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## Checklist for One Health Epidemiological Reporting of Evidence (COHERE)



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### ABSTRACT

One Health is defined as the intersection and integration of knowledge regarding humans, animals, and the environment, yet as the One Health scientific literature expands, there is considerable heterogeneity of approach and quality of reporting in One Health studies. In addition, many researchers who publish such studies do not include or integrate data from all three domains of human, animal, and environmental health. This points to a critical need to unify guidelines for One Health studies. This report details the Checklist for One Health Epidemiological Reporting of Evidence (COHERE) to guide the design and publication format of future One Health studies. COHERE was developed by a core writing team and international expert review group that represents multiple disciplines, including human medicine, veterinary medicine, public health, allied professionals, clinical laboratory science, epidemiology, the social sciences, ecohealth and environmental health. The twin aims of the COHERE standards are to 1) improve the quality of reporting of observational or interventional epidemiological studies that collect and integrate data from humans, animals and/or vectors, and their environments; and 2) promote the concept that One Health studies should integrate knowledge from these three domains. The 19 standards in the COHERE checklist address descriptions of human populations, animal populations, environmental assessment, spatial and temporal relationships of data from the three domains, integration of analyses and interpretation, and inclusion of expertise in the research team from disciplines related to human health, animal health, and environmental health.

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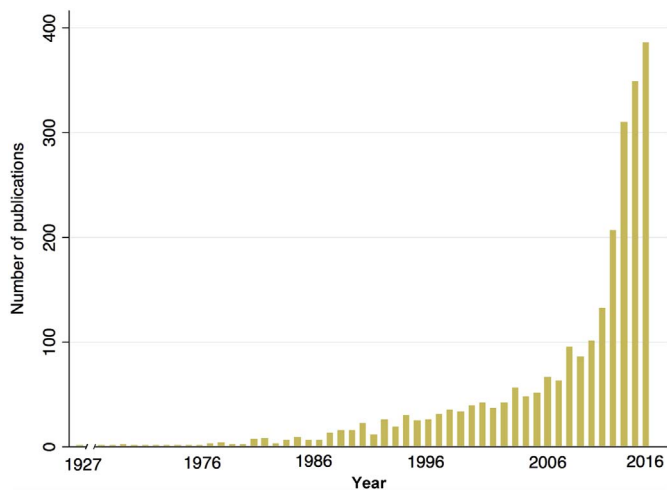


Fig. 1. Number of papers published per year identified with the search terms “One Health” or “One Medicine” in Pubmed (1927–2016).

## 1. Introduction

With the increased recognition that diseases often emerge out of interactions of human, animal, and environmental factors, a new approach to address these issues has arisen, known as One Health. The roots of this paradigm lie in the fertile grounds of comparative pathology, driven by the remarkable efforts, perspectives, and writings of William Osler, Calvin Schwabe, Rudolf Virchow, and many others [1]. This early foundation, focused mainly on the “one medicine” intersection of human and animal health, has grown into an effort that also incorporates preventative medicine and public health approaches, particularly environmental health and ecohealth [2]. In recent years, One Health has been described as “the collaborative effort of multiple disciplines — working locally, nationally, and globally — to attain optimal health for people, animals and our environment” [3]. The One Health approach, therefore, involves combined assessment of health risks across the three domains of humans, animals, and the environment, and it involves design and implementation of intervention and prevention strategies that address all three sectors with a goal to produce integrated knowledge [4].

A One Health approach, by definition, encompasses many fields, and these include, but are not limited to, infectious diseases, chronic diseases, toxicology, ecology, agriculture and sustainability, conservation medicine, economics, anthropology, ethnography, and the social

### Box 1

Glossary of key terms used in the standards and text.

**Ecohealth:** an integrated systemic approach to health incorporating the sustainability of ecosystem health services and social stability to maintain peaceful coexistence of humans, animals and their environments [27].

**Captive exotic animal:** An animal of a non-domesticated species that is living under human control.

**Domestic animal:** Companion and food-producing species that have lived for many generations with humans and whose characteristics and traits are generally considered to be under human control.

**Epidemiological studies:** Studies that determine the distribution of diseases in populations and the factors that may drive this distribution.

**Free-ranging wild animal:** An animal of a non-domesticated species that is living largely outside of human control.

**Generalizability:** applicability of research study findings from a sample population to the larger, target population.

**Inter-professional education:** training approach that brings together and fosters collaboration among students of various disciplines in order to enhance collaboration and promote acquisition of interdisciplinary knowledge.

**Qualitative data:** data that are non-numerical.

**Quantitative data:** numerical data.

**Semi-qualitative data:** data that have a numerical hierarchy but are presented in terms of categories or scales.

**Signalment:** An animal's age, sex, species and breed.

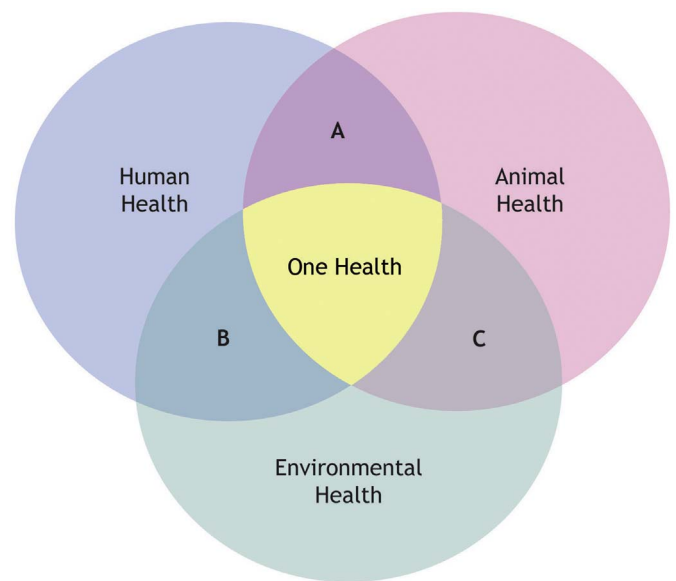


Fig. 2. Venn diagram illustrating the three domains of One Health. (A) Epidemiological studies relating factors between animal and human health; (B) Epidemiological studies relating factors between environmental and human health; (C) Epidemiological studies relating factors between animal and environmental health.

sciences. The approach can inform efforts to develop and implement studies or programs related to human and animal wellness, mental health and wellbeing, and the human-animal bond. However, the fields in question often are segregated by methodology, funding, and publication [5]. Requirements from funding sources and publication silos may contribute to the fracture of One Health studies into multiple, discipline-specific studies and/or publications. At the same time, the term “One Health” has become increasingly common in the biomedical literature (Fig. 1). As the literature expands, authors of this document and contributing experts who have conducted systematic reviews have noted considerable heterogeneity of approach and quality of reporting in One Health studies [4,6,7]. Such lack of consensus on criteria that constitute a well-designed and clearly-presented One Health study jeopardizes the impact of this growing field and limits the ability of the reader to judge the strengths and limitations of this literature.

To build on the foundation of scholarship and provide scope and guidance for future work, we propose the following Checklist for One Health Epidemiological Reporting of Evidence (COHERE) for research publications classified as One Health studies. We intend this work to

**Box 2**

## Definition of the Three Domains.

Although the three domains of humans, animals and the environment are quite broad, their application in a One Health context requires specific focus on health-related aspects of these sectors (see Fig. 2). That said, since health, as defined by the World Health Organization, is “a state of complete physical, mental, and social well-being and not merely the absence of disease or infirmity,” this allows for evaluation of not just disease factors, but well-being, societal resilience, and other beneficial aspects [28]. For example, the human-animal bond may reduce human and animal stress; safe and walkable neighborhoods may promote greater activity and reduced obesity in human and companion animal inhabitants; and preservation of ecosystem services may improve resilience of human and animal populations threatened by changes in climate. COHERE standards allow for authors whose work may not fall into traditional definitions of human health, animal health, and environmental health to describe and defend the definitions used for the study being reported. It is then incumbent upon editors, reviewers, and readers to determine if any non-traditional definitions are reasonable and justified.

The COHERE standards require that studies report data in all three domains, but sometimes, the boundary between domains may not be sharply delineated. Vectors are particularly problematic to classify. The term itself has multiple definitions that encompass the fields of mathematics, computer science, and biology. This can challenge accurate communication in a scientific arena as multidisciplinary as One Health. For the purposes of these standards, we will use two different definitions of vector: 1) *mechanical vector*, and 2) *biological vector*. In both these cases, invertebrate arthropods (*i.e.*, insects and arachnids) operate in the context of transmission of infectious agents from one host to another. However, some definitions of mechanical vector also include inanimate fomites that move, such as vehicles. The diversity of research that surrounds insect vectors and vector-borne diseases can cloud consensus on whether vectors should be considered in the animal domain or environmental domain.

Mechanical vectors, which more appropriately fall in the environmental domain, transfer infectious agents, chemicals, or other substances from one point in the environment to another point in the environment, much the same way a car could transfer or disperse a substance it contacts. When a research group considers vectors in this way, we argue that these data should be grouped with other environmental variables or treated as findings from a fomite. Biological vectors, in contrast, are part of an ecosystem or are part of the lifecycle of an infectious agent. They are living members of communities, and when researchers evaluate them as such and target their biology and not just their carriage of a pathogen, may belong in the sector with animals. Consider the example of malaria, a well-studied vector-borne disease. Research Group A studies how changes in the geographic dispersal of mosquitoes that correlate with changes in temperature and humidity result in changes to the geographic dispersal of malaria in human populations. In this case, COHERE would group data on the geographic distribution of mosquito populations with the environmental sector. Research Group B instead studies how temperature and humidity impact mosquito fecundity and the extrinsic incubation period of the malaria parasite within the mosquitoes. COHERE would group these data on the mosquitoes with the animal sector.

**Box 3**

## Incorporation of the Three Domains.

The COHERE standards advocate that studies which purport to be “One Health” in nature should present data from human, animal, and environmental domains of the problem, as illustrated in Fig. 2. However, a recent systematic review of integrated parasite surveillance identified more publications that integrated two One Health sectors than those that addressed all three [7]. Studies integrating human and animal data (illustrated as zone A in Fig. 2) appear to be most common, and report useful information that includes, but is not limited to, differences in prevalence, clinical features, and local reservoirs for infection. However, these studies (illustrated as zones A, B, and C in Fig. 2) represent a missed opportunity to present a complete picture of disease transmission, and may adversely affect pathogen control interventions due to unexpected pathogen dynamics in the uncharacterized One Health domain, whichever one that is.

By following the COHERE standards, investigators will be encouraged to include data about the human, animal, and environmental health domains of a particular disease or health issue. Authors who have completed data collection in only two of the three domains, or who do not have access to one of the three domains for a variety of reasons may still benefit from consideration of as many of the COHERE standards that apply to their work. Indeed, such studies may be necessary precursors to the successful launch of a One Health study, and the data derived from these efforts often are critical to inform interpretation of the results of subsequent One Health research. Therefore, this group makes a number of suggestions for how to use and incorporate the COHERE standards when only two of the three domains are well represented, as described in Table 2. As long as the research group incorporates expertise from all three domains and applies this multidisciplinary expertise diligently to the study design, conduct of the research, and interpretation of the findings, then use of partial data or surrogate assessment of one of the domains would not disqualify the research from being considered a One Health study. (N.B.: In considering expertise, individual researchers may have the background needed to represent more than one domain.) While some studies may be difficult to categorize, a necessary component to reporting a One Health study is explicit incorporation of all three domains in the introduction, methods, results, and discussion of the manuscript. Studies where authors reference the literature on an otherwise neglected third domain in the introduction and discussion alone do not fulfill the standards. This group recommends that studies that 1) cannot fulfill the majority of the standards and 2) do not have the necessary component of data reporting on all three domains as described above should not formally claim to be One Health studies, *e.g.*, in the title or keywords. Nonetheless, these research efforts are important and can be foundational to later One Health research efforts, and authors are encouraged to discuss One Health implications and position their findings within the larger One Health literature.

**Table 1**  
The COHERE standards.

Item	Standard number	Recommendation
<b>Introduction</b>		
Background	1	Review the human, animal, and environmental context of the problem and justify why a One Health study is appropriate to address the scientific question
Rationale	2	Clearly state the research aims and/or hypotheses in the context of the relationship among the three domains (human, animal and environment), or state and defend the nature of the study if it is not hypothesis-driven
<b>Methods</b>		
Study design	3	(a) Explain or describe the relationship/interaction (epidemiologic, biological, ecological, spatial/temporal, etc.) of the collection of the human, animal, and environmental specimens and/or data <sup>a</sup> (b) Provide inclusion and exclusion criteria for all domains (c) According to study design, follow other guidance, e.g. STROBE and its extensions (STROBE-VET, STROME-ID), CONSORT, PRISMA, etc., as indicated
Human participants	4	(a) Provide qualitative and/or quantitative description of the human population or human data, including characteristics related to inclusion or exclusion from the study, sample size (at all relevant population levels), and sample size justification, as appropriate (b) Ensure human subject assurances adhere to the highest standards of ethics governing human subjects research
Animal participants <sup>b</sup>	5	(a) Provide qualitative and/or quantitative description of the animal population (domestic, captive exotic, or free-ranging wild), including characteristics related to inclusion or exclusion from the study, sample size (at all relevant population levels), and sample size justification (b) Include, at minimum, the common or generic name for the species of animal or animals studied, and provide the taxonomic <i>Genus species</i> if indicated ( <i>i.e.</i> for less common species) if the species chosen is dependent on study design <sup>a</sup> (c) Ensure animal subject assurances adhere to the highest standards of ethics governing animal subjects research
Environment <sup>b</sup>	6	(a) Identify environmental (abiotic) and/or ecosystem (biotic) factors including vector characteristics <sup>b</sup> if appropriate, that are under investigation (b) Describe the type and purpose of any environmental samples or data collected (c) Provide qualitative and/or quantitative description of the study location, including geographic locale ( <i>e.g.</i> region and country, latitude/longitude or a centralized point if the location of the site is sensitive information), ecosystem type ( <i>e.g.</i> mangrove forest) and/or land use description ( <i>e.g.</i> urban, agricultural, etc.), and number and description of where samples were obtained <sup>b</sup>
Measurement	7	(a) If indicated, include the frequency of sampling ( <i>i.e.</i> sample interval) and calendar timing ( <i>i.e.</i> date, month, season, year) <sup>b</sup> (b) Describe the relationships/interactions (epidemiologic, biological, ecological, spatial/temporal, etc.) among human, animal, and environmental samples and data, as well as other significant differences in data collection methods between domains <sup>a</sup> (c) Describe and justify testing or analysis measures used, and indicate the validity for such measurements for use among human, animal and environmental domains
Analysis	8	(a) Identify how data among the three domains were collected (b) Explain how any hierarchical relationships within and between domains ( <i>e.g.</i> at the individual or group level) were handled (c) If data were handled differentially among the three domains ( <i>e.g.</i> collection of data from one domain at a different time interval than from another domain), describe this in sufficient detail to allow assessment of potential bias introduced by this decision <sup>a</sup>
Study team	9	(a) If applicable, describe the involvement of study team members, stakeholders and community members ( <i>e.g.</i> farmer participant stakeholders, industry, etc.) (b) Indicate how study team members representing all three domains contributed to development of the research question and study design
Ethics	10	(a) Report animal (IACUC/ACUC) and human ethics (IRB) approvals, as well as other relevant permissions that were obtained (b) If applicable, describe the framework for adhering to community based research standards ( <i>e.g.</i> community approval, cultural respect, knowledge translation)
<b>Results</b>		
Human participants	11	(a) Report recruitment data, provide study population percentages and describe generalizability of study population to underlying population (b) Describe demographics ( <i>i.e.</i> sex, age, race/ethnicity, etc.) or case characteristics, as well as exposure factors and behavioral characteristics evaluated, of human subjects <sup>a</sup>
Animal participants	12	(a) Report study population percentages and describe generalizability of study population and study species to the underlying animal population of interest (b) Describe demographics ( <i>i.e.</i> sex, age, breed, etc.) or signalment, as well as exposure factors, of animal subjects (c) If applicable, describe animal management characteristics ( <i>i.e.</i> housing, diet, other environmental factors)
Environment	13	(a) Report findings from collected samples and/or measurements, including measures of heterogeneity that could impact generalizability of findings (b) Provide descriptive statistics for all appropriate environmental/ecosystem variables (c) If appropriate, provide geographic referencing for all samples or data submitted to public databases
Measurement	14	(a) Identify populations, pathogens and/or vectors to the same taxonomic level across all three domains (b) Report findings in a way that is standardized or equivalent across all three domains
Analysis	15	(a) Provide comparative statistics, qualitative comparisons or integrated analyses among human, animal, and environmental variables, including (as appropriate) measures or descriptions of uncertainty ( <i>e.g.</i> variance, confidence intervals, qualitative limitations) (b) Consider the potential for lack of independence or group effects that may impact statistical inference ( <i>e.g.</i> at the household or building level, pen or other animal cohort level, and community level) (c) If indicated, provide geospatial comparisons or illustrations of spatial relationships ( <i>e.g.</i> maps) to describe the distribution between human and animal populations
<b>Discussion</b>		
Overall	16	(a) Provide a comprehensive discussion that integrates the human, animal and environmental aspects of the results (b) Indicate generalizability of findings to local, national, and/or international levels

(continued on next page)

Table 1 (continued)

Item	Standard number	Recommendation
Limitations	17	(a) Discuss any discordance in acquisition, analysis or interpretation of data among the three domains (e.g. identify problems with application of different methods among the domains) (b) Identify where methods lack validation (e.g. animal methods used in human populations or <i>vice versa</i> ) (c) Identify any methods that may not have been optimal to address research aims and suggest how future studies could overcome such limitations (d) Comment on issues that may impact the reproducibility of the study, as appropriate (e) Identify and discuss potential sources of bias (f) Discuss species-specific differences that may impact the results or the interpretation of the results (g) Identify other potential populations of humans or animals that could be involved in the problem and were not measured or addressed in the study
One Health Contribution	18	(a) Describe how a One Health approach to the study—specifically incorporation of expertise among the disciplines and integration of findings from human, animal and environmental domains—furthered the understanding of the data/research problem (b) If appropriate, describe lessons learned from the One Health interdisciplinary study team approach, e.g. successes and challenges identified as part of the process of conducting the study, methods for operationalizing participation among the disciplines, and cost-benefit analyses of the resource efficiencies of One Health studies (c) Identify how the conclusions relate to promotion of human, animal and ecosystem health (d) Include “One Health” as a keyword and, if appropriate, also in the title of the manuscript
Acknowledgment	19	Indicate funding source(s) and potential conflicts of interest

<sup>a</sup> Please adhere closely to STROBE or extension (e.g. STROBE-VET, STROME-ID, etc.) guidelines for reporting of observational epidemiology studies, which may impact placement of these COHERE checklist data. Where indicated, data should be placed in methods or results sections per STROBE guidance.

<sup>b</sup> Please see additional discussion of definitions of biological vectors and when and how to report them as part of the animal participants or part of the environment.

<sup>c</sup> The authors and working group strongly encourage collection of and consideration of additional data on human subjects as appropriate, particularly occupation/work-related exposures, socioeconomic parameters, and other community parameters.

apply primarily to the approach and reporting of observational and interventional One Health studies that employ epidemiological methods (see Box 1), although these guidelines may also benefit other One Health study designs. Given that interdisciplinary work can serve as an incubator for innovation, we further intend this checklist to be a living document informed by iterative feedback from authors, editors, and readers of the One Health literature.

## 2. Aims and use of the COHERE standards

The Checklist for One Health Epidemiological Reporting of Evidence (COHERE) provides a set of standards that should be included in articles reporting on the results of One Health studies that use epidemiological methods. Box 1 provides a glossary of terms that may be useful to those who will use these standards.

The twin aims of COHERE are to 1) improve the quality of reporting of observational or interventional epidemiological studies that collect and integrate data from humans, animals and/or vectors, and their environments (the One Health domains); and 2) promote the concept that One Health studies should integrate knowledge from all three of these domains. Fig. 2 offers an illustration of this concept, which is further explained in Box 2 (Definition of the Three Domains) and Box 3 (Incorporation of the Three Domains). We intend this guidance to aid, not only to report data at the point of manuscript preparation, but to design and plan studies, since certain criteria not obtained or observed during the execution of the study cannot be corrected at the reporting stage. While the scope of this document and these standards is limited to epidemiological studies (aim 1), the concept that all One Health studies should strive to integrate knowledge from human, animal, and environmental domains (aim 2) can be applied regardless of study methodology.

## 3. Development of the COHERE standards

The COHERE standards were developed by a multidisciplinary core team of experts who determined the process for standard development, drafted the initial checklist, and chose the membership of the COHERE expert review group. This review group was an extended panel of experts who individually and jointly reviewed the standards and whose feedback was incorporated by the core team. The COHERE expert

review group was chosen to represent both professional and global diversity in the field. Experts in the conduct of One Health epidemiological studies were included from human medicine, veterinary medicine, public health, allied professionals, clinical laboratory science, ecohealth, and environmental health. By design, multiple institutions and countries were represented in the core team and expert review group.

The structure of the COHERE checklist was designed to closely follow the model of STROBE and its extensions, with the intention that authors of One Health manuscripts should additionally follow these and related standards where appropriate [8,9]. The COHERE checklist is intended to cover content description felt to be critical to report and interpret studies conducted at the intersection of human, animal, and environmental health.

## 4. The COHERE standards

Table 1 provides the checklist of standards that should be considered when undertaking, reporting, and reviewing “One Health” epidemiological studies with the goal to produce integrated knowledge. The 19 standards encompass the approach and reporting of findings related to the following manuscript sections: Introduction [1-2], Methods [3-10], Results [11-15], Discussion [16-17], One Health contribution [18], and acknowledgements [19]. As indicated in the standards, authors should additionally follow other guidance documents, e.g., STROBE and its extensions (STROBE-VET, STROME-ID, etc.), CONSORT, PRISMA, in accord with the study design [10–15]. Authors should use these standards as guidance for the types of information to include in a manuscript, but not as a constraint to the narrative flow of the text. For example, authors are not required to report human, animal, and environmental data separately if an integrated presentation will be more clear for the reader, nor are they required to combine all findings into a single construct if the data are better presented using separate table or figures.

## 5. Assessment of the COHERE standards

Given the anticipated evolution of the field, driven by interdisciplinary collaboration and innovation, and given expected feedback from diverse users, the COHERE checklist is intended to be a living



**Table 2**  
Suggested categorization of One Health and related epidemiological studies involving at least two of the three domains.

	Data reported			Researcher expertise			Description	Hypothetical example	Example studies
	H	A	E	H	A	E			
One Health	X	X	X	X	X	X	Data and researcher expertise are well represented among all three domains	Concurrent assessment of a zoonotic pathogen in humans, animals, and a shared environmental reservoir	[29–36]
One Health	[X]	X	X	X	X	X	Researcher expertise covers all domains, but data are limited or surrogate assessments are used for one of the domains	Concurrent investigation of a worksite where animals and the environment are sampled, but access to workers is limited; breathing zone and ambient assessments are made and although humans are not sampled, overall study inference is to worker health	[37–39]
One Health	X	[X]	X	X	X	X	Researcher expertise covers all domains, but data are limited or surrogate assessments are used for one of the domains	Concurrent investigation of the association between an environmental exposure and human disease where access to animals is restricted but detailed data are collected instead on human-animal contacts or proximity as a primary risk factor or effect modifier of interest	[40,41]
One Health	X	X	[X]	X	X	X	Researcher expertise covers all domains, but data are limited or surrogate assessments are used for one of the domains	Concurrent investigation of the overlapping spatial distribution of clinical disease in humans and animals where data from the literature are used to model or infer the environmental exposure	[42]
One Medicine	X	X	X	X	X	X	Data and expertise capture human and animal domains	Concurrent investigation of zoonotic disease transmission between animal and human populations, where animal disease is known to emerge from an environmental reservoir, but contributions from environmental factors are neither assessed nor modeled	[43–45]
Environmental Health	X	X or [X]	X	X	X	X	Data and expertise capture human and environmental domains	Concurrent investigation of an environmental contaminant that may derive from animals and the effects of that contaminant on human health, where animals are not assessed	[46–49]
Veterinary Preventative Medicine	X	X or [X]	X	X	X	X	Data and expertise capture animal and environmental domains	Concurrent investigation of a pathogen reservoir in animal housing and the effects of that reservoir on animal carriage of the pathogen, where humans may interact with the animals and/or housing reservoir but human carriage is neither assessed directly nor are human interactions with animals and environment quantified using survey or other surrogate measures	[50–52]

H: human domain; A: animal domain; E: environmental domain.  
 X: fully represented; [X] surrogate used or partially represented.  
 Example studies were not assessed for research team composition and are included primarily as illustrations of data reporting in the context of the three domains.

document. Authors, editors and readers may provide suggestions to the corresponding authors. The online checklist of standards will be updated as needed at intervals driven by input from users or advances in the field [16].

## 6. Discussion

Adoption of One Health approaches is growing, driven in part by the inherent integration of diverse disciplines and in part through the emergence of financial and resource support for policy and program initiatives, educational programs, and research [17–20]. However, such growth may be constrained by the preferences of journal editors, boundaries on resources, lack of sustainable government commitment, and a paucity of international educational opportunities [5,17,18,20–22]. As One Health re-emerges as a top priority for those involved in the mitigation of diseases and promotion of wellness, it is important to recognize the challenges faced by those who work collaboratively to integrate the knowledge of multiple disciplines. Examples of such challenges may include budget, competing timelines, long-term sustainability, data sharing, media contact, language and/or culture differences, and synching research interests. Policy makers and academic leaders can alleviate some pressures of multi-disciplinary collaboration through the introduction of data-sharing agreements between governmental agencies, by the promotion of opportunities for inter-professional education [23], and by the prioritization of funding for research teams composed of members from different fields. Institutional animal and human research ethics committees—such as the Institutional Care and Use Committee (IACUC) and Institutional Review Board (IRB)—can collaborate to improve oversight of One Health studies [24]. Studies that monitor the effectiveness of One Health approaches are underrepresented in the literature to date [4,6]. To overcome this, authors of One Health studies can contribute to the evidence for the cost-effectiveness and efficacy of integrated approaches to investigation and intervention among the three domains by including such outputs in the report of their findings.

If a One Health approach is to continue to thrive, it also will require a shift within academia to recognize the efforts and rewards of interdisciplinary collaborations that may take more time to complete, require more initial funding or resource investment, and require shared credit by multiple investigators. This includes a shift away from “publication splitting,” a temptation for academics who rely on a productive publication record to compete for tenure and promotion [7]. Shared lead and senior authorship may be one solution to overcome such challenges when findings are presented in an integrated fashion rather than piecemeal in journals specific to the discipline of the expertise groups within the research team. In addition, authors may contend with preferences of journal editors who give priority to manuscripts with more discipline-specific focus. The emergence of journals focused on One Health studies provides one avenue for publication where integrated manuscripts have priority [25].

The COHERE standards are designed to strengthen the quality of reporting of One Health observational or interventional epidemiological studies that integrate knowledge and expertise from all three domains. This process challenges authors, editors, and readers to support efforts to break down publication silos, improve collaborative reporting, and foster innovation. (See Box 3 for additional discussion of how to undertake and report studies focused on only two of the three domains.) The types of studies that will employ COHERE standards are likely to be quite diverse. Data may be quantitative, semi-quantitative, qualitative, or a combination, and study designs may be retrospective or prospective. The study findings may be pertinent to local, national, or international scales, and the work may be conducted in both well-served and underserved areas. Diseases tackled using a One Health approach are not limited to infection outcomes in humans caused by zoonotic pathogens. Studies may include a wide clinical spectrum of both acute and chronic diseases in animals as well

as humans, or they may consider ecosystem and planetary health. Hence, authors of One Health studies will need to be careful to avoid jargon and to emphasize clarity in communication that can bridge the various disciplines involved in the field. Some One Health expert groups have endorsed involvement of communication specialists in this effort [26].

These standards are not intended to constrain the evolution of the field nor to limit One Health research funding. Given the intrinsic multidisciplinary nature of the field, it is perhaps inevitable that the number of disciplines represented by researchers in this arena will increase and include some areas of expertise less well represented in the health disciplines, e.g., the earth sciences and engineering. As a result, the standards may have to be adapted to new perspectives. Our author group invites feedback *via* communication with the corresponding author, and we will iteratively update the checklist of standards. We also encourage development of extensions to COHERE for other study designs, such as basic research, mathematical modeling, systematic and narrative literature reviews, economic analyses, program evaluation, the social sciences, policy and law. As the acceptance and adoption of a One Health approach continues to grow, the criteria used to conduct and report research studies should grow with it.

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## Conflicts of interest

None.

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