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Mixed-method analysis of published national One Health strategic plans

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Declaration of independence

I hereby declare that

no resources and literature other than those mentioned were included,

the decisive work was carried out by myself and that all contributors to the work have been named,

the thesis submitted for assessment was written independently, and

the thesis has not been submitted or published elsewhere.

Abstract

While some countries have formulated national One Health (OH) strategic plans, there is a lack of comprehensive overview of their content and no analysis of their potential overlaps or differences. This study aimed to assess the alignment of existing national OH strategic plans with the definitions of One Health provided by the One Health High-Level Expert Panel (OHHLEP) and the Berlin Principles.

We conducted a comprehensive search to retrieve existing, publicly available, national OH strategic plans. This involved utilizing relevant keywords in database searches, exploring dedicated websites, and directly contacting governments. Eight national OH strategic plans developed by seven African and one Asian countries met the criteria for inclusion and were analyzed through a mixed-method approach consisting of a qualitative content analysis and a quantitative text analysis.

Our results showed that the basic concept of OH, i. e., the interconnections between the health of humans, animals, and the environment as well as the need for collaboration between diverse sectors, disciplines, and public and private institutions, is recognized in the plans. The acknowledgment and consideration of environment health varied across the individual strategic documents. We also observed that certain OH socio-ecological values, such as animal welfare as well as equity and parity, were overlooked in the strategic plans, with limited recognition of Traditional Knowledge Systems. The quantitative text analysis identified a common semantic and similar pattern in unigram frequencies across the eight documents. However, examination of the 50 most common bigrams revealed great variations in word associations between plans. A more detailed investigation of the subgraphs of terms related to the word "health" suggested varying perceptions of this concept among the different countries. Publicly available national OH strategic plans represent groundbreaking efforts, yet there is potential for improvement in institutionalizing OH. This includes integrating additional environmental and multicultural aspects, as well as novel social values such as resilience and solidarity. This work provides a comprehensive and reproducible assessment framework for analyzing documents describing OH strategies and intends to support future OH endeavors.

Zwar haben einige Länder nationale One-Health (OH)-Strategiepläne formuliert, doch fehlt ein umfassender Überblick über deren Inhalt und eine Analyse ihrer potenziellen Überschneidungen oder Unterschiede. Ziel dieser Studie war es, die Übereinstimmung der bestehenden nationalen OH-Strategiepläne mit den OH Definitionen des One Health High-Level Expert Panel (OHHLEP) und der Berliner Prinzipien zu bewerten.

Wir führten eine umfassende Suche nach bestehenden, öffentlich zugänglichen, nationalen OH-Strategieplänen durch. Dies beinhaltete die Verwendung relevanter Schlüsselwörter bei der Suche in Datenbanken, die Erkundung spezieller Websites und die direkte Kontaktaufnahme mit Regierungen. Acht nationale OH-Strategiepläne, die von sieben afrikanischen und einem asiatischen Land entwickelt wurden, erfüllten die Aufnahmekriterien und wurden mit Hilfe eines methodenübergreifenden Ansatzes, bestehend aus einer qualitativen Inhaltsanalyse und einer quantitativen Textanalyse, analysiert.

Unsere Ergebnisse zeigten, dass das Grundkonzept von OH, d. h. die Zusammenhänge zwischen der Gesundheit von Menschen, Tieren und der Umwelt sowie die Notwendigkeit der Zusammenarbeit zwischen verschiedenen Sektoren, Disziplinen sowie öffentlichen und privaten Einrichtungen, in den Plänen anerkannt wird. Die Anerkennung und Berücksichtigung der Umweltgesundheit variierte in den einzelnen strategischen Dokumenten. Wir stellten auch fest, dass bestimmte sozio-ökologische OH-Werte wie Tierschutz, Gleichberechtigung und Parität in den strategischen Plänen nicht berücksichtigt wurden und traditionelle Wissenssysteme nur in begrenztem Maße anerkannt wurden. Die quantitative Textanalyse ergab ein gemeinsames semantisches und ähnliches Muster in den Unigramm-Häufigkeiten der acht Dokumente. Die Untersuchung der 50 häufigsten Bigramme ergab jedoch große Unterschiede in den Wortassoziationen zwischen den Plänen. Eine detailliertere Untersuchung der Subgraphen von Begriffen, die mit dem Wort "Gesundheit" zusammenhängen, deutete auf unterschiedliche Auffassungen dieses Konzepts in den verschiedenen Ländern hin.

Die öffentlich zugänglichen nationalen OH-Strategiepläne stellen bahnbrechende Bemühungen dar, dennoch gibt es Verbesserungspotenzial für die Institutionalisierung von OH. Dazu gehört die Einbeziehung zusätzlicher ökologischer und multikultureller Aspekte sowie neuer sozialer Werte wie Resilienz und Solidarität. Diese Arbeit bietet einen umfassenden und reproduzierbaren Bewertungsrahmen für die Analyse von Dokumenten, die OH-Strategien beschreiben, und soll künftige OH-Bestrebungen unterstützen.

1 Table of Contents

List of Abbreviations

AMR	Antimicrobial resistance
COP15	UN Biodiversity Conference
COP27	27th World Climate Change Conference
DALYs	Disability-adjusted life years
FAO	Food and Agriculture Organization
NCDs	Non-communicable diseases
NGO	Non-governmental organisation
OH	One Health
OHHLEP	One Health High-Level Expert Panel
UN	United Nations
UNEP	United Nations Environment Programme
WCS	Wildlife Conservation Society
WHO	World Health Organization
WOAH	World Organisation for Animal Health

2 Introduction

The ongoing polycrisis characterized by climate change, biodiversity loss, deforestation, and global inequities (1) accentuates the risk of infectious disease emergence at human-animal-environment interfaces while driving and exacerbating non-communicable diseases (NCDs). Socio-economic factors play a foundational role in influencing health (2) . National and global inequalities and inequities impact access to healthcare, benefit sharing, education, capacity building, as well as political empowerment and participation. Effectively addressing these multiple drivers of disease emergence is crucial for mitigating health risks at animal-human-environment interfaces (3) .

The key focus of the One Health (OH) concept in the 21st century is on ecological processes and environmental factors as crucial determinants of human and animal health. A pivotal point in this process was the *One World, One Health Symposium* organized by the Wildlife Conservation Society (WCS) in 2004. This symposium focused on cross-species transmission of infectious diseases at the nexus human-livestock-wildlife. This event emphasized that achieving sustainable health for humans, animals, and the environment requires breaking down barriers between individuals, agencies, and sectors. The meeting also resulted in the publication of the *Manhattan Principles*, the first uniform set of OH guidelines for the broader public (4,5). On 25th October 2019, the WCS and the Department for Climate and Environmental Foreign Policy at the German Foreign Office convened the *One Planet, One Health, One Future* conference to revisit and adapt the *Manhattan Principles*. The *Berlin Principles,* which emerged from this meeting, integrated the climate crisis, equity, and a stronger focus on capacity building (6).

One Health has been recently defined by the Quadripartite One Health High-Level Expert Panel (OHHLEP) as *"an integrated, unifying approach that fosters the health and well-being of people, animals, and their shared ecosystems by emphasizing their interconnectedness. It mobilizes multiple sectors and disciplines to provide healthy food, water and energy, address climate change, and contribute to sustainable development."*(7). A OH approach builds on transdisciplinary and cross-sectoral collaborations at local, national, and international scale (8). Global leaders, national and regional governments, multilateral organizations, and civil society widely recognize that an intact and functioning socio-ecological system is critical for optimal health (9) while health, enshrined as a fundamental right of every human being, is increasingly recognized as a global good and societal asset (10) Greater cooperation and tangible actions are urgently required to fully realize a whole-of-society approach to health, to

address the threat of future pandemics, and to protect the environment for the benefit of all individuals(11).

Multilateral organizations have already undertaken multiple initiatives to operationalize OH and strengthen the governance for pandemic prevention, preparedness, and response (1,12). Significantly, in March 2022, the inclusion of the United Nations Environment Programme (UNEP) into the established Tripartite partnership for OH, which included the Food and Agriculture Organization (FAO) of the United Nations (UN), the World Organisation for Animal Health (WOAH), and the World Health Organization (WHO), expanded the partnership into the "Quadripartite" and formalized the environment as a strong actor of OH (13). The *One Health Joint Plan of Action 2022-2026* launched by the Quadripartite in October 2022 (14) provides a framework for the integration of OH systems and capacities, focusing primarily on six pillars: One Health capacity for health systems; emerging and re-emerging zoonotic epidemics/pandemics; endemic zoonoses, neglected tropical and vector-borne diseases; food safety risks; antimicrobial resistance and environment (14). It also provides policy, legislative, and technical guidance in setting national and international targets and priorities across sectors for the development and implementation of OH regulations, initiatives, and programs (14). More recently, in February 2023 the OHHLEP took an important step towards pandemic prevention by issuing a whitepaper defining effective and efficient mechanisms for primary prevention (or prevention at source) that aims to prevent pathogen spillover, specifically and actively identifying and addressing their drivers (15).

Similarly, recent key events have highlighted the significance of OH. In May 2022, the G7 countries made a joint statement recognizing the importance of disease surveillance and their support for OH (16). One Health was also addressed at the 27th World Climate Change Conference (COP27), in November 2022, with discussions including a call to increase the understanding of environmental issues in the OH community by better integrating environmental priorities and data into OH decision-making and actions in the future (17). In December 2022, the UN Biodiversity Conference (COP15), integrated OH into the conference exchanges, with the objective of building a strong OH community of practice that supports and advances the goals of the post-2020 Global Biodiversity Framework, as well as biodiversity-inclusive OH efforts (18).

Strengthening public health systems at the human-animal-environment interfaces and implementing a OH approach yields positive economic impact (19). Recent zoonotic-origin epidemics and pandemics including those caused by SARS, H1N1, or Ebola virus have incurred a substantial of US$ tens-of-billions, with the COVID-19 pandemic alone estimated to

have reached at least US$ 15 trillion (20). In contrast, the estimated cost of prevention is estimated at < 2% of the cost of the COVID-19 pandemic (20). By targeting the drivers of disease emergence and focusing on prevention within the Prevention-Preparedness-Response triad significantly reduces the morbidity, mortality, and economic costs of disease outbreaks (19). Simultaneously, enhanced collaboration and communication minimizes redundant spending across sectors (19).

While OH is acknowledged by international institutions and numerous governments, its institutionalization and operationalization pose intricate complexities. Specifically, integrating OH into governmental structures and legislative texts, along with securing national commitment to trans- or multi-disciplinary and cross-sectoral collaboration, represents significant challenges (21). The objective of this study was to assess to which extent the existing national OH strategic plans address the different aspects of the most up-to-date and recognized definitions of OH (6,7) and to characterize similarities and differences in the content of these strategic plans to support future harmonization of OH implementation. Additionally, we provide a reproducible framework for stakeholders, policy- and decision-makers, to effectively evaluate national OH strategies and support the development of similar future strategic initiatives.

3 Materials and Methods

3.1 Literature search

To retrieve publicly available national OH strategic plans we conducted a systematic online search between August 2022 and February 2023 and queried nine different search engines: Ecosia (22), Google Search (23) and Google Scholar (24), FAOLEX, One Health Outlook (25), Vetmed Seeker (26), Science Direct (27), the One Health Journal (28), and Scopus (29). The following English search terms were used and combined with the Boolean operators AND and OR: “one health”, “strategic plan”, “strategic”, “plan”, “one health concept”, “one health strategic plan”, “one health plan”. The search was additionally conducted across all search engines in German, Spanish, French, Dutch, Portuguese, Russian (using DeepL (30)), and Arabic languages (using Google Translate (31) as DeepL did not cover Arabic language). A workflow summarizing the search strategy is presented in Figure 1.

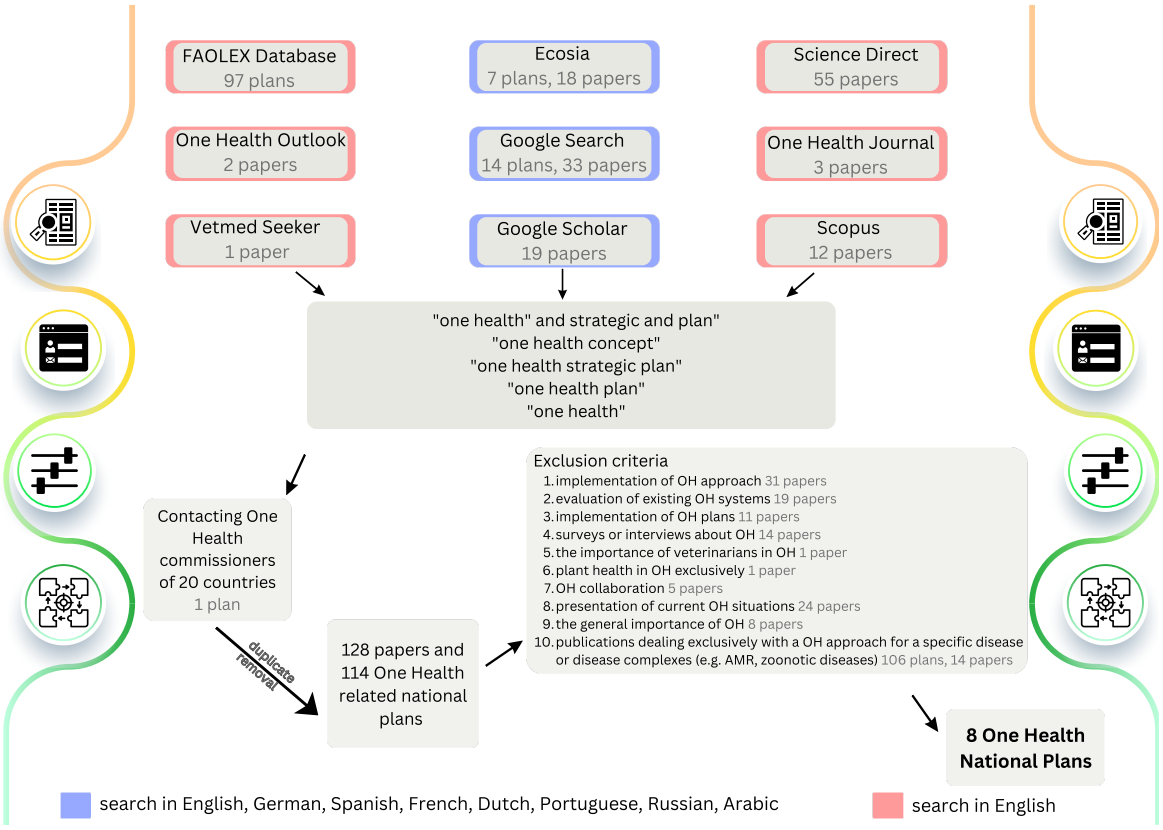

Fig. 1. Flow chart of the literature search, August 2022 – February 2023

Papers, documents, and publications were included if they mentioned the implementation of approaches, were policy documents in the form of national OH strategic plans or associated topics, such as antimicrobial resistance (AMR), health security, and zoonoses. We considered peer-reviewed papers and policy documents if they were authored by a government or governmental institutions. In addition to the online search, we used a “direct contact” strategy among OH commissioners from countries whose OH strategic plans could not be found online but which offered a OH-related website. This resulted in contacting the OH commissioners from 20 countries through the contact form of the national OH-related websites: Uzbekistan, France, Norway, Netherlands, Bhutan, Fiji, Germany, New Zealand, Italy, Bangladesh, Mongolia, Chile, Costa Rica, Uruguay, Bolivia, Suriname, Argentina, Romania, UK, and Canada. We received responses from France, Norway, the Netherlands, Bhutan, Fiji, Mongolia, and Canada.

The retrieved publications were then sorted in the research manager Mendeley and duplicates were removed. Publications were screened and we excluded those dealing with the implementation of OH approach, evaluation of existing OH systems, implementation of OH plans, surveys or interviews about OH, the importance of veterinarians in OH, plant health in OH exclusively, OH collaboration, presentation of current OH situations, or the general importance of OH. Publications dealing exclusively with a OH approach for a specific disease or disease complexes (e. g. AMR, zoonotic diseases) were also excluded. We included publications that met the following inclusion criteria: the document describes a national OH strategic plan for a country and is declared as such. Documents written in the eight languages used during the search were considered for inclusion. We eventually excluded all scientific papers, as none of them described national OH strategic plans.

3.2 Qualitative content analysis

To establish a unified understanding of the OH aspects of the national OH strategic plans, we first summarized the ten Berlin Principles (6) and the definition of OH, along with its key underlying principles, by the OHHLEP (7), into ten *overarching concepts.* To achieve this, we carefully read through the above-mentioned publications, looked for recurring themes, concepts, notions, and ideas that stood out in one or both documents and listed them. Related concepts were grouped following discussion and agreement among co-authors. We subsequently wrote a concise summary for each identified *overarching concept*, focusing on capturing the core meaning of each of them. Expert knowledge among co-authors ensured that these *overarching concepts* encapsulated the fundamental principles and definitions they aimed to represent.

In a second step, each identified *overarching concept* was deconstructed by CSW into *OH aspects* related to them. For each aspect, an exhaustive list of *keywords*, encompassing terms synonymous or term associated with the *OH aspect*, was compiled. The lists of *OH aspects* and *keywords* were then discussed and refined with CW and ADL. The final compilation of *keywords* was then utilized for a manual search within the national OH strategic plans to locate mentions of the targeted *OH aspects*. This involved reading each keyword within the context of the entire document. Furthermore, a clear distinction was made to determine whether the OH aspects were merely acknowledged ("recognized") or if the plans defined specific actions to be taken ("action taken"). The result of the search was compiled into a dedicated matrix, which columns represented the national OH strategic plans and rows represented the targeted *OH aspects*.

3.3 Quantitative textual analysis

3.3.1 Text cleaning, normalization, and tokenization

The national OH strategic plans were imported into R v.4.3.0. (32) and transformed into a corpus object. Text pre-processing involved converting all texts to lowercase, removing punctuation, numbers, common English stop words, and extra white spaces. The stop word list was customized by incorporating domain-specific terms that contained minimal informative value and were therefore filtered out prior to processing, e. g., terms related to the document's country of publication, document structure, or self-designation. Furthermore, some acronyms were spelt out in full (e.g., “one health” for “oh”, “one health secretariat” for “ohs”, and “ministry of health” for “moh”) and plural noun singularization was performed. Additionally, when identified, typological errors were rectified. Lastly, stemming was performed prior to the unigram analysis using the Porter’s stemming algorithm (33). This process reduces words to their root form to allow for grouping together variations of the same word (analysis of bigrams was performed without applying a stemming process). The cleaned corpus was then tokenized into unigrams or bigrams (two-word sequences) for further analysis.

3.3.2 Unigram and bigram token analysis

Unigrams and bigrams frequencies were computed using the term frequency weighting method in which the weights represent the frequency of the term in a specific document. Unigrams that appeared at least 100 times and bigrams that appeared at least 50 times across the eight national OH strategic plans, were filtered and visualized. N-gram frequency patterns were compared by calculating the Spearman correlation across different strategic plans.

3.3.3 Comparative analysis of terms associated to “health”

To describe and compare the conceptual concepts surrounding the term “health” across national OH strategic plans, we used graph theory (34) and investigated the structural relationships between the term “health” and other terms in each document. In this analysis, we used bigrams that appeared at least 10 times across the eight national OH strategic plans. First, for each national OH strategic plan, we built a directed weighted network of terms where each node represents an individual term, and each edge represents the association (relationship) between terms. Node weight represented the frequency of the individual term across all bigrams while edge weight represented the frequency with which related terms co-occur in the documents. The edge arrows represented the direction of the association (i. e., sequence) between the two terms of a bigrams (e. g., one → health correspond to the bigram “one health”, in this specific order). In a second step, we plotted a subset of each network graph by extracting the network component that comprised nodes accessible to each other through at least one path (34) including the node labelled as "health" (thereafter called health subgraphs)).

3.3.4 Software and packages

Analyses for this study were performed using the open-source software R v.4.3.0 (32). We used the pdftools package (35) for text extraction of PDF documents and the tm package (36) for text analysis: Network analysis and visualization were conducted using the igraph (37) and ggraph (38) packages, respectively.

4 Results

4.1 Selected publications

The search across nine databases retrieved a total of 262 publications, including 143 papers and 119 One Health related national plans. Duplicate removal resulted in 242 documents, including 128 papers and 114 plans. Inclusion criteria were met by eight national One Health strategic plans, of which seven were available on the One Health Commission website (39) and have been developed by seven African nations: Ethiopia, Liberia, Nigeria, Rwanda, Tanzania, Uganda, and Zambia (Table 1). The “direct contact” strategy enabled us to retrieve and subsequently include Bhutan's OH Strategic Plan Second Edition 2019 into this work. Included national OH strategic plans were published between 2014 (Rwanda) and 2022 (Zambia).

4.2 Qualitative content analysis

The ten overarching concepts identified through content analysis of the Berlin Principles and OH definition and key principles by the OHHLEP are summarized in Table 2. Sixty OH aspects were identified as describing best the multiple aspects embedded in these 10 concepts and 399 keywords related to them were subsequently searched through the texts.

Tab. 1. Eight analyzed national OH strategic plans including titled, authors and year of publication

National One Health strategic plan	**Author**	**Year of publication**
Bhutan One Health Strategic Plan, 2nd Edition 2018-2023	Ministry of Health (Department of Public Health), Ministry of Agriculture and Forests (Department of Livestock and Bhutan Agriculture and Food Regulatory Authority)	2019
Ethiopia National One Health Strategic Plan 2018-2022	Ministry of Agriculture and Livestock Resources, Ministry of Health, Ministry of Culture and Tourism, Ministry of Environment, Forest and Climate Change	2018
Liberia National One Health Strategic Plan, 2019-2023	Ministry of Health, Ministry of Agriculture, Forestry Development Authority, Environmental Protection Agency, Ministry of Commerce and Industry, National Disaster Management Agency, National Public Health Institute of Liberia	2018
Nigeria National One Health Strategic Plan, 2019-2023	Federal Ministry of Health, Federal Ministry of Agriculture and Rural Development, Federal Ministry of Environment	2019
Rwanda One Health Strategic Plan (2014-2018)	Ministry of Health, the Ministry of Agriculture and Animal husbandry, University of Rwanda, Rwanda Development Board	2014
The United Republic of Tanzania One Health Strategic Plan 2015 – 2020	United States Department of Defense (DoD), Defense Threat Reduction Agency (DTRA), Cooperative Threat Reduction (CTR), Cooperative Biological Engagement Program (CBEP)	2015
Uganda One Health Strategic Plan 2018-2022	Ministry of Health (MoH), Ministry of Agriculture Animal Industry and Fisheries (MAAIF), Uganda Wildlife Authority (UWA), Ministry of Water and Environment (MWE)	2018
Republic of Zambia One Health Strategic Plan 2022-2026	Ministry of Health, Ministry of Fisheries and Livestock, Ministry of Green Economy and Environment	2023

Tab. 2. Ten overarching concepts aiming at summarizing both the Berlin Principles and One Health definition and key principles developed by the OHHLEP (13,17), the 60 related One Health aspects that described the overarching concepts, and keywords used for manual search in the national One Health strategic plans.

Overarching concepts	**One Health aspects**	**Keywords**
1. Recognize and take action to further the critical links between the health of humans, wildlife, livestock, plants, fungi and their shared environment.	Health links: 1. Humans 2. Wildlife 3. Livestock 4. Plants 5. Fungi	Interlinked; interconnected; connected; linked; linkages; zoonosis; zoonotic; human; animal; wildlife; livestock; domestic; plant; fungi; connection, public health; interface; socio-economy; migration; relatedness.
	6. Environmental health	Environment; environmental health; ecosystem health; health of the environment; healthy environment; contamination; ecological health; environmentally friendly practices; environmental friendliness; flora; fauna; rehabilitation.
2. Equity across sectors and disciplines. Develop strong One Health institutions, infrastructure, and governance frameworks while investing and facilitating multi-, transdisciplinary research and cross-sectoral collaborations. Translate science to inform policies and communicate with civil society.	7. Equity across sectors and disciplines	Equity; partnership; shared responsibility; equitably; adequate; synergism.
	8. Development of One Health institutions, infrastructure and governance frameworks	Institutions; institutional; infrastructure; governance; institutional linkages; network; institutional framework; collaboration; committee; health services; working group; collaboration; platform; actors; structure; harmonization; unit; division.
	9. Multi- or transdisciplinarity	Multidisciplinary; multi-disciplinary; transdisciplinary; trans-disciplinary; across disciplines; ministry; cross-disciplinary; interoperable; multi-actors; connectivity; decentralized; interdisciplinary; veterinary; medicine; environment.
	10. Cross-sectorality	Cross-sectoral; cross-sectoral; across sectors; multi-sectoral; multisectoral; ministry; united; connectivity; tiers; decentralised; inter-ministerial; industry; nonprofit; NGO; government.
	11. Invest in One Health research	Research; collaborative research; joint research; publication; dissemination; innovation; development; proposal; united.

	12. Translate science	Translate; translation; science-to-policy; explain*; communication; communicating; guidelines; publication; dissemination; policy briefs; agenda; sensitization; disseminate; presentations; report; media; channel.
3. Recognize and take action on the climate crisis.	13. Climate crisis	Climate change; climate crisis; global warming; green economy; alternative energy; renewable energy; carbon; greenhouse gas emission.
4. Recognize the dynamic anthropogenic drivers of the global health crisis and the foundational importance of intact environments and respective ecosystem services.	14. Anthropogenic drivers	Human-mediated; anthropogenic; economy; driving; driver; drivers; forces; cultural influences; human activities; manmade; globalization; population growth; pollution; environmental degradation; deforestation; land-use changes.
	15. Intact environments	Intact environment; intact environments; preserve environment; preserved environments; intact habitat; intact habitats; function; conservation; protection; protected areas; restauration; biodiversity; biological diversity ; water; air; balanced.
	16. Ecosystem services	Ecosystem services; benefits; services; ecological goods and services; environmental services; nature's services; land resources; natural resources; biological resources.
	17. Dynamic.	Dynamic; dynamical; changing; change; shifting; “living document”.
	18. Uncertainty.	Uncertain; uncertainty; unpredictable.
5. Devise adaptive, holistic, and forward- looking approaches to the prevention, detection, monitoring, control, and response to emerging or resurging communicable and noncommunicable diseases.	19. Holistic.	Holistic; integrated; comprehensive; universal.
	20. Prevention.	Prevention; preventive; preventing; prevent; preparedness; early warning; quarantine; precaution; biosecurity.
	21. Detection.	Detection; detecting; detect; inspection; investigate; diagnose; identification; hotspots.
	22. Monitoring, surveillance.	Monitoring; surveillance; monitor; oversight.
	23. Control, mitigation, response, respond.	Control; mitigation; mitigate; response; respond; stopping; stop; reduce; reducing; reduction; eradication.

6. Recognize and integrate human behaviours and practices in One Health approaches. Develop solutions for present and future generations that draw on scientific as well as traditional knowledge while considering animal welfare.	24. Human behaviours and practices.	Behavior; behavior; tradition; culture; practice; social; socio; ethical; moral; values; behavior change.
	25. Social sciences.	Social science; social; socio; questionnaire; survey.
	26. Animal welfare.	Welfare; well-being.
	27. Present and future generations, multigenerational.	Generation; future; sustainable; sustainability; multigenerational; transmit; transmission; long-term; lifespan; continuity; lasting; commitment; resilient; impending; quality of life.
	28. Science.	Evidence-based; evidence-driven; data-driven; based on science; based on evidence; based on data; laboratory; diagnostic; technological; vaccine.
	29. Traditional knowledge.	Indigenous Knowledge; Traditional Ecological Knowledge (TEK); intergenerational knowledge; traditional medicine; healing practices; healer; spiritual.
7. Enhance capacity for cross-sectoral and transdisciplinary health surveillance and data information- sharing to improve coordination of responses across governments, NGOs, academia, public & private sectors.	30. Cross-sectoral & trans-disciplinary health surveillance.	Multidisciplinary; multi-disciplinary; transdisciplinary; trans-disciplinary; across disciplines; ministry; cross-disciplinary; interoperable; multi-actors; connectivity; decentralized; crosssectoral; cross-sectoral; across sectors; multi-sectoral; multisectoral; united; tiers; inter-ministerial; health surveillance; surveillance; disease surveillance.
	31. Data analysis.	Data analysis; analyzing data; interpreting data; edit data; statistics; process.
	32. Data and Information sharing mechanisms.	Data sharing; information sharing; sharing data; sharing information; network; networking; sharing; information exchange; information system; accessibility; coordination.
	33. FAIR data (findable, accessible, interoperable, and reusable).	FAIR data; accessibility; harmonize; centralized database; findability; accessibility; interoperability; reusability.
	Coordination: 34. governments, 35. multilaterals,	Government; multilaterals; multi-laterals; international; NGO; academia; high education; second school; university; non-governmental

	36. NGOs, 37. academia, 38. private sector.	organizations; public sector; non-state actors; partners; incorporate; levels; federal; civil society; agencies; private sector; parliament; internal; external; cross-border; stakeholders.
8. Recognise the importance of gender, socio-political, and multicultural parity and strengthen participatory, collaborative relationships across governments, multilaterals, NGOs, private sector and civil society including Indigenous Peoples and local communities as well as other marginalised voices to address the polycrisis of climate change, global health, and biodiversity loss.	39. Parity.	Equality; equivalence; equivalent; parity.
	40. Gender.	Gender; woman; empowerment.
	41. Indigenous People.	Indigenous people; native; rural.
	42. Local communities.	Communities; local; district; subnational level; regional; zonal; village.
	43. Other marginalized voices.	Marginalized; refugee; disability; vulnerable populations; ethnicity; neglected; nomadic; pastoral communities.
	Cooperation: 44. governments, 45. multilaterals, 46. NGOs, 47. private sector.	Government; multilaterals; multi-laterals; NGO; nongovernmental organizations; public sector; non-state actors; partners; incorporate; levels; federal; civil society; agencies; private sector; parliament; internal; external; cross-border; stakeholders.
9. Educate; build capacity and raise awareness among children, youth, and adults for global citizenship and planetary health utilising appropriate channels and facilities.	OH education & awareness: 48. general, 49. children, 50. youth, 51. adults, 52. communities, 53. students, universities, 54. policy.	Education educate; awareness; aware; youth; young people; children; communities; university; policy; students; school; behavior change; training; seminar; workshop; conference; sensitization; sensitize; curriculum; learning; understanding; knowledge; attitude; campaigns; skill; mainstreaming; academic; (social) media; teaching.
	55. Capacity bridging and building.	Capacity building; build capacity; capacities; human resources; supplies; equipment; mobilization; mobilize; manpower.
10. Develop, strengthen and influence policy to recognize that the health of all (including humans) ultimately depends on environmental integrity and a healthy planet.	56. Develop and influence policy.	Policymaking; policymaking; policy makers; decision-making; decision makers; policy framework; structure; policy environment; formulation; constitution.
	57. Develop and influence legislation.	Legislation; legislative; law; formulate; enforce; administrative; policy document; formulation.

	58. Multilateralism.	Multilateralism; multilateral; multi-lateral; international; governments; cross-border; neighboring country; partners.
	59. Develop and influence regulation.	Regulation; treaty; agreements; protocol; convention; accord; strategy; guidelines; standard operation procedure (SOP); standards; manual; instruction.
	60. Include One Health into policy.	Implementation; implement; One Health policy; incorporate; operationalization; integrate; policy document.

4.2.1 Addressing concept 1:

Recognize and take action to further the critical link between the health of humans, wildlife, livestock, plants, fungi, and their shared environment.

Overall, twenty-six out of 60 (43 %) OH aspects were both recognized and planned for implementation across the eight plans (Fig. 2). Notably, all plans recognized the links between human, livestock, and wildlife health, as well as the importance of environment health, and transformed this recognition into actions. However, the health of fungi was rarely mentioned in the plans while plant health was either unrecognized (Bhutan) or not included in planned actions (in four plans: Bhutan, Nigeria, Rwanda, and Tanzania).

4.2.2 Addressing concept 2:

Equity across sectors and disciplines. Develop strong One Health institutions, infrastructure, and governance frameworks while investing and facilitating multi-or transdisciplinary research and cross-sectoral collaborations. Translate science to inform policies and communicate with civil society.

All plans recognized and described steps for action towards the development of OH institutions, infrastructures, and governance framework. Similarly, multi- or transdisciplinary work, cross-sectoral approaches, as well as promotion of research and translation of science into policy were recognized in the eight documents and plans for implementation were described. However, if the aspect of equity across sectors and disciplines was addressed in seven plans, its implementation was only mentioned in four of them. Notably, Bhutan did not address the notion of equity in its plan. Nigeria, Tanzania, and Zambia list it in their values, but did not plan actions for its implementation.

4.2.3 Addressing concept 3:

Recognize and take action on the climate crisis.

The climate crisis is recognized uniformly by all plans. Surprisingly, only three plans (Ethiopia, Liberia, and Zambia) described actions to be implemented toward its realization.

4.2.4 Addressing concept 4:

Recognize the dynamic anthropogenic drivers to the global health crisis and the foundational importance of intact environments and respective ecosystem services.

Seven national OH strategic plans acknowledged the impacts of anthropogenic drivers on health, although only Liberia and Zambia planned to take appropriate actions to minimize them. The importance of intact environment was recognized in all plans, but only the Liberian, Rwandan, and Ugandan plan described actions. Ecosystem services was mentioned in four

national OH strategic plans (Liberia, Nigeria, Tanzania, and Zambia) while none of the document described planned actions. The dynamic nature of the root causes of the global health crisis was recognized in most national OH strategic plans however, no action were envisaged in all but one country (Nigeria). Similarly, the uncertainty related to the drivers of the global health crisis was poorly addressed across national OH strategic plans, with only two countries referring to it (Rwanda and Tanzania).

4.2.5 Addressing concept 5:

Devise adaptive, holistic, and forward- looking approaches to the prevention, detection, monitoring, control, and response to emerging or resurging communicable and noncommunicable diseases.

Prevention, detection, monitoring, and surveillance, as well as control, mitigation and response were recognized in all strategic plans and respective actions were planned. Similarly, the need for a holistic approach was recognized and included an actionable dimension across all strategic plans.

4.2.6 Addressing concept 6:

Recognize and integrate human behaviors and practices in One Health approaches. Develop solutions for present and future generations that draw on scientific as well as Traditional Knowledge Systems while considering animal welfare.

All plans recognized the need for science-based solutions and planned to act accordingly. In contrast, Traditional Knowledge Systems were recognized in three plans only, among which two planned actions. The consideration of present and future generations in the solutions proposed by the strategic plans was evident in all plans, although Ethiopia and Liberia did not describe any actions in this regard. Except for Tanzania, seven plans recognized and made use of social sciences to address One Health issues. While Tanzania recognized its benefits, it did not mention the use of social science in the plan. Animal welfare was not recognized as a OH aspect in any of the plans.

4.2.7 Addressing concept 7:

Enhance capacity for cross-sectoral and transdisciplinary health surveillance and data information- sharing to improve coordination of responses across governments, NGOs, academia, public and private sectors.

Cross-sectoral and multi-disciplinary health surveillance was uniformly recognized and actionable across all plans. Data analysis was recognized as beneficial in all national OH strategic plans, while Bhutan, Nigeria, Rwanda, and Uganda outlined actions to implement it.

Planned actions to implement data and information sharing mechanisms were recognized in the plans of all countries and all plans projected actions toward it. These actions mostly strived to improve the coordination between the involved stakeholders (government, multilaterals, NGOs, academia, private sector), with the government and private sector being included in the planning for action in all plans. The term “FAIR” data was not mentioned in any of the plans, but the accessibility component was addressed in those of Liberia and Rwanda, which also planned actions to its realization. The importance of multilateral coordination, coordination with the government, non-governmental organizations (NGOs), academia, and the private sector was generally acknowledged (six plans out of eight) with actions planned.

4.2.8 Addressing concept 8:

Recognize the importance of gender, socio-political, and multicultural parity and strengthening participatory, collaborative relationships across governments, multilaterals, NGOs, private sector and civil society including Indigenous Peoples and local communities as well as other marginalized voices to address the inter-related polycrisis of climate change, global health, biodiversity loss, and inequities.

The general notion of parity (e. g., gender, cultural, economic) was acknowledged as an important value in the Ethiopian (addressing gender equality, cultural sensitivity, and inclusion of disability) and Ugandan (addressing gender equality) strategic plans. Remarkably, it was not translated into action in any of the plans. Similarly, the consideration of gender in health issues and decisions was recognized in two plans only (Uganda and Ethiopia) while actions were planned in Uganda only. The importance of Indigenous People´s voices in addressing the polycrisis was recognized by Ethiopia, Nigeria, and Uganda, despite no action was planned. The value of marginalized people’s voice (e. g. refugees, disabled or other vulnerable people) in addressing the polycrisis was mentioned in all plans except Bhutan’s, but a practical action was only envisaged in the Ugandan plan. The importance of multilateral cooperation, cooperation with the government, NGOs, academia, and the private sector was generally acknowledged with actions planned for implementation.

4.2.9 Addressing concept 9:

Educate, build capacity and raise awareness among children, youth, and adults for global citizenship and planetary health utilizing appropriate channels and facilities.

Although all eight countries recognized and planned actions to improve general OH education and awareness, the plans inadequately documented which population segments were targeted. Interestingly, OH education rarely addressed specific age groups such as children, youth, or adults, except for the Ugandan plan, which explicitly mentioned these three age

segments. In contrast, OH education and awareness raising in communities, students, and in policy is clearly recognized with action planned in all national OH strategic plans but Uganda. Capacity bridging and building was consistently recognized, with actions planned across all national OH strategic plans.

4.2.10 Addressing concept 10:

Develop, strengthen, and influence policy to recognize that the health of all (including humans) ultimately depends on environmental integrity and a healthy planet.

The importance of including OH into policy was recognized and actions to achieve it were described in all plans. To accomplish this, all national OH strategic plans note the relevance and describe ways to influence policy, legislation, multilaterals, and regulations to ultimately recognize the importance of environmental integrity and a healthy planet. Except for Tanzania, who's plan does not describe corresponding actions to develop legislation.

Fig. 2. Heatmap summarizing the results of the qualitative content analysis of eight One Health national strategic plans. The y-axis represents the 60 One Health aspects summarizing the One Health aspects mentioned in the 10 key concepts (number on the right side of the matrix); the x-axis represents the countries and how each aspect is addressed in the plan (i. e. "recognized" or "action planned"). Value 0 means: not addresses; value 1: addressed.

4.3 Quantitative text analysis

The corpus counted 6,050 unique tokens appearing across the eight documents after the stop words were removed, with a sparsity reaching 71 %, meaning that almost three quarters of the terms only occurred in a few documents. Unigram frequency patterns were highly similar across national OH strategic plans (Spearman´s Rho comprised between 0.3 and 0.6, with p-values < 0.001). The unigrams “health” (n = 3,930 occurrences) and “one” (n = 2,509) were the most common across the eight national OH strategic plans. They were followed by the word stems “diseas” (n = 1292), “develop” (n = 804), “anim” (n = 725), “active” (n = 647), “zoonot” (n = 610), “human” (n = 594), “surveil” (n = 571), “sector” (n =567), “implement” (n = 535), “public” (n = 535), “respons” (n = 529), “research” (n =458), and “coordin” (n = 450) (Fig 3).

The bigrams "one health" (n = 2,298) exhibited the highest frequency across the eight national OH strategic plans, followed by "zoonotic disease" (n = 423) "public health" (n = 402), "animal health" (n = 223), “human animal” (n = 175), “health approach” (n = 172), “preparedness response” (n = 133), “health surveillance” (n = 124),“health threat” (n = 119), “infectious disease” (n = 114), “health activity” (n = 103), and “health secretariat” (n = 103) (Fig 4). The bigram patterns between the following pairs of national OH strategic plans were significantly similar: Ethiopia-Liberia, Liberia-Rwanda, Liberia-Bhutan, Rwanda-Bhutan, Rwanda-Tanzania, Rwanda-Nigeria, Bhutan-Tanzania, Bhutan-Nigeria, and Nigeria-Uganda (Spearman´s Rho between 0.45 and 0.6, with p-value $\leq$ 0.05). Other bigram pattern pairwise comparisons among all national OH strategic plans revealed poor correlation. The bigram network analysis focusing on the terms that were most related to the term “health” evidenced the relationship (direction and frequency) between them, enabling to grasp how each country thinks about health and translates it into its national OH strategic plan. Figure 5 illustrates the network graphs of the most common bigrams associated to health in the eight national OH strategic plans. The network analysis demonstrated that the terms “one” and “public” generally came before the term “health”. Similarly, “human” and “animal” appeared before “health” in all national OH strategic plans. The term environmental appeared before “health” in the national OH strategic plan of Liberia, Nigeria, and Zambia whereas the term “environment” appeared after it in the Ugandan national OH strategic plan. Notably, the term “water” appeared in relation to health solely in the Ugandan national OH strategic plan. The network graphs depicting the health-related bigrams in the Nigerian and Rwandan national OH strategic plans exhibited a similar shape, with two strong components: one related to the node “health” and a second one related to the node “disease”. The network graph depicting the health-related bigrams in the Rwandan

national OH strategic plan showed similarly two main components; however, additional to the health-centered component, the second one is related to the term “activity”, with terms that mostly referred to project management or implementation. Reference to terms related to implementation of OH was observed in the national OH strategic plans of Bhutan, Nigeria, and Uganda. The term “research” was associated to health in the national OH strategic plan of Zambia and Tanzania. Communication and training in the context of health were only mentioned by Tanzania.

Fig. 3: Frequency distribution of the top common 150 unigrams used in the eight national One Health strategic plans. Only unigrams that appeared at least 100 times across the eight national One Health strategic plans were considered in this analysis.

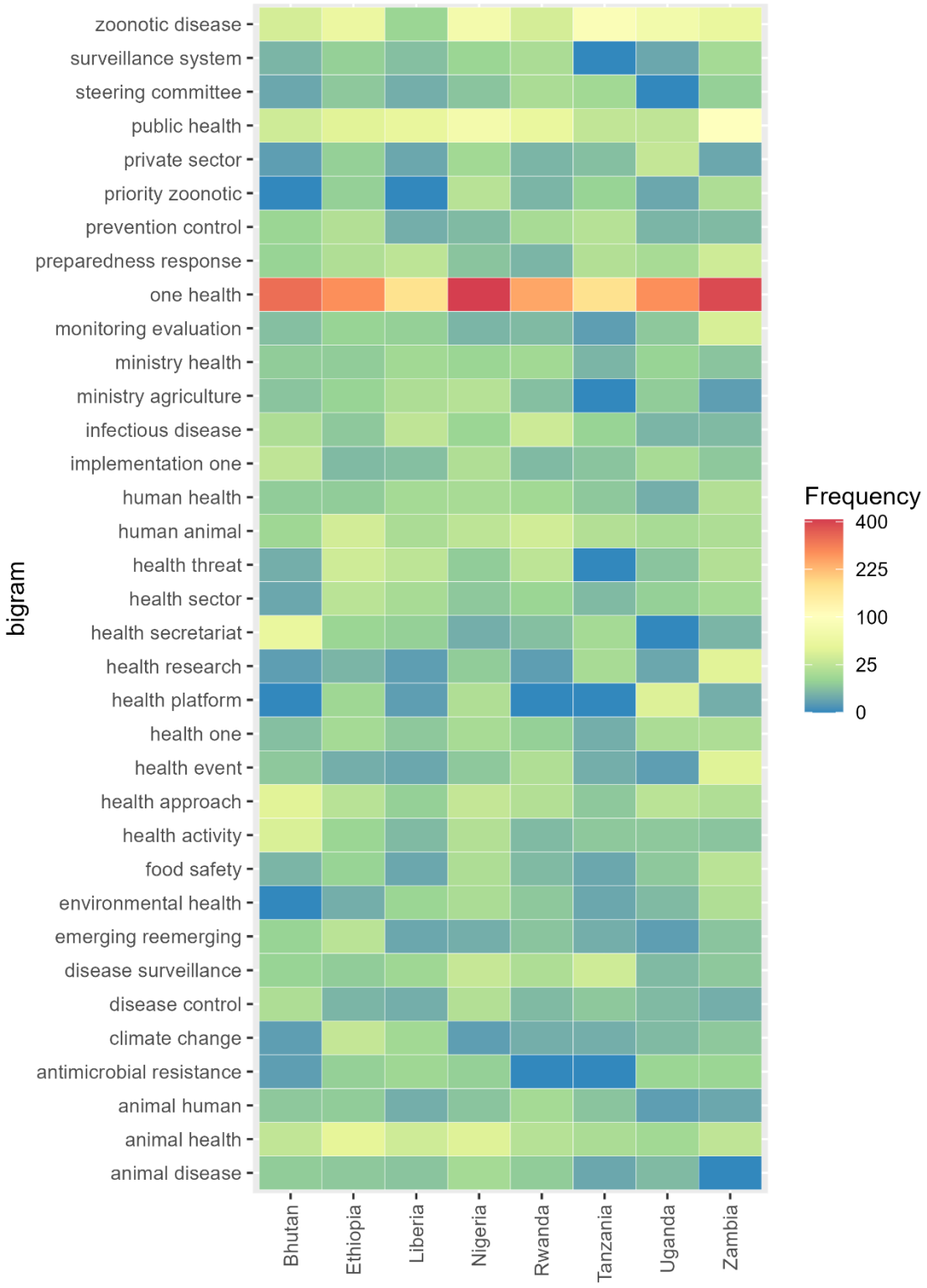

Fig. 4: Heatmap representing the bigram frequency in the national One Health strategic plans. Only bigrams that appeared at least 50 times across the eight nation One Health strategic plans were considered in this analysis.

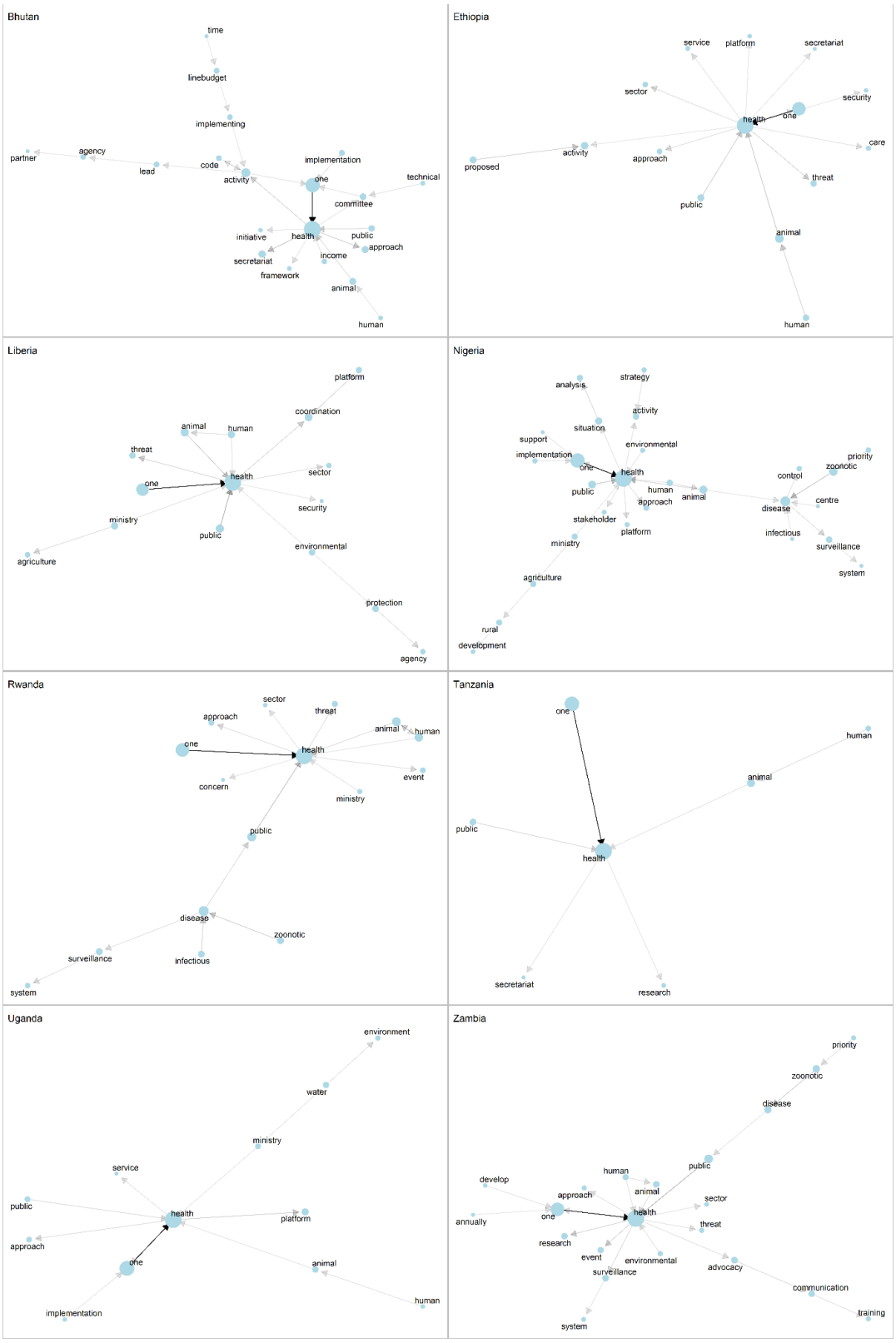

Fig. 5: Bigram network graphs of the terms related to "health" in the eight national One Health strategic plans. The size of the nodes represents the number of times the word appears in each national One Health strategic plan.

5 Discussion

The efforts of the countries developing national OH strategic plans must be acknowledged as pioneering work in this field. Our analysis is not intended as criticism; it rather aims to highlight possible gaps and provide suggestions for improvement in future plans, therefore serving both as guidance for the countries involved and as motivation and groundwork for countries still developing plans.

This study is the first to specifically analyze and compare national OH strategic plans using the latest definitions, i. e. those from the OHHLEP and the Berlin Principles (6,7). Previous efforts to evaluate the OH-ness of OH initiatives highlighted the challenges of creating an evaluation framework, emphasizing the necessity for mixed methods to generate comparable measures and benchmarks (40). In this study, we introduce a novel evaluation framework tailored to national OH strategic plans. This distinction is justified as national OH strategic plans refer to comprehensive, organized frameworks, developed by countries to address health issues at the human-animal-environment interfaces. In contrast, OH initiatives (40) encompass a range of collaborative efforts, projects, or activities aimed at achieving OH goals, even if they are not formally integrated into a strategic plan.

Surprisingly, only eight national OH strategic plans have been made publicly available. Seven of these plans are from Africa, with Bhutan representing the only Asian country. No national plans were found for Europe, Australia, or the Americas. This could be due to African countries' experience with zoonotic diseases, challenges with healthcare access and funding opportunities that support formulating national OH strategic plans. In low-income economies, zoonoses and emerging diseases of zoonotic origin count for 26 % of the disability-adjusted life years (DALYs) lost related to infectious diseases (41,42). Increasing rates of urbanization and deforestation have further exacerbated the occurrence of zoonotic outbreaks. Habitat destruction forces local wildlife to relocate, increasing human-wildlife and livestock-wildlife interactions, and therefore facilitating spillover events (42). Excessive resource extraction practices, such as mining and oil drilling, are mostly concentrated in the Global South, particularly in Africa, leading to drastic environmental changes and damages, most often at the expense of the well-being of the local population and financial benefit for the Global North (43,44). As a result, many African nations have adopted evidence-based frameworks within their governance structures accompanied by multilateral cooperations, such as the Africa One Health Network, to enhance resilience to zoonoses while coordinating activities to tackle zoonotic diseases (42,45). This commitment is evident in the high frequency of the bigram “zoonotic disease” across national strategic plans.

There is a growing interest in OH, evident in peer-reviewed publications, with 8,313 papers published between 2012 and 2021, primarily originating from higher-income countries (46). However, it appears that the number of national OH strategic plans lags behind the growing interest in the concept. Importantly, there exists a gap between countries contributing to publications on the topic, mostly from the Global North, and those actively developing comprehensive One Health strategic plans, which are predominantly from the Global South. It is interesting to note that all plans, except for Zambia's, were published before the onset of the COVID-19 pandemic in 2020.

Our database search yielded 70 hits on OH antimicrobial resistance (AMR) strategic action plans. Limiting OH to AMR only satisfies one of the six OH Joint Plan of Action Tracks (areas of action) for addressing critical health challenges at the human–animal–plant–environment interfaces, as defined by the Quadripartite (14). The exclusive emphasis on AMR highlights the stark contrast between a comprehensive One Health approach and those that focus on individual health aspects.

The analysis of content revealed that nearly half (43 %) of the OH aspects identified, as defined by two key papers outlining OH, were acknowledged and included in the plans for implementation across the eight national OH strategic plans. This strongly suggests a common core understanding of the OH concept across countries, alignment in proposed actions, and recognition of shared health threats (47,48). Overall, our analysis suggested that the most recognized and actionable overarching concepts (as evaluated through the keywords search) were the concept 1 *“Recognise and take action to further the critical links between the health of humans, wildlife, livestock, plants, fungi and their shared environment”*; the concept 2 *“Equity across sectors and disciplines. Develop strong One Health institutions, infrastructure, and governance frameworks while investing and facilitating multi-, transdisciplinary research and cross-sectoral collaborations. Translate science to inform policies and communicate with civil society”;* the concept 5 “*Devise adaptive, holistic, and forward- looking approaches to the prevention, detection, monitoring, control, and response to emerging or resurging communicable and noncommunicable diseases”* and the concept 10 “*Develop, strengthen, and influence policy to recognize that the health of all (including humans) ultimately depends on environmental integrity and a healthy planet”.*

Moreover, the observation of a shared semantic composition among the eight national OH strategic plans provides additional support to the notion of a common understanding of OH. Nevertheless, the bigram analysis, which contextualizes terms, highlighted significant variations in the frequencies of key OH notions, such as “animal health”, “human health”,

“environmental health”, “public health”, “surveillance system”, “disease control”. These variations may indicate diverse interests and priorities across countries. Significantly, there were notable differences in the conceptualization of the overarching term "health" across these plans. These distinctions may be indicative of cultural diversity or differences in the health threats and challenges encountered by the respective countries.

Although all countries addressed environmental health in their plans, the focus remained on public health and/or human-animal health. The general neglect of the environmental pillar is consistent with the findings of other studies on OH initiatives (49). Similarly, the climate crisis has been recognized in all plans, but only three countries, Ethiopia, Liberia, and Zambia, have outlined strategies for planned action in addressing it. The absence of explicit strategies in the OH plans of the remaining countries regarding the climate crisis does not diminish their commitment to addressing this issue, as evidenced by independently published plans on climate change policies (50–54). It merely demonstrates that considerations related to the climate crisis are not seamlessly integrated into OH action plan. Additionally, despite three countries having coastlines that contribute significantly to food security and other ecosystem services, plans from these countries did not explicitly consider and integrate the marine environment into OH planning and action.

Structural aspects, such as the development of OH institutions and the establishment of holistic disease surveillance systems and control strategies were well emphasized in several national One Health strategic plans. These practical points are more tangible and may be easier to incorporate into a strategic plan compared to less concrete issues like equity. In particular, the introduction of new institutions and disease control strategies are challenges that governments have been addressing well before the advent of the OH approach. Consequently, it is coherent that these procedures are more firmly established, better understood, and relatively easier to budget for.

The general aspiration for OH education, capacity building, and awareness is evident across all countries, reflecting a commendable commitment to critical elements for the long-term success and sustainability of OH initiatives. It is noteworthy that there remains a necessity for tailored educational initiatives, particularly with respect to diverse demographic segments. Emphasizing the importance of heightening awareness among various age and social cohorts is crucial, given that each group may encounter distinct health risks, exhibit varying susceptibilities to diseases, and require dedicated information channels. To optimize engagement and interest in OH-related subjects, educational content should be customized, considering factors such as age, educational accessibility, and academic background. A good

example of this is Rwanda's University of Global Health Equity, which offers students an innovative OH education model (55).

Our findings demonstrate that socio-cultural aspects are frequently overlooked within national OH strategic action plans. For instance, only one country, Uganda, both recognized and planned action regarding gender aspects in addressing the polycrisis although both gender inequalities and inequities continue to exert a substantial negative influence on health outcomes, including inequalities in living conditions, access to health services and health protection (3,56,57) While Uganda stood out regarding the recognition of gender parity in its national OH strategic plan, the country has recently enacted a controversial anti-LGBTQ+ bill imposing severe penalties, including death sentences, for homosexual acts (58). This legislation raises concerns about human rights violations and potential impact on affected individuals, limiting their access to social life, education, and healthcare, contradicting one of the key principles of the One Health definition by the OHHLEP, which advocates for "*multicultural parity (the doctrine that all people are equal and deserve equal rights and opportunities)"* (7). This example illustrates the potential discrepancies between adopted strategic plans and their operationalization in the field, which may encounter cultural, social, political, or economic barriers.

The voices and rights of Indigenous Peoples in addressing the polycrisis are not mentioned in the majority of the national OH strategic plans. However, Indigenous Peoples possess, inhabit, or utilize a quarter, of the Earth's surface and they play a crucial role in safeguarding 80 percent of the world's remaining biodiversity. Moreover, forestlands under the collective stewardship of Indigenous Peoples and local communities contain a minimum of one quarter of the above-ground carbon in tropical and subtropical forests. Beyond their environmental contributions, these communities hold invaluable ancestral knowledge, particularly in navigating and addressing challenges related to climate and disasters (59). Therefore, the non-inclusion of Indigenous People and their Knowledge Systems from OH strategic plans and policies represents a significant gap in addressing health concerns comprehensively. Moreover, Indigenous communities often face distinct health challenges linked to their lifestyles and environments. Inclusion of Indigenous Peoples in policy development ensures cultural sensitivity, equity, and a more accurate representation of the diverse factors influencing health at the human-animal-environment interface (60).

Traditional Knowledge Systems were only addressed in three plans (Nigeria, Tanzania, Uganda) with action planned in two of them (Nigeria, Uganda), suggesting a potentially negative stance towards Traditional Knowledge within governing bodies and health institutions.

The Ethiopian national OH strategic plan briefly acknowledges traditional healing and medical practices but dismisses their consideration in OH strategies, citing concerns about limiting access to modern healthcare, fostering misconceptions, and impacting healthcare-seeking behaviour, as illustrated by the example of human rabies. The Shanghai Declaration of 2016 on promoting health in the 2030 Agenda for Sustainable Development (61) and the WHO Global Report on Traditional and Complementary Medicine 2019 (62) both recognize the importance of Indigenous Knowledge and Traditional Medicine in achieving global health objectives. There is an emerging consensus to decolonize the limited appreciation of Indigenous Knowledge and Traditional Medicine and embrace a broader perspective that encompasses traditional, complementary, and integrative medicine and health systems (63,64).

The animal welfare aspect has been overlooked in all national OH strategic plans. Despite the acknowledged connection between the concepts of One Health and One Welfare, both recognizing that humans, animals, and the environment are interconnected and interdependent, the absence of aspects related to animal welfare in the national OH strategic plans may reflect the (still) anthropocentric focus of these OH initiatives and their failure to embrace some aspects of socio-ecological complexity, such as the animal welfare ethics. Animal welfare is recognized in the OHHLEP definition of OH (7) but not specifically mentioned in the Berlin Principles (6). Recognizing animal welfare is crucial when operationalizing One Health, suggesting a need to move beyond a singular focus on traditional technical aspects of OH such as detection, surveillance, and adopt a well-being paradigm (65,66). Notably, improvements in animal welfare can enhance the sustainability and the safety of food systems (67) while contributing to advancements in achieving the Sustainable Development Goals (SDGs) of the United Nations (68).

Advancing future national OH strategic plans and enhancing the efficacy of their operational recommendations can be achieved through of a harmonised core set of concepts and social values aligning with the guiding principles of widely recognized OH publications, such as those by the OHHLEP and the Berlin principles (6,7). This vision could be a “OH strategic master plan” as a first step toward harmonization of national strategic plans, which would subsequently require context-specific adaptation, and scaling to align with individual national health strategies. The success of such a master plan initially relies on the provision of clear definitions and a well-defined scope to overcome semantic and language barriers. Integration of a social-ecological framework is essential, ensuring shared goals for One Health are distinctly defined, considering an equitable continuum of care across species and generations (69).

Incorporating currently overlooked aspects and anticipating their potential importance in the future is critical for strategic plans that can be updated and adapted in response to the dynamic and uncertain nature of the global health landscape. Future plans will clearly benefit from including resilience and solidarity elements. While resilience, defined by the World Organisation for Animal Health (WOAH) as “the ability to flexibly prepare for, adapt and recover from adverse events”, “One Health resilience” remains to be precisely defined (70). This could encompass multiple dimensions, including social-ecological systems resilience (71), health system resilience (72), and resilience to climate change (73). Specifically, the notion of “health systems resilience” has emerged as an adaptive approach to analyse the impact of various crises, such as economic downturns (74), the Ebola epidemic (75), waves of refugees (76), and infectious disease outbreaks (77). On the other hand, the notion of solidarity is highly relevant in (public) health ethics (78) although it is not explicitly addressed in the One Health Joint Plan of Action by the Quadripartite (14). Solidarity spans various dimensions (78), such as multispecies (“more-than-human) solidarity (79)and collective responses to disasters and global health threats, with an overarching goal of diminishing health inequalities (80).

6 Conclusion

Our analysis reveals that, while certain criteria aligned with the latest OH definitions are well-established in the existing national OH strategic plans, others require further attention. Particularly, the equitable integration of environmental considerations, including addressing the climate crisis and its associated health risks, must be improved. Similarly, the actionable components related to social aspects within the national OH strategic plans must equitably encompass and incorporate socio-political and multicultural aspects, such as parity and equity, to foster a more inclusive, fair, and holistic framework for addressing complex health challenges. Social-ecological factors, subject to regional variations, should be duly acknowledged, and the intersectionality of different genders, social groups, and origins with health should be systematically considered and transformed into actions. Additionally, our evaluation underscores the imperative to integrate animal welfare comprehensively into OH discussions and initiatives, as a substantial gap persist on this aspect. The current draft for the WHO Pandemic Agreement includes OH as a standalone Article (Article 5) and addresses the concept in multiple other Articles (81). This document, commonly referred to as the Pandemic Treaty, will form the basis of future member state negotiations aiming to strengthen pandemic prevention, preparedness, and response. The recognition of OH by this major document for global health governance may have a positive impact and even accelerate the institutionalization of OH into national strategic plans that will go beyond AMR.

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