

Original article

Trends in environmental risk and child health research: A bibliometric study, 1990–2022

Subhojit Shaw^{*}, Aparajita Chattopadhyay, Lobsang Tshering Bhutia

Department of Population and Development, International Institute for Population Sciences, Deonar, Mumbai, 88, India

ARTICLE INFO

Keywords:

Bibliometric analysis
Child health
Environment exposure
Mapping
Networking
Resilience

ABSTRACT

Background: Worldwide, climate change has significantly contributed to the global burden of disease. Children are among the most vulnerable groups of population bearing the brunt of climate change. To explore the development of research on environmental risk and child health, a bibliometric analysis was conducted encompassing literature from 1990 to 2022.

Methods: The study draws upon 6816 published articles related to environmental risk and child health, sourced from the Scopus database spanning the period from 1990 to 2022. The research encompasses several key analyses: trend analysis, country and journal contribution, author contribution using the Bibliometrix R package and co-occurrence analysis was performed using VOSviewer.

Results: The study highlights the major contributions of the USA and China. The USA leads in both Single Country Publications and Multiple Country Publications. The International Journal of Environmental Research and Public Health stands out as the primary source, with the highest number of documents in this field. Co-occurrence analysis revealed common clusters of words like children, child health, mental health, adolescence, and physical activity. The keyword network map highlighted climate change, social determinants of health, and resilience as the most emerging research topics.

Conclusions: The study highlights the crucial role of environmental factors in influencing child health. The geographical disparities in research output suggest a need for broader research engagement globally, particularly from developing countries, to better address and mitigate the adverse effects of environmental exposures on children's health worldwide.

1. Introduction

Environmental changes are posing obstacle for attaining the sustainable development goals. How to address, mitigate and adapt to climate change has become an important issue in both the academic and political community. Hence, the discipline of climate change vulnerability has emerged as an important part of sustainable development, and it has received extensive attention during recent years.¹ The intricate relationship between environmental factors and human health is a critical concern in today's world. As our planet faces the challenges of climate change and environmental degradation, the repercussions extend far beyond ecological systems. This vicious cycle of cause and effect impacts not only the natural world but also human well-being, particularly among vulnerable populations. Climate change has altered global weather patterns. Rising temperatures, extreme weather events, and shifting ecosystems are all manifestations of this

phenomenon.² As climate change intensifies, the availability and quality of natural resources are affected in terms of water scarcity, soil degradation, disrupting ecosystems and compromising essential resources.³ The depletion of natural resources directly impacts livelihoods, especially in low-income countries by reducing crop yields, soil degradation, erratic weather condition, and water scarcity leading to uncertainty⁴ and impacting human health.⁵ Diminished agricultural productivity and food scarcity contribute to malnutrition,⁶ contaminated water sources lead to diseases like cholera, dysentery, and typhoid,⁷ air pollution causes respiratory illnesses,⁸ and altered weather conditions and ecosystems favour vector-borne diseases.⁹ However, the impact is disproportionate as certain groups of people are most vulnerable like women, children and older people of low-income countries as their lack of resources and infrastructure exacerbates health vulnerabilities.¹⁰ A study based on 120 developing countries revealed that climate change directly or indirectly impacts agricultural production, which will aggravate

^{*} Corresponding author.

E-mail addresses: subhojitshaw93@gmail.com (S. Shaw), aparajita@iipsindia.ac.in (A. Chattopadhyay), lbhutia8@gmail.com (L.T. Bhutia).

<https://doi.org/10.1016/j.cegh.2024.101651>

Received 23 April 2024; Received in revised form 13 May 2024; Accepted 16 May 2024

Available online 23 May 2024

2213-3984/© 2024 Published by Elsevier B.V. on behalf of INDIACLEN. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

hunger every year.¹¹ In the grim of climate change vulnerability, developing countries are prone to frequent shocks like drought and floods, which can be understood as a public health concern.

Addressing climate change, promoting sustainable resource management, and prioritizing vulnerable populations are essential steps toward breaking the cycle of climate threat. Ensuring a resilient ecosystem can withstand environmental shocks. According to a UNICEF report, South Asia bears a disproportionate burden of 40 % stunted children and 53 % worldwide.¹² In a study conducted in Afghanistan, children under-five health and nutritional status were significantly influenced by water-related suffering.¹³ Climate change is expected to worsen all of the top five causes of death worldwide for children under the age of five, including malnutrition, neonatal deaths, acute respiratory illness, diarrhea, and malaria.¹⁴ The linkage between child nutrition and food security is intuitive as children affected by stunting and wasting have deficient nutritional intake and higher mortality risk.¹⁵ Studies have found that the mortality risk associated with wasting is highest in the first few years of life and it continues to remain a nutritional problem even in older children.¹⁶ Thus, the health response to environmental exposure has become extremely important in low- and middle-income countries where resources are limited and people seeking shelter are more.

Extensive collaborative research efforts and networking initiatives have been undertaken to address global health by mitigating the adverse effects of environmental exposure across the globe. A key approach to gaining insights into this issue involves the thorough and systematic use of bibliometric analysis, particularly focusing on the impact of environmental exposure on child health. To the best of our knowledge, the application of bibliometric analysis in exploring the nexus between environmental exposure and child health remains remarkably scarce. The objectives of this study were threefold: first, to quantify literature on environmental risk and child health outcomes. Second, to map the trends of research, countries' involvement and collaborations, and volume of journals publishing these research (1990–2022); and third, to highlight the most emerging and trending keywords within the realm of environmental risk and child health literature. The above objectives will address the following critical questions- what is the state of environmental risk and child health research? What are the countries actively engaged in this research field? What are the most common keywords used by the authors, and what are the emerging themes in this context? This underscores the urgent need for more focused research, effective interventions and policy formulations, especially in developing countries where adaptation and mitigation efforts are limited.

2. Data and methods

In this study, we conducted a comprehensive bibliometric analysis using the extensive Scopus database, which incorporates MEDLINE for examination, and visualization of the vast literature. Scopus is distinguished by its broader coverage, encompassing a larger array of indexed journals compared to the Web of Science.^{17,18} Our primary goal was to meticulously extract data and analyse it to produce distinct metrics, such as the yearly increase in publications, and identification of the most commonly used author keywords to uncover prevailing research interests and identify potential research gaps. Meta-analysis, on the other hand, is typically used to combine results from independent studies (usually randomized controlled trials) to provide a more robust statistical summary. It focuses on treatment effects and outcomes.¹⁹ We wanted to understand a broader landscape of research trends, collaborations, and emerging themes that align with our research objectives. Bibliometric analysis serves as a cornerstone in understanding the dynamics, trends, and impact of research in public health. By quantitatively evaluating publication patterns, citations, and collaborations within the academic community, it offers several invaluable insights. Our research specifically focused on examining scholarly articles related to climate change, environment, floods, temperature, rainfall, and

resilience (collectively categorized under environmental exposure) affecting child health, including child mortality, child malnutrition, and child health outcomes (summarized as child health trajectories).

Data extraction was utilized to determine which data were included in the study, which included numerous indicators used in evaluating research papers. The analysis was performed using the large database, of Scopus, to retrieve, analyses and map the data. In the present bibliometric analysis, retrieved data are analyzed to generate specific indicators such as annual growth of publications, most frequent author keywords to gain insight into research interest and research gaps, calculation of international research collaboration, and most active authors, journals, countries and institutions using open-source software R and to visualize the results VOSviewer has been used. The title, abstract, or complete paper was checked at each step to confirm that it satisfied the selection criteria indicated above.

3. Search strategy

Fig. 1 represents a bibliometric conceptual framework that focuses on the relationship between environmental risk and child health. The framework outlines a systematic approach to gathering, filtering, and analyzing data from a vast number of documents to derive meaningful insights.

The process begins with the Scopus Search Query, which is divided into two keys. Key 1 focuses on environmental factors like climate change, heat, flood, etc., while Key 2 is centered around child health outcomes and related terms. The initial search yields over 11, 325, 931 documents for Key 1 and 136,761 for Key 2. These are then combined to filter down to 11,845 relevant documents that intersect both keys (Fig. 1). The inclusion and exclusion criteria were applied based on several factors: the period of research (1990–2022), language (English), document type (article), and subject areas (medicine, social science, earth science, health, and arts), resulting in an initial set of 5029 documents. Following further refinement through our filtering process, this number was narrowed down to 6816 documents that were deemed most relevant for the present study.

These selected documents undergo bibliometric indicators and mapping analysis divided into four categories: Trend Analysis, Country & Journal Contribution, Author Contribution, Co-Occurrence, and Thematic Analysis. Trend Analysis involves examining publication trends over time and identifying country-specific publication trends. Country & Journal Contribution analyzes which countries and journals are contributing most to the literature in this field. Author Contribution identifies the most cited document in this collection of literature - an essential aspect as it highlights key influential works within the dataset. Co-occurrence examines the frequency of major keywords' appearance together within these works - offering insights into common themes or topics being discussed concurrently in literature.

4. Result

4.1. Trend analysis of scientific publication

Fig. 2a depicts a clear trend of increasing scientific output over the years, as measured by the number of articles published annually. The x-axis represents the years, although specific years are not visible, and the y-axis represents the number of articles, ranging from 0 to about 600+. There has been a significant increase in production around the last quarter of the timeline. In the initial phase (leftmost part of the graph), there is a relatively stable production of scientific articles. As we move towards the middle section of the graph, a slight but steady increase in article production is observed. The most notable feature is the sharp increase towards the end (i.e. rightmost part) of the graph. This exponential growth indicates a boom in scientific research production.

Fig. 2b shows the production of scientific literature on environment and health by country over time. The x-axis represents the years from

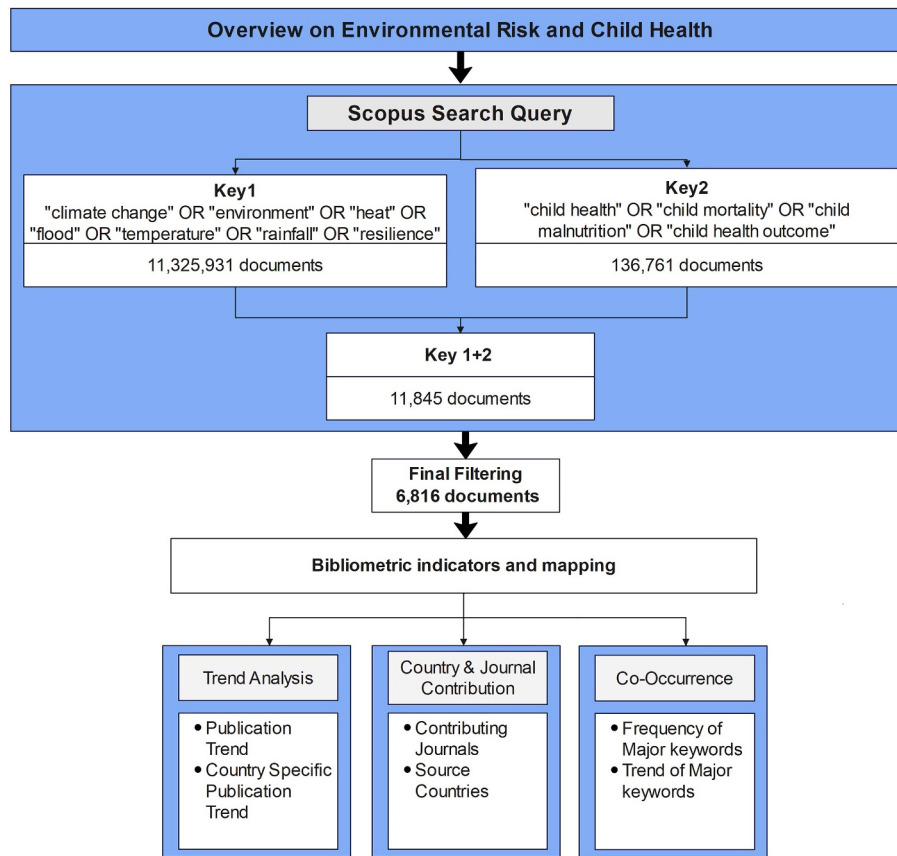


Fig. 1. Flow chart of the study selection process.

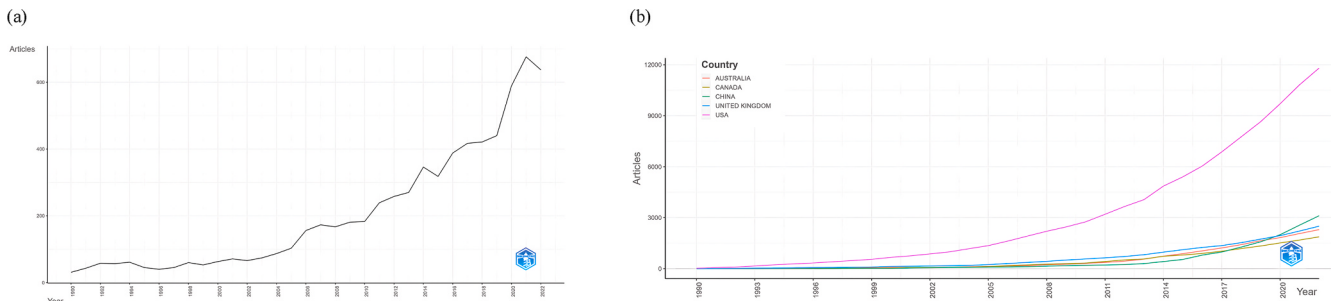


Fig. 2. (a) Annual scientific publication; (b) Countries performance over the years.

1990 to 2022, and the y-axis represents the number of articles produced. The graph shows a significant increase in the number of articles produced by the USA, with a steep upward trajectory starting around 2005 and surpassing other countries by a wide margin. Australia, Canada, the United Kingdom, and China have also increased their production but at a much slower rate. Another striking feature is China's exponential growth in production over time. And continues an upward trajectory. By 2020, China's production surpasses all other countries combined except the USA. In contrast, Australia, Canada, and the United Kingdom exhibit linear growth. Their production increases steadily but not as rapidly as China's. The USA's curve is slightly steeper than these three countries but still linear.

4.2. Authors' country and journal contribution

Table 1 shows the distribution of corresponding authors by country for documents related to environment and health trajectories. The USA has the leading number of both Single Country Publications (SCPs) and

Multiple Country Publications (MCPs). SCPs are publications authored within one country, while MCPs involve collaboration between authors from different countries. The United Kingdom follows, though with fewer documents than the USA. China, Australia, and Canada also have notable contributions but less than the UK. Countries like Japan, Spain, Sweden, Italy, and Germany's contribution is primarily through SCPs with minimal international collaborations depicted have fewer total publications. Brazil, Netherlands, and India exhibit similar levels of publications. South Africa has an almost equal number of SCPs and MCPs despite its lower total output compared to other nations listed. Korea's bar shows an equal distribution between SCPs and MCPs; Denmark leans more towards international collaborations similar to Italy; New Zealand has more national publications; France exhibits a balanced approach like Korea; Poland has minimal contributions but maintains balance.

Developing countries like India, Nigeria, Mexico have a moderate representation in terms of the number of documents published. There is a balanced mix of both SCP and MCP which indicates a healthy level of

Table 1
Top 25 corresponding author's country information over the years (1990–2022).

Country	Articles	SCP	MCP	Frequency	MCP Ratio
USA	1857	1483	374	0.272	0.201
United Kingdom	443	298	145	0.065	0.327
China	392	263	129	0.058	0.329
Australia	389	272	117	0.057	0.301
Canada	314	217	97	0.046	0.309
Japan	186	151	35	0.027	0.188
Spain	142	86	56	0.021	0.394
Sweden	115	72	43	0.017	0.374
Germany	102	63	39	0.015	0.382
Brazil	101	79	22	0.015	0.218
Netherlands	100	61	39	0.015	0.39
India	97	78	19	0.014	0.196
Italy	96	67	29	0.014	0.302
South Africa	79	41	38	0.012	0.481
Korea	69	45	24	0.01	0.348
Denmark	55	35	20	0.008	0.364
New Zealand	52	36	16	0.008	0.308
France	51	33	18	0.007	0.353
Poland	50	43	7	0.007	0.14
Turkey	46	42	4	0.007	0.087
Finland	45	25	20	0.007	0.444
Nigeria	45	35	10	0.007	0.222
Hong Kong	39	24	15	0.006	0.385
Mexico	37	20	17	0.005	0.459
Portugal	37	28	9	0.005	0.243

national as well as international collaboration in research (Table 1). The developing countries have made significant strides with a balanced approach to national and international collaborations in environmental and health trajectories' research; there's substantial room for growth to reach or exceed levels seen in leading countries like the USA, UK and China.

Table 2 represents the number of documents published by various journals related to environmental and public health. The "International Journal of Environmental Research and Public Health" has the highest number of documents, making it a significant source in this field. Other journals that have published a considerable number of documents include "Environmental Research," "Social Science and Medicine," and "Science of the Total Environment." The graph also shows that the

Table 2
Top 25 relevant published papers in the field of environmental exposure and child health.

Sources	Articles
International Journal of Environmental Research and Public Health	543
Environmental Research	221
Social Science and Medicine	175
Science of the Total Environment	171
Pediatrics	142
Environment International	141
BMC Public Health	118
BMJ Open	110
Health And Place	86
Maternal And Child Health Journal	77
Environmental Health Perspectives	75
Environmental Science and Pollution Research	72
Journal of Paediatrics and Child Health	72
International Journal of Epidemiology	69
Journal of Epidemiology and Community Health	67
Child: Care, Health and Development	51
Environmental Health: A Global Access Science Source	50
Environmental Pollution	49
Public Health	45
American Journal of Epidemiology	39
BMC Pediatrics	39
Tropical Medicine and International Health	38
Chemosphere	36
BMC Pregnancy and Childbirth	33
Building and Environment	32

number of documents published by each journal varies widely, with some journals publishing over 400 documents while others publishing less than 100 over time (1990–2022).

4.3. Co-occurrence keywords and cluster analysis

Fig. 3 displays the network formed by the co-occurrence, which aims to measure the relationship between items by counting how often they appear together in documents. Out of 11,763 unique terms found in the surveyed articles, only the most relevant 118 terms were selected for inclusion in the co-occurrence network to ensure the diagram remained legible. The diameter of each circle in the network indicates the frequency of each term's co-occurrence across the articles (Fig. 3a). The closeness of two connected terms in the network signifies their level of association determined by the count of their joint appearances. The analysis revealed five distinct but interlinked clusters, including a primary cluster focused on systemic children (red), child health (green), mental health and adolescence (yellow), physical activity (blue), and a smaller cluster related to public health (purple).

Fig. 3b depicts the keyword network map, with larger circles representing higher co-occurrence of an item. The shorter the distance between circles, the stronger the relationship. It is worth noting that, from 1990 to 2022, the primary focus of the research was on environmental and child health trajectories (blue and dark-green colour), including children, child health, climate change, resilience, public health, mental health, and others. Fig. 3b emphasizes the co-occurrence of networks in new study fields. The most emerging research topics are in the light green to yellow colour circle, such as climate change, social determinants of health, and resilience.

5. Discussion

In the present study, we have explored the trends and patterns of environmental exposure and child health-related literature using the Scopus database. The volume and growth of publications from 1990 to 2022 revealed a tremendous increase over the last two decades. The sudden peak observed might be attributed to the emergence of the 'omics' era in the late 20th century. This era provides a holistic view of biological systems (genomics, proteomics, metabolomics, transcriptomics, phenomics and others) that holds for elucidating the mechanisms of gene-environment interaction in human health and disease.²⁰ The recognition of the interconnectedness between environmental factors and human well-being has led to increased research output in this field. Previously, the topics related to environment was neglected, and over time more attention was paid to environmental health issues. These studies are broadly divided into two categories: air, water, food, and soil (bio-physical environment) related and lifestyle-occupational health related (social environment). The climate change and environmental exposure research on health was also highlighted by the Intergovernmental Panel on Climate Change (IPCC) which declared "very high confidence" that climate change already contributes to the global burden of disease.²¹ Expert groups were also set up by the IPCC to investigate climate change vulnerability and consequently, numerous qualitative and quantitative research emerged and became beneficial for researchers within this field.²² World Health Organization (WHO) also emphasized disease prevention by addressing the environment.²³ Thus, a timely study was called to critically understand the trend of a growing body of literature on environmental exposure and health. A specific focus on child health was also been observed over time.²⁴ Studies have reported that children are more vulnerable to contaminated air, water, food and soil as they are more exposed to outdoor activities and early childhood diseases (like malaria, diarrhoeal disease and malnutrition) that get aggravated due to adverse climatic conditions with long run consequences.²⁵ Various climate change scenarios and projections analysis have pointed out additional children's deaths per year in low-middle-income countries through gross domestic product losses

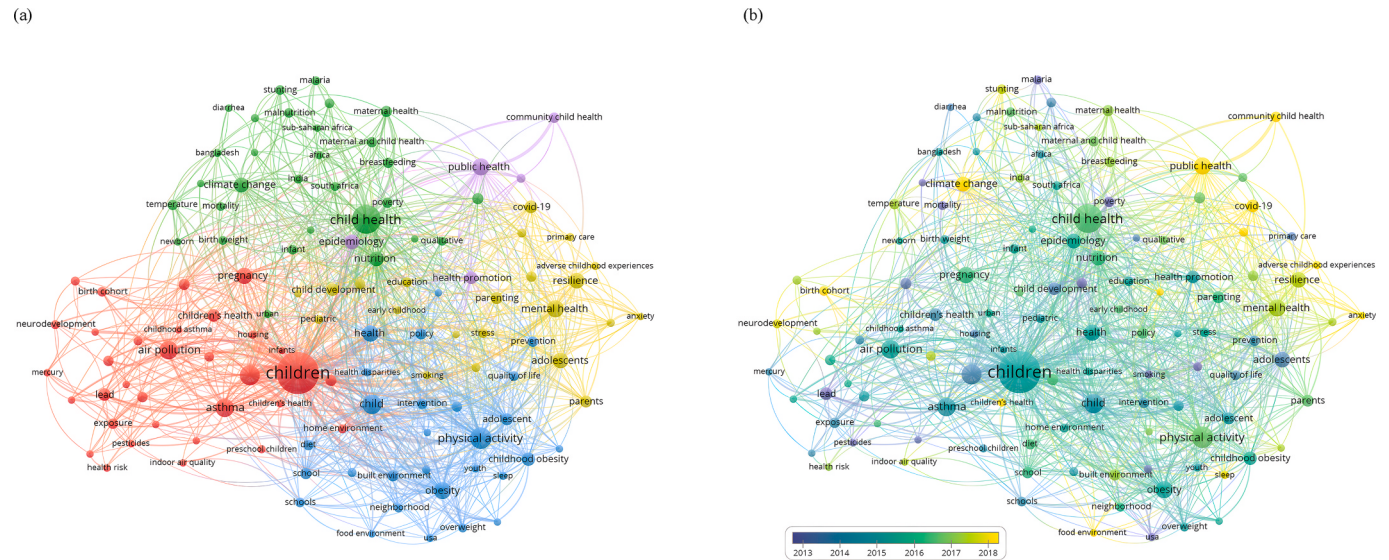


Fig. 3. (a) Co-occurrence plot for keywords; (b) Overlay visualization plot based on keywords co-occurrences and time in the field of environment and child health.

alone, by 2100.²⁶ Because of these facts, there has been an increase in interest in researching children’s health concerning environmental exposure and climate change.

Visualization of author keywords showed that the child health and climate change related literature dominated this field, mainly on air pollution, nutrition, physical activity, poverty, and mental health. However, still there are research gaps in the field of child health and environment especially in context of resilience.²⁷ The current body of research prominently features analyses of child health through the lenses of socio-demographic variability, bio-physical factors, and mental health considerations. These studies have been instrumental in identifying key factors that influence child health outcomes and in highlighting the disparities that exist among different demographic groups. For instance, children in lower socio-economic settings often face higher exposure to pollutants, poorer nutrition, and reduced access to health-care and mental health resources, exacerbating the health disparities rooted in environmental injustices.²⁸ Interestingly, the present study has a spotlight on the concept of resilience as an emerging component in the discourse on child health, environmental challenges, and sustainable development. The term ‘resilience’ has emerged as a co-occurring keyword across studies, indicating a shift towards exploring how individuals and communities can adapt to and recover from environmental stressors and disasters. The focus on resilience encompasses a broad spectrum of considerations, from mental and social resilience in facing environmental challenges to the resilience of ecosystems and the global community in mitigating the impacts of climate change.²⁹ The integration of resilience into the discourse on child health and environment highlights an evolving understanding of the complexity of these issues and the interconnected solutions required to address them.

The intersection of environmental exposure and health has emerged as a critical area of research. The geographical spread of this research, however, reveals significant disparities, with countries like the United States, the United Kingdom, and China leading the way in terms of output and impact, while developing countries lag notably behind the top contenders in this crucial field of study. For developing countries, there’s substantial room for growth to reach or exceed levels seen in leading countries. The most active research areas are the lower-income and developing countries wherein most children are affected due to economic disability for adaptation and mitigation.³⁰ The most active research institutions in this field are predominantly based in the United States, which has taken a leading role in expanding the boundaries of our understanding of environmental exposure and its implications for child health. Furthermore, an encouraging trend is emergence of global

collaborations that bridge the gap between countries with substantial scientific and financial resources and those facing high vulnerabilities with limited capabilities to respond. These international research partnerships are a beacon of hope, offering pathways to share knowledge and resources. For countries like India, Nigeria, Mexico, there exists a substantial opportunity for growth of research in this regard by investing in research infrastructure, fostering international collaborations, and prioritizing the allocation of resources towards environmental health studies. Such advancements are essential for developing relevant strategies that address safeguarding the health and well-being of the most vulnerable children. The present bibliometric analysis in public health research is essential for understanding the implications of climate change on children’s well-being. The reviewed literature highlights that climate change poses a significant threat to global child health by potentially reversing the progress made in reducing child mortality. Environmental consequences negatively affect children’s health and well-being, emphasizing the urgent need for research and interventions in this area.

The present comprehensive quantitative analysis has shed light on the most contemporary research on the environment and child health. However, there are some limitations of this study. Firstly, this study is limited to the Scopus database only and therefore there is a scope to combine other big databases. Another limitation is the capturing of English language articles within the relevant discipline. Hence, dissertations, books, and conference papers may be investigated in future studies to provide a robust overview of the research on environmental exposure and child health trajectories.

6. Conclusion

The present bibliometric analysis demonstrates the research trends and research collaborations among researchers in the field of environmental exposure and child health since 1990–2022. Even though the majority of studies in this field came from wealthy nations, and yearly production in this field has increased significantly, more research from developing nations is still required. In order to lessen the effects of environmental exposure on the vulnerable population, increasing research involvement inlow-developing nations may aid in the formation of national and international policies to reduce the impact of environmental exposure on the vulnerable population.

Author contributions

All authors contributed equally to each section of the study and have read and approved the final manuscript.

Funding

This research received no specific grant from any funding agency in the public, commercial or not-for-profit sectors.

Conflict of interest

The authors declare no conflict of interest among them.

Ethical statement

The analysis is based on secondary data available in public domain for research; thus, no approval was required from any institutional review board (IRB).

Declaration of competing interest

The authors declare the following financial interests/personal relationships which may be considered as potential competing interests.

Acknowledgement

Not applicable.

References

- Soma -Pillay P, Wium L, Pillay Y. The impact of climate change on maternal and child health. *Obstetrics and Gynaecology Forum*. 2022;32(3):1–3. https://doi.org/10.10520/ejc-medog_v32_n3_a1.
- Grimm NB, Chapin IIFS, Bierwagen B, et al. The impacts of climate change on ecosystem structure and function. *Front Ecol Environ*. 2013;11(9):474–482. <https://doi.org/10.1890/120282>.
- Rhodes CJ. Soil erosion, climate change and global food security: challenges and strategies. *Sci Prog*. 2014;97(2):97–153. <https://doi.org/10.3184/003685014X13994567941465>.
- Maja MM, Ayano SF. The impact of population growth on natural resources and farmers' capacity to adapt to climate change in low-income countries. *Earth Syst Environ*. 2021;5(2):271–283. <https://doi.org/10.1007/s41748-021-00209-6>.
- Myers SS, Patz JA. Emerging threats to human health from global environmental change. *Annu Rev Environ Resour*. 2009;34:223–252. <https://doi.org/10.1146/annurev.environ.033108.102650>, 34, 2009.
- Lloyd SJ, Kovats RS, Chalabi Z. Climate change, crop yields, and undernutrition: development of a model to quantify the impact of climate scenarios on child undernutrition. *Environ Health Perspect*. 2011;119(12):1817–1823. <https://doi.org/10.1289/ehp.1003311>.
- Levy K, Smith SM, Carlton EJ. Climate change impacts on waterborne diseases: moving toward designing interventions. *Curr Envir Health Rpt*. 2018;5(2):272–282. <https://doi.org/10.1007/s40572-018-0199-7>.
- Saleh S, Shepherd W, Jewell C, et al. Air pollution interventions and respiratory health: a systematic review. *Int J Tuberc Lung Dis*. 2020;24(2):150–164. <https://doi.org/10.5588/ijtld.19.0417>.
- Rocklöv J, Dubrow R. Climate change: an enduring challenge for vector-borne disease prevention and control. *Nat Immunol*. 2020;21(5):479–483. <https://doi.org/10.1038/s41590-020-0648-y>.
- Romanello M, McGushin A, Napoli CD, et al. The 2021 report of the Lancet Countdown on health and climate change: code red for a healthy future. *Lancet*. 2021;398(10311):1619–1662. [https://doi.org/10.1016/S0140-6736\(21\)01787-6](https://doi.org/10.1016/S0140-6736(21)01787-6).
- Wheeler T, von Braun J. Climate change impacts on global food security. *Science*. 2013;341(6145):508–513. <https://doi.org/10.1126/science.1239402>.
- UNICEF. *Child Stunting, Hidden Hunger and Human Capital in South Asia: Implications for Sustainable Development Post 2015*. 2018.
- Mashal T, Takano T, Nakamura K, et al. Factors associated with the health and nutritional status of children under 5 years of age in Afghanistan: family behaviour related to women and past experience of war-related hardships. *BMC Publ Health*. 2008;8(1):301. <https://doi.org/10.1186/1471-2458-8-301>.
- Kiang K, Graham S, Farrant B. Climate change, child health and the role of the paediatric profession in under-resourced settings. *Trop Med Int Health*. 2013;18(9):1053–1056. <https://doi.org/10.1111/tmi.12153>.
- Headey DD, Ruel MT. Economic shocks predict increases in child wasting prevalence. *Nat Commun*. 2022;13(1):2157. <https://doi.org/10.1038/s41467-022-29755-x>.
- Wright CM, Macpherson J, Bland R, Ashorn P, Zaman S, Ho FK. Wasting and stunting in infants and young children as risk factors for subsequent stunting or mortality: longitudinal analysis of data from Malawi, South Africa, and Pakistan. *J Nutr*. 2021;151(7):2022–2028. <https://doi.org/10.1093/jn/nxab054>.
- Falagas ME, Pitsouni EI, Malietzis GA, Pappas G. Comparison of PubMed, Scopus, Web of science, and google scholar: strengths and weaknesses. *Faseb J*. 2008;22(2):338–342. <https://doi.org/10.1096/fj.07-9492lsf>.
- Sweilhe WM. A bibliometric analysis of health-related literature on natural disasters from 1900 to 2017. *Health Res Pol Syst*. 2019;17(1):18. <https://doi.org/10.1186/s12961-019-0418-1>.
- Grant MJ, Booth A. A typology of reviews: an analysis of 14 review types and associated methodologies. *Health Inf Libr J*. 2009;26(2):91–108. <https://doi.org/10.1111/j.1471-1842.2009.00848.x>.
- Olden K. Genomics in environmental health research—opportunities and challenges. *Toxicology*. 2004;198(1):19–24. <https://doi.org/10.1016/j.tox.2004.01.015>.
- IPCC. *Climate Change 2007: The Fourth Assessment Report of the Intergovernmental Panel on Climate Change*. 2007.
- Wang B, Pan SY, Ke RY, Wang K, Wei YM. An overview of climate change vulnerability: a bibliometric analysis based on Web of Science database. *Nat Hazards*. 2014;74(3):1649–1666. <https://doi.org/10.1007/s11069-014-1260-y>.
- WHO. *Our Planet, Our Health: Report of the WHO Commission on Health and Environment*. World Health Organization; 1992.
- Akachi Y, Goodman D. *Global Climate Change and Child Health: A Review of Pathways, Impacts and Measures to Improve the Evidence Base*; 2009. Published online January 1 https://www.academia.edu/15249491/Global_Climate_Change_and_Child_Health_A_review_of_pathways_impacts_and_measures_to_improve_the_evidence_base. Accessed March 26, 2024.
- Helldén D, Andersson C, Nilsson M, Ebi KL, Friberg P, Alfvén T. Climate change and child health: a scoping review and an expanded conceptual framework. *Lancet Planet Health*. 2021;5(3):e164–e175. [https://doi.org/10.1016/S2542-5196\(20\)30274-6](https://doi.org/10.1016/S2542-5196(20)30274-6).
- Weber E, Downward GS, Ebi KL, Lucas PL, Vuuren D van. The use of environmental scenarios to project future health effects: a scoping review. *Lancet Planet Health*. 2023;7(7):e611–e621. [https://doi.org/10.1016/S2542-5196\(23\)00110-9](https://doi.org/10.1016/S2542-5196(23)00110-9).
- Rylander C, Øyvind Odland J, Manning Sandanger T. Climate change and the potential effects on maternal and pregnancy outcomes: an assessment of the most vulnerable – the mother, fetus, and newborn child. *Glob Health Action*. 2013;6(1), 19538. <https://doi.org/10.3402/gha.v6i0.19538>.
- Lu C, Cuartas J, Fink G, et al. Inequalities in early childhood care and development in low/middle-income countries: 2010–2018. *BMJ Glob Health*. 2020;5(2), e002314. <https://doi.org/10.1136/bmjgh-2020-002314>.
- Morgart K, Harrison JN, Hoon Jr AH, Wilms Floet AM. Adverse childhood experiences and developmental disabilities: risks, resiliency, and policy. *Dev Med Child Neurol*. 2021;63(10):1149–1154. <https://doi.org/10.1111/dmcn.14911>.
- Devlin MK, Grey MA. Climate change refugees and public health implications. In: Leal Filho W, Wall T, Azul AM, Brandli L, Özuyar PG, eds. *Good Health and Well-Being*. Springer International Publishing; 2020:91–99. https://doi.org/10.1007/978-3-319-95681-7_72. Accessed March 25, 2024.