

Treball de Fi de Grau en Medicina

Curs acadèmic 2022 – 2023

Health definitions in the age of Anthropocene: a conceptual analysis and critical review

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Vist-i-plau dels tutors (4/4/2023)

Signatura de l'estudiant (4/4/2023)

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Word count: 10785

Abstract word count: 295

References: 81

Tables: 1

Figures: 3

Supplementary Material: 2 appendixes

Keywords: definition of health, Anthropocene, public health, environmental health, indigenous health, Eco Health, One Health, Planetary Health

Abstract

Defining health is key to the orientation of health services, policies, and priorities in research. The concept of health has evolved through history. Remarkably, the impacts of the Anthropocene on health boosted the interest on health-related frameworks and definitions with environmental perspective since 1950s. We performed a critical review, with indexed and grey scientific literature, on the evolution of the concept of health in the age of Anthropocene and characterized the main traditions defining health, classifying them in three axes: scientific/non-scientific, anthropocentrism, and integration (vs. fragmentation). We additionally classified them according to their epistemological tradition, which encompassed the following: environmental health, ecology of health, holistic medicine, Eco Health, One Health, Planetary Health, and indigenous definitions of health. No clear consensus in the definition of health was found, even within the same tradition. Environmental health was found as the most anthropocentric and fragmented scientific tradition. Ecology of health is an ecocentric and integrated scientific tradition. Holistic medicine is a heterogeneous movement, with scientific to non-scientific approaches, that claimed opposite philosophical assumptions to scientific medicine, but with an individual focus. Eco Health, One Health, and Planetary Health are recent traditions, with significant differences between and within them, and with no consensus in their definition. A broad approach to Eco Health is an ecocentric and integrative scientific tradition. One Health is mainly limited to a convergence of veterinary and human medicine. Planetary Health was found, as presented by the mainstream approach, as the most fragmented and anthropocentric from the new approaches. Indigenous concepts of health were found as non-scientific, ecocentric, and integrated. Our review showed that there is a need for a new

integrated definition of health with historical and intercultural approach. The unclear definition of health is a barrier for implementation of health policies in the Anthropocene.

Abstract (català)

Definir la salut és clau per orientar els serveis de salut, les polítiques i les prioritats en recerca. El concepte de salut ha evolucionat al llarg de la història. De forma notable, els impactes de l'Antropocè van impulsar l'interès en els marcs i definicions relacionats amb la salut amb perspectiva ambiental des de la dècada dels 50. En aquest treball duem a terme una revisió crítica, amb literatura científica indexada i grisa, sobre l'evolució del concepte de salut a l'era de l'Antropocè i caracteritzem les principals tradicions que defineixen la salut, classificant-les en tres eixos: científic/no científic, antropocentrisme i integració (vs. fragmentació). A més, els classifiquem segons la seva tradició epistemològica, obtenint les següents: salut ambiental, ecologia de la salut, medicina holística, *Eco Health* [Eco Salut], *One Health* [Una Salut], *Planetary Health* [Salut Planetària] i definicions indígenes de salut. No es va trobar un consens clar en la definició de salut, fins i tot dins d'una mateixa tradició. La salut ambiental apareix com la tradició científica més antropocèntrica i fragmentada. L'ecologia de la salut és una tradició científica ecocèntrica i integrada. La medicina holística és un moviment heterogeni, amb enfocaments científics a no científics, que va reivindicar assumpcions filosòfiques oposades a la medicina científica, però amb un enfocament individual. *Eco Health*, *One Health* i *Planetary Health* són tradicions recents, amb diferències significatives entre elles i dins d'elles, i sense consens en la seva definició. Un enfocament ampli d'*Eco Health* és una tradició científica ecocèntrica i integradora. *One Health* es limita principalment a una convergència de la medicina veterinària i humana. *Planetary Health* és, tal com el presenta l'enfocament dominant, el més fragmentat i antropocèntric d'aquests nous enfocaments. Els conceptes indígenes de salut apareixen com a no científics, ecocèntrics i integrats. La nostra revisió va mostrar la necessitat d'una nova definició integrada de salut amb un enfocament històric i intercultural. La definició poc clara de salut és una barrera per a la implementació de polítiques de salut a l'Antropocè.

Abstract (castellano)

Definir la salud es clave para la orientación de los servicios de salud, las políticas y las prioridades en investigación. El concepto de salud ha evolucionado a lo largo de la historia. De forma notable, los impactos del Antropoceno impulsaron el interés en los marcos y definiciones relacionados con la salud con perspectiva ambiental desde la década de los 50. En este trabajo realizamos una revisión crítica, con literatura científica indexada y gris, sobre la evolución del concepto de salud en la era del Antropoceno y caracterizamos las principales tradiciones que definen la salud, clasificándolas en tres ejes: científico/no científico, antropocentrismo e integrador. (vs. fragmentación). Además, los clasificamos según su tradición epistemológica, obteniendo las siguientes: salud ambiental, ecología de la salud, medicina holística, *Eco Health* [Eco Salud], *One Health* [Una Salud], *Planetary Health* [Salud Planetaria] y definiciones indígenas de salud. No se halló un consenso claro en la definición de salud, incluso dentro de la misma tradición. La salud ambiental aparece como la tradición científica más antropocéntrica y fragmentada. La ecología de la salud es una tradición científica ecocéntrica e integrada. La medicina holística es un movimiento heterogéneo, con enfoques científicos a no científicos, que reivindicó asunciones filosóficas opuestas a la medicina científica, pero con un enfoque individual. *Eco Health*, *One Health* y *Planetary Health* son tradiciones recientes, con diferencias significativas entre ellas y dentro de ellas, sin consenso en su definición. Un enfoque amplio de *Eco Health* es una tradición científica ecocéntrica e integradora. *One Health* se limita principalmente a una convergencia de la medicina veterinaria y humana. *Planetary Health* es, tal como lo presenta el enfoque dominante, el más fragmentado y antropocéntrico de estos nuevos enfoques. Los conceptos indígenas de salud aparecen como no científicos, ecocéntricos e integrados. Nuestra revisión mostró que existe la necesidad de una nueva definición integrada de salud con un enfoque histórico e intercultural. La definición poco clara de salud es una barrera para la implementación de políticas de salud en el Antropoceno.

Introduction

“We must pay attention to the meaning of words we use, ensuring that we use only words whose meaning we understand, and, so far as possible, words whose meaning others understand.”

Thomas G. Pickering

Defining and conceptualizing health has important implications in terms of measurement, analysis, and interpretation of the outcomes that we use to consider an individual or a population as healthy or not (1,2). The orientation of health systems –which could be denominated as systems of disease services (3)–, and priorities in research, policies, and actions to improve health, or tackle health inequalities, are developed upon a common understanding of the concept of health (2,4,5) as it appears as something desirable or a state to fulfil. Discourses and concepts are in constant interchange with institutions, so *“the acceptance of a concept implies, more than a statement, addressing certain interventions that are effective over bodies and lives”* (6). However, the implicit assumptions, underlying values, and scientific and philosophical paradigms of the different definitions of health are often unclear, becoming some definitions widely used without these being understood or accepted (5).

Health has been historically understood in many ways. The historical experience of health and disease, and its realisation in individuals and the community, led to different interpretations of health, mostly determined by the way cultures understood the generation of disease (1). This is, in turn, determined by the way they understood nature and the physical world because of the hegemonic philosophical, scientific, or moral paradigms in a very specific historical moment. We can identify different traditions of understanding nature in relation to health, which differ in the implications for human and environmental health.

The Hippocratic vision of nature was determined by the first direct observations of the environment in the 4th century BCE. So, the interpretations of health and disease are based on Hippocratic environmentalism, which underpinned the tight dependence of health on the relations between

humans and their natural environment (1,7–9). Health was understood in terms of adaptation and balance between the body and its total environment. This idea will remain in force, with different contributions like those coming from Galenism (a theory that explained health-disease as the equilibrium of four corporal humours), until the 19th century, when the environmentalist paradigm lost relevance in favour of the contagion theory.

The Enlightenment meant a tipping point in the relations of societies with nature from the 16th century onwards. Such switch in the relationships with the environment took an anthropocentric and desacralized appraisal that was explained with mechanistic metaphors. The domination of nature was seen as the way for human progress and wellbeing, e.g., the eradication of animism –the belief that every being has soul life– and the rise of a vision of humans as the centre of the existence, that had one of its first manifestations in the works of Francis Bacon (10). According to the emerging mechanical philosophy the study of the parts composing reality was sufficient to understand the whole. This reductionist paradigm permeated the understanding of health, which started to be progressively conceived away from the notion of balance and from an ecological conception of the body and replaced by the contagion theory. This process eventually led to the contemporary biomedical conception of health, namely individual and clinical, identifying health as a quality of an individual body (8,11,12). The mechanistic philosophy of Descartes (1596-1650) and its ontological dualism: *res cogitans* (the mind) and *res extensa* (the body), had an enormous influence on the development of medicine and life sciences, that assumed this reductionist and anthropocentric philosophical paradigm (7).

In the context of post-World War II, in 1946, the vastly widespread World Health Organization (WHO) definition of health was coined, i.e., “*Health is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity*” (13). Its appearance must be contextualized in a historic epoch defined by the emergence of a new social contract and the Welfare State, linked to the working class struggles for living conditions improvement (14). Despite its utopianism and inoperancy in the real world to dealing with certain conditions like chronic diseases,

ageing of the population or new challenges to health (2–5), it became the starting point of many definitions and approaches that conceived health beyond the mechanistic paradigm, and in some cases were influenced by ecology (8). It also had a great influence in the development of national health services (4). There were two key attempts to redefine this utopian vision: the Declaration of Alma Ata in 1978, that introduced the “attainment of the highest possible level of health” as a goal (15); and the Ottawa Charter in 1986, that defined health as an “everyday resource” (16).

Later in the 20th century, the emergence of diseases related to urban and industrial expansion gave rise to the concept of non-communicable diseases. The application of mechanical philosophy to these diseases showed serious limitations, which led to the formulation of the multicausality model, “a chain of events” (17,18). This model put nature in a generic position of a risk factor among many others, in general those related to the “way of living”. This understanding of health, although less anthropocentric and more sophisticated than other post-Enlightenment (modern) appraisals, still assumed the Cartesian philosophical paradigm (8,19). A clear example of this limited vision of nature is the Lalonde Report, in which nature is limited to “environmental risks” (20) and quantification of the exposure to them (11). This is an approach still current in public health.

From the 1950, the growth in economic activity, human population, and resources consumption –with particular emphasis on fossil fuels and technological development– started to increase exponentially in their trends in what has been called the Great Acceleration, a series of complex interlinked socioeconomic and biophysical changes, mostly driven by the so-called developed countries (21): “*without doubt [...] the most rapid transformation of the human relationship with the natural world in the history of humankind*” (22). The variations in the indicators of Earth Systems’ functioning moved so far from the expected for the Holocene geological epoch –the epoch that starts at the end of the last Glacial Period (approximately 9700 BCE) (23)– that there is growing evidence that we entered a new geological epoch: the Anthropocene. Crutzen proposed this term for the first time, suggesting that its starting point can be located around the First Industrial Revolution (24), but there is strong evidence that human-driven large-scale changes in the whole Earth Systems can be

ascertained since 1950, so the Great Acceleration was defined by Steffen et al. as the starting point of our epoch (21,22). Other authors pointed that the Anthropocene approach does not consider the political, colonial, and power relations that are in the cause and origin of the socio-ecological crisis, suggesting that the correct denomination for our epoch is Capitalocene (25).

The effects of the degradation of nature due to the Great Acceleration were ascertained through numerous publications since 1950: the first articles revealing the consequences of the rise of carbon dioxide in the atmosphere and the burning of fossil fuels on the terrestrial climate (26); the publication by Carson in 1962 of *Silent Spring*, a warning of the negative impact of biocides on the environment (27); or the publication in 1972 of *The limits to growth* (28), among many others, put for the first time ecology in the public agenda. This publications and social movements increased the interest in the relation between humans, nature, and health, and a new scientific perception of nature based on interdependence of all living forms on Earth was born. The most relevant theories of this new way to understand nature are the Gaia theory by James Lovelock, that proposed the Earth as a self-regulating superorganism, and the endosymbiotic theory by Lynn Margulis (29–31).

Following this new scientific conception of human interdependence on nature, many pioneer authors in the 1970s published innovative works that pointed out that the definitions of health cannot exclude the natural world. For example, in its conference *Environment, Ecology and Epidemiology*, Stallones plead for “*an ecological approach to health and diseases*” (18). San Martín pointed out that “*health depends on the eco-social equilibrium of the whole community*” (3). Dubos criticized physicians kept acting as though they were dualist Cartesians, and according to him the base of medical art should be the understanding of environmental forces (7). Tsaregorodotsev called for a “*new, interdisciplinary branch of science, [...] planetary public health*” (32). With these publications the anthropocentric philosophical assumptions of previous understandings of health and science were questioned. According to scholars embracing a more integrated human-nature (ecological) approach to health, humans and their health are an inseparable part of nature.

Parallel to Western history of science and its changing conception of nature, many indigenous cultures developed knowledge systems apart from the anthropocentric vision, based on the harmony with nature and spirituality, developing approaches to health from this vision, conceived in an individual and collective way (33,34). These systems have special relevance to understand health from a non-anthropocentric point of view and must be considered in the analysis of the evolution of the concept of health related to nature.

Despite some of the historical ways, Western and indigenous, to understand nature and health recognized human health as a part of the ecological environment, and the consequences of its degradation, already ascertained in the 1960s, humanity has not assumed proper cultural transformations, and in the 21st century it is in the middle of an unprecedented ecological and social crisis. The Great Acceleration trends that started in 1950, rather than slowing, kept rising in general terms. Its impacts on the Earth's life-sustaining systems have been largely documented: loss of biodiversity, climate change, overshoot of the charge capacity of ecosystems, alteration of the biogeochemical cycles, or the acidification of the oceans (21) are some examples of the deepness of the alteration of the biosphere humanity has induced. It has been estimated that in 2020 (± 6 years) the human-made mass exceeded the global biomass of Earth (35). These changes will have irretrievably an impact on human health in many ways, making evident that the paradigm of ecodependence on nature, and the collective conscience of industrialized societies impact on nature since the Great Acceleration, have not permeated enough to induce sociocultural changes of the productive and power systems of industrialized societies, being the conception of health still determined by these hegemonic productive and power systems.

Biomedical research is still mostly centred in single diseases and in the technological solutions for them. It is still operating in a paradigm that we could recognize as mostly Cartesian, defined by reductionism and without putting emphasis on the vastness of the ecological relations between human health and nature. It is urgent to broaden research to understand the ecology of health and disease and the interrelation between factors that overcome the traditional boundaries of disciplines

(36). Classic public health suffers also of a narrow view. It does not consider, when analysing disease, other than human health (plant or animal), the ecological evolution of relations between species, nor the changing environment resulting from human action (37). In the context of the Anthropocene's massive ecosocial crisis is crucial to understand the concept of health as a part of the ecological systems of which human societies are intrinsic part and affected by, conforming the eco-social environment (36). Some proposals to address this disconnection between health sciences and the ecological environment started to rise from the late 20th century onwards. The most relevant include: One Health, Eco Health, and Planetary Health (11,38). Their aim is to provide, with more or less deepness, and with some notable differences, a framework to understand health in an ecological way and respond to the pressing challenges for it.

Given the growing knowledge and literature on health in relation to the environment and the heterogeneity of disciplines it comes from, it would clearly benefit from a review that collects this diverse knowledge. In this article we perform a critical review of the academic indexed and grey literature to identify traditions of defining health that consider the ecological environment, since the starting of the Great Acceleration, including academic perspectives on indigenous concepts of health. We categorize them according to their shared understandings, critically analysing the implicit characteristics that underlie them. Our objective is to develop a new categorization for these traditions, that helps understanding the evolution of the concept of health in the Anthropocene. This is, to know what has been done since the realisation of the impact of human activities on Earth life-sustaining systems in the field of the definition of health. The purpose of this review is to clarify these definitions –that are nowadays unclear and, in some cases, vastly dispersed without assuming their implicit characteristics– and to orient future understandings of health for an era defined by ecosocial crisis. Public policies in this era must be designed upon a holistic and clear definition of health that considers nature and its relationship with humans at its core if they want to be effective safeguarding it. So, the contributions of this review are not only for a theory of health, but for the orientation of public policies.

Methods

Methodological approach to the review

We conducted a critical review (sometimes called integrative review) of existing literature about the concept of health and its relationship with the natural environment. Unlike systematic reviews, that adhere to strict methodological guidelines to appraise and synthesize research evidence, or like scoping reviews that make a preliminary assessment of the existing literature, the main objective of the critical review is to critically evaluate the existing literature, not just describing what exists, but performing a conceptual analysis and synthesis, creating new understandings that produce knowledge (39,40). In our field converge both mature and emerging theories, diverse in their characteristics, so a critical review to holistically reconceptualize and synthesize literature is the most appropriate methodology (40).

Our main research question was: how have the traditions defining health in relation to the environment changed and evolved in the period of the Anthropocene (since 1950s to the present)? Secondary questions were: what are the characteristics of the literature defining health and environment? Is there any tradition defining health developed from a Gaian perspective and considering alternative epistemologies?

Search strategy

We selected Scopus database for screening the existing literature as the best choice, since it has the highest journal coverage, compared to PubMed and Web of Science, from health, life, and social sciences, and allows bibliometric analysis; and PubMed, since it indexes core medical journals and starts in 1950 (41). We limited the searches by date since 1950 –when the Great Acceleration starts and there is a progressive emergence of the awareness of the relation of health with the natural environment– to the date.

The sensitivity of the search strategy for Scopus was ensured by including terms that referred to historical conceptions of health and environment, and emerging terms, providing an approach that accounts the historical evolution of this topic. All terms were agreed within the group of researchers based on the preliminary assessment of literature from all periods. For Scopus the search was limited to title, abstract, and keywords. The following comprehensive search string was defined (for the refinement process and adapted string for Scopus see Appendix I):

((("definition of health") OR ("defining health") OR ("concept* of health")) AND (("ecology") OR ("natural environment") OR ("ecosystem*") OR ("state of equilibrium") OR ("harmony") OR ("sustainab*") OR ("One Health"))) NOT ("concept of health promotion"))

The terms in the first part of the formula: “definition of health”, “defining health”, and “concept* of health” were used to retrieve publications that include definitions or conceptualizations of health in the different terminology used in literature. With the second part of the formula, we aimed to identify all references to the concept of health in relation to the environment that have been historically used in literature. The terms “harmony and “state of equilibrium” were introduced to capture indigenous visions linked to a sacred vision of environment. These terms were also used in a substantial proportion of the scientific literature of the mid-20th century.

“One Health” was the only term included from those who emerged in the last decades, because it was the only that incremented the retrieved results.

Since many irrelevant results were linked to “concept of health promotion”, we excluded them from the search results.

To be included in the review the publications had to follow these criteria:

- (1) provide a clear definition of health with environmental or ecological approach or contribute to the conceptualization of health with this perspective. By environmental or ecological approach, we mean considering human health as an intrinsic part of the

environment or considering environment as a factor influencing human health. If articles used a definition of health for other purposes but their scope was not related with the conceptualization of health were excluded. We also excluded articles that did not refer to human health.

- (2) be written in English, Spanish, Portuguese, Italian, French, or Catalan. This selection of languages was defined by the group of researchers aiming to identify relevant literature coming from the Latin American and European Latin countries academic tradition, and academic articles studying indigenous conceptions of health.
- (3) be available in full text

Due to the complex nature and interdisciplinarity of the topic of the definition of health and the scope of the review, unlike in other literature reviews, identifying relevant literature cannot be limited only to a search through databases. Many relevant literature was disperse in books and other grey literature, so we complemented this search strategy with snowballing techniques: including secondary references in the review if they were relevant, reading of key documents, and active ad-hoc searches in databases and catalogues. Preliminary research results were also included in the final review.

Literature selection

References were screened independently by the team of researchers, excluding those references that did not meet the inclusion criteria based on title and abstract. If inclusion/exclusion could not be determined only by title and abstract, full text review was performed and eligibility was assessed. Finally, a list of included references was assigned to each researcher and full text reviewed. If any doubt emerged, the reference was also reviewed by a second researcher.

Data forms on Excel were created to compile all publications selected for full text review we found with our different searching strategies (see Appendix II).

Conceptual analysis

One of the objectives of a critical review is to provide some degree of conceptual analysis and new knowledge in the form of a synthesis (40). We provide in this article a conceptual classification of the traditions of defining of health in the Anthropocene regarding their consideration of nature, which to the best of our knowledge does not exist to the date. This is crucial to develop a map of the evolution of this relation and clarify the assumptions of definitions, because commonly new definitions arise and are used being these questions unclear, having practical implications in policies and actions in health that are oriented, consciously or not, upon a certain way to understand health.

We classified the traditions in the following three axes to conceptually characterize the findings (Figure 3):

Scientific/non-scientific

- *Scientific*: approaches coming from the scientific thinking
 - *Non-scientific*: definitions and conceptualizations that do not come from scientific thinking, but from others knowledge generation systems (e.g., activism, indigenous or religious conceptions of health...), despite they are analysed in an academic work.
- Relation nature-society: we classified each approach in one of the following (42).
- *Heavy Anthropocentrism*: considers the absolute primacy of humans over nature, neglecting any moral consideration of the relationship between humans and nature.
 - *Light Anthropocentrism*: even when acting in the benefit of humans, light Anthropocentrism recognizes to nature more than just economic value. Does not see humans as despotic dominators over nature, but as responsible and rational administrator of the nature, still seen as a resource.
 - *Biocentrism*: recognizes moral relevance to all living beings. The moral relevance of the subjects is often determined for biocentrism in their capacity to feel or experience pain. Living beings can have interests and goals, and in consequence they have intrinsic value, not being this a synonym of having rights.

- *Ecocentrism*: considers that not only individuals should have moral consideration, but also other entities as ecosystems. All entities have intrinsic value even if they are not conscious of their interests.
- Relation society-health: if identifiable, we classified the approach according to the relation it considers between health and the cultural, political, economic, imperialist, power... relations within society.
 - *Integrated*: the approach accounts the above-mentioned societal relations in the definition of health.
 - *Fragmented*: the approach presents health as something pretended to be “objective”. It does not consider how power relations and hegemonic discourses affect the conceptualization of health.

Additionally, we summarized the main definition/conceptualization and characteristics of the different traditions of understanding health in relation to the environment that have commonalities in their assumptions and values in Table 1, adding the following dimensions to the previous:

- Human-environment dualism: consideration of humans and environment as two separated entities. This should be distinguished from the relation nature-society, because despite considering humans and the environment as different entities, the relation between the society and nature can vary from anthropocentric to non-anthropocentric positions.
- Epistemological/ontological position of each tradition in the following categories in Table 1 (43):
 - *Positivist*: dualist/objectivist epistemology; scientific findings are true. Verified hypotheses are established as facts or laws. Ontologically naïve realism: reality is apprehensible.
 - *Post-positivist*: modified dualist/objectivist epistemology. Non falsified hypotheses that are probable facts or laws. Ontologically critical realism: an objective reality does exist but is only imperfectly and probabilistically apprehensible.

- Critical Theory: transactional/subjectivist epistemology. Structural and historical insights into knowledge. Ontologically historical realism: reality is shaped by social, political, cultural, economic, ethnic, and gender values and is crystallized over time.
 - Constructivist: transactional/subjectivist epistemology. Individual or collective reconstructions of knowledge coalescing around consensus. Ontologically relativist: local and specific constructed and co-constructed realities.
- Levels of health:
- Individual (animal, human, or both): health considered from an individual's perspective.
 - Population (animal, human, or both): health considered from a population perspective.
 - Ecosystem: health considered as a property of ecosystems.
 - Gaia: health considered as a property of the whole Earth system as an entity.

Results

Included references

Figure 1 shows the flowchart of included references. A total number of 367 publications retrieved from databases search (March 2023) were screened, from which 61 were excluded as duplicates. After title and abstract screening, a total number of 63 references remained. After full text review 7 articles were excluded. The complementary searching strategy identified a total number of 12 relevant secondary references and 6 preliminary references. A total number of 74 publications were included in the final review. All references included after title and abstract review are listed in Appendix II.

Figure 2 shows the included references per year of publication.

Traditions in the definition of health since the Great Acceleration

The following traditions of conceptualizing health in relation to the environment in the historical period of the Anthropocene could be identified in the literature review:

- A) Environmental health.

- B) Scientific vision of ecodependence: ecology of health, political ecology of health, post-normal approach to health, holistic medicine. Holistic medicine included some non-scientific views on health.
- C) Recent integrated visions: Eco Health, One Health, Planetary Health. In Eco Health and One Health, narrow and wide approaches could be distinguished.
- D) Indigenous approach to health.

Figure 3 shows traditions classified in the three axes: (1) Anthropocentric/non-anthropocentric; (2) Scientific/non-scientific; (3) Integrated/fragmented. Table 1 shows the main definition for each approach, their characteristics, and the full text reviewed references that theorize them. The integration level shows qualitatively the integration of the multiple dimensions of health listed to provide a simple overview of the degree of integration of each tradition. The characteristics of each level of integration are explained in Table 1.

Nature as environmental risks: environmental health and multicausality

The advance of industrialized societies and the rise of diseases linked to them gave place to the environmental health approach. Its main objective is “to assess the influence of various factors on the general level of illness” (20). The interpretation of environmental health vision of nature is of a composite of environmental expositions and risks, that combined with individuals’ characteristics, and the “way of living”, can affect individuals and populations’ health in a multicausal network of interactions (8,17). Its goal is to identify risks in the environment that pose a threat to health and tackle them with public health interventions. This vision involves one of the first returns in the Anthropocene to the environment as a determinant of health, and in some cases the term environment referred to the natural and social environment. However, this is a vision fragmented and anthropocentric, and limits the relation of humans and nature to expositions that can be associated to the development of diseases, not as its cause, but as a contribution to the cause, that still tends to be considered of specific aetiology (44). This approach can be classified epistemologically as positivist

or post-positivist, because its main objective is to identify physical threats to health that are objective and quantifiable.

Scientific vision of ecodependence: ecology of health, political ecology of health, post-normal approach to health, and holistic medicine

Linked to the Great Acceleration and the realisation of the degradation of Earth's life sustaining systems, since 1960s, more integrative approaches to nature, and consequently to health, emerged. In this period, we can identify the first references for a need to consider the whole biosphere when studying health.

For the ecology of health, one of the central aspects regarding the concept of health in relation to nature is the notion of adaptation and dynamic equilibrium of body and the environment, understanding health as a permanent transaction with the environment (3,7,18,19,32,45,46). Concepts of equilibrium have been present since ancient times in Western and Oriental traditions (47). These theories also considered the social environment as an integral part of the human environment and ascertained how the political and societal relations influence health, expanding the concept of health from clinical medicine to the total environment and the interrelations that sustain it (7,19,45,48,49). References to the value of ancestral and indigenous knowledge systems can be found in these approaches (19). They moved away from dualism and considered humans as an integral part of the biosphere (19,50). Many authors called for the urgency of reformulating the WHO definition of health and pointed that medical definitions of health are "inadequate, because they are, for specific historical reasons, from the clinical study of individuals" and "individuals are not clinical entities", failing to provide a valid positive definition of health (14) and making health systems unable to diminish the burden of disease (3). Because this recognition to the relevance of social interactions and to the validity of ancestral knowledge, ecology of health approaches from the 1970s and 80s can be classified epistemologically as Critical Theory or constructivist.

There are also some notable approaches to the concept of health from the political ecology of health (sometimes referred as political ecology of disease), based on Marxist theories, in the literature (8,14,51,52). According to this approach, medical ecology may appear as the more holistic approach to health, but is in many cases limited, as it does not recognize the relevance of political and power relations and is too centred in individuals. These authors introduce the means of production as a determinant of health (8,14,51) and advocate for overcoming human-environment dichotomy by the analysis of social relations (51). Human-environment relations are characterized in this approach by a relation of dominion of nature, because of the work developed to provide the means for their survival (8,14). The concept of health is understood in Marx's terms as "*a society in which men, liberated from the 'alienations' and 'mediations' of capitalist society, would be the masters of their own destiny, through their understanding and control of both Nature and their own social relationship.*" (14). Linked to the political ecology of disease, there are the proposals coming from environmental justice movements, that have an integral vision of health that "*relates not only to illness and death, but also to life, nature, culture and fundamental human rights*" and to the capacity of communities affected by environmental injustices to democratically overcome them (52). Political ecology of health is clearly positioned in the Critical Theory epistemology, and the environmental justice approaches tend to also include constructivist approaches to knowledge, as they emphasize the communities' role.

To overcome this dualism human-environment, constructivist proposals for post-normal science approach –in Kuhn's terms (53)– to the concept of health were developed, suggesting a shift from identifying causal factors to a post-normal question that addresses culture, history, system, etc: "*Are the quality and quantity of internal and external resources sufficient, and is their organization appropriate for the system to meet its goals?*" (54).

The first references to Planetary Health can be found in the literature from this epoch, concerning the impact of human activities to the "planetary life support-system" (50,55), calling for a new,

interdisciplinary branch of science, “planetary public health” (32) and ascertaining the inseparability of human and planetary health (50).

Holistic medicine stands out as one of the movements that opposed to mainstream biomedical medicine and its neglect of the environment and social conditions effects on health. It was a heterogeneous movement, with contributions that went from scientific to non-scientific approaches. Awareness that many diseases are directly caused by the degradation of the environment and that traditional medicine was unable to prevent them, was one of the main causes of the emergence of the holistic medicine movement (44). It claimed opposite philosophical assumptions to mainstream scientific medicine, like body-mind dualism, and advocated for the incorporation of spirituality and ancestral and indigenous knowledges to the practice of medicine. Some contributors to holistic medicine, like Jonas Salk, also incorporated views on planetary health to the concept of holistic medicine (50,56). However, holistic medicine has also been criticised for a too individualistic approach, and for neglecting social causes of disease, putting more emphasis on the individual healing strategies, with risk of medicalization, than in the socio-economic and political context (44,45).

Emerging visions: Eco Health, One Health, Planetary Health

Since the 1990s a series of approaches to health that, in the face of interlinked and aggravated ecosocial crisis, pretended to offer a more holistic and integrative view became mainstream. The main traditions in this field are Eco Health, One Health, and Planetary Health. Despite sharing some common characteristics, they have significantly different approaches to the concept of health, existing differences within a same tradition. A clear definition of each one of these traditions does not exist (57).

Linked to the UN Millennium Development Goals, the Millennium Ecosystem Assessment initiative appeared, and from this keystone document and its specific report on health *Ecosystems and Human Well-Being: Health Synthesis*, the ecosystem approach to health (Eco Health) was developed (58,59).

Eco Health was defined as commitment “*to fostering the health of humans, animals and ecosystems and to conducting research which recognizes the inextricable linkages between the health of all species and their environments*” (57).

In a wider and more integrative approach, Eco Health adopts a constructivist epistemological position, and in some cases with influence of Critical Theory (60). It recognizes the interdependence of humans, wildlife, and ecosystems, emphasizing in the need for transdisciplinarity (11,38,57). This Eco Health approach gives attention to social and political relations in health, and in some cases ascertains the need to incorporate indigenous and ancestral knowledges (38,57,60), and considers health a property of ecosystems and not only of individuals (57), advocating for an ecocentric view. They also account humanities and social sciences, not only health related disciplines (57,60).

In a narrower and more fragmented approach, Eco Health adopts positions tendent to positivist epistemology (60). Despite recognizing value to the ecosystems, its understanding of them departs from the notion of “ecosystem services” (59), that is anthropocentric.

Some leading organizations in Eco Health define themselves as “*dedicated to a 'One Health' approach to protecting the health of people, animals, and the environment from emerging infectious diseases*” (61). So, the boundaries between Eco Health and One Health approaches are unclear.

One Health foundational roots can be found in the one medicine movement back in the 19th century (62). Emerging zoonotic diseases in the early 21st century made evident the need for a broader approach to the control of this diseases and One Health gained relevance among scholars and institutions. The approach to the concept of One Health is highly variable, it goes from narrow approaches for a convergence of human and veterinary medicine for the control of diseases, to calls for the integration of social sciences to wide its scope (60).

The One Health Commission defined it as “*the collaborative effort of multiple health science professions, together with their related disciplines and institutions – working locally, nationally, and*

globally – to attain optimal health for people, domestic animals, wildlife, plants, and our environment.”(63).

The most recent definition of One Health, that adopts a wider perspective, by the One Health High Level Expert Panel defines it 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 inter-dependent.”* (64).

Despite the claims of this recent definition, One Health, contrary to Eco Health, tends to consider health as a property of individuals, human or animal, and mainly accounts for health science professionals (57). Its notions of relation of society and nature go from anthropocentrism to biocentrism, recognizing value to sentient beings and their well-being.

Mainstream One Health approaches are anthropocentric, fragmented, and presented in an apolitical way, not acknowledging the relevance of social relations for health and degradation of the natural environment (65). They adopt a positivist or post-positivist epistemological position, despite claims for a widening of the scope of One Health to non-positivist position, also embracing humanities and social sciences like some Eco Health approaches (60,65). The above mentioned most recent definition of One Health clearly stands for a broader integrated and interdisciplinary approach, similar to the wide Eco Health approach, but hardly recognizes the relevance of the socio-political and power relations (64).

It should be noted that the way Eco Health and One Health are applied and understood is highly dependent on each researcher or group of researcher’s perspective (60).

Planetary Health appears as the most recent approach to health and environment and acquired great impact in mainstream academy. Despite The Lancet – Rockefeller report of the Commission on Planetary Health claims it as their original contribution it is not a new concept (66). References to this concept can be found in literature back in 1970s (50). And even if the literal concept of Planetary

Health is not mentioned, its ideas and foundational assumptions are not new at all. The Commission defines Planetary Health as “*the achievement of the highest attainable standard of health, well-being, and equity worldwide through judicious attention to the human systems -politic, economic, and social- that shape the future of humanity and the Earth’s natural systems that define the safe environmental limits within which humanity can flourish*” (66). This approach to Planetary Health focuses mainly on human health, while Eco Health and One Health consider health at other levels (57). Its view on sustainability also gives higher relevance to human health (57), being anthropocentric. The appellation in the report mainly to health professionals, and the emphasis on human health, situates this approach to Planetary Health in a post-positivist epistemological position.

The notion of Planetary Health in the literature from 1970s and previous is, however, broader than the one that became mainstream since the publication of The Lancet – Rockefeller report. Despite there is no clear definition of Planetary Health in that epoch, the notions tended to acknowledge social and political relations and the value of indigenous and ancestral knowledges, presenting Planetary Health with historical perspective and from a constructivist epistemological position.

The concept of health in indigenous peoples

The ecosocial crisis drove special attention from the academic literature to indigenous and ancestral knowledge that has been historically neglected by mainstream science. Notable works studying these concepts can be found in the literature.

The neglect of mostly constructivist and participatory epistemologies had severe effects on indigenous health, considered strictly biomedical paradigm, without accounting their concept of health (67). This knowledge offers approaches to health away from anthropocentric views and that tightly linked to the land and their whole environment.

Indigenous peoples are significantly different between and within them, but the indigenous conception of health described in the scientific literature shares basic commonalities in most cases. For indigenous people health is always understood more than as the absence of disease, it is attached

to the health of the land they inhabit, the equilibrium between the environment and people, and the emotional bonds that they establish with nature. Spirituality is also central to the indigenous concept of health (68–72).

Discussion

Our review showed that no clear or unique approach or definition of health in relation to the environment exists, rather a great diversity of ways to understand our relationship with the natural environment exists and are used without being the assumptions we describe here even considered. One example is the term Planetary Health, that has become widely used since the publication of The Lancet – Rockefeller report (66), and presented in some instances as a more integrative approach to health than One Health and Eco Health, yet seems to be as well constrained by the adoption of a dualist lens towards health and disease.

The concern for considering nature when defining health has been a constant since the evolution of industrialized societies and the Great Acceleration changed the morbimortality patterns. The new concepts of health in many cases retrieved concepts of balance, adaptation, equilibrium, or interdependence from the Western, ancestral, and indigenous traditions of thinking health (73).

The prolific literature production in the 1970s and 80s did not impact significantly on mainstream academia until the Eco Health and One Health movements appeared in the late 1990s and early 2000s. Despite they represent an advance and introduced the need for a broadening of the concept of health, they are in most cases limited and have a fragmented approach. Eco Health and One Health view on ecosystems is variable, but when applied to research it is mostly fragmented and with a positivist connotation (60), as the value of ecosystems is understood in the terms of the services they provide to humans. Eco Health is often used as a synonym of One Health and limited to the control of zoonotic diseases (60). The unclear significance of each approach and the wide variety of definitions add confusion and difficult them to really provide a change to the concept of health and the way research is done.

In the case of the most recent approach, Planetary Health, as defined by The Lancet – Rockefeller Commission (66), is anthropocentric, fragmented, and presented in an ahistorical way, as if previous contributions did not exist. For this definition humans occupy a privileged place and are valued more than ecosystems, whose value is only acknowledged as long as they allow humanity to flourish, denying their intrinsic value. Moreover, the report is almost uniquely addressed to health professionals, thus overlooking relevant stakeholders, and missing a broader transdisciplinary approach. It also neglects the value of other epistemologies and ancestral and indigenous knowledge, even claiming for “*Training of indigenous and other local community members as primary health-care workers, while respecting their local knowledge and culture, can help protect health and biodiversity*” (66).

These new approaches that emerged since the 1990s, gave place to fruitful and integrative approaches for research in health, that still contribute to face pressing issues like zoonoses, but rather than providing a substantive definition of health, they focused on moving forward in a collaborative and multidisciplinary effort to tackle emerging threats to health, so they do not resolve the problem of defining health in the Anthropocene.

Relationships between the traditions that started to emerge from the 1960s and the traditions from the last decades are difficult to trace. The most significant and easy to ascertain may be the one existing between a broad vision of Eco Health and the ecology of health from 1970s and 80s, represented mainly by Dubos, San Martín, and Stallones (3,7,18,19,74–77). However, One Health and Planetary Health, hardly trace any explicit connexion with the literature from this epoch and tend to be presented as new.

To the date no consensus has been reached, even within the practitioners of a certain tradition, to define health in a positive way considering the relation of humans and nature. We assume that reaching a unique and valid definition is epistemologically impossible, because of the changing interests and priorities of societies. However, the inexistence of an integrative and shared conception

of health for the age of Anthropocene that accounts the three axes of the definition of health that we described –remaining only the WHO definition as the one broadly accepted– poses a threat to the health of humans, ecosystems, and Gaia. An integrated shared imaginary of health beyond the anthropocentric, biomedical model, that acknowledges the diversity of cultures and epistemologies does not exist. This hinders changing our priorities in health, research, and policies in an era defined by the urgency to act to preserve human health and the vastness of the interdependent ecological, emotional, and planetary relations that allow us to exist, perpetuate and live healthy in this planet.

The health problems, derived from the ongoing ecosocial crisis, that humanity faces are not of technological nor material nature, but have a socio-political root. There is an urgent need for a new definition of health that could permeate and change the biomedical imaginaries of health that are deeply rooted in our societies and reflected in the orientation of health services and policies. The hegemony of a certain body of knowledge, in this case the biomedical, is not objective, but is part of the reproduction of the system of beliefs that legitimates a social organization and explains the reality from the viewpoint of those that retain power (48). Changing these imaginaries is also relevant to train professionals that could be able understand the complex and interrelated nature of health-disease problems of the Anthropocene. Their training generally does not include tools for understanding the ecological and socio-political nature of health (78).

According to the nature of this crisis, a Gaian perspective on health, that recognizes health as a property of the Earth as a whole, but also the emotional and spiritual bonds to Earth is required. The traditions here analysed present in some cases (ecology of health and indigenous concepts of health), a certain perspective on Gaia, but is limited to the two mentioned traditions, with low or no impact on mainstream academia or research in health.

In the age of Anthropocene, we should reorient our priorities and policies in health upon a common and clear definition that considers the relation between humanity and nature, existing an unsatisfied need to clarify the previous theories. This may be seen as a secondary problem, but as we argued,

how we define health affects how we develop policies, having a real impact on human and non-human lives.

A new definition of health for the Anthropocene should recognize, value, and take as a base the enormous efforts done by social and indigenous movements for environmental justice, and compromised scholars, to find new ways to understand health and our relationship with nature. In other words, it should be a *historical* definition of health for our immediate future. It should be an *intercultural* definition of health, that acknowledges and is valid for the epistemologies of the Global South, promoting an intercultural imaginary and a convergence of epistemologies, recognizing health in a Gaian perspective, emotional, scientific, and even religious. Otherwise, pointing the need of considering the Global South epistemologies and their Gaian perspective, but at the same time rejecting to expand this imaginary to science and health –that in fact accounts with great scientific contributions (29,30,79)– in the whole world would be hypocrite (80).

Religious and spiritual dimensions of nature should not be underestimated in the transformation of the imaginaries of health and the relation of societies with nature. Imaginaries of health and nature are mediated in many cases by the spiritual value given to them. Indigenous approaches account for this integral vision of humans as a part of nature, but also Pope Francis, in his Encyclical Letter *Laudato si'*, points that “*Nature cannot be regarded as something separate from ourselves or as a mere setting in which we live. We are part of nature, included in it and thus in constant interaction with it. [...] It is essential to seek comprehensive solutions which consider the interactions within natural systems themselves and with social systems. We are faced [...] with one complex crisis which is both social and environmental. Strategies for a solution demand an integrated approach to combating poverty, restoring dignity to the excluded, and at the same time protecting nature*” (81).

This claim moves the Christian vision of nature from a light anthropocentric perspective to a more integrative and ecocentric view and could be helpful to transform imaginaries of our relationship with nature and consequently of health.

The scope of this review is limited to the academic and scientific literature on the definition of health and environment. We did not consider other literature, like those coming from active social or indigenous movements, limiting the concept of health to that that appears in scientific literature.

This review showed the general lines in which the definition of health in relation to the natural environment has been moving since the massive realisation of the anthropogenic alteration of the Earth systems that occurred with higher intensity since 1950s. It provides a valuable overview of the academic literature that has been generated and shows that serious limitations in the definition of health exist, and that there is an unsatisfied need to change definitions and imaginaries of health. To the best of our knowledge, a comprehensive critical review of the traditions of defining health in relation to the natural environment, that evaluates, categorizes, and summarizes what has been developed in this field, analysing the characteristics and implications of the definitions, does not exist, as others are mainly centred in the emerging fields in this area since the 1990s and 2000s: Eco Health, One Health and Planetary Health, without considering the whole period of the Anthropocene (1950s to the present) (11,38,57). The historical perspective on the traditions defining health is an important strength of this work that has not been adequately studied previously.

This review orients future research on the concept of health, and the development of new holistic understandings of health for implementation of health policies, that could be analysed with the conceptual lenses we provided to ensure a real interdisciplinary and integrated approach into the pressing issues of the Anthropocene. Future research on the concept of health should pay attention to the concepts of health generated outside scientific literature if a real convergence of epistemologies is wanted.

Acknowledgements

Joan Benach gratefully acknowledges the financial support by ICREA under the ICREA Academia programme.

Author contributions

All authors fulfil ICMJE criteria for authorship. In particular, contributorship for each author was as follows:

Miquel Amengual-Moreno: Conceptualization, Methodology, Investigation, Writing- Original Draft, Project administration; Lucinda Cash-Gibson: Methodology, Validation, Data Curation, Writing- Review & Editing; Adrián Almazán: Data Curation, Writing- Review and Editing; Laila Vivas: Data curation; Eliana Martínez Herrera: Data curation; Juan M. Pericàs: Conceptualization, Methodology, Writing- Review & Editing, Supervision; Joan Benach: Conceptualization, Methodology, Writing- Review & Editing, Supervision.

Funding sources

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Declaration of competing interests

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Guide for Authors

Guide for Authors which this work adheres to (Social Science and Medicine):

<https://www.elsevier.com/journals/social-science-and-medicine/0277-9536/guide-for-authors>

Figures and tables

Figure 1: publications flowchart

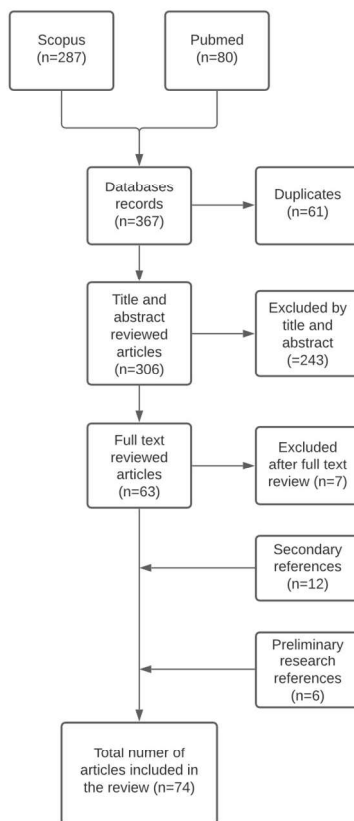


Figure 1: flowchart of the review process showing included/excluded references.

Figure 2: Included references by year of publication

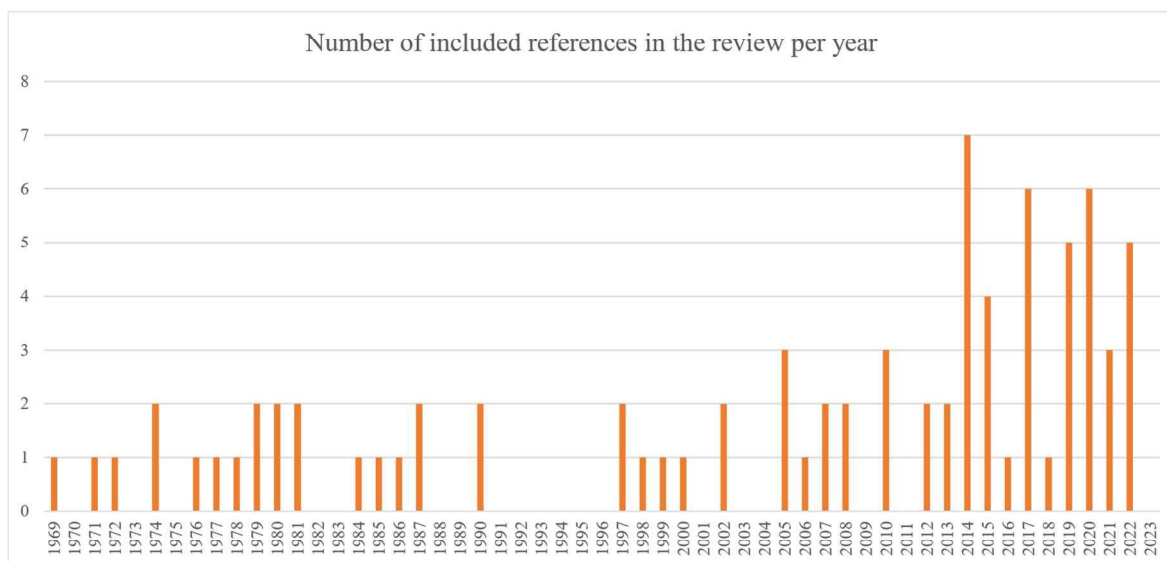


Figure 2: included references by year of publication.

Figure 3: Classification of the approaches in three axes

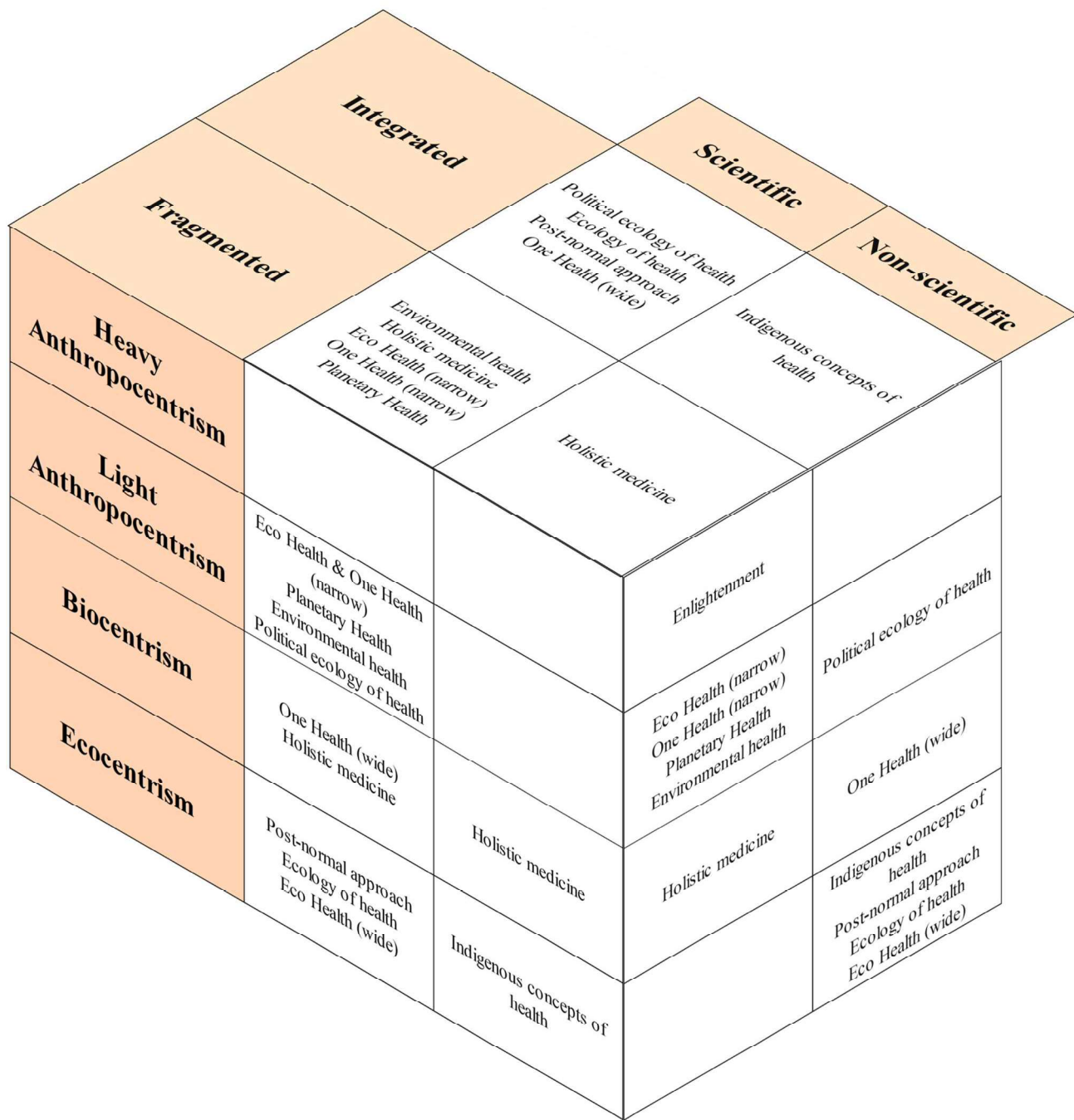


Figure 3: classification of the traditions in the definition of health in the three axes (relation nature-society, scientific/non-scientific, and integration)

Table 1: classification of the characteristics of traditions and their main definition of health

Environmental risks assessment		Scientific visions of ecodependence			
Environmental health	Ecology of health	Political ecology of health	Post-normal approach to health	Holistic medicine*	
Main definition/conceptualization of health Health conceptualized in a positivist way, and environmental threads may affect it	Health as dynamic equilibrium and permanent exchange with the environment	Health as relation with the environment determined by the means of production	Shift from identifying causal factors (determinants) to a post-normal question that addresses culture, history, system, etc: a post-normal question: <i>Are the quality and quantity of internal and external resources sufficient, and is their organization appropriate for the system to meet its goals?</i>	Health as a value in and of itself, and as a praxis implicating the individual on its maintenance, assuming unity between mind, body, and spirit	
Health levels - Individual + - Population + - Ecosystem + - Gaia +	ECO	LA	ECO	LA/ECO	
Relation nature-society LA	ECO	LA	ECO	LA/ECO	
Human-environment dualism Yes	No	Yes	No	No	
Epistemological/ontological position - Positivist + - Post-positivist - Critical Theory - Constructivist	+ + + +	+ + 	+ + 	+ + 	
Integration level +	++++	+++	+++	+++	
References (Appendix II) 4, 39	1-3, 8-10, 13-17, 19, 20, 25, 28, 44	7, 11, 15, 20, 55, 57, 70	23	12, 42	

Emergent approaches to health					Indigenous approach to health	
	Eco Health (narrow)	Eco Health (wide)	One Health (narrow)	One Health (wide)	Planetary Health	
Main definition/conceptualization of health	Health as the assessment of human and ecosystem health	Health as the assessment of human and ecosystem health, and the political and social relations determining it	Health as the convergence of veterinary and human medicine	Health as the convergence of human and veterinary medicine, and other disciplines, like social sciences and humanities	Health as the state of highest attainment of human health and the ecosystems on which it depends	Health as the health of the individual, its family, community, and the equilibrium with environment they inhabit, with particular emphasis on spirituality
Health levels						
- Individual	+	+	+	+	+	+
- Population	+	+	+	+	+	+
- Ecosystem	+	+	+	+	+	+
- Gaia						+
Relation nature-society	LA	ECO	LA	BIO	LA	ECO
Human-environment dualism	Yes	No	Yes	Yes	Yes	No
Epistemological/ontological position						
- Positivist	+		+	+	+	
- Post-positivist	+		+	+	+	
- Critical Theory		+				
- Constructivist		+				+
Integration level	++	++++	+	++	++	++++
References (Appendix II)	27, 29, 30, 38, 54, 58, 60, 67, 74		37, 46, 48, 49, 50, 52, 58, 60, 63, 65, 67, 74, 80, 81	3, 5, 53, 58, 60, 66, 74, 80	24, 33-36, 45, 47, 59, 69-71, 73, 75, 77, 78	
<p>LA: Light Anthropocentrism, BIO: biocentrism, ECO: ecocentrism Integration level: +: positivist, anthropocentric, and consider health as a property of individuals or populations; ++: positivist, anthropocentric, dualist, and consider health as a property of ecosystems; +++: non-positivist, may be dualist or not, anthropocentric or not, consider health at the ecosystem level; ++++: non-positivist traditions considering health at a Gaian level, non-dualist, and non-anthropocentric. *Holistic medicine has been classified as +++ integration level. Despite being centred mainly on individuals, but because its high heterogeneity, some references to other levels of health can be found (56). Their positions regarding nature-society are also variable and go from LA to ECO.</p>						

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Appendix I: search strategies

Starting strategy:

((“definition of health”) OR (“defining health”) OR (“concept* of health”)) AND ((“ecological environment”) OR (“ecology”) OR (“ecology of disease”) OR (“natural environment”) OR (“ecosystem*”) OR (“state of equilibrium”) OR (“harmony”) OR (“environmental limits”) OR (“ecological variation”) OR (“ecological process”) OR (“sustainab*”) OR (“planetary health”) OR (“planetary”) OR (“EcoHealth”) OR (“Eco Health”) OR (“One Health”))

Addition: NOT (“concept of health promotion”). Many irrelevant results linked to this concept:

((“definition of health”) OR (“defining health”) OR (“concept* of health”)) AND ((“ecological environment”) OR (“ecology”) OR (“ecology of disease”) OR (“natural environment”) OR (“ecosystem*”) OR (“state of equilibrium”) OR (“harmony”) OR (“environmental limits”) OR (“ecological variation”) OR (“ecological process”) OR (“sustainab*”) OR (“planetary health”) OR (“planetary”) OR (“EcoHealth”) OR (“Eco Health”) OR (“One Health”)) NOT (“concept of health promotion”)

Elimination of irrelevant terms. The following were eliminated as they did not alter the results the formula returned: ecological environment, ecology of disease, environmental limits, ecological variation, ecological process, planetary, planetary health, EcoHealth/Eco Health:

((“definition of health”) OR (“defining health”) OR (“concept* of health”)) AND ((“ecology”) OR (“natural environment”) OR (“ecosystem*”) OR (“state of equilibrium”) OR (“harmony”) OR (“sustainab*”) OR (“One Health”)) NOT (“concept of health promotion”)

Search strategy adapted for Scopus. Restricted by title, abstract and keywords:

TITLE-ABS-KEY ((“definition of health”) OR (“defining health”) OR (“concept* of health”)) AND TITLE-ABS-KEY ((“ecology”) OR (“natural environment”) OR (“ecosystem*”) OR (“state of equilibrium”) OR (“harmony”) OR (“sustainab*”) OR (“One Health”)) AND NOT TITLE-ABS-KEY-AUTH (“concept of health promotion”)

Appendix II: references included for full text review

Reference ID	Authors	Titles	Year	Source title	Inclusion after full text	Source	Tradition/s in the document
1	Dubos, R..	Hombre, Medicina y Ambiente	1969	Monte Ávila Editores	I	Preliminary research Secondary ref. from refs. 15, 7	Ecology of health
2	Stallones, RA.	El ambiente, la ecología y la epidemiología.	1971	Conferencias de la OPS/OMS sobre Ciencias Biomédicas	I	Preliminary research	Ecology of health
3	Sargent, F.	Man - environment problems for public health	1972	American Journal of Public Health	I	Secondary ref. from refs. 14, 66	Ecology of health, planetary health
4	Lalonde, M.	A new perspective in the health of Canadians	1974	Government of Canada	I	Secondary ref. from refs. 14, 16	Environmental health
5	Tsaregorodtsev, G. I.	Dialectics of interaction of economic and humanistic approaches	1974	Soviet Studies in Philosophy	I	Secondary ref. from ref. 66	Planetary health
6	Schlenger WE.	A new framework for health	1976	Inquiry		Pubmed	-
7	Turshen M.	The Political Ecology of Disease	1977	Review of Radical Political Economics	I	Scopus	Political ecology of health
8	Menchaca F.J.	Toward a renewed definition of health: [HACIA UNA DEFINICION ACTUALIZADA DE SALUD]	1978	Anales Espanoles de Pediatria	I	Scopus	Ecology of health
9	San Martín, H.	Ecología humana y salud	1979	La Prensa Médica Mexicana	I	Preliminary research Secondary ref. from ref. 15	Ecology of health
10	Dubos, R..	Mirage of health: utopias, progress, and biological change	1979	Harper Torchbooks	I	Secondary ref. from refs. 16, 66	Ecology of health
11	Navarro, V.	Work, ideology, and science: the case of medicine	1980	International Journal of Health Services	I	Secondary ref. from ref. 15	Political ecology of health
12	Berliner, HS; Salmon JW	The holistic alternative to scientific medicine: History and analysis	1980	International Journal of Health Services	I	Secondary ref. from ref. 66	Holistic medicine
13	San Martín, H.	La crisis mundial de la salud	1981	Editorial Karpos	I	Preliminary research Secondary ref. from ref. 15	Ecology of health
14	Lee, PR; Franks, PE	Health and disease in the community	1981	Möbius: A Journal for Continuing Education Professionals in Health Sciences	I	Preliminary research Secondary ref. from ref. 15	Ecology of health
15	Martínez Navarro, JF	Assaig sobre salut comunitària	1984	Acadèmia de Ciències Mèdiques de Catalunya i de Balears	I	Preliminary research	Ecology of health, political ecology of health
16	Alonzo A.A.	Health as situational adaption: A social psychological perspective	1985	Social Science and Medicine	I	Scopus	Ecology of health
17	Draper P.	Nancy Milio's work and its importance for the development of health promotion	1986	Health Promotion International	I	Scopus	Ecology of health
18	Lorimer D.	The near-death experience and spiritual health	1987	Journal of Interprofessional Care	E	Scopus	Ecology of health
19	Last, JM	Human Ecology and Public Health	1987	Prentice Hall International	I	Preliminary research	Ecology of health
20	Castellanos P.L.	On the concept of health and disease. Description and explanation of the health situation.	1990	Epidemiological bulletin	I	Scopus	Political ecology of health,

									ecology of health
21	King M.	Swellingrebel lecture. Public health and the ethics of sustainability	1990	Trop Geogr Med	E	Pubmed			
22	Ness P.	Understandings of health: How individual perceptions of health affect health promotion needs in organizations	1997	AAOHN Journal	I	Scopus			-
23	Waltnet-Toews D.; Wall E.	Emergent perplexity: In search of post-normal questions for community and agroecosystem health	1997	Social Science and Medicine	I	Scopus			Post-normal approach to health
24	Wheatley M.A.	Social and cultural impacts of environmental change on aboriginal Peoples in Canada.	1998	International journal of circumpolar health	I	Scopus			Indigenous approach to health
25	Piko B.	Teaching the mental and social aspects of medicine in eastern Europe: Role of the WHO definition of health	1999	Administration and Policy in Mental Health	I	Scopus			Ecology of health
26	Conner RF, Tanjasiri SP.	Communities defining environmental health: examples from the Colorado (U.S.A.) Healthy Communities Initiative	2000	Rev Environ Health	I	Pubmed			-
27	Rapport D.J.	The health of ecology and the ecology of health	2002	Human and Ecological Risk Assessment	I	Scopus			Eco Health
28	Vega-Franco L.	Ideas, beliefs and perceptions about health. A historical account; [Ideas, creencias y percepciones acerca de la salud. Reseña histórica]	2002	Salud Publica de Mexico	I	Scopus			Ecology of health
29	Cecchi G.; Mancini L.	Ecosystem health and human health; [Salute degli ecosistemi e salute umana]	2005	Annali dell'Istituto Superiore di Sanita	I	Scopus			Eco Health
30	Freitas C.M.	Brazilian public health research output related to the environment; [A produção científica sobre o ambiente na saúde coletiva.]	2005	Cadernos de saúde pública / Ministério da Saúde, Fundação Oswaldo Cruz, Escola Nacional de Saúde Pública	E	Scopus			
31	Corvalan C, Hales S, McMichael A, et al.	Ecosystems and Human Well-being: Health Synthesis	2005	World Health Organization	I	Preliminary research			Eco Health
32	Björklund A.; Svenson T.; Read S.	Holistic and biomedical concepts of health: A study of health notions among Swedish occupational therapists and a suggestion for developing an instrument for comparative studies	2006	Scandinavian Journal of Occupational Therapy	I	Scopus			-
33	Labun E.R.; Emblen J.	Health as Balance for the Sto: Lo Coast Salish	2007	Journal of Transcultural Nursing	I	Scopus			Indigenous approach to health
34	Nettleton C.; Stephens C., et al.	Utz wachil: Findings from an international study of indigenous perspectives on health and environment	2007	EcoHealth	I	Scopus			Indigenous approach to health
35	Omonzejele P.F.	African Concepts of Health, Disease, and Treatment: An Ethical Inquiry	2008	Explore: The Journal of Science and Healing	I	Scopus			Indigenous approach to health
36	Yurkovich E.E.; Lat-tergrass I.	Defining health and unhealthiness: Perceptions held by Native American Indians with persistent mental illness	2008	Mental Health, Religion and Culture	I	Scopus			Indigenous approach to health

37	Davis, A. and Sharp, J.	Rethinking One Health: Emergent Human, Animal, and Environmental Assemblages	2020	Social Science & Medicine	I	Preliminary research	One Health (broad)
38	Dustin D.L.; Bricker K.S.; Schwab K.A.	People and nature: Toward an ecological model of health promotion	2010	Leisure Sciences	I	Scopus	Eco Health (narrow)
39	Cicollella A.	[Health and environment: the 2nd public health revolution.]	2010	Sante Publique	I	Pubmed	Environmental health
40	Genovez P.F.; Vilarino M.T.B.; Cazarotto J.L.	Between the modern and the rustic: The territorialization of preventive medicine in the middle doce river; [Entre o moderno e o rústico: A territorialização da medicina preventiva no médio rio doce]	2012	Historia, Ciências, Saude - Manguinhos	E	Scopus	-
41	Ríos-Osorio L.A.; Salas-Zapata W.A.; Ortiz-Lobato M.	Concepts associated with health from the perspective of sustainable development; [Conceptos asociados a la salud desde la perspectiva del desarrollo sostenible]	2012	Saude e Sociedade	I	Scopus	-
42	Bullington J.	Health and Illness and Holistic Health	2013	SpringerBriefs in Philosophy	I	Scopus	Holistic medicine
43	Callahan D.	The Roots of Bioethics: Health, Progress, Technology, Death	2013	The Roots of Bioethics: Health, Progress, Technology, Death	E	Scopus	-
44	Bircher J.; Kuruvilla S.	Defining health by addressing individual, social, and environmental determinants: New opportunities for health care and public health	2014	Journal of Public Health Policy	I	Scopus	Ecology of health
45	Hopkirk J.; Wilson L.H.	A call to wellness - Whitiwhitia i te ora: exploring Māori and occupational therapy perspectives on health	2014	Occupational therapy international	I	Scopus	Indigenous approach to health
46	Evans B.R.; Leighton F.A.	A history of One Health	2014	OIE Revue Scientifique et Technique	I	Scopus	One Health
47	Green D.; Minchin L.	Living on climate-changed country: Indigenous health, well-being and climate change in remote Australian communities	2014	EcoHealth	I	Scopus	Indigenous approach to health
48	Stephen C.; Karesh W.B.	Introduction: Is one health delivering results?; [Introduction Le concept «Une seule santé» donne-t-il des résultats?]	2014	OIE Revue Scientifique et Technique	I	Scopus	One Health
49	Stephen C.	Toward a modernized definition of wildlife health	2014	Journal of Wildlife Diseases	I	Scopus	One Health
50	Lerner H, Berzell M.	Reference values and the problem of health as normality: a veterinary attempt in the light of a one health approach	2014	Infect Ecol Epidemiol	I	Pubmed	One Health
51	Ibell C.; Sheridan S.A.; Hill P.S.; Tasserei J.; Maleb M.-F.; Rory J.-J.	The individual, the government and the global community: Sharing responsibility for health post-2015 in Vanuatu, a small island developing state	2015	International Journal for Equity in Health	I	Scopus	-
52	Lerner H, Berg C.	The concept of health in One Health and some practical implications for research and education: what is One Health?	2015	Infect Ecol Epidemiol	I	Pubmed	One Health
53	Whitnee S, Haines A, Beyrer C, et al.	Safeguarding human health in the Anthropocene epoch: report of The Rockefeller Foundation-Lancet Commission on planetary health	2015	Lancet	I	Secondary ref. from refs. 60, 66 Preliminary research	Planetary health
54	Asakura T, Mallee H, et al.	The ecosystem approach to health is a promising strategy in international development: lessons from Japan and Laos	2015	Global Health	I	Pubmed	Eco Health

55	Benatar S.	Politics, power, poverty and global health: Systems and frames	2016	International Journal of Health Policy and Management	I	Scopus	Political ecology of health
56	Pons-Vigués M.; Berenguera A., et al.	Health-care users, key community informants and primary health care workers' views on health, health promotion, health assets and deficits: Qualitative study in seven Spanish regions	2017	International Journal for Equity in Health	I	Scopus	-
57	Porto M.F.; Ferreira D.R.; Finamore R.	Health as dignity: Political ecology, epistemology and challenges to environmental justice movements	2017	Journal of Political Ecology	I	Scopus	Political ecology of health
58	Mallee H.	The evolution of health as an ecological concept	2017	Current Opinion in Environmental Sustainability	I	Scopus	Eco Health, One Health, Planetary Health
59	Charlier P.; Coppens Y., et al.	A new definition of health? An open letter of autochthonous peoples and medical anthropologists to the WHO	2017	European Journal of Internal Medicine	I	Scopus	Indigenous approach to health
60	Lerner H.; Berg C.	A comparison of three holistic approaches to health: One health, ecohealth, and planetary health	2017	Frontiers in Veterinary Science	I	Scopus	Eco Health, One Health, Planetary Health
61	Warren M.	Defining Health in the Era of Value-Based Care: The Six Cs of Health and Healthcare	2017	Cureus	I	Pubmed	-
62	Conti A.A.	Historical evolution of the concept of health in Western medicine	2018	Acta Biomedica	I	Scopus	-
63	Huth M.; Weich K.; Grimm H.	Veterinarians between the Frontlines?! The Concept of One Health and Three Frames of Health in Veterinary Medicine	2019	Food Ethics	I	Scopus	One Health
64	Wang J.; Yu R.-X.; Wang Q.	New Concept of Health with Perspective of Chinese Medicine	2019	Chinese Journal of Integrative Medicine	I	Scopus	Oriental approaches to health
65	Lerner H.	A critical analysis of definitions of health as balance in a One Health perspective	2019	Medicine, Health Care and Philosophy	I	Scopus	One Health
66	Prescott S.L.; Logan A.C.	Planetary Health: From the Wellspring of Holistic Medicine to Personal and Public Health Imperative	2019	Explore	I	Scopus	Planetary Health
67	Harrison, S; Kivuti-Bitok, L., et al.	EcoHealth and One Health: A theory-focused review in response to calls for convergence	2019	Environment International	I	Secondary ref. from ref. 37	Eco Health, One Health
68	Mude W.W.; Fisher C.M., et al.	South Sudanese perceptions of health and illness in South Australia	2020	International Journal of Migration, Health and Social Care	I	Scopus	-
69	Pichasaca R.A.	Conception of health-disease from the cañari worldview: [Concepção da saúde-doença desde a visão de mundo cañari]; [Concepción de la salud-enfermedad desde la cosmovisión cañari]	2020	Revista Ciencias de la Salud	I	Scopus	Indigenous approach to health
70	Spiegel S.J.; Thomas S., et al.	Visual storytelling, intergenerational environmental justice and indigenous sovereignty: Exploring images and stories amid a contested oil pipeline project	2020	International Journal of Environmental Research and Public Health	I	Scopus	Indigenous approach to health, political ecology of health
71	Guimarães M.B.; Nunes J.A., et al.	Integrative and complementary practices in the health field: Towards a decolonization of knowledge and practices; [As práticas integrativas e complementares no campo da saúde: Para uma	2020	Saude e Sociedade	I	Scopus	Indigenous approach to health

	descolonização dos saberes e práticas]					
72	Campello L.G.B.; De Oliveira A.F.; Do Amaral R.D.	The fundamental right to health in the intersection of the environmental crisis with the covid-19 pandemic; [O direito fundamental à saúde na interseção da crise ambiental com a pandemia da covid-19]	2020	Revista Jurídica	E	Scopus
73	Bautista-Valarezo E.; Duque V., et al.	Towards an indigenous definition of health: An explorative study to understand the indigenous Ecuadorian people's health and illness concepts	2020	International Journal for Equity in Health	I	Scopus
74	Elton S.	Relational health: Theorizing plants as health-supporting actors	2021	Social Science and Medicine	I	Scopus
75	Bussalleu A.; King N., et al.	Nuya kankantawa (we are feeling healthy): Understandings of health and wellbeing among Shawi of the Peruvian Amazon	2021	Social Science and Medicine	I	Scopus
76	Kaira S.; Arora V.; Verma M.; Kumar V.	A novel definition of health: Crafting a contemporary classic	2021	Journal of the Pakistan Medical Association	I	Scopus
77	Reweti A.; Ware F.; Moriarty H.	A tangata whenua (people of the land) approach to conceptualising Māori health and wellbeing	2022	Global Health Promotion	I	Scopus
78	Smith S.-J.; Penados F.; Gahman L.	Desire over damage: Epistemological shifts and anticolonial praxis from an indigenous-led community health project	2022	Sociology of Health and Illness	I	Scopus
79	Al-Obaidi T.; Prior J.; McIntyre E.	Conceptual Approaches of Health and Wellbeing at the Apartment Building Scale: A Review of Australian Studies	2022	Sustainability (Switzerland)	E	Scopus
80	Heuckmann B.; Zeyer A.	Science Environment Health, One Health, Planetary Health, Sustainability, and Education for Sustainable Development: How Do They Connect in Health Teaching?	2022	Sustainability (Switzerland)	I	Scopus
81	One Health High-Level Expert Panel, et al.	One Health: A new definition for a sustainable and healthy future	2022	PLoS Pathog	I	Preliminary research

I: included after full text review; E: excluded after full text review for not fulfilling inclusion criteria.