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An integrated inventory of One Health tools: Mapping and analysis of globally available tools to advance One Health

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Abstract

The global demand from multi-sectoral partners for operational tools for One Health implementation and capacity building is increasing, yet a validated global inventory of One Health tools did not exist. Here, we map and analyze available One Health tools and assess their suitability to support One Health implementation, including the One Health Joint Plan of Action 2022–2026 (OH JPA). Our objectives were to identify (i) publicly available One Health tools to support capacity building and OH JPA implementation; (ii) optimal outcomes for countries/regions using available One Health tools; (iii) linkages to OH JPA Action Tracks and pathways in the One Health Theory of Change (TOC); and (iv) gaps and priorities for the development of additional One Health tools. One Health High Level Expert Panel (OHHLEP) members compiled information on One Health tools that were publicly available and released up to June 30, 2023, via online sources and partner networks including the Quadripartite organizations. Inclusion criteria addressed One Health relevance, use at the national, subnational, or regional level in ≥5 locations, and publicly available information. Tools were assessed for applicability by OH JPA action track, TOC pathway, scope, and intended outcomes, as well as the extent to which tools addressed gender equality, social inclusion, and environmental dimensions of One Health. Of 132 candidate tools, 50 (38%) met the inclusion criteria. These tools addressed all six OH JPA Action Tracks, but relatively fewer tools addressed Action Tracks 4 (Food Safety), 5 (Antimicrobial Resistance), and 6 (Environmental Integration). Tools were available to support all three TOC outcome pathways, and many addressed more than one Action Track and TOC outcome pathway. Most available One Health tools addressed assessment and to a lesser extent implementation, with fewer tools available for action planning, prioritization, and monitoring. Gaps and opportunities for improving One Health tools were identified, including the integration of the environment dimension, gender equality, and social inclusion. Ultimately, our findings will contribute to further the advancement of One Health globally, including via OH JPA implementation, while spurring adjustments to existing One Health tools and the development of new ones to address key gaps.

One Health impact statement

The One Health approach is gaining momentum globally, and this study represents the first integrated mapping and analysis of globally available One Health tools. Our findings aim to improve the quality, applicability, and availability of tools to support One Health implementation at the subnational, national, regional, and global levels, including through the Quadripartite's One Health Joint Plan of Action. By using the OHHLEP definition of One Health to assess available One Health tools and map them onto the One Health Joint Plan of Action, we identify the need for a systematic approach and enhanced integration across dimensions of One Health to lead to sustainable One Health systems.

Keywords: One Health tools, multi-sectoral, collaboration, One Health, gender, environment, ecosystems, animal health, public health

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Introduction

A One Health approach is critical to address health risks and threats that arise at the human–animal–plant–environment interface (WHO, 2020; UN, 2022). Countries, governments, and communities request guidance and tools to assess, prioritize, develop, and implement a One Health approach to better address shared health threats at the subnational, national, regional, and global levels.

The One Health High-Level Expert Panel (OHHLEP) was convened in 2021 by the Quadripartite organizations (United Nations Food and Agriculture Organization (FAO), the United Nations Environment Programme (UNEP), the World Health Organization (WHO), and the World Organization for Animal Health (WOAH)) to enhance their science-based cross-sectoral collaboration by assessing One Health science and providing technical advice (Mettenleiter *et al.*, 2023). The OHHLEP defined One Health as "an integrated, unifying approach that aims to sustainably balance and optimize the health of people, animals, and ecosystems. It recognizes the health of humans, domestic and wild animals, plants, and the wider environment (including ecosystems) are closely linked and interdependent. The approach mobilizes multiple sectors, disciplines, and communities at all levels of society to work together to foster well-being and tackle threats to health and ecosystems, while addressing the collective need for healthy food, water, energy, and air, acting on climate change and contributing to sustainable development (OHHLEP *et al.*, 2022a)." One Health is predicated on the foundational principles of equity, parity, stewardship, socio-ecological equilibrium, and transdisciplinarity. The definition emphasizes the need for action to sustainably implement One Health through improved multi-sectoral and transdisciplinary collaboration, coordination, communication, and capacity building.

With input from OHHLEP, the Quadripartite issued a One Health Joint Plan of Action 2022–2026 (OH JPA) and an associated Implementation Guide that calls on all countries to act now to integrate systems and capacity to collectively better prevent, predict, detect, and respond to emerging threats and improve the health of humans, animals, plants, and the environment, while also contributing to sustainable development (FAO, UNEP, WHO and WOAH, 2022; WHO, FAO, UNEP and WOAH, 2023). The OH JPA has six action tracks: *Action Track 1*: enhancing One Health capacities to strengthen health systems; *Action Track 2*: reducing the risks from emerging and re-emerging zoonotic epidemics and pandemics; *Action Track 3*: controlling and eliminating endemic zoonotic neglected tropical and vector-borne diseases; *Action Track 4*: strengthening the assessment management and communication of food safety risks; *Action Track 5*: curbing the silent pandemic of antimicrobial resistance (AMR); and *Action Track 6*: integrating the environment into One Health. In December 2023, the Quadripartite released "A Guide to Implementing the One

Health Joint Plan of Action at National Level" to provide practical guidance on how countries can adopt and adapt the OH JPA to strengthen and support national One Health action (WHO, FAO, UNEP and WOAH, 2023).

The Implementation Guidance for the OH JPA addresses the outcome pathways of the OH JPA Theory of Change (TOC): *Pathway 1* – policy, advocacy, and financing; *Pathway 2* – organizational development, implementation, and sectoral integration, and *Pathway 3* – data, evidence, education, and knowledge (FAO, UNEP, WHO and WOAH, 2022). The OH JPA TOC was influenced by the OHHLEP's TOC (OHHLEP *et al.*, 2022b). The Guide outlines the process from situation analysis through to establishing or strengthening national, multi-sectoral, One Health coordination mechanisms and national One Health action plans. It also recommends building on and linking to existing national work and defining clear roles and responsibilities for primary stakeholder groups. Countries and stakeholder groups are encouraged to design, adapt, and institutionalize national One Health action plans and to link across existing relevant national action plans while featuring activities prioritized by pathway and linking to OH JPA action tracks. While this analysis of One Health tools is comprehensive, countries will still need additional tools and guidance to achieve sustainable implementation of a One Health approach.

An array of One Health tools has been developed over many years, but these tools and their outcomes have never been fully inventoried and analyzed to address their relevance toward One Health implementation. The number of frameworks and tools that address infectious diseases and pandemic preparedness, antimicrobial resistance, food safety, or climate change appear to be proliferating rapidly. However, these tools and their outcomes are not typically well connected into a One Health context. Additionally, many tools profess to adopt a One Health approach, but few fully achieve the sectoral and disciplinary integration across the three dimensions of One Health, with attention to its foundational principles.

In 2019, a conceptual framework was published by Pelican *et al.* on how 12 widely implemented One Health tools might align to best support countries in strengthening One Health systems with a focus on zoonotic diseases (Pelican *et al.*, 2019). The paper presented a One Health conceptual model with five categories to inform how tools may be used together: Assessment, Prioritization, Action Planning, Implementation and Monitoring. The study highlighted how One Health tools and their outputs might be used to inform and strengthen outputs from other tools, implemented subsequently or concurrently, with the intention of maximizing the results of national efforts in addressing complex health threats at the human–animal–plant–environment interface by engaging and mobilizing resources more effectively across One Health sectors.

Based on demand from subnational, national, and regional partners and the Quadripartite for guidance and support for the

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implementation of the OH JPA, the OHHLEP undertook to map and assess available One Health tools using the OHHLEP One Health definition. OHHLEP's review of these tools paid particular attention to environmental and social equity dimensions of One Health tools, with a view to support the implementation of the OH JPA via all six action tracks and outcome pathways in the One Health Theory of Change (OHHLEP *et al.*, 2022b). The specific objectives of this paper were to identify: (a) publicly available One Health tools to support capacity building and implementation for the OH JPA and its associated Implementation Plan; (b) optimal outcomes for subnational, national, and regional partners using available One Health tools; (c) linkages to Action Tracks in the OH JPA and the pathways in the One Health Theory of Change; and (d) gaps and priorities for the development of additional One Health tools including to further incorporate environment and social equity dimensions.

Methods

OHHLEP and Quadripartite members collected information on One Health tools, resources, and guidance documents that were publicly available up to June 30, 2023, via online sources, formal publications, and documents accessible through OHHLEP and Quadripartite networks.

The OH JPA formed the primary framework for this analysis of available One Health tools, with emphasis on coverage of all dimensions of One Health based on the OHHLEP One Health definition, the six action tracks of the OH JPA, and the three outcome pathways in the One Health Theory of Change, described above. Additionally, authors evaluated the conceptual framework of Pelican *et al.* (2019), for the application of One Health tools, assessing the utility of its conceptual model with five categories for relevance to our study.

To be included in the final One Health tools inventory for further analysis, a tool had to meet the following inclusion criteria:

1. The tool helped support a One Health approach to address health and/or environment issues at the human–animal–plant–environment interface as outlined in the OH JPA.
2. The One Health tool was implemented at the national level in at least five countries or locations (e.g. subnational or regional level) to ensure the tool was in use beyond the pilot stage.
3. Information on a One Health tool was publicly available as of June 30, 2023, via online sources and/or through networks of the authors.

Tools were identified using information extracted from several sources, including iterative literature reviews, online sources (e.g. pubmed.gov and various search engines), and reviews of the Tripartite Zoonoses Guide (TZG) (FAO, WHO and WOA, 2019), the TZG Surveillance and Informational Sharing Operational Tool (SISOT) database of tools (WHO, FAO and WOA, 2022b), the World Bank Operational Framework for strengthening human, animal, and environmental public health systems at their interface (Berthe *et al.*, 2018), and expert knowledge from the OHHLEP members and Quadripartite organization staff. Search terms are presented in Supplementary Appendix A. The One Health tools included in our final list were validated by two or more OHHLEP members and/or Quadripartite partners who have familiarity with the tool and, when needed, by consultation with the others involved in developing or implementing the tool.

The authors identified One Health tools that met the above inclusion criteria and jointly conducted a landscape analysis to establish a cohesive understanding of these tools and analyze key aspects of their role, scope, and application in relation to the OH JPA. One or more OHHLEP members not involved with designing or implementing a One Health tool were assigned to review tools against the inclusion criteria to prevent biases. OHHLEP and

Quadripartite partners familiar with the design or implementation of One Health tools answered questions when needed.

The authors sought to answer the following questions with the landscape analysis including:

1. How have One Health tools developed over time to meet global health needs?
2. What organizations most commonly develop One Health tools?
3. What are the intended audience and sectors for available One Health tools?
4. How do the available One Health tools contribute to one or more Action Tracks of the One Health Joint Plan of Action?
5. How do the available One Health tools and their outcomes advance implementation of the One Health Joint Plan of Action and the One Health Theory of Change pathways?
6. What are the themes of the intended outcomes of available One Health tools?
7. How do the tools integrate gender analysis, intersectionality, and social inclusion?
8. How do the tools integrate the environment?
9. What are the gaps and opportunities for future development of One Health Tools?

To address these questions, a consensus-driven iterative review process involving the OHHLEP and key experts from the Quadripartite organizations was used to select 13 descriptive variables: (i) Name of One Health Tool; (ii) Year Tool First Released; (iii) Contributing Organization(s); (iv) Organization Level; (v) Scope; (vi) Link with OH JPA Action Track(s); (vii) Link to One Health Theory of Change Pathway; (viii) Audience Level; (ix) Audience Type; (x) Outcome of One Health Tool Usage; (xi) One Health Tool Description; (xii) Key Outputs; and (xiii) Website, Publications, and Other Available Resources. These descriptive variables are defined in Supplementary Appendix B.

When relevant, for each descriptive variable, themes were identified, and categories were created. For example, the variable for outcome was assessed for each One Health tool based on how the tool supported One Health advancement, grouped into themes, and then grouped into the overall category for outcomes. Outcomes are described in detail in Appendix B. For the Scope variable, authors assessed the application framework proposed by Pelican *et al.*, 2019 to determine whether the five proposed categories reflected the current scope of available One Health tools based on the following definitions: (i) assessment (reviewing and analyzing a system's capacity); (ii) prioritization (identifying issues and topics of interest requiring the most immediate efforts); (iii) Action Planning (developing an implementable plan); (iv) Implementation (executing an action plan); and (v) Monitoring (systematically observing quality and outcomes of an ongoing process). Authors worked collaboratively using a cloud-based spreadsheet to populate the variables and other collected information.

Two OHHLEP members with experience in gender analysis additionally evaluated, using a three-level classification, how well the chosen tools addressed gender and social inclusion considerations: (i) present to a significant degree; (ii) present to some degree; and (iii) absent. Tools that referred to gender equity or equality in some respects (for example, stakeholder engagement) but not others (gender disaggregated data, gender lens to risk assessment) or that covered gender without considering other social exclusion factors, were rated as "present to some degree." For some tools, methodological details required to conduct this sub-analysis were not available to the authors. The environment sector has a wide disciplinary application in relation to One Health under Action Track 6. An OHHLEP member with environmental experience further assessed the tools linked with Action Track 6.

Descriptive variables used for analyses were standardized using the definitions summarized in the supplemental materials

(Appendix A). Data visualization and analyses were conducted using R version 4.0.0 (2020-04-24) (R Core Team, Vienna, Austria). The summary of One Health tools presented here is not intended to be prescriptive and does not imply endorsement of any specific tool.

Guidance documents, tools under development, and other resources identified during this study were not included in our analysis. They were reviewed by the authors and discussed with the Quadripartite partners and then compiled as background information toward the use of the One Health tools identified here and as further support for OH JPA implementation (OHHLEP, 2023; WHO, FAO, UNEP and WOA, 2023).

Results

A total of 132 candidate One Health tools were identified for review and assessment. Fifty (38%) met the inclusion criteria for the final database (Table 1). The earliest One Health tool that met our inclusion criteria was first released in 1999. Sixty-eight percent ($n = 34$) of tools were first released after 2016. The years with the greatest number of One Health tools first released were 2021 ($n = 7$) and 2022 ($n = 7$) (Fig. 1). Some tools were updated over time after their first release with two or more versions. What follows is a description of the distribution of tools across all categories of key descriptive variables, listed in *italics*.

ORGANIZATION TYPE

Tools were developed and published by various organizations, which were categorized as Quadripartite, other international or regional organizations (e.g. Africa Centers for Disease Control, European Commission), national (e.g. U.S. Centers for Disease Control and Prevention [CDC] and French Agricultural Research Centre for International Development [CIRAD]), academic, or non-governmental institutions (e.g. Association of Public Health Laboratories [APHL]). Tools could be labeled with more than one category because many of them were developed jointly by several organizations. Quadripartite organizations developed or contributed to developing 57% of tools ($n = 34$), followed by international/regional level organizations (15%; $n = 9$), national level organizations (13%, $n = 8$), non-governmental organizations (8%; $n = 5$), and academic institutions (7%; $n = 4$) (Table 2).

AUDIENCE

The tools were categorized by the audience type according to their potential application for One Health. The primary target audience for the uptake of these tools was primarily multi-sectoral (76%; $n = 38$), but some of the One Health tools focus on individual sector needs: animal health (domestic and wild animals; 8%; $n = 4$), policy makers (8%; $n = 4$), laboratorians (4%; $n = 2$), environmental health (2%; $n = 1$), and public health (2%; $n = 1$) (Table 2). These sector-specific tools were included because they had a focus on advancing that sector using a One Health approach and had One Health linked outcomes.

SCOPE FOR APPLICATION

The objectives of the One Health tools were evaluated according to scope for application in the conceptual framework by Pelican *et al.*, 2019, and after an assessment, no changes or additional grouping categories were considered necessary. One Health tools could be assigned to more than one scope category since many of the tools were suitable for application in more than one phase of the implementation model. Forty-seven percent of tools ($n = 29$) addressed One Health assessment while 27% ($n = 17$) focused on One Health implementation (Table 2). Other tools addressed monitoring (11%; $n = 7$), action planning guidance (8%; $n = 5$), and prioritization (7%; $n = 4$).

ONE HEALTH OUTCOMES

The One Health tools were categorized into seven outcomes based on how they support One Health advancement. Although the outcomes of some tools were applicable to more than one category, for the purpose of this analysis, the category of greatest relevance was selected for each tool. The abbreviated title of the outcome is shown in parentheses and used in Table 1:

1. Build or Strengthen One Health Coordination/Collaboration (coordination/collaboration).
2. Enhance One Health Approach to Emergency Response/ Rapid Response (Emergency Response).
3. Address Environment Sector Needs to Strengthen One Health (Environment Needs).
4. Enhance One Health Systems Capacity (One Health Capacity).
5. Apply One Health into National Action Plans/Strategic Plans/ Framework/Action Plans (Plans/Frameworks).
6. Improve Surveillance and Information Sharing Across One Health Sectors (Surveillance).
7. Improve Performance of Veterinary Services for One Health Needs (Veterinary Services).

Almost 50% of the tools contributed to the outcomes of either building and strengthening One Health coordination and collaboration (28%; $n = 14$) or enhancing One Health systems capacity (20%; $n = 10$) (Table 2).

ACTION TRACKS OF THE ONE HEALTH JOINT PLAN OF ACTION

The One Health tools were categorized according to how they could be used to support the six action tracks of the OH JPA. Some tools were applicable to more than one action track. In this analysis, we assess the Action Track of greatest relevance for each tool as well as interactions between and among tools and Action Tracks. Of the six action tracks of the OH JPA (multiple action tracks being served by some tools), Action Track 1 (enhancing One Health capacities to strengthen health systems) was the most common Action Track addressed by selected One Health tools ($n = 30$). Action Track 3 (controlling and eliminating endemic zoonotic, neglected tropical, and vector-borne diseases) was the next most addressed ($n = 16$). Action Track 2 (reducing the risk from emerging and re-emerging zoonotic epidemics and pandemics) had 14 tools, while Action Track 6 (integrating the environment into One Health) had 13 tools and Action Track 4 (strengthening the assessment, management, and communication of food safety risks) had 11 tools. Action Track 5 (curbing the silent pandemic of AMR) had the fewest number of available tools ($n = 8$).

Evaluating the commonality of track overlaps can identify possible synergistic relationships between the different focus areas outlined in each OH JPA action track. Fig. 2 displays the distribution of One Health tools by single and paired combinations of action tracks. Of the 50 included tools, 34 (68%) addressed a single Action Track; the most common track of focus was Action Track 1 (44%; $n = 15$) followed by Action Track 6 (24%; $n = 8$). The heat map also shows that a greater number of tools address paired combinations of Action Tracks 1 through 4, compared to pairs that include Action Tracks 5 or 6 (antimicrobial resistance and environmental aspects of One Health). While Action Track 4 was covered by multiple tools, there was no tool focused only on this action track.

ONE HEALTH THEORY OF CHANGE PATHWAYS

Given that the effectiveness of the OH JPA will be assessed according to its One Health Theory of Change, One Health tools are needed to support each of its three outcome pathways. Each tool was exclusively assigned to one of these three outcome pathways, according to the authors' assessment of the likeliest application of the tool. Sixty-six percent of tools ($n = 33$) aligned with Pathway 2

Table 1. Landscape analysis and comparison of 50 One Health tools listed by the year of first release that met the inclusion criteria, * 1999 to June 30, 2023.

Name of the One Health Tool	Year of first release	Contributing organization(s)	Organization level	Scope	Link with OH-JPA Action Track(s)	One Health Theory of Change Pathway*	Audience level	Audience type	Outcome of tool usage	One Health tool description	Key outputs	Website, publications, and other available resources	References
Global Environment Outlook (GEO) and Integrated Environmental Assessments	1999	United Nations Environmental Program (UNEP)	Quadripartite	Assessment	6	3	National	Policy makers	Address environment needs to strengthen One Health	Global environmental assessments are destined for decision makers to support rapid action regarding environmental issues. Since the instigation of this initiative 6 GEO assessments have been developed by UNEP, they include global and regional assessments. Guidelines to conduct IEA are detailed to conduct an assessment and for training purposes. With GEO-6 Report, updated Integrated Environmental Assessment (IEA) methodology was applied to include social, environmental, and economic aspects to the assessment, aligned with One Health.	The sixth edition of the Global Environment Outlook (GEO-6) provides a clear assessment of the current state of the environment, the challenges that we face, and how well we have dealt with them, with due consideration given to gender, indigenous knowledge, and cultural dimensions. The assessment lays the foundation for continued socio-environmental assessments across relevant scales, with a thematic as well as an integrated focus, enabling and informing societal transitions and the tracking of Sustainable Development Goal targets and goals as well as previously agreed internationally environmental goals. The enhanced policy analysis in this sixth edition is aimed at assisting member states to position themselves on the most effective pathways for transformations toward a sustainable future. IEA guidelines for intersectoral assessment and training manual are available.	https://www.unep.org/global-environment-outlook/why-global-environment-outlook-matters/global-geo-resources/geo-6 https://www.unep.org/explore-topics/environment-under-review/what-we-do/environmental-assessment/guidelines-conducting	UNEP (1999, 2019b, 2019c)
EMPRES Global Animal Disease Information System (EMPRES-i)	2004	Food and Agriculture Organization (FAO)	Quadripartite	Implementation	1, 2, 3, 4	3	National	Multi-sectoral	Improve Surveillance and Information Sharing Across One Health Sectors	EMPRES-i is a web-based secure information system to support country level veterinary services by facilitating regional and global disease and a global reference database for animal diseases including zoonosis. EMPRES-i team receives information about disease events worldwide from different sources: country or regional project reports, field mission reports, partner non-governmental organizations (NGOs), cooperating institutions, government Ministries of Agriculture and Health, FAO in-country representations or other United Nations parties, public domains, the media, and web-based health surveillance systems. EMPRES-i also integrates data from other databases, i.e. livestock density or environmental layers from FAO databases, e.g. the Global Livestock Production and Health Atlas, GLPHA (user-friendly, highly interactive electronic atlas using the Key Indicator Data System (KIDS)) and from other systems. The EMPRES-i genetic module is a novel tool that aims to facilitate the analysis and better understanding of influenza viruses by linking epidemiological outbreak data, including and genetic characteristics of influenza, (e.g. virus clades, antiviral resistance markers, mammalian adaptation markers, and reassortment to the epidemiological information) to detailed epidemiological disease event records.	EMPRES-i provides up-to-date information on the global animal disease distribution and current threats at national, regional and global level. 'Disease Events' can be presented on a map and further analyzed by choosing from a variety of optional layers.	https://empres-i.apps.fao.org/	FAO (2004)

Continued

Table 1. Continued.

Name of the One Health Tool	Year of first release	Contributing organization(s)	Organization level	Scope	Link with OH-JPA Action Track(s)	One Health Theory of Change Pathway*	Audience level	Audience type	Outcome of One Health tool usage	One Health tool description	Key outputs	Website, publications, and other available resources	References
Environmental Impact Assessment (EIA) and Strategic Environmental Assessment (SEA): Towards an Integrated Approach	2004	UNEP	Quadrupartite	Implementation	6	2	National, subnational	Multi-sectoral	Build or Strengthen One Health Coordination/ Collaboration	This document provides guidance on the application of SEA and EIA. It supports the use of a more integrated approach and represents a detailed resource for parties implementing SEA and EIA and for training purposes.	Integrated assessment of the environmental impact. Support a more informed decision making and development of new policies.	https://www.unep.org/resources/report/environmental-impact-assessment-and-strategic-environmental-assessment-towards	UNEP (2004)
Electronic Integrated Disease Surveillance System (EIDSS)	2005	Defence Threat Reduction Agency (DTRA)	National	Implementation	1, 2, 3, 4	2	National	Animal health	Improve Surveillance and Information Sharing Across One Health Sectors	EIDSS is a customizable web-based electronic disease reporting system that can support passive and active human and animal health surveillance, laboratory diagnostics, vector surveillance, and outbreak management to provide near real-time information flow for infectious disease-related decision making.	Integrated Disease reporting system that has been applied in Georgia, Azerbaijan, Kazakhstan, Armenia, and Ukraine so far	Github.com/EIDSS EIDSS is an application configured for use by public health practitioners, in a country, for data collection and analysis related to infectious diseases. You must be a member to access this system.	DTRA (2005)
Protected Areas Management Effectiveness (PAME) Assessment	2006	International Union for Conservation of Nature and Natural Resources (IUCN) / UNEP	International/ regional, quadripartite	Assessment	6	2	National	Policy makers	Address environment needs to strengthen One Health	PAME is an assessment guide for protected areas. It provides guidance to a step-by-step assessment of the management in place and identifies the gaps in it, offers a set of recommendations for the selection or development of the most appropriate assessment tool according to the area and need. It also provides recommendations for the assessment team composition, implementation, as well as how to use and report results.	Guide the assessment and the management of a protected area. Informs how protected areas are being managed through the available reports. Maintain and preserve a protected area's value.	https://www.unep.org/cep/resources/publication/how-conduct-protected-areas-management-effectiveness-assessment	IUCN and UNEP (2006)
Performance of Veterinary Services (PVS) Pathway (Evaluation, Follow-Up, Gap Analysis, Veterinary Legislation Support Programme, Sustainable, Workforce Development, Public-Private Partnerships, etc.) (WOAH)	2007	World Organisation for Animal Health (WOAH)	Quadrupartite	Assessment, Monitoring, Implementation	1, 2, 3, 4	2	National	Terrestrial and aquatic animal health and welfare	Improve performance of veterinary services for One Health needs	The PVS Pathway promotes the sustainable improvement of Veterinary Services and improve their compliance with the international standards in the WOAH Codes (continuous improvement cycle). PVS activities are based on standardized methodologies that include external expert-led, in-depth field missions. The WOAH-trained experts meet with stakeholders, observe field sites and operations, and visit key facilities such as laboratories, border posts, and slaughterhouses. With its focus on aligning the quality of all countries' Veterinary Services and measuring their progress against objective criteria based on WOAH international standards. The PVS Pathway examines each country's unique challenges and advantages to support the Veterinary Services' continuous improvement, even in low-resource settings.	The data and insights developed throughout the PVS Pathway enable countries to take ownership and prioritize improvements to their animal health systems. They can use these findings to advocate for additional investment and sustainable funding, both from their governments and international or bilateral donors, to support more resource-intensive investments, including in One Health. Resource partners can benefit from engagement with the PVS Pathway by using its outputs, particularly the PVS Pathway reports, data and recommendations, in partnership with the host country, to guide the design and implementation of development programs that broadly contribute to stronger and more resilient overall health systems for improved pandemic preparedness.	https://www.woah.org/en/what-we-offer/improving-veterinary-services/pvs-pathway/	WOAH (2007, 2019, 2021)

2008	Integrated Biodiversity Assessment Tool (IBAT)	UNEP World Conservation Monitoring Centre (WCMC)/ IUCN, Conservation International/ BirdLife International	Quadrupartite, International/ regional, NGO	Implementation, Monitoring, Action Plans	6	3	National, sub-national	Multi-sectoral	Improve Surveillance and Information Sharing Across One Health Sectors	IBAT is a free database that gives access to biodiversity maps and provides additional paid services based on subscriptions. IBAT is considered as most authoritative data on biodiversity worldwide. This tool provides relevant stakeholders with the necessary data to support biodiversity conservation actions such as policy making.	Offers authoritative data to stakeholders, companies, government and funding bodies to reduce or prevent the impact on biodiversity and the environment. In cases of implementation and funding of projects worldwide. Offers a visual screening of biodiversity. Offers authoritative biodiversity data from around the world. Allows an evidence-based decision making and policy making linked to biodiversity and conservation.	https://www.ibat-alliance.org/	UNEP-WCMC <i>et al.</i> (2008)
2011	International Plant Protection Convention (IPPC) Phytosanitary Capacity Evaluation (PCE)	FAO	Quadrupartite	Assessment	1, 6	2	National	Environment	Address environment needs to strengthen One Health	The Phytosanitary Capacity Evaluation (PCE) is a fully comprehensive NPPO-led, facilitator-enabled, IPPC Secretariat supported process of multiple phases, with a wide range of benefits, to help countries evaluate their phytosanitary capacities to strengthen the national phytosanitary system.	1. Draft by consensus with all stakeholders a National Capacity Development Phytosanitary Strategy; 2. Revise the Phytosanitary legislation; 3. Enhance dialogue with donors and all national stakeholders.	https://www.ippc.int/en/core-activities/capacity-development/phytosanitary-capacity-evaluation/ https://www.ippc.int/en/stories/	FAO (2011, 2023b)
2012	Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) Assessments	Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services including UNEP/ United Nations Educational, Scientific and Cultural Organization (UNESCO)/FAO/ UNDP	Quadrupartite, International/ regional	Assessment	6	3	National	Policy makers	Address environment needs to strengthen One Health	IPBES platform provides a series of assessment reports for different territories on topics such as biodiversity and ecosystem services, land degradation and restoration, sustainable use of wild species. In addition the work program of IPBES is available and includes knowledge assessment, policy support building capacity and others.	Delivery of reliable assessment on specific themes related to biodiversity and ecosystems. Support policy making. Building capacity and knowledge. Communication and outreach.	https://ipbes.net	UNEP <i>et al.</i> (2012)
2012	One Health Systems Mapping and Analysis Resource Toolkit (OH-SMART)	University of Minnesota (UMN) & USDA	Academic, National	Assessment, Action Plans, Prioritisation	1	1	National	Multi-sectoral	Build or Strengthen One Health Coordination/ Collaboration	The OH-SMART process includes six steps and is designed to map and analyze complex One Health challenges like zoonotic disease outbreaks or antimicrobial resistance. Six OH-SMART steps include: 1. Identify stakeholder network; 2. Interview stakeholders; 3. Map the system; 4. Analyze the system; 5. Identify improvement opportunities; 6. Develop an action plan.	1. Mapping and analysis of multi-sectoral agency systems; 2. Improvement in agency coordination and collaboration around a specific crisis, outbreak or other complex challenge; 3. Multi-sectoral systems improvement through pro-active planning, retroactive analysis of events and/or just-in-time response using actionable implementation plans developed during the OH-SMART Workshop; 4. Development of a consensus action plan to advance systems strengthening across sectors. As of 2022, 17 countries used OH-SMART to strengthen One Health systems for prevention, detection, and response to infectious disease threats.	https://oh-smart.umn.edu/	University of Minnesota and USDA (2012)
2013	Association of Public Health Laboratories (APHL) Informatics Self-Assessment Tool	Association of Public Health Laboratories (APHL), U.S. Centers For Disease Control and Prevention (CDC)	National	Assessment	1, 2, 3	2	National	Laboratory	Enhance One Health Systems Capacity	The APHL Informatics Self-Assessment Tool allows public health laboratories to assess strengths and gaps in informatics capability by addressing 19 critical operational areas. It captures data longitudinally, enabling laboratories to measure growth and leverage results to advocate effectively for their needs.	This tool will help public health laboratory professionals prioritize the use of existing resources, document and communicate laboratory priorities to policy makers, and monitor laboratories' informatics capabilities on an on-going basis. Because concerned PHL directors, senior staff, and informatics experts guided development of the self-assessment, this tool can be seen as representing best-practice benchmarks and standards.	https://www.aphl.org/programs/informatics/Documents/LEI_2013Jun_Informatics-Self-Assessment-Tool-for-PHLs.pdf	APHL and CDC (2013)

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Table 1. Continued.

Name of the Health Tool	Year of first release	Contributing organization(s)	Organization level	Scope	Link with OH-JPA Action Track(s)	One Health Change Pathway [†]	Audience level	Audience type	Outcome of tool usage	One Health tool description	Key outputs	Website, publications, and other available resources	References
The One Health Systems Assessment for Priority Zoonoses (OH-SAPZ)	2013	Georgetown University	Academic	Implementation	1, 2, 3, 4, 6	2	National, sub-national	Multi-sectoral	Build or Strengthen One Health Coordination/ Collaboration	OH-SAPZ aims to facilitate a systematic assessment of national structures for One Health coordination with respect to preventing, detecting, and responding to zoonotic diseases. Users will follow a three-phase process for disease prioritization; systems mapping across surveillance and laboratory; and analysis and recommendations.	The overall goal of the assessment tool is to help identify priorities and gaps that limit information sharing for action through an examination of coordination and communications from the index case to notification at the national and international levels, focusing on zoonotic diseases seen as a priority by all implicated sectors.	https://georgetown.app.box.com/s/50r9ay3kac56zfady15mdbas2k0zm69g	Georgetown University (2013); Standley and Sorrell (2019)
One Health Zoonotic Disease Prioritization (OHZDP) Process	2014	CDC	National	Prioritisation	1, 2, 3, 4, 5, 6	1	International, Regional, National, sub-national	Multi-sectoral	Enhance One Health Systems Capacity	The OHZDP process uses a multi-sectoral, One Health approach to prioritize endemic and emerging zoonotic diseases of major concern to jurisdiction that should be jointly addressed by national-level human, animal (domestic and wild), and environmental health sectors and other relevant partners. The OHZDP tool is flexible in scale and can be applied at the regional, national, or subnational level. During the workshop, participants prioritize zoonotic diseases using equal input from all represented One Health sectors through a transparent and collaborative process. The workshop helps participants focus limited resources to build capacity and collaboratively address the priority zoonotic diseases, and informs assessments, planning efforts, and strategy development relevant to One Health. The process is adaptable to local context and scalable for use at the subnational, national, and regional levels, and can be adapted to apply to other infectious diseases and One Health issues. The OHZDP process utilizes a standardized, mixed methods approach and is implemented by trained facilitators. The OHZDP process is conducted upon the request of a country, region, or other jurisdiction and consists of an in-person workshop that gathers relevant ministries and partners representing One Health sectors to prioritize zoonotic diseases of greatest national concern for One Health collaboration and to develop next steps and action plans to build One Health capacity to address the newly prioritized zoonotic diseases. The OHZDP workshop consists of five steps. Step 1 (Preparation and Logistics) is completed prior to the workshop. Steps 2–5 occur during the multi-day workshop and include the following: Step 2: Criteria Development, Step 3: Question Development, Step 4: Ranking and Scoring the Zoonoses; and Step 5: Next Steps and Action Planning.	The OHZDP Workshop is a voluntary and collaborative process that allows countries, regions, and other areas to do the following: 1. Develop a list of priority zoonotic diseases of greatest concern agreed upon by all represented One Health sectors; 2. Create recommendations for next steps and action plans for multi-sectoral, One Health engagement to address the priority zoonotic diseases; 3. Understand the roles and responsibilities of all represented One Health sectors; 4. Create or strengthen multi-sectoral, One Health coordination mechanisms and networks; and 5. Develop a report highlighting the outcomes of the workshop to help advocate for One Health priorities. Workshop participation can help strengthen multi-sectoral, One Health collaborations by connecting representatives from human, animal, and environmental health sectors and other relevant partners.	To request information on the OHZDP tool, contact OneHealth@cdc.gov www.cdc.gov/onehealth/global-activities/prioritization.html www.cdc.gov/onehealth/what-we-do/zoonotic-disease-prioritization/completed-workshops.html https://onehealthoutlook.biomedcentral.com/articles/10.1186/s42522-021-00055-6 www.sciencedirect.com/science/article/pii/S2352771423001544?via%3Dihub https://journals.plos.org/plosone/article?doi=10.1371/journal.pone.0259706 http://journals.plos.org/plosone/article?doi=10.1371/journal.pone.0196799 http://journals.plos.org/plosone/article?doi=10.1371/journal.pone.0161576 http://journals.plos.org/plosone/article?doi=10.1371/journal.pone.0109986 https://onlinelibrary.wiley.com/doi/10.1111/zph.13015	CDC (2014, 2014–2021); Goryoka <i>et al.</i> (2021); Munyua <i>et al.</i> (2016); Osman <i>et al.</i> (2023); Pieracci <i>et al.</i> (2016); Rist <i>et al.</i> (2014); Salyer <i>et al.</i> (2017); Sekamatte <i>et al.</i> (2018); Varela <i>et al.</i> (2023); Wang <i>et al.</i> (2021)

Protected Planet	2014	UNEP/ UNEP WCMC/ IUCN	International/ regional, quadripartite	Assessment	6	1	National	Policy makers	Address environment needs to strengthen One Health	Protected planet is an online authoritative data platform that offers a listing of protected areas and Other Effective area-based Conservation Measures' (OECM) areas. They are displayed as maps and classified by countries, regions or individual areas. Thematic areas are also mapped, such as marine protected areas, territories and areas managed by indigenous peoples and local communities (CCAs) and others. In addition, protected planet allows users to explore other databases such as WDPA, global database on PAME.	Resource for evidence-based decision making / Communication analysis and sharing of data on protected areas / informs on the progress toward achieving international environmental targets, e.g. 2030 Sustainable Development Goals.	https://www.protectedplanet.net/en/search-areas?geo_type=site	UNEP-WCMC and IUCN (2014)
International Health Regulations (IHR) Monitoring & Evaluation Framework: After Action Review (AAR) / Intra Action review (IAR) and Simulation Exercises (SimEx)	2014	World Health Organization (WHO)	Quadripartite	Monitoring	1, 2, 3, 4	2	National, subnational	Multi-sectoral	Enhance One Health approach to Emergency Response/ Rapid Response	SimEx and AAR are two of the four components of the IHR monitoring and Evaluation Framework. These processes allow a qualitative review of national operational capacity for responding to events, either proactively (Simex) or retrospectively (AAR). Simexes can be used to test specific aspects of a system (e.g. collaboration among partners) under a hypothetical scenario, whereas AARs and IARS review (respectively, after and during) the actual function of the system during a real event involving hazards as described in the IHR (2005), as well as for natural and man-made disasters. Duration, scope, focus, structure, and partners vary according to the event or scenario. These voluntary processes are carried out by countries with support from WHO as needed. Out of the 35 AARs conducted since 2016, 17 were associated with zoonotic or food safety events. Out of the 73 WHO simulation exercises conducted since 2016, 41 had a multi-sectoral. One Health component related to a zoonotic disease.	Identification and documentation of the strengths and gaps in the functional, operational aspects of implementation of IHR capacities in the specific scope reviewed or tested through exercises.	https://www.who.int/emergencies/operations/international-health-regulations-monitoring-evaluation-framework	WHO (2014a)
State Parties Annual Reporting Tool (SPAR)	2014	WHO	Quadripartite	Assessment	1	2	International, National, Regional	Multi-sectoral	Apply One Health into National Action Plans/ Strategic Plans/ Framework/ Action Plans	SPAR is for countries self-reporting of national capacity – particularly infrastructural capacity – in 13 technical areas that cover the scope of IHR core capacities. Includes evaluation of capacity for collaboration across sectors for public health outcomes. One of the four components of the IHR Monitoring and Evaluation Framework. Mandatory reporting every year to the IHR Secretariat in WHO, which prepare a report to the World Health Assembly. Conducted under the leadership of the IHR National Focal point, usually related to the Ministry of Health. Mid-year States Parties are informed to initiate the process of self-assessment and reporting to the World Health Assembly, using a multi-sectoral approach to obtain information from all sectors involved in implementing IHR core capacities.	Final report of the self-assessment of capacities through 35 indicators for the 15 IHR capacities needed to detect, assess, notify, report, and respond to public health risk and acute events of domestic and international concern. For each of the 15 capacities, one to three indicators are used to measure the status of each capacity. Indicators are further broken down to a few elements called attributes, which further define the indicator at each level.	Must have a register email to sign in: https://extranet.who.int/e-spar/	WHO (2014b)

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Table 1. Continued.

Name of the One Health Tool	Year of first release	Contributing organization(s)	Organization level	Scope	Link with OH-JPA Action Track(s) ^a	One Health Theory of Change Pathway ²	Audience level	Audience type	Outcome of One Health tool usage	One Health tool description	Key outputs	Website, publications, and other available resources	References
Joint External Evaluation (JEE) Tool for international health Regulations Monitoring and Evaluation	2016	WHO	Quadripartite	Assessment, Monitoring	1	2	National	Multi-sectoral	Enhance One Health approach to Emergency/ Rapid Response	The JEE allows for evaluation of national capacity – particularly infrastructural capacity – in 19 technical areas that cover the scope of IHR core capacities and includes evaluation of capacity for collaboration across sectors for public health outcomes. The JEE is voluntarily undertaken every 4-5 years by a country, in two stages, using the JEE tool. (1) an initial self-evaluation conducted by the country and (2) an in-country evaluation conducted jointly by a multi-sectoral external team and a team of the national experts from all relevant sectors. Normally initiated by Ministry of Health; WHO supports logistics and implementation; WOA and FAO are generally systematically invited as external experts. Two of the four components of the IHR Monitoring and Evaluation Framework.	Final report prepared by the external team in collaboration with the multi-sectoral national team and validated by the national government. The report includes, for each of the 19 technical areas, a review of the strengths and areas for strengthening, priority actions, and scores for each of the indicators. The report is posted on the WHO website once cleared by the national government.	https://www.who.int/publications/item/9789240051980	WHO (2016a, 2022b)
National Action Plan for Health Security (NAPHS)	2016	WHO	Quadripartite	Action Plans	1	2	International, Regional, National	Multi-sectoral	Apply One Health into National Action Plans/ Strategic Plans/ Framework/ Action Plans	The Country Planning for Health Security is an activity of Member States to develop their National Action Plan for Health Security with the support of WHO. The activity includes acknowledging, coordinating, and collaborating on different areas of health security, defining national stakeholders' roles and responsibilities, and consolidating the information into a single comprehensive national action plan. The principles of Country Planning for Health Security are country ownership, active partnerships, and WHO leadership.	A costed plan to improve the national health system and national and global health security.	https://www.who.int/publications/item/naphs-for-all_StraveThreehyphen_a-country-implementation-guide-for-naphs	APHL and CDC (2013); WHO (2016b, 2019b)
Tripartite AMR Country Self-assessment Survey (TRACSS)	2016	FAO, WHO, WOA	Quadripartite	Assessment	5	1	National	Multi-sectoral	Apply One Health into National Action Plans/ Strategic Plans/ Framework/ Action Plans	TRACSS is for countries to involve a multi-sectoral group in assessing national progress and provide consolidated responses agreed by all. Many countries have found that the process of completing the questionnaire is a useful review of progress for the national action plan (NAP) implementation team.	1. Information on progress with multi-sectoral working on AMR, and information on completing a multi-sectoral national action plan on AMR; 2. Progress on the strategic objectives in the Global Action Plan on AMR; 3. The areas of human health, animal health and production aspects, plant production, the environment, and food safety concerns; 4. National assessment of risks for AMR transmission in the environment and pollution control and legislations to prevent environmental contamination with antimicrobials. Implementation of relevant policies and plans to prevent, control, and monitor AMR. To monitor country progress in the implementation of the national actions plans.	https://www.who.int/publications/m/item/tripartite-amr-country-self-assessment-survey-(tracss)-2020-2021	FAO, WHO and WOA (2021)

FAO Assessment Tool for Laboratories and Antimicrobial Resistance Surveillance Systems (FAO-ATLASS)	2016	FAO	Quadripartite	Assessment, Prioritisation, Monitoring	3	2	National	Multi-sectoral	Apply One Health into National Action Plans/ Strategic Framework/ Action Plans	FAO-ATLASS maps the national antimicrobial resistance (AMR) surveillance systems along 5 pillars (laboratory capacity and network, epidemiology unit, governance, communication, and sustainability). The tool consists of two modules – laboratory and surveillance – which include features of FAO-LMT and FAO-SET, focusing on AMR. FAO-ATLASS provides recommendations for improvement of the systems, evidence for action and advocacy, and measures progress relative to FAO Global AMR Action Plan. 5-day assessment carried out by certified FAO-ATLASS assessors. The first assessment is always carried out by external assessors, while follow up assessments may be carried by national assessors, or by FAO-ATLASS focal point. Evaluations include: (i) a preparatory phase where all relevant documents are gathered for the country assessed; (ii) meetings with all national authorities and stakeholders for the assessment of the whole AMR surveillance system in the country, and (iii) the evaluation of each laboratory included or to-be-included in the national AMR surveillance system.	Outputs of FAO-ATLASS evaluations include: (i) a final report summarizing the outcome of the assessment including description of findings, a progressive improvement pathway (PIP) score and recommendations for the gradual improvement of the AMR surveillance system; (ii) for each laboratory: FAO-LMT AMR and PIP scoring are generated; and (iii) for the National AMR surveillance system: the PIP scoring identifies and prioritizes the areas of intervention for five pillars of an AMR surveillance system (laboratory capacity and network, epidemiology unit, governance, communication, and sustainability).	https://www.fao.org/antimicrobial-resistance/resources/tools/fao-atlass/en/ https://doi.org/10.3389/fvets.2022.1057040	FAO (2016a); Keck <i>et al.</i> (2023)
Emerging Infectious Disease (EID) Risk Profile	2017	EcoHealth Alliance	NGO	Assessment	2	2	National, sub-national	Multi-sectoral	Enhance One Health Systems Capacity	The EID Risk Profile uses a standard template to identify factors, including country-specific ones, which may affect (decrease or increase) emerging infectious disease risk and impact. It aims to promote shared understanding across sectors and institutions about potential sources of risk, as well as potential opportunities for risk mitigation. It is meant to serve as a basis for discussion, including to consider the relevance of factors, target gaps in knowledge where further assessment may be needed, and identify priorities for pandemic risk reduction. Utilizing prior research, evaluations, and programs, the process involves a literature review led by national experts, via a national workshop to review and discuss initial findings, and completion and interpretation of completed assessment forms. The process also informs on utility of the tools to ensure their readiness and suitability for potential expanded use.	1. Risk profile: a high-level snapshot of key factors affecting disease emergence, spread, vulnerability, and protection; 2. Literature review: expands on relevant factors, particularly around current interfaces for emergence and anticipated changes that may affect risk; and 3. Country Assessment of Environmental Health Services: examines capacity to assess and manage threats, particularly related to wildlife-borne epidemic and pandemic prevention and detection.	https://www.ecohealthalliance.org/wp-content/uploads/2022/06/Ghana_Workshop-Report.pdf	EcoHealth Alliance (2017); EcoHealth Alliance (2021)

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Table 1. Continued.

Name of the One Health Tool	Year of first release	Contributing organization(s)	Organization level	Scope	Link with OH-JPA Action Track(s)	One Health Theory of Change Pathway ^a	Audience level	Audience type	Outcome of One Health tool usage	One Health tool description	Key outputs	Website, publications, and other available resources	References
One Health - Assessment for Planning and Performance (OH-APP)	2017	USAID/ Preparedness and Response	National	Implementation	1	2	National	Multi-sectoral	Build or Strengthen One Health Coordination/ Collaboration	The One Health Assessment for Planning and Performance (OH-APP) is a monitoring framework for multi-sectoral coordination mechanisms (MCM) to annually self-assess their organizational capacity and performance to inform planning and development assistance. The OH-APP complements the WHO Joint External Evaluation by providing more specific indicators to measure the maturity of a Multi-sectoral, One Health Coordination Mechanism and benchmark its progress toward becoming a sustainable mechanism capable of coordinating multi-sectoral and multi-stakeholder collaboration for preparedness and response to public health threats. The OH-APP is administered over the course of a two-day workshop, using participatory decision making tools. Assessment results are used to inform decision making around joint planning, implementation and response to public health threats.	The report produced by the OH-APP, including assessment scores, visualizations, and agreed actions, is used to support MCM annual planning and development assistance. Resources accessible through the OH-APP site are used to support further development of MCM capacity and performance.	https://www.onehealthisapp.org/about https://pdf.usaid.gov/pdf_docs/PA00TTD9.pdf https://s3.amazonaws.com/one-health-app-static/docs/toolkits/Stakeholder_Mapping_Toolkit_OH-APP.pdf https://s3.amazonaws.com/one-health-app-static/docs/toolkits/Private_Sector_Engagement_Toolkit_OH-APP.pdf https://s3.amazonaws.com/one-health-app-static/docs/toolkits/Gender_Integration_Toolkit_OH-APP.pdf https://s3.amazonaws.com/one-health-app-static/docs/toolkits/One_Health_Sensitization_Toolkit_OH-APP.pdf https://s3.amazonaws.com/one-health-app-static/docs/toolkits/Org_Structure_and_TOR_Toolkit_OH-APP.pdf https://s3.amazonaws.com/one-health-app-static/docs/toolkits/Leading_Change_Toolkit_OH-APP.pdf https://www.onehealthisapp.org/abouthttps://s3.amazonaws.com/one-health-app-static/docs/toolkits/One_Health_Strategic_Plan_Toolkit_OH-APP.pdf https://s3.amazonaws.com/one-health-app-static/docs/toolkits/Sustainable_Funding_Strategy_Toolkit_OH-APP.pdf https://s3.amazonaws.com/one-health-app-static/docs/toolkits/Governance_Manual_Toolkit_OH-APP.pdf https://s3.amazonaws.com/one-health-app-static/docs/toolkits/Platform_Launch_Toolkit_OH-APP.pdf https://s3.amazonaws.com/one-health-app-static/docs/toolkits/Disease_After_Action_Review_Toolkit_OH-APP.pdf https://s3.amazonaws.com/one-health-app-static/docs/toolkits/Preparedness_and_Response_Toolkit_OH-APP.pdf https://s3.amazonaws.com/one-health-app-static/docs/toolkits/Simulation_Toolkit_OH-APP.pdf https://s3.amazonaws.com/one-health-app-static/docs/toolkits/Incorporating_One_Health_into_Policy_and_Technical_Guidance_Toolkit_OH-APP.pdf https://s3.amazonaws.com/one-health-app-static/docs/toolkits/Policy_Advocacy_Toolkit_OH-APP.pdf https://s3.amazonaws.com/one-health-app-static/docs/toolkits/One_Health_Policy_Model_OH-APP.pdf	USAID, Preparedness and Response (2017a, 2017b, 2018)

National Bridging Workshops (NBW) Program	2017	WHO, WOA, FAO	Quadripartite	Assessment	1	2	National	Multi-sectoral	Build or Strengthen One Health Coordination/ Collaboration	The NBW assesses strengths and weaknesses in the One Health collaboration for 15 key technical areas and develops an actionable, joint NBW Roadmap to improve the collaboration. Implementation of the NBW Roadmap is followed-up upon and supported (NBW Catalysts, NBW Follow-up). "Implemented as a workshop in seven steps over three days: (i) setting the scene; (ii) case studies and diagnosis of the levels of collaboration for 15 key technical areas; (iii) IHR and PVS tools and mapping of the identified gaps on the IHR-PVS matrix; (iv) extraction and compilation of results from previous assessments; (v) development of a joint roadmap (objectives and activities); (vi) fine-tuning of the NBW Roadmap; and (vii) way forward and linkages with other mandated plans. In many countries, a NBW catalyst is then recruited by the Tripartite to support the implementation of the NBW Roadmap activities. Some of the NBW Roadmap activities are directly supported by the Tripartite. A NBW follow-up workshop is conducted every 1–2 years to monitor the implementation.	1. A diagnosis of the strengths and weaknesses of the current collaboration coordination between animal health, human health and environmental health services (based on 4-5 priority zoonotic diseases); 2. A NBW Roadmap of joint activities that the three sectors commit to implementing in order to improve their collaboration at the animal-human-environment interface; and 3. Implementation and M&E of the NBW Roadmap activities.	https://www.who.int/activities/bridging-human-and-animal-health-sectors https://extranet.who.int/sph/ihr-pvs-bridging-workshop	WHO (2023); WHO, WOA and FAO (2017)
FAO Laboratory mapping tool (FAO-LMT)	2018	FAO	Quadripartite	Assessment, Monitoring, Prioritising	1, 2, 3, 4	2	National, sub-national	Laboratory	Enhance One Health Systems Capacity	FAO-LMT is a standardized, semi-quantitative toolkit used to determine gaps in laboratory functionality and define mechanisms and targets for capacity building. The FAO-LMT-core assesses the veterinary laboratories general functionality through 108 questions. The FAO-LMT family was further expanded in 2016 with the release of the FAO-LMT-Safety (98 questions) providing a standardized assessment of environmental safety of veterinary laboratories and occupational risks. FAO is currently pilot testing and will release 3 new FAO-LMT modules, related to the assessment of laboratory capabilities to support the prevention of and response to an agro-terrorist or agro-criminal act affecting animal health and production (FAO Laboratory Mapping Tool-Bio-Threat module (LMT-BT)), as well as the laboratory capabilities to detect FMD and PPR (LMT-FMD and LMT PPR modules).	The tool automatically generates graphical outputs and a profile which can be followed over time to evaluate the evolution of laboratory capacities, guide capacity building and develop strategic plans that will correspond to individual laboratory needs, addressing all key elements required for an operational laboratory.	https://www.fao.org/3/i5439e/i5439e.pdf https://www.mdpi.com/2414-6366/3/1/33	FAO (2016b, 2018b); Mouillé <i>et al.</i> (2018)
FAO Surveillance Evaluation Tool (FAO-SET)	2018	FAO	Quadripartite	Assessment, Monitoring	1, 2, 3	3	National, sub-national	Animal health	Build or Strengthen One Health Coordination/ Collaboration	FAO-SET is a comprehensive and standardized evaluation of national animal/zoonotic disease surveillance systems along 96 indicators organized in 19 categories, including aspects of intersectoral cooperation between veterinary services, public health and wildlife. FAO-SET provides veterinary services with a 360-degree assessment of their surveillance network, which is used to develop a locally relevant action plan for capacity building of national animal disease surveillance. Teams of 5–10 people (FAO staff and national focal point(s) from the veterinary services) conduct an initial evaluation to provide a baseline of the animal disease surveillance system. Missions may last between 10 and 12 days where stakeholders are interviewed at all levels of the system (central, intermediate, field). Information collected is entered into FAO-SET, and outputs are automatically generated, allowing the evaluation team to develop an action plan for improvement with specific, measurable, attainable, relevant and prioritized recommendations. Subsequent evaluations may occur every 3–5 years thereafter.	Visual outputs generated by the tool include: (i) capacity for core categories of surveillance system and (ii) performance attributes of system. A final evaluation report is generated with evaluation results and a locally relevant action plan for improvement of the national animal disease surveillance system.	https://www.fao.org/3/CA2747EN/ca2747en.pdf	FAO (2018a, 2018d)

Table 1. Continued.

Name of the One Health Tool	Year of first release	Contributing organization(s)	Organization level	Scope	Link with OH-JPA Action Track(s)	One Health Theory of Change Pathway ^a	Audience level	Audience type	Outcome of One Health tool usage	One Health tool description	Key outputs	Website, publications, and other available resources	References
FAO Methodology to Analyze AMR-relevant legislation in the food and agriculture sectors	2018	FAO	Quadrupartite	Assessment	4, 5	1	National	Multi-sectoral	Enhance One Health Systems Capacity	The FAO Methodology identifies the legal areas relevant for AMR in the food and agriculture sectors and the elements of those areas that can be strengthened to support AMR policy objectives. It includes chapters on veterinary legislation, food safety, plant health and pesticides management, the environment, and AMR governance. It was developed with inputs from WOA and has been implemented in 27 countries and four regional organizations. The FAO Methodology is aimed at supporting AMR legal analysis at the national level. To this purpose, it is applied through a process that involves national lawyers and the national counterparts for all ministries and entities with a role on AMR. In close collaboration and coordination with the national counterparts, the national lawyer identifies and analyses the legal framework across all relevant sectors following the questionnaire that is included in the Methodology. The resulting legal analysis identifies legal gaps, weaknesses and opportunities for legal reform.	National reports identifying legal gaps, weaknesses and opportunities for legal reform in AMR relevant legislation in the food and agriculture sectors.	https://www.fao.org/antimicrobial-resistance/key-sectors/legislation/en/#:~:text=The%20Methodology%20is%20a%20guidance%20document%20initially%20created,regulatory%20areas%20of%20the%20food%20and%20agriculture%20sector	FAO (2018c)
One Health Monitoring Tool (OHMT)	2018	FAO	Quadrupartite	Assessment	1, 2, 3, 4, 5, 6	2	National, sub-national	Multi-sectoral	Build or Strengthen One Health Coordination/ Collaboration	The One Health Monitoring Tool assesses the status of One Health institutionalization and national operationalization covering all One Health areas (food safety, AMR, zoonotic diseases, environment, biosafety and security and etc.). The One Health monitoring tool (OHMT) consists of three sets of criteria: (i) communication, coordination, collaboration; (ii) multi-sectoral disease response; and (iii) sustainability. These criteria are scored at five capacity levels (no capacity; limited capacity; developed capacity; demonstrated capacity; and sustainable capacity).	Comprehensive and coordinated high-level assessment of One Health governance and implementation progress, identify gaps and challenges, and orient users to identify priority actions and to leverage on existing One Health tools and resources to address the gaps.	https://www.atlantipress.com/proceedings/essah-19/125927943 https://www.fao.org/liberia/news/detail-events/en/c/1477413/	FAO (2018e, 2022); Wicaksono <i>et al.</i> (2019)
FAO Progressive Management Pathway for Antimicrobial Resistance (FAO-PMP-AMR)	2019	FAO	Quadrupartite	Action Plans	5	2	National	Multi-sectoral	Apply One Health into National Action Plans/ Strategic Plans/ Framework/ Action Plans	The FAO-PMP-AMR serves as a guide to help countries put their NAPs into action. The progressive approach enables specific sectors to make step-by-step improvements toward the sustainable use of antimicrobials and management of AMR. FAO helps countries apply the FAO-AMR-PMP approach through in-country workshops, which usually take two to four days. These workshops bring together public and private stakeholders to self-assess the level of NAP implementation in their country and agree on actions to be taken to take AMR management to a higher stage as required. The trained FAO-PMP-AMR facilitators help participants assess progress within the different focus areas and stages. Using the FAO-PMP-AMR tool, stakeholders quantify this progress through a dashboard that displays gaps and next steps for NAP implementation.	The FAO-PMP-AMR assessment enables countries to identify gaps and challenges in implementing national activities against AMR. It generates short- and mid-term action strategy, facilitating focused efforts to address these issues and fortify the country's commitment to combating AMR across various sectors. Subsequent reassessments allow countries to monitor and track the progress made in their AMR initiatives.	https://www.fao.org/antimicrobial-resistance/resources/tools/fao-pmp-amr/en/ https://www.fao.org/antimicrobial-resistance/news-and-events/news/news-details/en/c/1251863/	FAO (2019a, 2019b)

Data Reporting Tool (DaRT) for Multilateral Environment Agreements (MEAs)	2019	UNEP	Quadripartite	Assessment	6	3	National, sub-national	Multi-sectoral	Address environment needs to strengthen One Health	DaRT represents a single entry platform for various tools, for the implementation of biodiversity related conventions, for indicators of biodiversity as well as for data related tools. It represents a working platform for the user to collect, store and use data across the different conventions and to support the constitution of reports.	https://dart.informea.org/files/inline-files/DaRT_Handbook_200626_1.pdf	UNEP (2019a, 2020)
Resource Mapping for IHR and Health Security (Remap)	2019	WHO	Quadripartite	Assessment	1	1	National	Multi-sectoral	Enhance One Health approach to Emergency Response/ Rapid Response	The Resource Mapping and Impact Analysis on Health Security Investment (REMAP) is an Excel based tool developed by WHO to map the resources available and potential that contribute to building and maintaining IHR capacities at country level. WHO supports countries to develop suitable templates and checklists for the REMAP based on country context. This is done through consultations with multi-sectoral national stakeholders, including donors and partners.	https://apps.who.int/ris/bitstream/handle/10665/329385/WHO-WHE-CPI-2019_17-eng.pdf?sequence=1&isAllowed=y	WHO (2019c)
Health Emergency and Disaster Risk Management Framework (HEDRM) Framework	2019	WHO	Quadripartite	Implementation	1	2	National	Multi-sectoral	Enhance One Health approach to Emergency Response/ Rapid Response	The Health EDM Framework was published in 2019 to describe comprehensive actions to reduce hazards, exposures, and vulnerabilities and strengthen capacities for prevention, preparedness, response, and recovery.	https://apps.who.int/ris/handle/10665/326106	WHO (2019a)
Food Control System Assessment Tool	2019	WHO, FAO	Quadripartite	Assessment	1, 4	2	National, sub-national	Multi-sectoral	Enhance One Health Systems Capacity	The WHO/FAO Food Control System Assessment Tool was jointly developed as a comprehensive tool to assess the effectiveness of national food control systems. The aim is to propose a harmonized, objective and consensual basis to analyse the performance of a national food control system. It will help to identify priority areas of improvement and plan sequential and coordinated activities to reach expected outcomes. The Tool is based on Codex principles and Guidelines for National Food Control Systems, as well as other relevant Codex guidance for food control systems, and its scope is given by the dual objectives quoted in Codex guidance for these systems: protect health of consumers and ensure fair practices in the food trade. The Food Control Systems Assessment Tool is to protect the health of consumers and ensure fair practices in the food trade. Food chain covers primary production through to the consumer. Tool based on Codex Alimentarius guideline and IHR. Participatory approach involving public and private sectors stakeholders.	https://www.fao.org/fao-who-codexalimentarius/news-and-events/news-details/en/c/1201886/ https://www.who.int/publications/item/9789240028371 https://www.fao.org/food-safety/food-control-systems/assessment-tool/en/ https://www.who.int/publications/item/9789241515719	FAO (2023a); FAO and WHO (2019a, b, 2021)

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Table 1. Continued.

Name of the One Health Tool	Year of first release	Contributing organization(s)	Organization level	Scope	Link with OH-JPA Action Track(s)	One Health Theory of Change Pathway ^a	Audience level	Audience type	Outcome of One Health tool usage	One Health tool description	Key outputs	Website, publications, and other available resources	References
One Health Toolkit for Health Officials Managing Companion Animals with SARS-CoV-2	2020	CDC	National	Implementation	1	2	National, subnational	Multi-sectoral	Build or Strengthen One Health Coordination/ Collaboration	The One Health Toolkit for Health Officials Managing Companion Animals with SARS-CoV-2 provides multiple resources for COVID-19 case investigations and outbreak management for people and animals in shared environments with SARS-CoV-2 infections. This toolkit is for health officials managing cases of zoonotic SARS-CoV-2 infections within their jurisdiction, including state public health veterinarians, state animal health officials, zoonotic disease epidemiologists, and wildlife health specialists. State, tribal, local, and territorial (STLT) jurisdictions may have their own specific requirements for management. Public health officials, animal health officials, veterinarians, and wildlife health specialists should collaborate using a One Health approach when deciding to test an animal or conduct epidemiologic investigations for animals with confirmed SARS-CoV-2 infection. Early coordination with federal animal and public health partners is encouraged.	Public health and animal health officials collaborate using a One Health approach to conduct epidemiological investigations for companion animals with SARS-CoV-2 infection. Early coordination and communication between state and federal animal and public health partners is established.	https://www.cdc.gov/coronavirus/2019-ncov/animals/toolkit.html	CDC (2020)
One Health Risk Analysis System (OHRAS)	2020	COHESIVE, a One Health European Joint Programme project	International/ regional	Assessment	1	2	national	Multi-sectoral	Build or Strengthen One Health Coordination/ Collaboration	OHRAS is a combination of six activities: One Health (OH) signaling, OH risk assessment, OH feasibility assessment, OH Risk management and OH Governance. Communication and OH Governance. The way in which these activities are designed and implemented is very flexible and can therefore be specifically adapted and applied to the needs of each country.	Support countries to set up or strengthen One Health collaboration in the area of risk analysis (signaling, risk assessment, risk management, and risk communication) of zoonoses including antimicrobial resistance.	https://www.ohras.eu/page/home https://onehealth.eu/wp-content/uploads/2021/06/COHESIVE-OHRAS-infographics.pdf	COHESIVE (a One Health European Joint Programme project) (2020)
Tripartite Zoonoses Guide (TZG) Joint Risk Assessment Operational Tool (JRA OT)	2020	WHO, FAO, WOAH	Quadrupartite	Implementation	1	2	National	Multi-sectoral	Enhance One Health Systems Capacity	The TZG JRA OT provides a step-wise process to conduct joint qualitative risk assessments for priority zoonotic diseases, resulting in risk management and communication options that address the complexities at the human-animal-environment interface.	A final report including: (i) a detailed technical assessment of the risk for each selected hazard; (ii) risk management and communication options; (iii) a plan to reconvene participants for additional follow-up and risk assessment.	https://www.who.int/initiatives/tripartite-zoonosis-guide/ https://www.who.int/initiatives/tripartite-zoonosis-guide/joint-risk-assessment-operational-tool https://www.who.int/initiatives/tripartite-zoonosis-guide/joint-risk-assessment-operational-tool-webversion.pdf https://www.fao.org/3/cb1520en/	WHO, FAO and WOAH (2020)

Stepwise Approach to Rabies Elimination (SARE)	2021	CDC, Global Alliance for Rabies Control (GARC)	National, NGO	Implementation	3	2	National	Multi-sectoral	Enhance One Health Systems Capacity	The Stepwise Approach towards Rabies Elimination (SARE) has been developed as a practical planning, monitoring and evaluation tool to guide, develop, and refine rabies control programs. This tool provides tangible and achievable steps for the control and prevention of dog transmitted rabies. The list below shows the outcome of a high-level technical meeting and provides the elements that ideally need to be in place to allow and facilitate effective intersectoral collaboration in the spirit of a One Health approach.	The SARE tool provides an Excel assessment scoresheet with measurable steps, designed as a logical flow of activities, to progress from Stage 0 to Stage 5, in efforts toward freedom from dog transmitted rabies. Countries with no information on rabies start at Stage 0, while others may start further along the scale, and when the country reaches Stage 5, it is free from dog-transmitted rabies.	https://rabiesalliance.org/tools/planning-tools/sare	CDC and GARC (2021)
Evaluation of Collaboration for Surveillance The Evaluation of Collaboration for Surveillance (EcoSur) tool	2021	CIRAD (French Agricultural Research Centre for International Development)	National	Assessment	5	2	National	Multi-sectoral	Build or Strengthen One Health Coordination/ Collaboration	The EcoSur tool aims at evaluating the organization, functioning, and functionalities of collaboration taking place in a multi-sectoral surveillance system. The final purpose is to assess whether collaboration as planned and implemented is relevant and functional to produce the expected collaborative outputs. The tool relies on the scoring of 22 attributes and three indexes characterizing the organization of collaboration at the governance and operation level and nine attributes referring to core functions of collaboration to ensure the sustainable operation of an effective multi-sectoral surveillance system. Three automatically generated outputs display the evaluation results for attributes and indexes and support the identification of strengths and weaknesses of collaboration and the formulation of recommendations for its amelioration.	1. The organization and functioning of the collaboration in the multi-sectoral surveillance system. 2. The key functions of collaboration for an effective and sustainable multi-sectoral surveillance system.	https://www.survtools.org/wiki/surveillance-evaluation/lib/exe/fetch.php?media=files:guidance_v2.pdf https://link.springer.com/content/pdf/10.1007/978-3-030-82727-4_9.pdf	Bordier et al. (2022); French Agricultural Research Centre for International Development (CIRAD) (2021)
OUTCOST	2021	FAO	International/ regional, academic	Assessment	1	1	National	Animal health	Enhance One Health Systems Capacity	OUTCOST is a decision support tool that estimates the losses due to the occurrence of an infectious disease in an animal population of a geographical region, and its control, and the costs associated with its prevention and/or treatments based on a deterministic model. The tool can be used for actual epidemics or hypothetical scenarios, therefore allowing estimation of the potential cost of future outbreaks and alternative management strategies.	Cost analysis of actual epidemics or future hypothetical scenarios.	https://www.fao.org/leadadmin/user_upload/faoweb/animal-health/OutCost_PIG.xlsx https://pubmed.ncbi.nlm.nih.gov/35526144/	Casal et al. (2022); FAO (2021a)

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Table 1. Continued.

Name of the One Health Tool	Year of first release	Contributing organization(s)	Organization level	Scope	Link with OH-JPA Action Track(s)	One Health Theory of Change Pathway*	Audience level	Audience type	Outcome of One Health tool usage	One Health tool description	Key outputs	Website, publications, and other available resources	References
European Joint Programme (EJP) Decision Support Tool	2021	European Commission	International/ regional	Implementation	3	3	National	Multi-sectoral	Enhance One Health Systems Capacity	The EJP Decision Support Tool will: Showcase fifteen risk assessment approaches, providing a short description of each; Broadly assess your needs and limitations using a series of questions; Make suggestions on those needs and limitations; and be easily reset and adjusted for changing answers, allowing the user to explore many different paths.	Qualitative risk assessment Deterministic risk assessment Stochastic risk assessment Bespoke modelling techniques Qualitative disease prioritization Semi-quantitative disease prioritization Quantitative disease prioritization Multi-country disease prioritization Regional disease prioritization Cost-benefit analysis Import risk assessment: stochastic Farm-to-consumption QMRA Preliminary outbreak assessment Rapid risk assessment Horizon scanning	https://cohesive.onehealth.eu/projects https://onehealth.eu/projects	European Commission (2021); One Health European Joint Programme (2023)
Progressive Pathway for Emergency Preparedness (PPEP)	2021	FAO	Quadripartite	Implementation	3	2	National	Multi-sectoral	Improve performance of veterinary services for One Health needs	Progressive pathway for emergency preparedness (PPEP) is a capability building process and a tool that enables countries to self assess and standardize their animal health emergency management capacity needs.	The PPEP provides a 'diagnostic kit' to be applied to individual countries to identify their and their regions' capability needs in terms of readiness as regards animal health emergencies, and to pinpoint how countries can work both independently and collectively to assist each other in reaching an adequate level of preparedness, particularly in terms of transboundary animal diseases. Once the results of the assessments are gathered in a reasoned analytic report, it can be shared with FAO's regions and FAO EMC for strategic planning and implementation purposes.	https://www.fao.org/3/cb7324en/cb7324en.pdf#:~:text=Developed%20by%20the%20Food%20and%20Agriculture%20Organization%20of%20standardise%20their%20animal%20health%20emergency%20management%20capacity%20needs	FAO (2021b)
Strategic Toolkit for Assessing Risks (STAR)	2021	WHO	Quadripartite	Assessment	1	2	National	Multi-sectoral	Enhance One Health approach to Emergency Response/ Rapid Response	STAR is a comprehensive toolkit serves to provide guidance for developing appropriate risk assessments to better prevent, prepare, for, and respond to a health emergency or disaster. The STAR approach, which involves six key steps, uses a participatory approach and consolidation of existing evidence to describe the risks in the country including the following: 1. Identify country hazard(s) and describe the most likely scenario to require activation of national response; 2. Assess the likelihood of the risk occurring; 3. Estimate the impact of the risk to the country; 4. Determine the estimated level of risk; 5. Draft key recommendations and priority actions based on the risk ranking; 6. Integrate recommendations into the national and subnational action planning process.	The expected outputs from a STAR workshop is a country risk profile, which includes: A risk matrix (ranking risks visually on a 5x5 matrix, describing likelihood and impact of the hazard); a risk summary (describing health consequences, scale of the hazard and identified population at risk, frequency of occurrence, likelihood to occur, seasonality, severity, vulnerability, coping capacity, potential impact, and confidence level in data available for each hazard); and Overall workshop report that consolidates the risk matrix, risk summary, as well as initial short-term prioritized action planning. Using the results of the strategic risk assessment, countries will be able to apply evidence to inform country planning, prioritize key actions for rapid scale-up of capabilities for high risks, and rationalize and make effective use of limited resources for strengthening health emergency and disaster risk management capacities in the context of competing priorities.	https://www.who.int/publications/item/9789240036086	WHO (2021a)

2021	WHO	Quadrupartite	Assessment	5	1	National	Multi-sectoral	Apply One Health into National Action Plans/ Strategic Plans/ Framework/ Action Plans	The WHO costing and budgeting tool for national action plans on antimicrobial resistance user guide describes the step-by-step processes for using the costing tool and data capture forms, functionalities of the tool, resulting outputs of dashboards, graphics and summary analyses. This manual should be used in conjunction with other WHO resources, such as the draft WHO implementation handbook for national action plans on antimicrobial resistance and turning plans into action for antimicrobial resistance (AMR). The WHO Costing and Budgeting Tool for NAPs on AMR is user friendly, flexible, easy to navigate, and adaptable to the needs of countries. It can be used to calculate and visualize detailed costs for prioritized activities included in the NAPs on AMR. Taking into account the different country contexts, the tool can be filled using a modular approach which allows different sectors, ministries or event departments to fill in the tool independently and these plans can then be consolidated into one national costing plan. NAP entry: the user specifies the NAP priorities, objectives and activities that were selected for costing. Basic inputs: the user enters key parameters relevant to their country, including ministry/implementer names, funder names, implementation years and unit costs for various items. Costing matrix: these tabs are automatically generated after NAP entry is completed and are used to insert sub-activities and to enter unit costs and units according to the implementation developed by the country prior to costing. Funding (optional): the user enters existing funds from various sources/donors. This step is optional but recommended and can be completed at any time after NAP entry is complete. Dashboards: the user can specify various cross-tabulations and levels of analysis to produce dashboards and visualize all data. The Dashboard tab summarizes cost data entered by the user. The Funding Dashboard tab combines cost and funding data (if funding data in Step 4 above have been entered) by the user.	Identification of priority activities in plan, prioritization of activities based on evidence and resources, development and/or revision of AMR operational plan, costing of plan, resource mapping, re-prioritization of activities based on evidence and resources available.	https://www.who.int/teams/surveillance-prevention-control-amr/who-amr-costing-and-budgeting-tool	WHO (2021b)
2022	WHO, FAO, WOAAH	Quadrupartite	Implementation	1	2	National	Multi-sectoral	Build or Strengthen One Health Coordination/ Collaboration	The TZG SIS OT supports national authorities in their efforts to establish or strengthen a One Health multi-sectoral coordinated surveillance and information sharing system for zoonotic diseases. This tool includes a stepwise assessment for users to evaluate the existing capacity within their country, to identify activities and ultimately create a roadmap and a workplan to establish or strengthen their coordinated surveillance and information sharing system. For each activity, the SIS OT recommends a curated array of tools and resources, with comprehensive guidance for selection. Designed for nations across the spectrum of surveillance capabilities, the SIS OT helps those without a foundational system to establish one, while also aiding countries with mature systems to further refine their processes. The tool package includes a guidance document with annexes and an Excel-based workbook (SIS OT workbook).	1. Provides a stepwise methodology to guide assessment of the national structures or mechanisms already in place to support coordinated zoonotic disease surveillance and cross-sectoral information sharing. It is based on the framework of activities necessary to develop a national coordinated SIS system for zoonotic diseases; 2. Generates an SIS development plan which includes a list of activities and a timeline to advance development of the national coordinated surveillance system for zoonotic diseases; and 3. Provides an inventory of suggested resources to support each of the activities in the list, based on nationally established priorities and unique situational needs.	https://www.fao.org/documents/card/en/cc0716en https://www.who.int/initiatives/tripartite-zoonosis-guide/surveillance-and-information-sharing-operational-tool https://www.woah.org/app/uploads/2022/09/af-sis-eng-woah-web.pdf	WHO, FAO and WOAHA (2022b)
WHO Costing and Budgeting Tool for National Action Plans on Antimicrobial Resistance (and User Guide)												
Tripartite Zoonoses Guide (TZG) Surveillance and Information Sharing Operational Tool (SIS OT)												

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Table 1. Continued.

Name of the One Health Tool	Year of first release	Contributing organization(s)	Organization level	Scope	Link with OH-JPA Action Track(s)	One Health Theory of Change Pathway*	Audience level	Audience type	Outcome of One Health tool usage	One Health tool description	Key outputs	Website, publications, and other available resources	References
Tripartite Zoonoses Guide (TZG) Multi-sectoral, One Health, Coordinating Mechanism Operational Tool (MCM OT)	2022	WHO, FAO, WOAH	Quadrupartite	Implementation	1	2	National	Multi-sectoral	Build or Strengthen One Health Coordination/ Collaboration	The TZG MCM OT provides countries a step-wise process to address 18 technical elements critical for establishing or strengthening a government-led Multi-sectoral, One Health, Coordination Mechanism.	After completing the MCM OT process, countries will have multi-sectoral agreement on the scope and role of the MCM, a government-validated action plan for implementing next steps, and materials for a 6-month impact evaluation.	https://www.who.int/initiatives/tripartite-zoonosis-guide/multisectoral-coordination-mechanism-operational-tool https://www.woah.org/app/uploads/2022/09/mcm-veng-woah-2.pdf https://www.fao.org/documents/card/en/c/cc0483en/	WHO, FAO and WOAH (2022c)
Response Preparedness (REPREP) Programme	2022	WHO, FAO, WOAH	Quadrupartite	Action Plans	1, 2, 3, 4	2	National, subnational	Multi-sectoral	Build or Strengthen One Health Coordination/ Collaboration	The Response Preparedness Programme (REPREP) scope is to facilitate the development of a national framework for coordination between the human health sector, the animal health sector, the environmental health sector and other relevant sectors for the management of outbreaks of zoonotic disease. This program consists of three components: 1. An online introduction; 2. A 3-day interactive national workshop; 3. Post-workshop assignment(s). The purpose of the program is to strengthen the capacity and preparedness of countries for the response to outbreaks of zoonotic disease, through improved coordination between sectors and by applying One-Health principles.	1. Joint framework for a coordinated response to zoonotic disease outbreaks. 2. Increased understanding of expertise and capacities existing in other sectors and opportunities and benefit to pool and synergize between sectors.	http://www.who.int/initiatives/tripartite-zoonosis-guide/response-preparedness/	WHO, FAO and WOAH (2022a)
Country Assessment for the Environment Sector in Health	2022	EcoHealth Alliance	NGO	Assessment	6	2	National	Multi-sectoral	Address environment needs to strengthen One Health	This Country Assessment for the Environment Sector in Health complements other resources that can assist countries in assessing capacities to target areas of risk, improve risk management, and potentially inform investment, such as the World Bank's "Climate Change and Health Diagnostic: a country-based approach for assessing risks and investing in climate-smart health systems" and forthcoming tools (e.g. Needs Assessments related to the Environment Sector and National Wildlife Health Programs) targeted to collaboration at the human-animal-environment interface. It is intended to be a practical resource, to be built on and strengthened to best serve the needs of the environment sector.	A precise definition for Environmental Health Services is still evolving. Entry points relate to air, land, and water, and the functional components that are shaped by inputs from multiple ministries/departments. Together, these enable capacity to protect natural systems and manage determinants of environmental health. While recognizing that abiotic factors affect ecosystem integrity and should be considered by broader environmental services, the overall scope of the tool is focused on the health of living ecological components – specifically humans, animals and plants. List of Components: I. Resources, Governance, and Collaboration; (i) Personnel Resources; (ii) Financial Resources; (iii) Governance/Legal Authority; (iv) Collaboration II. Technical Aspects: (i) Environmental Surveillance; (ii) Laboratory; (iii) Risk Analysis; (iii) Emergency Management III. Focal Issues: (i) Aquatic and Terrestrial Wildlife and Ecosystems; (ii) Vectors; (iii) Invasive Alien Species; (iv) Plants and Soil.	https://www.ecohealthalliance.org/country-assessment-for-the-environment-sector-in-health#:~:text=Country%20Assessment%20for%20the%20Environment%20Sector%20for%20the%20Environment%20Sector%20in%20Health%20tool	EcoHealth Alliance (2022)

CADRI (Capacity for Disaster Reduction Initiative) Digital Tool	2022	United Nations Development Programme (UNDP)	International/ regional	Assessment	1, 6	2	National	Multi-sectoral	Enhance One Health approach to Emergency Response/ Rapid Response	The CADRI tool is used to guide assessors and planners to apply an analytical frame to assess capacities to manage disaster risk reduction (DRR) and climate change adaptation (CCA) that is relevant to a country context. As a joint UN program with joint funding proposals, it is used to assist in developing national (DRR) and CCA strategies, inform on national contingency planning, identify entry points for risk reduction in national development plans.	The CADRI Tool project goal was to develop a methodology and system that allows Capacity Diagnosis teams to customize country questionnaires based on an array of filters including modules, hazards, capacities, report elements, and principles. Once a questionnaire is generated for a particular country, team members are invited to the system to tailor their questionnaire subsets further for use and application in the field.	https://www.cadri.net/cadriool/home http://dh-ckan.apps.fao.org/dataset/toolkits-for-livelihood-assessment-climate-and-disaster-risk-screening-and-management/ resource/1545110b-b57-44b9-bfbc-a50cc14a2cb5	UNDP (2022)
The Epidemic Intelligence from Open Sources (EIOS)	2022	WHO	Quadrupartite	Implementation	1, 2, 3	3	National, subnational	Multi-sectoral	Build or Strengthen One Health Coordination/ Collaboration	EIOS Initiative is a unique collaboration between WHO and various stakeholders that brings together new and existing initiatives, networks and systems to create a unified all hazards, One Health approach to early detection, verification, and assessment of public health risks and threats using open source information.	It facilitates the global collaboration of partners from multiple sectors, supporting countries and other stakeholders to address future pandemic and epidemic risks with better access to data, better analytical capacities, and better tools and insights for decision making.	Azure account needed to login https://portal.who.int/eios/Login https://www.who.int/initiatives/eios	WHO (2022a)
WHO Implementation Handbook for National Action Plans on Antimicrobial Resistance: Guidance for the Human Health Sector	2022	WHO	Quadrupartite	Implementation	5	2	National	Public health	Apply One Health into National Action Plans/ Strategic Plans/ Framework/ Action Plans	The One Health approach to national action plans (NAP) on AMR calls for coordination and collaboration between the human health, animal health, agriculture and food production sectors. In collaboration with FAO and WOA, WHO has been monitoring the progress of country action on AMR through the annual Tripartite AMR country self-assessment survey (TACSS) since 2016. Results for 2019–2020 (TACSS 4.0) show that 88% of 136 responding countries had a NAP on AMR. However, only 20% of those countries have fully financed their NAPs, reflecting a major gap in implementation. For comprehensive and sustainable implementation of NAPs, coordination both across sectors and within individual sectors and programmes is critical. The Draft AMR Tripartite strategic framework sets objectives for collaborative action to address AMR. The present handbook focuses on providing technical guidance to strengthen implementation within the human health sector.	Develop national action plan and identify priorities for implementation, monitor/evaluate progress using human health indicators and health security assessments, and indicate a communication strategy for relaying plan progress.	https://www.who.int/publications/item/9789240041981	WHO (2022d)
Spillover: Viral Risk Ranking	2023	USAID, PREDICT, University of California at Davis, Global Virome Project	International/ regional, academic, NGO	Assessment	2	3	National, subnational	Multi-sectoral	Improve Surveillance and Information Sharing Across One Health Sectors	Spillover: Viral Risk Ranking explores and directly compares hundreds of virus, host and environmental risk factors to identify viruses with the highest risk of zoonotic spillover from wildlife to humans. Scientists developed Spillover for policy makers, scientists and the general public to assess the likelihood that a wildlife virus will spillover and spread in humans.	Spillover creates a spillover risk report for each virus using a comprehensive database of viral findings in wildlife and associated animal, virus and environmental risk factors and viral spillover risk data.	https://spillover.global/#curious https://www.frontiersin.org/10.3389/fzfr.2019.00068 https://www.pnas.org/doi/10.1073/pnas.2002324118	Grange <i>et al.</i> (2019); Grange <i>et al.</i> (2021); USAID <i>et al.</i> (2023)

*One Health Joint Plan of Action: Action Tracks: 1=Action track 1: enhancing One Health capacities to strengthen health systems; 2=Action track 2: reducing the risks from emerging and re-emerging zoonotic epidemics and pandemics; 3=Action track 3: controlling and eliminating endemic zoonotic neglected tropical and vector-borne diseases; 4=Action track 4: strengthening the assessment, management, and communication of food safety risks; 5=Action track 5: curbing the silent pandemic of AMR; 6=Action track 6: integrating the environment into One Health.

†One Health Theory of Change Pathways: 1=Pathway 1: policy, advocacy, and financing; 2=Pathway 2: organizational development, implementation, and sectoral integration; 3=Pathway 3: data, evidence, education, and knowledge exchange

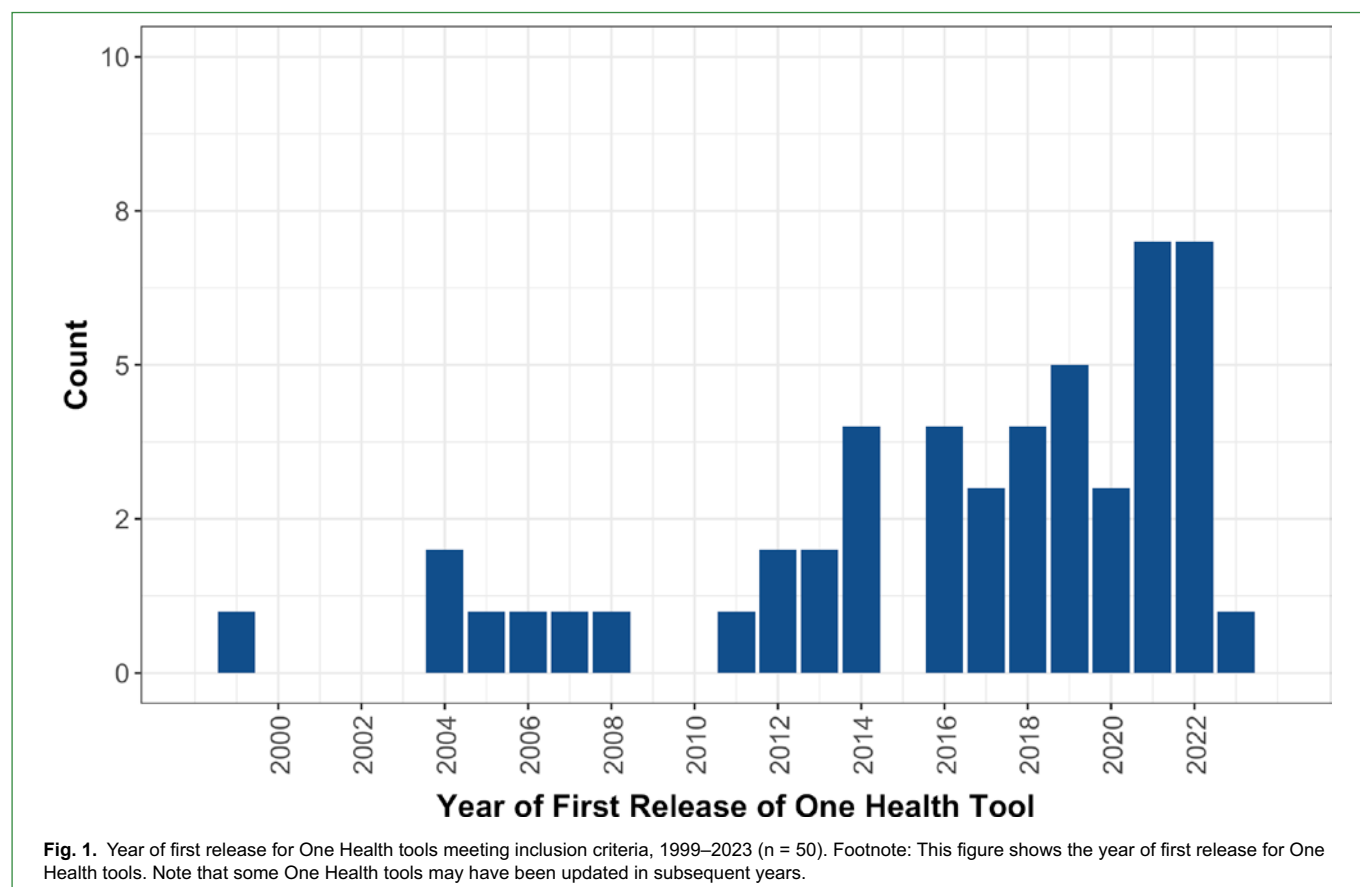
*Inclusion criteria for OHLEP tools database.

(1) The tool helps support a One Health approach to addressing health and/or environment issues at the human–animal–environment interface as outlined in the One Health Joint Plan of Action.

(2) The tool has been implemented at the national level in at least five countries, or if not used at a national level, the tool has been applied more than once in a non-research setting.

(3) The tool was validated by one or more OHLEP members or Quadrupartite partners who have familiarity with the tool or by consultation with the original tool implementer(s) involved in developing or implementing the tool.

This database of One Health Tools was developed by the One Health High Level Expert Panel (OHHLEP) at the request of the Quadrupartite. All links were validated as of 13 February 2024.



(organizational development and sectoral integration), while 18% (n = 9) focused on Pathway 3 (data, evidence, education, and knowledge exchange), and 16% (n = 8) covered Pathway 1 (policy, advocacy, and financing; Table 2).

ASSESSMENT OF LINKAGES ACROSS SCOPE, ACTION TRACKS, AND OUTCOMES

To deepen our exploration of the data, understanding the relationship between key descriptive variables is critical, especially in systems that rely heavily on collaboration across sectors. Alluvial plots were used to visualize the distribution of tools simultaneously across two descriptive areas of association between categorical variables (Figs. 3–5). In these representations, the plots serve to display how the categories of Scope, Action Tracks, and Outcomes can have many variations in linkages. Observing a large ratio variation across the data relationships can indicate which linkages are most common and where there are gaps. We selected the following plots (Figs. 3–5) to illustrate patterns that help answer our study questions posed in the landscape analysis section of methods; The width of the ribbons in each alluvial plot is proportional to the quantity represented in the flow between the variables.

We analyzed how One Health tools of each scope contributed to the six action tracks of the OH JPA. We found that tools addressing each scope, from Assessment through to Monitoring, could be applied to each of the six Action Tracks, with only one exception; there was no One Health tool categorized for monitoring antimicrobial resistance.

We analyzed the distribution of One Health Tool outcomes by the scope of the tool. There were tools of each scope available to achieve outcomes of Coordination and Collaboration, One Health Capacity building, Plans and Frameworks, and Surveillance. However, there were primarily Assessment scope tools available for environmental dimensions of One Health. There were

assessment, implementation, and monitoring One Health tools available for Veterinary Services, but no specific tools categorized for prioritization or action planning. Supplementary Appendix C presents additional data.

GENDER AND SOCIAL INCLUSION CONSIDERATIONS

As gender and inclusion aspects are an integral part of One Health implementation, the authors sought to assess the degree to which the selected One Health Tools supported gender and social inclusion considerations. Four (8%) One Health tools incorporated a strong intersectional gender analysis and addressed social inclusion. These were the UNEP Integrated Environmental Assessment Guidelines (UNEP, 2019c); the WHO's Strategic tool for Assessing Risks (STAR) (WHO, 2021a), One Health Assessment for Planning and Performance (OH-APP) (USAID and Preparedness and Response, 2017b), and the WHO's Joint External Evaluation Guidelines (JEE) for the International Health Regulations (WHO, 2016a, 2022b). Five tools (10%) addressed gender and social inclusion to some degree, at least regarding stakeholder involvement, but did not include detailed gender analysis or social inclusion and intersectionality. Thirty-one tools (64%) failed to mention gender or social inclusion. Ten tools (20%) could not be assessed for gender and intersectionality. This was either because the tool was not immediately available online to be assessed; the methodology was not described in sufficient detail to support the analysis; or the tool was embedded in or referred to many other tools that could not be individually analyzed due to time constraints. Supplementary Appendix D presents additional data.

ENVIRONMENT CONSIDERATIONS

Twenty-six percent (n = 13) of tools addressed Action Track 6 (Integration of Environment into One Health) either as a primary

Table 2. Summary of data for 50 One Health tools by organization, audience, scope, intended outcome of tool implementation, and linkage to One Health theory of change with each category ranked from highest to lowest.

Organization that developed One Health tool		
<i>Organization type (tools could be assigned to more than one category)</i>	<i>n</i>	<i>%</i>
Quadripartite (FAO-UNEP-WHO-WOAH)	34	57
International/regional	9	15
National	8	13
Non-governmental	5	8
Academic	4	7
Intended audience for One Health tool		
<i>Audience Category</i>	<i>n</i>	<i>%</i>
Multi-sectoral	38	76
Animal Health	4	8
Policy makers	4	8
Laboratory	2	4
Environmental Health	1	2
Public Health	1	2
Total	50	100
Scope for One Health tool		
<i>Scope Category (Tools could be assigned to more than one category)</i>	<i>n</i>	<i>%</i>
Assessment	29	47
Implementation	17	27
Monitoring	7	11
Action plans	5	8
Prioritization	4	7
Expected outcome for One Health tool use		
<i>Outcome Category</i>	<i>n</i>	<i>%</i>
Coordination/collaboration	14	28
One Health capacity	10	20
Plans/framework	7	14
Environment needs	7	14
Emergency response	6	12
Surveillance	4	8
Veterinary services	2	4
Total	50	100
Theory of change pathway		
<i>Pathway</i>	<i>n</i>	<i>%</i>
Pathway 2: organizational development and sectoral integration	33	66
Pathway 3: data, evidence, education, and knowledge exchange	9	18
Pathway 1: policy, advocacy, and financing	8	16
Total	50	100

Footnote: For some variables where noted, tools could be assigned to more than one category.

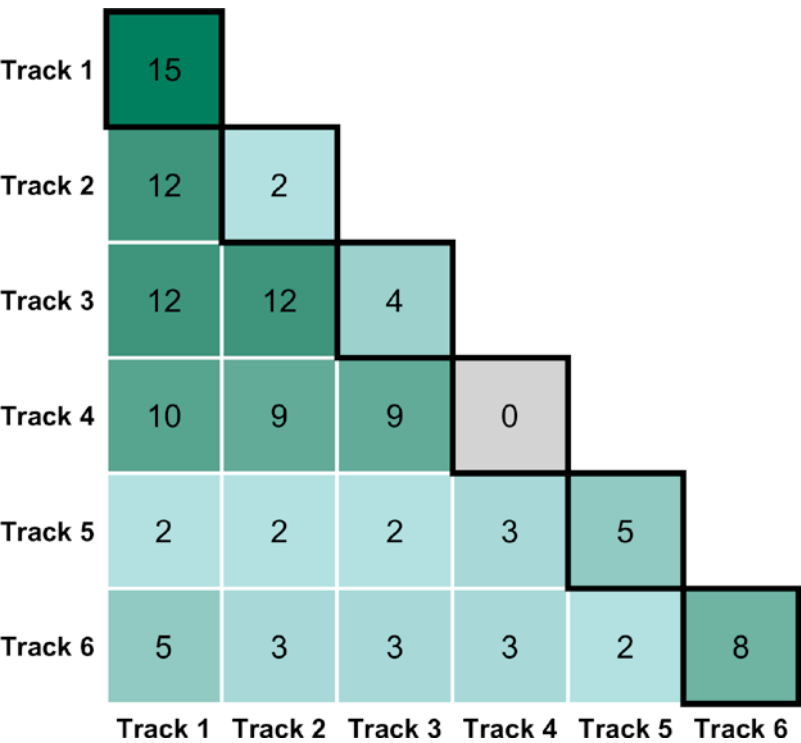


Fig. 2. Summary of One Health tools that address multiple action tracks in the One Health Joint Plan of Action. Footnote: The outer blocks, outlined in black, are counts of tools that address only one action track. Action Tracks of the One Health Joint Plan of Action are abbreviated in parentheses as follows: Action track 1: enhancing One Health capacities to strengthen health systems (OH Systems). Action track 2: reducing the risks from emerging and re-emerging zoonotic epidemics and pandemics (Emerging Zoonoses). Action track 3: controlling and eliminating endemic zoonotic, neglected tropical and vector-borne diseases (Neglected Zoonoses/VBDs). Action track 4: strengthening the assessment, management and communication of food safety risks (Food Safety). Action track 5: curbing the silent pandemic of AMR (AMR). Action track 6: integrating the environment into One Health (Environment).

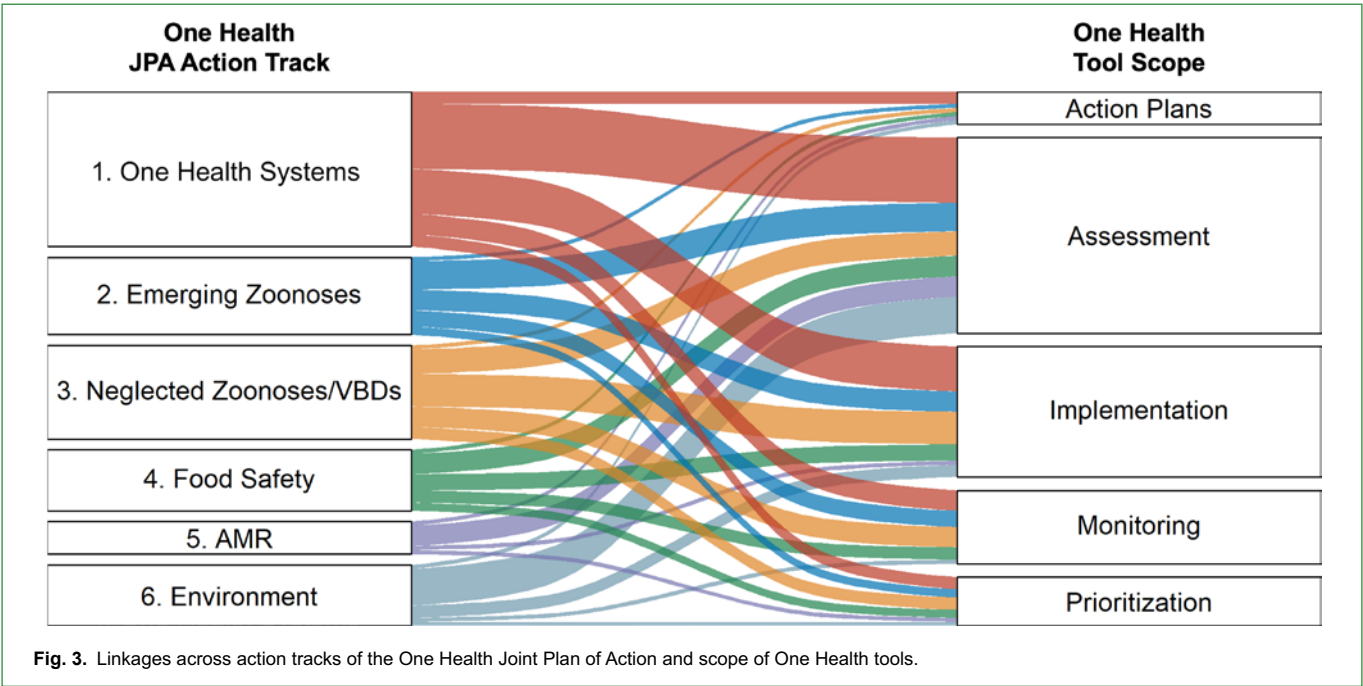
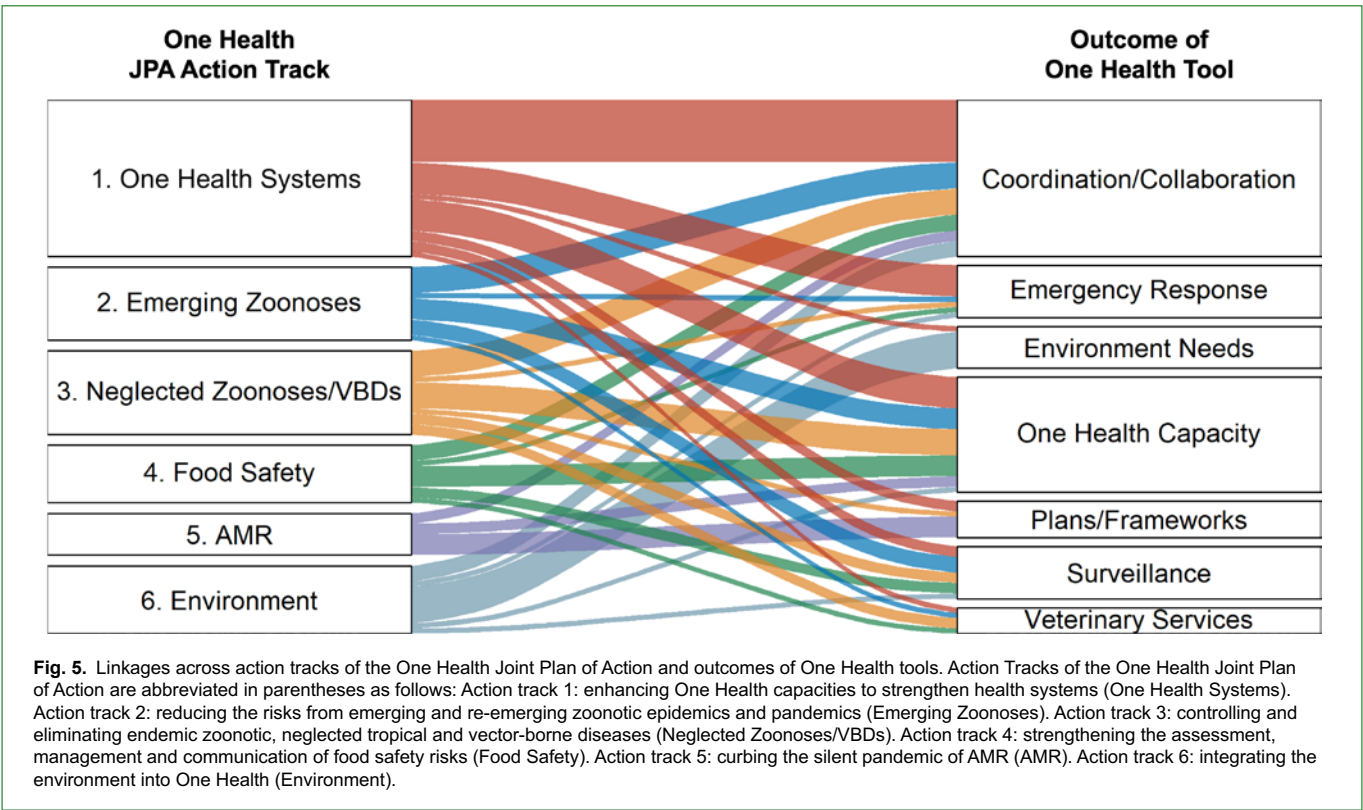
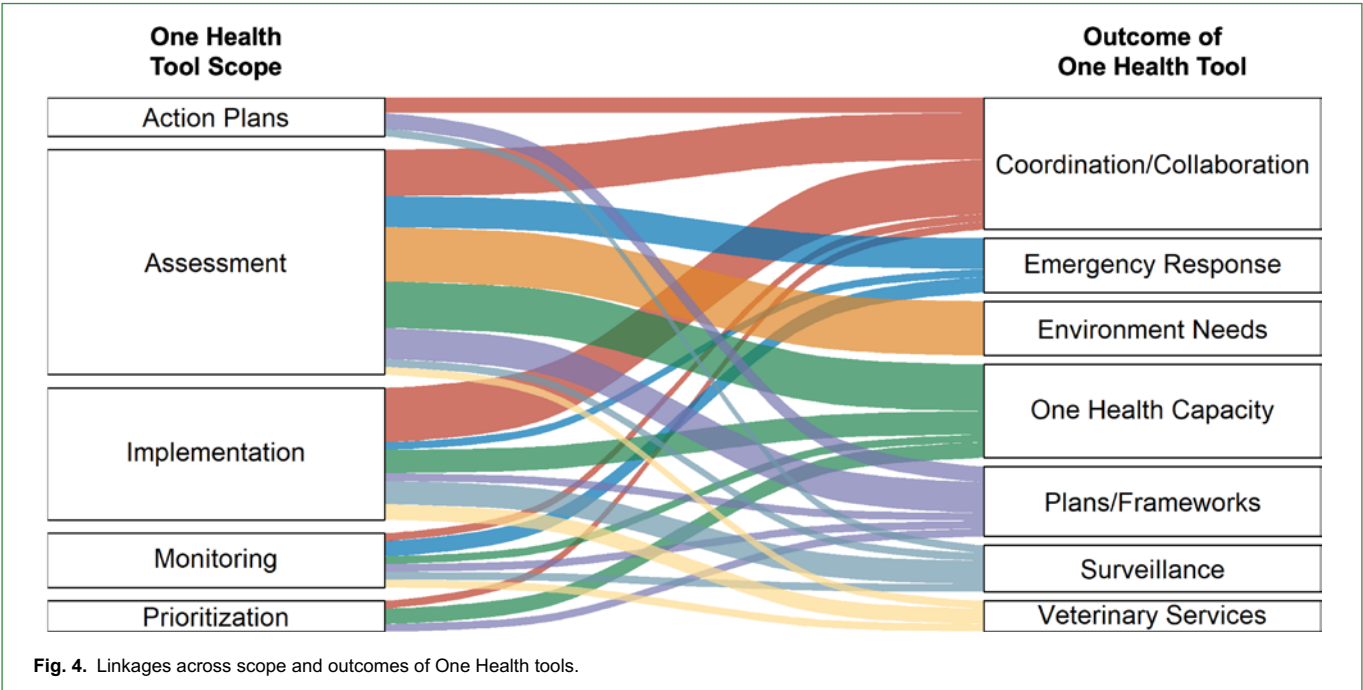


Fig. 3. Linkages across action tracks of the One Health Joint Plan of Action and scope of One Health tools.

focus or in combination with other Action Tracks. Seven tools focused on the outcome of addressing the environment sector needs to strengthen One Health; the other six tools focused on a variety of other outcomes. Tools addressing Action Track 6 covered environmental topics from reviewing system capacity to monitoring biophysical status (e.g. biodiversity indicators), integrated environmental impact assessment, the status and management of protected and conserved areas, biodiversity, plant health, and ecosystem services, progress under environmental conventions, and general assessment of the environment sector capacity and resourcing.



Discussion

This integrated inventory, mapping, and analysis of One Health tools represents an important step in supporting the advancement of One Health. For the first time, a comprehensive inventory of globally available One Health Tools is presented, which is timely given the increased demand from multi-sectoral partners to have such a resource to support One Health implementation and capacity building. We present a descriptive analysis of 50

selected One Health tools that were publicly available from 1999 to June 30, 2023, along with key themes toward the sustainable implementation of One Health.

OHHLEP was convened in 2021 by the Quadripartite agencies to provide technical advice and guidance on how to strengthen One Health to prevent future pandemics, identify knowledge gaps, and provide guidance on One Health implementation (Mettenleiter *et al.*, 2023). The One Health tools we identified are

not necessarily endorsed by the Quadripartite or the OHHLEP, and the outcomes of this study are not intended to be prescriptive. The Quadripartite annexed this list of 50 One Health tools to their Guide to Implementing OH JPA at National Level (WHO, FAO, UNEP and WOA, 2023). During the collection of documents for consideration in this study, we also compiled guidance documents, frameworks, databases, and other resources that did not fit our inclusion criteria for this study but that we deemed to be helpful as background and support for the application and use of One Health tools, and as further support for implementation. After thorough vetting for relevance to the OH JPA by the Quadripartite agencies, a list of 71 resources was also included in Annex 2 of the Guide to Implement the OH JPA (WHO, FAO, UNEP and WOA, 2023).

IMPLICATIONS FOR OH JPA IMPLEMENTATION

Most (68%; $n = 34$) of the selected One Health tools were produced by the Quadripartite organizations, often in collaboration with partners, yet gaps still remain in the types of tools needed toward fulfilling OH JPA implementation. Selected One Health tools were themed around seven outcomes as described above. In terms of linkages to the One Health TOC pathways, Pathway 2 (organizational development and sectoral integration) had the greatest coverage by One Health tools (66%; $n = 33$), reflecting the cross-sector nature of most tools. This trend was also reflected in One Health tool outcomes, as almost half of the tools had aims of either building and strengthening One Health coordination and collaboration (28%; $n = 14$) or enhancing One Health systems capacity (20%; $n = 10$). However, the remaining tools were split nearly equally between Pathway 3 (data, evidence, education, and knowledge exchange (18%; $n = 9$) and Pathway 1 (policy, advocacy, and financing (16%; $n = 8$).

We found that tools addressing each phase of the Pelican *et al.*, 2019 application framework, from Assessment through Monitoring, could be applied to each of the six OH JPA action tracks, except that there were no tools identified for monitoring AMR. It is possible that existing One Health tools for AMR may include a monitoring aspect not captured by our analysis. In terms of scope for application, most selected One Health tools were relevant for Assessment (47%; $n = 29$) followed by Implementation (27%; $n = 17$). There were comparatively fewer tools available for Prioritizing, Action Planning, or Monitoring which are gaps that should be addressed to support adequate One Health implementation. Although there are some examples of linkages across One Health tools and using tools collaboratively (Varela *et al.*, 2023), this is not yet the current standard. While the majority (76%; $n = 38$) of selected One Health tools were multi-sectoral in nature, there is also an important role for sector-specific tools that can advance One Health.

Promoting the sharing of outcomes of One Health tools publicly in a timely way and across all relevant stakeholders combined with working collaboratively with multi-sectoral partners to plan the implementation of additional One Health tools is important. Pelican *et al.* identified some strong real-world examples relevant to zoonoses (Action Track 3) as to how the outcomes of a One Health tool, when shared with partners and/or publicly, can help to inform the process of another One Health tool. We found some One Health tools to give strong support for multi-sectoral coordination, such as the Tripartite Zoonoses Guide's operational tool for Multi-sectoral, One Health Coordination Mechanisms (WHO, FAO and WOA, 2022c). Coordinating the implementation of One Health tools through a national One Health coordination structure can support more effective planning and implementation of One Health tools, linkage of outcomes over time, and efficient coordination across all relevant sectors and action tracks of the OH JPA.

GENDER AND SOCIAL INCLUSION CONSIDERATIONS

Very few One Health Tools (8%; $n = 4$;) thoroughly addressed gender and social inclusion considerations when addressing the

populations they serve. We propose several possible reasons for this: (i) lack of awareness about the necessity to integrate gender equality and inclusion considerations in One Health; (ii) lack of knowledge and capacity on how to go about integrating gender and inclusion considerations in One Health; (iii) lack of clear guidance on what is required and how to do it; and (iv) insufficient attention to gender equality and inclusion considerations in pandemic preparedness and other One Health monitoring and accountability exercises. We found that many of the 50 selected One Health tools analyzed for this paper could be improved to better integrate gender and social inclusion. The four tools that scored well on gender analysis and inclusion considerations serve as good examples for what needs to be done to improve other existing tools and to develop new tools to support this important dimension of One Health. The One Health Assessment for Planning and Performance (OH-APP) toolkit included a One Health Gender Integration Toolkit (USAID and Preparedness and Response, 2018), a resource and model for strengthening gender and intersectionality in any dimension of One Health. Those developing One Health tools may also be inspired by the examples from the field of ecohealth (Mertens *et al.*, 2006; Webb *et al.*, 2023), the WHO's Special Programme for Research and Training in Tropical Diseases (WHO, 2022c) and Jhpiego Corporation (Jhpiego, 2016) and the Women's Empowerment in Livestock Index (Galiè *et al.*, 2019), and UNEP Global Gender and Environment Outlook (UNEP, 2016). The OHHLEP One Health definition and the Quadripartite OH JPA include a strong intent and commitment to gender equity and inclusion, setting the right tone, but there needs to be further improvement to gender and social inclusion considerations in operationalizing One Health and its tools. Failure to do so will not only perpetuate inequalities faced by women, youth, and marginalized groups, but will also impede the effectiveness of One Health action by failing to reach, mobilize, and include them.

INTEGRATION OF ENVIRONMENTAL DIMENSION OF ONE HEALTH

Few tools (14%; $n = 13$) explicitly addressed the environment dimension of One Health (as a tool outcome and/or aligned to Action Track 6). Also, more Assessment tools were available for environmental dimensions of One Health, highlighting the need for additional tools to further integrate environmental needs into One Health. For example, some environmental assessment tools (e.g. Integrated Biodiversity Assessment Tool) (UNEP World Conservation Monitoring Centre [UNEP-WCMC] *et al.*, 2008) may also be used to support increased capacity and more effective multi-sectoral decision making, particularly addressing trade-offs and cobenefits between sectors. We found that some environmental assessment tools (e.g. Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services [IPBES] (UNEP *et al.*, 2012, IPBES, 2019), UNEP Global Environmental Outlook (UNEP, 2019b)) provided an important understanding of the state of our environment and methodologically integrated human and animal health dimensions, but none the less could be strengthened by providing clearer guidance for One Health application beyond their current primarily environmental focus. Previous analyses found that many tools developed in the human and animal health sectors have very limited focus on wildlife and environment outcomes (Machalaba *et al.*, 2021). To better support OH JPA Action Track 6, the Quadripartite, through Conventions under UNEP and collaborations with others, has a leadership role to build new One Health tools and expand existing tools to better integrate environmental outcomes. This requires the integration of many aspects from a range of disciplines and agencies (e.g. wildlife management, plant health, biodiversity conservation, terrestrial and aquatic ecosystems, chemical management, climate, and air and water quality) and must consider ecosystem integrity and health.

Existing tools can be strengthened to enhance environment sector needs. For example, though tools are available for prioritizing, planning, and costing to support health security and zoonotic

disease prevention, detection, and response, parallel tools are lacking for wildlife and ecosystem health capacity and resource mobilization. WHO Joint External Evaluation (JEE) and WOAHP Performance of Veterinary Services (PVS) (WOAH, 2019) process encourage the progressive strengthening of human health and veterinary services through routine assessment and supporting tools (IHR-PVS Bridging Workshops, Tripartite Zoonoses Guide and associated operational tools), a suite of tools oriented toward a progressive strengthening of the environment sector is missing. Additionally, a progressive pathway of environmental capacity strengthening is needed (Berthe *et al.*, 2018). For example, National Biodiversity Strategies and Action Plans, a major tool for national implementation under the Convention on Biological Diversity (Convention on Biological Diversity, 2023), lack a dedicated assessment tool to inform capacity needs and are not costed to inform investment. Successful practices from the human and livestock health sectors should be examined to support strengthening of One Health tools and their use in the wildlife and environment sectors. Additionally, several One Health tools have been updated periodically over time to ensure that the tool versions are up to date and useful for implementers.

STUDY LIMITATIONS

While this study represents the most extensive analysis of One Health tools to date, some limitations exist. Because the methods used to identify tools were not exhaustive, it is possible that some existing candidate tools were not included in our analysis. For example, we excluded tools in use in fewer than five countries or locations to avoid including tools that were still being piloted, yet these tools might be very useful toward implementing One Health. OHLEP's diverse disciplinary and sectoral backgrounds enabled a holistic analysis of the tools, although it would have benefited from the involvement of affected communities including indigenous groups. Furthermore, we did not specifically assess tools regarding community engagement methodologies. Tools should include such methodologies to fulfill the outcomes of the second pathway of the One Health TOC (Organizational Development and Sectoral Integration).

RECOMMENDATIONS

Our gap analysis identified needs for tools for monitoring and evaluation, including the absence of tools for monitoring AMR, building a multi-sectoral workforce, joint or coordinated One Health outbreak investigations, and tools to further integrate gender and social inclusion considerations and the environment into One Health. The Quadripartite and other tool developers should continue to collaborate to address identified gaps. Tool developers should develop new and future versions of One Health tools with the OHLEP One Health definition (OHLEP *et al.*, 2022a). This study highlights several key needs in achieving sustainable One Health systems including how implementers of One Health tools may collaborate and share information and outcomes; the importance of engaging all relevant sectors and disciplines for planning and implementation; linking outcomes across One Health tools and across the six OH JPA action tracks to optimize resources and achieve maximum impact; linking relevant existing national action plans to national One Health plans; and sharing outcomes and lessons learned in real time with all relevant stakeholders to advance One Health.

We recommend that the Quadripartite continues to assist countries and regions in navigating and applying One Health tools toward building sustainable One Health systems including through the OH JPA and its implementation guide. The Quadripartite can also play a guiding role in choice and order of applying One Health tools through providing continued guidance to countries and regions on tool usage and multi-sectoral coordination. The recent growth in the number of One Health tools is a positive development in the global increase and uptake of One Health, but may also

pose implementation challenges, since it could contribute to data fragmentation, and lack of comparability, creating challenges for assessing performance and making adjustments.

During this study, the authors identified several forthcoming One Health tools under development by the Quadripartite and other partners, but these were not included in our analysis. They include, for example, the development of workforce development modules of the Tripartite Zoonoses Guide (FAO, WHO and WOAHP, 2019), forthcoming emergency preparedness and response tools of WOAHP, a new FAO Environment Sector Stakeholder Mapping and Needs Assessment Tool, and an updated US CDC's Field Epidemiology Training Program Frontline curriculum incorporating One Health principles and examples throughout (CDC, 2021; Martin and Socé Fall, 2021). We recommend that the Quadripartite organizations collaborate to regularly maintain and publicly share an updated inventory of available One Health tools at least once per year based on the process developed by the OHLEP as new tools become available to provide ongoing support for sustainable One Health implementation.

All One Health tool developers, including those in the Quadripartite, should support multi-sectoral coordination for the development of new tools including how to share, synergize, and link tool outcomes for maximal benefit using minimal resources for sustainable One Health systems. Tool developers should periodically review and update existing One Health tools to meet multi-sectoral needs over time. Additionally, the Quadripartite can support evaluation of uptake and impact of tools to determine effectiveness, including whether monitoring, advocacy, and costing-focused tools are performing in mobilizing resources to support the uptake of One Health globally.

Countries can collaborate to create or strengthen national One Health coordination mechanisms to support efficient coordination across all relevant sectors for more effective planning and implementation of One Health tools and linkage of outcomes over time. No single One Health tool provides a comprehensive roadmap to a One Health system; therefore, tools should be used in combination to cover all dimensions and needs. Future analyses of One Health tools should be conducted to examine the order of applying One Health tools and the combined application of tools in real settings.

CONCLUSIONS

This inventory of One Health Tools (Table 1) can be used by countries and regions to support national One Health action plans, One Health assessments, and to inform priorities for national One Health implementation and establish or strengthen One Health mechanisms. The Quadripartite provided a solid framework and road map via the OH JPA and its Implementation Guide. As countries work to implement the OH JPA and make national One Health action plans, decision makers will need to assess and plan how to use multiple One Health tools to maximize impact while minimizing resources for implementation to achieve a sustainable One Health system. The Quadripartite, as well as other agencies and academics developing tools and resources for One Health should heed the gaps identified in this paper: the need for One Health tools that better integrate environment, gender and inclusion; tools for action planning, prioritization, monitoring and evaluation; One Health tools that support outcome of all three pathways of the One Health Theory of Change; improving existing tools to strengthen their One Health framing or build new tools that address Action Tracks 4 (Food Safety), 5 (Antimicrobial Resistance), and 6 (Environmental Aspects) of the OH JPA; and improved interlinkages between tools and coordination in their application.

While much progress has been made in developing and implementing various One Health tools, continued coordination and collaboration is to be encouraged across sectors, disciplines,

and stakeholders to best share lessons learned and best practices on how to develop and implement a sustainable One Health approach. Similarly, coordination is also needed in the development of new tools and how to share, synergize, and link their outcomes for maximal benefit using minimal resources for sustainable One Health systems. Ultimately, the results of this publication can be widely used in all regions of the world to further One Health implementation, including via the OH JPA.

CONFLICT OF INTEREST

Wanda Markotter and Serge Morand are members of the editorial board of CABI One Health. All other authors have no conflicts of interest to declare.

ETHICS STATEMENT

The authors confirm that the research meets any required ethical guidelines, including adherence to the legal requirements of the study country.

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AUTHOR CONTRIBUTIONS

OHHLEP members served in their personal capacity for the preparation of this publication. The opinions expressed in this article are the author's own and do not necessarily reflect the view of the employer or affiliated institution or agency.

CBB and DC conceptualized the study and co-led the interpretation of findings and writing. CBB coordinated the scientific writing, managed data quality and analysis, and oversaw the production of results, tables, and figures. AL iterated the data, performed the data analysis, produced figures and tables, and contributed to writing. N Cedié and DC co-led the gender and social inclusion analysis and discussion. CM led the analysis and discussion of the environmental dimension. DH contributed to writing, analysis, and figure design. HB coordinated the production of Table 1, contributed to writing, and supported reference management. JZ contributed to writing. All authors contributed to the review and assessment of One Health tools to finalize the data set and provided input for the final paper.

DISCLAIMERS

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DATA AVAILABILITY

The data identified by this study on One Health tools, resources, and guidance documents are publicly available online in the 'OHHLEP Inventory of One Health Tools and Resources' associated with

Annex 2 of the Implementation Guide for the One Health Joint Plan of Action (WHO, FAO, UNEP and WOAH, 2023). Additionally, WHO will maintain Microsoft Excel versions of the data.

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