

## Article

# Alternative Paradigms in Animal Health Decisions: A Framework for Thinking Beyond Money

Liz P. Noguera<sup>1,2\*</sup>, Sonja Hartnack<sup>1</sup> and Paul R. Torgerson<sup>1</sup>

<sup>1</sup> Affiliations <sup>1</sup> Section of Epidemiology, Vetsuisse Faculty, University of Zürich, Zürich, Switzerland

<sup>2</sup> Affiliations <sup>2</sup> Epidemiology and Biostatistics, Life Science Zurich Graduate School, University of Zurich, Zurich, Switzerland

\* Correspondence: lizpaola.noguerazayas@uzh.ch

**Abstract:** Zoonoses are diseases transmitted from (vertebrate) animals to humans. Control and prevention of these diseases require an appropriate way to measure health for prudent and well-balanced decisions in public health. We propose a framework that aims to explore, understand and open up a conversation about the non-monetary value of animals through environmental and normative ethics. As an example of its application, participants can choose what they are willing to give in exchange for curing an animal in hypothetical scenarios selecting a human health condition to suffer, the amount of money, and lifetime as a tradeoff. We believe that considering animals beyond their monetary value in public health decisions will contribute to a more rigorous assessment of the burden of zoonotic diseases, among other health decisions. This method might help us complement the existing metrics in health, adding more comprehensive values for animal and human health for the “One Health” approach.

**Keywords:** zoonosis; animal health; One Health

## 1. Introduction

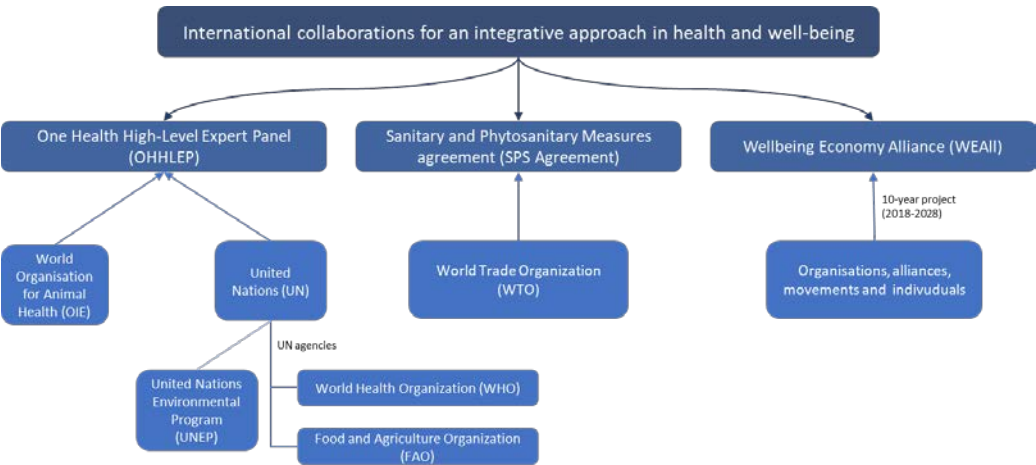
Approximately 75% of emerging human pathogens originate from animals (1). Certain diseases that affect the human population are considered “human diseases,” despite having an animal origin, such as HIV, dengue, among others (2). Animal diseases that can be transmitted to humans are called “zoonoses,” and their transmission can be directly and indirectly through food, air, water, vectors, and fomites. We encounter challenges in facing zoonoses, since we have to consider more factors and multiple species to control and prevent these diseases.

## 2. Background

We witness an increased risk of zoonosis outbreaks not only due to weather and climate change (3) but mainly due to anthropogenic impact on the environment (4,5), such as overpopulation, overconsumption (6), deforestation, biodiversity loss (7), pollution of natural resources (air, water, and soil), intensification of animal and plant trade (8), civil unrest and war (9), famine (10). The outbreak scenarios repeat over time with different infectious diseases (11), and it could worsen if appropriate measures are not taken. For that reason, zoonosis control requires intervention in the transmission pathway between animals and humans to prevent diseases, e.g., milk pasteurization, vaccination, habitat conservation, and more sustainable alternatives. Due to this, environmental ethics, a branch of applied philosophy, has lately gained more attention to develop solutions in an integrative approach. Even though its beginning is already dated in the 1960s (12).

Animal health matters the most when they represent an economic loss. Animal economic value has been the main component of international organizations that regulate health and trade. Nonetheless, these organizations have lately raised more awareness to address health challenges in an integrative approach ([Fig. 1](#)), such as the One Health

High-Level Expert Panel (OHHLEP) since 2020 (13), and the World Trade Organization (WTO) Agreement on the Application of Sanitary and Phytosanitary Measures (SPS Agreement) since 1995 to protect human, animal, and plants health – because trade and health go together (14). In a socio-ecological system, the economy is not only about economic growth, but it is also a way of delivering well-being to populations through the protection of humans, plants, and animals. An example of this is “The 2030 Agenda for Sustainable Development” (15) – an action plan adopted by all United Nations Member States in 2015 for the planet, people, and prosperity –, and the Wellbeing economy alliance (WEAll) – a 10-year project that aims to transform the economic system to provide social justice on a healthy planet (16). Although more awareness-raising exists about the health of populations (including humans, animals, and plants) goes beyond money, concrete actions are still pending to contribute to the goals of these international collaborations.

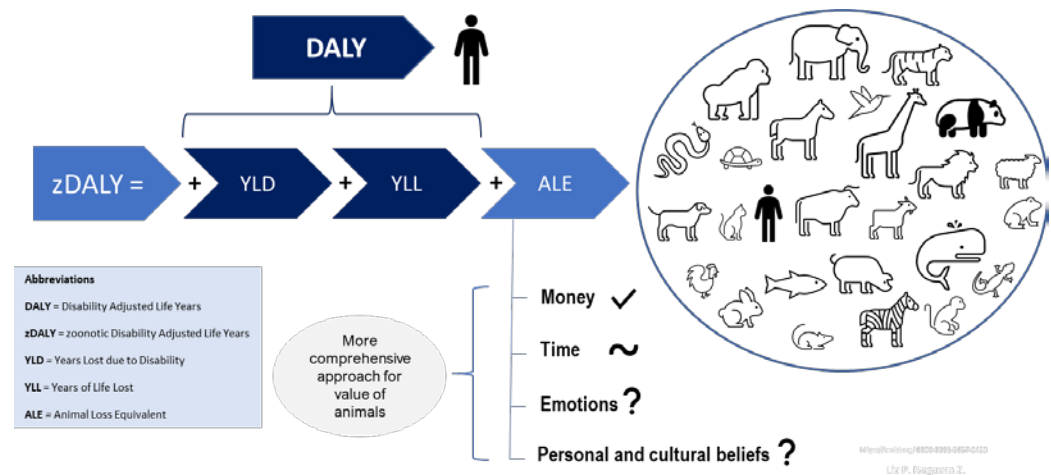


**Figure 1.** International collaborations that lately address challenges in health with an integrative approach.

Certain metrics were created to measure population health in non-monetary terms. For human health, there are well-known and accepted metrics to identify the health priorities in populations for decision-making in global health policy implemented through the World Health Organization (WHO) (17–19). These metrics exist because money is not an equitable means of valuing human life and health e.g., a high-income country, that logically spends more money on health, may have a greater financial burden of ill health despite a lower incidence of disease than a low-income country. One of the metrics created to solve this problem, making the measurement of ill health more equitable, is the *Disability Adjusted Life Years (DALY)*. The *DALY* consists of the *years of life lost (YLL)* due to early mortality and the *years lost due to disability (YLD)* caused by a disease or condition. The YLD depends on the disability weight assigned to the health condition. The disability weight indicates the level of severity of a health condition, and can be calculated by several techniques such as pairwise comparison, time trade-off, and visual analogue scale (20).

Regarding animal health, the existing metrics for decision-making in public health are mainly based on monetary values so far. Nevertheless, the *DALY* has been modified to estimate the burden of zoonotic diseases considering the animal lost based on time trade-off (i.e., time taken to earn sufficient money to “replace” the value of the animal). This metric is called *zoonosis Disability Adjusted Life Years or zDALY* (21). However, *zDALY* has not yet included other factors yet (emotional attachment, cultural beliefs, or intrinsic value.) Such factors need to be included in metrics when valuing animal diseases and

animal health in order to include more species (besides livestock) and avoid their under-estimation) – see [Fig. 2](#).



**Figure 2.** The zDALY: missing factors.

The value of animals or any value leads us to think first of money since it is the most accepted commodity by general consent as a medium of economic exchange. This is also convenient to weigh different interests that affect public decisions. However, thinking just in terms of money for public health decisions can affect how we deal with zoonoses, food safety, antibiotic resistance, sustainable development, and welfare. A controversial topic is how we translate the value of animals as well as the value of health in monetary terms. Thus, decision-making based on just monetary equivalents bears serious ethical concerns and calls for alternative practices.

### Framework on alternative paradigms in animal health decisions

Animal heterogeneity requires a different and more comprehensive approach to assessing animal value and health. For this framework, we consider the value of animals differs by species, among cultures, beliefs, place, time, and context; also, personal needs, wishes, and expectations ([Fig. 3](#)). To understand better how people can value health and animals in a more integrative approach, we consider the four main perspectives of environmental ethics: anthropocentrism, zoocentrism, biocentrism, and ecocentrism (12) (see [Fig. 4](#)). Anthropocentrism believes that humans are the only beings with moral standing. In contrast, zoocentrism assumes that at least some animals, including humans, have moral standing (22). From the biocentric perspective, all living beings have an intrinsic value (including humans, non-human animals, plants), but that does not imply that all of them have an equal value (23). For ecocentrism, the whole nature has an intrinsic value, including living beings and non-living things. In this framework, environmental ethics intertwine with normative ethics, being this latter, the way we behave and treat others (including animals) ([Fig. 5](#)). The main theories of normative ethics consist of consequentialism (consequence of actions) or utilitarianism (the greatest amount of good for the greatest number of people), deontology (right based: duties, rules), and virtue ethics (moral character). It has been considered that mainly consequentialism and deontology ethics played a role in the intrinsic value of animals. Under the scope of consequentialism, we find utilitarianism which maximizes well-being. According to Nussbaum, among all ethical theories in normative ethics, utilitarianism has contributed the most to the recognition of the intrinsic value of animals (24).

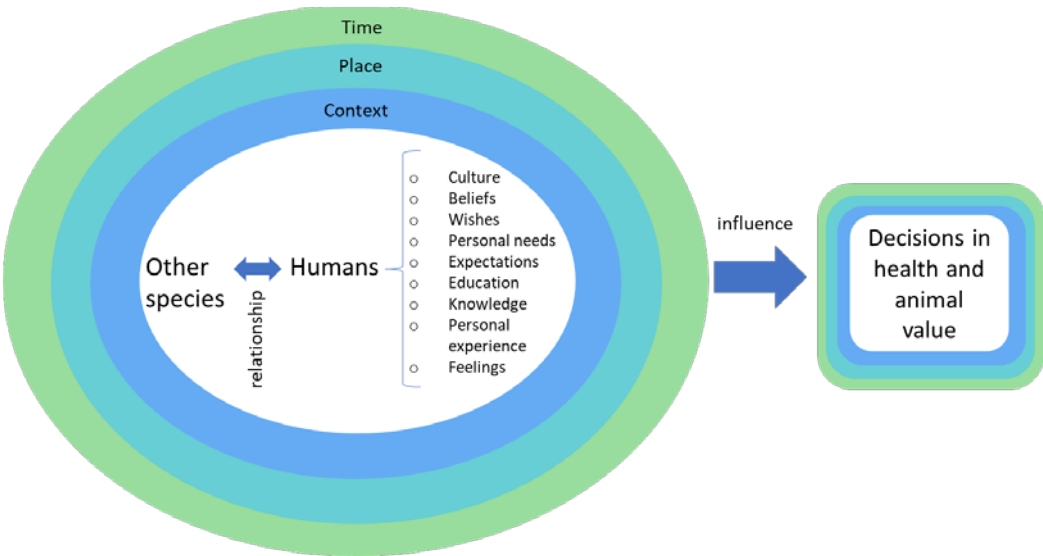
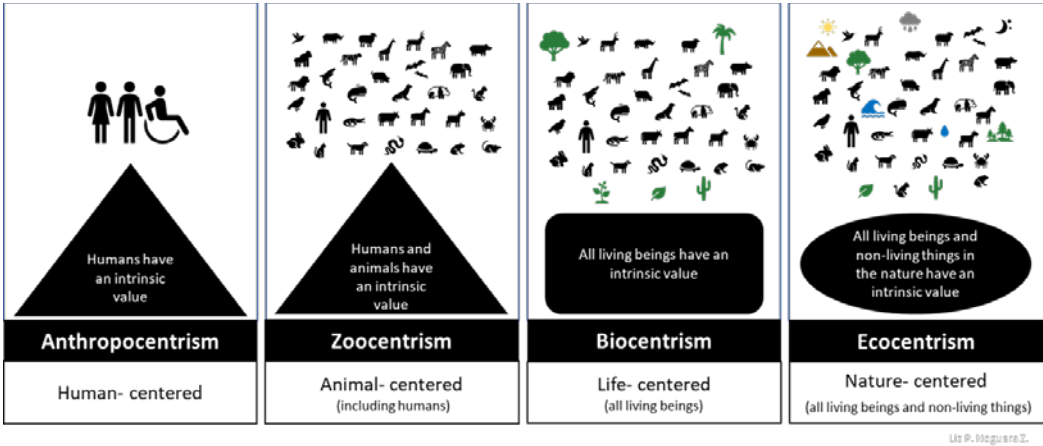
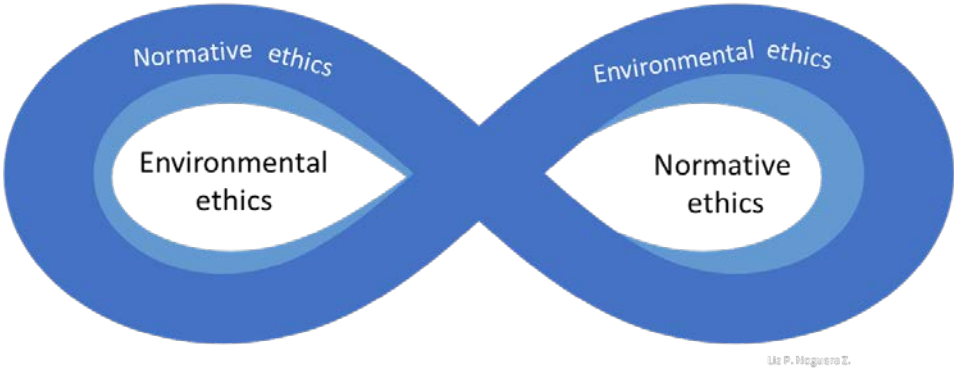


Figure 3. Factors that influence the way we value animals.



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Figure 4. Main perspectives of environmental ethics to understand better the value of animals and health.

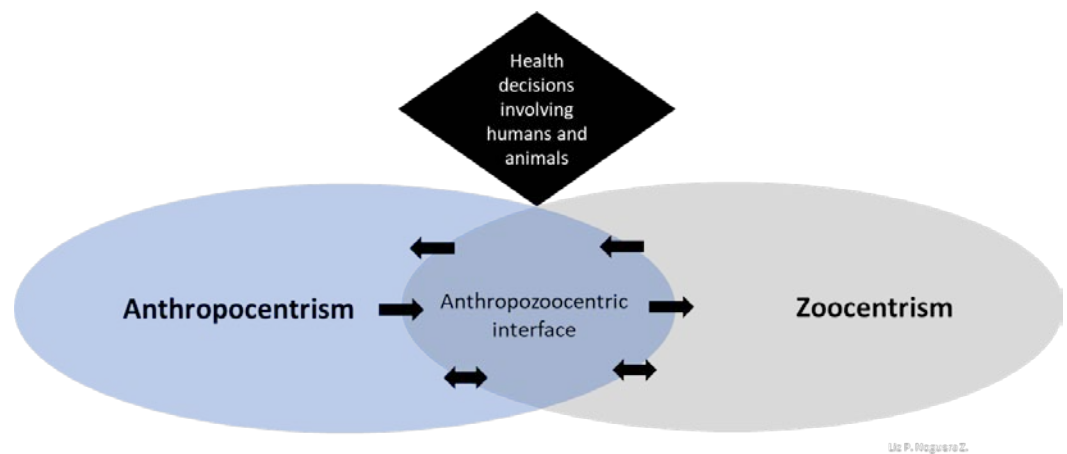


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Figure 5. The interconnection between environmental and normative ethics for valuing decisions in health.

Anthropozoo-centric interface

The increasing interest in animals that society has is known as the “animal turn” (25), but this change in mindset has not yet taken place in public health decisions. Therefore, we aim to explore this “mindset shift” or at least a “scout mindset” (26) regarding the value of animals’ health in an anthropocentric and zoocentric interface that we call “anthropozoocentric interface.” This means that we, as humans, are not restricted to only one perspective for our decisions on health and animals. Consequently, according to the situation, the “anthropozoocentric interface” has flexible boundaries where we can shift from one perspective to another (Fig. 6). According to the perspective that we chose, the way we value animals influences how we decide about their health and welfare. Therefore, in the “anthropozoocentric interface,” the opinions and perspectives are flexible.



**Figure 6. Anthropozoocentric interface:** the direction of arrows indicates how the point of view varies according to specific situations (not always anthropocentrism or zoocentrism, sometimes none of both).

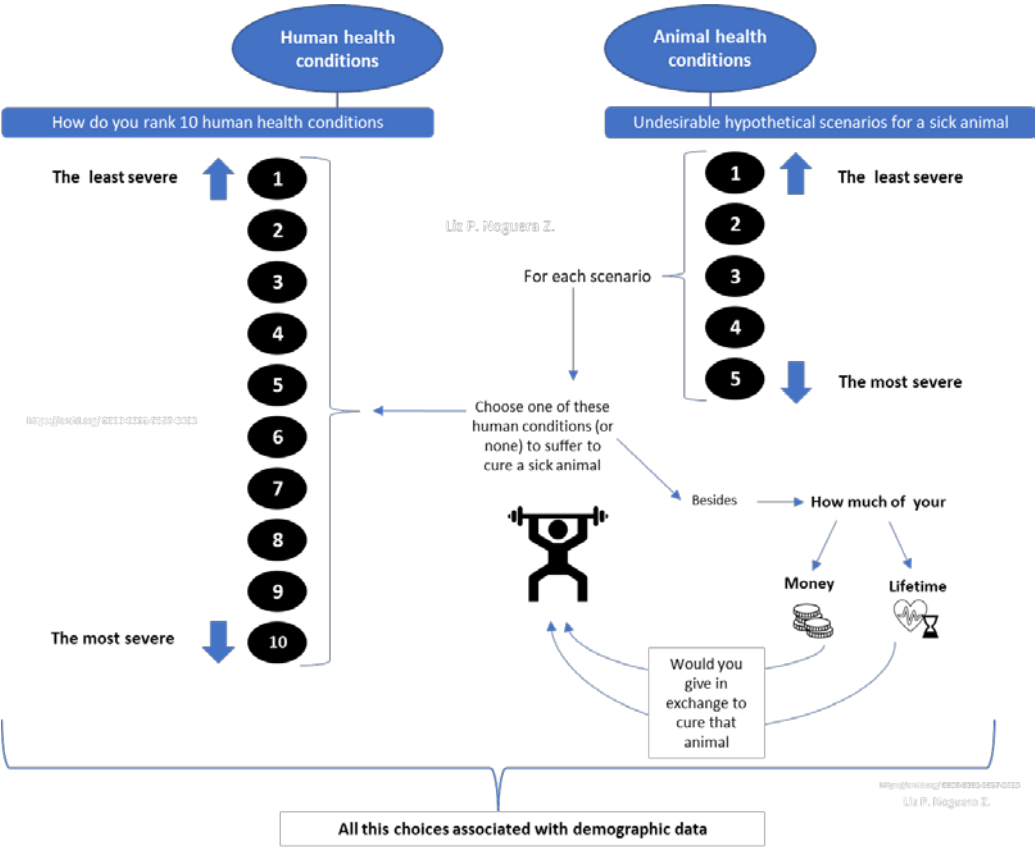
Regarding the inclusion of non-monetary value of animal health, we propose a method through reflexive questions in an “anthropozoocentric” interface. So, how do we decide about animals’ health beyond money? Health, time, and money are essential factors for all humans. However, the level of importance among these three factors varies according to each person’s priorities. What if we must give in exchange part of our health, money, and lifetime to cure a sick animal? Answering these questions will help identify how we perceive and value animals; and how we make decisions about them – considering that we share with animals not only the environment but also emotions and potential diseases. All decisions about animals’ health affect us directly and indirectly. For this reason, science and society need to collaborate for better and fairer decisions in health and welfare.

This framework aims to explore updated perceptions about animals in order to improve existing animal and human health metrics for zoonoses. Thus, what societies think about animals to see to what extent we are ready to change actions and decisions for societal health, which includes both human and animal populations. These perceptions included in metrics can be applied to laws based on evidence in the long term. Health, sickness, pain, and death are “comparable” benchmarks for humans and non-human animals because we all can suffer from diseases, pain, and our life cycle ends with death. Therefore, the first challenge is asking ourselves if we are ready to compare the value of animal health to our own health, thinking out of speciesism – being this an anthropocentric perspective which consists of the discrimination against other species different from ours (27). A perspective out of anthropocentrism does not mean that we aim to put animals in an equal position. However, it is up to people to decide how they value the pain, suffering, and sickness of animals, and how important it is for them to avoid them, and at what cost. In this respect, we are aiming to estimate the disability weight of animal diseases in a

pairwise comparison with known DWs of human conditions using similar methodology to the Global Burden of Diseases (GBD) studies (28).

We agree that extreme ways of thinking are not ideal for the health of populations; thus, we need prudent decisions and actions in health.

An example of application (Fig. 7)



**Figure 7.** The employed methodology for animal health valuation.

This framework calls not only for quantitative but mainly for qualitative analysis as a starting point. Diverse data sources (surveys, open societal questions) need to be included through a culturally and context-sensitive method that does not judge any cultural belief as right or wrong, better or worse. As public health concerns everyone, participants with or without animals in charge deserve to share their opinion about animal health since, directly and directly, this affects all of us.

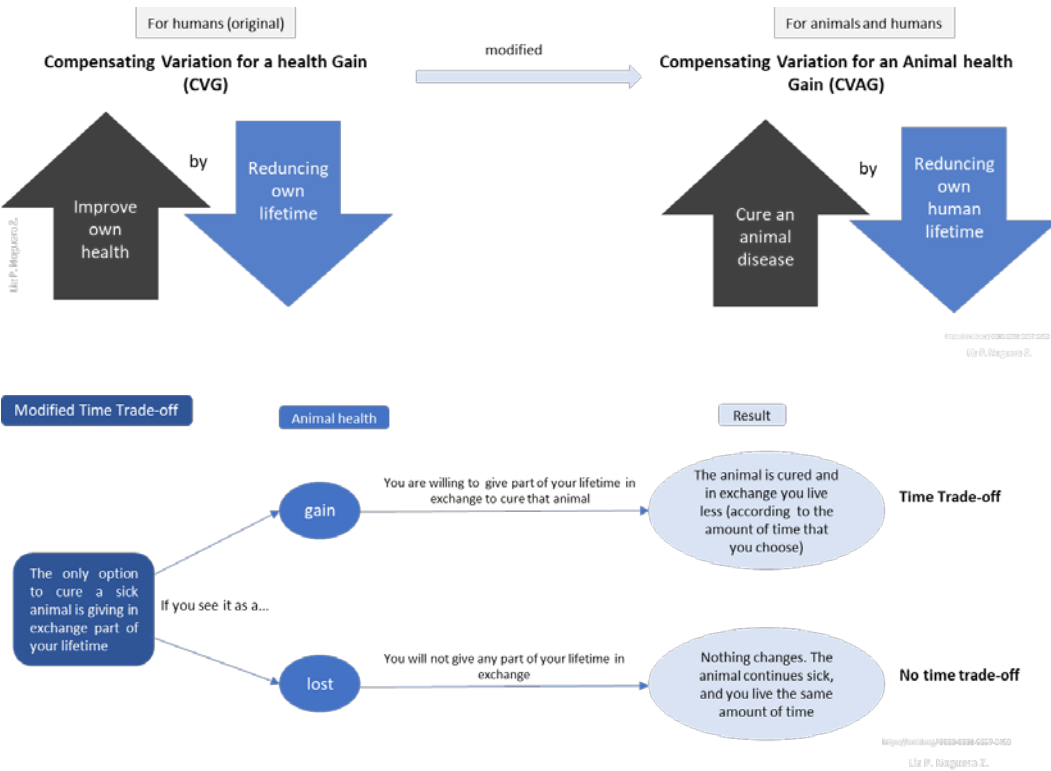
We propose to modify the GBD methodology for animal health valuation. First, find out which health state in an animal causes equivalent suffering to a person, such as an owner or not. The following points consist of an example to explore whether the burden of animal diseases and injuries can be estimated and directly incorporated into the DALY metric through the morbidity suffered by people in an “anthropozoo-centric” interface (beyond its monetary value.)

- 1) Compare an animals’ health condition to human health conditions. This would give us an “exchange rate” between the disability weights given to human diseases and those of animals.
- 2) Elicit how much money people would be willing to pay to cure an animals’ disease.
- 3) Elicit how much time of their lives, people would be willing to trade to cure an animals’ disease.



Based on the *Population Health Equivalence (PHE)* (29), we suggest modified questions to compare human and animal populations' health that we name the "*Human-Animal Health Equivalence*" (HAHE). For the GBD, the PHE was made to compare hypothetical health programs. In contrast, the *HAHE* covers hypothetical animal scenarios where humans have a whole severity range of human diseases to choose from in exchange for curing an animal under specific conditions. Therefore, we can anchor these values for animal health conditions based on the answers of participants.

Alternatively, the willingness to pay (which can then be converted to a time trade-off) and direct time trade-off (how much time you would give up for your animal). Regarding the time-trade off, we suggest a modification of the original metric "*Compensating Variation for a Health Gain (CVG)*" (30) to "*Compensating Variation for an Animal Health Gain (CVAG)*" (Fig. 8: A, B).



**Figure 8.** Time trade-off: (A) Modified Time Trade-off – CVAG. (B) Time trade-off according to the perception.

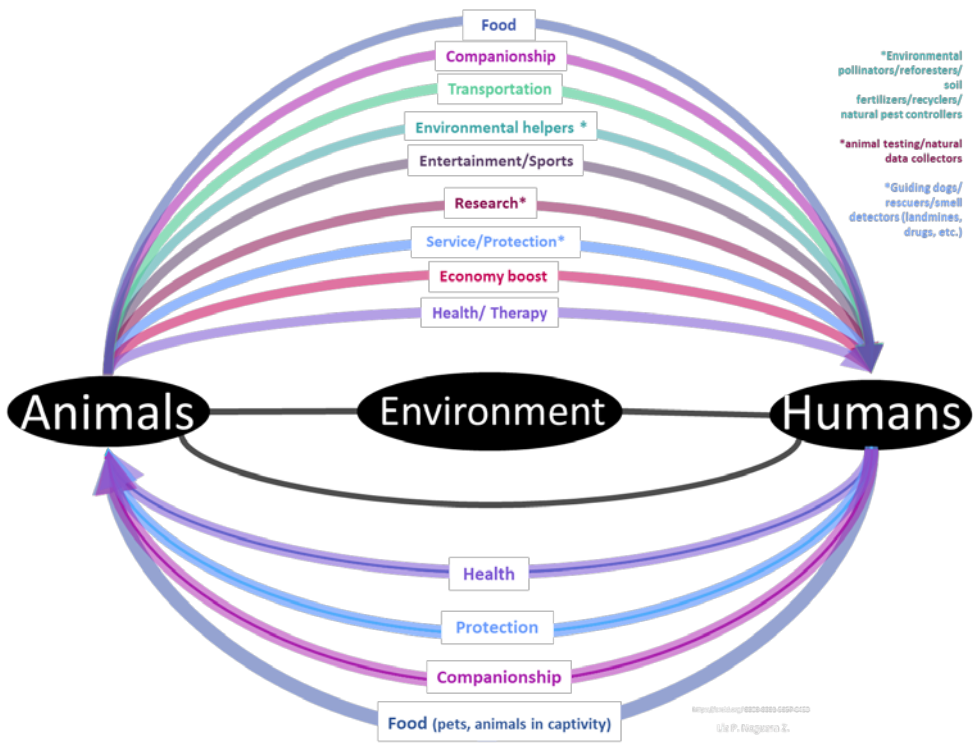
We believe that we can complement the existing metric with the proposed framework, adding more comprehensive values for animal and human health in order not to only focus on its monetary value or just on livestock.

### Discussion

We consider this framework is needed to approach different and more comprehensive ways of assessing the health and welfare of the animal and human populations for zoonoses decision-making. We know that integrating this complexity is a challenge due to the diverse perceptions of animals. Animal topics trigger controversies mainly when discussing their value, which impacts their health and quality of life. The way we value animals is dynamic and relative due to the conflation of several factors. This can reveal part of "ourselves," based on what we respect, believe, know, want, and how we feel about it. For example, feminists have contributed to animal protection throughout their history because they have felt the need to protect oppressed populations such as animals

(31). Most feminists have sympathy for animals because, in the past, women were treated as objects as well as animals – and in certain countries, they still are.

How we perceive animals, and their value substantially depends on how we interact with them. The human-animal relationship (Fig. 9) has always been a complex and dynamic process in diverse ways and forms, according to time and place. This human-animal interaction has changed due to different reasons such as sources of food, transportation, companionship, service animals (guide dogs, landmine detector rats), therapy (32), ornament, animals as source of inspiration (being part of superstitions, legends, myths, paintings, sculptures, and biomimetics (33)), to express identities (25) (in some indigenous cultures or as a representation of specific groups in society); as a part of the history (34), and our story. In some instances, the human-animal interaction has been critical lately (35) because of conflicts between farmers and wild animals due to habitat and resource competition (human encroachment). In other cases, the increased anthropomorphism that humans attribute to their pets to consider them as children.



**Figure 9.** Human-animal relationship: a screenshot of a dynamic and complex interaction. The direction of the arrows indicates the beneficiaries in the interaction.

The context or situation also influences the value of animals, e.g., a pig as a pet is not perceived the same as a farm pig or as a laboratory pig. Regarding wildlife species, their value depends mainly on their population size, their role in the ecosystem, and whether they are native or not native to a specific place or ecosystem because that implies the level of damage or benefit that such interactions with their environment can cause. For example, the value of beavers in Tierra del Fuego is perceived as completely opposite to their value in Canada. The reason is that beavers are not native to South America, thus, they are destroying part of the ecosystem in Tierra del Fuego and invading more areas in Argentina and Chile (36). Whereas beavers in Canada are a national symbol, and a native species, so their impact is regulated by all the components of the natural environment.

All the species are different, and logically we have different perceptions about them. Almost every human has at least another species with that person feels stronger connected, such as pets. In some cases, pets are preferred over other humans, even partners



or children – as several online polls have already shown it. According to Walsh, 57% of participants in a survey would choose their pet if stranded on a desert island with only one companion (37). However, certain animal-related polls and surveys tend to be slightly restrictive and biased since animal lovers participate the most.

As some species are preferred, others cause aversion or disgust, such as snakes, frogs, spiders, rats, cockroaches, bats – among the most popular. When such aversion is present, humans value these animals lower. However, more awareness is also about species' ecological role to keep the balance in the environment. Thus, we do not need to like certain species to protect them if we are aware of their value in the environment. The protection of species goes beyond our personal preferences under zoocentric, biocentric and ecocentric perspectives.

From an anthropocentric point of view, one of the behaviors considered normal is that humans assess (or try to assess) their surroundings in terms of money. Money appeared as a human need to trade in order to survive. A theory about trade claims that trade was a "way of saving humanity from extinction" (38) and then became a source of safety and power. Thousands of years of "monetary" thinking are difficult to change. Money has become the benchmark almost for everything. For example, animal health value, especially livestock, is usually only a concern when it represents an economic loss. Only within anthropocentrism is monetary value important. However, for zoocentrism, biocentrism, and ecocentrism, money is not essential but represents a mean. These theories have more complexities and movements, with some exceptions that make them difficult to generalize.

Complexity-aware or integrative approaches were proposed to solve health problems such as "One Health" (39). Within a biocentric perspective, this approach requires us to think and act differently when we make decisions about health, questioning how we can improve for a more equitable consideration of humans, animals, and the environment in a socio-ecological system. This respect or moral consideration for other living beings places us to think firstly about non-human animals, and their value.

Biocentrism and ecocentrism are similar theories, but the latter is broader and harder to apply. In reality, we cannot change abruptly from anthropocentrism to biocentrism or ecocentrism. However, we believe that this transformation of thinking can be gradual and flexible. We agree that radical ways of thinking are not healthy for anyone. For that reason, we proposed a perspective from the "anthropozoocentric interface," where we are respectful and flexible according to the situation in order to minimize the damage that we can cause through our decisions.

We consider the "anthropozoocentric interface" as a friendly transition that can help to apply "One Health" concepts. To protect species, we need healthy populations, and for that, keeping the balance of human interference and non-interference in nature is a challenge. A factor that may help is measuring the value of each living being and non-living things beyond money, prioritizing the point of narrower human-animal contacts and conflicts. "One Health" and "Well-being economy" approaches are playing an important role to go beyond money for decision-making in laws and regulations that affect health, well-being, and welfare.

Worldwide, most countries are aware of animal suffering; thus, they have laws against animal cruelty, according to the Animal Protection Index (API) (40). However, only a few countries recognize animal sentience, being this the ability of animals to feel and experience positive and negative emotions (pleasure, joy, fear, and pain) (40,41). The OIE has also been developing the Animal Welfare international Standards since 2002 (42), and animal welfare organizations have proposed to the United Nations the adoption of the "Universal Declaration on Animal Welfare" (UDAW), being currently still in draft.

Animal welfare has increased over the years but as an isolated field. So, the challenge is to apply it in other fields, namely health and laws. There are no concrete actions, including quantitative representations on how adding the animal value to laws in public health

or how ethical values are integrated into risk assessments of disease outbreaks. For example, the animal health regulation adopted by European Union in 2016 but applicable from 2021 includes only animal transmissible diseases. This is the “Regulation 2016/429”, encompassing rules for the prevention, control, eradication, traceability of animals and their products. This regulation does not include animal welfare but recognizes a connection between animal health and welfare (43). This means that animal welfare is not mandatory for combating diseases, so non-monetary metrics to include animal health value or their welfare are not considered. For example, how governments proceed in case of disease outbreaks still arises controversies, such as mass culling of animals, for instance as the case of 17 million minks killed for COVID-19 prevention – in the absence of sufficient evidence that minks transmit the virus (44) Is it rational? Would this still be an option in the future during disease outbreaks? Part of our answers depends on how we perceive animals as societies, and how laws can be legislated based on that.

Regarding animal welfare, some animal metrics were introduced, such as the *Welfare-Adjusted Life Years* (WALY) (45) to estimate the animal disease impact, including their welfare compromise. However, it only encompasses the animal factor without considering the human component. By contrast, the *Zoonosis Disability Adjusted Life Years* (zDALY) (46) integrates human and animal health, and this metric can be improved through the inclusion of more values proposed by this framework in order to be more comprehensive regarding different factors and species. Even though we search for a more comprehensive approach, the environmental factor is still not represented through this metric, and it should be considered in the future.

For most (anthropocentric) people, animal health only matters when it affects us, but having this mindset will not allow us to solve the underlying problems. The value of animals, as well as the value of human health, are difficult to translate in monetary terms. For that reason, we need to call concrete alternatives for reshaping our thoughts, morality, and ethics under the scope of normative and environmental ethics. One of the reasons that environmental ethics is becoming valuable is because it is believed that the planet can survive without humans, but no humans can survive without the planet, leading us to think beyond us to find solutions out of anthropocentrism.

Regarding the health of populations, human health has been the most studied from different approaches beyond money; thus, human health might work as a benchmark to measure the health of other living beings. From the anthropocentric perspective, it is unacceptable to compare human health to animal health because under this perspective, humans feel superior, and animals are considered instrumental values, “something” that they can benefit from. From an anthropocentric perspective, people can say that they care about animals or some of them, as long as they do not interfere with their own benefits, such as taking away part of their health, or part of their lifetime. This creates a paradox that we call the “animal paradox,” where we affirm that we care about animals, but we do not in practice, especially if they interfere with our own interests and benefits. The “animal paradox” can also appear as a defensive mechanism for difficult situations. For example, in the case of euthanasia, for humans, this is generally prohibited to preserve life at all costs, whereas for animals, it is generally accepted that an animal can be euthanized to alleviate pain and suffering. The loss of a patient is not easy but considering that animal life is not as “important” as human life alleviates the guilt of veterinarians. Therefore, keeping an anthropocentric perspective on animals makes the lives of veterinarians less difficult.

Something similar to the “animal paradox” happens with eat-meaters, and animal lovers; someone can love some animals but eat meat creating the so-called “meat paradox” (47). Thus, avoiding the “uncomfortable” topic of the value of animals is a way to prevent cognitive dissonance and moral disengagement, especially for meat-eaters (48) and anthropocentric animal keepers. Cognitive dissonance appears when we act against our beliefs and values. In the case of moral disengagement, we convince ourselves that we are the exception to ethical standards in particular situations, such as the ones for the “animal

paradox" and "meat paradox." Veganism appears as a zoocentric option for those who avoid the "meat paradox"; this philosophy under animal rights rejects animal consumption or its subproducts. Even though it has been a behavior change regarding certain topics, anthropocentrism has been the main approach to our decisions, and going against what we were taught our whole life, can create an internal conflict that some people prefer to avoid. However, we will not solve problems by avoiding them but through deep and thoughtful thinking as a first step. New ways to value animals and their health can create new paths towards a "paradigm shift."

Anthropocentrism has been the predominant way of thinking, especially in Western cultures and their religions. Whereas Eastern religions such as Hinduism, Jainism, and Buddhism have in common a wider approach regarding the value of other species, similar to biocentric principles – even though biocentrism is not related to any religion (23). Each person and culture have an inherent bias which is reducible diversifying opinions. The more diverse the sources, the closer we will be to assessing the value of animals in society and learning more about ourselves. We are aware that we cannot debunk theories based only on surveys, but this helps clarify the perspectives of the participants to start from a different approach and continue debating about the value of animals for integrative solutions in health. Methods of dialogue and reflection should be complemented (49), but for that, we need a starting point that might facilitate through this framework. By collecting the values of many people from different backgrounds, we expect to gain a better understanding of how humans value animals to contribute to "One Health" to address health challenges in prevention of animal diseases that can be transmitted to humans (zoonoses) and in animal welfare.

We share with animals the environment, emotions, and potential diseases. Therefore, all decisions about them affect us directly and indirectly. If animal's health matters when it only affects us, we still continue within an anthropocentric perspective, not a truly "One Health" which is based on biocentrism. Animals, even being sentient, do not logically have the power to change their situation; only we can. As humans, it is our responsibility to make fairer decisions for them and us. We believe that this framework will guide us to more integrative efforts from an "anthropozoocentric interface" towards biocentrism, which might need gradual progress. We are uncertain that "One Health" is the panacea of zoonotic diseases, but only with concrete actions, we will have the answer in the future. We hope we can get the answers that will help better tackle the dilemmas related to animal diseases, public health, and welfare through this framework, which is not perfect, but a way to go forward. We need to seize the strength that science and society have together for a transformative change. So, the real question is if societies are ready for a metamorphosis of thinking, with alternative paradigms, applied into concrete actions beyond "might-makes-right" led by anthropocentrism.

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