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## Food Safety & Consumer Choices: Lake Victoria's Algal Blooms

Investigating the Impact of Persisting Harmful Algal Blooms on Consumer Choices

## Redefining "Health" Through Cross-Cultural Lenses: Analyzing Ameliorative Skepticism

As a Solution to Health Through the Lens of Buddhism and Hinduism

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# Letter from the Editors

Dear reader,

We are excited to present the fifth issue of the Cornell Undergraduate Research Journal (CURJ). CURJ is Cornell's peer-reviewed bi-annual publication of exemplary research work from undergraduates across many disciplines. We aim to allow all students to showcase their work to their peers and the general public, foster intellectual discussion and collaboration, and provide a range of academic perspectives.

Due to logistical challenges we faced last semester, we were unable to publish an issue, but we are back with a new publication. Many members of our staff who have long been dedicated to CURJ are now leaders on our team, working hard to make the journal the best it can be. Additionally, this semester came with an influx of new members, many of them freshmen who are passionate about what we do while sharing new ideas essential for pushing CURJ forward. These changes did not come without challenges, but we are very proud of the team we have built, and their persistence to weather any storm.

In addition to giving thanks to our staff members who have been working for months to develop the Fall 2024 issue, we would also like to applaud each student who submitted their work for publication in this issue. This journal is only possible due to the diligent work of all the student researchers who have submitted their projects to CURJ. The primary purpose of CURJ is to highlight these projects and publish them for a greater audience to see. It would not have been possible without the contribution of Cornell's undergraduate researchers. Furthermore, the dedication of graduate reviewers and faculty advisors who bring the hard work of each Cornell student's unique manuscript to the forefront must be mentioned. Leading the ever-growing teams that stitch these subjects together has been a pleasure and hopefully brings CURJ one step closer to the vision of our founder, Victoria Alkin.

CURJ has always focused on ensuring the Cornell community can learn about research across all subjects. This issue spans diverse topics from redefining health through cross-cultural lenses to observing how algal blooms affect food safety. Our manuscripts highlight the importance of disseminating information that students with all interests can learn from.

We are delighted to share the fifth issue of the Cornell Undergraduate Research Journal with you and hope you enjoy reading the edition as much as we enjoyed producing it.

Sincerely,

Isaac Chang Irene Hwang

CURJ

CORNELL UNDERGRADUATE RESEARCH JOURNAL

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# Food Safety and Consumer Choices: The Impact of Lake Victoria's Algal Blooms

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## Abstract

Harmful Algal Blooms (HABs) in freshwater ecosystems worldwide are a growing threat to both human health and the health of aquatic ecosystems. In East Africa, HABs threaten the livelihoods and health of the more than 42 million people who live in the Lake Victoria basin. This paper provides an overview of current research around harmful algal blooms and their impacts on human health and the surrounding environment, particularly in the Lake Victoria basin. Since fish is an important food source in this area, understanding how food safety concerns from HABs influence consumer choices is crucial to any policy response. By exploring current literature around discrete choice experiments (DCEs), I detail the possibility of using DCEs to understand how harmful algal blooms impact consumer choices in Lake Victoria, Kenya. As a relatively new approach to choice experiments, with research especially lacking in developing countries, the research for using DCEs to study consumer choices around food safety is scarce. The impact of HABs on consumer choices, especially in the Lake Victoria basin, presents a gap in literature that requires further research.

**Keywords:** discrete choice experiment, Lake Victoria, harmful algal blooms, food safety

## Summary Statement

This paper explores the impact of harmful algal blooms (HABs) on food safety and consumer choices. In particular, I focus on the increasing prevalence of blooms in Lake Victoria, Kenya, as the presence of HABs threatens the livelihoods and health of the more than 42 million people who live in the Lake Victoria basin. By reviewing the impact of HABs on the safety of eating fish and the potential for this to change consumer choices, I explore what current literature can tell us about the impact of HABs in Lake Victoria, Kenya. My findings highlight the severity of the impact of HABs and the danger they pose to human health and food safety, underscoring the need for further research and increased awareness about HABs and their influence on communities.

## Background

In Africa, high population growth along major river basins has increased land use and pollution, putting pressure on the aquatic ecosystem. Namely, the Lake Victoria basin is home to more than 42 million people and is bordered by three countries, Kenya, Uganda, and Tanzania, serving as an essential resource for food and water in East Africa. As the world's second largest freshwater lake, Lake Victoria has a shoreline of 3,500 km and a surface area of 68,000 km$^2$ (Olokotum et al., 2020).


**Figure 1 (right):** Map of Lake Victoria and surrounding countries in East Africa

Issues such as a changing fishing dynamic and eutrophication have contributed to the presence of cyanobacteria blooms in the water, primarily due to human population growth and subsequent human activities. Increasing human activities such as farming, housing construction, industrial activities, and solid and liquid waste discharge can result in increased nutrient pollution in the lake, leading to a higher occurrence of cyanobacteria blooms (Olokotum et al., 2020). These cyanobacteria blooms can produce microcystins, inhibiting protein phosphatases and contaminating the water (WHO Guidelines, 2021). This paper will focus on the impact of Lake Victoria's HABs in Kenya, although harmful algal blooms are a pressing public health crisis worldwide. As these blooms become increasingly prevalent, fully understanding their impact on local fish consumers and markets will be pivotal in informing policy responses.

This paper conducts a literature review to assess the state of the art in the impact of HABs, particularly in Lake Victoria, Kenya, on the ecosystem and the surrounding community. Additionally, it covers recent advancements in discrete choice experiments, particularly those around food safety, to explore how discrete choice experiments can be used to understand the influence of HABs on food choices. HABs have the potential to impact human health, especially through fish consumption. There is a notable gap in the literature regarding how algal blooms in Lake Victoria impact human health, especially with food consumption. There was also a deficit in discrete choice experiments conducted in Kenya and developing countries in general. Evidently, the amount of prior research closely related to the project is lacking, leaving room for future exploration.

## Methods

This project focused on creating a comprehensive literature review of current research on consumer choices of fish in Lake Victoria, Kenya. From June 5th to August 14th, I conducted a literature update using Google Scholar (https://scholar.google.com) and Web of Science (https://www.webofscience.com/) to find research papers about discrete choice experiments, particularly those around food safety and based in Lake Victoria, Kenya or nearby locations. My literature review was done as part of an existing project under Dr. Kathryn Fiorella, Dr. Kira Lancker, and Dr. Christopher B. Barrett at Cornell University. I began my review using the past papers used on the project (Table 1) and looked for papers that cited those papers in an attempt to compile recent developments, ideally from the last five to ten years. While I did use papers from further back than five to ten years, my goal with this research was to analyze recent advances in the field. After that, I used the Web of Science to search using different combinations of keywords such as "Harmful Algal Blooms," "algal blooms," "Discrete Choice Experiments," "Food Safety," "Kenya," and "Lake Victoria."

By searching "discrete choice experiments" on the Web of Science, I found 7,325 papers. I then narrowed my search by filtering for papers from Kenya, Tanzania, or Uganda (the countries bordering Lake Victoria, yielding 82 results and eventually down to 38 when further focusing on Kenya. When "discrete choice experiments" was searched with "Lake Victoria," the search yielded two papers, neither relevant to this research project. Table 2 provides a visual for these searches. After repeating this process with other keywords, I found fifteen key papers that provided valuable insight into the current state of discrete choice experiments, especially those around harmful algal blooms and food safety. It is important to note that one potential bias in these papers is that I limited my study to papers written in English, which may exclude other perspectives. However, it is generally rare that this type of literature is not written in English.

**Table 1:** Papers used as a starting point and the number of citations they had in Google Scholar.

| Paper | Citations |
|---|---|
| Aura, C.M., Nyamweya, C.S., Njiru, J.M., Odoli, C., Musa, S., Ogari, Z., Abila, R., Okeyo, R., Oketch, R., 2019. Using fish landing sites and markets information towards quantification of the blue economy to enhance fisheries management. Fisheries Management and Ecology 26, 141–152. doi: 10.1111/fme.12334. | 27 |
| Chen, J., Xie, P., Li, L., Xu, J., 2009. First identification of the hepatotoxic microcystins in the serum of a chronically exposed human population together with indication of hepatocellular damage. Toxicological Sciences 108, 81–89. doi: 10.1093/toxsci/kfp009. | 473 |
| Fitzgeorge, R., Clarke, S., Keevil, C., 1994. Routes of intoxication, in: Codd, G.A., Jefferies, T.M., Keevil, C.W., Potter, E. (Eds.), Detection methods for cyanobacterial toxins. The Royal Society of Chemistry, Cambridge, pp. 69–74. | 171 |
| Fitzgerald, D.J., Cunliffe, D.A., Burch, M.D., 1999. Development of health alerts for cyanobacteria and related toxins in drinking water in south australia. Environmental Toxicology 14, 203–209. doi: 10.1002/(SICI)1522-7278(199902)14:1<203::AID-TOX26>3.0.CO;2-X. | 123 |
| Flores, N.M., Miller, T.R., Stockwell, J.D., 2018. A Global Analysis of the Relationship between Concentrations of Microcystins in Water and Fish. Frontiers in Marine Science 5, 30. doi: 10.3389/fmars.2018.00030. | 45 |
| Greer, B., Meneely, J., Elliot, C., 2018. Uptake and accumulation of Microcystin-LR based on exposure through drinking water: An animal model assessing the human health risk. Scientific reports 8. doi:10.1038/s41598-018-23312-7. | 86 |
| Johnson, R., Orme, B., 2003. Getting the Most from CBC. Sawtooth Software, Inc. Sequim: Sawtooth Software Research Paper Series. | 223 |
| Lancaster, K.J., 1966. A new approach to consumer theory. Journal of Political Economy 74, 132–157. doi: 10.1086/259131. | 17337 |
| Matsushima, R.N., Ohta, T., Nishiwaki, S., Suganuma, M., Kohyama, K., Ishikawa, T., Carmichael, W., Fujiki, H., 1992. Liver tumor promotion by the cyanobacterial cyclic peptide toxin microcystin-LR. Journal of Cancer Research and Clinical Oncology 118, 420–424. doi: 10.1007/BF01629424. | 1063 |
| Mbonde, A.S., Sitoki, L., Kurmayer, R., 2015. Phytoplankton composition and microcystin concentrations in open and closed bays of Lake Victoria, Tanzania. Aquatic Ecosystem Health & Management 18, 212–220. doi: 10.1080/14634988.2015.1011030. | 31 |

**Table 1, continued.**

| Paper | Citations |
|---|---|
| McFadden, D., 1974. Conditional logit analysis of qualitative choice behavior, in: Zarem-bka, P. (Ed.), Frontiers of Econometrics. Academic Press, New York. chapter 4, pp. 105–142. | 25370 |
| Mulvenna, V., Dale, K., Priestly, B., Mueller, U., Humpage, A., Shaw, G., Allinson, G., Falconer, I., 2012. Health risk assessment for cyanobacterial toxins in seafood. International Journal of Environmental Research and Public Health 9, 807–820. doi: 10.3390/ijerph9030807. | 81 |
| Poste, A.E., Hecky, R.E., Guildford, S.J., 2011. Evaluating microcystin exposure risk through fish consumption. Environmental Science & Technology 45, 5806–5811. doi: 10.1021/es200285c. | 195 |
| Roegner, A., Sitoki, L., Weirich, C., Corman, J., Owage, D., Umami, M., Odada, E., Miruka, J., Ogari, Z., Smith, W., Rejmankova, E., Miller, T.R., 2020. Harmful algal blooms threaten the health of peri-urban fisher communities: A case study in kisumu bay, lake victoria, kenya. Exposure and Health doi: 10.1007/s12403-019-00342-8. | 27 |
| Rousu, M.C., Colson, G., Corrigan, J.R., Grebitus, C., Loureiro, M.L., 2015. Deception in experiments: Towards guidelines on use in applied economics research. Applied Economic Perspectives and Policy 37, 524–536. doi: 10.1093/aepp/ppv002. | 43 |
| Simiyu, B.M., Oduor, S.O., Rohrlack, T., Sitoki, L., Kurmayer, R., 2018. Microcystin content in phytoplankton and in small fish from eutrophic nyanza gulf, lake victoria, kenya. Toxins 10. doi: 10.3390/toxins10070275. | 46 |
| Sitoki, L., Kurmayer, R., Rott, E., 2012. Spatial variation of phytoplankton composition, biovolume, and resulting microcystin concentrations in the nyanza gulf (lake victoria, kenya). Hydrobiologia 691, 109–122. | 136 |
| WHO, 2017. Chemical fact sheets. In: Guidelines for drinking-water quality: 4th edn. Incorporating the First Addendum, License: CCBY-NC-SA 3.0 IGO. Technical Report. World Health Organization (WHO). Geneva. | 120 |

**Table 2:** Web of Science database search for "discrete choice experiments" with different restrictions and the corresponding results for each search.

| Search | Restrictions | Number of Results |
|---|---|---|
| "discrete choice experiments" | (AND) "Kenya" OR "Tanzania" | 7,325 |
| "discrete choice experiments" | OR "Uganda" | 82 |
| "discrete choice experiments" | (AND) "Kenya" | 38 |
| "discrete choice experiments" | (AND) "Lake Victoria" | 2 |

# Results

## Algal Blooms and Human Health

Eutrophication caused by human activities in bodies of water worldwide has resulted in an increase in the formation of harmful algal blooms. These algal blooms contain the cyanobacteria *Microcystis*, which can contaminate drinking water and the food chain (Sitoki et al., 2012). This issue is only further exacerbated by the warming temperatures due to climate change (Griffith & Gobler, 2020). Microcystins produced from algal blooms can be dangerous as they can act as an inhibitor for protein phosphatases, generally targeting the liver. In humans, exposure to the harmful toxins from HABs comes through multiple routes: dermal contact, ingestion of contaminated waters, fish, or scum, and inhalation. Dermal contact with toxins produced by cyanobacteria can result in skin irritation, and sometimes severe contact dermatitis or severe skin lesions may result. Inhalation of aerosols containing toxins from HABs has been linked to respiratory symptoms and discomfort (Roegner et al., 2023; WHO Guidelines, 2021). Other health risks such as gastrointestinal illness, and even poisoning (especially for animals) are a concern with the recreational use of freshwater with cyanobacteria (WHO Recreation Criteria 1999).

## Fish Consumption and Algal Blooms in Lake Victoria

In Lake Victoria, toxic algal blooms have significant effects on the community, especially in terms of public health. Research has shown that during the dry season, the average microcystin concentrations in drinking water from Winam Gulf, Lake Victoria, consistently exceeded the WHO's guidelines (Roegner et al., 2023). The World Health Organization (WHO) guidelines indicate that 20,000 cyanobacterial cells/ml in water puts individuals at risk for short-term health risks (WHO Recreation Criteria 1999). When sampling water quality in Kisumu Bay, Lake Victoria, for eight months, researchers found that 83.7% of surface-level samples exceeded the guidelines for short-term health risks (Roegner et al., 2023). Long-term health risks from recreational activities are associated with cyanobacteria cell counts of 100,000 cells/ml (WHO Recreation Criteria 1999). In the study, 68.5% of the surface water samples exceeded the 100,000 guideline (Roegner et al., 2023).

Fish from Lake Victoria serve as an important source of food for those in the surrounding communities, adding to the concern about cyanobacteria blooms and the health risks associated with consuming fish from an area where there has been a bloom (Olokotum et al., 2020). During the bloom season, seafood consumption can pose health risks due to microcystins for fishing communities, especially the more vulnerable subpopulations. In a study of Winam Gulf that looked at fish consumption and HABs, the top five most common fish catches reported when surveying 400 female household heads were reported to be (in order from most to least frequent): adult *Lates niloticus*, *Rastrineobola argentea*, adult *Oreochromis nolticus*, *Clarias gariepinus*, and *Synodontis victoriae*. Notably, it was found that the average daily intakes of small species, like *R. argentea*, can be 5 to 10 times the permissible limit from the lifetime tolerable daily intake for chronic exposure of 0.04 μg per kg body weight per day throughout a lifetime (Toxic Cyanobacteria in Water 2021; Roegner et al., 2023). Research indicates that seafood consumption is a health concern for the fishing communities in the Lake Victoria Basin, especially for children and immunocompromised people, due to the presence of microcystins. However, despite the risk of toxin consumption from fish, in the Lake Victoria survey, fish consumption did not emerge as something subjects perceived as a health risk when surveyed, while water was more of a widespread concern (Roegner et al., 2023).

**Figure 2:** Algal Blooms in Kisumu Bay, Lake Victoria, Kenya.

## Discrete Choice Experiments

Further research is required to properly understand how consumers of fish perceive the risk of toxins from fish consumption in the areas surrounding Lake Victoria, and how consumers might change behavior if informed of that risk. One way to accomplish this goal would be through the use of a discrete choice experiment. Discrete Choice Experiments (DCEs) have grown rapidly as a way to understand food choices. In DCEs, subjects are given a context (e.g., buying food in a grocery store) and then are asked to choose between various alternatives. This method allows researchers to elicit willingness to pay estimates, market shares, and/or elasticities of goods (Lizin et al., 2022). DCEs try to model real-world decisions better than regular choice experiments by attempting to mirror real-world shopping situations. For example, experiment subjects may be offered different food choices at different prices and then asked to choose what to buy, like they would in the store. DCEs can help researchers examine the everyday tradeoffs shoppers face in real time (Caputo & Scarpa, 2022). In the context of Lake Victoria, Kenya, discrete choice experiments could be used to understand the tradeoffs everyday people face when deciding whether or not to purchase fish that may pose health risks due to HABs. For example, consumers may choose to eat potentially dangerous fish because of a lack of information about food safety or because of socioeconomic factors, two different reasons that require different policy solutions. Using discrete choice experiments, researchers could help determine what exactly is influencing food choices.

Choice experiments can also be used as a method of environmental valuation by showing consumers' tradeoffs and using it to elicit their willingness to pay (WTP) for that environmental resource (Hanley et al., 1998). Unfortunately, the discrete choice experiment method is still relatively new, which comes with its drawbacks. One downfall of DCEs is that they often tend to disregard how the subject's choice can influence the overall dynamic of the market. For example, products tend to have substitutes or compliments whose demand depends on that product. Conducting this experiment will likely require reducing the choices of fish consumers to certain fish, which introduces bias as consumers will be substituting between fewer choices than they would in real life (Marette et al., 2008). For example, in the real world, consumers may substitute fish for other sources of protein, not just different types of fish. In the case of conducting a DCE in fish markets, a significant restriction on the experiment is the fact that pricing constraints may mean that it is only feasible to offer subjects choice options with restricted quantities. Research indicates that willingness to pay may be overestimated in existing DCE studies, as they tend to rely on smaller experimental quantities. Furthermore, this impact has been shown to be more likely

to affect high-income consumers than low-income consumers, which could skew results (Lin et al., 2023).

One of the primary challenges that could arise from designing an experiment to be conducted in Lake Victoria, Kenya, stems from the fact that the majority of past DCEs have been conducted in Western or developed countries. The limited literature does play a role in restricting the level of preparation available to understand the potential nuances of the area, especially when trying to limit potential biases (Lizin et al., 2022). However, a similar DCE on fish products and consumer preferences was conducted in four European countries (Germany, Italy, Spain, and the UK). Generally, there tend to be positive premiums for safety and health claims around fish (Menozzi et al., 2020). In the European study, nutrition and health claim estimates had a positive impact on consumers' utility of 0.142. Additionally, consumers were willing to pay a premium for fish with nutrition and health claims of an average of €0.51 per kg. Unfortunately, the exact premiums that exist in the Lake Victoria, Kenya, fish market are still unclear (Menozzi et al., 2020).

### Designing Discrete Choice Experiments

Cultural and language barriers in this experiment provide a unique challenge when determining study design. To reduce bias or other complications, previous studies have emphasized the importance of pretesting questionnaires to vet potential problems before they occur. Additional aids, such as pictures, diagrams, symbols, etc., will be crucial to help assuage the effect of a potential lack of literacy among study participants (Mangham et al., 2009). The challenge of delivering information about food safety to participants directly is further complicated because the Lake Victoria fish market is home to multiple types of fish with varying toxicity levels, even varying throughout the year. A previous study in France looked at how women respond to health advisories around fish consumption, both in the lab and in the field, to examine how to make health advisories more successful. Subjects were tested on their ability to recall what fish species were mentioned in the recommendation, and it was found that only a minority of the subjects remembered the species. Most consumers only remembered a few species. More specifically, the study found a low correlation between percent recall and consumption habits, indicating that the women had better memory for fish species that they consumed more frequently. Their experiment did find that there was a decrease in fish consumption after receiving health information, even though the majority of consumers did not remember specific species (Marette et al., 2008). When applied to a Lake Victoria consumer choice experiment, these findings may provide insight into how people will respond to health advisories around microcystins, especially because, like in the French experiment, this experiment will involve multiple species that the consumers need to remember.

## Conclusion

The presence of cyanobacteria blooms in Lake Victoria, particularly those that exceed the WHO's guidelines for recreation, threatens the people who rely on the lake as a livelihood and a source of food and water. This much is clear from the literature. However, the lack of studies specifically focused on this topic, especially regarding the impact of HABs on consumer choices, leaves gaps for further research on how these blooms may affect the surrounding community. While a search for "discrete choice experiments" on the Web of Science yielded approximately 7,325 results, many of these results were from developed countries. For example, of the 7,325 results, 3,982 of those results came out of either the USA, England, or Australia. A search for "discrete choice experiments" in Kenya only had 38 results on the Web of Science. My searches did not yield any discrete choice experiments directly looking at the impact of microcystins in fish on consumer choice experiments, leaving room for future research on this subject.

Looking towards the future, this literature review could be improved by looking at more databases for literature besides the two that I utilized (Web of Science and Google Scholar), as well as looking at other sources, like newspapers. I mainly focused on research papers, so sources like reports, policies, or newspapers could provide more useful information. Additionally, looking at databases in other languages could yield more results, as this search was constrained to papers written in English, which may exclude some papers that were written by African research teams or news articles from Kenya. My research was also focused primarily on recent updates in the literature from the past decade. Looking at papers published further back in time may yield more results.

Finally, beyond research, educating the public about preventing HABs and the safety precautions to take when they occur is crucial, both in Lake Victoria and worldwide. As the world continues to grow in population and climate change worsens, the frequency of these blooms may increase. To adequately protect against the future challenges that may come, further research on HABs and their impacts, along with possible solutions, is vital.

## Acknowledgments

Thank you to my research mentors, Dr. Kathryn Fiorella, Dr. Kira Lancker, and Dr. Christopher B. Barrett, for their leadership and the opportunity to participate in their project. Thank you to Dr. Peter McIntyre, Angela Nankabirwa, Horace Owiti Onyango, Eric Teplitz, Olivia Cheung and Kiran Ganga, who also worked on this project. I am also grateful to my graduate student mentor, Jose Guridi, from the Laidlaw Scholars Program, for his support while I was conducting research and writing this paper. Finally, I am very grateful to the Laidlaw Scholars Program and Cornell University for the opportunity and the funding to work on this project.

## References

Caputo, V., & Scarpa, R. (2022). Methodological Advances in Food Choice Experiments and Modeling: Current Practices, Challenges, and Future Research Directions. In Annual Review of Resource Economics (Vol. 14, Issue Volume 14, 2022, pp. 63–90). Annual Reviews. https://doi.org/10.1146/annurev-resource-111820-023242

Environmental Protection Agency. (2022, September 1). *World Health Organization (WHO) 1999 Guideline Values for Cyanobacteria in Freshwater*. EPA. https://www.epa.gov/cyanohabs/world-health-organization-who-1999-guideline-values-cyanobacteria-freshwater.

Griffith, A. W., & Gobler, C. J. (2020). Harmful algal blooms: A climate change co-stressor in marine and freshwater ecosystems. *Harmful Algae, 91*, 101590. https://doi.org/10.1016/j.hal.2019.03.008

*Guidelines on Recreational Water Quality: Volume 1 Coastal and Fresh Waters.* (2021). World Health Organization. http://www.ncbi.nlm.nih.gov/books/NBK572628/

Hanley, N., Wright, R. E., & Adamowicz, V. (1998). Using Choice Experiments to Value the Environment. *Environmental and Resource Economics, 11*(3), 413–428. https://doi.org/10.1023/A:1008287310583

Lin, W., Ortega, D. L., & Caputo, V. (2023). Experimental quantity, mental budgeting and food choice: A discrete choice experiment application. *European Review of Agricultural Economics, 50*(2), 457–496. https://doi.org/10.1093/erae/jbac017

Lizin, S., Rousseau, S., Kessels, R., Meulders, M., Pepermans, G., Speelman, S., Vandebroek, M., Van Den Broeck, G., Van Loo, E. J., & Verbeke, W. (2022). The state of the art of discrete choice experiments in food research. F*ood Quality and Preference, 102*, 104678. https://doi.org/10.1016/j.foodqual.2022.104678

Mangham, L. J., Hanson, K., & McPake, B. (2009). How to do (or not to do) ... Designing a discrete choice experiment for application in a low-income country. *Health Policy and Planning, 24*(2), 151–158. https://doi.org/10.1093/heapol/czn047

Marette, S., Roosen, J., & Blanchemanche, S. (2008). Health information and substitution between fish: Lessons from laboratory and field experiments. *Food Policy, 33*(3), 197–208. https://doi.org/10.1016/j.foodpol.2007.10.003

Menozzi, D., Nguyen, T. T., Sogari, G., Taskov, D., Lucas, S., Castro-Rial, J. L. S., & Mora, C. (2020). Consumers' Preferences and Willingness to Pay for Fish Products with Health and Environmental Labels: Evidence from Five European Countries. *Nutrients, 12(*9), 2650. https://doi.org/10.3390/nu12092650

Olokotum, M., Mitroi, V., Troussellier, M., Semyalo, R., Bernard, C., Montuelle, B., Okello, W., Quiblier, C., & Humbert, J.-F. (2020). A review of the socioecological causes and consequences of cyanobacterial blooms in Lake Victoria. *Harmful Algae, 96*, 101829. https://doi.org/10.1016/j.hal.2020.101829

ResearchGate. (2019, March). Climate change adaptation, social capital, and the performance of polycentric governance institutions [Scientific figure]. Retrieved April 18, 2024, from https://www.researchgate.net/figure/Map-of-the-Lake-Victoria-region-in-East-Africa-wit h-fieldwork-locations-indicated_fig1_330959366.

Roegner, A. (2020, September). NSF to fund study on far-reaching algal bloom impacts. *Cornell Chronicle*. Retrieved from https://news.cornell.edu/stories/2020/09/nsf-fund-study-far-reaching-algal-bloom-impacts.

Roegner, A. F., Corman, J. R., Sitoki, L. M., Kwena, Z. A., Ogari, Z., Miruka, J. B., Xiong, A., Weirich, C., Aura, C. M., & Miller, T. R. (2023). Impacts of algal blooms and microcystins in fish on small-scale fishers in Winam Gulf, Lake Victoria: Implications for health and livelihood. *Ecology and Society, 28*(1). https://doi.org/10.5751/ES-13860-280149

Simiyu, B. M., Oduor, S. O., Rohrlack, T., Sitoki, L., & Kurmayer, R. (2018). Microcystin Content in Phytoplankton and in Small Fish from Eutrophic Nyanza Gulf, Lake Victoria, Kenya. *Toxins, 10*(7), 275. https://doi.org/10.3390/toxins10070275

Sitoki, L., Kurmayer, R., & Rott, E. (2012). Spatial variation of phytoplankton composition, biovolume, and resulting microcystin concentrations in the Nyanza Gulf (Lake Victoria, Kenya). *Hydrobiologia, 691*(1), 109–122. https://doi.org/10.1007/s10750-012-1062-8

# A Critique of Ameliorative Skepticism Through the Lens of Buddhism and Hinduism

By Naveen Sharma
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## Abstract

Elizabeth Barnes' book *Health Problems: Philosophical Puzzles About the Nature of Health* conducts philosophical examination of the nature of health. She coined the term *ameliorative skepticism*: a theory stating that we should not try to fix or redefine our current definitions of health. Instead, Barnes composed the term to show that health has no coherent, unified definition that works for every person or scenario. This idea from Barnes leaves us asking questions: how is ameliorative skepticism practiced across the world? Can we practically apply it? If so, how do we go about it? This essay will address three major points regarding Barnes' understanding of health. First, the essay will analyze the concept of ameliorative skepticism regarding Barnes' separation of health from well-being. Second, it will explore the philosophy of health, the general practices, foundational beliefs, and specific cases through the lens of Buddhism and Hinduism practices. These studies will be used to critique Barnes' idea of ameliorative skepticism and show how cultures have lived through unifying health and wellness for treatment. Third, the essay will explore two possible solutions that arise from the critique: either acceleration or rejection of ameliorative skepticism. It will fill in the cultural perspective gaps in Barnes' writing of health through the themes and ideas of Buddhist and Hindu practices.

## Introduction

*Health Problems* covers multiple aspects of health to properly conceptualize it, or, at least to attempt to create discourse. Barnes stresses the biological importance of health, but also the political, socioeconomic, and personal values that surround health and maintain it. She states that there is nothing that can explain every way health is important, as "the ways that health matters to us often pull against each other" (Barnes, 2023, p. 6). Barnes argues that this creates a version of health that, depending on the context, is inconsistent and incompatible with some people's goals (Barnes, p. 6).

The goal of Barnes' book is to establish the argument of ameliorative skepticism. Ameliorative skepticism is the concept that we should be skeptical about health because "there is no specific, coherent thing that health is; no specific theory or concept or definition of health that can do everything we require"(Barnes, p. 7). In her statement, she explains that she does not think there is a better term for "health," or a need for another meaning of being healthy. In her view, we need to accept the messiness of health rather than replace it. Ameliorative skepticism is meant to help explain why it is such a mess, but it is still useful to talk about health in that manner (Barnes, p. 7). A major reason for this messiness is the differences between health and well-being. What Barnes ends up pushing towards is the idea that health is connected to well-being, though they are not the same. For example, someone could feel wonderful with their physical body, but they could have a cancerous tumor growing in their lungs that they do not notice. Yes, they have a phenomenal well-being, but they are not healthy, as their body is under attack by the tumor that will eventually get worse without treatment.

The messiness of health is due to the myriad of factors that health encapsulates. There are distinctive roles, such as biological

phenomenological, normative, and political, but there is also the task of having to explain the nature of all these roles (Barnes, pp. 203–204). As Barnes states, health is a mess that infects all parts of health as a theory, so narrowing down health to only specific categories or factors does not change the mess left behind (Barnes, p. 215).

For something to be healthy, Barnes describes it as being flourishing or thriving (Barnes, p. 193). Barnes divides this into a physical and mental separation, where a person can be physically thriving but mentally unwell or physically unwell and mentally thriving. For example, a person who is unknowingly living with pancreatic cancer may feel mentally well but is physically dying. This is why Barnes is skeptical of and consistently tries to avoid, allowing well-being to become a part of health. Health is survival while wellness is feeling. To Barnes, they should be separate, and separating them would cause us to have "lost the distinct complexity" (Barnes, p. 72). Barnes states that there are some things of value that we can ignore and still live a great life, such as music and art. However, disregarding health is not possible because then we would be dead (Barnes, p. 67).

In accepting ameliorative skepticism, Barnes argues that "there's no account of health that can do the legitimate work we want and need it to do" (Barnes, p. 203). Barnes is stating that no definition of health will be sufficient for everyone. There will always be at least one person whose illness, condition, or lifestyle won't fit the chosen definition. It is these questions that show the importance of considering cross-cultural connections. Barnes may not adequately find a way to encapsulate all the different aspects of health, but it would be beneficial to see how health is defined and practiced outside of the Eurocentric frame that she uses.

This poses the question: Who exactly is the "our" referring to when Barnes says, "Our understanding of health is such a mess" (Barnes, p. 205). Throughout Barnes' book, there is one glaring aspect missing. Barnes addresses Eurocentric theories and practices of health; she considers health and the language of health from European and Anglo-American points of view. The "our" that Barnes is referring to are the people who live within those health standards and practices that, throughout the book, she criticizes as inadequate. Yet, she does not state the regional boundaries of the philosophical nature of health which she is referring to. The audience of the essay is the people living in Eurocentric societies, and the book is written only in the context of those societies without drawing much influence from abroad.

Cultures, especially those based on religions, are tricky to analyze. Religion can be considered a culture, but there are subcultures created from religion based on interpretations of the religion. For example, within Buddhism are three major branches: Theravada, Mahayana, and Vajrayana. Within the three major branches, there are a myriad of subcultures each with their own languages. Since we do not have the time or ability to study every scripture of Buddhism and Hinduism, this essay will give a brief overview of cultural health conceptions within Buddhist and Hindu practices to show their implementation through examples and case studies. This way, the theory is shown, and its practical application is established to create ideas on dealing with health and wellness. It is important to take note that translations of texts from the written language can reshape its original and intended meaning.

## Buddhism

Starting with Buddhism, it is important to understand that natural laws govern Buddhism, and one of those natural laws is the law of *kamma*. This aspect governs human actions that inhibit a moral or ethical value, and it is a law that determines the results of actions. It is the idea of doing good to receive good or doing bad to receive bad (Chaiyasuj, 2015, pp. 299–300). The importance of kamma regarding health is that in Buddhism, health is taken on a community basis. Doing good for oneself and

for others, is encouraged, and this translates into good health for all.

In Buddhism, practicing mindfulness is the proper way to protect and strengthen an individual's health (Mahanarongchai, 2015, p. 265). Mindfulness means training in emotional balance, where "one can learn to be happy by distinguishing between the way things are and the conceptual superimpositions one projects upon them" (Mahanarongchai, p. 276). Happiness is understood in Buddhism as "a state of flourishing that arises from the mental balance from which an insight into the nature of reality… is derived" (Mahanarongchai, p. 276). In other words, it is not a sensual pleasure, but rather a deep sense of well-being, compassion, and interconnectivity with community and nature (Mahanarongchai, p. 276). This indicates an early origin point for the derivatives of health in Buddhism, as mindfulness is the practice of sustaining happiness. This shows how the Buddhist ideals of healthcare are more about the societal impacts when combating personal health. It is expected then that the practice of health in Buddhism has a focus on community healing and current affairs, even if it is through one patient or individual. This implies that Buddhism includes well-being as a component of health.

The practice of health in Thailand is rooted in Buddhism. Naturalism is the main attitude this branch of Buddhism places towards human beings and health (Sirikanchana, 2015, p. 284). Broken down into different sub-positions, naturalism is the idea that nothing exists beyond the laws of nature. One of the sub-positions is the composite nature of human beings, which is under the idea that every person possesses a mind-body connection that is governed by both internal and external causes (Sirikanchana, p. 284). It is the belief that the mind and body are interrelated entities, where deterioration of health is caused by either an imbalance of the natural elements that make our body or a mental attachment to pain and suffering (Sirikanchana, p. 287). Another is the belief in the law of nature, which postulates that "one needs to understand all the natural causes of one's experience to be free from both physical and mental problems" (Sirikanchana, p. 286). This means that a person must always be aware of themselves, including their actions and habits, since these will always pertain to their health. This idea is supported by a fundamental principle of Buddhism — the principle that "one is taught to suffer only physically but not mentally," (Sirikanchana, p. 286). This concept shows that proper care of the mind will translate to care of the body. From this, we gather that Thai Buddhism takes in all worldly and natural factors as health and that people must maintain their health through understanding and knowing themselves, which is first and foremost a mental aspect.

Buddhist culture in Thailand attends to health uniquely. Instead of following the Buddhist scriptures, which emphasize wisdom and critical thinking, Thai Buddhism focuses more on holding faith in certain people or beings (Sirikanchana, p. 287). This can be translated as the work of doctors. A doctor would usually recommend their patient to meditate along with their treatment. On top of that, they are "encouraged to take an optimistic view of life and cheerful spirit to maintain his/her good health and to speed up his/her recovery from illness" (Sirikanchana, p. 287). This usually involves other practices of mindfulness that are prescribed alongside medicinal treatments (Mahanarongchai, p. 278). It is not reckless happiness, but an optimism that finds balance between the mind and body. Doctors have a strong connection to their patients through Thai Buddhism, and this is bounded through faith in the doctor, but also through the doctor's ability to understand Buddhist teachings such as meditation, yoga, and medicine (Sirikanchana, p. 290).

In the *Vinaya*, which are the precepts of Buddhist scripture, we can find the concept of holistic treatment. "Holistic" refers to "the circular relationship of mind and body as well as their simple interaction" (Sirikanchana, p. 290).

Not only does it mean caring for both the physicality and mentality of a patient, but it means that they should be treated without comparison to others. Everyone has their journey of changing nature, so therefore, everyone's mind and body connections are different and require specific care and treatment (Sirikanchana, pp. 288–289).

The difference between Thai Buddhist perspectives of health and Eurocentric views of health can be summed up with one sentence: "Unlike Western medicine in which medical techniques and methods can be generalized, Thai Buddhist medicine needs knowledge of a micro-world of human life in which everything is changing according to reality constructed by human experience" (Sirikanchana, p. 291). This is connected with holistic treatment. Eurocentric medical practices have a set standard for who is to receive treatment and how much of it, usually almost always based on the body and not the mind. Thai Buddhist methods are dependent specifically on the individual and their ability to balance their mind and body connection. This shows a unification of health and well-being that counters the argument proposed by Barnes.

There are four healthcare systems in Thailand: Western medicine, Thai Traditional Medicine (TTM), Indigenous or folk medicine, and alternative medicine. Western medicine mostly replaced all other types of medicine in the early 20th century, but in the 1970s, a revival of TTM began (Chaiyasuj, 2015, pp. 293–294). Through Buddhist Principles, medicine, and philosophy, TTM treats people through indigenous Thai practices rather than through Western consumerist methods. The limitations of its applications, as they were not holistic, drew people away from Western notions of health (Chaiyasuj, p. 299). Through TTM, illnesses are categorized by five factors, including powers of nature, powers of the universe, supernatural powers, behavior, and Kimijati, meaning microorganisms or parasites (Chaiyasuj, p. 300). TTM is a holistic form of medicine that encourages a focus on balancing bodily and mental needs, but most importantly, it focuses on the origin and causation of illness or sickness. Instead of simply treating a patient, Buddhism searches for the ontological questions surrounding an individual's health to determine treatments and also preventative measures for the future to connect everyone back to the laws of nature.

To summarize, Buddhist notions of health have both a selfless and selfish component. The health of an individual has effects on the community they are a part of, as the community is always involved with health, but it is only possible to become healthy again through taking care of oneself. It is a responsibility to focus on oneself through personal and holistic methods of healthcare, and only then will one be able to benefit society. There are many practices of mindfulness to maintain health and happiness that are encouraged throughout communities. Buddhist understandings of health are based on all surrounding factors in a person's life.

## Hinduism

Of the many Hindu texts, the *Vedas* are the main and most studied. In the journey for happiness, the Vedic approach is non-dualism, or the holistic approach (Bhargava, 2016, p. 3). This means that the soul and the body exist in harmony, rather than in conflict or "duel" with each other. Additionally, in Hinduism, there are two aspects of life: internal and external. Internal consists of the intellect and the soul, and external consists of the body and mind. These are considered the four philosophical ends of human life, and each has its own needs (Bhargava, p. 4).

Physical objects are needed for the body, while fulfilling desire is the demand of the mind. The body is the least respected, as it is fulfilled through shelter, food, and clothing, usually met with money. The mind has necessities as well, but also wants luxuries (differing from Buddhism, where desires are pushed away). Together, the mind and body, which are the

external aspects of life, make up what is called the secular aspect of life (Bhargava, p. 4).

The internal aspects of life, which are intellect and soul, are the foundational aspects of health. Intellect oversees the activities and desires of the body and mind. This keeps the mind and body from desiring unnecessary materials and items (Bhargava, p. 4); in other words, a knowledgeable intellect will keep one from greed. With health, this can translate in numerous ways. Being knowledgeable about drunk driving makes one drive sober and safer. Being knowledgeable about tooth decay makes one brush one's teeth. This is the internal mechanism of Hinduism.

*Dharma* is just as important. In short, "*Dharma* means service before self" (Bhargava, p. 4). This is the concept of selflessness that is a major aspect of Hinduism. It is the path to liberation, which is the ultimate end of human life (Bhargava, p. 4). What this means for health is that society comes before the self. It does not indicate that one should sacrifice oneself, but rather that when there is an issue of health, it becomes an issue for the whole community. This also ties in the idea in Hinduism that sinful activities lead to suffering (Bakre, 2016, p. 11).

Understanding a message in the Yajurveda, part of the *Vedas*, is necessary for understanding health in Hinduism:

> *One who devotes himself to knowledge and action both, simultaneously, he gets over death by action and attains immortality by knowledge.' Death stands for change, immortality stands for stability; both go together. The difference between sentient and the insentient is not of fundamental nature, the sentient beings have senses, where as, the insentient have no sense except touch. This means obliteration of distinction between individual and God (Bhargava, p. 4).*

The idea of no distinction between individuals and God is often misunderstood. The idea of Gods in Hinduism is that the Gods are projections of oneself. It is self, or a projection of self, and not literal Gods that rule from above. They are incarnations that represent a reflection of us that are invoked or summoned. This recognizes the interconnectedness of every person in society. Specifically, it shows how a health problem of one person can manifest to affect every person, as every person under this belief is connected through projections of Gods.

The Vedic view on health includes two unique concepts: well-being and moral features. To the *Vedas*, a community state of being morally righteous and properly behaved helps an individual move forward to meet their goals. Health itself is an end, called *moksa*, and it is embodied through teleological notions (Balan, 2016, p. 28). For example, to obtain the "highest state of Brahman," one needs a healthy body and mind, as the mind and body are instruments to attain *moksa* (Balan, p. 32). The *Vedas* show us that the health of the mind and body requires a balance of both earthly and spiritual needs. This includes a balance of diet and lifestyle by the laws of nature to help us obtain our goals of bringing health, happiness, and prosperity (Balan, p. 32). Going back to *Dharma*, liberation is a necessary factor for health. It is a teleological and spiritual liberation through knowledge that highlights moral righteousness and virtue (Balan, p. 32).

Happiness is an important virtue in Hinduism. The narrow sense of happiness is the fulfillment of selfish desires. In a wider sense, happiness is to love and be loved (Bakre, p. 13). Good health is necessary to maintain happiness, and it starts with the body. Specifically, the main parts of physical health and happiness in Hinduism, according to the *Vedas*, are diet, a daily routine, and benevolent conduct, meaning studying the *Vedas* (Pandey, 2016, pp. 40–42). A disregard for these parts is deemed as carelessness, laziness, or negligence (Pandey, p. 40). The famous Indian book, the *Kama* Sutra, has a section that specifies a proper gentleman routine in the morning and throughout the day (Vatsyayana, 2011, p. 16). The *Vedas* even include specifics for the three parts of maintaining physical health. The idea behind studying the *Vedas* as a factor of health is community. If everyone is

dedicated to the *Vedas* and studies it as a way of life, the community will better understand the health and well-being of everyone.

Health in Hinduism is a revolutionary prospect that is built on discipline and dedication to study. Happiness is therefore also discipline, where well-being is factored into health. To give and receive love requires good health for someone and the people around them. The focus on health throughout the *Vedas* is based on well-being. The *Vedas* indicate a community aspect to health and happiness that is attained through services, balancing desires with necessities, and care of the body throughout everyone. Hinduism's most unique feature is its combination of health and well-being with morality. The focus is as much on the individual person looking to improve their health as it is on the impacts their treatment will have on the community.

## Comparisons with Barnes

Buddhism and Hinduism's most noticeable commonality is that well-being is a part of health. This goes against the concepts Barnes established, as she argues for the two to be seen as distinct. For Buddhists and Hindus, when one's well-being is disrupted, the overall state of mind and being is also disrupted. This can cause breaks in routine, new desires, or even issues such as poor dietary habits. The effect may only be marginal, but as Hinduism and Buddhism show, disrupted well-being still affects health. This means thinking about the temporal properties of health and well-being.

We can utilize Barnes' soccer example. Barnes states that one can sacrifice health to increase well-being. For example, imagine someone wants to play soccer, but is more prone to injury due to age and past injuries. Barnes states that if that person chooses to keep playing anyway, it sacrifices health for well-being. Buddhism and Hinduism would disagree; they would state that both health and well-being are disrupted. Remember in Hinduism, intellect is supposed to control the desires of the mind and body. If one properly follows Hinduism, which would mean continuing a path of accumulating knowledge, one would be able to distinguish that playing soccer is not the brightest idea healthwise. One may have great well-being in the beginning, but in the future, when an injury occurs, it will drop right with health. From a Buddhist perspective, playing soccer despite the risk would show a mental attachment to pain and suffering. Like Hinduism, it would think of the future rather than the state of positive well-being in the present.

The challenges of health and well-being are strongly divided between Western and Eastern practices. The divide is how they value and treat health, not just in its components and appendages. Hinduism and Buddhism share the quality that health, and therefore well-being and happiness, involve the whole community. Although they have different ways of experiencing and handling their health, these two cultures share a bond with health that manifests in the entire community. The holistic bonds created build community as they encourage health to be a fluid and open conception to live in harmony. Western practices are based on individual encounters with health problems that are established broadly. The community aspect of health is not emphasized, instead, the focus is specifically on how the individual feels. There are set treatments for specific illnesses, and the health practices have become so commercialized that it has become less about assisting a patient and more about selling pharmaceutical drugs. There is more emphasis on curing the current situation and less on preventing it from happening in the future (Mckee and Stuckler, 2012, pp. 238–239).

The difference between the two practices could make it almost impossible to implement knowledge from one field of practice to another. Buddhism and Hinduism are based on community values of discipline, liberation,

selflessness, and cooperation, which are completely lacking in Eurocentric practices of health. The skills and knowledge would not transfer properly or would be met with frustration or confusion as they are meant for a different cultural climate. I propose two paths to take in handling the mess of health. It is either through an acceleration of Barnes' ameliorative skepticism, or a rejection of it.

To say that there needs to be an acceleration of ameliorative skepticism means that Barnes could've gone further. In regards to health, ameliorative skepticism says that there is no coherent or non-messy way of conceptualizing health (Barnes, p. 223). This idea is like both the Buddhist and Hindu concepts of holistic treatment. Holistic treatment, as previously stated, is the treatment of a patient individually from others. Each patient, or simply, each person with a health problem, is seen only from their situation without comparison. This will push the boundaries of Barnes' ameliorative skepticism because health is not only a mess to conceptualize, but also it is even broader than she initially comprehended. The holistic approach opens new possibilities for health that focus on the intrinsic value of how a person views their health through their goals and community.

The second option is a complete rejection of ameliorative skepticism. This option would be to adopt community values of Eastern cultures that have a defined and studied definition of health in Western society. Why is ameliorative skepticism even an option when there are communities that have successfully figured out how to define and study health? There would not be a need for ameliorative skepticism in places where Hinduism and Buddhism are practiced because health already has its definition and practice that has been in effect for hundreds of years. This option would be a restructuring of the health system in Eurocentric nations entirely to a system that would establish and promote stronger community bonds. Health would be based not just on an individual suffering, but throughout the connection that has to the environment and society altogether.

The second option is less realistic. It would completely restructure everything most people in Eurocentric areas know about health. It would be difficult to change because it would require education for decades of education to shift the culture of health. With that being said, the methods shown by Buddhism and Hinduism have been in practice for hundreds of years. They have been effective through their existence and practice into the present day. It might even be an indication that the West's inability to define health is a catastrophe in its health development.

## Conclusion

Elizabeth Barnes provides insight into the issues surrounding perspectives of health in Eurocentric contexts. Ameliorative skepticism allows for open and creative solutions on how to work with health, a concept muddied by contested definitions. While Barnes has struggled with the idea of defining health and landing on ameliorative skepticism as the solution, Hindu and Buddhist views of health have defined health and have practiced it effectively across the world for millenia. Hindu and Buddhist practices unify the concepts of health and wellness in their practices, something that Barnes had fervently argued against. Moving forward, especially with a subject as broad as health, it is necessary to compare ideas and theories through practices across the world before assigning conclusions.

If Barnes had considered the views of health models outside the Eurocentric frame, this essay would have taken a different turn. Implementing the Hindu and Buddhist concepts of health into Eurocentric models of health would open a radical conversation on the healthcare industry. Hospitals would have to function differently, medical students would have new curriculums, and present doctors would have to relearn a new culture of health to properly treat their patients. While the work to

accomplish that is monumental, it would allow patients to be treated not just in their illness, but in the future prevention of their illness. A revolutionary change in healthcare is the only way to have a societal and personal protection of health and well-being.

Eurocentric health authorities distinguish "outside" practices and views of health as "alternative" or "complementary" rather than taking on the work to implement it within their own practice. It is as if those practices are not adequate in answering complex assessments of health and well-being. The irony is that many of them have already developed systems that work to answer the questions raised by Barnes thousands of years ago. It is time to be skeptical of those who claim authority over conversations on healthcare that lack knowledge of the global, interconnected practices of health and well-being. We must go beyond the practices that remain isolated to one model of healthcare founded on notions of superiority that "other" different interpretations.

## References


Bakre, A. (2016). An Approach to Health and Happiness as reflected in the Atharvaveda. In S. Tiwari (Ed.), *Health and Happiness in Indian Tradition* (pp. 9–15). Pratibha Prakashan.

Balan, S. (2016). Vedic View on Health: Some Reflections on the Intricacies. In S. Tiwari (Ed.), *Health and Happiness in Indian Tradition* (pp. 28–38). Pratibha Prakashan.

Barnes, E. (2023). *Health Problems: Philosophical Puzzles About the Nature of Health*. Oxford University Press.

Bhargava, D. (2016). The Holistic Approach of the Vedas towards Happiness. In S. Tiwari (Ed.), *Health and Happiness in Indian Tradition* (pp. 3–8). Pratibha Prakashan.

Chaiyasuj, A. (2015). Thai Traditional Medicine in Thailand Health System. In F. Lan, F. Wallner (Eds.), *The Concepts of Health and Disease: From the Viewpoint of Four Cultures* (pp. 293–307). Traugott Bautz.

Mahanarongchai, S. (2015). The Wheel of Life and Buddhist Understanding of Health. In F. Lan, F. Wallner (Eds.), *The Concepts of Health and Disease: From the Viewpoint of Four Cultures* (pp. 265–307). Traugott Bautz.

McKee, M., & Stuckler, D. (2012). The Crisis of Capitalism and the Marketisation of Health Care: The Implications for Public Health Professionals. *Journal of Public Health Research, 1*(3), 236–239. https://doi.org/10.4081/jphr.2012.e37.

Pandey, N. (2016). Divine Message of Vedas for Health and Happiness. In S. Tiwari (Ed.), *Health and Happiness in Indian Tradition* (pp. 39–43). Pratibha Prakashan.

Sirikanchana, P. (2015). Thai Buddhism on Health. In F. Lan, F. Wallner (Eds.), T*he Concepts of Health and Disease: From the Viewpoint of Four Cultures* (pp. 283–292). Traugott Bautz.

Vatsyayana. (2011). The Kama Sutra: *A Guide to the Art of Pleasure* (Deluxe ed.). (A. N. D. Haksar, Trans.). Penguin Group.

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