

Biodiversity and environment in chronically ill older adults: a scoping review

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Abstract

Considering the influence of the environment on the immunobiography of older adults, this study aimed to identify and describe the main impacts of biodiversity and the environment on the quality of life of chronically ill older adults. This is a scoping review conducted in accordance with the PRISMA-ScR recommendations, including articles published in English, Spanish, and Portuguese over the past ten years. Based on the descriptors "environment and public health," "quality of life," "elderly," and "chronic disease," 115 articles from MEDLINE, 106 from Scopus, and 25 from the Virtual Health Library were assessed; however, only five studies met the established inclusion criteria. To ensure a safer and healthier aging process for the population, urgent actions are needed to reduce pollution, improve urban accessibility, and promote healthier lifestyle habits.

Keywords: Environment and public health. Quality of life. Elderly. Chronic disease.

Resumo

Biodiversidade e ambiente em idosos cronicamente doentes: revisão de escopo

Considerando a influência ambiental na imunobiografia dos idosos, este estudo teve como objetivo identificar e descrever as principais repercussões da biodiversidade e do ambiente na qualidade de vida de idosos cronicamente doentes. Trata-se de revisão de escopo, a partir das recomendações do PRISMA-ScR, que incluiu artigos em inglês, espanhol e português publicados nos últimos dez anos. Com base nos descritores "environment and public health", "quality of life", "elderly" e "chronic disease", foram avaliados 115 artigos da Medline, 106 da Scopus e 25 da Biblioteca Virtual em Saúde, mas apenas cinco estudos atenderam aos critérios aqui estabelecidos. Para garantir envelhecimento mais seguro e saudável da população, são necessárias ações urgentes para redução da poluição, maior acessibilidade urbana e estímulo de hábitos de vida mais salutar.

Palavras-chave: Meio ambiente e saúde pública. Qualidade de vida. Idoso. Doença crônica.

Resumen

Biodiversidad y medio ambiente en personas mayores con enfermedades crónicas: revisión de alcance

Considerando la influencia del ambiente en la inmunobiografía de las personas mayores, este estudio tuvo como objetivo identificar y describir las principales repercusiones de la biodiversidad y del medio ambiente sobre la calidad de vida de las personas mayores con enfermedades crónicas. Se trata de una revisión de alcance realizada de acuerdo con las recomendaciones de PRISMA-ScR, que incluyó artículos publicados en inglés, español y portugués durante los últimos diez años. Con base en los descriptores "environment and public health", "quality of life", "elderly" y "chronic disease", se evaluaron 115 artículos de MEDLINE, 106 de Scopus y 25 de la Biblioteca Virtual en Salud; sin embargo, solo cinco estudios cumplieron con los criterios de inclusión establecidos. Para garantizar un envejecimiento más seguro y saludable de la población, son necesarias acciones urgentes dirigidas a reducir la contaminación, mejorar la accesibilidad urbana y fomentar hábitos de vida más saludables.

Palabras clave: Medio ambiente y salud pública. Calidad de vida. Anciano. Enfermedad crónica.

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Aging is a complex biological process that involves gradual changes in the human body. Healthy aging in people aged over 65 years is called senescence, while senility is characterized by the onset of diseases in this age group^{1,2}. The healthy maturation of the human body and the pursuit of homeostasis with immunosenescence are intimately related to the environment and, therefore, factors such as climate change, biodiversity scarcity, consumption of ultra-processed foods, sun exposure, and excessive atmospheric pollution influence the onset of chronic diseases such as cancer^{3,4}.

The correlation between environmental determinants and pathological aging is widely known, as the advancement of senescence increases the time and burden of individual exposure, consolidating a deleterious exposome, that is, a set of harmful environmental factors to which individuals are exposed throughout life⁵.

The epidemiological context presents alarming data: in 2015, 52,000 deaths in Brazil were attributed to exposure to fine particulate matter (PM_{2.5}). Globally, there is a worsening trend: between 1990 and 2015, ozone pollution levels experienced by the population in countries such as Pakistan, India, Bangladesh, and Brazil increased by 14% to 25%. Given this interdependence between ecosystem integrity and human well-being, the Pan American Health Organization (PAHO) has established strategies to mitigate climate change, pollution, and biodiversity loss, under the transdisciplinary paradigm of One Health^{6,7}.

Notably, PAHO's main initiatives include the promotion of healthy environments, the encouragement of sustainable practices, and the strengthening of public policies focused on environmental determinants of health. The strategies emphasize social participation and research to boost environmental health surveillance, build the capacity of professionals, and foster collaboration among countries, seeking not only to improve population health but also to ensure the protection and preservation of the environment for future generations. The goals of the strategic plan include the Sustainable Health Agenda for the Americas 2018-2030 (ASSA 2030), which aims to achieve the Sustainable Development Goals related to health in the region⁷.

Such a broad issue justifies a scoping review to identify environmental determinant factors that influence the health of older adults with chronic diseases, with a multisectoral and integrated approach to address the challenges at the intersection between health and the environment. Therefore, this study aims to identify and describe the main consequences of biodiversity and the environment on the quality of life of chronically ill older adults.

Method

This is a scoping review following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA-ScR)⁸ protocol, based on a systematic search of scientific studies on the influence of the environment on aging with chronic illness. After analysis, the most relevant articles were chosen for a synthesis of studies to support the proposal of a scope of the most important environmental factors that influence the well-being of chronically ill older adults.

For this review, we established six steps: 1) Identification of the theme and selection of the research question for review; 2) Determination of study inclusion or exclusion criteria; 3) Definition of the information to be extracted from the selected scientific articles; 4) Quality Assessment of the research works by the Grading of Recommendations Assessment, Development and Evaluation (GRADE) system; 5) Interpretation of the results corresponding to the objectives; and 6) Conclusion of the review/synthesis of knowledge.

The online article search was based on the question: "What are the repercussions of biodiversity and the environment on the quality of life of older adults with chronic diseases?" The searched databases were the Medical Literature Analysis and Retrieval System Online (MEDLINE), Scopus, and the Virtual Health Library of Brazil (BVS), due to their concentration of a large portion of high-impact publications in health.

In addition, we used the following Descriptors in Health Sciences (DeCS): *meio ambiente e saúde pública AND qualidade de vida AND idoso AND doença crônica*. For international databases, we used

the MESH descriptors: *environment and public health AND quality of life AND aged AND chronic disease*.

Articles written in Portuguese, English, and Spanish and published over a ten-year span (February 2015 to January 2025) were included. Only articles with high methodological rigor (GRADE system) and that matched the scope of the interference of biodiversity with the quality of life of older adults with chronic diseases were selected.

Results

The review included only articles addressing the older adult population (P) and the concept of

biodiversity (C) in the context of chronically ill older adults (C), following the Extension for Scoping Reviews (PRISMA-ScR)⁸ framework.

The researchers found 115 articles in the PubMed/MEDLINE database: after reading the titles and abstracts, three articles were included that corresponded to the question under study. In Scopus, 106 articles were found, of which four were selected; however, as two were duplicates, only two articles were chosen. In the BVS, 25 texts were found: 20 were not part of the theme, four were theses, and one scientific article coincided with another previously selected (Figure 1).

Chart 1 addresses the objectives and main results of the studies selected in the scoping review.

Figure 1. PRISMA and selection of articles in databases

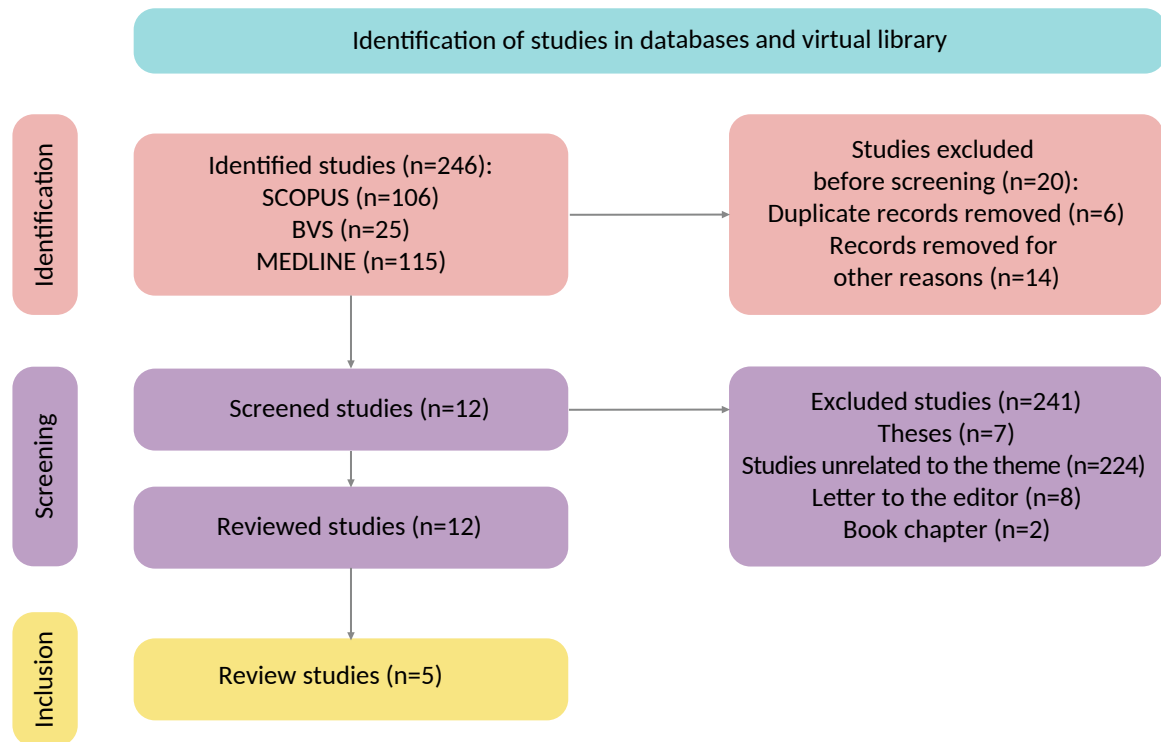


Chart 1. Characterization of the articles by author, year, objectives, and results related to the impact of biodiversity, the environment, and quality of life in older adults with chronic diseases

Author; year	Title	Objective	Results
Vegi ASF et al.; 2020 ³	Caminhabilidade e envelhecimento saudável: uma proposta de análise para cidades brasileiras de pequeno e médio porte	To establish a walkability index using geographic information systems for a medium-sized city, with freely accessible data, and test its relation with functional disability in older adults.	In total, 99 older adults were evaluated using generalized estimating equations. The resulting walkability index was composed of residential density, commercial density, street connectivity, presence of sidewalks, and public lighting. These variables composed the first factor of the factorial analysis, excluding only urban forestry that was retained in the second factor. It was found that the worst walkability score was associated with the highest functional disability score. Based on the results and their validation, the study suggests an easily applicable walkability index with major potential for use in action plans to adapt settings.
Andrade A et al.; 2023 ⁴	Effects of air pollution on the health of older adults during physical activities: mapping review	To analyze the effects of air pollution on the health of older adults during physical activity.	As for the outcomes for air pollution effects during physical activity, out of the 75 studies, air pollution had harmful effects on the health of older adults during practice in 29 studies, most frequently on cardiovascular diseases. On the other hand, in 25 results, there remained the beneficial effects of physical activity on the health of older adults, mainly on mental disorders, despite exposure to high concentrations of pollutants. In 21 studies, the evidence was limited or inconclusive, especially in respiratory diseases.
Requia WJ et al.; 2024 ⁹	Short-term air pollution exposure and mortality in Brazil: investigating the susceptible population groups	To assess the association between air pollution (PM _{2.5} , O ₃ , and nitrogen dioxide NO ₂) and mortality across Brazil between 2003 and 2017.	The results demonstrated an association between air pollution and mortality in Brazil. The higher number of deaths (54%) was associated with respiratory issues and 52% for circulatory mortality. Most individuals were aged over 65 years.
Burholt V, Roberts MS, Musselwhite CBA; 2016 ¹⁰	Older People's External Residential Assessment Tool (OPERAT): a complementary participatory and metric approach to the development of an observational environmental measure	Verify if the OPERAT tool can be used to assess the adequacy of external residential settings for older adults with different physical and cognitive abilities, in rural or urban areas.	A four-factor model was selected as the best fit for the tool. The domains were named: natural elements, incivilities and nuisances; navigation and mobility; and territorial functioning.
Naud D et al.; 2019 ¹¹	Social participation in older women and men: differences in community activities and barriers according to region and population size in Canada	To compare the quality of life of older women and the social participation of men, the desire to participate more and barriers, according to Canadian region and population size.	The results showed that Canadians participate in about one community activity every two days, with few differences between regions, population size, and genders. The desire to participate more indicates the presence of at least one barrier to social participation and was expressed by a quarter of the respondents. Perceived personal and environmental barriers were uniform between regions, population size, and genders.

Discussion

Air pollution effects on population health constitute one of the major concerns related to biodiversity, as they compromise the health and quality of life of people, especially those who are more vulnerable, such as older adults. The main pollutants that predispose to health problems are particulate matter (PM), ozone (O₃), nitrogen dioxide (NO₂), sulfur dioxide (SO₂), and carbon monoxide (CO), which have been detected in different places attended by older adults, such as residential kitchens, highways, squares, parks, and gyms, among others.

Therefore, air pollution is an important component of mortality risk among individuals aged 60 years and over, especially those who already suffer from chronic diseases such as asthma, chronic obstructive pulmonary disease (COPD), and heart diseases. However, healthy practices such as physical activities can contribute toward reducing these diseases and mortality rates. The problem is that evidence shows that air pollution also ends up affecting these same activities, often nullifying some or all of their benefits⁴.

Thus, the finding that ecosystem integrity protects geriatric health poses a profound ethical reflection. From the perspective of protection bioethics, proposed by Schramm¹², the State and society have the moral duty to intervene in favor of groups suffering from “vulnerability,” a condition that goes beyond intrinsic human vulnerability. In the case of older adults, exposure to degraded environments constitutes environmental injustice, as this group has a lower capacity for adaptive response and greater dependence on ecosystem services to maintain homeostasis¹³.

Complementarily, the concept of vulnerability by Miguel Kottow¹⁴ allows us to distinguish older adults as subjects “made vulnerable” by negligence in relation to environmental preservation policies. Biodiversity degradation does not affect the population equally; it disproportionately affects those whose physiological reserves are already compromised by chronic diseases¹⁵. Therefore, environmental protection must be considered as a tool for health equity.

Accordingly, the integration of Environmental Health Surveillance (EHS) actions with the National Health Policy for Older Adults is fundamental. This policy is a normative framework of the Unified Health System (SUS) whose central purpose is to ensure the social rights of older adults and promote their autonomy, functional independence, and quality of life. Its primary objective is to promote active and healthy aging, understood as the process of optimizing opportunities for health, participation, and security, in order to preserve functional capacity and delay dependence. This integration requires what EHS proposes: continuous monitoring of environmental risks in the older adults’ residential territory and analysis of their effects on prevalent chronic conditions⁵.

In the context of chronically ill older adult populations, this surveillance gains particular relevance, as prolonged exposure to air, water, and soil contaminants, in addition to adverse climatic conditions, can exacerbate pre-existing chronic conditions and compromise quality of life. However, care should not be limited to monitoring contaminants, but should be expanded to the promotion of biodiverse territories that function as public health assets. Therefore, biodiversity destruction constitutes a violation of the precautionary principle and an aggravation of the disease burden on the public system, burdening the SUS and reducing the quality of life in the additional years gained by the demographic transition¹⁵.

Studies of Andrade and collaborators⁴ showed encouraging results for the health of older adults regarding physical exercise, even in settings with high pollutant concentrations. However, considering protection bioethics¹², such benefits do not exempt from the duty to protect vulnerable populations, such as chronically ill older adults, who cannot avoid environmental risks by themselves. Thus, exercise practice in degraded areas must be combined with surveillance and risk mitigation, reconciling health gains with the guarantee of safe environments for aging. In the review, 16 studies showed benefits of physical activity, maintained even when considering exposure to air pollutants, with mental disorders being the condition that showed the greatest improvement (there were no studies indicating risks of physical activity)⁴.

Currently, air pollution effects on mental and cognitive health are well-established—for example, exposure to $\text{PM}_{2.5}$ and NO_2 is a risk factor for the development of Alzheimer's disease, and increased exposure to these pollutants and ozone is also related to the development of depression in older adults. Requia⁹ shows association between air pollution ($\text{PM}_{2.5}$, NO_2 , and O_3) and mortality in Brazil. The intensity, statistical significance, and amplitude of effect of this correlation varied considerably according to type of pollutant, region, and population group (sex and age range), with older adults again being the most affected.

Schramm¹² provides an ethical basis for the condition of chronically ill older adults, who, due to presenting difficulty in maintaining their quality of life without assistance, are included in the category of vulnerable individuals described by protection bioethics. This current, proposed by Schramm and Kottow precisely to respond to public health conflicts, imposes on the State and health institutions the duty of protection, based on state safeguard of citizen integrity and manager responsibility for sanitary measures. Thus, environmental exposure constitutes a threat to the quality of life of this population, which, without due protection, lacks the conditions to face adversities autonomously¹⁶. As an epidemiological complement, the environmental health literature indicates that exposure to pollutants tends to cause more severe health problems in older adults than in other populations, since even concentrations within tolerable standards increase the risk of severe cardiorespiratory diseases in this group. These effects on the cardiovascular and respiratory systems result from damage to the epithelium and the consequent increase in oxidation and inflammation in the body^{4,9}.

In contrast to the risks inherent in exposure to pollutants, the practice of physical activities reduces depression and improves the mood of older adults, in addition to representing a recognized strategy for the prevention and treatment of Alzheimer's disease. Andrade and collaborators⁴ showed that air pollution can potentiate and aggravate pre-existing comorbidities in this population, such as cardiovascular diseases and COPD.

Furthermore, the planning of cities adapted for the senescent population arises as a central issue concerning the environment and aging. In this context, the World Health Organization (WHO) proposed the Age-friendly Cities framework, which organizes urban initiatives into eight interconnected domains: outdoor spaces and buildings; transportation; housing; social participation; respect and social inclusion; civic participation and employment; communication and information; and community and health care, aiming to promote active and healthy aging¹⁵. This approach is justified by the particular vulnerability of older adults to their immediate environment, which can accentuate cognitive and physical declines and, consequently, compromise the quality of life of this population.

In small-sized and medium-sized Brazilian cities, Vegi and collaborators³ found a predominance of areas with low accessibility, attributed mainly to insufficient coverage of public lighting and sidewalks. By favoring walkability, these spaces can ensure active aging for this public, which reinforces the need for validated instruments for assessing environmental quality, such as OPERAT 10^{3,10}.

The reduction of environmental barriers, in turn, broadens the social participation of older adults, facilitates their mobility, and increases collective well-being. A Canadian study by Naud and collaborators¹¹ found that participants engaged in a community activity every two days, on average, with few differences between regions, population size, and sex. However, the desire for greater involvement in community life showed the persistence of at least one barrier to social life, reported by a quarter of the respondents. The perceived difficulties, of a personal and environmental nature, were uniform between regions and population size, with emphasis on transportation and the physical setting among the issues that interfere with the daily lives of this group¹¹.

Finally, it should be noted that the scope adopted in this study may have disregarded other studies dedicated to the relation between environmental factors and the health of the older adult population; however, no studies of this nature with a high quality of evidence were identified. Thus, a scoping review following the

PRISMA-ScR⁸ guidelines, focused on policies for minimization of environmental risk in older adults, could provide more effective solutions to an urgent and growing need of this population.

Final considerations

It is evident that air pollution represents a significant challenge for the health of the older adult population, given their higher vulnerability to cardiorespiratory and neurodegenerative diseases. Despite the negative impacts, the practice of physical activities continues to be an essential tool for maintaining the health and well-being of older adults, reinforcing the importance of

urban strategies that create healthier and more accessible environments.

Furthermore, the Age-friendly Cities framework, proposed by the WHO, reinforces the need to adapt urban spaces to ensure mobility, safety, and social participation for this population. The implementation of effective public policies, combined with initiatives that reduce exposure to pollutants and foster healthy habits, can significantly contribute toward the quality of life of these individuals.

Therefore, it is fundamental that public managers, researchers, and society in general engage in solutions that minimize the impacts of pollution, ensuring active and healthy aging for this growing segment of the population.

References

1. Kovaïou RD, Grubeck-Loebenstein B. Age-associated changes within Cd4+T Cells. *Immunol Lett* [Internet]. 2006 [acesso 22 abr 2026];107(1):8-14. DOI: 10.1016/j.imlet.2006.07.006
2. Liu Z, Liang Q, Ren Y, Guo C, Ge X, Wang L *et al.* Immunosenescence: molecular mechanisms and diseases. *Signal Transduct Target Ther* [Internet]. 2023 [acesso 22 abr 2026];8(1):200. DOI: 10.1038/s41392-023-01451-2
3. Vegi ASF, Fernandes Filho EI, Pessoa MC, Ramos KL, Ribeiro AQ. Caminhabilidade e envelhecimento saudável: uma proposta de análise para cidades brasileiras de pequeno e médio porte. *Cad Saúde Pública* [Internet]. 2020 [acesso 22 abr 2026];36(3):e00215218. DOI: 10.1590/0102-311X00215218
4. Andrade A, D'Oliveira A, Souza LC, Bastos ACRF, Dominski FH, Stabile L *et al.* Effects of air pollution on the health of older adults during physical activities: mapping review. *Int J Environ Res Public Health* [Internet]. 2023 [acesso 22 abr 2026];20(4):3506. DOI: 10.3390/ijerph20043506
5. Brasil. Ministério da Saúde. Secretaria de Atenção à Saúde. Departamento de Ações Programáticas Estratégicas. Política Nacional de Saúde da Pessoa Idosa [Internet]. Brasília: Ministério da Saúde; 2006 [acesso 22 abr 2026]. Disponível: <https://bit.ly/4yuxBGN>
6. Cohen AJ, Brauer M, Burnett R, Anderson HR, Frostad J, Estep K *et al.* Estimates and 25-year trends of the global burden of disease attributable to ambient air pollution: an analysis of data from the global burden of diseases study 2015. *Lancet* [Internet]. 2017 [acesso 22 abr 2026];389(10082):1907-1918. DOI: 10.1016/S0140-6736(17)30505-6
7. Organização Pan-Americana da Saúde. Plano estratégico da Organização Pan-Americana da Saúde 2020-2025: equidade, o coração da saúde (Documento oficial: 359). PAHO [Internet]. 2020 [acesso 22 abr 2026]. Disponível: <https://bit.ly/3T2kpsB>
8. Tricco AC, Lillie E, Zarin W, O'Brien KK, Colquhoun H, Levac D *et al.* PRISMA extension for scoping reviews (PRISMA-ScR): checklist and explanation. *Ann Intern Med* [Internet]. 2018 [acesso 22 abr 2026];169(7):467-73. DOI: 10.7326/M18-0850
9. Requia WJ, Vicedo-Cabrera AM, Amini H, Schwartz JD. Short-term air pollution exposure and mortality in Brazil: Investigating the susceptible population groups. *Environ Pollut* [Internet]. 2024 [acesso 22 abr 2026];340(2). DOI: 10.1016/j.envpol.2023.122797
10. Burholt V, Roberts MS, Musselwhite CBA. Older People's External Residential Assessment Tool (OPERAT): a complementary participatory and metric approach to the development of an observational environmental measure. *BMC Public Health* [Internet]. 2016 [acesso 22 abr 2026];16(1):1-14. DOI: 10.1186/s12889-016-3681-x

11. Naud D, Génereux M, Bruneau JF, Alauzet A, Levasseur M. Social participation in older women and men: differences in community activities and barriers according to region and population size in Canada. BMC Public Health [Internet]. 2019 [acesso 22 abr 2026];19(1):1-14. DOI: 10.1186/s12889-019-7462-1
12. Schramm FR. Bioética de proteção: ferramenta válida para enfrentar problemas morais na era da globalização. Rev. bioét. (Impr.) [Internet]. 2009 [acesso 22 abr 2026];16(1):11-24. Disponível: <https://bit.ly/4pqMXrH>
13. World Health Organization. Connecting global priorities: biodiversity and human health. Geneva: WHO [Internet]. 2015 [acesso 22 abr 2026]. Disponível: <https://bit.ly/4fHmRxj>
14. Schramm FR, Kottow M. Principios bioéticos en salud pública: limitaciones y propuestas. Cad Saúde Pública [Internet]. 2001 [acesso 25 jun 2026];17(4):949-56. DOI: 10.1590/S0102-311X2001000400029
15. Ng SI, Lim XJ, Hsu HC. The importance of age-friendly city on older people's continuity and life satisfaction. Int J Environ Res Public Health [Internet]. 2021 [acesso 22 abr 2026];18(14):7252. DOI: 10.3390/ijerph18147252
16. Possamai VR, Siqueira-Batista R. Bioética da proteção de Schramm e Kottow: princípios, alcances e conversações. Rev. bioét. (Impr.) [Internet]. 2022 [acesso 22 abr 2026];30(1):10-8. DOI: 10.1590/1983-80422022301501PT

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José Augusto Ferreira da Silva: conceptualization; data curation; investigation; writing – original draft. Mayara Inácio de Oliveira: methodology; writing – review & editing. Georgia Veras de Araújo Gueiros Lira: methodology; writing – review & editing. Marco Aurélio de Valois Correia Júnior: methodology; writing – review & editing. Emanuel Sávio Cavalcanti Sarinho: methodology; writing – review & editing.

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