the health sector and other development sectors has been encouraged to promote health and policy goals. Under ordinary circumstances, failure to coordinate may result in duplication of efforts and waste resources.[4] However, failure to collaborate at the national or international levels may have more severe consequences during a public health emergency due to the uncertain and disrupted environment.

In different health areas, collaborative efforts have made significant progress in achieving health goals. Notable are international CCC for vaccination against smallpox, the Paris agreement to address climate change, and ACT-Accelerator – a collaboration of public health agencies to accelerate the development of COVID-19 vaccines, diagnostics, and therapeutics. Based on the International Health Regulation of 2005 (IHR 2005) and the Global Health Security Agenda (GHSA), efforts have been made to encourage sectors to contribute and strengthen emergency preparedness and response. Nevertheless, effective interagency and multisector CCC remains lacking and a challenge.[5,6]

In the wake of COVID-19, gaps in interagency CCC have become clear among all member states (MS) of the World Health Organization (WHO). Some gaps include information and communication challenges (e.g., inconsistent data and information sharing, poor communication); administrative challenges (e.g., limited funding); poor organizational processes and decision-making; resistance to adapt; lack of clear understanding of each agency's roles, responsibilities, and resources; lack of policies supporting collaboration; and political challenges and tension. These hinder decision-making and implementation, cause strain on resources, and lead to poor CCC and delayed responses.[7-9]

This thesis examined literature from the COVID-19 pandemic and other public health events to assess interagency CCC for public health preparedness and response, including successes and failures to consider what lessons might be learned.

The research questions were:

- What frameworks exist for interagency CCC for public health preparedness and response?
- What are the gaps and impediments to effective interagency CCC during public health preparedness and response?
- What are the opportunities to enhance interagency CCC to optimize preparedness and response during public health events?

CCC among agencies was defined in the literature as *a process in which organizations exchange information, alter activities, share resources, and enhance each other's capacity for mutual benefit and a common purpose by sharing risks, responsibilities, and rewards*.

Chapter 2. Literature review

Health systems and public health programs are designed and developed based on local and national contexts, needs, and conditions. Yet these systems and programs are frequently tested by events, decisions, and characteristics that go beyond borders. Some of the greatest threats to human and animal health arise from diseases – infectious disease – that know no boundaries. Decision-making in healthcare within a country is based on evidence, culture, values, political and economic conditions, and policies.

However, these factors are greatly affected by international laws, travel, trade, and investments. Several events (e.g., Ebola pandemic in 2015 and COVID-19) revealed health security by large was determined through coordination, communication, and collaboration (CCC) across the globe, supported by the realities of increasing interconnection and dependence. This means national health security is highly dependent on global health security.[6]

A shared vision and collective action among and within countries are required to ensure collective health security. This requires a wide range of actors – government agencies, businesses or private sector, non-governmental and non-profit organizations, and international agencies – to effectively CCC.

The revised International Health Regulations (IHR 2005) – the binding instrument of international law to prevent, protect, and control the international spread of disease – represents a new paradigm in global health governance where governments are accountable to both their publics' health and the global community in managing public

health events.[10] Therefore, CCC has evolved to be vital in making decisions, managing and allocating resources, and developing systems and policies.

Health systems and public health programs are developed based on local and national contexts, needs, and conditions. Yet they are frequently tested by events, decisions, and characteristics that go beyond borders. Some of the greatest threat to health arise from diseases – infectious diseases – that know no boundaries.

Decision-making in healthcare within a country is based on evidence, culture, values, political and economic conditions, and policies. However, these factors are greatly affected by international laws, trade, and investments. Several events (e.g., Ebola pandemic in 2015 and COVID-19) revealed that health security is determined by extensive CCC across the globe, supported by the realities of increasing interconnection and dependence. This means national health security is highly dependent on global health security.

A shared vision and collective actions among and within countries are required to ensure collective health security. This requires a wide range of actors – government agencies, businesses or private sector, non-governmental and non-profit organizations, and international agencies – to effectively CCC at all stages of public health emergency preparedness and response.

Interagency CCC represents a fundamentally different approach to prepare and respond to public health emergencies. It incorporates the health sector and non-health sectors and requires action at several levels (local, national, regional, and global) by different organizations to improve public health. This includes CCC that directly delivers health

benefits such as the One Health initiative for Antimicrobial Resistance (AMR), and those that produce ripple effects for public health (e.g., efforts to address social determinants of health).[11]

The revival of focus on interagency CCC aligns with the revised IHR 2005 and represents a new paradigm in global health governance where governments are accountable to both their publics' health and the global community in managing public health events.[10] It also strengthens the World Health Organization (WHO) to bypass political barriers by allowing it to independently declare a Public Health Emergency of International Concern (PHEIC) and issue guidelines for control and response plus provide a collective responses with other global actors in situations of need.[6]

Part of this push is no doubt due to economic conditions and shortage of government funding that may force the health sector to uncover ways to do more with fewer resources. However, a major appeal is to ensure governments do not implement unilateral public health measures that may hurt international travel and trade.

The goal to achieve Universal Health Coverage (UHC), the Sustainable Development Goals (SDGs), the Global Health Security Agenda (GHSA), and other efforts to prevent and protect public health have emphasized the importance and interdependence of various sectors in achieving goals and objectives. This requires establishing strong CCC across various sectors, such as human and animal health, agriculture, education, security, law enforcement, social welfare, foreign affairs, trade, and finance.

Defining Interagency CCC

Interagency CCC occurs at policy, planning, and implementation levels. For several systems, agencies, or sectors to work together, it is important to understand their individual roles and the ways they interact with each other through shared visions and policies. Understanding this relationship is crucial when building systems that support working together.[12] Several approaches, frameworks, and tools exist to assess collaboration and partnerships, most of which share CCC.

In *coordinated* systems, mechanisms are put in place for organizations or agencies to achieve common goals. These have policies, mechanisms, committees, and terms to assign tasks, leveraging organizations' strengths and resources to ensure the overall goal is met efficiently. Coordination involves *aligning one's actions with those of other relevant actors and organizations to achieve a shared goal*.[13] It requires interaction and cooperation among actors to ensure they work together without interference while they achieve their own goals and overarching vision. Coordination forms the backbone for organizations across sectors or countries to work together, with collaboration being at the high end. Many emergencies are coordinated through a thematic cluster approach, which lays down structures, processes, principles, and commitments to coordinate support for responses based on the national government's request or international standards.

Communication involves the exchanges of data, information, and knowledge among agencies, organizations, and countries for mutual benefit. The communication process in emergency preparedness and response involves integrated and interoperable systems, transparency, timeliness, and frequency of information on risk, decisions, resources. The

Integrated Surveillance System for AMR and Antimicrobial Use (AMU) is a great example of public health surveillance that fosters communication through assembled data on resistant nosocomial pathogens, zoonotic and foodborne pathogens, and elements of AMU in humans and animals across One Health sectors.[14]

Collaboration is about the different yet complementary and integrated roles, skills, and knowledge that agencies bring to achieve the shared vision. At this stage, different agencies explore and leverage their information and resources and come together to exchange or merge these information and resources to achieve desired goals. Here, decisions are made together, and efficiency is prioritized. Fundamentally, interagency collaboration requires a shared vision with aligned goals and matrix to track progress, a strategy or roadmap for action, and effective governance to facilitate collective decision-making and ensure accountability.[15-17]

Benefits of Interagency Coordination, Communication, and Collaboration

Interagency CCC is integral to managing public health events and has the potential to promote a holistic approach to needs across all sectors. For example, the complex realities of border closures and mitigation measures during COVID-19 resulted in unintended consequences (e.g., negative impacts on the supply of essential goods and services, economic activities, and migrant communities).

The International Organization for Migration (IOM) partnered with national and regional immigration and border authorities to support data collection, disease surveillance, risk communication, and many other interventions.[18] Second, collaboration reduces duplication and fragmentation of services. The Sphere project for humanitarian response

uses a cluster approach to strengthen response by grouping different agencies by thematic areas (e.g., health, education, nutrition).[19]

Each cluster is under the lead agency, the Humanitarian & Emergency Relief Coordinator that works to ensure coordination actions to foster a common strategy, avoid duplication and confusion, address gaps, combine knowledge and efforts, and share information.[19] With this example of the Sphere Project, interagency collaboration enhances complimentary actions taken toward achieving the desired goals. Effective interagency CCC offers an avenue to mobilize and pull resources, knowledge, and funds to create systems better equipped to address current and future public health challenges.

Collaboration in One Health

Covid-19 underscores the need for multisectoral action and One Health for research, decision-making, preparedness, and response to current and future pandemics.[20] One Health is defined by the United Nations (UN) Quadripartite – Food and Agriculture Organization of the United Nations (FAO), the World Organization for Animal Health (OIE), WHO, and the United Nations Environment Programme (UNEP) – as an *integrated, unifying approach that aims to sustainably balance and optimize the health of people, animals and ecosystems*.[21]

One Health recognizes the interdependence of humans, animals, plants, and the environment. This involves CCC across multiple disciplines and sectors to promote and protect health. The IHR (2005), GHSA 2030, Performance of Veterinary Services, and One Health Approach among others have called for collaboration to respond to public health events. However, most countries have inadequate mechanisms for effective

collaboration among the human, animal, and environmental sectors. Some of these challenges include the lack of joint preparation, coordination, information sharing across relevant sectors that may lead to confusion, obstructed, or delayed response, and failure to meet goals and objectives.[21]

More recently, the United Nations (UN) Tripartite developed the Tripartite Zoonoses Guide (TZG); it takes into account the need for countries to adapt to their local contexts by providing guidance and tools for the implementation of One Health to address public health threats. This guide relies on strengthening human, animal, and environmental systems, expansion of public health surveillance, effective CCC, monitoring and evaluation, governance, and sustainable financing.[22]

Whole-of-Society Approach

A whole-of-society approach is critical in public health emergency preparedness and response. Preventing or addressing public health events requires health systems to interact with other government sectors (non-health sectors) at all levels, collaboration, and partnerships with the private sector, civil society, non-governmental, and international organizations.[23]

The focus of the whole-of-society approach is on building and maintaining relationships and communication within and between health and non-health sectors and having a coordinated plan for public health emergency preparedness and response. This helps reduce the negative consequences of public health events on not only health but for well-being and livelihood. The GHSA emphasizes the need for strong multisectoral engagement, including human and animal health, agriculture, security, defense, law

enforcement, development assistance, foreign affairs, research, and finance sectors, among others.[24]

Chapter 3. Methodology

Introduction

This systematic review assessed the conceptual understanding of interagency CCC for public health preparedness and response based on previous public-health events (e.g., COVID-19). This enabled identification of gaps and impediments based on past successes and failures and identified opportunities for enhancements and to formulate recommendations to improve interagency CCC.

Framing Questions

The research questions and search were formulated using the SPIDER model for qualitative studies. SPIDER stands for five components of the study question: Sample, phenomenon of Interest, Design, Evaluation, and Research type or Problems (Figure 1).

Figure 1. SPIDER Structure for Literature Search

Context

Publications were reviewed that assessed collaboration at national or global levels from several parts of the world. Only studies that focused on public health interventions, response, and preparedness were included.

Problem

Assessment of collaborative efforts where the study or reports explicitly noted the aim to improve or assess collaboration between two or more agencies were included. Other terms besides interagency collaboration were accepted, such as multisectoral collaboration, coordination, and communication.

Interest

No restrictions were placed on interest. The study aimed to assess frameworks, mechanisms, gaps, and opportunities for interagency CCC.

Search Approach

Electronic Searches: The research was carried out on the following databases.

- PubMed™
- Embase™
- CAB Direct™

I identified grey literature by searching relevant organizational websites such as World Health Organization Institutional Repository for Information Sharing (IRIS).

Search Strategy: The search strategy was designed using the following concepts and alternate terms.

Concept 1: Interagency

Keywords: interagency, network, intersectoral, multisectoral, inter-organization

Mesh term: “Interinstitutional Relations” [Mesh}

Concept 2: Collaboration

Keywords: collaboration, cooperation, partnership, coordination, alliance, coalition

Mesh term: “Intersectoral Collaboration”[Mesh}

Concept 3: Public health

Keywords: public health, global health, population health

Mesh term: “Public Health” [Mesh}

The keywords were searched on each database for relevant studies in English published between Jan 2012 and Mar 2022. The global movement for One Health which promoted the improvement of inter-agency CCC to address public health threats, began in 2012 when the first One Health summit was held in Switzerland.[25]

The search strategy was tested in PubMed to ensure that relevant studies were found using the keywords and terms.

Inclusion and Exclusion Criteria

Inclusion criteria were developed to identify studies relevant to the research question. These focused on studies related to collaborations between two or more agencies or

organizations, collaborations involving the health sector and non-health sector at the national and global levels, and collaborations focused on public health preparedness and response. Also, studies that reported collaboration frameworks, mechanisms, and processes were included. Studies examining similar phenomena without focusing on collaboration at an organizational level (e.g., interprofessional or multidisciplinary collaboration at hospital levels) were excluded. The criteria also focused on excluding studying examining collaboration between organizations within the health care system only or between agencies focused on academic research.

Table 1. Inclusion and Exclusion Criteria for the Systematic Review

Inclusion Criteria	Exclusion Criteria
Focuses on collaboration between two or more distinct organizations that aim to improve public health emergency response	Focuses on collaboration between professional groups within single organizations
Focuses on collaborations with at least one health care organization and at least one non-healthcare organization within a country	Focuses on multidisciplinary partnerships or interprofessional collaboration without any focus on related collaboration at an organizational level
Focuses on collaborations between health agencies between two or more countries	Focuses on collaborations between organizations within the health care system or between agencies focused on academic research
Focuses on interagency collaboration at local, national, or global level	It is does not include the use of empirical data on collaboration mechanisms or outcomes or is not a review of actual events, cases, reports, or policies

Data Collection and Analysis

Selection of Studies

I conducted a review of scholarly and peer-reviewed articles, reports, and guidelines. The review relied on Internet search databases to identify published articles between Jan 2012, and Mar 2022. Reviews that do not describe the search strategy and inclusion criteria explicitly in the full text were excluded.

Search results were imported and stored in an EndNote™ library for reference management and duplicate removal. The articles retrieved were exported to the web-based system Covidence™ for selection. The articles were initially screened by reviewing the titles and abstracts for eligibility. Afterward, the full text of all screened articles was examined to determine if they met all criteria set. At this stage of full-text assessment, any reasons for exclusion were recorded in Microsoft Excel™.

Data Assessment, Extraction, and Synthesis

After selecting eligible articles and reports, they were assessed for depth and appropriateness of the data to ensure that they provided evidence to answer the research questions. The information was then extracted and summarized. Extracted information included the following:

1. Article information: Author, title, year of publication, publication type, the aim of the study or report, country or setting, public health event
2. The focus of research: level of collaboration (e.g., local, national, or global level); collaborating agencies or organizations; objectives of collaboration; components

of collaboration (inputs such as framework, tools, mechanism, policies, strategies, processes); reviews (e.g., challenges, facilitators, barriers, opportunities, recommendations).

Reporting Bias

I attempted to reduce the risk of reporting bias by searching multiple databases.

Ethical Considerations

This systematic review used data from open sources. The thesis was considered non-human subject research; therefore, Emory University Institutional Review Board (IRB) approval was not required.

Limitation and Delimitations

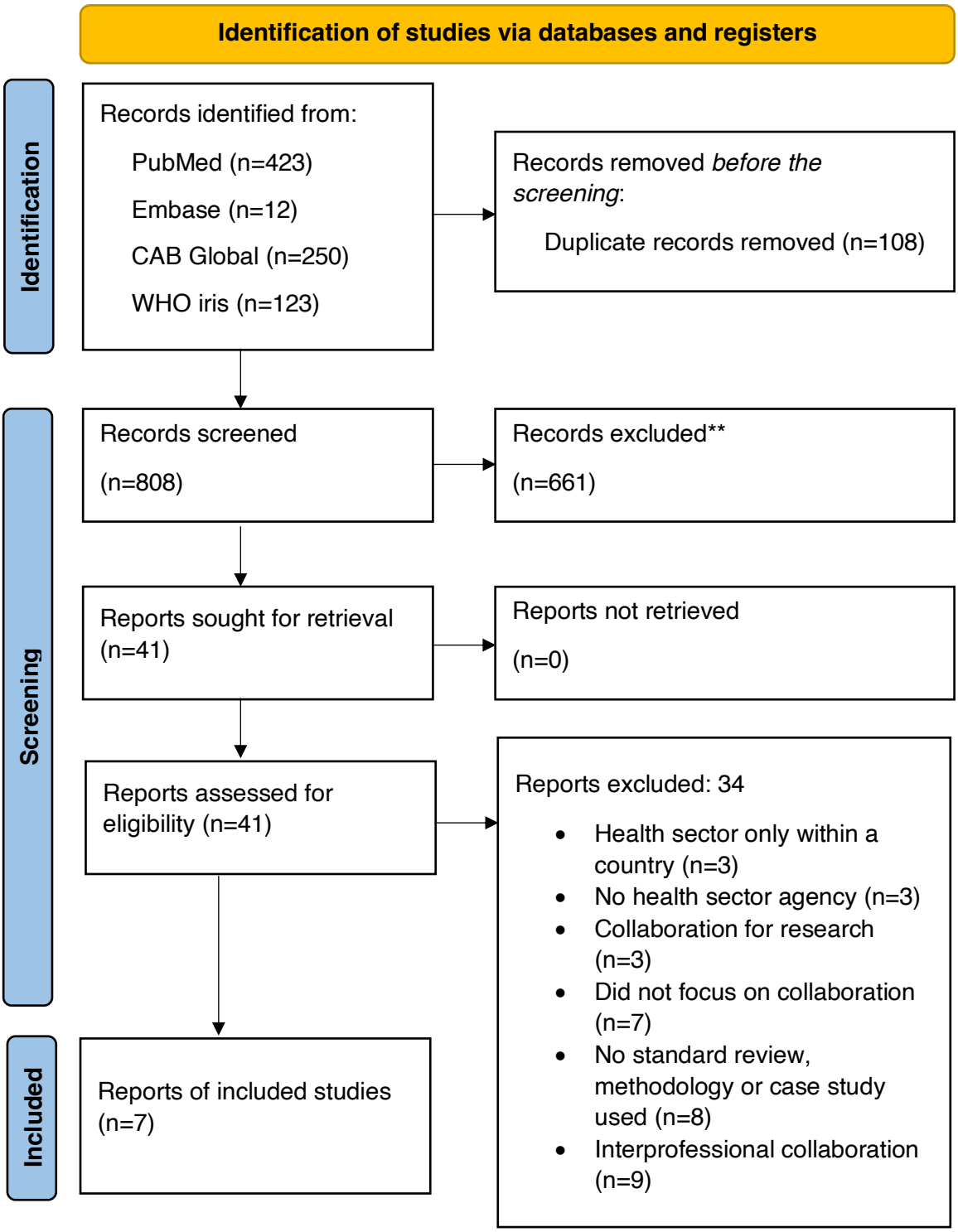
As with any systematic review, this review had limitations and delimitations. An *a priori* protocol was not previously published. Only one reviewer was used for this study which leaves room for potential bias. The search was conducted using four databases PubMed™, Embase™, CAB Direct™, and WHO IRIS and therefore may not comprise all information and recommendations published in the literature. Despite the combination of these terms and the use of alternate terms, the search strategy may not be comprehensive, and some references may have been excluded. References from other languages than English were not included. Only a few websites were searched for grey literature. Articles published between 2012 to 2022 were used. All these could lead to the exclusion of some recommendations. Therefore, the results must be interpreted carefully.

Chapter 4. Results

Selection of Sources

The initial search across the databases yielded 808 results with 423 from PubMed™, 250 from CAB Global Health, 12 from Embase, and 123 from WHO IRIS. Fourteen publications were excluded from the WHO IRIS because they were not reported in English. Of the 808, 108 were duplicates and an additional 661 were irrelevant to the purposes of this review. The full texts of the remaining 41 were reviewed, and 33 publications were excluded as they did not meet the inclusion criteria. Thirty-three were excluded for the following reasons: three only focused on collaboration within the health sector only, three focused on coordination outside the health sector (i.e., emergency response), three focused on collaboration for research purposes, seven did not focus on collaboration but rather on only the outcome of the program, and eight were considered to be opinion pieces as they were not based on systematic analysis or data collection, and nine focused on interprofessional collaboration. A thorough search of titles, abstracts, and full text resulted in seven publications, whose references were reviewed to identify additional studies that fit the inclusion criteria for the systematic review. The review of references resulted in the assessment of six additional articles, of which only one met the inclusion criteria. However, this was excluded because it contained a similar study as one of the already selected studies and did not provide any new information. At the end of the review process, a total of seven publications met the criteria for analysis.[26-32] (Figure 2)

Figure 2. Flow Chart of Study Selection



Characteristics of Selected Studies

Of the seven publications, five were published in peer-reviewed journals and two were documents published and available online as independent evaluations. (Table 2)

Year of Publication

All publications were published between 2016 and 2022; one each in 2016, 2017, 2019, and 2022 and two each in 2020 and 2021. Those published between 2019 and 2022 emphasized the importance of the research or publication in designing implementation strategies or frameworks to address the current COVID-19 pandemic.

Methodology

Across all seven publications, the study evaluation designs included case study methodology and network analysis, and data collection methods included document reviews, literature search, key-informant interviews, and surveys. Two of the studies conducted a network analysis to evaluate the effectiveness of collaboration by evaluating its ability not just to meet the overall goal of collaboration but to ensure goals are met while managing resources and providing prompt and quality services. The remaining five studies focused on the functions, governance, and components of collaboration.

Setting of Collaboration

Of the five journal articles, two reviewed several global-level collaborations. These two studies assessed collaboration at the national level but with emphasis on international collaboration with other countries. The publications focused on collaboration at the

national level, although they also mentioned partnerships with local and international non-governmental organizations and development agencies.

Public Health Event

In the peer-reviewed articles, two focused on the 2015 Middle East respiratory syndrome-coronavirus (MERS-CoV) outbreak in South Korea, one focused on COVID-19 in the United States, one focused on an organization's rapid response to epidemics in low- and middle-income countries (LMICs), and the last one was on Influenza threats in China. The independent review focused on multiple case studies of public health events at country and regional levels, such as outbreaks of yellow fever, Ebola virus, cholera, meningitis, and Zika in Africa, and Polio in WHO Eastern Mediterranean Region, South-East Asia, and Africa.

Reason for Collaboration

Across all the included studies, the overarching goal was to reduce the transmission of infectious diseases. More specifically, the included articles collaborated to increase capacity (through training and development of systems or software), implement program activities, provide technical assistance, social mobilization, and establish coordinated response. One of the studies discussed the sustainability of existing collaborative networks to fight future public health threats.

Table 2. Overview of Selected Studies

Author(s)	Title	Publication Type; Year	Data Collection Method	Setting	Collaborating Organizations
Kim K; Andrew SA; Jung K	Public Health Network Structure and Collaboration Effectiveness during the 2015 MERS Outbreak in South Korea: An Institutional Collective Action Framework	Journal Article; 2017	Social network analysis, surveys, interview	National; South Korea	Local public health, police, and fire agencies, national and regional government, Korea CDC, Ministry of Health and Welfare
Ku M; Han A; Lee KH	The Dynamics of Cross-Sector Collaboration in Centralized Disaster Governance: A Network Study of Interorganizational Collaborations during the MERS Epidemic in South Korea.	Journal Article; 2021	Social network analysis using white paper published by the Ministry of Health and Welfare and articles from 4 major domestic newspapers	National; South Korea	Ministries (Health, security, environment sectors), Private organizations and hospitals, National Medical Center, Korea CDC
Shu YueLong; Song Ying; Wang DaYan; Greene, C. M.; Moen, A.; Lee, C. K.; Chen YongKun; Xu XiYan; McFarland, J.; Xin Li; Bresee, J.; Zhou SuiZan; Chen Tao; Zhang Ran; Cox, N.	A ten-year China-US laboratory collaboration: improving response to influenza threats in China and the world, 2004–2014	Journal Article; 2019	Report	Global; China & US	hinese National Influenza Center (CNIC), United States Centers for Disease Control and Prevention (USCDC)
Kapucu N; Hu Q	An Old Puzzle and Unprecedented Challenges:	Journal Article; 2022	Analysis of a series of government	National; US	FEMA, HHS, CDC

Author(s)	Title	Publication Type; Year	Data Collection Method	Setting	Collaborating Organizations
	Coordination in Response to the COVID-19 Pandemic in the US		reports, national strategies for COVID-19, and policies		
Raftery P, Hossain M, Palmer J	A conceptual framework for analysing partnership and synergy in a global health alliance: case of the UK Public Health Rapid Support Team	Journal Article; 2021	Interviews, case review	Global: UK and LMICs e.g., Nigeria, Bangladesh	UK Public Health Rapid Support Team, country ministries
World Health Organization	Multisectoral preparedness coordination framework	Framework; 2020	Systematic review, Qualitative case study	Global	Multiple government agencies and international non-governmental organizations (INGOs)
World Health Organization	Contributions of the polio network to the COVID-19 response: turning the challenge into an opportunity for polio transition	Report; 2020	Qualitative case study	Global	Multiple government agencies and INGOs

Results of Selected Studies

The selected studies were assessed for the inclusion of input components of collaboration, success or challenges of collaboration (outputs) during public health emergencies, and collaboration drivers. The input components referred to any framework, guideline, process, or activity that was already in place prior to the public health event. The success or challenges help contribute to the lessons learned from each event, and the collaboration drivers include the key components of collaboration that either prohibited or inhibited collaboration. (Table 3)

Table 3. Study Assessment

Author(s)	Inputs	Outputs	Drivers
Kim *et* al. (2017)	Y	Y	Y
Ku *et* al. (2021)	Y	Y	Y
Shu *et* al. (2019)	N	Y	Y
Kapucu & Hu (2022)	Y	Y	Y
Raftery *et* al. (2021)	Y	Y	Y
WHO (2020)	Y	Y	Y
WHO (2020)	N	Y	N

*Y = Yes; N=No

Synthesis of Results

Overall, all the studies highlighted the benefits and importance of collaboration, particularly during public health emergencies. However, the articles also discussed the potential risks of participation in collaboration, while explaining the importance of effective collaboration - the ability for interagency CCC to produce outcomes that could not be achieved by any of the agencies alone. For this purpose and to answer the research question, the result synthesis is divided into three key sections: frameworks for collaboration, gaps and impediments, and opportunities.

Frameworks for Interagency CCC

All publications discussed a form of national plan or guideline (preexisting) to facilitate interagency collaboration. The publications on MERS-CoV in South Korea explained the incident command system (ICS) used in South Korea that guides the direction and coordination of response.[26,27] This system is led by the public sector and guides using national plans in South Korea such as Korea's Framework Act on the Management of Disasters and Safety (FAMDS) and Infectious Disease Control and Prevention Act (IDCPA). These plans describe the roles and responsibilities of the several collaborating organizations, as well as communication channels. Despite the existence of these plans, the centralized system of response management resulted in a lack of flexibility- which is essential in emergency response- and bureaucracy.[27] Similarly, Kapucu and Hu (2020) discussed the challenges of inflexible guidelines or plans for collaboration. The authors also highlighted the potential confusion caused by having too many policies, plans, and

frameworks, and the need to train collaborating agencies on the guidelines and fund the activities stated therein.[30]

The plans and policies stated in Kapucu and Hu's article included the Pandemic Crisis Action Plan, Public Health Service Act, and the Robert T. Stafford Disaster Relief and Emergency Assistance Act, all of which explain governance, resource mobilization, and crisis management.[30] Shu *et* al. (2019) discussed the existence of a cooperative agreement between partnering organizations and its importance in guiding collaboration through a shared mission and well-defined priorities.[28]

WHO provides a comprehensive approach to reducing the risks and effects of public health emergencies. The WHO Health Emergency and Disaster Risk Management Framework is designed to be adapted at the national level based on contextual factors and relies on joint planning and participation. The publication also highlights three key elements for multisectoral coordination; political commitment, formalized coordination plan (includes stakeholder, structures, joint needs assessment), and an implementation plan (includes strategies to ensure effective communication, funding, activities to build trust, and monitoring and evaluation) .[31]

Gaps and Impediments to Effective Interagency CCC

Across all publications that described challenges of interagency collaboration, the major theme that arose were limited communication between agencies and with the communities, lack of adequate systems or platforms for information sharing, poor leadership and governance, and limited capacity or resources to effectively collaborate. In the effectiveness analysis of the public health network during the 2015 MERS-CoV

outbreak in South Korea, Kim, Andrew, and Jung described the inability to share data between local and national agencies due to different information systems. This invariably led to delays in communicating the index case of MERS-CoV. Also, the authors stated the issue of limited resources needed to combat the outbreak both at the local level and delayed response from national-level agencies to support local actions. [26]

Similarly, Ku, Han, and Lee discussed the limited sharing of information and knowledge between agencies (public and private, and health and non-health) which resulted in delays in diagnosis, isolation, understanding and knowledge of the virus, etc. South Korea has a mandate that requires government and non-government entities to render assistance, upon request, to the local government. Despite the great intention of this policy, it may lead to a more bureaucratic mechanism rather than one that is built on trust and commitment to achieve shared goals (in this case, to control the transmission of MERS-CoV).[27]

Similar to the major information system challenges explained earlier, Kapucu and Hu highlighted the difference in information management systems between two of the agencies that lead the response to public health emergencies and crises in the US, the Federal Emergency Management Agency (FEMA) and the Centers for Disease Control and Prevention (CDC), which resulted in communication problems during a crisis. Since the government has the prime responsibility of protecting the public, political will has a strong influence on interagency CCC. Underutilization and underfunding of agencies such as the CDC resulted in a shortage of essential resources, lack of governance capacity, and trust in government.[30]

Cultural differences between different agencies can also cause a strain on collaborative efforts. Differences in work practice and communication should be understood prior to collaboration.[29,30] In the analysis of global partnerships with the United Kingdom's Public Health Rapid Support Team (UK-PHRST), Raftery, Hossain, and Palmer discussed that different human resources grading systems between organizations resulted in staff being on different salaries for the same job type, creating potential conflicts. Although this was in the context establishment of a new organization to achieve a goal, balancing cultural differences and ensuring equity is vital for sustaining collaboration. [29] They also explained the challenges of physical barriers (working internationally) and their impact on effective communication and building relationships and trust with government agencies.[29]

Opportunities to Enhance Interagency CCC

All publications explained the importance of having a shared vision or interest, building trust, and establishing an interagency collaboration plan. Trust and inclusiveness is ensured through joint planning, decision-making, and resource mobilization.[26-31] The dynamic environment during public health events creates a need for flexible and easily adaptive plans for collaboration. The results from the network study by Ku, Han, and Lee showed that collaboration changes and evolves during public health events also depending on the scale of the event (i.e., local, national, global).[27] Therefore, understanding these changes, processes and their impact is essential for preparing for future events. Likewise, leveraging existing organizational networks or relationships that have worked together, understand their organizational cultures, and achieve results is vital in combating public health threats.[28] The availability of policies and frameworks is

important but not enough, evaluation of interagency CCC is essential to better understand and improve these policies and frameworks.[30]

Other Findings

Changes in power and nature of collaboration in emergencies: Kim, Andrew, and Jung in their analysis explained the changes in the nature of collaboration throughout the disease trends. The authors showed that there was minimal communication and collaboration at the onset of MERS-CoV in South Korea, and this gradually increased as more cases were identified. In the review of COVID-19 in the United States, changes in lead coordinating organization from HSS to FEMA were also noted.

Risks of Collaboration: While reviewing and extracting data from the articles, information about potential or actual disadvantages of collaboration were identified and have been characterized here as risks of collaboration. (Table 4)

Table 4. Risks Associated with Interagency Collaboration

Risk Associated with Interagency Collaboration
• The need to develop or invest in integrated communication platforms and processes
• Different and inflexible organizational structures and cultures
• Reallocation of resources
• Potential loss or negotiation of power
• Difficulties integrating with emergent or newly formed task forces into existing structures, and the need to create coordination and communication channels to effectively respond to emergency
• The involvement of diverse sectors, agencies, and stakeholders, including the private sector that may give rise to concerns related to conflict of interest.

Chapter 5. Discussion

Interagency CCC has been proposed by several policies and guidelines to bring various organizations or agencies together to achieve a common goal. However, challenges remain in how different agencies actually work together to improve public health security. I sought to review evidence on the processes and effectiveness of interagency collaboration with the main reference to public health threats by infectious diseases. I identified seven studies that reviewed the evidence of national and global collaboration and synthesized the results.

Overall, interagency CCC has been shown to effectively address public health threats and prevent the overwhelming of the health systems. At the global level, it helps bridge gaps in research, policies, and programs to ensure global security, equity, and access. Evidence across all studies reveals a major benefit of interagency CCC is the ability to facilitate and coordinate activities during a crisis and to pool and allocate resources (money, technical, infrastructure). Where effectiveness was evaluated using social network analysis, surveys, and interviews there was significant improvement in the quality of services. However, there was limited information about the impact of collaboration on cost savings. The evidence used varied widely based on the type of collaboration and how collaboration was assessed.

The studies reported on factors and mechanisms that enable or inhibit effective interagency collaboration. I grouped these into six domains— agreements and guidelines; communication; resources and capacity; leadership and governance; trust, relationship, and culture; monitoring and evaluation. These provide a guide of essential components

that agencies can use for effective collaboration during public health emergencies. Understanding these will also help mitigate or reduce the risks of collaboration identified in the result.

Agreements and Guidelines

This is the first step toward effective interagency collaboration. The availability of a document that explains the goals, objectives, activities, roles and responsibilities, and mechanism for collaboration. The studies reviewed that mention the availability of a written policy or agreement mentioned that it helped facilitate effective collaboration. However, too many policies or documents from different organization leads to confusion. Therefore, in developing a guideline, policy, or agreement for collaboration it is important to identify all participating agencies or organizations who will be involved. This also ensures that the agencies have a say in how they intend to collaborate.

It is also important to update the agreements or guidelines based on changes in organizational structures or policies and evaluation results or lessons learned from previous efforts. It is critical to build this together and ensure each agency has a clear understanding of the contents and the role they and other partnering agencies play to achieve the desired goals. Collaboration may occur in different forms; between specific individuals in different agencies or agencies to form a new committee or organization (e.g., the Presidential task force for COVID-19) or among different agencies that play complementary roles in addressing a public health issue. The overall aim or goal for collaboration may vary slightly among agencies. It is important to note this and use it in designing the shared goals among agencies as well as the individual roles and

responsibilities. This will also help understand how the agency's goals align with the shared goals of the collaboration.

Communication

Effective communication is essential for collaboration. This involves the exchange of data, information, and knowledge. Communication among agencies and how the collaborating agencies communicate with the public are important. Setting a channel or platform for frequent and open collaboration is important to ensure agencies can work together effectively and prevent misunderstanding. Similarly, ensuring uniformity of information shared with the public is essential. Creating trust with the public is a very important aspect of collaboration, particularly during public health emergencies as it facilitates effective implementation. Therefore, establishing a process to validate information across different agencies or a common platform (e.g., creating a new website or webpage) to collectively deliver information plays an important role in interagency collaboration.

Trust, Relationship, and Culture

Joint decision-making, equity between agencies, shared goals, and an acceptance of different but complementary roles are key to successfully implement and sustain interagency CCC. Understanding the diversity of different organizational culture is important to create a suitable work environment for collaboration. This involves understanding how different agencies communicate and their communication channels, working protocols and procedures, terminologies and language use, and so on. In some cases, leveraging existing partnerships or networks helps to sustain relationships and

build trust. This also includes understanding and appreciating the respective agencies' roles in the collaboration.

Resources and Capacity

Agencies should identify the human resources, technology, infrastructure, financial resources, and so on needed to initiate, implement, and sustain collaboration. The article reviewed explained the challenges of lack of financial and human resources. Funding can be through the establishment of a joint fund system where the different agencies set aside a specific amount to achieve the set goals. For interagency collaboration at the national level, funding may be acquired through a separate budget allocation from the government to achieve the goals of the collaboration. Regardless of the funding mechanism, it is important to establish how the collaborative efforts will be funded and tracked.

Developing the capacities of personnel in collaborating agencies is essential to understanding the roles and functions they and others play in implementation. Shu *et* al. discussed the importance of commitment to capacity-building efforts in ensuring the agency can carry out its required activities. Other authors explained that it is beneficial for different agencies to have the knowledge and understanding of relevant resources in their agency and how to effectively use them to achieve the shared goals. Building capacity here also refers to infrastructural capacities. Two articles stated the issues of lack of adequate systems for information sharing. Evidently, when agencies collaborate, data integration or interoperability is essential for effective and timely sharing of data.

Leadership and Governance

Leadership and governance play an important role in effective collaboration. Several leadership models can be adopted for interagency collaboration. As previously discussed, leadership dynamics may change during emergencies. However, it is important to identify the leading agency. CCC during complex humanitarian emergencies is done using a cluster approach. This requires organizations to work in clusters based on the thematic area (e.g., health, nutrition, etc.) with one lead cluster agency [e.g., WHO for health, United Nations Children's Fund (UNICEF) for nutrition].[19] On a different note, the National One Health Platform in Uganda is co-chaired by directors of the collaborating ministries on a rotational basis.[33] Ultimately, the leadership structure is based on the type and stage of collaboration and the overall aim of the collaboration. Clarity and consensus of leadership are essential.

Monitoring and Evaluation

The availability of policies and frameworks is important but not enough; evaluation of interagency CCC is essential to better understand these policies and frameworks based on lessons learned from various events globally.[30] Monitoring and evaluation should be done throughout the emergency response and findings should be reported and used to foster accountability and improve collaboration activities and processes (during and after implementation). Also, certain policies and processes change during public health emergency response; these can be identified and documented for future use in the presence of an adequate monitoring and evaluation plan. The plan should not only be

used to evaluate processes but to identify if the outcomes and goals of the collaboration are met.

Recommendations

Public health threats facing countries, such as COVID-19, cut across sectors in the society; health, trade, education, financial, environment, and others.[34] Tackling these challenges requires a range of sectors and their interconnected services to achieve a shared goal, to protect the public.[35] This systematic review has revealed that interagency CCC is based on trust, effective communication and information sharing, good governance, and capacity building, all bound by a framework, protocol, or agreement that was jointly developed and understood by all collaborating agencies. These factors, including political will at all levels of government to support commitment to efforts, enable, enhance, and empower sustainable interagency CCC for public health.

Emphasis should be placed on policy development or changes, commitment to national and international strategic plans or goals, and availability of sustainable resources (financial, technical, human, and infrastructure) across the various sectors for collaborative implementation of activities.[21,36] Another is the mutual understanding of the issues, vision, and actions. This builds on trust and understanding and ensures that partners, stakeholders, or agencies have coordinated actions, monitoring, evaluation, and public health outcomes. Effective communication through interoperable systems, joint evaluation, and the establishment of risk communication channels or protocols increases transparency and credibility. Generally, this will require collaboration between relevant

agencies for continuous communication, training, decision-making, and planning during public health crises and non-public health crises.

This review has added to the current body of knowledge on interagency collaboration, highlighted the challenges and risks of collaboration, and identified opportunities and key elements for effective collaboration during public health emergencies. There is also a need for more evidence-based approaches to strengthen emergency preparedness and response.

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