AMA Journal of Ethics
Illuminating the Art of Medicine

Existential Health Care Ethics

August 2025, Volume 27, Number 8: E541-627

AMA Journal of Ethics®

August 2025, Volume 27, Number 8: E543-548

FROM THE EDITOR

Existential Health Care Ethics

Devin M. Kellis, MS

This issue of the *AMA Journal of Ethics* is dedicated to addressing ethical questions at the intersection of human extinction and health care. These questions include some of the following: *Should clinicians be considered to hold special obligations to ensure humanity's survival? Would such obligations conflict with traditional codes of health professional ethics? And, if so, what might this mean for clinical care, public health, or health law?* How one responds to such inquiries has pragmatic implications for any agent aiming to promote health.

While this special issue draws inspiration primarily from existential ethics, an emerging discipline in contemporary moral philosophy concerned with human extinction,[1] it is rooted in 20th-century health activism on nuclear war and the environment. Despite these cross-disciplinary influences, existential ethics remains largely separate from health care ethics and unknown to most clinicians. To understand why, we must look back on a long, winding history of ideas, one in which science, health care, philosophy, and religion intersect in what Albert Schweitzer referred to as a "struggle for a satisfactory world-view" that "unrolls itself like a tragic drama."[2]

19th Century

The physician Thomas Percival is credited with having coined the term *medical ethics* in 1803, a time when there were no clear scientific mechanisms by which humanity could go extinct.[1,3] In fact, since classical antiquity, many Western people had believed that every possible thing existed along an unbroken, hierarchical "Great Chain of Being" supposedly representing divine perfection.[1,4] Under this worldview, the concept of *extinction* made little sense.[1,3] In 1767, the physician and anatomist William Hunter challenged the Great Chain of Being dogma, arguing that species extinction is possible based on fossil evidence.[5,6] George Cuvier's work in the early 1800s fostered this idea's wide acceptance by attributing species extinction to geological revolutions, which clashed with Christian stories about human origins.[1,7] Later, the mid-19th-century discovery of the second law of thermodynamics led scientists to infer that the sun and universe would eventually fizzle out, taking humanity with them. Thinking about human extinction has since taken on 2, interrelated forms: scientific description and ethical evaluation, the latter of which is the focus of existential ethics.

In 1856, the physician and scientist Hermann von Helmholtz described ethical implications of the second law of thermodynamics, whereby "this store of force, which can only suffer loss and not gain, must be finally exhausted.... But above the forms of life gone by, the human race has higher moral problems before it, the bearer of which it is, and in the completion of which it fulfils its *destiny* [italics mine]."[8] In philosophy, however, heat death (ie, the inevitable trudge to maximum entropy in the universe, eventually incompatible with humanity's survival) has long sparked perceptions that life is meaningless.[9] In 1952, Hans Jonas called this view "cosmic nihilism," which some posit might require pharmacotherapy to cope with.[9,10,11] Yet the philosopher Philipp Mainländer saw in heat death a different, redemptive destiny for humanity: an end of suffering.[1,12,13] Endorsing pro-extinctionism, he died by suicide in 1876.[1] Later, the philosopher Friedrich Nietzsche denied heat death, God, and objective ethics, proposing a destiny in which some humans become *Übermenschen* and define their own values.[9,14,15]

In 1883, the same year that Nietzsche published these ideas, Francis Galton popularized the term *eugenics* and framed it as a scientific enterprise, thereby furthering racism, classism, sexism, ableism, and genetic determinism, particularly in medicine.[16] Believing Indigenous people and many with minoritized identities to be "primitives," "savages," or "barbarians" by nature and therefore inferior to "more evolved" European men, some rationalized the former's eradication as civilizational or evolutionary "progress."[17,18] After the First World War, racialized thinking about extinction, paired with utopian and Nietzschean ideas, culminated in the Holocaust.[19,20,21,22,23]

20th Century

Following the Second World War, the context of thinking about human extinction shifted to nuclear war and the environment. Concerned with both, the public scientist Julian Huxley gave eugenics a makeover by merging it with postwar concepts of human rights, advocating for a new secular religion: *evolutionary humanism*.[24] Incredibly, his physician colleague C. P. Blacker called for eugenics to create more intelligent managers of nuclear competition.[25] However, health activism on nuclear war overwhelmingly focused on a pragmatic ethic of "social responsibility" devoid of eugenic advocacy.[26] International Physicians for the Prevention of Nuclear War (IPPNW) argued that physicians have duties to prevent global catastrophe, and their Nobel Prize-winning advocacy helped halt the Cold War arms race.[26] In 1991, 7 years after at least one medical book had considered near-term global threats altogether from a psychological perspective, it was argued that IPPNW should extend its mission to addressing anything and everything that compromises "global security."[27,28]

Although the term *bioethics* is thought to have been introduced by Fritz Jahr in 1927,[29,30] 2 forms of bioethics emerged in 1970 (before the advent of IPPNW), one of which was responsive to global threats.[31] Van Rensselaer Potter used the term to call for a new, interdisciplinary "science of survival" integrating biology, ecology, and ethics,[32] which he later is credited with having named "global bioethics."[33] This new name was meant to differentiate these ideas from a Georgetown model of bioethics, which developed a narrower focus, mostly on clinical practice and research.[31,33] Despite the emergence of public health ethics and global health ethics more recently, both forms of bioethics generally remain siloed from the pragmatic ethics of practitioners in groups like IPPNW.[34] In the latter part of the 20th century, Huxley's evolutionary humanism consolidated into *transhumanism*, a movement that to this day aims to create a new

humanity ("posthumanity") through so-called directed evolution of *Homo sapiens* via ethically dubious iterative embryo selection, genetic engineering, and technological enhancement, which commonly appear in the bioethics discourse.[24,35,36,37]

21st Century

In 2002, the transhumanist philosopher Nick Bostrom defined *existential risk* ("x-risk") as anything that could "annihilate Earth-originating intelligent life or permanently and drastically curtail its potential."[37] Bostrom's insight was that many existential threats to humanity are also existential threats to posthumanity.[37] Separate from medical efforts, the concept of x-risk, with its secular and enhancement orientation, led to greater attention to threats from long-term phenomena (eg, asteroids, volcanic super-eruptions, astrophysical events) and emerging technologies.[38,39,40] Today, x-risk has morphed into a field of existential risk studies (ERS) aiming to prevent extinction and a heavily utilitarian philosophy of longtermism concerned with what some view as a kind of fulfillment of humanity's long-term "potential."[41,42] While ERS and longtermism now dominate extinction discourse due to support from some wealthy technologists,[43] a new variant of ethical inquiry is emerging that challenges these paradigms.

For example, Mollie Gleiberman coined *x-risk transhumanitarianism* to refer to transhumanists' reframing of their goals under the banner of "existential risk reduction"[44]; this co-optation of the language of "safety" and the "protection of humanity" leads to goals that are seemingly shared with humanitarian initiatives like IPPNW (eg, preventing catastrophe) but with an emphasis on different reasons (eg, enabling "superior" posthumans to colonize space in the future instead of protecting today's vulnerable humans).[44] Although some might view this characterization as an oversimplification of shifting views, of ethical importance is that some longtermists and existential risk scholars—while portraying themselves as motivating the interests of "humanity"—work on projects that *perpetuate* global risk, inequality, neocolonialism, and harmful eugenics practices.[45,46,47] Health care should be wary of these harms alive in today's thinking and should unequivocally oppose them.

This special issue arose to understand these developments, to bring together siloed discourses and histories, and to reawaken health care to the urgent need to address threats to humanity. While these issues appear abstract, they are of paramount importance in health care for several reasons. First, global health, extinction, and eugenic threats are real, neglected, poorly managed when addressed, and imbued with injustice. Second, an understanding of philosophical views associated with these threats can help isolate underlying drivers of human-caused global risk and reconcile conflicting policy proposals to protect patients. Third, ethical inquiry into health care's roles in mitigating existential threats is necessary to balance the health interests of current and future generations. Finally, health professionals, policy makers, and institutions have moral, social, and cultural authority and can use these advantages to help society address global threats.

Overall, it is increasingly important for health professionals to engage in critical analyses and evaluations of all threats to humanity, the worldviews they promote, and how those threats intersect with health care. Through such engagement, we might humbly hope to foster and improve the conditions of humanity's existence.

References

1. Torres ÉP. *Human Extinction: A History of the Science and Ethics of Annihilation*. Routledge/Taylor & Francis Group; 2023.
2. Schweitzer A. *The Philosophy of Civilization*. Rev ed. Prometheus; 1987.
3. Baker RB, McCullough LB. What is the history of medical ethics? In: Baker RB, McCullough LB, eds. *The Cambridge World History of Medical Ethics*. Cambridge University Press; 2009:3-15.
4. Moynihan T. *X-Risk: How Humanity Discovered Its Own Extinction*. Urbanomic; 2020.
5. Moynihan T. Existential risk and human extinction: an intellectual history. *Futures*. 2020;116:102495.
6. Durant G, Rolfe WI. William Hunter (1718-1783) as natural historian: his "geological" interests. *Earth Sci Hist*. 1984;3(1):9-24.
7. Roberts MB. Geology and genesis unearthed. *Churchman*. 1998;112(3):225-256.
8. Helmholtz H. *Popular Lectures on Scientific Subjects*. Atkinson E, trans. Appleton; 1885.
9. White J. How does one cosmotheoretically respond to the heat death of the universe? *Open Philos*. 2023;6(1):20220233.
10. Veit W. Existential nihilism: the only real serious philosophical problem. *J Camus Stud*. 2018:211-232.
11. Rosenberg A. *The Atheist's Guide to Reality: Enjoying Life Without Illusions*. WW Norton & Co; 2011.
12. Bielik-Robson A. Nihilism as world politics: Benjamin's theology of entropy. In: Moran B, Schwebel P, eds. *Walter Benjamin and Political Theology*. Bloomsbury; 2024:93-116.
13. Woolfe S. Pessimism and pandeism: Philipp Mainländer on the death of God. Sam Woolfe. December 14, 2020. Accessed November 11, 2024. https://www.samwoolfe.com/2020/12/pessimism-pandeism-philipp-mainlander-death-of-god.html
14. Leiter B. Nietzsche's moral and political philosophy. In: Zalta EN, Nodelman U, eds. *The Stanford Encyclopedia of Philosophy.* August 26, 2004. Revised September 5, 2024. Accessed March 11, 2025. https://plato.stanford.edu/archives/fall2024/entries/nietzsche-moral-political/
15. Maden J. Übermensch explained: the meaning of Nietzsche's "superman." Philosophy Break. June 2022. Accessed March 11, 2025. https://philosophybreak.com/articles/ubermensch-explained-the-meaning-of-nietzsches-superman/
16. Turda M. Race, science, and eugenics in the twentieth century. In: Bashford A, Levine P, eds. *The Oxford Handbook of the History of Eugenics.* Oxford University Press; 2010:62-79.
17. Segal D. Civilization, barbarism, and savagery. In: McNeill WH, Bentley JH, Christian D, et al, eds. *Berkshire Encyclopedia of World History.* Vol 1. Berkshire Publishing Group; 2005:358-363.
18. Levine P. Anthropology, colonialism, and eugenics. In: Bashford A, Levine P, eds. *The Oxford Handbook of the History of Eugenics*. Oxford University Press; 2010:43-61.
19. Whyte M. The uses and abuses of Nietzsche in the Third Reich: Alfred Baeumler's "heroic realism." *J Contemp Hist*. 2008;43(2):171-194.
20. Singleton M. Yoga, eugenics, and spiritual Darwinism in the early twentieth century. *Int J Hindu Stud*. 2007;11(2):125-146.

21. Mügge MA. Eugenics and the superman: a racial science, and a racial religion. *Eugen Rev*. 1909;1(3):184-193.
22. United States Holocaust Memorial Museum. Victims of the Nazi era: Nazi racial ideology. Holocaust Encyclopedia. Updated September 20, 2024. Accessed November 12, 2024. https://encyclopedia.ushmm.org/content/en/article/victims-of-the-nazi-era-nazi-racial-ideology
23. Lichtenberg E. Hitler's "utopia": an analysis of *Gleichschaltung* in the Third Reich, 1933-1939. *Expositor*. 2017;13:29-49.
24. Weindling P. Julian Huxley and the continuity of eugenics in twentieth-century Britain. *J Mod Eur Hist*. 2012;10(4):480-499.
25. Blacker CP. Eugenics in an atomic age. *Eugen Rev*. 1959;51(1):21-24.
26. Forrow L, Sidel VW. Medicine and nuclear war: from Hiroshima to mutual assured destruction to abolition 2000. *JAMA*. 1998;280(5):456-461.
27. Walsh RN. *Staying Alive: The Psychology of Human Survival*. Shambhala Publications; 1984.
28. Smith R. What now for IPPNW? *BMJ*. 1991;303(6795):145-146.
29. Goldim JR. Revisiting the beginning of bioethics: the contribution of Fritz Jahr (1927). *Perspect Biol Med*. 2009;52(3):377-380.
30. Jahr F. Bio-Ethik: eine Umschau über die etchischen Beziehungen des Menschen zu Tier und Pflanze. *Kosmos*. 1927;24:2-4.
31. Lee LM. A bridge back to the future: public health ethics, bioethics, and environmental ethics. *Am J Bioeth*. 2017;17(9):5-12.
32. Potter VR. *Bioethics: Bridge to the Future.* Prentice-Hall; 1971.
33. Potter VR. *Global Bioethics: Building on the Leopold Legacy.* Michigan State University Press; 1988.
34. Stapleton G, Schröder-Bäck P, Laaser U, Meershoek A, Popa D. Global health ethics: an introduction to prominent theories and relevant topics. *Glob Health Action*. 2014;7(1):23569.
35. Gebru T, Torres ÉP. The TESCREAL bundle: eugenics and the promise of utopia through artificial general intelligence. *First Monday*. 2024;29(4):1-42.
36. Bohan E. *A History of Transhumanism*. Dissertation. Macquarie University; 2018.
37. Bostrom N. Existential risks: analyzing human extinction scenarios and related hazards. *J Evol Technol*. 2002;9(1):1-30.
38. Bostrom N, Cirkovic MM, eds. *Global Catastrophic Risks*. Oxford University Press; 2011.
39. Torres P. *The End: What Science and Religion Tell Us About the Apocalypse*. Pitchstone Publishing; 2016.
40. Torres P. *Morality, Foresight and Human Flourishing: An Introduction to Existential Risks*. Pitchstone Publishing; 2017.
41. Cremer CZ, Kemp L. Democratising risk: in search of a methodology to study existential risk. In: Beard SJ, Hobson T, eds. *An Anthology of Global Risk*. Open Books Publishers; 2024:75-124.
42. Greaves H, MacAskill W. The case for strong longtermism. Global Priorities Institute, Oxford University; 2021. GPI working paper 5-2021. Accessed November 19, 2024. https://globalprioritiesinstitute.org/wp-content/uploads/The-Case-for-Strong-Longtermism-GPI-Working-Paper-June-2021-2-2.pdf
43. Naughton J. Longtermism: how good intentions and the rich created a dangerous creed. *The Guardian*. December 4, 2022. Accessed November 19, 2024.

https://www.theguardian.com/technology/commentisfree/2022/dec/04/longtermism-rich-effective-altruism-tech-dangerous
44. Gleiberman M. Effective altruism: doing transhumanism better. Institute of Development Policy, University of Antwerp; 2023. Accessed April 24, 2025. https://medialibrary.uantwerpen.be/files/8518/c8d22373-5690-4a9b-a472-aa8bde961caf.pdf
45. Edwards PN, Luby S. SERI statement on longtermism and racism in existential risk studies. Accessed August 3, 2023. https://docs.google.com/document/d/1Kzmt9EsCiwQlQ3Is2lq2Ky6tWlJd7eJn5bPpCl9E4cU/edit
46. Futerman G. Statement on pluralism in existential risk studies. Effective Altruism Forum. August 16, 2023. Accessed March 11, 2025. https://forum.effectivealtruism.org/posts/pLGtCkxmBiaFCEuox/statement-on-pluralism-in-existential-risk-studies
47. Wells-Jensen S, Beard SJ. We have to include everyone: enabling humanity to reduce existential risk. In: Beard SJ, Rees M, Richards C, Rios-Rojas C, eds. *The Era of Global Risk: An Introduction to Existential Risk Studies*. Open Book Publishers; 2023:101-122.

Devin M. Kellis, MS is a medical student at the University of South Carolina School of Medicine Columbia, where he received an MS in biomedical science. He holds a BS in biology and a BS in psychology from Francis Marion University. His current research aims to understand drivers of human-caused existential threats and to develop a medical specialty that promotes humanity's survival under conditions of minimal social harm (behavioral eschatology and extinction medicine, respectively).

Citation
AMA J Ethics. 2025;27(8):E543-548.

DOI
10.1001/amajethics.2025.543.

Conflict of Interest Disclosure
Contributor disclosed no conflicts of interest relevant to the content.

ISSN 2376-6980

AMA Journal of Ethics®
August 2025, Volume 27, Number 8: E549-558

CASE AND COMMENTARY: PEER-REVIEWED ARTICLE

How Might Health Care Think About the Ethics of Human Extinction?

Devin M. Kellis, MS and Émile P. Torres, PhD

Abstract

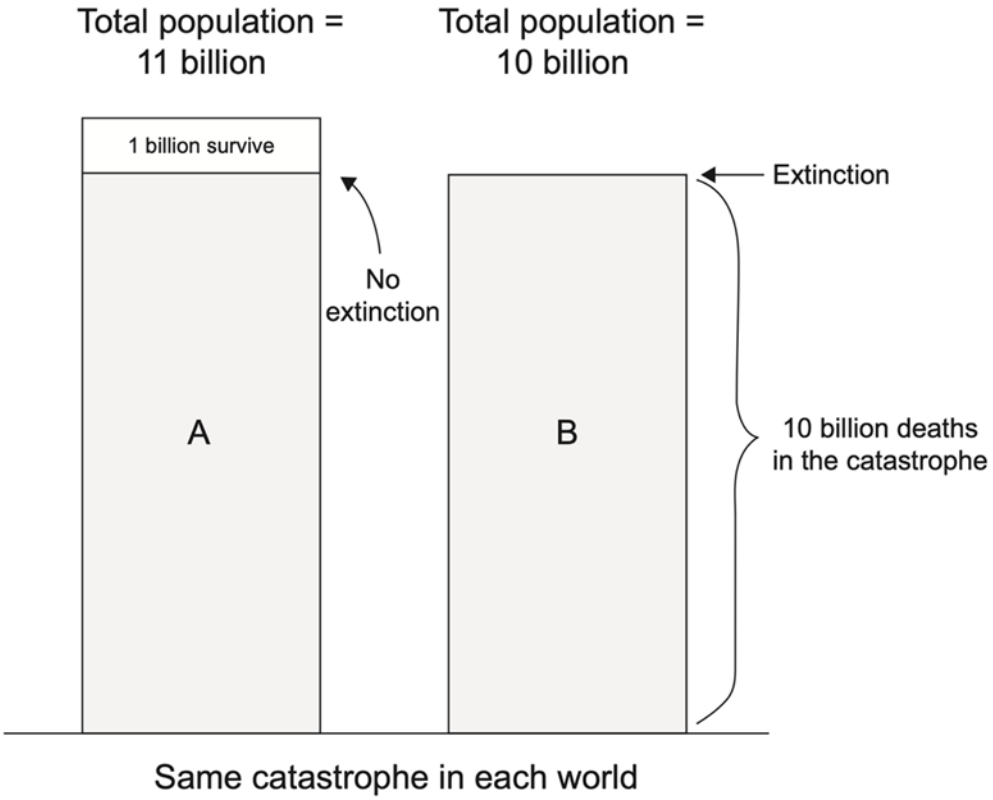
Is there an important ethical difference between a global catastrophe that causes human extinction and one that does not? This commentary on a case introduces 3 approaches—equivalence, further-loss, and pro-extinctionist—in responding to this question. In particular, focus is placed on equivalence and further-loss views' implications for how clinicians, health professions, and health care organizations orient themselves ethically towards managing the risk of extinction.

The American Medical Association designates this journal-based CME activity for a maximum of 1 AMA PRA Category 1 Credit™ *available through the* AMA Ed Hub™. *Physicians should claim only the credit commensurate with the extent of their participation in the activity.*

Case

Consider 2 hypothetical worlds.[1] World A contains 11 billion people. World B contains 10 billion. Now imagine that, in both worlds, a global catastrophe causes exactly 10 billion people to die. In World A, one billion people survive, while human extinction occurs in World B (see Figure). Is there a reason to believe that the World B scenario is worse than the World A scenario? Moreover, if someone were responsible for causing the catastrophe in each world, should they be viewed as having done something "extra" morally wrong in World B?

Figure. Illustration of the "2-Worlds" Thought Experiment



In both worlds, 10 billion people die in an identical global catastrophe. However, as World A has 1 billion more people than World B, extinction occurs in World B, but not in World A.

Commentary

A topic of growing interest among contemporary moral philosophers concerns the ethical and evaluative implications of human extinction. With some exceptions,[2,3,4,5,6,7] however, the literature on this topic has been largely ignored by the health care community, and philosophers have said little about the role of health professionals in preventing human extinction. This disconnect is problematic for at least 2 reasons. First, some views on the ethics of human extinction suggest that health care as practiced today may be ethically misguided. Second, the practical expertise of health professionals (eg, an appreciation of the suffering caused by diseases or the concrete effects of health policy on patients' lives) may inform whether the first point is truly the case and, if so, what can be done about it.[5]

We attempt to rectify this situation by outlining a theoretical framework for thinking about the ethics of human extinction, which groups various positions in the field into 3 categories: equivalence views, further-loss views, and pro-extinctionist views (see Table).[1] Each view is based on a fundamental distinction between (1) the process of Going Extinct and (2) the subsequent state of Being Extinct. To address the questions posed by the "2-worlds" thought experiment above, we will focus solely on equivalence and further-loss views and define *human extinction* as having occurred if humanity ceases to exist forever without leaving behind any successors (sometimes called "final" human extinction).[1] The following sections offer an overview of the arguments for these views and then explore their potential implications for health care.

Table. Views on the Moral Significance of Human Extinction in 2 Worlds

View	Definition[a]	World A vs World B
Equivalence	The view that human extinction would be bad or wrong *only insofar* as Going Extinct is bad or wrong (eg, because Going Extinct involves suffering and death). Being Extinct is morally irrelevant.	The catastrophes of World A and World B are morally equivalent.
Further-Loss	The view that Being Extinct is an *additional source* of extinction's badness or wrongness because of the further losses associated with Being Extinct—that is, losses that go above and beyond whatever harms Going Extinct might entail (eg, the loss of all future people and value, the loss of future scientific discoveries).	The catastrophe of World B is much worse than that of World A.
Pro-Extinctionist	The view that Being Extinct would be *better* than continuing to exist (eg, because of our harmful impact on the environment, how much human suffering there is in the world). This view is often concomitant with the claim that we ought to bring about our extinction, usually through some voluntary means such as deciding not to have children.	The catastrophe of World B is better than that of World A.

[a] Torres.[1]

Equivalence Views

Equivalence views claim that our extinction would be bad or wrong only insofar as Going Extinct would be bad or wrong. Hence, if the event(s) that occurred while Going Extinct involved nothing bad or wrong, our extinction would also not be bad or wrong.

For example, imagine a nuclear war that causes immense suffering and kills all 8 billion people[8] currently living on Earth. Equivalence theorists would say that our extinction under such circumstances would be very bad and wrong because Going Extinct *in this way* would be very bad and wrong. In contrast, imagine that everyone voluntarily decides not to have children, causing the worldwide population to fall to zero. Equivalence theorists would argue that, in this scenario, our extinction would be neither bad nor wrong, since (many would claim) there is nothing bad or wrong about anyone deciding, for any reason, not to procreate. For such theorists, the resulting state of Being Extinct is morally irrelevant: unlike Going Extinct, Being Extinct cannot harm anyone, since no one would exist to suffer the nonexistence of humanity. It thus cannot be bad or wrong. All that matters, ethically, are the details of Going Extinct.

Equivalence views imply that human extinction does not pose any special moral problems. The only difference between a catastrophe that kills 99% of the population and one that kills 100% is a single percentage point.[9] Equivalence views follow from so-called "person-affecting" moral theories such as Scanlonian contractualism and Jan Narveson's utilitarianism, both of which posit that an actual, existing person must be affected by an event, such as Going Extinct, in order for that event to be good or bad.[10,11]

Consider again the 2-worlds thought experiment. Equivalence theorists would say that the catastrophe of World B, which results in human extinction, is no worse than the catastrophe of World A, which leaves 1 billion survivors. If someone named Tom is

responsible for causing both of these catastrophes, he does not do anything extra wrong in World B. The badness or wrongness of what happens in World B *just is* the badness or wrongness of 10 billion people being killed. This is why we call it the "equivalence" view.

From a health care perspective, equivalence theorists could argue that health professionals have no special obligation to prevent our extinction per se. Health professionals may, of course, have an obligation to prevent suffering and death and, hence, insofar as Going Extinct would cause suffering and death, they would be obligated to prevent us from Going Extinct. But, if everyone were to voluntarily decide to be childless, health professionals may be obligated to—in effect—facilitate our extinction by making contraception accessible, even if causing humanity's extinction is not their specific intention (that is, assuming they have an obligation to provide such access in the first place). Although everyone deciding to be childless is exceedingly unlikely, the point is to highlight the implications of equivalence views for health care.

As far as we can tell, equivalence views do not prescribe significant changes to the commonly espoused goals of medicine or public health in academic literature. These goals include, for example, those outlined by Christian Munthe and Christopher Boorse, which focus on promoting the health, autonomy, and equality of individual patients and broader populations, in addition to acquiring knowledge of how to bring about those ends.[12,13] These goals are only concerned with people existing here and now—ie, those who would be affected by the process of Going Extinct—but say nothing about Being Extinct, consistent with the claim that human extinction does not introduce any special moral problems.

However, the goals of health care can change radically based on how one defines concepts such as medicine or health. For example, Alex Broadbent defines health as "states that promote the survival and reproduction of the species,"[14] and, hence, health care would by definition involve engaging in actions that prevent extinction.[6] Further-loss views similarly suggest that traditional health care should be reconceptualized with an emphasis on future generations, as we will now discuss.

Further-Loss Views

Whereas equivalence views claim that assessing the badness or wrongness of human extinction only involves examining the details of Going Extinct, further-loss views assert that a second step is required, namely, considering the various "further losses" or "opportunity costs" associated with Being Extinct. In the 2-worlds thought experiment, further-loss theorists would contend that the catastrophe in World B is far worse than that in World A, because our extinction in World B would preclude the realization of future goods that could have otherwise existed (eg, happiness, satisfied desires, the development of the arts and sciences).

Totalist utilitarianism is one type of further-loss view.[15] It holds that we are morally obligated to maximize total well-being (or intrinsic value) in the universe. According to modern cosmology, the universe may remain habitable for billions or trillions of years.[16] If humanity spreads beyond Earth and survives for such periods, there could be "astronomical" numbers of future people, many more than have ever existed thus far.[15,17] Assuming they would have "happy" or "worthwhile" lives on average, the "loss" of these people would constitute an additional source of extinction's badness or wrongness. Notice that this loss is unrelated to how Going Extinct unfolds: whether

humanity dies out from nuclear war or because everyone voluntarily decides to stop procreating, the opportunity costs of Being Extinct would be unchanged.

For further-loss theorists who expect the long-term future to be full of immense, positive value, the difference between an extinction-causing and a non-extinction-causing catastrophe is thus one of kind rather than degree: 100% of humanity dying off would be immensely worse than "only" 99% dying off.[9] This view implies that human extinction does pose special moral problems: it is the only event that would guarantee the loss of all future value, which could be many orders of magnitude larger than all the value thus far created. As 3 advocates of this view write: "One very bad thing about human extinction would be that billions of people would likely die painful deaths. In our view, this is, by far, not the worst thing about human extinction. The worst thing about human extinction is that there would be no future generations."[18] Hence, even if Going Extinct were to cause terrible suffering, the death of the 8 billion current people pales in comparison to the nonexistence of the trillions or quintillions of people who could have otherwise existed.[9] This particular claim is associated with a further-loss view known as longtermism, which is closely connected to totalist utilitarianism.[19,20]

Whereas equivalence views may not prescribe major changes to current health care systems, longtermism likely would. It implies that preventing human extinction should take precedence over preventing billions of painful deaths, if those deaths (or the underlying causes of those deaths) pose no threats to our collective survival. Hence, we should allocate a large portion of society's resources to ensuring our survival. The longtermist Toby Ord, for example, recommends allocating 1% of global GDP toward mitigating "existential risk."[21] That equaled $1 trillion in 2023, more than enough to end world hunger, eliminate global poverty, and provide sanitary drinking water in 140 low- and middle-income countries, if done on a per-year basis.[22,23,24,25] Notably, this is not an either/or scenario. For instance, one can say that society should allocate $1 trillion to these humanitarian causes and to preventing human extinction (eg, by reallocating portions of the 2.3% and 9.1% of global GDP spent on the military and travel, respectively).[26,27] Health professionals could play important roles in advocating for such resource redistribution.

While some longtermists do support humanitarian initiatives (Ord included),[28] it is important to recognize what many might construe as the logical conclusion of longtermism: a large fraction of the health care workforce should stop treating patients and instead focus on the long-term fate of humanity's descendants in the cosmos over the coming billions of years. For example, in their initial argument for a "strong" form of longtermism, philosophers Hilary Greaves and William MacAskill claimed that, "for the purposes of evaluating actions, we can in the first instance often *simply ignore* all the effects contained in the first 100 (or even 1000) years, focussing primarily on the further-future effects. Short-run effects act as little more than tie-breakers [italics in original]."[20]

If population collapse is ever perceived to threaten our species, health professionals who embrace a further-loss view might also be inclined to prevent people from accessing contraceptives. In essence, endorsing Henry Sidgwick's view that "a universal refusal to propagate the human species would be the greatest of conceivable crimes"[29] seems to imply that, if humanity's long-term future depends on it, certain human rights might be trampled upon or at least restricted. For example, investing in longtermist projects, such as colonizing Mars or working to ensure the "safety" of building what

some call "God-like AI,"[30] could be prioritized instead of providing basic access to health care.

While there are certainly instances in which health professionals' promotion of policies that prioritize the "greater good" over autonomy might be justified (eg, masking mandates during a pandemic, involuntary psychiatric treatment when a patient threatens themselves or others), health professionals can help evaluate the credibility of longtermist claims through the lens of health and warn, when appropriate, about risks of prioritizing our collective survival.

Humanity's Future and Health Care

Equivalence and further-loss views thus have quite different implications for health care. The former does not, it seems, prescribe an overhaul of our health care systems. In contrast, the latter, especially longtermism, might imply to some that health professionals, policies, and institutions must strongly prioritize addressing threats to humanity's long-term future, during which many trillions of not-yet-born people could live "happy" lives. Both views would agree that we should avoid human extinction if caused by a catastrophe, although for quite different reasons. For equivalence theorists, extinction-causing catastrophes are among the worst-possible type of catastrophe, given the enormous magnitude of suffering and premature death they could cause. However, there is no ethical difference between extinction-causing and non-extinction-causing catastrophes on the equivalence view (ie, in the 2-worlds thought experiment, the catastrophes of World A and B are equally bad or wrong). Therefore, we have no reason to strongly prioritize avoiding our extinction. This view is opposed to further-loss views that contend that, because World B involves astronomical amounts of "impersonal" harm (ie, all the future value that could have otherwise existed), World B is much worse than World A, and hence we must strongly prioritize preventing extinction, whether caused by asteroid impacts, nuclear war, or people around the world voluntarily deciding not to have children.

We have presented these views as stark dichotomies for emphasis. In our view, a long lifespan for humanity would be good (assuming that future lives are worthwhile); health care should thus help ensure that there are future people, although not at *any cost*. Another approach would be to say that, insofar as we have reasons to believe that not-yet-born future people will in fact exist—and we do have such reasons at present—health care should work to ensure that their lives are sufficiently well-off without wholly neglecting the needs of current patients. However, like equivalence theorists, we are not convinced that Being Extinct itself would be bad or wrong, although we believe that Going Extinct would likely involve enormous suffering and premature death (ie, the most probable scenarios of Going Extinct would be violent and involuntary). In light of health professionals' responsibility to act in the interests of their patients' health, they should therefore help prevent such catastrophes to a greater degree than they do at present. In other words, an extinction-causing catastrophe would likely entail such terrible harms to billions of people that focusing on preventing or responding to such catastrophes does justify, to some extent, more attention than it currently receives from health professionals.

The World Medical Association claims that physicians hold responsibilities to future generations.[31] This stipulation adds urgency to the project of fostering an inclusive, global consensus regarding how, to what extent, and under which conditions society should prevent our extinction. We argue that, given the substantially different

implications of the equivalence and further-loss views, such a project should be pursued, and health professionals should contribute to it. This effort would require a global collaboration to better understand the current existential threat environment and the drafting of an unbiased overview of positions in the ethics of human extinction, among other things, akin to a recent proposal and US governmental report.[32,33] Health professionals could help, for example, by outlining the detailed proximate biological mechanisms by which human extinction could occur. We have also argued that a new medical specialty could focus on these issues, which one of us (D.M.K) proposes calling "extinction medicine."[7,34]

Lastly, this article does not present an exhaustive analysis of the issue—far from it. We have said nothing about, for example, the third major position within the ethics of human extinction: pro-extinctionism, versions of which are advocated for by some philosophical pessimists, radical environmentalists, and contemporary technologists who endorse near-term replacement of our species with "intelligent machines." Nonetheless, we hope this overview provides a useful point of departure for future discussions on the (potentially very important) role of health professionals in ensuring the just perpetuation of humanity.

References

1. Torres ÉP. *Human Extinction: A History of the Science and Ethics of Annihilation.* Routledge/Taylor & Francis Group; 2023.
2. Razis DV. Modern Cassandras and our survival as a species—a new role for medicine? *J R Soc Med*. 1989;82(10):575-576.
3. Epstein RJ, Zhao Y. The threat that dare not speak its name: human extinction. *Perspect Biol Med*. 2009;52(1):116-125.
4. Millett P, Snyder-Beattie A. Existential risk and cost-effective biosecurity. *Health Secur*. 2017;15(4):373-383.
5. Bryan CS, Kellis DM, Sokol D. Osler's valediction: how might physicians contribute to the effort to postpone human extinction? *BMJ*. 2024;384:q499.
6. Bryan CS, Kellis DM. Osler's gravest prognosis: extinction. *Pharos Alpha Omega Alpha Honor Med Soc.* 2024;2:19-23. Accessed March 26, 2025. https://www.alphaomegaalpha.org/wp-content/uploads/2024/02/pp19-23-Bryan_Osler_WIN24.pdf
7. Kellis DM, Torres ÉP. Extinction medicine: the case for a new medical specialty. SSRN. January 23, 2025. Accessed February 3, 2025. https://papers.ssrn.com/sol3/papers.cfm?abstract_id=5109482
8. World population by year. Worldometer. Accessed April 28, 2025. https://www.worldometers.info/world-population/world-population-by-year/
9. Parfit D. *Reasons and Persons*. Oxford University Press; 1986.
10. Finneron-Burns E. What's wrong with human extinction? *Can J Philos*. 2017;47(2-3):327-343.
11. Narveson J. Utilitarianism and new generations. *Mind*. 1967;76(301):62-72.
12. Munthe C. The goals of public health: an integrated, multidimensional model. *Public Health Ethics*. 2008;1(1):39-52.
13. Boorse C. Goals of medicine. In: Giroux E, ed. *Naturalism in the Philosophy of Health: Issues and Implications*. Springer; 2016:145-177.
14. Broadbent A. Health and disease. In: *Philosophy of Medicine*. Oxford University Press; 2019:93-126.
15. Bostrom N. Astronomical waste: the opportunity cost of delayed technological development. *Utilitas*. 2003;15(3):308-314.

16. Mack K. *The End of Everything (Astrophysically Speaking)*. Scribner; 2021.
17. Newberry T. How many lives does the future hold? Global Priorities Institute, University of Oxford; 2021. GPI technical report T2-2021. Accessed September 29, 2024. https://globalprioritiesinstitute.org/wp-content/uploads/Toby-Newberry_How-many-lives-does-the-future-hold.pdf
18. Singer P, Beckstead N, Wage M. Preventing human extinction. Effective Altruism Forum. August 19, 2013. Accessed February 7, 2025. https://forum.effectivealtruism.org/posts/tXoE6wrEQv7GoDivb/preventing-human-extinction
19. MacAskill W. "Longtermism." Effective Altruism Forum. July 25, 2019. Accessed February 7, 2025. https://forum.effectivealtruism.org/posts/qZyshHCNkjs3TvSem/longtermismMacAskill
20. Greaves H, MacAskill W. The case for strong longtermism. Global Priorities Institute, University of Oxford; 2021. GPI working paper 5-2021. Accessed November 19, 2024. https://globalprioritiesinstitute.org/wp-content/uploads/The-Case-for-Strong-Longtermism-GPI-Working-Paper-June-2021-2-2.pdf
21. Ord T. *The Precipice: Existential Risks and the Future of Humanity*. Hachette Books; 2020.
22. GDP, current prices: billions of US dollars. International Monetary Fund. 2025. Accessed July 15, 2025. https://www.imf.org/external/datamapper/NGDPD@WEO/OEMDC/ADVEC/WEOWORLD
23. Summer A, Yusuf AA. New estimates of the cost of ending poverty and its global distribution. World Institute for Development Economics Research, United Nations University; 2024. WIDER working paper 2024/46.
24. How much money would it take to end world hunger? Oxfam. December 9, 2022. Accessed September 13, 2024. https://www.oxfamamerica.org/explore/stories/how-much-money-would-it-take-to-end-world-hunger/
25. World Water Assessment Programme. *The United Nations World Water Development Report 2021: Valuing Water*. UNESCO; 2021. Accessed September 9, 2024. https://unesdoc.unesco.org/ark:/48223/pf0000375724
26. Tian N, da Silva DL, Liang X, Scarazzato L. Trends in world military expenditure, 2023. SIPRI; 2024. Accessed February 7, 2025. https://www.sipri.org/sites/default/files/2024-04/2404_fs_milex_2023.pdf
27. Total contribution of travel and tourism to gross domestic product (GDP) worldwide in 2019 and 2023, with a forecast for 2024 and 2034. Statistica. July 15, 2024. Accessed February 7, 2025. https://www.statista.com/statistics/233223/travel-and-tourism-total-economic-contribution-worldwide/
28. Matthews D. This man has donated at least 10% of his salary to charity for 11 years running. *Vox*. November 30, 2020. Accessed March 22, 2025. https://www.vox.com/future-perfect/21728925/charity-10-percent-tithe-giving-what-we-can-toby-ord
29. Sidgwick H. *The Methods of Ethics*. DigiCat; 2022.
30. Tangermann V. Sam Altman seems to imply that OpenAI is building God. *Futurism*. November 15, 2023. Accessed March 22, 2025. https://futurism.com/sam-altman-imply-openai-building-god

31. WMA international code of medical ethics. World Medical Association. Adopted October 1949. Revised October 2022. Accessed March 1, 2024. https://www.wma.net/policies-post/wma-international-code-of-medical-ethics/
32. Bressler RD, Alstott J. The International Panel on Global Catastrophic Risks (IPGCR). In: Zimmer D, Undheim TA, Edwards PN, eds. *Intersections, Reinforcements, Cascades*: *Proceedings of the 2023 Stanford Existential Risks Conference*. Stanford Existential Risks Initiative, Stanford University; 2023:233-247. Accessed March 26, 2025. https://stacks.stanford.edu/file/druid:pn116pv4512/Intersections,%20Reinforcements,%20Cascades_Proceedings%20of%20the%202023%20Stanford%20Existential%20Risks%20Conference.pdf
33. Willis HH, Narayanan A, Boudreaux B, et al. Global catastrophic risk assessment. RAND; 2024. Accessed July 9, 2025. https://www.fie.undef.edu.ar/ceptm/wp-content/uploads/2024/11/RAND_RRA2981-1.pdf
34. Kellis DM. On the way to extinction medicine. *Oslerian.* 2024;25(1):10-11.

Devin M. Kellis, MS is a medical student at the University of South Carolina School of Medicine Columbia, where he received an MS in biomedical science. He holds a BS in biology and a BS in psychology from Francis Marion University. His current research aims to understand drivers of human-caused existential threats and to develop a medical specialty that promotes humanity's survival under conditions of minimal social harm (behavioral eschatology and extinction medicine, respectively).

Émile P. Torres, PhD is a postdoctoral scholar at the Inamori International Center for Ethics and Excellence at Case Western Reserve University in Cleveland, Ohio. Their work focuses on existential threats to humanity and civilization, as well as on the ethical and evaluative implications of human extinction. They have published widely in both academic journals and popular media outlets.

Editor's Note

The case to which this commentary is a response was developed by the editorial staff.

Citation

AMA J Ethics. 2025;27(8):E549-558.

DOI

10.1001/amajethics.2025.549.

Conflict of Interest Disclosure

Contributors disclosed no conflicts of interest relevant to the content.

The people and events in this case are fictional. Resemblance to real events or to names of people, living or dead, is entirely coincidental. The viewpoints expressed in this article are those of the author(s) and do not necessarily reflect the views and policies of the AMA.

ISSN 2376-6980

AMA Journal of Ethics®
August 2025, Volume 27, Number 8: E559-570

CASE AND COMMENTARY: PEER-REVIEWED ARTICLE

Why and How Should Physicians Mitigate Threats of Nuclear War?

Ghee Rye Lee, MMSc, MM, Devin M. Kellis, MS, Arthur E. Hale, MS, and Joseph G. Hodgkin, MD

Abstract

Most physicians do not see, or learn to see, nuclear war threat mitigation as within the scope of their professional duties. This commentary on a case argues there are 2 reasons why physicians, in particular, should draw on their unique training and expertise in medicine to help avert nuclear war: the risk of nuclear war and therefore the risk of catastrophic community, domestic, and global health consequences is presently high; and physicians today can draw on a strong history of past physicians' nuclear disarmament advocacy strategies. This commentary concludes by canvassing how those past strategies can best be applied today.

The American Medical Association designates this journal-based CME activity for a maximum of 1 AMA PRA Category 1 Credit™ *available through the* AMA Ed Hub™. *Physicians should claim only the credit commensurate with the extent of their participation in the activity.*

Case

A long-time advocate of nuclear weapons elimination, Dr A has spent their career listening to and caring for survivors of the 1945 atomic bomb strikes on Hiroshima and Nagasaki.

One of Dr A's talking points is that a single nuclear warhead dropped on a city could kill or injure millions of people. With more than 12 000 nuclear weapons remaining in the arsenals of 9 nuclear-armed states,[1] and with the understanding that even a "small-scale" nuclear war could have indirect effects that threaten billions with starvation,[2] Dr A argues that all health professions have a responsibility to address this risk because they have fiduciary and ethical duties to both domestic and international communities. Dr A's supporters add that nuclear war could cause societal collapse or human extinction, but detractors argue that such fears are overblown and rooted in ultimately unverifiable hypotheses.

Dr A and other members of International Physicians for the Prevention of Nuclear War (IPPNW) advocate that physicians are obliged to work to eliminate any morbidity and mortality risk, including that arising from nuclear weapons proliferation. Dr A and their colleagues wonder how to model positions and responses that other health professionals could also adopt and implement.

Commentary

Physicians have long recognized that health and well-being depend not only on patient care provided in clinics and hospitals, but also on broader social conditions and public policy. Rudolf Virchow, the 19th-century German pathologist and parliamentarian, is often cited as an early advocate of this concept, having said that "[m]edicine is a social science, and politics is nothing but medicine on a large scale."[3,4] This awareness that policy and social factors influence health underpins the disciplines of public health, social medicine, and global health. However, the boundaries of physician action on public policy remain contested. For example, the National Rifle Association told physicians via social media to "stay in their lane" during public discourse on US gun violence in 2018.[5] Physicians who treat gunshot wounds responded, "This is our lane."[5]

In the mid-20th century, the medical community began addressing the global health threat of nuclear war through advocacy and education. While nuclear disarmament and abolition remain an interest for a small but active subset of physicians, there is a need for greater physician involvement in—and coalition building to support—nuclear disarmament. Dr A and their colleagues can advance this effort by emphasizing 2 key points to other health professionals. First, there is a significant precedent of physicians effectively addressing the threat of nuclear weapons.[6] Second, the risk of nuclear war and its foreseeable consequences of mass casualties and a humanitarian crisis are greater now than at any point since the end of the Cold War.[7,8,9,10] These 2 facts, Dr A should argue, confer upon health professionals an ethical obligation to promote patient well-being and safety by redoubling their efforts to abolish nuclear weapons.

Physicians Addressing Nuclear War

Physicians managed the health effects of nuclear weapons even before the use of such weapons in war. In the Manhattan Project, the US government's top-secret program to develop atomic bombs during the Second World War, physicians conducted research—sometimes unethical—on the health effects of plutonium.[11] They also issued a warning to military officials before the first atomic weapon test, predicting that weather patterns would disperse radioactive material and harm American citizens.[11,12] After the atomic bombings of Hiroshima and Nagasaki, Japanese health professionals provided direct patient care to survivors.[13]

After the Second World War, physicians continued to issue warnings of the health effects of nuclear testing. In 1957, the Nobel Prize-winning physician Albert Schweitzer published one such warning, his Declaration of Conscience, which swayed public opinion on nuclear weapons testing in the Western world.[14] Antinuclear protests and polls showing negative attitudes toward nuclear weapons testing placed moral pressure on US President Dwight D. Eisenhower, who issued a cessation of nuclear testing in 1958, although it was resumed under President John F. Kennedy in 1962.[14] Subsequent advocacy by the US organization Physicians for Social Responsibility (PSR) and the findings from the St Louis Baby Tooth Survey, which revealed excessive amounts of radioactive Strontium-90 in children's teeth, played a role in President Kennedy's decision to sign the Partial Nuclear Test Ban Treaty on behalf of the United States in 1963, which ended above-ground nuclear testing.[15,16]

Nevertheless, the number of nuclear warheads in the United States and Soviet arsenals continued to rise. To address this threat, American physician Bernard Lown, Soviet physician Yevgeniy Chazov, and several others founded the IPPNW in 1980.[17] The IPPNW's work earned it the Nobel Peace Prize in 1985.[18] By promoting the movement

for nuclear disarmament and engaging with policymakers, IPPNW physicians played a role in the development of the 1987 Intermediate-Range Nuclear Forces Treaty, which facilitated bilateral nuclear disarmament and helped usher in the end of the Cold War.[6]

In 2006, after disarmament progress had slowed, the IPPNW initiated the International Campaign to Abolish Nuclear Weapons (ICAN).[19] ICAN went on to play an active role in negotiations on the Treaty on the Prohibition of Nuclear Weapons (TPNW), for which it received the Nobel Peace Prize after the treaty was adopted by the United Nations in 2017.[19] One hundred twenty-two nations voted to pass the TPNW in the General Assembly.[19] Since then, 94 nations have become signatories, and 73 have ratified the treaty, urging nuclear-armed nations to eliminate their nuclear weapons.[20,21] However, much work remains, as none of the nuclear-armed states support the TPNW.[20,21] Dr A can draw on this history to illustrate that physicians can effectively promote nuclear weapons policies that preserve human survival and prevent incurable suffering.

Threat of Nuclear War

In January 2025, the Doomsday Clock of the *Bulletin of the Atomic Scientists* was set at the closest position to midnight in history, reflecting an unprecedented risk of nuclear war.[7] Over 12 000 nuclear weapons exist today, some of which have 80-fold the explosive power of the bomb used in Hiroshima.[22,23] Despite a long history of nuclear weapons accidents and false alarms,[24] nuclear-armed states are pursuing campaigns to enhance and modernize their nuclear weapons to improve lethality and efficiency.[25] In 2023, $91.4 billion was spent globally on such efforts, which was $10.8 billion more than the previous year. The US alone was responsible for 56% of the $91.4 billion.[26] The estimated cost of US nuclear weapons spending alone over the next 30 years is $1.5 trillion.[27] However, there is uncertainty over US nuclear policy since January 2025; the oft-cited “Project 2025” supports investment in nuclear modernization, but there have been expressions of executive branch interest in “denuclearization” and reductions in nuclear weapons spending.[28,29]

To illustrate why nuclear risk reduction matters to physicians, Dr A can appeal to evidence of the health effects of the bombings of Hiroshima and Nagasaki, nuclear weapons testing, nuclear reactor disasters, and health care-associated radiation, as well as to climate modeling, which indicates that a nuclear war would be catastrophic. Immediate and long-term health effects of nuclear explosions—from thermal burns and radiation sickness to cancer—are well-documented.[30] Nuclear attacks in Japan in 1945 resulted not only in the acute deaths of approximately 210 000 individuals, but in leukemia, heart disease, stroke, anxiety, posttraumatic stress disorder-like symptoms, and somatization symptoms among survivors.[30,31,32,33] Psychological damage can extend to those living with threats of nuclear destruction and can manifest as anxiety and a sense of helplessness.[34]

Communities exposed to nuclear weapons testing in locations such as the Marshall Islands, the Zhanasemey District of Kazakhstan, and Xinjiang, China, have also experienced long-term adverse health outcomes, including an elevated incidence of thyroid cancer.[35,36] These findings are consistent with the health effects among survivors of the Chernobyl accident.[37] In addition to external radiation exposure, these events can cause internal irradiation through contaminated air, food, and water.[38]

In metropolitan and industrial areas, fires from nuclear blasts would drive smoke into the atmosphere, which would reduce sunlight, temperature, and ozone; diminished

ozone, specifically, would increase ultraviolet radiation exposure and exacerbate the risk of cataracts and skin cancer.[39,40] Models of nuclear war between India and Pakistan or the United States and Russia suggest that these climate alterations would be substantial, prolonged, and global, leading to a nuclear winter that threatens 2 to 5 billion people, respectively, with famine.[2,41] Similar models predict mass species extinction, a tragedy that would also reduce the diversity of natural products available for drug discovery.[42,43]

Given the destructive capacity of nuclear weapons, nuclear war poses not only significant health risks but also the potential for societal collapse. The likelihood of outright human extinction from nuclear war is more debatable, as Dr A's detractors indicate. It is indeed impossible to precisely predict the outcome of a full-scale nuclear war. In such discussions, Dr A should, first and foremost, emphasize that the health implications of nuclear weapons alone are more than enough to merit substantial efforts to prevent nuclear war by physicians. Dr A could add that nuclear war would compromise global trade, including pharmaceutical supply chains, medical technology equipment, and commodities.[44,45] Combined with infrastructural damage to research centers, sanitation systems, and governmental social services, these factors would cause further negative downstream health effects of nuclear weapons use.[44,45] In the face of such disruptions, humanity's vulnerability to other hazards, such as pandemics or natural disasters, would also increase, thereby increasing the risk of human extinction.

Medical Ethics and Nuclear Threat

Dr A could call upon the 4 foundational principles of medical ethics—beneficence, nonmaleficence, justice, and autonomy—to emphasize the role of physicians in discussions about the nuclear threat (see Table).[46]

Table. Application of Medical Ethics Principles to Physicians' Mitigation of Nuclear Threats

Ethical principle	Relevance to physicians' mitigation of nuclear threats
Beneficence and nonmaleficence	Given the health effects of nuclear war, acting to reduce nuclear risk can prevent harm to physicians' patients and communities, and, historically, it has led to tangible benefits for patients (eg, by limiting radiation exposure and weapons spending). Physician knowledge of the health effects of nuclear war and their management could become clinically relevant in the event of a nuclear attack.[47]
Justice	The principle of justice should guide physicians when discussing the opportunity cost of US nuclear weapons spending with colleagues, allied health professionals, and the public. They must critically examine whether this money could be better spent on health and social services, particularly given that the US health system is ranked lowest overall among high-income countries.[a]
Respect for autonomy	By educating the public about the health effects of nuclear weapons testing and war, clinicians can enable patients to make more informed decisions at the polls—that is, to exercise their right to vote with full awareness of the implications.

[a] This ranking is attributable to limited access to health care, its lack of affordability, and poor health outcomes, including the highest infant mortality rate and lowest life expectancy among high-income countries.[48]

Efforts to address nuclear weapons by physicians may be viewed as supererogatory (ie, as an additional, but not necessary, moral obligation that goes "above the call of duty"), in which case physician autonomy to *not* engage in such advocacy is warranted.[49]

However, taking this view could not only endanger public safety, but potentially lead to shaming physicians who disagree about the need to address the nuclear threat. A case can be made that using moral shame or stigmatization to protect millions or billions of lives, given the catastrophic nature of nuclear weapons, is worthwhile.[50,51] Indeed, it is not unusual for physicians who minimize or neglect the risks posed by other global health issues that broadly apply to all medical specialties, such as pandemics, to be morally shamed by other members of the health profession. While respectful debate about public health measures is important, it is critical to build a medical consensus and norm that nuclear weapons are an unacceptable threat to public health that must be "cured."

Ending the Nuclear Threat

By appealing to the history of physician activism and the predictable health risks of nuclear war, Dr A and their colleagues could help reorient physicians and other health professionals to nuclear weapons as a public health threat. It is time for every health professional to treat nuclear war as a tangible, imminent threat, just as we do pandemics, climate change, and natural disasters. How can we address the threat of nuclear war? We suggest that physicians can take the following actions.

First, physicians can urge their congressional representatives to support legislation that reduces the risk posed by nuclear weapons. Several bills under consideration propose additional funding for research on the health effects of nuclear weapons[52,53] or encourage a "no first use" nuclear weapons policy (ie, a commitment not to initiate a nuclear attack) by the US government.[54,55] Additional proposals include formal US recognition of the TPNW and reductions in spending on nuclear weapons.[56,57]

Second, they can oppose bills that increase the risk of nuclear war, such as the Sentinel Nuclear Deterrence Act of 2023, which calls for additional nuclear modernization in the name of deterrence.[58]

Third, physicians can join grassroots social movements such as IPPNW, PSR, and Back from the Brink. These campaigns advocate for several actionable policies: (a) an end to presidential sole authority to launch nuclear weapons, (b) the adoption of an unconditional nuclear "no first use" policy, (c) the removal of intercontinental ballistic missiles from high alert status, (d) a funding reduction for nuclear weapons, and (e) the initiation of negotiations for a multilateral, verifiable, and time-bound agreement to abolish nuclear weapons.[59]

Fourth, physicians can call on institutions and other health care professionals to support social movements and policies that reduce nuclear risk. Specifically, physicians-in-training could engage the profession through advocacy and research.[60] Those in allied health professions could take similar actions at their respective institutions. Ideally, this work would happen cooperatively with military leaders, either retired or in their civilian capacities, and academics, given that these professionals are perceived as highly trusted sources of information about nuclear weapons.[61]

Fifth, physicians can raise awareness of the opportunity cost of US nuclear weapons spending among colleagues, other health care professionals, and the American public by organizing or participating in town hall meetings and discussions focused on health care funding. Physicians can also leverage social media platforms to spread information and engage a broader audience.

Sixth, physicians can communicate with the American public and promote informed voting, as many citizens do not understand nuclear policy or its financial costs. Only 30% and 20% of the US public are somewhat familiar with US nuclear weapons policy and the cost of nuclear weapons, respectively.[61] However, 60% of the public is "at least somewhat interested" in learning more about these topics, suggesting opportunities for advocacy and education.[61]

Barriers to Action and Potential Solutions

Although the potential benefits for public health are clear, physician advocacy to reduce nuclear risk may take time away from clinical care, self-care, and research.[62] Coalition building through conference attendance, lobbying sessions, and campaign events may require travel and transportation expenses, although video conferencing can help mitigate some logistical and financial challenges to collaborating with colleagues in distant locations. Moreover, mentoring the next generation of physicians on nuclear issues demands the attention and effort of current thought leaders.

Physicians in academic centers may struggle to secure financial support for the time they dedicate to nuclear advocacy, as this type of work is not compensated[63] or traditionally funded by research grants. While other grant-making organizations related to nuclear risk exist and might be avenues for funding,[64,65,66] physician-advocates seeking funding must carefully consider issues such as bias, transparency, and conflicts of interest. With some creativity, advocates could design scholarly projects to advance knowledge about the dangers of nuclear weapons and grow the evidence base for relevant advocacy approaches. An ideal solution might be to seek endowments to create new research centers or departments at medical schools dedicated to managing nuclear and other extinction threats, perhaps under the heading of a new medical specialty.[67]

While serving the greater good of humanity, nuclear weapons advocacy could introduce political tensions that challenge professional relationships or affect career advancement opportunities. In this regard, it is notable that our 6 proposed actions for reducing nuclear risk are designed with a representative democracy in mind (particularly, the United States); they may not be applicable to other nuclear-armed states with differing political systems and security priorities. While some of the strategies described are only applicable in liberal democracies, the diplomacy of physicians and scientists involved in IPPNW in the 1980s was effective in changing nuclear weapons policy in both the United States and the former Soviet Union.[68] These physicians adapted their advocacy to the political context in which they operated, suggesting that such work is possible, if difficult, in authoritarian nuclear-armed states today. Further knowledge of non-democracies is needed to understand why nuclear weapons are favored under some regimes and how physicians might help advance nuclear disarmament or abolition under such regimes.[69] Ultimately, effective global collaboration can be achieved through careful diplomatic efforts, as demonstrated by American and Soviet physicians' work through IPPNW.

Conclusion

Dr Bernard Lown, a co-founder of IPPNW, once said: "We physicians who shepherd human life from birth to death have a moral imperative to resist with all our being the drift toward the brink."[70] We are, once again, at the brink of a preventable nuclear arms race.[71] The threat of nuclear war today is real, historically high, and growing. Physicians take an oath to promote the health of their patients and communities. Reducing the risk of nuclear war is fulfilling that oath. Given their past effectiveness in helping prevent

nuclear war, physicians must act now against one of the greatest threats, if not *the* greatest threat, to public health.

References

1. Which countries have nuclear weapons? International Campaign to Abolish Nuclear Weapons. Accessed March 15, 2025. https://www.icanw.org/nuclear_arsenals
2. Xia L, Robock A, Scherrer K, et al. Global food insecurity and famine from reduced crop, marine fishery and livestock production due to climate disruption from nuclear war soot injection. *Nat Food*. 2022;3(8):586-596.
3. Mackenbach JP. Politics is nothing but medicine at a larger scale: reflections on public health's biggest idea. *J Epidemiol Community Health*. 2009;63(3):181-184.
4. Virchow R. Der Armenarzt. *Med Reform*. 1848;(18):126-127.
5. Wamsley L. After NRA mocks doctors, physicians reply: "this is our lane." *NPR*. November 11, 2018. Accessed January 27, 2025. https://www.npr.org/2018/11/11/666762890/after-nra-mocks-doctors-physicians-reply-this-is-our-lane
6. Lown B, Chazov EI. Physician responsibility in the nuclear age. *JAMA*. 1995;274(5):416-419.
7. Mecklin J, ed; Science and Security Board. Closer than ever: it is now 89 seconds to midnight. *Bulletin of the Atomic Scientists*. January 28, 2025. Accessed March 18, 2025. https://thebulletin.org/doomsday-clock/current-time/
8. Risk of nuclear weapons use higher than at any time since Cold War, disarmament affairs chief warns Security Council. United Nations. March 31, 2023. Accessed March 15, 2025. https://press.un.org/en/2023/sc15250.doc.htm
9. Andrus J. A new era in nuclear arms reduction. New York State Bar Association. February 3, 2025. Accessed March 16, 2025. https://nysba.org/a-new-era-in-nuclear-arms-reduction/
10. Remarks from UN Secretary-General António Guterres. Arms Control Association. June 7, 2024. Accessed March 16, 2025. https://www.armscontrol.org/2024AnnualMeeting/UNSG-Remarks
11. Moreno J. Physicians of the Manhattan Project. *Am Sci*. 2021;109(3):182-186.
12. Blume LMM. Collateral damage: American civilian survivors of the 1945 Trinity test. *Bulletin of the Atomic Scientists*. July 17, 2023. Accessed January 27, 2025. https://thebulletin.org/premium/2023-07/collateral-damage-american-civilian-survivors-of-the-1945-trinity-test/
13. Kosuge NM. Prompt and utter destruction: the Nagasaki disaster and the initial medical relief. *Int Rev Red Cross*. 2007;89(866):279-303.
14. Wittner LS. Blacklisting Schweitzer. *Bull At Sci*. 1995;51(3):55-61.
15. Gerl E. Scientist-citizen advocacy in the atomic age: a case study of the Baby Tooth Survey, 1958-1963. *PRism*. 2014;11(1):1-14.
16. History. Physicians for Social Responsibility. Accessed January 27, 2025. https://psr.org/about/history/
17. Abrams I. The origins of International Physicians for the Prevention of Nuclear War: the Dr James E. Muller diaries. *Med Confl Surviv*. 1999;15(1):15-31.
18. International Physicians for the Prevention of Nuclear War. The Nobel Prize. Accessed March 15, 2025. https://www.nobelprize.org/prizes/peace/1985/physicians/facts/

19. The road to a world free of nuclear weapons. International Campaign to Abolish Nuclear Weapons. Accessed January 27, 2025. https://www.icanw.org/ican_history
20. IPPNW World Congresses. International Physicians for the Prevention of Nuclear War. Accessed January 27, 2025. https://www.ippnw.org/news/ippnw-world-congresses
21. TPNW signature and ratification status. International Campaign to Abolish Nuclear Weapons. Accessed January 27, 2025. https://www.icanw.org/signature_and_ratification_status
22. Stockholm International Peace Research Institute. SIPRI yearbook 2024: armaments, disarmament and international security summary. Stockholm International Peace Research Institute; 2024. Accessed January 27, 2025. https://www.sipri.org/sites/default/files/2024-06/yb24_summary_en_2_1.pdf
23. Walsh B. Understanding the true scale of a nuclear bomb. *Axios*. August 5, 2020. Accessed January 27, 2025. https://www.axios.com/2020/08/05/beirut-nuclear-bomb-lebanon
24. Union of Concerned Scientists. Close calls with nuclear weapons. Union of Concerned Scientists; 2015. Accessed May 1, 2025. https://www.ucs.org/sites/default/files/attach/2015/04/Close%2520Calls%2520with%2520Nuclear%2520Weapons.pdf
25. Ruff TA. Ending nuclear weapons before they end us: current challenges and paths to avoiding a public health catastrophe. *J Public Health Policy*. 2022;43(1):5-17.
26. Sanders-Zakre A, Snyder S. Surge: 2023 global nuclear weapons spending. International Campaign to Abolish Nuclear Weapons; 2024. Accessed January 27, 2025. https://assets.nationbuilder.com/ican/pages/4079/attachments/original/1718371132/Spending_Report_2024_Singles_Digital.pdf?1718371132
27. Cameron D. US nuclear missile silos need modernizing, but fixes aren't coming soon. *Wall Street Journal*. August 26, 2024. Accessed January 27, 2025. https://www.wsj.com/politics/national-security/u-s-nuclear-missile-silos-need-modernizing-but-fixes-arent-coming-soon-7985e1ba
28. Whisnant G, Mesa J. Donald Trump wants to "get rid" of nuclear weapons. *Newsweek*. March 6, 2025. Accessed March 16, 2025. https://www.newsweek.com/donald-trump-wants-get-rid-nuclear-weapons-2040867
29. Trump regains control over nuclear policy: what's next? Arms Control Association blog. February 21, 2025. Accessed March 15, 2025. https://www.armscontrol.org/blog/2025-02-21/trump-regains-control-over-nuclear-policy-whats-next
30. Xu S, Dodt A. Nuclear bomb and public health. *J Public Health Policy*. 2023;44(3):348-359.
31. Baker JE, Moulder JE, Hopewell JW. Radiation as a risk factor for cardiovascular disease. *Antioxid Redox Signal*. 2011;15(7):1945-1956.
32. Tomonaga M. The atomic bombings of Hiroshima and Nagasaki: a summary of the human consequences, 1945-2018, and lessons for *Homo sapiens* to end the nuclear weapon age. *J Peace Nucl Disarm*. 2019;2(2):491-517.
33. Yamada M, Izumi S. Psychiatric sequelae in atomic bomb survivors in Hiroshima and Nagasaki two decades after the explosions. *Soc Psychiatry Psychiatr Epidemiol*. 2002;37(9):409-415.

34. Dyer J. Psychopathology of nuclear war. *Bull R Coll Psychiatrists*. 1986;10(10):281.
35. Ruff TA. The humanitarian impact and implications of nuclear test explosions in the Pacific region. *Int Rev Red Cross*. 2015;97(899):775-813.
36. Becker C, Hill JT, Muratov S. Brighter than a million suns: contemporary health consequences of atomic testing in the Semipalatinsk nuclear polygon. University of Central Asia; 2022. Working paper 70.
37. Scientific Committee on the Effects of Atomic Radiation. *Sources and Effects of Ionizing Radiation, Volume 2: Effects: Scientific Annexes C, D and E*. United Nations; 2011. Accessed January 27, 2025. https://www.unscear.org/unscear/uploads/documents/unscear-reports/UNSCEAR_2008_Report_Vol.II.pdf
38. Prăvălie R. Nuclear weapons tests and environmental consequences: a global perspective. *Ambio*. 2014;43(6):729-744.
39. Jehn FU. Anthropocene under dark skies: the compounding effects of nuclear winter and overstepped planetary boundaries. In: *Proceedings of the Stanford Existential Risks Conference*. Stanford University; 2023:119-132. Accessed May 1, 2025. https://stacks.stanford.edu/file/zb109mz2513/Jehn_Anthropocene%20Under%20Dark%20Skies.pdf
40. Bardeen CG, Kinnison DE, Toon OB, et al. Extreme ozone loss following nuclear war results in enhanced surface ultraviolet radiation. *J Geophys Res Atmos*. 2021;126(18):e2021JD035079.
41. Diaz-Maurin F. Nowhere to hide: how a nuclear war would kill you—and almost everyone else. *Bulletin of the Atomic Scientists*. October 20, 2022. Accessed January 27, 2025. https://thebulletin.org/2022/10/nowhere-to-hide-how-a-nuclear-war-would-kill-you-and-almost-everyone-else/#top
42. Kaiho K. An animal crisis caused by pollution, deforestation, and warming in the late 21st century and exacerbation by nuclear war. *Heliyon*. 2023;9(4):e15221.
43. Chivian E. Environment and health: 7. Species loss and ecosystem disruption—the implications for human health. *CMAJ*. 2001;164(1):66-69.
44. Cotterlaz P, Gaulier G, Sztulman A, Ünal D. Pioneering a new classification: a comprehensive study of healthcare products in global trade. Banque de France. September 19, 2024. Working paper series 963. Accessed January 27, 2025. https://www.banque-france.fr/en/publications-and-statistics/publications/pioneering-new-classification-comprehensive-study-healthcare-products-global-trade
45. Barlow P, van Schalkwyk MC, McKee M, Labonté R, Stuckler D. COVID-19 and the collapse of global trade: building an effective public health response. *Lancet Planet Health*. 2021;5(2):e102-e107.
46. Varkey B. Principles of clinical ethics and their application to practice. *Med Princ Pract*. 2021;30(1):17-28.
47. Al-Ibraheem A, Moghrabi S, Abdlkadir A, et al. An overview of appropriate medical practice and preparedness in radiation emergency response. *Cureus*. 2024;16(6):e61627.
48. Kuehn BM. US health system ranks last among high-income countries. *JAMA*. 2021;326(11):999.
49. Heyd D. *Supererogation*. Cambridge University Press; 1982.
50. Dolezal L, Rose A, Cooper F. COVID-19, online shaming, and health-care professionals. *Lancet*. 2021;398(10299):482-483.

51. Strydom C. Stigmatisation as a road to denuclearisation—the stigmatising effect of the TPNW. In: Black-Branch JL, Fleck D, eds. *Nuclear Disarmament and Security at Risk—Legal Challenges in a Shifting Nuclear World*. Springer Nature; 2021:453-478. *Nuclear Non-Proliferation in International Law*; vol 6.
52. Health Impacts of Nuclear War Act of 2023, S 2398, 118th Cong (2023-2024). Accessed March 19, 2025. https://www.congress.gov/bill/118th-congress/senate-bill/2398/text
53. Health Impacts of Nuclear War Act of 2023, HR 4703, 118th Cong (2023-2024). Accessed March 19, 2025. https://www.congress.gov/bill/118th-congress/house-bill/4703/text
54. Restricting First Use of Nuclear Weapons Act of 2023, HR 669, 118th Cong (2023-2024). Accessed March 19, 2025. https://www.congress.gov/bill/118th-congress/house-bill/669/text
55. Restricting First Use of Nuclear Weapons Act of 2023, S 1186, 118th Cong (2023-2024). Accessed March 19, 2025. https://www.congress.gov/bill/118th-congress/senate-bill/1186/text
56. Embracing the Goals and Provisions of the Treaty on the Prohibition of Nuclear Weapons, HR 77, 118th Cong (2023-2024). Accessed March 19, 2025. https://www.congress.gov/bill/118th-congress/house-resolution/77/text
57. Nuclear Weapons Abolition and Conversion Act of 2023, HR 2775, 118th Cong (2023-2024). Accessed March 19, 2025. https://www.congress.gov/bill/118th-congress/house-bill/2775/text
58. Sentinel Nuclear Deterrence Act of 2023, S 2017, 118th Cong (2023-2024). Accessed March 19, 2025. https://www.congress.gov/bill/118th-congress/senate-bill/2017/text
59. Our five policy solutions. Back from the Brink. Accessed January 27, 2025. https://preventnuclearwar.org/our-five-policy-solutions/
60. Hale AE, Kellis DM, Lee GR, Hodgkin JG. Addressing the health threats of nuclear war as United States medical students. *Med Confl Surviv*. 2024;40(4):330-338.
61. Smeltz D, Kafura C, Weiner S. Majority in the US interested in boosting their nuclear knowledge. Lester Crown Center on US Foreign Policy; Carnegie Corporation of New York; Chicago Council on Foreign Affairs; 2023. Accessed March 18, 2025. https://media.carnegie.org/filer_public/f1/65/f1652f81-0d93-442e-9f77-37954dc505dc/majority_in_the_us_interested_in_boosting_their_nuclear_knowledge.pdf
62. Warwick S, Kantor L, Ahart E, Twist K, Mabry T, Stoltzfus K. Physician advocacy: identifying motivations for work beyond clinical practice. *Kans J Med*. 2022;15(3):433-436.
63. Louisias M, Hicks R, Jacobs S, Foggs MB. The role of physician advocacy in achieving health equity: where is the allergist-immunologist? *J Allergy Clin Immunol Pract*. 2022;10(4):910-917.
64. International peace and security. Carnegie Corporation of New York. Accessed March 16, 2025. https://www.carnegie.org/programs/international-peace-and-security/
65. Global Catastrophic Risks Fund. Founders Pledge. Accessed March 16, 2025. https://www.founderspledge.com/funds/global-catastrophic-risks-fund
66. Grantmaking work. Future of Life Institute. Accessed March 16, 2025. https://futureoflife.org/our-work/grantmaking-work/

67. Kellis DM, Torres ÉP. Extinction medicine: the case for a new medical specialty. SSRN. March 25, 2025. Accessed May 8, 2025. https://papers.ssrn.com/sol3/papers.cfm?abstract_id=5109482
68. IPPNW: a brief history. International Physicians for the Prevention of Nuclear War. Accessed March 15, 2025. https://www.ippnw.org/about/ippnw-a-brief-history
69. Way C, Weeks JLP. Making it personal: regime type and nuclear proliferation. *Am J Pol Sci*. 2014;58(3):705-719.
70. Chazov Y. International Physicians for the Prevention of Nuclear War acceptance speech. The Nobel Prize. December 10, 1985. Accessed January 27, 2025. https://www.nobelprize.org/prizes/peace/1985/physicians/acceptance-speech/
71. Klare MT. The nuclear arms race is back and more terrifying than ever. *The Nation*. September 17, 2024. Accessed January 27, 2025. https://www.thenation.com/article/world/nuclear-war-new-start/

Ghee Rye Lee, MMSc, MM is a medical student at the Ohio State University College of Medicine in Columbus with master's degrees in immunology from Harvard Medical School and music from the Boston Conservatory at Berklee. She holds a BS in chemistry from Carnegie Mellon University.

Devin M. Kellis, MS is a medical student at the University of South Carolina School of Medicine Columbia, where he received an MS in biomedical science. He holds a BS in biology and a BS in psychology from Francis Marion University. His current research aims are to understand drivers of human-caused existential threats and to develop a medical specialty that promotes humanity's survival under conditions of minimal social harm (behavioral eschatology and extinction medicine, respectively).

Arthur E. Hale, MS is a fourth-year medical student at Harvard Medical School in Boston, Massachusetts. He holds a BA in international relations and an MS in community health and prevention research, both from Stanford University. His academic interests focus on global anesthesia and disaster preparedness.

Joseph G. Hodgkin, MD is an attending hospitalist physician at Massachusetts General Hospital and an instructor in medicine at Harvard Medical School in Boston, Massachusetts. He is co-chair of the Greater Boston chapter of Physicians for Social Responsibility and a member of International Physicians for the Prevention of Nuclear War.

Editor's Note

The case to which this commentary is a response was developed by the editorial staff.

Citation

AMA J Ethics. 2025;27(8):E559-570.

DOI

10.1001/amajethics.2025.559.

Conflict of Interest Disclosure

Dr Hodgkin reports being co-chair of Greater Boston Physicians for Social Responsibility, a board member of Physicians for Social Responsibility, and a member of International Physicians for the Prevention of Nuclear War. The coauthors disclosed no conflicts of interest relevant to the content.

The people and events in this case are fictional. Resemblance to real events or to names of people, living or dead, is entirely coincidental. The viewpoints expressed in this article are those of the author(s) and do not necessarily reflect the views and policies of the AMA.

ISSN 2376-6980

AMA Journal of Ethics®
August 2025, Volume 27, Number 8: E571-581

CASE AND COMMENTARY: PEER-REVIEWED ARTICLE

Why Should Extinction Medicine Be a Specialty?

Devin M. Kellis, MS

Abstract

This commentary on a case builds on recent literature on climate change, health, and human extinction to argue in favor of a new clinical specialty: extinction medicine. If based on precise application of scientific findings about species extinction, disaster prevention and management, and health policy, such a specialty could help reduce humanity's extinction risk. Finally, the commentary suggests extinction medicine competencies, who might become an extinction medicine clinician, and how the specialty might be launched.

The American Medical Association designates this journal-based CME activity for a maximum of 1 AMA PRA Category 1 Credit™ *available through the* AMA Ed Hub™. *Physicians should claim only the credit commensurate with the extent of their participation in the activity.*

Case

Dr B is a pediatric internist considering how to care well for patients experiencing anxiety and moral trauma related to human-caused climate change. Dr B feels they and their clinician colleagues are generally unprepared to help their patients, their organizations, and their professions navigate such global health threats that many people tend to experience as overwhelming and unmanageable. Dr B organizes a meeting at their state medical association to discuss the issue.

A number of Dr B's fellow physicians throw their hands up and leave the room when Dr B mentions some of the following facts or hypothetical threats: not including morbidity and other measures of suffering, fossil fuels have already contributed to millions of premature human deaths[1,2]; some academicians speculate that for every 1000 tons of CO_2 emitted, one future person might die a premature death (ie, the "1000-ton rule"), potentially amounting to a billion future premature deaths over the next 1 to 2 centuries[3,4]; and many of the communities at most risk of dying from climate change have historically emitted relatively little greenhouse gases, such as CO_2 or methane, and have access to relatively few health professionals.[5,6]

Although Dr B doubts that climate change would lead to human extinction, they wonder whether their finite time is better spent addressing threats to humanity as a whole rather than attending to individual patients. Dr B considers leaving medicine as currently widely practiced and wonders what to do.

Commentary

Threat detection and response are key to organismal survival and well-being, which jointly constitute health. Whether it be single-cell bacteria sensing danger, plants' activation of pattern-triggered immunity, or animals defensively freezing, acute threat processing in local settings is virtually universal in biology.[7,8,9] Yet humanity's ability to ponder our extinction is evolutionarily new.

With respect to climate change, some philosophers have indicated that something like human extinction is unlikely.[10,11] However, there are advocates who think it is within the realm of possibility, even likely.[12] When evaluating such claims, focus must be placed on evaluating whether there might be credible scientific mechanisms by which the human population could dwindle to zero. While outlining exact pathways by which climate change could contribute to the risk of human extinction is difficult and underexplored, there is no denying that rising global temperatures lead to increased mortality through their influence on heat waves, droughts, floods, hurricanes, and wildfires. The World Health Organization, for example, has estimated that approximately 250 000 excess deaths from malaria, diarrheal diseases, dengue, undernutrition, and excess heat will occur due to climate change every year from 2030 to 2050, over 90% of which are expected to occur in low- and middle-income countries.[13] In light of one estimate in 2020 indicating that only 7 high-income areas in the Global North emitted 92% of CO_2 emissions from 1850 to 2015,[8] these projected deaths are also an issue of health justice. Whether and to what extent climate change-related mortality projections come true (especially highly speculative estimates such as the 1000-ton rule)[3,4] is dependent on decisions made today with respect to funding mitigation and adaptation efforts.

In addition to climate change negatively affecting health, some scientists worry that it could contribute to societal collapse by reinforcing interactions among other global threats related to inequality, violence, and resource scarcity, among others.[14] In light of this risk, global risk scholar Luke Kemp perhaps says it best: we simply "do not know whether climate change or anthropogenic ecological disruption could spiral into human extinction."[15] That possibility ought to concern all of us, especially with more than 200 journals agreeing that the climate and biodiversity crisis is a global health emergency.[16] With CO_2 emissions hitting a new high in 2023 despite decades of effort to address the issue, it is no surprise that people are experiencing climate anxiety.[17]

Indeed, learning about global threats may trigger several cognitive, emotional, and behavioral responses in both patients and clinicians. The climate change and pandemic literatures focus mostly on fear, anxiety, grief, and denial.[18,19] In the 20th century, studies of nuclear anxiety also emphasized "psychic numbing," a blunted emotional response to mass atrocities, such as genocide or nuclear war, among others.[20,21] Ideally, global threat responses would promote human survival and welfare through straightforward consensus building, public policy, and health law; however, the outcome is too often behavioral avoidance and intergroup conflict. Significantly less attention has been given to the psychological effects of thinking about human extinction, perhaps because so few people appear to be doing it. However, when we, like Dr B, do find the time to consider humanity's extinction, our thinking about it is often shallow, fleeting, and in relation to a single hazard, such as global warming, nuclear weapons, or asteroids, considered in isolation. The planetary health movement and advancements in the field of existential risk studies (ERS) are increasingly recognizing the need to consider global threats instead as a complex, interacting system.[22,23,24,25,26] Despite this convergence of interests, medicine and ERS generally emphasize different moral

theories (eg, deontology and duties to one's patients and impartial utilitarianism,[27] respectively). Regrettably, these differences have fostered an unwarranted situation: no profession has adopted a duty to prevent human extinction.

Some argue that medicine should step in to fill this gap by creating a new medical specialty, "extinction medicine," which would aim to translate knowledge into actions that "promote humanity's survival while minimizing social harm."[28] The development of such a specialty would provide a solution for Dr B, as it would allow Dr B to remain in the medical profession, but more broadly construed. This paper therefore bolsters the central thesis that extinction medicine should be created as a new specialty. After evaluating reasons and justifications as to why this is the case, a picture of what extinction medicine might look like is painted more fully.

Why Medicine Should Care About Human Extinction

Straightforward reasons for medicine to adopt specialized consideration of human extinction have been discussed recently.[28] Select rationales are reiterated here in greater detail and in tandem with others drawn from literature on the ethics of human extinction.

Extinction cannot be cured. The first reason for medicine to care about extinction can be made by analogy with disease: while we can cure diseases after they happen, final human extinction cannot be cured.[29] Once extinction occurs, that's it—there are no do-overs. As Nick Bostrom makes clear, a "reactive approach—to observe what happens, limit damages, and then implement improved mechanisms to reduce the probability of a repeat occurrence—does not work when there is no opportunity to learn from failure."[29] It is therefore critical that human extinction be well understood from a mechanistic and human biological perspective, which medicine excels at. As Physicians for Social Responsibility indicates: "we must prevent what we cannot cure."[30]

Extinction compromises human values. An additional consideration was emphasized by Jonathan Schell who stated that, with respect to those things that humanity finds valuable, "none of them have any meaning or application unless one first assumes the existence of … mankind."[31] There is little use for art, infrastructure, entertainment, sports, science, or cures for medical diseases if there is no one around to appreciate or benefit from those goods.

Extinction would harm every patient (past, present, and future). With respect to health, any instantaneous extinction event would cause everyone who exists at that moment to die. These deaths would be premature if this event could otherwise have been prevented; however, an instant extinction (eg, via vacuum decay of the universe) is incredibly unlikely both to occur when humans are around and to be prevented.[32] In the case of a more complex extinction event extended through time, which is more likely over the coming centuries and millennia, many premature deaths attributable to various proximate causes may occur. The amount of suffering caused may be greater than in non-extinction-causing catastrophes, a concept referred to as the *no ordinary catastrophe thesis*.[33]

If an extinction event (whether instantaneous or not) is foreseen, anticipation of it could cause great psychological despair,[34] regardless of whether extinction risk is merely perceived and not real, or, if real, in the near- or very long-term future. Regardless of how human extinction comes about, if and when it does occur, there will be no more

future generations after the fact. Although there would be no people around for whom this state of non-being would be harmful *per se*, anticipation of extinction could be bad for existing people for the duration of their remaining life prior to extinction, as it would call into question the meaning of human existence, which is an important contributor to mental health.[35]

In addition to negatively affecting current and future generations, it has been argued that extinction would disrespect our ancestors and lead them to die a "second death."[36,37] Altogether, then, human extinction affects not only current and future generations, but also, in some sense, past ones. To modify a phrase from the 20th century anti-nuclear activist, Günther Anders: human extinction threatens what we might call the League of Patients: every patient who has been, is, and ever could be.[37]

Focusing solely on treating individual patients might cause iatrogenic harm by increasing extinction risk. Consider 2 examples: medicine's facilitation of resource extraction that impedes development of a circular economy and of climate change through resource expenditure.[28] Modern health care, expenditure on which was 10% of global GDP in 2021,[38] requires immense natural resources (and for good reason). Mass manufacturing of drugs and equipment (such as magnetic resonance imaging, X-ray, computed tomography, and ultrasound machines, as well as pacemakers, defibrillators, wearables, prosthetic, surgical robots, and other devices) requires rare earth elements and other critical minerals that are vulnerable to supply chain disruptions, such that medical use of these resources is now being considered from cross-sector competitive, national security, geopolitical, and systemic risk perspectives.[39,40,41,42] A 2019 report also indicates that the health sector contributes 4.4% of global greenhouse gas emissions, an amount equivalent to that of the fifth largest emitter if it were a country.[43] The flip side of medicine's inadvertently increasing extinction risk is that its deliberate efforts to reduce this risk might help prevent iatrogenesis and serve as a model for reducing extinction risk arising from other social sectors.

Justifying Medicine's Role

The training of health professionals already provides transferable skills relevant to extinction prevention and harm-reduction: in-depth knowledge of pathophysiology, strong understanding of the basic sciences, communication skills, and teamwork, among others. Therapeutic approaches and future advancements in existing medical specialties, including emergency, disaster, reproductive, and space medicine, might help reduce suffering during a putative extinction event and extend the time during which humans can be born, experience life, and appreciate the world. Knowledge of other specialties, such as psychiatry or palliative care, might also have utility for clinicians if patients excessively ideate about extinction to their own or others' detriment or if extinction becomes inevitable. In addition, extinction medicine specialists would be able to help evaluate the credibility of extinction threats, which could help guide human behavior in the context of existential anxiety.

Establishing a new specialty could also help frame human extinction as a health care issue, which might increase public support and funding for human extinction prevention and harm reduction. More specifically, establishing extinction medicine could help make evolutionary definitions of health part of the norm. As Pamela Ayo Yetunde and her colleagues say, "no one can be healthy when the community is sick."[44] Evolutionary definitions of health extend this community to humanity: being healthy requires existing in a state that nurtures the survival of our species.[45] This "humanity perspective" can be

illustrated with a thought experiment. Imagine that every person was set to live more than a century with faultless well-being but that the cost of this utopian state was human extinction in 200 years, significantly earlier than if emphasis were placed on extinction postponement and not merely individual life extension and well-being. Would these people truly be healthy? On an evolutionary definition, the answer is clear. No, they would not be.

Need for an Extinction Medicine Specialty

While the above sections clarify the relevance of and justification for medicine's role in extinction prevention, an additional rationale must be provided for why a new *specialty* in particular is needed. In this regard, new scientific and ethical knowledge informing health promotion requires deep understanding that often sparks specialization. For example, lifestyle medicine was formalized following discoveries that sedentary behavior, changes in diet and caloric intake, and social isolation negatively affect health. Additional examples of specialization include infectious disease and public health, which were fostered by discoveries linking disease to microorganisms and social structures, respectively. Research over the past 170 years has led to a number of discoveries that suggest that humanity's extinction is possible, even inevitable (1-3, below), or that may actually unintentionally increase the probability that we will, in fact, go extinct (4-6, below), an understanding of which requires specialized knowledge.

1. Discoveries of radiometric dating, of asteroid impact craters, of volcanic super-eruptions, and of fossilized species now long gone make it clear that extinction has been a common occurrence on Earth.

2. Discoveries of solar evolution show that our biosphere will collapse in 840 million to 1.6 billion years from CO_2 deficits and excess heat, respectively, well before the 7.59-billion-year moment when our sun might engulf our planetary home.[46,47]

3. Discoveries of the universe suggest that, even if some semblance of humanity reaches the stars, our lifespan may have hard limits due to either universal spatial expansion that makes habitable planets inaccessible or other physical eschatological processes.[48,49]
4. Discoveries of combustion, crude oil, natural gas, and other physical processes enabled the climate crisis.

5. Discoveries of fission and fusion led to nuclear weapons and their testing, which have killed hundreds of thousands of people and continue to threaten billions today.[50,51]

6. Discoveries of genetic engineering, nanotechnology, and artificial intelligence can foster deadlier chemical and biological weapons, nano-weapons, and lethal autonomous weapons, potentially increasing extinction risk from global war.[52,53,54,55]

The intent here is not to outline a near-term, direct chain of events that would cause extinction, but rather to provide an overview of issues that, in addition to climate change, are often cited as being relevant to evaluations of extinction risk. The breadth and depth of knowledge that these subjects span suggests that no single existing

medical specialty provides the overall knowledge for making such assessments and, subsequently, intervening effectively.

A surgeon requires nearly a decade of training to be able to operate on patients, but, as of now, individuals working towards the explicit aim of protecting *all of humanity* from extinction require no training. This is unacceptable. Humanity needs specialists with knowledge vetted by experts who can dedicate themselves to extinction-related harm reduction and who can help other health professionals acquire basic skills in this domain without undue burden.

Competencies for Extinction Medicine

To benefit humanity, extinction medicine needs effective ways to translate knowledge into goal-directed action that would promote humanity's survival while minimizing social harm. The table below lists competencies key to extinction medicine practice.

Table. Preliminary Extinction Medicine Competencies

Knowledge	• Understand how sociocultural factors and processes in the human body and in terrestrial and cosmic ecosystems interact to alter human behavior, survival, and welfare. • Demonstrate mastery of global and extinction threats, their underlying mechanistic drivers, how they compromise health, and their historical management by health care. • Understand foundational concepts in the ethics of human extinction, health care ethics, and moral philosophy, including how they interact and translate into practice.
Disaster medicine	• Understand (and actively engage in) global and extinction risk analysis based on approaches used in risk science, health care, and existential risk studies, with recognition of their limitations. • Enable comprehensive emergency management of global and extinction threats via mitigation, preparedness, response, and recovery, including emphasis on the avoidance of iatrogenesis. • Be capable of effective interaction with individuals, communities, and organizations in different social sectors, global regions, and cultures during both crisis and stability.
Public health policy	• Design and evaluate the effectiveness of interventions to reduce global and extinction risks, focusing on both the near-term and long-term survival of humanity. • Understand the processes of developing, adopting, enforcing, and evaluating health policies aimed at global catastrophe and extinction prevention, including global treaties. • Understand (and actively engage in) evidence-based advocacy and risk communication on mitigating global and extinction risks, including human rights concerns.
Organized medicine	• Be active in extinction medicine professional societies to facilitate coordination, financing, and incentivization of action to address global and extinction threats. • Aid the development and maintenance of a robust institutional memory and educational resources for training extinction medicine specialists and non-specialists in other sectors.

Extinction Medicine

As a professional practice, extinction medicine's core mission is to identify and execute actions that help all of humanity overcome environmental and moral challenges of collective survival. The need for this specialty, and what some of its actions might be, has briefly been explored above. But who, exactly, should become an extinction medicine specialist?

All health professionals, especially physician leaders, need to receive training in extinction medicine to some degree. For many physicians, it should be their "second specialty," similar to disaster medicine.[56] Interprofessional education (eg, in moral philosophy, social services, law, business, science, and engineering) would aid the success of extinction medicine and help embed it in society like other clinical specialties are today.

Extinction medicine, of course, does not exist. That needs to change. We must work together to raise awareness of the need for and concept of extinction medicine, to nurture an interest group, and to develop educational materials. Forming a specialty society, a code of ethics, a fellowship program, and an academic journal are examples of other important next steps. Through this work, health professionals can help prevent, delay, and promote a peaceful transition to humanity's final sepulture: a universe without us—or even no universe at all.

References

1. Wyns A, Maiero M, Egorova A, Campbell-Lendrum D. *COP26 Special Report on Climate Change and Health: The Health Argument for Climate Action*. World Health Organization; 2021. Accessed April 28, 2025. https://iris.who.int/bitstream/handle/10665/346168/9789240036727-eng.pdf?sequence=1
2. Vohra K, Vodonos A, Schwartz J, Marais EA, Sulprizio MP, Mickley LJ. Global mortality from outdoor fine particle pollution generated by fossil fuel combustion: results from GEOS-Chem. *Environ Res*. 2021;195:110754.
3. Parncutt R. The human cost of anthropogenic global warming: semi-quantitative prediction and the 1,000-tonne rule. *Front Psychol.* 2019;10:2323.
4. Pearce JM, Parncutt R. Quantifying global greenhouse gas emissions in human deaths to guide energy policy. *Energies*. 2023;16(16):6074.
5. Tietjen B. Many of the world's poorest countries are the least polluting but the most climate-vulnerable. Here's what they want at COP27. *PBS News*. November 2, 2022. Accessed March 19, 2025. https://www.pbs.org/newshour/science/many-of-worlds-poorest-countries-are-the-least-polluting-but-the-most-climate-vulnerable-heres-what-they-want-at-cop27
6. Crisp N, Chen L. Global supply of health professionals. *N Engl J Med*. 2014;370(10):950-957.
7. LeRoux M, Peterson SB, Mougous JD. Bacterial danger sensing. *J Mol Biol*. 2015;427(23):3744-3753.
8. Zhou JM, Zhang Y. Plant immunity: danger perception and signaling. *Cell*. 2020;181(5):978-989.
9. Roelofs K. Freeze for action: neurobiological mechanisms in animal and human freezing. *Philos Trans R Soc Lond B Biol Sci*. 2017;372(1718):20160206.
10. Ord T. *The Precipice: Existential Risk and the Future of Humanity*. Hachette Books; 2020.

11. MacAskill W. *What We Owe the Future*. Basic Books; 2022.
12. Hallam R. *Common Sense for the 21st Century: Only Nonviolent Rebellion Can Now Stop Climate Breakdown and Social Collapse*. Chelsea Green Publishing; 2019.
13. Hales S, Kovats S, Lloyd S, Campbell-Lendrum D, eds. *Quantitative Risk Assessment of the Effects of Climate Change on Selected Causes of Death, 2030s and 2050s*. World Health Organization; 2014. Accessed February 3, 2025. https://iris.who.int/bitstream/handle/10665/134014/9789241507691_eng.pdf?sequence=1
14. Kemp L, Xu C, Depledge J, et al. Climate endgame: exploring catastrophic climate change scenarios. *Proc Natl Acad Sci U S A*. 2022;119(34):e2108146119.
15. Kemp L. Ecological breakdown and human extinction. In: Beard SJ, Rees MJ, Rios-Rojas C, Richards CE, eds. *The Era of Global Risk: An Introduction to Existential Risk Studies*. Open Book Publishers; 2024:147-172.
16. Abbasi K, Ali P, Barbour V, et al. Time to treat the climate and nature crisis as one indivisible global health emergency. *Indian J Med Res*. 2023;158(4):330-333.
17. CO2 emissions in 2023. International Energy Agency. March 2024. Accessed April 29, 2025. https://www.iea.org/reports/co2-emissions-in-2023
18. Ágoston C, Csaba B, Nagy B, et al. Identifying types of eco-anxiety, eco-guilt, eco-grief, and eco-coping in a climate-sensitive population: a qualitative study. *Int J Environ Res Public Health*. 2022;19(4):2461.
19. Menzies RE, Neimeyer RA, Menzies RG. Death anxiety, loss, and grief in the time of COVID-19. *Behav Change*. 2020;37(3):111-115.
20. Lifton RJ. Beyond nuclear numbing. *Teach Coll Rec*. 1982;84(1):15-29.
21. Slovic P, Zionts D, Woods AK, Goodman R, Jinks D. Psychic numbing and mass atrocity. In: Shafir E, ed. *The Behavioral Foundations of Public Policy*. Princeton University Press; 2013:126-142.
22. Horton R, Beaglehole R, Bonita R, Raeburn J, McKee M, Wall S. From public to planetary health: a manifesto. *Lancet*. 2014;383(9920):847.
23. Futerman G. Beyond simple existential risk: survival in a complex interconnected world. Effective Altruism Forum. November 21, 2022. Accessed September 24, 2024. https://forum.effectivealtruism.org/posts/cXH2sG3taM5hKbiva/beyond-simple-existential-risk-survival-in-a-complex
24. Sepasspour R. A new "all-hazards" approach for reducing multiple catastrophic threats. *Bulletin of the Atomic Scientists*. November 24, 2023. Accessed February 3, 2025. https://thebulletin.org/2023/11/a-new-all-hazards-approach-for-reducing-multiple-catastrophic-threats/
25. Undheim TA. An interdisciplinary review of systemic risk factors leading up to existential risks. *Prog Disaster Sci*. 2024;22:100326.
26. Arnscheidt CW, Beard SJ, Hobson T, et al. Systemic contributions to global catastrophic risk. SocArXiv. July 8, 2024. Updated July 16, 2024. Accessed February 3, 2025. https://osf.io/preprints/socarxiv/wcj9e_v1
27. Sundaram L, Maas MM, Beard SJ. Seven questions for existential risk studies. SSRN. June 7, 2022. Accessed March 20, 2025. https://papers.ssrn.com/sol3/papers.cfm?abstract_id=4118618
28. Kellis DM, Torres ÉP. Extinction medicine: the case for a new medical specialty. SSRN. March 25, 2025. Accessed June 11, 2025. https://papers.ssrn.com/sol3/papers.cfm?abstract_id=5109482

29. Bostrom N. Existential risk prevention as global priority. *Glob Policy*. 2013;4(1):15-31.
30. Physicians for Social Responsibility. Accessed January 30, 2024. https://psr.org/
31. Schell J. *The Fate of the Earth*. Knopf; 1982.
32. von Hippel M. Vacuum of space to decay sooner than expected (but still not soon). *Quanta Magazine*. July 22, 2024. Accessed March 20, 2025. https://www.quantamagazine.org/vacuum-of-space-to-decay-sooner-than-expected-but-still-not-soon-20240722
33. Torres ÉP. *Human Extinction: A History of the Science and Ethics of Annihilation*. Routledge/Taylor & Francis Group; 2023.
34. Finneron-Burns E. What's wrong with human extinction? *Can J Philos*. 2017;47(2-3):327-343.
35. Scheffler S. *Why Worry About Future Generations?* Oxford University Press; 2018.
36. Kaczmarek P, Beard S. Human extinction and our obligations to the past. *Utilitas*. 2020;32(2):199-208.
37. Anders G. Theses for the atomic age. *Mass Rev*. 1962;3(3):493-505.
38. Current health expenditure (% of GDP). World Bank Group. Accessed March 19, 2025. https://data.worldbank.org/indicator/SH.XPD.CHEX.GD.ZS
39. Minerals in the medical supply chain. National Mining Association. Accessed March 19, 2025. https://nma.org/minerals-in-the-medical-supply-chain/
40. Health-ISAC. The global risks of systemic reliance on critical mineral imports. Health-ISAC; 2024. Accessed March 19, 2025. https://www.aha.org/system/files/media/file/2024/10/tlp-white-the-global-risks-of-systemic-reliance-on-critical-mineral-imports-hisac-report-10-2024.pdf
41. H Rept 118-710: Recognizing the Importance of Critical Minerals in Healthcare Act of 2023, HR 6395, 118th Cong, 2d Sess (2023-2024). Accessed March 19, 2025. https://www.congress.gov/congressional-report/118th-congress/house-report/710/1
42. Idso I. Resource depletion risk for medical equipment: embracing the circular economy. *Biomed Instrum Technol*. 2022;56(1):12-18.
43. Karliner J, Slotterback S, Boyd R, Ashby B, Steele K. Health care's climate footprint: how the health sector contributes to the global climate crisis and opportunities for action. Health Care Without Harm; ARUP; 2019. Accessed January 30, 2025. https://global.noharm.org/sites/default/files/documents-files/5961/HealthCaresClimateFootprint_092319.pdf
44. Yetunde PA, Harilall R, Mpotulo N, Robinson-Morris DW, Dibia YO. Ubuntu: I am because we are. Lion's Roar. Accessed September 30, 2024. https://www.lionsroar.com/ubuntu-i-am-because-we-are/
45. Broadbent A. *Philosophy of Medicine*. Oxford University Press; 2019.
46. Mello FS, Friaça ACS. The end of life on Earth is not the end of the world: converging to an estimate of life span of the biosphere? *Int J Astrobiol*. 2020;19(1):25-42.
47. Schröder KP, Smith RC. Distant future of the sun and Earth revisited. *Mon Not R Astron Soc*. 2008;386(1):155-163.
48. Mack K. *The End of Everything (Astrophysically Speaking)*. Scribner; 2021.
49. Ord T. The edges of our universe. ArXiv. April 2, 2021. Updated May 5, 2021. Accessed March 20, 2205. https://arxiv.org/abs/2104.01191

50. Tomonaga M. The atomic bombings of Hiroshima and Nagasaki: a summary of the human consequences, 1945-2018, and lessons for *Homo sapiens* to end the nuclear weapon age. *J Peace Nucl Disarm*. 2019;2(2):491-517.
51. Xia L, Robock A, Scherrer K, et al. Global food insecurity and famine from reduced crop, marine fishery and livestock production due to climate disruption from nuclear war soot injection. *Nat Food*. 2022;3(8):586-596.
52. Federspiel F, Mitchell R, Asokan A, Umana C, McCoy D. Threats by artificial intelligence to human health and human existence. *BMJ Glob Health*. 2023;8(5):e010435.
53. Urbina F, Lentzos F, Invernizzi C, Ekins S. Dual use of artificial-intelligence-powered drug discovery. *Nat Mach Intell*. 2022;4(3):189-191.
54. Sandbrink JB. Artificial intelligence and biological misuse: differentiating risks of language models and biological design tools. ArXiv. July 24, 2023. Updated December 23, 2023. Accessed February 3, 2025. https://arxiv.org/abs/2306.13952
55. Ali A, Fareed Z, Nadeem SM, et al. Nanotechnologies: AI weapons governing the military battle field. *Found Univ J Eng Appl Sci*. 2022;3(1):21-33.
56. What is the ABODM? American Board of Disaster Medicine. Accessed September 30, 2024. https://www.abpsus.org/american-board-of-disaster-medicine/

Devin M. Kellis, MS is a medical student at the University of South Carolina School of Medicine Columbia, where he received an MS in biomedical science. He holds a BS in biology and a BS in psychology from Francis Marion University. His current research aims are to understand drivers of human-caused existential threats and to develop a medical specialty that promotes humanity's survival under conditions of minimal social harm (behavioral eschatology and extinction medicine, respectively).

Editor's Note

The case to which this commentary is a response was developed by the editorial staff.

Citation

AMA J Ethics. 2025;27(8):E571-581.

DOI

10.1001/amajethics.2025.571.

Conflict of Interest Disclosure

Contributor disclosed no conflicts of interest relevant to the content.

The people and events in this case are fictional. Resemblance to real events or to names of people, living or dead, is entirely coincidental. The viewpoints expressed in this article are those of the author(s) and do not necessarily reflect the views and policies of the AMA.

ISSN 2376-6980

AMA Journal of Ethics®
August 2025, Volume 27, Number 8: E582-587

HEALTH LAW: PEER-REVIEWED ARTICLE

Is There a Right to Protection Against Environmental Existential Threats?

Amber R. Comer, PhD, JD

Abstract

Despite broad awareness of impending existential threats to humanity, protections from these threats are not yet widely recognized as human rights. This article distinguishes human rights from legal rights, considers possible domestic and international legal approaches to rights-based protection from environmental existential threats, and offers recommendations about how to motivate such protections.

A Rights-Based Approach?

It is well established in the scientific literature that humanity is facing mounting environmental existential threats including, but not limited to, climate change, natural disasters,[1] bioterrorism,[2] and pandemics.[3] This article explores which ethical and legal rights currently exist for present and future generations to use to protect against such threats. This article also considers limitations of rights-based approaches and recommends how to motivate protections against mounting environmental existential threats.

Human Rights vs Legal Rights

The term *right* is colloquially and broadly used, so some might believe they have a plethora of "rights" (eg, right to heath care, right to free speech, right to a clean environment, and right to education).[4,5] Although there is variation in the literature as to what is considered a right, and there is general consensus in philosophy and law that human rights and legal rights exist, some key distinctions will be offered to clarify the nature and scope of human rights and legal rights.

Human rights refer to entitlements that all humans have on the basis of being born human.[6] Derived from various origins, including natural and moral law, human rights apply to all persons regardless of their status, and denial of or encroachment on these rights by society or government is deemed unethical.[6] Although human rights are ethically and morally encouraged, they are not enforceable in and of themselves. In order to ensure protection of human rights, governments must adopt and enforce human rights through the power of the law.[6]

Once a human right is protected by the law, it becomes a legal right with tangible protection and consequences for violation.[6] Within the law, there are various levels of

legal rights, with fundamental rights affording the greatest governmental protection. This article focuses on the development and evolution of a human right to a healthy environment as a fundamental legal right because these 2 types of rights showcase the difference between an ethical duty and a legal obligation and provide a tangible framework for establishing and protecting an ethical and legal right to environmental protection enforceable under the law.

Protection From Environmental Existential Threats

A right to protection from environmental existential threats as a human right is a relatively modern view that gained global traction in 1972 when the United Nations (UN) adopted the Stockholm Declaration on the Human Environment, which asserts that there is a "fundamental right to freedom, equality and adequate conditions of life, in an environment of a quality that permits a life of dignity and well-being."[7,8] Building on the momentum of the Stockholm Declaration, countries around the world ratified their national constitutions to provide legal protections for the human right to a healthy environment.[7] By 2022, 156 of the 193 UN member states recognized a legal right to a healthy environment in their constitutions, legislation, or treaties.[7,9]

In July 2022, the UN General Assembly specifically declared that the right to "a clean, healthy, and sustainable environment is a human right."[7] However, this declaration was again made in a nonbinding resolution on the UN member states, meaning that the right to a healthy environment is still not recognized as an official human right by the UN, and the UN member states are not required to follow or act on this declaration.[10]

Although many nations consider the right to a clean environment to be a human right and provide legal protections in attempts to uphold this right,[11] there is not a universally agreed-upon definition of what a human right to a clean environment encompasses. However, there are generally agreed-upon substantive elements that form the basis of this right, including the rights to a safe environment, clean air, healthy and biodiverse ecosystems, safe and sufficient water, healthy and sustainable food, and a nontoxic environment.[7] To protect the environment, people must be able to realize other human rights: access to information, public participation, and access to justice.[7]

As mentioned, the United States is among the minority of UN member nations that fails to recognize a human or legal right to a healthy environment,[7,9] but there is ongoing federal interest in and concern for environmental existential effects. For example, the United States ratified the UN Framework Convention on Climate Change (UNFCCC) in 1992.[12] Additionally, leaders within the US federal government have acknowledged the impending existential threat of climate change, with the White House stating President Obama's belief "that no challenge poses a greater threat to our children, our planet, and future generations than climate change—and that no other country on Earth is better equipped to lead the world towards a solution."[13] In April 2021, the US Department of Defense secretary declared climate change an existential threat and called for action to protect the environment.[14] In September 2024, in an address to the UN, the US presidential administration pledged billions of dollars to environmental protections to tackle sea-level rise from melting glaciers.[15] However, orders and policies implemented in early 2025 have begun to walk back some of these environmental protections.[16]

Although there is not a federally recognized human or legal right to a healthy environment within the United States, currently 3 states—Pennsylvania, New York, and Montana—have adopted "Green Amendments" in their state constitution's bill of rights,

which provide citizens with the inalienable right to clean air, water, and a healthy environment.[17,18] For example, in 1972, Montana amended its state constitution to provide protection for maintaining a clean and healthful environment for all Montanans,[19] and this right has been recognized as a fundamental right by the Montana Supreme Court, affording it the highest legal protection. Of the 3 states that have taken the initiative to establish this constitutional right through Green Amendments, only Montana has successfully utilized its constitutional provision to try to motivate legal protection for the environment. In 2020, 16 Montana youths filed a lawsuit (*Held v Montana*[20]) alleging that the state of Montana's support of the fossil fuel industry was violating the state constitutional provision "to maintain and improve a clean and healthful environment in Montana for present and future generations."[21] The state regulators accused of the constitutional violation defended themselves by asserting that the state's repeal of a statute that the plaintiffs alleged was unconstitutional mooted the plaintiffs' claim,[20] thus making the youths' claim a political grievance and not one that could be addressed by the courts. In the end, the trial court found in favor of the Montana youths, marking the first case in US history to use state constitutional law to uphold the human right to a clean and healthful environment.[22]

Held v Montana opens the door to establishing a fundamental right to protection against existential threats, such as environmental harm, for current and future generations in the United States; however, there are still several factors contributing to courts' failure to address the environmental existential threat. Importantly, while *Held v Montana* was the first successful climate change lawsuit premised on a constitutional right, it was not the first climate change legal case.[23] Other climate-change related lawsuits have failed because the individual state did not provide adequate protections under the law or because there is a need to establish causation, for example.[24] Another legal factor contributing to the existential threat of environmental harm is that future unborn persons do not have legal rights and, according to some, they also have no moral rights,[25,26] placing future generations at risk for experiencing negative consequences from environmental impact created today through transgenerational effects. The lack of established legal and moral rights thus leaves future generations vulnerable and unprotected from the environmental harm caused by the current generation and prior generations.

Motivating Protections

Despite a majority of UN member states recognizing a right to a healthy environment, the United States has failed to recognize a human right to a healthy environment and has failed to establish federal environmental protections in the US Constitution. As climate change is an existential threat to the continued survival of humanity, there is an ethical imperative to establish a fundamental federal human and legal right to a healthy and clean environment and to enforce regulatory protections of this right. In order to ensure the utmost protection of the environment, a federal Green Amendment is essential. Additionally, individual states are following—and should follow—Montana's lead by declaring a state constitutional right to environmental protection.[27] Individual state action can have 2 effects: first, it provides protection for residents within the state and, second, it might provide support for asserting a federal fundamental right to such protections through an amendment to the US Constitution.

With regard to future generations, while they do not technically have legal rights, an attempt should be made to leverage the rights of currently living individuals to protect future generations. Protecting future generations is imperative, as there is a vast body of

literature showing that exposure to environmental toxins induces epigenetic transgenerational inheritance of disease.[28,29,30] A well-known example is the transgenerational effects of maternal tobacco use on offspring.[31] There is mounting evidence that environmental exposures of pregnant persons have transgenerational effects, and these known effects can cause pregnant persons psychological harm.[32] A person pregnant with a biologically female fetus could use the arguments of psychological distress (such as used in *Held v Montana*) to assert a transgenerational claim for environmental protection because that pregnant person is not only carrying their child, but carrying the genetic material for their grandchildren in the form of the eggs within the female fetus.

Conclusion

While most of the world has acknowledged that an impending environmental existential threat to humanity exists, protections from this threat are not yet officially recognized as a human right, and the human right to a clean environment has not yet been enshrined as a fundamental legal right for all Americans. Failure to recognize a right to a clean environment as a human or legal right deprives all living persons of adequate protections against impending threats from environmental degradation. This consequence is especially important, given the potential for negative future transgenerational effects. It is time for the United States to join the majority of other UN member nations and fight for a federal Green Amendment to motivate protection against environmental existential threats.

References

1. Shivanna KR. Climate change and its impact on biodiversity and human welfare. *Proc Indian Natl Sci Acad*. 2022;88(2):160-171.
2. Casadevall A. The future of biological warfare. *Microb Biotechnol*. 2012;5(5):584-587.
3. Santos JM. Countries are neglecting the existential threat of pandemics. Bold leadership is necessary. *Bulletin of the Atomic Scientists*. January 30, 2025. Accessed March 19, 2025. https://thebulletin.org/2025/01/countries-are-neglecting-the-existential-threat-of-pandemics-bold-leadership-is-necessary/
4. Haule RR. Some reflections on the foundation of human rights—are human rights an alternative to moral values? In: von Bogdandy A, Wolfrum R, eds. *Max Planck Yearbook of United Nations Law*. Vol 10. Koninklijke Brill; 2006:367-395.
5. Wenar L. The nature of rights. *Philos Public Aff*. 2005;33(3):223-252.
6. Human rights. United Nations. Accessed September 30, 2024. https://www.un.org/en/global-issues/human-rights
7. Office of the High Commissioner for Human Rights; United Nations Environment Programme; United Nations Development Programme. What is the right to a healthy environment? Office of the High Commissioner for Human Rights; United Nations Environment Programme; United Nations Development Programme; 2023. Accessed February 10, 2025. https://www.undp.org/sites/g/files/zskgke326/files/2023-01/UNDP-UNEP-UNHCHR-What-is-the-Right-to-a-Healthy-Environment.pdf
8. United Nations. *Report of the United Nations Conference on the Human Environment, Stockholm, 5-16 June 1972*. United Nations; 1973. Accessed February 10, 2025. https://digitallibrary.un.org/nanna/record/523249/files/A_CONF.48_14_Rev.1-EN.pdf?withWatermark=0&withMetadata=0&registerDownload=1&version=1

9. Joint statement by UN human rights experts for World Environment Day. United Nations. June 4, 2021. Accessed April 25, 2025. https://www.ohchr.org/en/statements-and-speeches/2021/06/joint-statement-un-human-rights-experts-world-environment-day#_ftn2
10. In historic move, UN declares healthy environment a human right. United Nations Environment Programme. July 28, 2022. Accessed September 30, 2024. https://www.unep.org/news-and-stories/story/historic-move-un-declares-healthy-environment-human-right
11. Knox JH. Human rights. In Rajamani L, Peel J, eds. *The Oxford Handbook of International Environmental Law.* 2nd ed. Oxford University Press; 2021:chap 45.
12. Status of ratification of the convention. United Nations Framework Convention on Climate Change. Accessed September 30, 2024. https://unfccc.int/process-and-meetings/the-convention/status-of-ratification-of-the-convention
13. A historic commitment to protecting the environment and addressing the impacts of climate change. Obama White House Archives. Accessed September 30, 2024. https://obamawhitehouse.archives.gov/the-record/climate
14. Vergun D. Defense secretary calls climate change an existential threat. US Department of Defense. April 22, 2021. Accessed February 10, 2025. https://www.defense.gov/news/news-stories/article/article/2582051/defense-secretary-calls-climate-change-an-existential-threat/
15. Blinken AJ. Secretary Antony J. Blinken at a high-level meeting on addressing the existential threats posed by sea-level rise. News release. US Department of State; September 25, 2024. Accessed February 10, 2025. https://2021-2025.state.gov/secretary-antony-j-blinken-at-a-high-level-meeting-on-addressing-the-existential-threats-posed-by-sea-level-rise/
16. Bush E. EPA administrator announces huge rollback of environmental regulations. *NBC News.* March 12, 2025. Accessed April 25, 2025. https://www.nbcnews.com/science/environment/epa-rollback-environmental-regulations-zeldin-rcna196112
17. Green amendments in 2023: states continue efforts to make a healthy environment a legal right. National Caucus of Environmental Legislators. March 27, 2023. Accessed September 30, 2024. https://www.ncelenviro.org/articles/green-amendments-in-2023-states-continue-efforts-to-make-a-healthy-environment-a-legal-right/
18. Green amendment. National Caucus of Environmental Legislators. Accessed September 30, 2024. https://www.ncelenviro.org/issue/green-amendment/
19. Eggert A. How the Montana Constitution shapes the state's environmental landscape. *Montana Free Press.* March 24, 2022. Accessed March 19, 2025. https://montanafreepress.org/2022/03/24/montana-constitution-environment-stream-access/
20. *Held v State of Montana*, No. CDV-2020-307 (Mont 1st Dist Ct 2023).
21. Montana Judicial Branch. The Constitution of the State of Montana. Montana Judicial Branch; 1972. Accessed February 10, 2025. https://courts.mt.gov/External/library/docs/72constit.pdf
22. *Held v State*: Montana court holds that Montana youth can access equitable relief from climate impacts. *Harv Law Rev*. 2024;137(5):1491-1498.
23. Setzer J, Higham C. Global trends in climate change litigation: 2021 snapshot. Grantham Research Institute on Climate Change and the Environment; Centre for Climate Change Economics and Policy; 2021. Accessed February 10, 2025.

https://www.lse.ac.uk/granthaminstitute/wp-content/uploads/2021/07/Global-trends-in-climate-change-litigation_2021-snapshot.pdf
24. McCormick S, Glicksman RL, Simmens SJ, Paddock L, Kim D, Whited B. Strategies in and outcomes of climate change litigation in the United States. *Nature Climate Change.* 2018;8:829-833.
25. Türk V; Office of the High Commissioner for Human Rights. We must reclaim human rights as problem-solving tools—High Commissioner. United Nations. August 7, 2024. Accessed September 30, 2024. https://www.ohchr.org/en/statements-and-speeches/2024/08/we-must-reclaim-human-rights-problem-solving-tools-high-commissioner
26. Weiss EB. Our rights and obligations to future generations for the environment. *Am J Int Law*. 1990;84(1):198-207.
27. Brown D. Montana's climate change lawsuit may see sequels across America. *State Court Report*. July 9, 2024. Accessed September 30, 2024. https://statecourtreport.org/our-work/analysis-opinion/montanas-climate-change-lawsuit-may-see-sequels-across-america
28. Skinner MK. Environmental stress and epigenetic transgenerational inheritance. *BMC Med*. 2014;12:153.
29. Benincasa G, Napoli C, DeMeo DL. Transgenerational epigenetic inheritance of cardiovascular diseases: a network medicine perspective. *Matern Child Health J*. 2024;28(4):617-630.
30. Moelling K. Epigenetics and transgenerational inheritance. *J Physiol*. 2024;602(11):2537-2545.
31. Zakarya R, Adcock I, Oliver BG. Epigenetic impacts of maternal tobacco and e-vapour exposure on the offspring lung. *Clin Epigenetics*. 2019;11(1):32.
32. Nilsson EE, Sadler-Riggleman I, Skinner MK. Environmentally induced epigenetic transgenerational inheritance of disease. *Environ Epigenet*. 2018;4(2):dvy016.

Amber R. Comer, PhD, JD is the director of ethics policy and the secretary of the Council on Ethical and Judicial Affairs at the American Medical Association in Chicago, Illinois. She is also an associate professor of health sciences and medicine at Indiana University. Dr Comer is an expert in medical decision making for patients with critical illness.

Citation
AMA J Ethics. 2025;27(8):E582-587.

DOI
10.1001/amajethics.2025.582.

Conflict of Interest Disclosure
Contributor disclosed no conflicts of interest relevant to the content.

The viewpoints expressed in this article are those of the author(s) and do not necessarily reflect the views and policies of the AMA.

ISSN 2376-6980

AMA Journal of Ethics®
August 2025, Volume 27, Number 8: E588-592

MEDICINE AND SOCIETY: PEER-REVIEWED ARTICLE

Medicine, Futures, and the Prevention of Human Extinction

Bruce E. Tonn, PhD and Christopher R. Tonn, MD

Abstract

This article draws a parallel between ethical reasons why people alive today have obligations to members of future generations and ethical reasons why physicians have obligations, besides helping improve patients' quality of life, to help some patients confront their own deaths and human extinction. This article argues for the view that many clinicians tend to express—daily, and one patient at a time—ethical values that support human extinction prevention as a project of medicine.

The American Medical Association designates this journal-based CME activity for a maximum of 1 AMA PRA Category 1 Credit™ *available through the* AMA Ed Hub™. *Physicians should claim only the credit commensurate with the extent of their participation in the activity.*

Extinction as Harm

Despite humanity's extraordinary achievements in science, technology, and medicine, it can be argued that a plethora of unintended consequences of progress have increased the probability of human extinction. The list of existential risks is long and includes nuclear war, climate change, pandemics, and biological terrorism. In addition, lesser risks, when chained together, can compound worries about human extinction.[1] Futurists and many others from a plethora of disciplines and backgrounds believe that the risk of human extinction is substantial.[2,3,4]

The fields of medicine and futures studies—the holistic analysis of trends to understand continuity and change—can be seen as sharing an interest in preventing human extinction. Physicians take an oath to do no harm. They work to save and improve the quality of their patients' lives, regardless of their patients' demographic identities. Futurists anticipate threats to the well-being of members of future generations, regardless of those people's station in life. They are concerned with the harms that current generations may be imposing on future generations, with the ultimate harm being the extinction of humanity. Physicians showing concern for each individual life is one way to increase humanity's concern for the well-being of future individuals and future generations. Physicians' day-to-day care of individual patients thus can help humanity address the real but seemingly abstract threats to humanity's existence.

The rest of this article explores relationships between the practice and philosophy of medicine, futurism, and the prevention of human extinction. We first argue that futurists addressing the death of humanity with policy makers and the public can learn from the medical community's do-no-harm and beneficence principles. We then explore practical recommendations to help both medical and futures communities address human extinction, including what futurists addressing the death of humanity with policy makers and the public can learn from how the medical community helps individuals face death. Finally, we speculate on how the medical and futures communities could collaborate to help humanity deal with the existential threat of long-term, less-than-replacement levels of fertility.

One Patient at a Time

Nonmaleficence. An equivalent of do no harm in futures studies is encouraging current generations to meet their obligations to future generations. In addition to an obligation to prevent human extinction, other obligations include bequeathing sustainable societies and systems of production, protecting the essential nature of what it means to be human, and maintaining options for future generations to explore their own paths through time and space.[5]

However, it has been quite difficult to motivate humanity writ large to seriously consider obligations to future generations in general and threats to human extinction in particular, just as Western medicine still exhibits trouble facing the end of life for an individual.[6] One substantial barrier is that imagining futures beyond a few years strains human imagination because it is too abstract. Another barrier is that it can create anxieties. Certainly, many become anxious when asked to contemplate their own deaths, much less the death of humanity. Addressing these obligations might also create a worry that the current generation would need to sacrifice income and quality of life for unknowable future individuals at unimaginable points of time. There is thus a need to make obligations to future generations and the risk of human extinction more understandable and concrete.

It can be argued in some cases that doing no harm, one patient at a time, is a strong metaphor for futures concerns that can make them more concrete. Clinicians demonstrate in real time, one patient at a time, what it means to protect life in a way that is both concrete and consistent with the tenet of obligations to future generations. Discussions about concessions (ie, sacrifices) that individuals may need to make to maintain their health and quality of life as they age could also prove to be a strong metaphor for sacrifices that current generations may need to make to meet obligations to future generations as humanity "ages."

Beneficence. Providing care is good and rational. Few would choose to live in a society where they were not provided with care. And helping individuals live full lives is integral to ensuring humanity's full journey through time and space.

In sum, the bottom-up clinicians' approach is sorely needed in tandem with the top-down futures approach to address human extinction because so many aspects of society devalue individual lives and ignore obligations to future generations (eg, wars, climate change denial, gun violence, lack of consumer protections, lack of support for the poor and for human rights). Saving and improving lives through modern medicine contributes to humanity's journey and, perhaps, to the durability of future generations.

Practical Recommendations

There are things that the medical and futures communities can do to address the issue of human extinction.

Educational changes. It is worth exploring whether space could be made in medical school ethics courses to address this issue. Groups affiliated with the medical community, such as Physicians for Social Responsibility, could also advocate for educational reform. Conversely, applied futures degree programs and professional training and certification programs could use the "do no harm, one patient at a time" metaphor to help futurists communicate about meeting obligations to future generations. Groups affiliated with the futures community, such as the Association of Professional Futurists, could help advocate for such a change.

Communication changes. It is recommended that both physicians and futurists consider framing communications about human extinction in terms of *descendants*. This recommendation is drawn from the seminal work of John Rawls, who argued that a just society must concern itself with benefits and opportunities afforded to at least the ensuing 2 generations.[7] For example, the physicians' charge to do no harm, one patient at a time, can be extended to encompass patients' children, grandchildren, and further descendants, as a healthy current generation is necessary for humanity to survive into the long-term. Perhaps physicians can respectfully work these ideas into their conversations with their patients at appropriate times in appropriate settings. Conversely, futurists should consider anchoring communications with policy makers and the public around children, grandchildren, and descendants when they are working to help humanity anticipate risks of human extinction. We acknowledge that a great deal of additional thought is needed for physicians and futurists to operationalize these recommendations.

Citizens in our society by and large do not spend enough time thinking about either their own death or the deaths of family members, much less the longevity of humanity. Yet we suggest that everyone owes it to themselves and their families to ponder what death really means and to seek guidance, perhaps from medicine, about how the process may be experienced. Prompting thought and discussion on individuals' longevity and prospective deaths may help ease the resistance that our society seems to have with making concessions to meet obligations to future generations and reduce the probability of human extinction. Talking more about protecting current generations and their descendants through effective and empathetic health care may help lessen the distance people feel when talking about prospective humans.

Collaborate to Address an Extinction Risk

One extinction risk that has been identified by futurists relates to the worldwide decline in fertility rates. Populations of many countries across the globe have fertility rates that are below the United Nations-defined replacement level of 2.1.[8] For example, Japan's is 1.4 and South Korea's is 1.1, the world's second lowest.[9] The global fertility rate in 2021 was 2.3, according to the United Nations,[10] and the Population Reference Bureau's current estimate of the global fertility rate in 2024 sits at 2.2.[11] If the global fertility rate drops below 2.1 and never rebounds, human extinction will surely follow.[12] In the words of philosopher Nick Bostrom, humanity will cease to exist in "a whimper."[3]

Futurists have anticipated many major societal impacts of declining fertility rates that fall well short of human extinction. An aging population might be forced to work longer,

as younger generations are not sizable enough to replace them in the workforce. Economic, governmental, and social support might thin without the necessary tax revenue contributed by younger generations. Health care costs associated with aging might strain the already resource-limited medical industry.[13] Socially and politically, liberalism and creativity might be overshadowed by the views of older generations, who historically have been more conservative and more risk averse.

How to explain the declining birth rate? Some of childbearing age, regardless of fertility, decide they don't want children for any number of reasons. Regarding fertility specifically, however, there are many reasons why fertility rates are dropping.[14,15] Infertility is related to age, exposure to toxic and endocrine-disrupting chemicals in the environment, and other variables. Some infertility can be addressed by medicine (eg, egg freezing, in vitro fertilization), and futurists, for example, could alert policy makers and clinicians about mid- to long-term consequences of global fertility decline. In turn, some physicians might feel comfortable communicating to, say, patients of childbearing age who want to bear children their own commitment to the well-being of such patients and their descendants.

Summary

Doing no harm is a transcendent ideal for medical and futures communities. Death and the risk of human extinction are 2 very important topics that affect all of us, as well as future generations. While we cannot force people to engage in this discourse, perhaps highlighting its importance and urgency earlier in people's lives might allow them to better prepare for their own deaths and even provoke them to support or contribute to the longevity of humanity.

References

1. Tonn BE, MacGregor D. A singular chain of events. *Futures*. 2009;41(10):706-714.
2. Rees MJ. *Our Final Hour: A Scientist's Warning: How Terror, Error, and Environmental Disaster Threaten Humankind's Future in this Century—on Earth and Beyond*. Basic Books; 2004.
3. Bostrom N. Existential risks: analyzing human extinction scenarios and related hazards. *J Evol Technol*. 2002;9(1):1-30.
4. Stern N. *The Economics of Climate Change: The Stern Review*. Cambridge University Press; 2007.
5. Tonn BE. *Anticipation, Sustainability, Futures and Human Extinction: Ensuring Humanity's Journey Into the Distant Future*. Routledge; 2021.
6. Chapple HS. *No Place for Dying: Hospitals and the Ideology of Rescue*. Routledge; 2019.
7. Rawls J. *A Theory of Justice*. Rev ed. Harvard University Press; 1999.
8. Department of Economic and Social Affairs, Population Division. *World Population Prospects: The 2006 Revision, Volume 1: Comprehensive Tables*. United Nations; 2007. Accessed January 22, 2025. https://www.un.org/development/desa/pd/sites/www.un.org.development.desa.pd/files/files/documents/2020/Jan/un_2006_world_population_prospects-2006_revision_volume-i.pdf
9. O'Neill A. The 20 countries with the lowest fertility rates in 2024. Statista. April 16, 2025. Accessed April 29, 2025. https://www.statista.com/statistics/268083/countries-with-the-lowest-fertility-rates/

10. Department of Economic and Social Affairs, Population Division. World population prospects 2022: summary of results. United Nations; 2022. Accessed January 22, 2025. https://www.un.org/development/desa/pd/sites/www.un.org.development.desa.pd/files/wpp2022_summary_of_results.pdf
11. Highlights from the 2024 World Population Data Sheet. Population Reference Bureau. September 16, 2024. Accessed March 10, 2025. https://www.prb.org/articles/highlights-from-the-2024-world-population-data-sheet/
12. Bainbridge WS. Demographic collapse. *Futures*. 2009;41(10):738-745.
13. Jones CH, Dolsten M. Healthcare on the brink: navigating the challenges of an aging society in the United States. *NPJ Aging*. 2024;10(1):25.
14. Kearney MS, Levine PB, Pardue L. The puzzle of falling US birth rates since the great recession. *J Econ Perspect*. 2022;36(1):151-176.
15. Götmark F, Andersson M. Human fertility in relation to education, economy, religion, contraception, and family planning programs. *BMC Public Health*. 2020;20(1):265.

Bruce E. Tonn, PhD is president of Three^3 Inc, a scientific and educational nonprofit located in Knoxville, Tennessee. Dr Tonn is an internationally known academic futurist and has published extensively on the topics of obligations to future generations and human extinction. He holds degrees from Stanford, Harvard, and Northwestern universities.

Christopher R. Tonn, MD is an otolaryngologist in the US Air Force who is currently assigned to the Landstuhl Regional Medical Center in Landstuhl, Germany. Dr Tonn earned his medical degree from Boston University and completed his residency at Brooke Army Medical Center in San Antonio, Texas.

Citation
AMA J Ethics. 2025;27(8):E588-592.

DOI
10.1001/amajethics.2025.588.

Conflict of Interest Disclosure
Contributors disclosed no conflicts of interest relevant to the content.

ISSN 2376-6980

AMA Journal of Ethics®
August 2025, Volume 27, Number 8: E593-600

MEDICINE AND SOCIETY: PEER-REVIEWED ARTICLE

Why Should Clinicians Care About Infectious Disease Existential Hazards?

Robert T. Ball Jr, MD, MPH

Abstract

Of all infectious disease events, pandemics could result in significant human depopulation in this Anthropocene epoch or even in the next few centuries. Existential factors that exacerbate pandemic risk include global warming, overpopulation, habitat loss, permafrost thawing, geopolitical conflict, and bioterrorism from naturally occurring or engineered pathogens. This article argues that clinicians have ethical duties to strengthen global public health systems and research on pandemic risk factors, promote proven prevention strategies (especially vaccines), and incentivize domestic and international partnerships that build capacity to respond to existential pandemic harms.

The American Medical Association designates this journal-based CME activity for a maximum of 1 AMA PRA Category 1 Credit™ *available through the* AMA Ed Hub™. *Physicians should claim only the credit commensurate with the extent of their participation in the activity.*

Scientific literacy is an intellectual vaccine against the … charlatans who would exploit ignorance.
Neil deGrasse Tyson[1]

Pandemics and Existential Risks

History documents the stunning mortality and morbidity from pandemics, and we currently face a host of new microbial pathogens, some potentially pandemic. These might arise from spillover from other mammalian species,[2] irreversible permafrost thawing that releases ancient or virulent microorganisms,[3] or the emergence of yet-unknown undersea or exobiological microbes. Novel pathogens, especially viruses, might be unrecognizable by current diagnostic testing. We will therefore need to develop new technologies, as was the case with previously unknown human retroviruses, notably HIV. Providing adequate public health resources, even for known microbial species, might be difficult at best, as was the case with development of timely Ebola vaccines and diagnostics.[4,5,6]

Of all infectious disease events, pandemics could result in significant human depopulation in this Anthropocene epoch or even in the next few centuries. *Depopulation* refers to a substantial reduction in the population of a species in a given

area, usually from multiple factors, especially wars, genocide, famine, or disease. Pandemics in recorded history have exacted dramatic morbidity and mortality but have seldom resulted in mass depopulation. Existential factors that exacerbate pandemic risk include global warming (primarily from rising atmospheric CO_2 and methane levels), rising sea levels with massive flooding of coastal communities, habitat destruction, famine,[7] pollution from multisource microplastics[8] and air pollution, which exacerbates underlying illnesses, especially in very large cities.[7,9] Most scientists agree that by the year 2100, climate change and nonmicrobial threats will pose unimaginable and unlivable threats.[10]

One of these threats is extinction. Extinction, by definition, is the complete and permanent depletion of a species. Familiar examples include the disappearances of dinosaurs and dodo birds. Major indicators of species extinction are magnitude and rate of species loss over time. Mass extinctions occur "when the Earth loses more than three-quarters of its species in a geologically short interval, as has happened only five times in the past 540 million years or so."[11] Barnosky and colleagues cite evidence that suggests that "humans are now causing the sixth mass extinction."[11] This mass extinction could transform the global biosphere into an inhospitable and unlivable state for *Homo sapiens* within the foreseeable future, unless we act wisely and make, as Ceballos and Ehrlich opine, "Immediate political, economic, and social efforts of an unprecedented scale [that] are essential if we are to prevent these extinctions."[12] Such efforts are justified because, with respect to land vertebrates, "[w]e are in the sixth mass extinction event. Unlike the previous five, this one is caused by the overgrowth of a single species, *Homo sapiens*.... It is changing the trajectory of evolution globally and destroying the conditions that make human life possible. It is an irreversible threat to the persistence of civilization and the livability of future environments for *H. sapiens*. Instant corrective actions are required."[12]

This article discusses infectious diseases and their control and argues that clinicians have ethical duties to strengthen global public health systems and research on pandemic risk factors, promote proven preventatives (especially vaccines), and incentivize domestic and international partnerships that build response capacity to existential harms that increase humanity's vulnerability to pandemics.

Examples of Infectious Disease Surveillance and Control

Infectious diseases with pandemic potential. Malaria, tuberculosis, bubonic plague, smallpox, influenza, and HIV lead the historic list of deadly microbes.[13,14,15] Two major bubonic plagues—the Justinian plague of the sixth century CE and the Black Death of the 14th century CE—probably killed at least 50 to 100 million Europeans, or an estimated 25% to 60% of the population.[14,15,16] Even more devasting was the impact of smallpox on Indigenous populations of the Americas after its introduction by Europeans beginning in the early 16th century. Up to 90% of certain Native populations perished.[15] In absolute terms, the influenza pandemic ("Spanish flu") of 1918 to 1920 had the largest recorded human death toll from a pandemic caused by a contemporaneously (though incorrectly) identified microbe,[17] resulting in a global mortality previously estimated at 50 to 100 million persons and, more recently, at about 17.4 million, with estimates ranging from less than 1% to 5.4% of the global population.[18,19] And the ongoing HIV/AIDS pandemic continues to bring high mortality and morbidity despite effective diagnostic, therapeutic, and preventive advances. HIV/AIDS had caused an estimated 32 million deaths as of 2021.[20]

More recently, the novel severe acute respiratory syndrome coronavirus (SARS CoV-2) has caused the current and well-studied COVID-19 pandemic. As variants continue to occur and infect more populations, the cumulative mortality and morbidity continue to rise. As of April 2025, over 7 million deaths attributable to COVID-19 had occurred globally.[21]

There are many more known emerging infectious diseases that could cause pandemics. The Institute for Health Metrics and Evaluation Pathogen Core Group described the global burden of infectious disease in a 2019 study[22] that listed dozens of pathogens that could cause global mortality and morbidity. Most are bacteria for which we have therapeutic antibiotics, albeit of variable efficacy. But the rising global incidence of antibiotic resistance necessitates ongoing research and continued collection of samples. We have no effective broad-spectrum antiviral agents, although some existing antiviral drugs exhibit modest cross-viral inhibition.[23]

Public health goals for infectious disease. All prevention and control paradigms utilize specific countermeasures targeting a specific pathogen. Such countermeasures include isolation, quarantine, mass vaccinations, antimicrobial drugs, control of vectors (such as insects) and vehicles of transmission (such as contaminated water), and continued surveillance.[13] Clinicians must support evidence-based best practices and majority-expert recommendations that promote reasonable public health policy for all citizens.

Eradication of a human pathogenic species refers to "zero disease," in which control measures are no longer needed.[13] To date, we have achieved eradication of only the smallpox virus. It has been 47 years since the last naturally occurring case of smallpox occurred.[24] However, the presence of frozen smallpox virus in a few secure governmental laboratories, its presence in permafrost corpses, and the potential for intentional or unintentional recrudescence of smallpox make vigilance and public health surveillance still necessary.[25] *Elimination* of a pathogen denotes achievement of zero disease in a specific region, not worldwide. Polio, for example, has been eliminated from the Western Hemisphere.[13] Nevertheless, polio surveillance and immunization remain necessary.

Clinicians' Roles

Communication. Although rapid development of vaccines against SARS-CoV-2, utilizing a novel messenger-RNA platform strategy, prevented at least 20 million deaths in the first year alone,[26,27] diminishing public trust in science has led to unnecessary mortality and morbidity from vaccine-preventable diseases, including COVID-19. Initial uncertainty about COVID-19 vaccines prompted politicians and other public opinion leaders to propagate conspiracy theories and other sources of misinformation. Failure to be vaccinated led to tens of thousands of unnecessary deaths.[28]

Physicians have ethical duties to dispel falsehoods that harm patients and the public.[29] All clinicians should become more active in countering disinformation, especially regarding vaccines, to renew the public's trust in America's public health system and in medical sciences. For example, explanatory videos can be effective in building trust. Buhr, Romero, and Wisk recently reported that trust in systems improved among lay persons and health care workers when exposed to a simple video on scarce resource allocation policies when demand for critical health services exceeds supply.[30]

Pathogen identification. Bioterrorism remains a concern, especially if nefarious actors develop novel pathogens, mutate known ones into highly transmissible and deadly agents, or recover replicative smallpox or even yet-unknown viruses from permafrost corpses.[2] Science has already sequenced the entire genome of the 1918 influenza virus from permafrost corpses.[31] Smallpox viruses trapped in cryptobiosis could be thawed and transformed into biologic weapons.[3] Bioterrorism becomes even more concerning if rogue terrorist agents develop high-efficiency delivery techniques in today's high-tech world. The remote possibility also exists that a laboratory accident could release a deadly pathogen. We must anticipate global chaos that could be caused by the appearance of such agents, against which most populations have lost vaccine-induced or natural immunity.

Recently, a team of Chinese researchers led by Tian Qin reported on the efficacy of existing technology to identify the possible pathogens and their animal origins associated with a "what-if" scenario known as "Disease X."[32] Using a framework developed by the United Nations Secretary-General, researchers assigned 11 international laboratories to apply a "Disease X Test" to identify known and discover new pathogens. Six of the 11 laboratories correctly identified "pathogen X" as a new Mammarenavirus, and 5 correctly identified the animal origin as *Rattus norvegicus,* the common brown rat. Their study suggests that many of the world's top laboratories might already have capacity and ability to identify a new virus associated with an outbreak, epidemic, or pandemic.

Surveillance. To predict the next pandemic, clinicians will need to use increasingly sophisticated laboratory methods. For example, public health laboratories will need yet-to-be-developed metagenomic microbial sequencing for surveillance, especially for wastewater and clinical samples. Clinicians must be able to test patients more often and depend on the latest laboratory techniques for rapid pathogen identification. Clinicians must also depend on their local, state, and national public health officials for timely and accurate surveillance data and direct reports. Physician researchers, academicians, and clinicians must collaborate more often to publish scientifically accurate results more rapidly.

The current US spread of influenza H5N1 ("bird flu") since March 2024 has triggered the Centers for Disease Control and Prevention to utilize a national targeted H5 surveillance system on clinical and environmental samples.[33] As of April 29, 2025, 70 human cases had been detected (with one death); most were exposed to backyard or wild birds. None of the cases involved person-to-person transmission.[34]

Advocacy to Rebuild Trust

Need for advocacy. Global partisanship stems from overlapping, rapidly expanding issues, including overpopulation, geopolitical differences, distrust of diverse populations viewed as "other," increasing distrust of governments and science (especially of public health), misuse of artificial intelligence, and disinformation (the nefarious use of misinformation for personal or political gain).[35,36] These factors further public misunderstanding of science and even foster escalation of existing hostilities, multinational crises, regional and even global wars, and the increasing threat of unthinkable global nuclear war.[37] A "multicrisis"[37] could be the most serious existential threat yet.

We cannot ignore expedient political arguments that seek to dismantle (and even demonize) public health in the guise of promising less expensive and better or different results in the future. We must repair the anti-science harm done and rebuild trust with wise critical thinking, active involvement in organized medicine, and countering misinformation from nonmedical sources.

So, how can physicians do all this? By using their voices. A 2024 Gallup poll found that physicians still rank among the top 5 professions rated "very high" or "high" on honesty, trust, and ethics (behind nurses, pharmacists, and military officers), although there was a 14% decline (from 67% to 53%) between 2021 and 2024 (during the COVID-19 pandemic) for uncertain reasons.[38] More notable was a concurrent drop in ratings for members of Congress, from 9% to 8%,[38] but, counterintuitively, many members of the public now trust these members to exert key political influence on decisions that will affect all Americans' health.

Clinicians who provide or promote vaccines now have a special stake in the current political climate. Anti-public health forces are already fragmenting our world-class public health system for unscientific political reasons. Increasing anti-vaccine disinformation is already being propagated unchecked on social media. It's up to the medical profession to stand up for truth to apparent power.

Advocacy efforts. To protect and promote good health for all our patients and the public, all physicians, even busy ones, should become more active in their professional societies, community organizations, and even in politics. Some might choose to become activists for specific causes, write or visit their local and state politicians (or even become politicians), sign petitions, help finance just causes, and otherwise advocate for protecting patients' and the public's health. Regardless of specialty, keeping wisely informed via trusted and respected medical sources is essential.

We clinicians must continue to educate ourselves, our colleagues and patients, leaders and politicians, and the general public. As the Latin etymology of doctor is *docere*, to teach, we are obligated to continuously and dispassionately learn and teach science, medicine, and wisdom ethics. Broad medical competence is required to overcome current public complacency, ignorance, and disinformation. We must stay highly and wisely informed.

References

1. Vergano D. Neil deGrasse Tyson tweets for science literacy. *USA Today*. October 20, 2012. Updated February 19, 2013. Accessed May 13, 2025. https://www.usatoday.com/story/tech/columnist/vergano/2012/10/20/neil-degrasse-tyson-sagan/1644383/
2. Quammen D. *Spillover: Animal Infections and the Next Human Pandemic*. WW Norton & Co; 2012.
3. Alempic JM, Lartigue A, Goncharov AE, et al. An update on eukaryotic viruses revived from ancient permafrost. *Viruses*. 2023;15(2):564.
4. Kallay R, Doshi RH, Muhoza P, et al. Use of Ebola vaccines—worldwide, 2021-2023. *MMWR Morb Mortal Wkly Rep*. 2024;73(16):360-364.
5. Bettini A, Lapa D, Garbuglia AR. Diagnostics of Ebola virus. *Front Public Health*. 2023;11:1123024.
6. Broadhurst MJ, Brooks TJG, Pollock NR. Diagnosis of Ebola virus disease: past, present, and future. *Clin Microbiol Rev*. 2016;29(4):773-793.

7. Lee H, Calvin K, Dasgupta D, et al; Lee H, Romero J, eds. *Climate Change 2023: Synthesis Report*. Intergovernmental Panel on Climate Change; 2023. Accessed April 30, 2025. https://www.ipcc.ch/report/ar6/syr/downloads/report/IPCC_AR6_SYR_FullVolume.pdf
8. Yee MS, Hii LW, Looi CK, et al. Impact of microplastics and nanoplastics on human health. *Nanomaterials (Basel)*. 2021;11(2):496.
9. CarbonTracker. Carbon dioxide pumphandle—2022. National Oceanic and Atmospheric Administration. Accessed May 20, 2024. https://www.youtube.com/watch?v=I7jKxO4nKZc
10. Osborne M. To prevent catastrophic damage by 2100, climate experts warn "it's now or never." *Smithsonian Magazine*. April 6, 2022. Accessed March 19, 2025. https://www.smithsonianmag.com/smart-news/greenhouse-gas-emissions-must-peak-within-three-years-to-stay-below-15c-new-report-finds-180979872/
11. Barnosky AD, Matzke N, Tomiya S, et al. Has the Earth's sixth mass extinction already arrived? *Nature*. 2011;471(7336):51-57.
12. Ceballos G, Ehrlich PR. Mutilation of the tree of life via mass extinction of animal genera. *Proc Natl Acad Sci U S A*. 2023;120(39):e2306987120.
13. Hopkins DR. Disease eradication. *N Engl J Med*. 2013;368(1):54-63.
14. Than K. Two of history's deadliest plagues were linked, with implications for another outbreak. *National Geographic*. January 29, 2014. Accessed March 19, 2025. https://www.nationalgeographic.com/animals/article/140129-justinian-plague-black-death-bacteria-bubonic-pandemic
15. Diamond J. *Guns, Germs, and Steel: The Fates of Human Societies*. WW Norton & Co; 1997.
16. Wade L. From Black Death to fatal flu, past pandemics show why people on the margins suffer most. *Science*. May 14, 2020. Accessed March 19, 2025. https://www.science.org/content/article/black-death-fatal-flu-past-pandemics-show-why-people-margins-suffer-most
17. Martini M, Gazzaniga V, Bragazzi NL, Barberis I. The Spanish influenza pandemic: a lesson from history 100 years after 1918. *J Prev Med Hyg*. 2019;60(1):E64-E67.
18. Roser M. The Spanish flu: the global impact of the largest influenza pandemic in history. Our World in Data. March 4, 2020. Accessed March 19, 2025. https://ourworldindata.org/spanish-flu-largest-influenza-pandemic-in-history
19. Spreeuwenberg P, Kroneman M, Paget J. Reassessing the global mortality burden of the 1918 influenza pandemic. *Am J Epidemiol*. 2018;187(12):2561-2567.
20. Beyrer C. A pandemic anniversary: 40 years of HIV/AIDS. *Lancet*. 2021;397(10290):2142-2143.
21. Number of COVID-19 deaths reported to WHO (cumulative total). World Health Organization. Updated April 12, 2025. Accessed April 30, 2025. https://data.who.int/dashboards/covid19/deaths
22. Naghavi M, Mestrovic T, Gray A, et al; IHME Pathogen Core Group. Global burden associated with 85 pathogens in 2019: a systematic analysis for the Global Burden of Disease Study 2019. *Lancet Infect Dis*. 2024;24(8):868-895.
23. Adalja A, Inglesby T. Broad-spectrum antiviral agents: a crucial pandemic tool. *Expert Rev Anti Infect Ther*. 2019;17(7):467-470.
24. The spread and eradication of smallpox: an overview. Centers for Disease Control and Prevention. October 23, 2024. Accessed March 24, 2025. https://www.cdc.gov/smallpox/about/spread-and-eradication.html

25. Preston R. *The Demon in the Freezer: A True Story*. Random House; 2002.
26. Fauci AS. The story behind COVID-19 vaccines. *Science*. 2021;372(6538):109.
27. Watson OJ, Barnsley G, Toor J, Hogan AB, Winskill P, Ghani AC. Global impact of the first year of COVID-19 vaccination: a mathematical modelling study. *Lancet Infect Dis*. 2022;22(9):1293-1302.
28. Jia KM, Hanage WP, Lipsitch M, et al. Estimated preventable COVID-19-associated deaths due to non-vaccination in the United States. *Eur J Epidemiol*. 2023;38(11):1125-1128.
29. Wu JT, McCormick JB. Why health professionals should speak out against false beliefs on the internet. *AMA J Ethics*. 2018;20(11):E1052-E1058.
30. Buhr RG, Romero R, Wisk LE. Promotion of knowledge and trust surrounding scarce resource allocation policies: a randomized clinical trial. *JAMA Health Forum*. 2024;5(10):e243509.
31. Taubenberger JK, Hultin JV, Morens DM. Discovery and characterization of the 1918 pandemic influenza virus in historical context. *Antivir Ther*. 2007;12(4, pt B):581-591.
32. Qin T, Zheng H, Luo X, et al. Disease X testing: the results of an international external quality assessment exercise. *J Biosecur Biosaf Biodef Law*. 2022;4(2):151-157.
33. H591 bird flu surveillance and human monitoring. Centers for Disease Control and Prevention. April 25, 2025. Accessed April 30, 2025. https://www.cdc.gov/bird-flu/h5-monitoring/
34. H5 bird flu: current situation. Centers for Disease Control and Prevention. April 29, 2025. Accessed April 30, 2025. https://www.cdc.gov/bird-flu/situation-summary
35. Scheufele DA, Hoffman AJ, Neeley L, Reid CM. Misinformation about science in the public sphere. *Proc Natl Acad Sci U S A*. 2021;118(15):e2104068118.
36. In a politically polarized era, sharp divides in both partisan coalitions. Pew Research Center. December 17, 2019. Accessed May 27, 2024. https://www.pewresearch.org/politics/2019/12/17/in-a-politically-polarized-era-sharp-divides-in-both-partisan-coalitions/
37. Abbasi K. Climate, pandemic, and war: an uncontrolled multicrisis of existential proportions. *BMJ*. 2022;376:o689.
38. Saad L. Americans' ratings of US professions stay historically low. *Gallup*. January 13, 2025. Accessed March 19, 2025. https://news.gallup.com/poll/655106/americans-ratings-professions-stay-historically-low.aspx

Robert T. Ball Jr, MD, MPH is an assistant adjunct professor in the Department of Public Health Sciences and the Division of Infectious Diseases at the Medical University of South Carolina in Charleston. Previously, he was on the faculty at the University of South Carolina's School of Public Health and School of Medicine. A specialist in internal medicine, infectious diseases, and public health, he is credited with diagnosing South Carolina's first cases of AIDS and Zika and, in his capacity as infectious diseases consultant for South Carolina's Department of Health, served as medical director of 2 statewide pandemic influenza taskforces. He has also served as a regional medical director for South Carolina's Department of Health and as a consultant for the Centers for Disease Control and Prevention and the Health Resources and Services Administration. Dr Ball has published 30 articles and 2 textbook chapters and is an oft-invited speaker, including on a panel at a 2022 international COVID conference. Over

his career, he has received numerous state and national awards, including the 2020 ReadyCommunities Partnership National Service Award.

Citation
AMA J Ethics. 2025;27(8):E593-600.

DOI
10.1001/amajethics.2025.593.

Conflict of Interest Disclosure
Contributor disclosed no conflicts of interest relevant to the content.

The viewpoints expressed in this article are those of the author(s) and do not necessarily reflect the views and policies of the AMA.

ISSN 2376-6980

AMA Journal of Ethics®
August 2025, Volume 27, Number 8: E601-606

MEDICINE AND SOCIETY: PEER-REVIEWED ARTICLE

Four Key Concepts in Existential Health Care Ethics

Émile P. Torres, PhD

Abstract

Existential ethics is the study of the ethical and evaluative implications of human extinction. This article examines 4 key concepts in this emerging field: (1) Going Extinct is different from Being Extinct; (2) extinction-causing catastrophes are different in kind, not just degree, from non-extinction-causing catastrophes; (3) "human extinction" can have multiple meanings, which, when applied, can yield multiple, even conflicting, conclusions about what might constitute best future outcomes; and (4) there are historical reasons why existential ethics has tended to be ignored until recently. One goal of this article is to launch a discussion about what existential health care ethics could look like.

Key Questions and Concepts

Existential ethics is a nascent field of philosophical inquiry that focuses on the ethical and evaluative implications of human extinction. The term *existential*, as I use it, refers to "of or relating to existence," rather than to the philosophical position of existentialism. It concerns questions like the following: If we have obligations to past people that require our species to continue to survive, what is the nature and scope of these obligations? Would the loss of hypothetical future people constitute a moral tragedy? What do we mean by "human" and "extinction" in the first place?

Some experts argue that the probability of human extinction in this century is higher than at any time in the past. Estimates can range from roughly 16% to 30%.[1,2] If these estimates are accurate, it behooves scientists, philosophers, policy makers, and health professionals to take the idea of extinction more seriously than they have. This article posits that 4 key concepts from existential ethics are important to health care and health professionalism: (1) Going Extinct is different from Being Extinct; (2) extinction-causing catastrophes are different in kind, not just degree, from non-extinction-causing catastrophes; (3) "human extinction" can have multiple meanings, which, when applied, can yield multiple, even conflicting, conclusions about what might constitute best future outcomes; and (4) there are historical reasons why existential ethics has tended to be ignored until recently.

The first 2 concepts could have significant implications for health care practice and how resources within health care systems are allocated, depending on how these concepts

are interpreted. From one perspective, which has become influential over the past decade, we should prioritize health care interventions that ensure the long-term survival of humanity—millions, billions, and trillions of years into the future—which *might* entail defunding "near-termist" interventions focused on, eg, treating individuals with diseases in impoverished countries. The third concept foregrounds the important fact that there are different ways that humanity could "go extinct." One of these ways is by using biomedical advancements to radically reengineer our species to become one or more new "posthuman" species. This goal of creating posthumanity could be seen as a form of "pro-extinctionism," ie, the view that our species *should* go extinct, which has become influential within the technology sector.[3] And, finally, the fourth concept considers why existential ethics has received very little attention until quite recently. The fact that there is no established "tradition" of existential ethics—of thinking about the ethical and evaluative implications of our extinction—might seem to undermine the field's credibility: If the topic were deserving of study, then many would have already written about it. Yet, for reasons specified below, until the 19th century, almost no one in the West believed that human extinction was even *possible*.

Given that medicine will—it seems plausible to claim—play a critical role in whether our species survives this century, the ideas and insights of existential ethics research are directly relevant to how health care is, or should be, practiced. This is why, I would argue, health professionals ought to understand at least the following 4 concepts.

Going Extinct vs Being Extinct

The first concept concerns a simple but crucial distinction between the process of Going Extinct and the subsequent state of Being Extinct. Imagine asking 2 people the question: "If a pandemic were to cause our extinction, would this be bad?" Both might answer affirmatively, but their underlying reasons might differ substantially. One person might say that the *only* reason our extinction would be bad is that Going Extinct would cause horrific suffering and cut short the lives of the approximately 8 billion people who currently exist.[4] The other might say that, *in addition to* the death and suffering caused by Going Extinct, our nonexistence would prevent a potentially vast number of future people from existing. The first person would argue that the "loss" of hypothetical future people cannot be bad, since one cannot be harmed by never existing. But for the second person, the nonexistence of these future people may constitute the *worst* aspect of our extinction by far. According to Carl Sagan, if humanity survives for another 10 million years, our planet could contain 500 trillion people.[5] The loss of these people would be much worse than the deaths of roughly 8 billion individuals, however horrific that might be.

The distinction between Going Extinct and Being Extinct is thus not merely academic; it has important practical implications: If one believes that Being Extinct is *also* a source of extinction's badness—perhaps the *main* source—then one might be inclined to strongly prioritize interventions aimed at preventing extinction-causing catastrophes over those targeting non-extinction-causing catastrophes. This brings us to a second key idea in existential ethics.

Is Being Extinct a Source of Badness?

In his 1984 book, *Reasons and Persons*, Derek Parfit describes 3 scenarios: (A) peace, (B) a nuclear war that kills 99% of humanity, and (C) a nuclear war that kills 100% of humanity.[6] He then asks whether the greater difference is between (A) and (B), or between (B) and (C). Most people identify (A) and (B) as the greater difference,[7] as most

people likely focus on immediate harms that might be associated with Going Extinct, but Parfit argues that what separates (B) and (C) is enormously larger.[6] This is because (C) would preclude the realization of all future people—and hence all future value—whereas neither (A) nor (B) necessarily would. Since the amount of future value could be astronomically huge, especially if our descendants were to colonize space, (C) coincides with a fundamental discontinuity in the badness of certain catastrophe scenarios. As the number of deaths caused by the nuclear war increases, so does the badness of the situation. However, once the last remaining human perishes, the badness of the situation suddenly skyrockets, because it is at *this particular moment* that all future value is lost forever.

In contrast to the second person's emphasis on lost future value, the first person above, who believes that the badness of human extinction is reducible entirely to the details of Going Extinct, would argue that once the last remaining human perishes, the badness of the situation *plateaus*. This is because they—contra Parfit—do not believe that the "lost" people and value associated with Being Extinct are morally relevant. As alluded to above, some who hold this view would argue that if there is no one around to suffer the nonexistence of humanity, then no one can be harmed by Being Extinct. And if Being Extinct harms no one, then Being Extinct itself cannot be bad (or wrong). This is a fundamental disagreement within existential ethics.

The connection with health care is that if there *is* a fundamental discontinuity between extinction-causing and non-extinction-causing catastrophes (ie, Being Extinct is a source of badness), then we should allocate more resources to prevent the former, even if this means neglecting the latter. Hence, health professionals who accept Parfit's view should deprioritize non-extinction-related interventions that use up valuable resources if those resources could be utilized instead to safeguard humanity's long-term survival. This reasoning is why the "longtermist" Nick Beckstead, who agrees with Parfit's view, argues that we should prioritize saving the lives of people in rich countries over saving the lives of people in poor countries, all other things being equal, given that (a) people in rich countries are better positioned to protect our long-term future and (b) the long-term future is of "overwhelming" moral importance.[8]

This conclusion follows even if the probability of any particular extinction scenario is minuscule, as the associated "existential risk" may still be very large. That is to say, a low-probability event that could result in the loss of enormous amounts of future value would still count as very "risky" on the standard definition of risk as the probability of an event multiplied by its consequences.[9] If Parfit and Beckstead are correct, then much of the current focus in health care—indeed, of our philanthropic efforts more generally—might be misguided. This is not to say that near-term individual care doesn't matter, but that it only matters insofar as it advances the aim of fulfilling our long-term "potential" in the universe over the coming millions, billions, and trillions of years—which, of course, requires that humanity does not go extinct anytime soon.

How Should *Human Extinction* Be Defined?

The third key idea concerns various ways that *human extinction* could be defined. Most people understand *human extinction* as denoting a situation in which our species, *Homo sapiens*, disappears entirely and forever. However, many futurists—including those sympathetic to Parfit's discontinuity thesis—define *humanity* as including not just *Homo sapiens* but any successors we might have, even if these beings are very different from us—eg, are entirely nonbiological in nature. Some add that our successors must also

possess certain properties to count as human, such as having a "moral status" comparable to ours.[10]

This broader definition implies that *Homo sapiens* could disappear entirely and forever, perhaps in the near future, without human extinction having occurred. As long as our disappearance coincides with the emergence of a new successor species, then "humanity" will persist. Consequently, people who define *human* or *humanity* differently might appear to agree about the importance of avoiding human extinction, yet their views could be diametrically opposed. One person might wish to preserve our particular species, while another might be indifferent to the survival of our species or even favor the active replacement of *Homo sapiens* with a successor species that they consider to be "superior."[11]

In fact, many of the loudest voices calling for efforts to avoid human extinction are "transhumanists" and longtermists who believe that creating a new posthuman species is integral to fulfilling our long-term cosmic potential.[1] (The terminology here is confusing, since posthumans would also count as humans on their definition.) Once posthumanity arrives, these transhumanists and longtermists are largely indifferent to the fate of *Homo sapiens*, and, indeed, some explicitly argue that our species *should* die out.[11,12] This is not a fringe view: The idea that the future of humanity is digital rather than biological is widespread among many in the technology sector, some of whom contend that replacing our species in the near future with artificial beings is "the natural and desirable next step in … cosmic evolution."[13]

If one understands *humanity* as referring specifically to our species, then such views, embraced by leading transhumanists and longtermists, should be categorized as pro-extinctionist, given that *Homo sapiens* would likely not survive a world run and ruled by our posthumans successors. While many people associate pro-extinctionism with positions like philosophical pessimism (nonexistence is preferable to existence; life is not worth living) and radical environmentalism (*Homo sapiens* should die out because we are destroying the biosphere), there is a particularly insidious form of pro-extinctionism that has become pervasive within powerful corners of Big Tech associated with transhumanist and longtermist ideologies.

Disambiguating the term *human extinction* is thus crucial for making sense of contemporary debates about the topic. The statement, "I oppose human extinction," is meaningless without further details about what one means by this term, as well as which aspect of extinction—Going Extinct or Being Extinct—one identifies as morally important sources of the badness or wrongness of our extinction.

Why Has Existential Ethics Been Neglected Until Quite Recently?

The fourth key idea concerns the historical question of why existential ethics has been largely neglected by academics until quite recently. For much of Western history, most people would have claimed that human extinction is fundamentally impossible. This was the case for 2 main reasons: First, most people accepted a model of reality called the "Great Chain of Being," which denies the possibility of *any kind* of extinction. The eternal completeness of the Great Chain was taken as reflecting God's perfection, and, hence, since God is perfect, no link in the chain could ever go missing. If extinction in general is impossible, then so is the extinction of humanity. This idea was immensely influential from the early first millennium until the early 1800s, when Georges Cuvier and others demolished it.[12] Second, most people throughout Western history also accepted a

Christian worldview according to which human extinction isn't part of God's plan for humanity. Our world will eventually end, but this ending will mark a glorious new beginning: eternal life in heaven for believers. Humanity cannot simply disappear entirely and forever. It wasn't until the 19th century, shortly after the idea of the Great Chain collapsed, that Christianity began to decline among the educated classes. This decline opened up conceptual space for people to accept what had, up to that point, been unthinkable: that human extinction is possible.[12]

For these 2 reasons, questions about the ethical and evaluative implications of human extinction were largely ignored within the Western intellectual tradition: What is the point of examining the ethics of something that cannot happen? However, over the past 20 years, existential ethics has begun to coalesce into a coherent field of inquiry. Much of the existential ethics discussion has been dominated by transhumanists and longtermists who accept Parfit's thesis that the badness of a catastrophe skyrockets the moment that 100% of humanity dies out—precisely because Being Extinct would prevent us from fulfilling our long-term potential in the universe.

Longtermism and transhumanism are just 2 of many positions one could espouse within existential ethics. Only since 2015 or so have philosophers begun to systematically explore a range of alternative views. This topic's novelty means there is no well-established, time-honored tradition of thinking about it rigorously. This is unfortunate because there are plausible arguments for the claim that human extinction may be more probable this century than ever before in our history, given the novel threats posed by thermonuclear war, engineered pandemics, and perhaps artificial superintelligence.

Conclusion

In this short article, I have outlined 4 key concepts in existential ethics. My hope is that this exposition provides a useful point of departure for future discussions about the important, yet underexplored, connections between health care and the ethical and evaluative implications of human extinction. If our species really could disappear this century—as some advocates of ideologies like transhumanism, longtermism, and "accelerationism" hope will happen—then surely it behooves philosophers and health professionals alike to examine the nature and implications of this event.

References

1. Ord T. *The Precipice: Existential Risk and the Future of Humanity*. Hachette Books; 2020.
2. Karger E, Rosenberg J, Jacobs Z, Hickman M, Tetlock P. Subjective-probability forecasts of existential risk: initial results from a hybrid persuasion-forecasting tournament. *Int J Forecast*. 2025;41(2):499-516.
3. Gebru T, Torres ÉP. The TESCREAL bundle: eugenics and the promise of utopia through artificial general intelligence. *First Monday*. 2024;29(4):13636.
4. Current world population. Worldometer. Accessed on March 14, 2025. https://www.worldometers.info/world-population/
5. Sagan C. Nuclear war and climatic catastrophe: some policy implications. *Foreign Affairs*. December 1, 1983. Accessed February 3, 2025. https://www.foreignaffairs.com/articles/1983-12-01/nuclear-war-and-climatic-catastrophe-some-policy-implications
6. Parfit D. *Reasons and Persons*. Oxford University Press; 1987.
7. Schubert S, Caviola L, Faber NS. The psychology of existential risk: moral judgments about human extinction. *Sci Rep*. 2019;9(1):15100.

8. Beckstead N. *On the Overwhelming Importance of Shaping the Far Future*. Dissertation. Rutgers University; 2013. Accessed February 3, 2025. https://rucore.libraries.rutgers.edu/rutgers-lib/40469/
9. Boyd M, Wilson N. Assumptions, uncertainty, and catastrophic/existential risk: national risk assessments need improved methods and stakeholder engagement. *Risk Anal*. 2023;43(12):2486-2502.
10. Hilary G, MacAskill W. The case for strong longtermism. Global Priorities Institute, University of Oxford; 2021. GPI working paper 5-2021. Accessed February 3, 2025. https://globalprioritiesinstitute.org/wp-content/uploads/The-Case-for-Strong-Longtermism-GPI-Working-Paper-June-2021-2-2.pdf
11. Shiller D. In defense of artificial replacement. *Bioethics*. 2017;31(5):393-399.
12. Torres ÉP. *Human Extinction: A History of the Science and Ethics of Annihilation*. Routledge/Taylor & Francis; 2023.
13. Tegmark M. *Life 3.0: Being Human in the Age of Artificial Intelligence*. Knopf Doubleday; 2017.

Émile P. Torres, PhD is a postdoctoral scholar at the Inamori International Center for Ethics and Excellence at Case Western Reserve University in Cleveland, Ohio. Their work focuses on existential threats to humanity and civilization, as well as on the ethical and evaluative implications of human extinction. They have published widely in both academic journals and popular media.

Citation
AMA J Ethics. 2025;27(8):E601-606.

DOI
10.1001/amajethics.2025.601.

Conflict of Interest Disclosure
Contributor disclosed no conflicts of interest relevant to the content.

ISSN 2376-6980

AMA Journal of Ethics®
August 2025, Volume 27, Number 8: E607-610

MEDICINE AND SOCIETY: PEER-REVIEWED ARTICLE

Would Conceptualizing Past, Current, and Future Generations as Constituting a "League of Patients" Be Useful for Humanity?

Elizabeth Finneron-Burns, DPhil and Susan McNair, MD

Abstract

Since health is a crucial, if not the most important, feature of persons' well-being, we have good reasons to consider all present and future persons as members of a "league of patients." This article explores what this concept might mean, proposes how it could be applied in the emerging field of existential health care ethics, and draws upon it to better conceive of how to meet the health needs of current and future patients.

Neighbors in Time

In 1962, German philosopher Günther Anders wrote that present-day humanity's increased ability to significantly influence future people had made distinctions between generations meaningless and that we would do better to understand generations as "*neighbors in time*."[1] Just as setting our own house on fire will affect our neighbours in space, so setting a fire metaphorically (or perhaps literally, given the potential catastrophic environmental effects of climate change) in our own generation can significantly affect future generations, our neighbors in time. According to Anders, "all are allies against the common [nuclear] menace," and "everybody is in the deadly reach of everybody else."[1] As such, we should not conceive of generations as independent, separate entities, but as all (past, present, and future generations) composing a single "*League of Generations*."[1] In the nuclear context in which Anders was writing, all individuals were at risk, meaning that the League of Generations would necessarily include individuals in the present and future. There was no option but to "join" (ie, to recognize that you are a member of) the league, since all would be affected.

Since health is an important, if not the most important, element of people's well-being, Anders' views might suggest that we should think of all generations of patients as a "league of patients" in order to underscore the importance of ensuring that the health needs of current and future generations of patients are met. However, we will argue that this concept is unlikely to be helpful in ensuring that health needs are met because there are significant differences in needs not only between generations, but also within them.

A League of Patients

Anders' conception of a League of Generations was an effective way to draw attention to the impact that our actions (for Anders, the use of nuclear weapons) can have on future generations: our actions affect those proximate to us not only in space, but also in time. It is important to remember that Anders was writing at a time when the world was on the brink of nuclear war; he wanted to remind us that, if that were to happen, it would affect not just the current generation, but also that generation's descendants and even their ancestors (by destroying the things they built, both physical and social, and possibly the human species). So, in a way, his was a call for equal recognition and protections, rather than equal treatment.

What would an intergenerational league of patients look like? Following Anders' conceptual model, it would be a call for intergenerational and international s*olidarity* around the issue of health care—a recognition that actions and choices (whether of individuals, clinicians, or institutions) can affect the health treatments and outcomes of others proximate in space *and* time. A league of patients would not be limited geographically. Everybody in the world is a patient at some time or another and is always at least a potential patient, so a league of patients would necessarily comprise all people globally. Moreover, a league of patients would not be limited by time since the proposal is for an *intergenerational* league of patients. Finally, a league of patients would be limited by subject matter—members have a common interest in everybody's health, wherever they live—but that's about it. What the intergenerational league of patients would *not* be is an actual organization akin to the World Health Organization or the United Nations. It is an attitude, not an object.

Would Conceptualizing a League of Patients Improve Health Care?

We have 2 reservations about the efficacy of the concept of a league of patients. The first is the feasibility of such international and intergenerational solidarity. Even within a single generation, members vary in terms of income, wealth, level of health and education, political views, religion, resource availability and consumption, and level of development, to name just a few factors. This means that, even within a single generation, it would be extremely difficult to form anything like an international league of patients that can agree on and work towards a single goal (eg, securing equal access to health care for all), even if that goal is something they all have in common. Moreover, an intergenerational league of patients, even if its members could agree on the goal of securing access to health care for all, would immediately discover that doing so requires some members to redistribute resources (eg, wealth, health care professionals) to others. This necessity would open up a complex discussion about the ethics of resource distribution both geographically and intergenerationally, contrary to the inclusive scope of the league.

Furthermore, because we can only imagine what health care will look like in a hundred years, let alone 5 hundred, including future people—especially distant future people—in a league of patients would do little to help people currently living or them. Standards of health have changed dramatically over time, with new diseases and treatments constantly being discovered. Medicine itself, and the way it is practiced, is also evolving. For example, in Western medicine, there has been a shift from a paternalistic model of health care to a collaborative model in which clinicians' expertise plays one part in patients' overall health decision-making. As digitalization expands, it is more and more commonplace for patients to have access to their medical records, which supports collaborative health care by facilitating patients' understanding and recall of health

information as well as their engagement with the treatment process.[2] However, there would be disagreement about the utility of expanding electronic health record (EHR) access among members of the league of patients charged with improving health care standards. A group of patients situated in the present day, in a relatively wealthy nation, could reasonably advocate for it. A group of patients situated a hundred years ago would have little understanding of how this type of access to health records would be possible. Furthermore, members of the group would likely not comprehend how EHR access would benefit their health, as the standard of medicine at the time relied on a more paternalistic model of care. And we have no idea how the documentation standard of medicine will evolve over time; it could be that, in another hundred years, the documentation standard of medicine will involve such radically different forms of recordkeeping and patient collaboration that access to the EHR would no longer be a meaningful idea.

Even if the goal pursued by an intergenerational league of patients were a general one of meeting everyone's health care needs, it is still not clear at all how this goal would be helpful. Since the league would include everyone in the world (and all current and future people), it is not clear which, if any, role the league would play in such advocacy. If all people presumably can agree that everyone's health care needs should be met and furthermore can agree on how they should be met, why hasn't this happened already?

Our second reservation about the efficacy of the concept of a league of patients is that it is pointless, because health care is one of the resources covered under the concept of caring for future generations more generally.[3]

Conclusion

Considering all people, from all over the world—past, present and future—as a single league of patients may have a similar appeal to Anders' League of Generations: it emphasizes our interconnectedness, as neighbors in both space and time. Unfortunately, when we consider such a league more closely, it necessarily dissolves, and the differences within the league become too stark to enable it to function as a means for ensuring that health needs are met.

References

1. Anders G. Theses for the atomic age. *Mass Rev*. 1962;3(3):493-505.
2. Wass S, Vimarlund V, Ros A. Exploring patients' perceptions of accessing electronic health records: innovation in healthcare. *Health Informatics J*. 2019;25(1):203-215.
3. Bell W. Why should we care about future generations? In: Didsbury HF Jr, ed. *The Years Ahead: Perils, Progress, and Promises.* World Future Society; 1993:25-41.

Elizabeth Finneron-Burns, DPhil is an associate professor of political theory at Western University in London, Ontario, Canada. She received her DPhil in politics from the University of Oxford. Her research interests include intergenerational justice and the ethics of human extinction. She is the author of *What We Owe to Future People: A Contractualist Account of Intergenerational Ethics* (Oxford University Press, 2024).

Susan McNair, MD is a psychiatrist in Hamilton, Ontario, Canada. She received her MD from the University of Western Ontario and completed her psychiatry residency at McMaster University.

Citation
AMA J Ethics. 2025;27(8):E607-610.

DOI
10.1001/amajethics.2025.607.

Conflict of Interest Disclosure
Contributors disclosed no conflicts of interest relevant to the content.

The viewpoints expressed in this article are those of the author(s) and do not necessarily reflect the views and policies of the AMA.

ISSN 2376-6980

AMA Journal of Ethics®
August 2025, Volume 27, Number 8: E611-618

MEDICINE AND SOCIETY: PEER-REVIEWED ARTICLE

Virtue Ethics and Postponing Human Extinction

Charles S. Bryan, MD

Abstract

Existential ethics (extinction ethics) evokes Van Renssalaer Potter's definition of bioethics as a science of human survival that integrates biological principles, the planetary ecosystem, and wisdom. Explored here is a thesis that virtue ethics (character ethics) should supplement deontological, consequentialist, and other approaches to decision-making relevant to extinction. Advances in philosophy, social science, and neuroscience support the idea that virtues such as faith, hope, and love should complement how virtues such as wisdom, justice, temperance, and courage are expressed when deliberating about existential ethical questions in areas such as global warming, nuclear warfare, and rogue artificial intelligence applications.

It has yet to be determined whether Science, as the embodiment of a mechanical force, can rule without invoking ruin.... [T]here must be a very different civilization or there will be no civilization at all.
Sir William Osler[1]

A new type of thinking is essential [in the atomic age] if mankind is to survive and move toward higher levels.
Albert Einstein[2]

From Bioethics to Existential Ethics

Coined by the German theologian Fritz Jahr in 1927,[3] the term *bioethics* was rediscovered in 1970 in separate contexts. The public servant Sargent Shriver reportedly introduced the term *bioethics* in his Bethesda, Maryland, living room while discussing plans for an institute to integrate moral philosophy and patient care dilemmas.[4] The biochemist and oncology researcher Van Rensselaer Potter similarly introduced *bioethics* during a bicycle ride while searching for a word to reconcile medicine with long-term human survival.[5] For Potter, bioethics was a "science of survival ... built on the science of biology, enlarged beyond the traditional boundaries to include the most essential elements of the social sciences and the humanities with emphasis on philosophy in the strict sense, meaning 'love of wisdom.'"[6] It is Potter's definition that concerns us here.

Events since 1970 have magnified Potter's concerns about species survival. The global Living Planet Index, derived from 34 836 monitored populations of 5495 nonhuman

vertebrate species, indicated a 73% decline in the average size of nonhuman vertebrate populations between 1970 and 2020.[7] Concurrently, the world human population rose by 114%, from 3.7 to 7.9 billion,[8] and, from 1990 through 2024, atmospheric CO_2 levels rose by 20%, from 354 to 425 parts per million.[9] The risk to human survival from climate change possibly exceeds that from nuclear weapons,[10,11] but recent actions by the world's great powers portend a new, global nuclear arms race.[12] Artificial intelligence also poses an array of risks, including the prospect that a machine would eliminate us.[13,14] Organizations such as the United Nations, the World Health Organization, the World Wildlife Fund, the Union of Concerned Scientists, the Future of Life Institute, International Physicians for the Prevention of Nuclear War, and others foster the idea that humanized science constitutes our best hope for long-term survival.

Potter's definition of bioethics has morphed into existential ethics (extinction ethics), which constitutes an evolving field encompassing various concerns and approaches. The Canadian philosopher Todd Dufresne submits that we are heading toward "a democracy of suffering" and must develop species consciousness, epochal consciousness, and globalization of empathy.[15] The Australian philosopher Toby Ord and others advocate for "longtermism," a view that prioritizes consideration of present actions' influences on humanity's future.[16] More recently, the American philosopher Émile Torres published a comprehensive treatise, *Human Extinction: A History of the Science and Ethics of Annihilation*, more than half of which deals with ethics.[17]

Explored here is the thesis that existential ethics should incorporate virtue ethics (ie, character ethics) in the effort to postpone human extinction. In what follows, I will review virtue ethics, its relevance to survival on "Spaceship Earth," and its potential enhancement by recent observations in psychology, sociology, and neuroscience.

Virtue Ethics

Virtue ethics examines the character of the actor as opposed to the rightness or wrongness of an action. Its champions through the years include Plato and Aristotle, Pope Gregory I in the 6th century, and William of Auxerre and St Thomas Aquinas in the 12th and 13th centuries. William of Auxerre selected 4 "cardinal" virtues—wisdom, justice, temperance, and courage—from *Plato's Republic* and 3 "theological" (or "transcendent") virtues—faith, hope, and love—from St Paul (1 Corinthians 13:13). Aquinas saw cardinal virtues as mental habits promoted by acting repeatedly in the same way (*habitus acquisitus*) and theological virtues as traits received by divine grace (*habitus infusus*). He ranked wisdom first among the cardinal virtues and love first among the transcendent virtues. In the mid-20th century, the German philosopher Josef Pieper revived interest in Aquinas' account of what he saw as 7 "classic" (Catholic) virtues,[18,19] but by then, virtue ethics had been long eclipsed by newer theories, such as deontology (duties or rules, including Kantianism) and consequentialism (results or outcomes, including utilitarianism). Renewed interest in virtue ethics began in 1958 with an influential paper by the British philosopher Elizabeth Anscombe.[20] She, her pupil Philippa Foot,[21] their pupil Rosalind Hursthouse,[22] and others advanced virtue ethics as a supplement to deontological and consequentialist theories of ethics.

Could virtue ethics even replace the other theories on the premise that a person of good character will usually do the right thing? A short answer is no. In the present author's simplification, virtues can be defined as excellences in pursuit of what is good for society and oneself; values, as determinations of what constitutes "the good," informed by virtues; morals, as determinations of right and wrong, informed by values; and ethics, as

determining how best to act, informed by virtues, values, and morals.[22,23] Hursthouse observes that virtue ethics "fails to provide action guidance when we come to hard cases or dilemmas."[24] Others concur.[25] Nonetheless, virtues condition us to make wise choices in tough situations,[26,27] and choices may reveal more about character than does action.[28]

Whether there are few or many virtues has been debated since Plato's *Meno* (circa 385 BCE), but here we focus on the 7 virtues listed above. These seven received support from the Values in Action Classification Project (VIA) conducted by American social scientists led by psychologists Christopher Peterson and Martin Seligman.[29] They concluded that, throughout history, most cultures have endorsed 6 clusters of character strengths. With minor modifications—adding "knowledge" to wisdom, combining faith and hope as "strengths of transcendence," and relabeling love as a "strength of humanity"—these clusters correspond to 7 long-standing virtues.[23,29] From the 6 clusters, the researchers identified 24 character strengths or "sub-virtues."[23,29] Although not without criticism,[30] the VIA construct has stimulated multidisciplinary research, which often utilizes functional neuroimaging, as discussed below.

Virtue Ethics and Spaceship Earth

In 1971, the year after coining the term *bioethics*, Potter published the book, *Bioethics: Bridge to the Future*. In it, he expressed "a growing concern that maybe survival is not something to be taken for granted, a concern that maybe there is no one at the controls on the spaceship earth or even in the United States."[31] Potter possibly appropriated his metaphor from R. Buckminster Fuller's 1969 publication, *Operating Manual for Spaceship Earth*,[32] which was *au courant* at the time. In Fuller's allegory, the Earthians' spaceship came without a user manual, leaving the Earthians to solve a host of problems, including governance, environmental pollution, and overreliance on fossil fuels.

These perspectives prompt various questions:

1. Are efforts to postpone extinction worthwhile?
2. If yes, then who should make the key decisions?
3. How should decision-makers go about making decisions?
4. Does it matter whether these people are of good character?

In response to the first question, one can argue that Earth would be better off without us.[33] However, the present author favors an argument from cosmic consciousness (or cosmic significance), agreeing with the evolutionary biologist Stephen Jay Gould that *Homo sapiens* is such a "wildly improbable evolutionary event" that we have a moral responsibility to prolong our sentient, atom-splitting, gene-editing species as long as we can.[34] Our extinction would deprive the known universe of a species capable of exploring and appreciating it with awe and wonder, dishonor the memory of our predecessors, and preclude the possibility of a future utopian state.[35,36,37] Others argue from religious perspectives that "driving ourselves extinct would constitute a complete failure to fulfil our God-given nature"[38] or that recognizing "ourselves as part of a larger, irreducible whole … might mean resisting the temptation to engineer the world around us and to remake it in our own image."[39]

In response to the second question, one can argue that decisions about how to try to postpone extinction could be made through greater collaboration among the leaders of the world's great powers.[40] The present author favors some form of world federalism, wherein management of global and existential threats is vested in a central authority.[41] Inclusive democracy will not work, because people (the *demos*) nearly always place self-interests above those of future generations. Spaceship Earth needs a central authority sensitive to the security needs of all or at least most stakeholders, yet small enough to respond quickly to existential threats.

In response to the third question, one can argue that existing deontic and consequentialist theories of ethics suffice for effective decision-making. However, the present author favors robust support for the nascent field of existential ethics. Torres observes that "the philosophical community as a whole has been slow to address the ethical and evaluative implications of our extinction—a tendency of general neglect that goes back to the early Atomic Age."[42] Clinical ethicists need familiarity with this field, since existential ethics often pits the interests of the species against the interests of identified individuals.[43]

Finally, one can argue that it does not matter whether those at the helm of Spaceship Earth are people of virtuous character. Ord uses the term "civilizational virtues and vices" to capture the idea that we must "gain insight into the systematic strengths or weaknesses in humanity's ability to achieve flourishing."[16] Agreeing with Ord, the present author contends that decision-makers for Spaceship Earth should collectively constitute a "best self" embodying many of the virtues as taught by Socrates, Plato, Aristotle, and others through the years.[44,45,46] Is it even possible to improve on these virtues, given our apparent need for a planetary, power-rebalancing "social contract for the first time in history?"[47]

Recent Advances Pertaining to the Virtues

Could deeper understanding of the virtues from neuroscience and social science perspectives facilitate decision-making by those at the helm of Spaceship Earth?

Researchers throughout the world now apply neuroimaging in studies of social decision-making and moral reasoning pertaining to the cardinal and transcendent virtues. The brain areas most often activated during social decision-making and moral reasoning include the posterior and anterior cingulate cortices, the dorsolateral and ventromedial prefrontal cortices, the ventral striatum, the amygdala, the temporoparietal junction, and the posterior superior temporal sulcus.[48,49] Neuroimaging studies of the transcendent virtues reveal activation of brain regions that overlap with those implicated in the cardinal virtues but with heavier representation of the limbic system.[50,51,52] Positive awe, a key component of religiosity, activated the left middle temporal gyrus, the anterior/posterior cingulate cortex, and the supramarginal gyrus in a recent study.[53] This overlap of brain regions activated in moral reasoning pertaining to cardinal and transcendent virtues supports the idea that, optimally, transcendent virtues (notably, love) should inform the cardinal virtues (notably, wisdom) in decision-making for the common good.

Research in the psychology, sociology, and neurobiology of wisdom has blossomed since the 1980s, when the German psychologist Paul Baltes and his colleagues defined wisdom as "an expert knowledge system about the fundamental pragmatics of life" permitting "exceptional insight" and "good judgment about practical matters in life,

especially those matters that are complex and uncertain regarding problem definition and solution."[54] More recent investigators define wisdom as "a complex human trait" and seek ways to measure it.[55,56] Whether an emerging strategy to use artificial intelligence to modulate emotional input in practical decision-making ("artificial wisdom") will promote the common good remains to be determined.[57]

Beyond the scope of this brief review are recent observations in psychology, sociology, and neuroscience relevant to the other classic virtues (justice, temperance, courage, faith, hope, and love). Also beyond this review are findings pertaining to such human flaws as psychopathy, greed, and the propensity to make war against our own kind.[58,59,60]

Hursthouse concludes her treatise on virtue theory with the observation that, throughout recorded history, we have failed "to achieve *eudaimonia* [the Aristotelian notion of "flourishing" as the endpoint of virtue training] in anything but very small patches to our vices" but should keep on trying.[61] Hence, "Keep hope alive."[61] Similarly, Torres ends his volume on human extinction by reflecting that the human story "is not over yet, and its ending is ultimately up to us."[42] Hence, "May we have the wisdom to do whatever we should."[42]

References

1. Osler W. The old humanities and the new science: the presidential address delivered before the Classical Association at Oxford, May, 1919. *Brit Med J*. 1919;2(3053):1-7.
2. Atomic education urged by Einstein: scientist in plea for $200,000 to promote new type of essential thinking. *New York Times*. May 25, 1946. Accessed September 23, 2024. https://www.nytimes.com/1946/05/25/archives/atomic-education-urged-by-einstein-scientist-in-plea-for-200000-to.html
3. Sass HM. Fritz Jahr's 1927 concept of bioethics. *Kennedy Inst Ethics J*. 2007;17(4):279-295.
4. Martensen R. The history of bioethics: an essay review. *J Hist Med Allied Sci*. 2001;56(2):168-175.
5. Whitehouse PJ. The rebirth of bioethics: a tribute to Van Renssalaer Potter. *Glob Bioeth*. 2001;14(4):37-45.
6. Potter VR. Bioethics, the science of survival. *Perspect Biol Med*. 1970;14(1):127-153.
7. World Wildlife Fund; Zoological Society of London. *2024 Living Planet Report: A System in Peril*. World Wildlife Fund; 2024. Accessed December 2, 2024. https://files.worldwildlife.org/wwfcmsprod/files/Publication/file/5gc2qerb1v_2024_living_planet_report_a_system_in_peril.pdf
8. World population by year. Worldometer. Accessed December 18, 2024. https://www.worldometers.info/world-population/world-population-by-year/
9. Tiseo I. Average monthly carbon dioxide (CO_2) levels in the atmosphere worldwide from 1990 to 2025. Statista. March 25, 2025. Accessed April 25, 2025. https://www.statista.com/statistics/1091999/atmospheric-concentration-of-co2-historic
10. Wallace-Wells D. *The Uninhabitable Earth: Life After Warming*. Tim Duggan Books; 2020.
11. Lustgarten A. *On the Move: The Overheating Earth and the Uprooting of America*. Farrar, Straus & Giroux; 2024.

12. Sciuto J. *The Return of Great Powers: Russia, China, and the Next World War*. Dutton; 2024.
13. Barrat J. *Our Final Invention: Artificial Intelligence and the End of the Human Era*. Thomas Dunne Books; 2013.
14. Bostrom N. *Superintelligence: Paths, Dangers, Strategies*. Oxford University Press; 2014.
15. Dufresne T. *The Democracy of Suffering. Life on the Edge of Catastrophe, Philosophy in the Anthropocene*. McGill-Queen's University Press; 2019.
16. Ord T. *The Precipice: Existential Risk and the Future of Humanity*. Hachette Books; 2020.
17. Torres ÉP. Existential ethics. In: *Human Extinction: A History of the Science and Ethics of Annihilation*. Routledge/Taylor & Francis Group; 2024:199-457.
18. Pieper J. *The Four Cardinal Virtues*. University of Notre Dame Press; 1966.
19. Pieper J. *Faith, Hope, Love*. Ignatius Press; 1997.
20. Anscombe GEM. Modern moral philosophy. *Philosophy*. 1958;33(124):1-19.
21. Foot P. *Virtues and Vices and Other Essays in Moral Philosophy*. Clarendon Press; 2002.
22. Bryan CS. *For Goodness Sake: the Seven Basic Virtues.* Phrontistery Press; 2006.
23. Bryan CS, Babelay AM. Building character: a model for reflective practice. *Acad Med*. 2009;84(9):1283-1288.
24. Hursthouse R. Right action. In: *On Virtue Ethics*. Oxford University Press; 1999:25-42.
25. Swanton C. A virtue-ethical account of right action. In: *Virtue Ethics: A Pluralistic View*. Oxford University Press; 2003:228-248.
26. Sherman N. *Making a Necessity of Virtue: Aristotle and Kant on Virtue.* Cambridge University Press; 1997.
27. Hooker B. Does moral virtue constitute a benefit to the agent? In: Crisp R, ed. *How Should One Live? Essays on the Virtues*. Oxford University Press; 2003:141-155.
28. Sherman N. The choices of character. In: *The Fabric of Character: Aristotle's Theory of Virtue*. Clarendon Press; 1989:56-117.
29. Peterson C, Seligman MEP. *Character Strengths and Virtues: A Handbook and Classification*. American Psychological Association; 2004.
30. Banicki K. Positive psychology on character strengths and virtues: a disquieting suggestion. *New Ideas Psychol*. 2014;33(1):21-34.
31. Potter VR. *Bioethics: Bridge to the Future*. Prentice-Hall; 1971.
32. Fuller RB. *Operating Manual for Spaceship Earth*. Southern Illinois University Press; 1969.
33. Kirsch A. *The Revolt Against Humanity: Imagining a Future Without Us*. Columbia Global Reports; 2023.
34. Gould SJ. *Wonderful Life: The Burgess Shale and the Nature of History*. WW Norton & Co; 1989.
35. Kaczmarek P, Beard S. Human extinction and our obligations to the past. *Utilitas*. 2020;32(2):199-208.
36. Schubert S, Caviola L, Faber NS. The psychology of existential risk: moral judgments about human extinction. *Sci Rep*. 2019;9(1):15100.
37. Frankel C. *Extinctions: From Dinosaurs to You*. University of Chicago Press; 2024.

38. Riedener S. Human extinction from a Thomist perspective. In: Riedener S, Roser D, Huppenbauer M, eds. *Effective Altruism and Religion: Synergies, Tensions, Dialogue*. Nomos; 2021:187-210.
39. Sideris LH. Resisting de-extinction. The uses and misuses of wonder. In: Kidwell JH, Skrimshire S, eds. *Extinction and Religion*. Indiana University Press; 2024:293-332.
40. Unger RM. *Governing the World Without World Government*. Verso; 2022.
41. Gilad O, Freeman D. *Global Democracy: The Key to Global Justice*. Democracy Without Borders; 2022.
42. Torres ÉP. *Human Extinction: A History of the Science and Ethics of Annihilation*. Routledge/Taylor & Francis Group; 2024.
43. Lo Sapio L. Bioethics and the ethics of extinction. *Sci Filos*. 2023;29:15-35.
44. Ballagh R. *Be Your Best Self: Ten Life-Changing Ideas to Reach Your Full Potential*. Allen & Unwin; 2024.
45. Bayer M. *Best Self: Be You, Only Better*. HarperCollins; 2021.
46. Pigliucci M. *The Quest for Character: What the Story of Socrates and Alcibiades Teaches Us About Our Search for Good Leaders*. Basic Books; 2022.
47. Ross A. *The Raging 2020s: Companies, Countries, People—and the Fight for Our Future*. Penguin Books; 2022.
48. May J, Workman CI, Haas J, Han HY. The neuroscience of moral judgment: empirical and philosophical developments. In: De Brigard F, Sinnott-Armstrong W, eds. *Neuroscience and Philosophy*. MIT Press; 2022:17-48.
49. Yoder KJ, Decety J. The good, the bad, and the just: justice sensitivity predicts neural response during moral evaluation of actions performed by others. *J Neurosci*. 2014;34(12):4161-4166.
50. Vaillant GE. Positive emotions, spirituality and the practice of psychiatry. *Mens Sana Monogr*. 2008;6(1):48-62.
51. Rim JI, Ojeda JC, Svob C, et al. Current understanding of religion, spirituality, and their neurobiological correlates. *Harv Rev Psychiatry*. 2019;27(5):303-316.
52. Rinne P, Lahnakoski JM, Saarimäki H, Tavast M, Sams M, Henriksson L. Six types of loves differentially recruit reward and social cognition brain areas. *Cereb Cortex*. 2024;34(8):bhae331.
53. Takano R, Nomura M. Neural representations of awe: distinguishing common and distinct neural mechanisms. *Emotion*. 2022;22(4):669-677.
54. Sternberg RJ, ed. *Wisdom: Its Nature, Origins, and Development*. Cambridge University Press; 1990.
55. Jeste DV, Lee EE. The emerging empirical science of wisdom: definition, measurement, neurobiology, longevity, and interventions. *Harv Rev Psychiatry*. 2019;27(3):127-140.
56. Zhang K, Shi J, Wang F, Ferrari M. Wisdom: meaning, structure, types, arguments, and future concerns. *Curr Psychol*. 2022;42(18):1-22.
57. Jeste DV, Graham SA, Nguyen TT, Depp CA, Lee EE, Kim HC. Beyond artificial intelligence: exploring artificial wisdom. *Int Psychogeriatr*. 2020;32(8):993-1001.
58. Deming P, Koenigs M. Functional neural correlates of psychopathy: a meta-analysis of MRI data. *Transl Psychiatry*. 2020;10(1):133.
59. Wang Q, Wei S, Im H, et al. Neuroanatomical and functional substrates of the greed personality trait. *Brain Struct Funct*. 2021;226(4):1269-1280.
60. Fitzduff M. *Our Brains at War: The Neuroscience of Conflict and Peacebuilding*. Oxford University Press; 2021.
61. Hursthouse R. *On Virtue Ethics*. Oxford University Press; 1999.

Charles S. Bryan, MD is the Heyward Gibbes Distinguished Professor Emeritus of Internal Medicine at the University of South Carolina School of Medicine Columbia. He formerly served as chair of the Department of Medicine and director of the Center for Bioethics and Medical Humanities at the University of South Carolina. His publications are mainly in the areas of infectious diseases, medical history, and medical biography, with particular interest in Sir William Osler.

Citation
AMA J Ethics. 2025;27(8):E611-618.

DOI
10.1001/amajethics.2025.611.

Conflict of Interest Disclosure
Contributor disclosed no conflicts of interest relevant to the content.

The viewpoints expressed in this article are those of the author(s) and do not necessarily reflect the views and policies of the AMA.

ISSN 2376-6980

AMA Journal of Ethics®
August 2025, Volume 27, Number 8: E619-623

ART OF MEDICINE

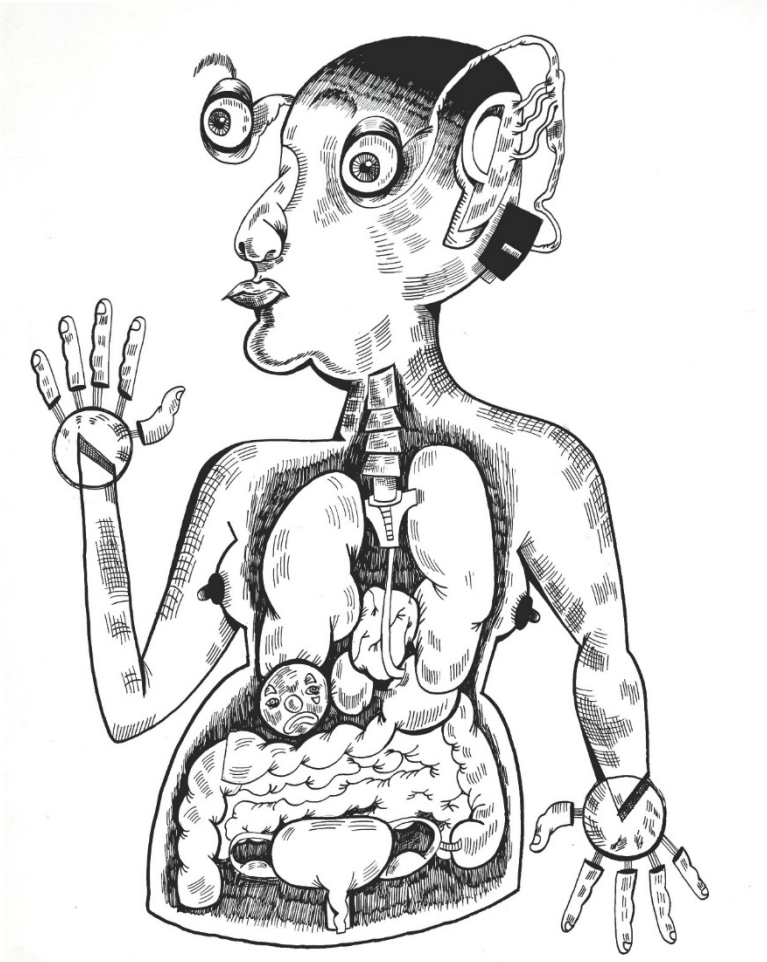
Self Portraits of a Woman in Peril

Kayla Mackenzie McCormick

Abstract

This series of self-portraits explores relationships between one's self and possible genetic and epigenetic sources of illnesses.

Figure 1. *The Call Is Coming From Inside My Body*



Media
Ink on paper.

Caption
Our organs, responsible for sustaining every function our bodies use to exist, are invisible to us, and they eventually fail us. Anxiety due to this invisibility can lead to a constant hum of thoughts about what could possibly be wrong. An apparatus on the figure's ear provides pathways to a mind trying to decipher physicians' words.

Figure 2. *I Would Like to Unzip Myself*

Media
Ink on paper.

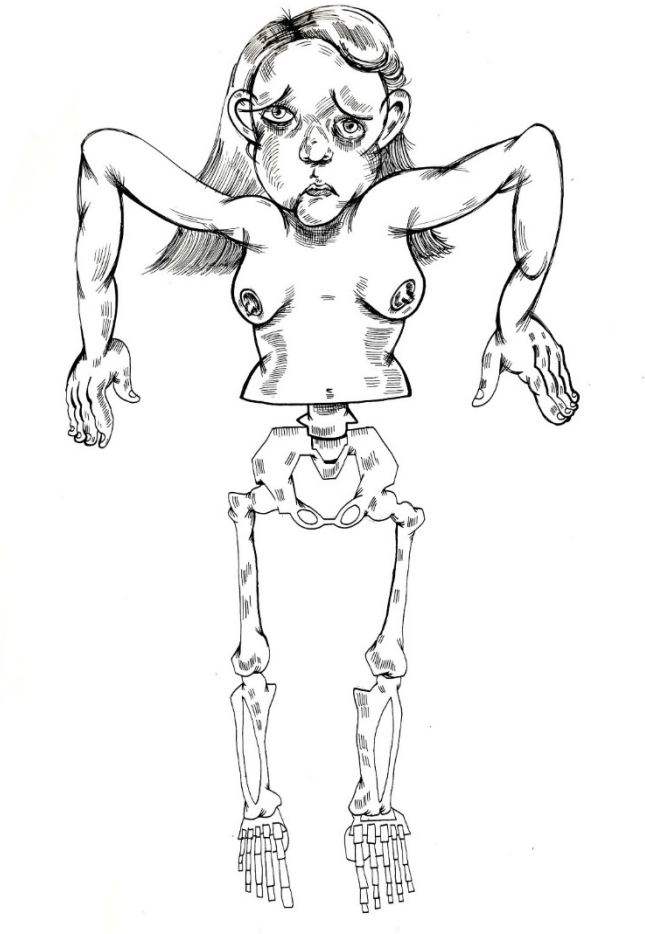
Caption
This work considers mourning the loss of a healthy body. The figure is pulling itself apart and also revealing a body, a self, and an anguished memory of lost vitality.

Figure 3. *Should I Cut Out Dairy?*

Media
Ink on paper.

Caption
In the history of humanity, now is the safest time to be alive, but despair about potential ailments based on an omnipresent, overwhelming flow of information could befall us.

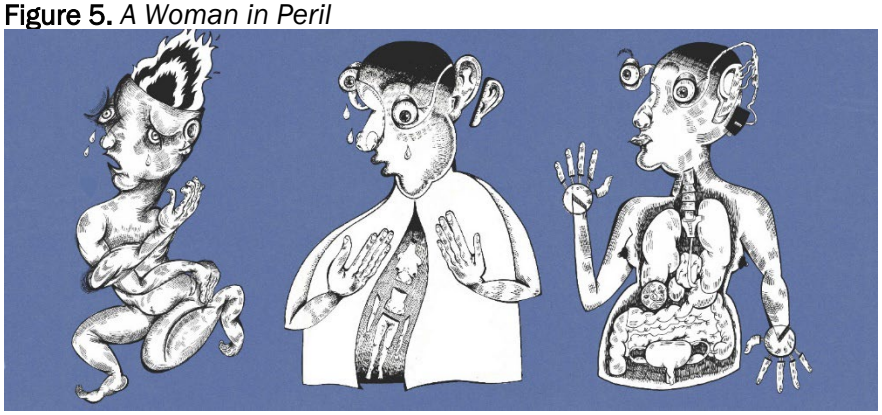
Figure 4. *It's Too Late, Isn't It?*



Media
Ink on paper.

Caption
This work considers fear of death.

Figure 5. *A Woman in Peril*



Media
Ink on paper, scanned and edited digitally.

Caption
Fear of our own mortality can be exacerbated by a history of chronic health conditions on both sides of a family, which is why all of these works are imbued with a sense of detached unease with human form.

Kayla Mackenzie McCormick is a student at the School of the Art Institute of Chicago in Illinois and was an Art of Medicine intern with the *AMA Journal of Ethics* in 2024.

Citation
AMA J Ethics. 2025;27(8):E619-623.

DOI
10.1001/amajethics.2025.619.

Conflict of Interest Disclosure
Contributor disclosed no conflicts of interest relevant to the content.

ISSN 2376-6980

AMA Journal of Ethics®
August 2025, Volume 27, Number 8: E624-627

ART OF MEDICINE

Radiate Youth?

Lio Barnhardt

Abstract

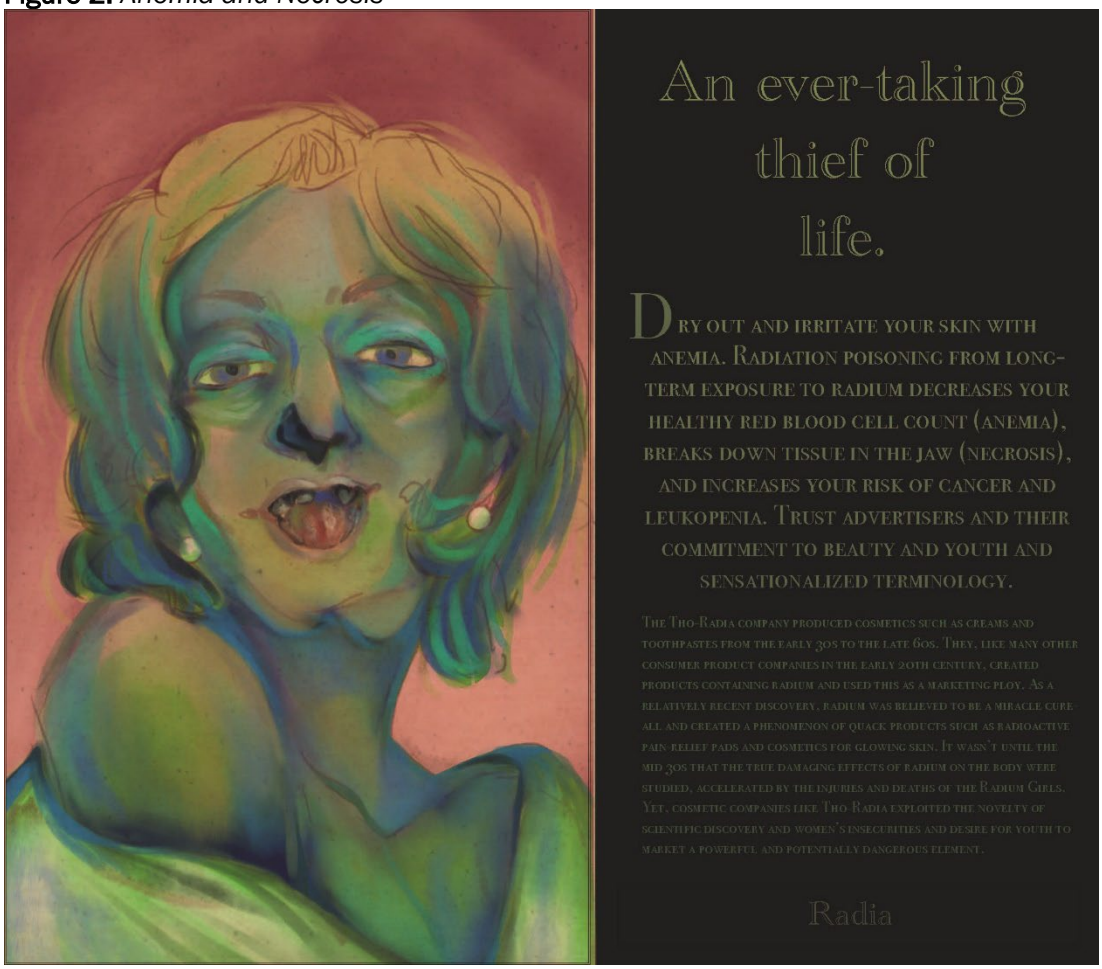
This diptych is a satirical advertisement for a fictional face cream, inspired by and based upon a radium health craze during the early 20th century.

Figure 1. *Radiation Rejuvenation*

Media
Procreate digital illustration.

Caption
This diptych contrasts desired with more likely outcomes of an imaginary product, inspired by actual advertising of Tho-Radia,[1] a French cosmetics company that promoted the beauty promise of its thorium- and radium-based skin care products.[2] The company's visual promotions featured the face of a woman that was lit from below, glowing beautifully yet mysteriously. This work is a creative variation on that iconic portrayal of white young womanhood, still widely recognizable and used today to promote allegedly science-based products of many kinds.

Figure 2. *Anemia and Necrosis*



Media
Procreate digital illustration.

Caption
The second image, juxtaposed to the first, de-romanticizes the ideals represented in the first image. As an artist, I've always been fascinated by pharmaceutical advertising.

From vintage newspaper print media to today's digital mix of misinformation and influencers, products have always vied for our attention. The appeal of the kind of advertising I explore here persists, and its early 20th-century expressions are worth reflecting upon today, as beauty continues to be used by manufacturers to draw our attention and prompt our purchases. Manufacturers such as the Radium Appliance Company of Los Angeles also advertised a variety of household products. Radium spas, pain-relieving radium pads,[3,4] and irradiated baths and drinking water[5] were promoted until their dangers were exposed in the1930s.[6] My artistic interests focus on the uses of women's bodies—especially faces—to bear the health risks of body images that are unattainable, especially over time.

References

1. Tho Radia. Museum of Radium. Accessed December 23, 2024. http://museumofradium.co.uk/tho-radia/
2. Tho-Radia items (ca 1950s). ORAU Museum of Radiation and Radioactivity. Accessed December 23, 2024. https://www.orau.org/health-physics-museum/collection/radioactive-quack-cures/pills-potions-and-other-miscellany/tho-radia-items.html
3. Radium spä (ca 1926-1930). ORAU Museum of Radiation and Radioactivity. Accessed December 23, 2024. https://www.orau.org/health-physics-museum/collection/radioactive-quack-cures/jars/radium-spa-1926-1930.html
4. Degnen's standard radio-active solar pad (1915-1930). ORAU Museum of Radiation and Radioactivity. Accessed December 23, 2024. https://www.orau.org/health-physics-museum/collection/radioactive-quack-cures/radioactive-pads/degnens-standard-radio-active-solar-pad.html
5. Braunold J. How pseudoscience generated US material and device regulations. *AMA J Ethics*. 2021;23(9):E721-E738.
6. Martland HS. The occurrence of malignancy in radioactive persons: a general review of data gathered in the study of the radium dial painters, with special reference to the occurrence of osteogenic sarcoma and the inter-relationship of certain blood diseases. *Am J Cancer*. 1931;15(4):2435-2516.

Lio Barnhardt is an undergraduate student at the School of the Art Institute of Chicago in Illinois. They are also an interdisciplinary filmmaker, a writer, and a comic artist with an interest in personal psychology, history, and women's mental and physical health.

Citation
AMA J Ethics. 2025;27(8):E624-627.

DOI
10.1001/amajethics.2025.624.

Conflict of Interest Disclosure
Contributor disclosed no conflicts of interest relevant to the content.

The viewpoints expressed in this article are those of the author(s) and do not necessarily reflect the views and policies of the AMA.

ISSN 2376-6980