



The interfaces between One Health and Global Health: A scoping review

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ABSTRACT

One Health (OH) and Global Health (GH) are interconnected perspectives that may contribute to subsidizing GH policies. This scoping review aims to map the volume, nature, and characteristics of studies focused on the interface of OH and GH concepts. We used PubMed (MEDLINE), Embase, Scopus, and The Virtual Health Library (BVS) as the literature data sources for the review. The search strategy used the descriptors “one health”, “one health concept”, “one medicine”, “global health”, “international health”, and “planetary health” in title and abstracts. We included original research presented as articles in scientific journals, book chapters or conference papers written in English, Spanish, or Portuguese, exploring the intersections between OH and GH concepts, not necessarily as their primary objectives, and published up to December 31, 2021. A total of 1.060 references were identified in the databases after removing duplicates, 139 publications selected for full-text evaluation and 45 publications were included for analysis. All included publications were published between 2011 and 2021, with the highest concentration in 2014 (22.2%). First authors were most frequently from the United States (35.6%), followed by the United Kingdom (15.6%). Overall, seven key themes were identified zoonosis, emerging infectious diseases, antimicrobial resistance, food safety, policy, human resources, and Sustainable Development Goals (SDG). The majority of the included publications employed OH concepts based on the United States Centre for Disease Control and Prevention, and the American Veterinary Medical Association definitions. We observed a common understanding of OH as an area of knowledge involving multiple disciplines and professionals and recognizing that both humans' and animals' health and the environment are interdependent. Although most authors demonstrated that health issues transcend national boundaries, a formal definition for GH was frequently not clearly identified. OH and GH interfaces are essential for accomplishing the 2030 Agenda and its SDG.

1. Introduction

The globalization process involves all dimensions of human relations, triggering systems of interdependence across countries, as in the case of international health policies and regulations [1]. Globalization also has implications for the emergence and re-emergence of infectious diseases [2]. Indeed, the World Health Organization (WHO) has declared a Public Health Emergency of International Concern six times in the past ten years. Previous pandemics and large-scale epidemics such as influenza A (H1N1), Zika, Ebola, and COVID-19, demonstrate the need for improvements in responses and governance of infectious diseases at the transnational level [3–6].

According to WHO, less than half of the world's population has access

to all essential health services, creating barriers in the already complex and challenging confrontation of emerging and re-emerging diseases [7]. Health is a crucial factor for countries' economic growth and social development [1]. However, the globalization process has created international disparities and produced substantial social and health problems, especially in the countries that are not in a leading role in the global economy [8]. Those countries tend to have more issues related to diseases due to governance limitations and constraints in their capacity to formulate and implement social and health policies [9].

Two concepts have been increasingly used to assess and understand the health consequences of global interconnections. The concept of Global Health (GH) is based on the idea of supraterritoriality, establishing connections from the global to the local level, considering the

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social, political, and even ideological contexts that influence public health. It highlights the principles of respect for human social and cultural diversity, social justice, equity, and the expansion of individuals and peoples' autonomy [1]. The second concept One Health (OH) integrates human and animal health and environmental determinants at the local, national, and global levels. This concept has been increasingly used to understand the complex interactions between the different dimensions and fields of knowledge related to health, requiring multi, inter, and transdisciplinary perspectives [10].

At the global level, environmental and sociodemographic changes increase populations' vulnerability and transpose public health challenges to all countries [11]. Therefore, a stronger interface between OH and GH perspectives is desired since both focus on studying factors that influence the emergence, dissemination, and control of diseases.

These two relatively novel concepts have broad and blurred definitions; thus, a more profound look at their interconnections may contribute to subsidizing proposals aimed at the sustainability of GH policies. Hence, this scoping review aims to map the volume, nature, and characteristics of studies focused on the interface of OH and GH concepts, described in the existing literature related to OH.

2. Methods

A scoping review was conducted following the Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR) [12] and the guidelines of the Joanna Briggs Institute (JBI) [13] to map the volume, nature, and characteristics of the existing studies focused on the interface of the OH and GH concepts.

The review included the following four key phases: (1) identifying the research question, (2) study selection, (3) charting the data, and (4) collating, summarizing, and reporting the results. The optional 'consultation exercise' of the framework was not conducted. The protocol of this review was registered in the OSF platform (<https://osf.io/zmw5d/>).

2.1. Research question

According to JBI guidelines, a scoping review research question should cover the population, the concept and the context (PCC) [13]. The problem of the study was the characterization of scientific publications that interconnect OH and GH concepts. The concept included the definition for each concept, quantity of publications relating both concepts, themes and areas of application, policies related to both concepts and regions which implemented or studied it. The context was based on the existing literature related to OH. Therefore, the main review research question was "How are GH and OH concepts related based on what is observed in the available OH literature?". In addition, as secondary guiding questions were developed: "How do the available literature describe the OH and GH concepts?", "Are there discrepancies in the OH and GH concepts presented in the available literature?", "What are the themes addressed in the literature related to both concepts?", and "What are the main countries where OH and GH studies were conducted?"

2.2. Search strategy and eligibility criteria

We used PubMed (MEDLINE), Embase, Scopus, and The Virtual Health Library (BVS) as the literature data sources for the review. The search strategy used the descriptors "one health", "one health concept", "one medicine", "global health", "international health", and "planetary health" in title and abstracts. The databases were selected to be comprehensive and to cover a broad range of disciplines. No limits were placed on the database search. Search was updated on January 7, 2022, to include articles published up to December 31, 2021. After searching the databases, the files generated were exported to the online reference management software Zotero 5.0, used to remove duplicates.

The inclusion criteria for the review were: original research presented as articles in scientific journals, book chapters or conference papers written in English, Spanish, or Portuguese, exploring the intersections between OH and GH concepts, not necessarily as their primary objectives, that included the selected search descriptors before mentioned. No filters related to specific populations were used. Editorials, lecture playbacks, opinions and review articles were excluded. Publications not exploring the interface between OH and GH were also excluded.

2.3. Selection, data charting and analysis processes

Selection processes were performed using a two-step screening strategy independently by two reviewers, with discrepancies solved by a third senior reviewer, using forms created in EpiData version 4.6.0.6. First, reviewers screened titles and abstracts; second, they assessed full-text studies.

Data from the selected publications were extracted into EpiData form created for the study, encompassing sections related to bibliographic data (year of publication, country of the first author); studies' characteristics, objectives, and methods; description of GH and OH concepts and how they were articulated; themes and areas of application, and funding. These data were described using frequency tables and graphs using R version 4.0.0 [14].

3. Results

3.1. Search and selection of included publications

A total of 1.060 references were identified in the databases after removing duplicates. Nine hundred twenty-one did not meet the inclusion criteria after titles and abstracts screening and 139 full-text publications were assessed by the review eligibility criteria. After data characterization of the full-text articles, 45 publications were included for analysis (Fig. 1).

3.2. General characteristics of included publications

The bibliographic information, objectives, and country or regions approached in the included publications are reported in Table 1.

The frequencies of the study characteristics are summarized in Table 2. All included publications were published between 2011 and 2021, with the highest concentration in 2014 (22.2%). Original journal articles (91.1%) comprised the majority of publications included in the review. Concerning first authors' country of affiliation, they were settled most frequently in the United States (35,6%) and the United Kingdom (15.6%). For the study region of interest, most had a global perspective (64.4%).

Theoretical studies comprised two-thirds (60.0%) of the total of the publications included for analysis and 60.0% of the publications declared not having received funds for the studies. For main themes/areas of application, 37.0% focused on zoonoses.

3.3. Studies themes/areas of application

Overall, seven key themes were identified regarding the OH-GH interface (Fig. 2): zoonosis ($n = 27$), emerging infectious diseases ($n = 24$), antimicrobial resistance ($n = 15$), food security/safety ($n = 7$), policy ($n = 6$), human resources (HR) training ($n = 5$), and sustainable development goals (SDGs) ($n = 1$).

3.4. One Health definitions and relation with Global Health

Most included publications employed OH concepts based on the United States Centre for Disease Control and Prevention (CDC) and the American Veterinary Medical Association (AMVA) definitions [12,60].

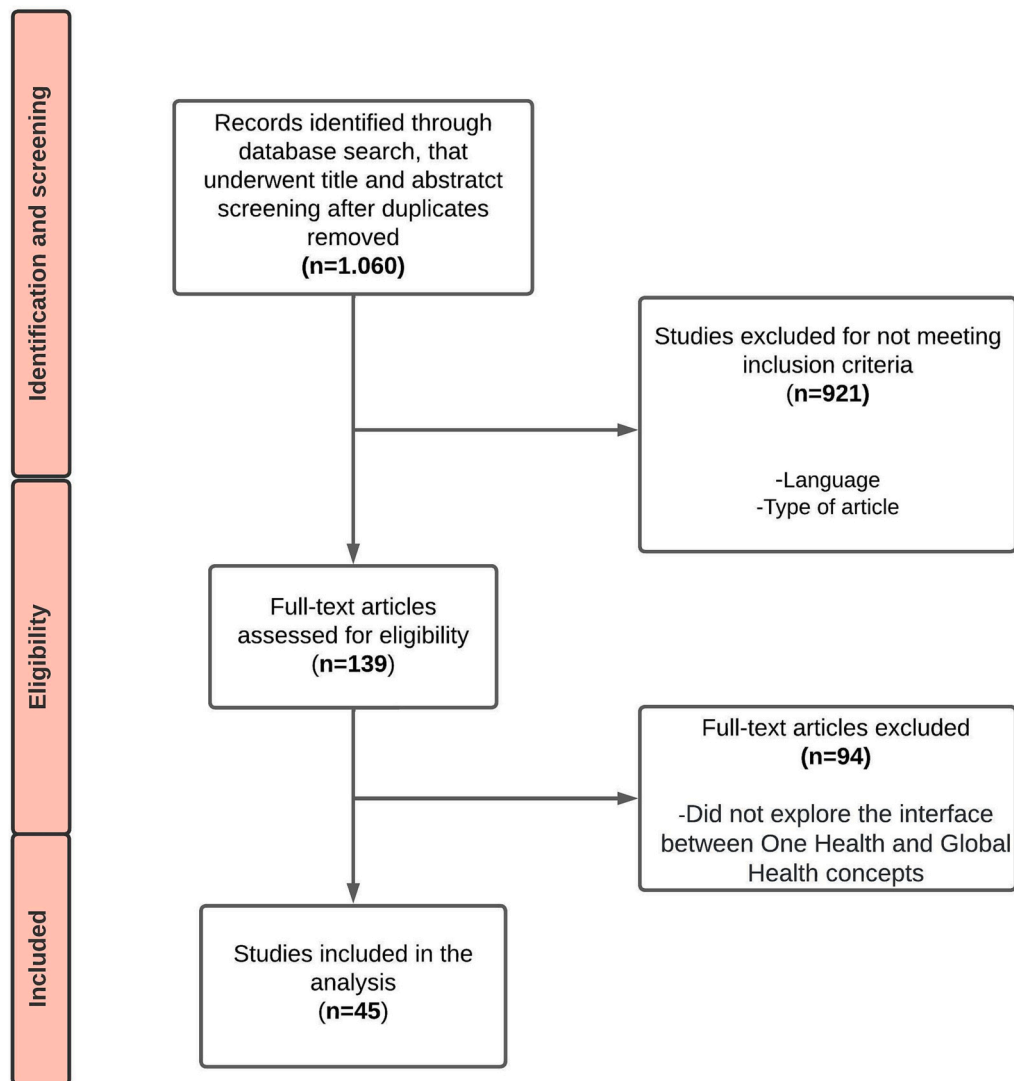


Fig. 1. Study selection flowchart.

Only one publication did not explicitly state the concept of OH [41]. We observed a common understanding of the OH concept as an area of knowledge involving multiple disciplines and professionals and recognizing that both humans' and animals' health and the environment are interdependent (Fig. 3).

Conversely, most publications did not explicitly specify a GH concept. Although most authors demonstrated that health issues transcend national boundaries, a formal definition for GH was frequently not clearly identified.

Concerning the articulation between OH and GH, we could identify three major interconnected conceptions:

- (1) OH and GH are distinct approaches in their underlying values and assumptions, but both share the notion of a multidisciplinary collaborative effort working locally, nationally and globally to attain optimal health for people, animals, and the environment.
- (2) OH as an essential tool to prevent or respond to GH threats, such as emerging and reemerging infectious diseases, bioterrorism, antimicrobial resistance, food insecurity and emergency responses to health crises, conflicts and natural disasters.
- (3) OH and GH as interconnected approaches supporting the need for intersectoral coordination and collaboration to maximize synergies for ensuring a better and stronger GH governance.

4. Discussion

Our findings showed a concentration of publications related to OH and GH after 2014, primarily focused on zoonoses, emerging infectious diseases, and antimicrobial resistance as the main areas of application. Progressively, since 2016, there was a relative increase in reports on other themes, such as health policy, food security, and health training. Those themes are linked to publications with a more global perspective, focusing on the challenges and strategies for improving cooperation between countries. OH is considered a key component of the GH security agenda, particularly concerning the detection and prevention of new diseases and zoonosis of pandemic potential [61].

Since 2017, an increase in publications focused on OH training strategies was also observed [37,43,47,55,58]. The training types and sponsors referred varied from institutional organizations to workshops, including multiple stakeholders, aiming at strengthening the content of training activities related to both OH and GH.

One publication highlighted the focus on animal health itself as a pillar for the World Health Organization to achieve success in the sustainability of OH initiatives [22]. This publication reinforces that managing major GH risks, from disease control to global warming, is not possible alone and needs the full cooperation of the animal, human, and environmental health sectors.

Table 1
Bibliographic information, objectives, and country or regions approached in the included publications for this review.

Title	Journal/Book publisher	Study objective	Study Countries/Region
1 From “one medicine” to “one health” and systemic approaches to health and well-being [15]	Preventive Veterinary Medicine	Recall the history of integrative thinking on human and animal health; review “one medicine” and “ecosystem approaches to health” in the conceptual landscape of comparable and neighboring approaches and explore avenues of systemic approaches to the health of animals and humans and their potential to address the challenges ahead. Review the infectious diseases affecting the respiratory tract with pandemic potential and discuss economic, political, and scientific measures required to minimize the risk of global spread and lessons from non-respiratory emerging infectious diseases that might inform planning for respiratory pandemic events. Discuss some of the recent successes and challenges with both Emerging and Neglected zoonoses in the sub-Saharan Africa context.	Global
2 Emerging infectious diseases and pandemic potential: status quo and reducing risk of global spread [16]	Lancet Infectious Diseases	Present three dimensions of intervention and interaction, each of which connects to a One World-One Health narrative. Present and weigh the objective merits of competing health priorities and identifies gaps in knowledge that	Global
3 One Health: Past Successes and Future Challenges in Three African Contexts [17]	PLOS Neglected Tropical Diseases		Nigeria, Tanzania, and Uganda
4 One World-One Health and neglected zoonotic disease: Elimination, emergence and emergency in Uganda [18]	Social Science & Medicine		Uganda
5 One Medicine One Science: a framework for exploring challenges at the intersection of animals, humans,	Annals of the New York Academy of Sciences		Global

Table 1 (continued)

Title	Journal/Book publisher	Study objective	Study Countries/Region
and the environment [19]		threaten health security, to promote discussion of major public policy implications such that they may be decided with at least an underlying platform of facts.	
6 Current initiatives in One Health: consolidating the One Health Global Network [20]	Revue Scientifique et Technique (International Office of Epizootics)	Review of one health initiatives.	Global
7 Making One Health a Reality — Crossing Bureaucratic Boundaries [21]	American Society for Microbiology	Identify actual cases of cross-sectoral working alliances that reached across bureaucratic boundaries to implement a One Health approach. Review the role and activities of the World Organization for Animal Health in strengthening the national Veterinary Services of its Member Countries for a more effective and sustainable One Health collaboration. Describe six international organizations, and ten national organizations that could well be involved in work with wildlife diseases and the One Health concept. Model the economic damages associated with increasing frequency of disease emergence. Describe a few initiatives and/or lessons learned from East Africa as experienced by the authors on the One Health approaches. Examine the emerging relationships between	Global
8 World Organization for Animal Health: strengthening Veterinary Services for effective One Health collaboration [22]	Revue Scientifique et Technique (International Office of Epizootics)		Global
9 The value of increasing the role of private individuals and organizations in One Health [23]	Revue Scientifique et Technique (International Office of Epizootics)		Global
10 Economic optimization of a global strategy to address the pandemic threat [24]	Proceedings of the National Academy of Sciences of the United States of America		Global
11 One Health: Lessons Learned from East Africa [25]	Book: One Health, People, Animals and the Environment		East Africa
12 Crossing institutional boundaries: mapping the	Health Policy and Planning		Uganda and Nigeria

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Table 1 (continued)

	Title	Journal/Book publisher	Study objective	Study Countries/Region
	policy process for improved control of endemic and neglected zoonoses in sub-Saharan Africa [26]		international One Health dialogue and its practical implementation in the African health policy context. Examine how epidemics achieve their global condition, hypothesizing that this global condition cannot be explained solely by the epidemiologic characteristics of the disease, such as mortality rate, propagation capacity, and mutation ability. Propose a type of analysis based on the Actor-Network Theory, and the concepts of operators and panorama, that would allow One World One Health to develop a broad and socio-technical way of understanding the dynamic of epidemics and their consequences. Show how the contingency of edibility complicates existing scientific models of travel that posit that singular objects spread peripherally outwards from a center into a globally connected, singular world.	
13	The global condition of epidemics: Panoramas in A (H1N1) influenza and their consequences for One World One Health programme [27]	Social Science & Medicine		Global
14	The world in a box? Food security, edible insects, and “One World, One Health” collaboration [28]	Social Science & Medicine		Global
15	An Integrated Systems Approach is Needed to Ensure the Sustainability of Antibiotic Effectiveness for Both Humans and Animals [29]	Journal of Law, Medicine & Ethics	Review of the global multisectoral coordination to antimicrobial resistance	Global
16	Periodic global One Health threats update [30]	One Health	Report on current major One Health threats and update on their epidemiological status.	Global
17	A One Health approach to antimicrobial resistance	International Journal of Antimicrobial Agents	This paper proposes a framework to promote a One	Global

Table 1 (continued)

	Title	Journal/Book publisher	Study objective	Study Countries/Region
	surveillance: Is there a business case for it? [31]		Health surveillance system for antimicrobial resistance. Report on the early experiences of a multisectoral Sino-Swedish research project that aims to address gaps in our current knowledge and seeks to improve the situation through system-wide interventions	
18	Building bridges to operationalize one health – A Sino-Swedish collaboration to tackle antibiotic resistance [32]	One Health	Report on an ethnographic case-study of policies on dog bites and rabies, with a focus on Calgary, Alberta, Canada, which is widely recognized as a leader in animal-control policies	China and Sweden
19	Dog-bites, rabies and One Health: Toward improved coordination in research, policy and practice [33]	Social Science & Medicine	In this paper the authors extend the health impact assessment approach to an integrated One Health impact assessment approach. Describe specific steps to prevent, detect, and respond to endemic zoonotic diseases and how to leverage them to detect and effectively respond to emerging and reemerging zoonotic health threats, and thereby enhance global health security. Discuss three current examples of international legal instruments for emerging infectious diseases: the International Health Regulations, the Pandemic Influenza Preparedness Framework and the Global Action Plan on	Canada
20	Biological threats from a ‘One Health’ perspective [34]	Revue Scientifique et Technique (International Office of Epizootics)		Global
21	Zoonotic Disease Programs for Enhancing Global Health Security [35]	Emerging Infectious Diseases		Global
22	Law as a fixture between the One Health interfaces of emerging diseases [36]	Transactions of the Royal Society of Tropical Medicine and Hygiene		Global

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Table 1 (continued)

Title	Journal/Book publisher	Study objective	Study Countries/Region
23 Prioritizing Zoonoses for Global Health Capacity Building— Themes from One Health Zoonotic Disease Workshops in 7 Countries, 2014–2016 [37]	Emerging Infectious Diseases	Antimicrobial Resistance. Summarize overarching themes identified from seven One Health Zoonotic Disease Prioritization workshops, and highlight successes and lessons learned to best support additional countries in prioritizing zoonotic diseases by using this tool.	Thailand, Kenya, Ethiopia, Azerbaijan, Cameroon, South Africa, and the Democratic Republic of the Congo.
24 Understanding the Complexities of Food Safety Using a “One Health” Approach [38]	Microbiology Spectrum	Discuss the complexities related to food safety through the One Health approach. Summarize the results of the investigation of knowledge integration in governance, as a mechanism for multi-institutional learning to improve the governance and coordination of One Health implementation in the absence of hierarchical chains of command.	Global
25 Knowledge integration in One Health policy formulation, implementation and evaluation [39]	Bull World Health Organ	Discuss about the unique role of non-governmental organizations (NGOs) in driving an agenda to address the recurrent neglect of rabies in the modern world, as well as in the execution of the ‘One Health’ paradigm on the global, regional and national levels, Take a more exacting regional view of rabies prevention, control and elimination within a ‘One Health’ context, focusing upon the history and current status of rabies in different	Global
26 The role of non-governmental organizations in controlling rabies: the Global Alliance for Rabies Control, Partners for Rabies Prevention and the Blueprint for Rabies Prevention and Control [40]	Revue Scientifique et Technique (International Office of Epizootics)	Discuss about the unique role of non-governmental organizations (NGOs) in driving an agenda to address the recurrent neglect of rabies in the modern world, as well as in the execution of the ‘One Health’ paradigm on the global, regional and national levels, Take a more exacting regional view of rabies prevention, control and elimination within a ‘One Health’ context, focusing upon the history and current status of rabies in different	Global
27 Global rabies management: perspectives on regional strategies for prevention and control [41]	Revue Scientifique et Technique (International Office of Epizootics)	Discuss about the unique role of non-governmental organizations (NGOs) in driving an agenda to address the recurrent neglect of rabies in the modern world, as well as in the execution of the ‘One Health’ paradigm on the global, regional and national levels, Take a more exacting regional view of rabies prevention, control and elimination within a ‘One Health’ context, focusing upon the history and current status of rabies in different	Global

Table 1 (continued)

Title	Journal/Book publisher	Study objective	Study Countries/Region
28 The case for a paradigm shift: from global to planetary nursing [42]	Nursing Forum	regions and considering the future prospects for continued progress in public health, veterinary medicine and conservation biology at a global level. Propose a paradigm shift from “global nursing” toward “planetary nursing” to more effectively engage worldwide health initiatives, such as the United Nations 2030 Agenda for Sustainable Development. Describe the first ‘Global Flipped Classroom on One Health’ and its outputs with the aim of promoting this new global educative and research model based on Massive Open Online Courses and active problem-based learning.	Global
29 First ‘Global Flipped Classroom in One Health’: From MOOCs to research on real world challenges [43]	One Health	Analyze how stakeholder dynamics and approaches to operationalizing One Health have evolved further to recent political and financial support for One Health. Explore water-related exposure pathways as they relate to human, animal, and environmental health; explore the possibility of surveillance of water and wastewater systems as means of identification of endemic disease and potential outbreaks at a population level; and develop a framework with which to apply the One-Health methodology for early detection and management	Switzerland
30 Is the current surge in political and financial attention to One Health solidifying or splintering the movement? [44]	BMJ Global Health	Analyze how stakeholder dynamics and approaches to operationalizing One Health have evolved further to recent political and financial support for One Health. Explore water-related exposure pathways as they relate to human, animal, and environmental health; explore the possibility of surveillance of water and wastewater systems as means of identification of endemic disease and potential outbreaks at a population level; and develop a framework with which to apply the One-Health methodology for early detection and management	Global
31 A water-focused one-health approach for early detection and prevention of viral outbreaks [45]	One Health	Analyze how stakeholder dynamics and approaches to operationalizing One Health have evolved further to recent political and financial support for One Health. Explore water-related exposure pathways as they relate to human, animal, and environmental health; explore the possibility of surveillance of water and wastewater systems as means of identification of endemic disease and potential outbreaks at a population level; and develop a framework with which to apply the One-Health methodology for early detection and management	Global

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Table 1 (continued)

Title	Journal/Book publisher	Study objective	Study Countries/Region
32 Implementation of the One Health approach to fight arbovirus infections in the Mediterranean and Black Sea Region: Assessing integrated surveillance in Serbia, Tunisia and Georgia [46]	Zoonoses and Public Health	of water-related viral outbreaks. Describe the implementation of a situation analysis study, carried out to contribute to the development of methods to assess One Health impact by Assess integration in surveillance of arbovirus infections in the Mediterranean Region. Address the gaps in the literature by highlighting two recently implemented systematic training programmes designed to support workforce development for professionals working in Veterinary Services and One Health.	Serbia, Tunisia and Georgia
33 Transforming the One Health workforce: lessons learned from initiatives in Africa, Asia and Latin America [47]	Revue Scientifique et Technique (International Office of Epizootics)	Describe One Health approaches in Thailand.	Africa, Asia and Latin America
34 Promoting the One Health concept: Thai Coordinating Unit for One Health [48]	Revue Scientifique et Technique (International Office of Epizootics)	Outline several approaches which, if applied to global health and environmental challenges, will maximize the opportunities to develop 'win-win-win' solutions. Introduce a novel toolkit, the One Health Systems Mapping and Analysis Resource Toolkit (OH-SMART), that adapts swim lane system mapping to One Health and combines it with other tools to form an operational, stepwise, and practical suite of tools.	Thailand
35 Integration of wildlife and environmental health into a One Health approach [49]	Revue Scientifique et Technique (International Office of Epizootics)	Review the ongoing commentary on the recognized benefits of the	Global
36 Strengthening multi-sectoral collaboration on critical health issues: One Health Systems Mapping and Analysis Resource Toolkit (OHSMART) for operationalizing One Health [50]	Plos One		Global
37 Importance of a One Health approach in advancing global health security	Revue Scientifique et Technique (International		Global

Table 1 (continued)

Title	Journal/Book publisher	Study objective	Study Countries/Region
and the Sustainable Development Goals [51]	Office of Epizootics)	implementation of a One Health approach in the global health security context, discuss challenges in measuring the impact of One Health, and propose possible solutions for evaluating the impact of One Health on global health security. Attempt to improve the awareness and understanding of	
38 Antimicrobial Resistance in One Health [52]	Springer	Antimicrobial Resistance as a threat to global health security, in the context of a One Health framework.	Global
39 Enhancing Preparedness for Arbovirus Infections with a One Health Approach: The Development and Implementation of Multisectoral Risk Assessment Exercises [53]	BioMed Research International	Describe the implementation of intersectoral priorities through multisectoral risk assessments of West Nile virus, Crimean–Congo hemorrhagic fever, and Rift Valley fever, in the framework of the MediLabSecure.	Albania, Algeria, Armenia, Bosnia and Herzegovina, Egypt, Georgia, Jordan, Kosovo, Lebanon, Libya, Moldova, Montenegro, Morocco, Palestine, Former Yugoslav Republic of Macedonia, Serbia, Tunisia, Turkey, and Ukraine
40 Antimicrobial Stewardship: Fighting Antimicrobial Resistance and Protecting Global Public Health [54]	Infection and drug resistance	Highlight Antimicrobial resistance scale and consequences, the importance, and implications of an antimicrobial stewardship program (ASP) to fight resistance and protect global health.	Global
41 IHR-PVS National Bridging Workshops, a tool to operationalize the collaboration between human and animal health while advancing sector-specific goals in countries [55]	PLoS One	Introduce NBWs as a novel diagnostic and planning tool by describing its development, detailing its method and material and by discussing the preliminary outputs obtained	Global

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Table 1 (continued)

Title	Journal/Book publisher	Study objective	Study Countries/Region
42	One Health	from NBWs conducted in 32 countries Describe the planning, implementation, and challenges of “Joint Initiative for Teaching and Learning on Global Health Challenges and One Health” as an example for other institutions aiming to develop international educational initiatives to promote the One Health approach to students and professionals. Quantify the relative contributions to the human Antibacterial resistance burden (% colonization with resistant bacteria) of human, animal, and environmental factors (including animal antibacterial use and transmission of Antibacterial resistance bacteria) within a One Health system in Thailand Identify the range of contributions, relevant skills and motivations for engaging in the response; characterize the extent of One Health collaboration and cooperation; and discover existing and developed insights into preparedness and response to COVID-19 and future pandemics.	Brazil, Germany, Mozambique, and Kosovo
43	One Health	One Health drivers of antibacterial resistance: Quantifying the relative impacts of human, animal and environmental use and transmission [57]	Thailand
44	One Health	Global health security must embrace a One Health approach: Contributions and experiences of veterinarians during the COVID-19 response in Australia [58]	Australia
45	One Health	The one health landscape in Sub-Saharan African countries [59]	Sub-Saharan African

Only one study related OH and GH concepts and the 2030 Agenda SDGs [51]. In this paper, the author reflects on the relationship between OH and GH by pointing out that the OH approach is a key component to providing data and generating indicators for GH security in terms of

Table 2

Frequency of the study characteristics included in the review.

Study characteristics	N	%
First Author Country		
United States of America	16	35.6
United Kingdom	7	15.6
Switzerland	5	11.1
Italy	2	4.4
Sweden	2	4.4
The Netherlands	2	4.4
Belgium	1	2.2
Canada	1	2.2
France	1	2.2
Singapore	1	2.2
South Africa	1	2.2
Spain	1	2.2
Thailand	1	2.2
Australia	1	2.2
Brazil	1	2.2
Tanzania	1	2.2
Barbados	1	2.2
Year of Publication		
2011	1	2.2
2012	0	0
2013	0	0
2014	10	22.2
2015	5	11.1
2016	2	4.4
2017	5	11.1
2018	7	15.6
2019	7	15.6
2020	3	6.7
2021	5	11.1
Study Type		
Original Article	41	91.1
Book Chapters	2	4.4
Others	2	4.4
Study Region		
Global	29	64.4
Africa	10	22.2
Asia	6	13.3
Europa	5	11.1
Latin America	2	4.4
North America	1	2.2
Oceania	1	2.2
Study methodological approach		
Theoretical	27	60.0
Qualitative	11	24.4
Quantitative	2	4.4
Others	5	11.1
Theme/area of application*		
Zoonoses	27	60.0
Emerging and re-emerging Diseases	24	53.3
Antimicrobial Resistance	15	33.3
Food Security / Safety	7	15.6
Policy	6	13.3
Human resources	5	11.1
Sustainable Development Goals	1	2.2
Funding		
No	27	60.0
Yes	18	40.0

* Studies may be pertinent to more than one category (percentages are over the total number of studies and may sum over 100%)

surveillance and decision-making, which are necessary for achieving the SDGs. Consistently with the other analyzed papers, the author emphasizes the synergies and plural aspects of the OH and GH approaches for promoting policies along different disciplines and allocating resources in an equitable way.

Indeed, to achieve SDG #3 (Good health and well-being), it is necessary direct and indirect interconnections with the other goals [62]. In addition, OH and GH are considered essential strategies for accomplishing the SDGs [63,64]. OH and GH are intrinsically related to many SDGs, particularly SDGs #2 (Zero hunger), #3 (Good health and well-being), #6 (Clean water and sanitation), #10 (Reduced inequalities),

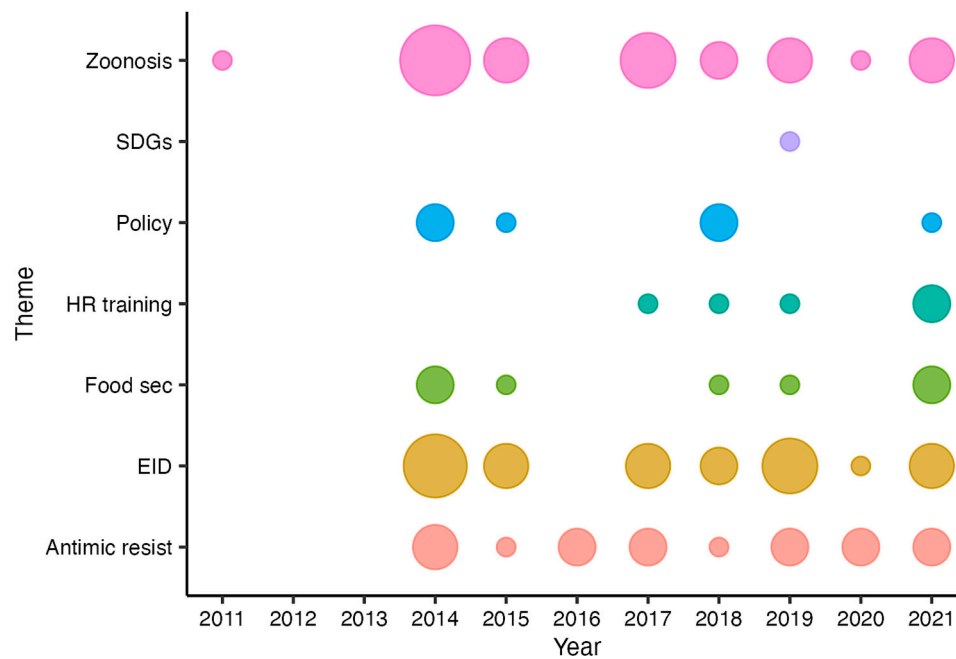


Fig. 2. Themes/areas of application of the studies according to publication years. EID- Emerging infectious diseases. SDGs-Sustainable development goals. HR training-Human resources training. Food sec-Food security/safety. Antimic resist-Antimicrobial resistance.

#11 (Sustainable cities and communities), #13 (Climate action), #14 (Life below water), and #15 (Life on land) [64,65]. However, none of the SDGs, not even SDG #3, explicitly consider the relation of the health of animals and the environment to the human health, although OH approaches have been advocated as essential for ending neglected tropical diseases and achieving the SDGs [66]. Attaining the SDGs would benefit from strengthening the interconnections between OH and GH and depend on implementing OH approaches for improving GH [64].

This scoping review focused on the interface between the fields of GH and OH. Surprisingly, although most studies analyzed make some interconnections between the two approaches, highlighting the importance of both to achieve a better world health, few explored their conceptual and theoretical distinctions and similarities. In most studies analyzed, OH is conceived as an approach to improve GH. Efforts to better define such fields might be important both scientifically and operationally in order to take advantage of the specific contributions arising from distinct fields of knowledge and practices and to foster their complementarities.

This scoping review has limitations. To start, we focused on the interface between OH and GH; therefore, theoretical and applied studies of relevance for understanding the characteristics of each field might not have been included since some of them could not be interested in exploring the bridges between OH and GH. Therefore, our study should not be considered a source of studies in each specific area but only for those who tried to establish a dialogue between OH and GH. Likewise, other related approaches such as Ecohealth and One World One Health were not directly approached and are certainly underrepresented in our study. Scoping reviews are characteristically studies willing to explore broad questions; therefore, specific questions, such as “In which extent practical experiences of OH have improved the health of communities?” should be explored using other strategies, such as systematic reviews. Restricting the scoping review to papers written in English, Spanish, or Portuguese, might have excluded important contributions written in other languages, such as Mandarin Chinese, Arabic, Hindi, Russian, and French, commonly spoken in many Asian and African countries. Our review also has some strengths. Using a scoping review following standard frameworks for approaching open questions, such as “How the OH and GH concepts have been connected in the literature?” is useful and

recommended for providing the “big picture” of a field and might offer a knowledge basis for fostering studies focusing on more specific questions derived from this more general approach.

This review demonstrated the connections between OH and GH in the existing literature, mostly in the recent years and converging on issues already considered priorities in the GH agenda. The increase in publications associated with these themes and the presence of reports of trainings activities that aim strengthening the content of OH and GH concepts, reveals how health issues require multidisciplinary approaches. The research and practice of GH and OH should go hand in hand with the socioeconomic development of all nations, requiring coordinated efforts from multiple sectors in which health becomes a central issue. Researchers and policymakers should consider the OH approach as a strategy that contributes to advance practices related to the GH agenda in a global and local levels.

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