Check for updates

Received: 22 April 2024 | Accepted: 31 July 2024
DOI: 10.1002/agm2.12343

COMMENTARY

Aging Medicine Open Access WILEY

What are blue zones? An argument in favor of its definition based on the most successful model of biological aging

Ivan David Lozada-Martinez[1,2] | Juan-Manuel Anaya[1,2]

[1]Health Research and Innovation Center (CIISA), COOSALUD EPS, Cartagena, Colombia
[2]Universidad de la Costa, Barranquilla, Colombia

Correspondence
Ivan David Lozada-Martinez, Universidad de la Costa, Barranquilla, Colombia.
Email: ciisa@coosalud.com

The exhaustive and rigorous study of aging, especially healthy aging, constitutes a highly interesting area of research today, due to the demographic transition the world is undergoing with a dramatic increase in the proportion of older persons. Due to the imprecise capacity of health systems to be able to respond to this scenario,[1] a transformation and restructuring of priorities in public health and global health have been considered. In recent years, the United Nations declared the period between 2021 and 2030 as the decade of healthy aging, defining four principles that have the potential to impact the human rights of healthy longevity,[2] and the health outcomes of older persons.[3] These principles, accompanied by some objectives of the World Health Organization on aging and health, propose strengthening research on healthy longevity to impact, more than life expectancy, on healthy lifespan.[4]

The term "blue zone" was coined by Poulain et al.[5] who arbitrarily defined it as a geographical area with a higher proportion of male centenarians compared to female centenarians (which is commonly the opposite case) in Sardinia. Despite this, the term has been used heterogeneously in some studies on extreme longevity, referring to areas or populations with high rate of centenarians, high life expectancy/healthy lifespan, high proportion of octogenarians and nonagenarians (but not centenarians), or very low prevalence of age-related chronic diseases in aged over 80 years old.

Dan Buettner, an American explorer, and journalist, is known for disseminating information about some "well-documented" blue zones,[6] which can be explored through documentary films on National Geographic and the Netflix series called "Live to 100: Secrets of the Blue Zones." These zones include Okinawa in Japan, Sardinia in Italy, Nicoya in Costa Rica, Ikaria in Greece, and Loma Linda in California.[6] In these documentary films, anecdotes and experiences related to lifestyles, customs, and social behaviors typical of areas, where octogenarians, nonagenarians, and centenarians with favorable health phenotypes can be found, are shared. However, just as there are similarities, there are also significant differences in the demographic and clinical characteristics of these populations, which must be examined and discussed considering the evidence.

In a nonsystematic search in PubMed, there are no more than 12 documents published to January 2024 that include the term "blue zones" in their titles. What is even more intriguing, most of the available documents are reviews or correspondences where claims are made about lessons, outcomes, and special considerations regarding extreme longevity. These analyses often include people starting from the age of 65 (who are not extreme longevity candidates).[7] Therefore, it is evident that the initial definition by Poulain et al.[5] is not being met since they exclusively referred to centenarians. Interestingly, the author of the blue zone's documentary films presents some anecdotal recommendations for reaching the chronological age of 100, specifically referring to centenarians.[8] However, he does refer to Poulain et al.'s initial definition[5] which contradicts some of his statements in the documentary films. In some instances, he also refers to areas where life expectancy is relatively high but not enough to support a representative rate of centenarians.

This analysis is worth to discus, given that not necessarily in areas where there is a significantly high rate of octogenarians or nonagenarians compared to a reference average, regardless of whether these older persons have a favorable health phenotype or not, there is a significantly high rate of centenarians.

During the execution of the Colombian Centenarians Cohort Study (COOLCEN Cohort),[9] we made a geographical and demographic finding that exemplifies our stance on the discrepancy in concepts regarding the use of the term "blue zones." Through our

This is an open access article under the terms of the Creative Commons Attribution-NonCommercial License, which permits use, distribution and reproduction in any medium, provided the original work is properly cited and is not used for commercial purposes.
© 2024 The Author(s). *Aging Medicine* published by Beijing Hospital and John Wiley & Sons Australia, Ltd.

own analysis of the 2018 National Population and Housing Census of Colombia (the latest available data on the demographic behavior of this country),[10] we calculated the overall and sex-differentiated rate of the population aged 85 and older, as well as centenarians per 10,000 inhabitants, for each territorial division of Colombia (32 territorial divisions and 44,164,417 inhabitants) (Figure 1). Specifically, we identified that all five territorial divisions with the highest rate of the population aged 85 and older are different from the five territorial divisions with the highest rate of centenarians per 10,000 inhabitants. It would be expected that a blue zone should be characterized by having a population pattern with extreme longevity, reflected in a high rate of both octogenarians and nonagenarians as well as centenarians. However, we did not observe this pattern in our country. Then, what defines a blue zone?

Many authors arbitrarily and heterogeneously use the term "blue zones" without an operational definition, affecting the validity, applicability, and reproducibility of results concerning longevity, centenarians, and healthy aging. The study of what would be the most successful model of healthy aging in the world (centenarians), demands rigorousness, seriousness, and scientifically robust foundation to extrapolate evidence that is useful, valid, and relevant to global health objectives regarding aging and human rights in healthy aging.[2,11] Within this framework, it is a mistake to investigate and make health-related assertions using concepts of global concern lacking methodological definition and validity, impeding falsifiability and reproducibility of the obtained results.

We propose that as defined by Poulain and colleagues,[5] a blue zone should be considered as the geographical area where there is a prevalence of centenarians higher than expected by demography (regardless of the centenarian's gender). This theoretically reflects an area that possesses unique characteristics, considering its population and environment, which allow the development of genuine healthy extreme longevity. This longevity is characterized by a chronological age of 100 years or older but a biological age that is younger (a slower aging process compared to the general population). Therefore, exclusive reference is made to the concept of the most successful model of healthy aging, as well as the opportunities and challenges in the care, study, and research of extreme longevity and healthy aging. Due to the relevance of this topic and the mentioned priorities, we make a call to establish an operational consensus on blue zones, based on the centenarian population, to avoid the emergence of significant biases that may affect the applicability of results regarding healthy aging.

AUTHOR CONTRIBUTIONS

IDLM and JMA conceptualized the study design, reviewed the literature, curated data, reviewed and confirmed abstracted data, wrote the first draft of the manuscript, and all authors reviewed and revised subsequent and finalized the draft of the manuscript.

ACKNOWLEDGMENTS

None.

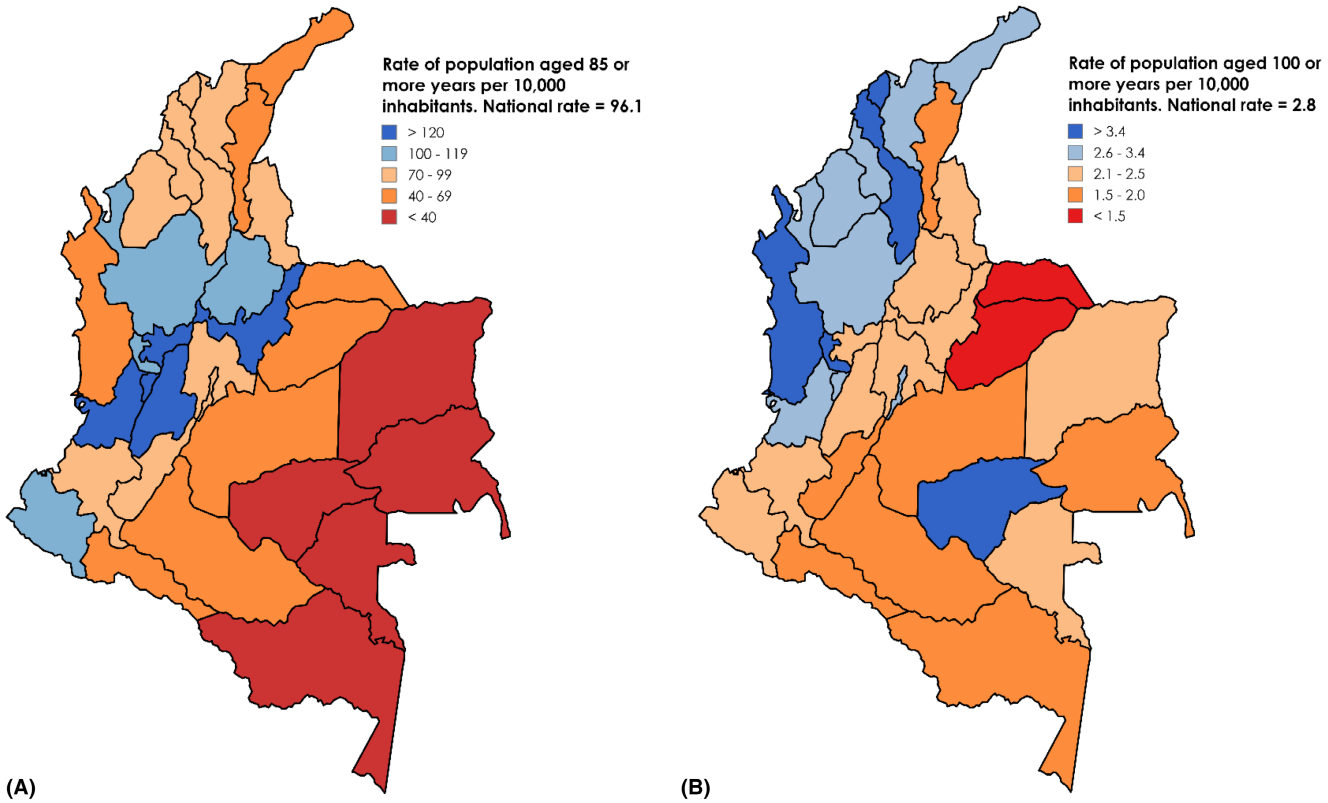

FIGURE 1 Comparison between rate of older persons aged 85 or more years, and centenarians per 10,000 inhabitants, disaggregated by territorial divisions of Colombia. (A) Rate of population aged 85 or more years. (B) Rate of centenarians.

24750360, 2024, 4, Downloaded from https://onlinelibrary.wiley.com/doi/10.1002/agm2.12343 by NICE, National Institute for Health and Care Excellence, Wiley Online Library on [15/11/2025]. See the Terms and Conditions (https://onlinelibrary.wiley.com/terms-and-conditions) on Wiley Online Library for rules of use; OA articles are governed by the applicable Creative Commons License

FUNDING INFORMATION

None.

CONFLICT OF INTEREST STATEMENT

The authors have no conflicts of interest to disclose.

DATA AVAILABILITY STATEMENT

The data sets used and/or analyzed during the current study are available from the corresponding author upon reasonable request.

ETHICS STATEMENT

Not applicable.

ORCID

Ivan David Lozada-Martinez https://orcid.org/0000-0002-1960-7334
Juan-Manuel Anaya https://orcid.org/0000-0002-6444-1249

REFERENCES

1. Gonzalez-Bautista E, Morsch P, Mathur M, Goncalves Bos A, Hommes C, Vega E. Assessing health system responsiveness to the needs of older people. *Rev Panam Salud Publica*. 2021;45:1-7. doi:10.26633/RPSP.2021.127
2. The Lancet Healthy Longevity. Human rights for healthy longevity. *Lancet Healthy Longev*. 2023;4(10):e517. doi:10.1016/S2666-7568(23)00196-4
3. United Nations. The Decade of Healthy Aging [Internet]. [cited 2023 Aug 24]. Available from: https://www.decadeofhealthyageing.org/
4. World Health Organization. Ageing and health [Internet]. [cited 2023 Aug 29]. Available from: https://www.who.int/news-room/fact-sheets/detail/ageing-and-health
5. Poulain M, Pes GM, Grasland C, et al. Identification of a geographic area characterized by extreme longevity in the Sardinia Island: the AKEA study. *Exp Gerontol*. 2004;39(9):1423-1429. doi:10.1016/j.exger.2004.06.016
6. Blue Zones. Original Blue Zones Explorations [Internet]. [cited 2023 Oct 19]. Available from: https://www.bluezones.com/exploration/
7. Chrysohoou C, Pitsavos C, Lazaros G, Skoumas J, Tousoulis D, Stefanadis C. Determinants of all-cause mortality and incidence of cardiovascular disease (2009 to 2013) in older adults: the Ikaria study of the blue zones. *Angiology*. 2016;67(6):541-548. doi:10.1177/0003319715603185
8. Buettner D, Skemp S. Blue zones: lessons from the World's longest lived. *Am J Lifestyle Med*. 2016;10(5):318-321. doi:10.1177/1559827616637066
9. Lozada-Martinez ID, Marín JS, Castelblanco-Toro SM, et al. Demographics and clinical characteristics of a new population of centenarians in Colombia. *COOLCEN Cohort Arch Gerontol Geriatrics Plus*. 2024;1(1):100006. doi:10.1016/j.aggp.2024.100006
10. National Administrative Department of Statistics of Colombia. 2018 National Population and Housing Census of Colombia [Internet]. 2019 [cited 2024 Feb 10]. Available from: https://www.dane.gov.co/index.php/estadisticas-por-tema/demografia-y-poblacion/censo-nacional-de-poblacion-y-vivenda-2018
11. Lozada-Martinez I, Anaya JM. Missing centenarians are an international concern. *Nat Aging*. 2024;4(3):277-278. doi:10.1038/s43587-024-00587-2

How to cite this article: Lozada-Martinez ID, Anaya J-M. What are blue zones? An argument in favor of its definition based on the most successful model of biological aging. *Aging Med*. 2024;7:446-448. doi:10.1002/agm2.12343

24750360, 2024, 4, Downloaded from https://onlinelibrary.wiley.com/doi/10.1002/agm2.12343 by NICE, National Institute for Health and Care Excellence, Wiley Online Library on [15/11/2025]. See the Terms and Conditions (https://onlinelibrary.wiley.com/terms-and-conditions) on Wiley Online Library for rules of use; OA articles are governed by the applicable Creative Commons License