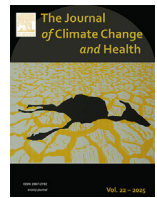




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Perspective

Adaptation and mitigation for the planetary health crisis: A scoping review from the perspective of primary health care providers

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ABSTRACT

Climate-related adverse health outcomes are on the rise worldwide, and primary health care providers are at the forefront of the growing climate-health crisis. There is an urgent need for a codification of solutions and strategies for adaptation, resilience, and transformation in primary health care. This scoping review sought to answer the following research question: "What strategies are being implemented across all forms of primary health care to adapt to and address the climate crisis?" After iterative axial coding of the 94 retained papers, 15 themes emerged: community engagement; reaching vulnerable populations; transdisciplinary and intersectoral collaboration; clinical strategies; research, surveillance; pluralism; patient education; continuing education and community of practice; benefits of nature; infrastructure resilience; advocacy; conservation; redefining health; provider wellbeing; and impact of health care. It behooves primary health care practitioners, especially those within dominant systems, to advocate strategies that promote health in all systems and policies. The planetary health crisis is a health crisis. It is urgent, it is human-created, and it can be mitigated.

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1. Introduction

Climate change has been called one of the greatest health threats of the 21st century [1–4]. Climate is one element of planetary health, which represents an understanding of the reciprocal relationship between human beings and the planet [5]. The causes of the planetary health crisis are complex, and generally accepted as being due to human activity [6]. Myers et al. created a conceptual framework to encapsulate the societal, economic and political drivers and mediators that have led to such mass ecological disruption and the consequential impacts on human health [4].

Primary health care providers are often the first to see and address climate-related adverse health impacts [7], which behooves us to respond. As such, improving access to efficient and effective primary health care has been considered in and of itself a climate solution, by reducing the need for more carbon-intensive - and often inaccessible - secondary and tertiary care [8,9,10]. Moreover, the carbon footprint of the healthcare sector is estimated to be 4–6% of all global emissions [11], equivalent to the fifth-largest emitter if the health sector was a country [8]. As per this report, the highest per capita emissions from the healthcare sector are produced by the United States.

In this review, we aim to answer the question, "What strategies are being implemented across all forms of primary health care to adapt to and address the climate crisis?" In the United States, Canada, and other high-income regions of the world, this type of care is typically delivered by general practitioners, family physicians, and nurse practitioners, and is often referred to as "primary care." However, it is important to be as inclusive as possible within the global context, and note that the term "primary health care" goes beyond "primary care"

Abbreviations: CBPR, Community-based participatory research

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to encompass population-level care [12,13]. Following a Global Conference on Primary Care in Astana, Kazakhstan in October 2018, a declaration was drafted which reemphasized the critical role of primary health care to deliver sustainable and equitable healthcare globally [14] and in much of the world, this is implemented by community health workers, nurses, midwives and traditional practitioners, and expands beyond individual level healthcare delivery [15,16].

While climate change is a great threat, it has also been called “the greatest global health opportunity of the 21st century” [7]. Just as planetary health-related disease has complex causal pathways, creative mitigation and adaptation responses from within primary health care may also lead to complex co-benefits: reductions in individual morbidity, enhanced community resilience, poverty alleviation, and improved health equity [17].

2. Methods

This scoping review followed the methodology described by the Joanna Briggs Institute [18].

2.1. Search Strategy

The search encompassed PubMed, MEDLINE, and Web of Science. We also hand-searched the Journal of Climate Change and Health. To ensure a pluralistic approach to primary health care was captured, two parallel searches were undertaken then combined. One focused on primary care (i.e. that delivered by physicians and nurses), and the other captured community, complementary/alternative, traditional and Indigenous health care. Both looked at strategies of adaptation and/or mitigation for the planetary health crisis and its consequences. Specific search terms are found in Appendix A. English-language, French and Spanish-language articles from any location within the timeframe of January 2010 to July 2023 (the month the search was completed) were considered.

A systematic gray literature search was not done, given the vastness of the material available upon scanning. However, a list of programs, toolkits and other resources that emerged during the search can be found in Appendix C.

2.2. Screening, Data Extraction and Analysis

Titles and abstracts were scrutinized by six independent reviewers to ensure relevance to the study question; agreement by at least two reviewers was necessary at this stage. The full-text screen was conducted by five reviewers; agreement by at least two reviewers was necessary before extraction.

Microsoft Excel was used to extract data from the included articles. Six reviewers participated in the extraction process. Before extraction, a draft of the format was generated by three reviewers to ensure that the content extracted was appropriate to answer the question, and that there was mutual interpretation of data. Practice extraction was undertaken to discuss and make adjustments before full extraction.

An open axial coding method was used to identify themes [19]. The data were inductively coded; an axial coding method was then used to add overarching labels or themes. Any discrepancies were resolved through discussion between review team members.

3. Results

The initial search yielded 7742 documents, of which 1081 were duplicates. 5983 were excluded, resulting in 678 documents being considered for a full-text review; of these, 537 were excluded. Ninety-four documents were reviewed (Fig. 1).

3.1. Study Characteristics

The number of publications increased slightly from 2010 until 2019, followed by a substantial increase (Fig. 2). Due to the large number and heterogeneity of papers, a critical appraisal of their quality was beyond the scope of this review. Of the 94 papers reviewed, 61.7% were primary research studies, most commonly employing qualitative methodologies. The remainder were descriptive of a response if not methodologically evaluated. The characteristics and main findings of the included articles are available in Appendix B.

Not all papers focused on one specific region, and many included team members from more than one location (Fig. 3). Most (70.3%) included authors from higher-income locations (Canada, US, Europe, United Kingdom, Australia). Bangladesh had the most representation (4.1%) among middle-to-lower-income locations. Of papers that focused on a specific area, all but one included an author from that location.

Some papers were explicit about the type of primary health care provider under consideration while others were more general (Fig. 4).

3.2. Thematic analysis

The coding process revealed fifteen themes. Most papers satisfied more than one theme, and themes had overlapping concepts. Table 1 outlines the distribution of themes. Fig. 5 represents an impression of the relative dominance of and relationships between themes.

3.2.1. Community engagement

The majority of papers (76.6%) spoke to the importance of community engagement, including strategies to empower community members and ensure strategies are locally relevant. Several sought to understand the perceived impacts of the climate crisis on health, as well as the adaptation priorities of affected communities [20–26]. Some examples include adapting and maintaining the delivery of healthcare to the community's needs during or after disruptive events (e.g. heat waves, pandemics, displacement) by mobilizing community members and organizations [27–31]. Other papers examined the role of community health workers in increasing access to care [31,32–34]. One paper described how community groups in the Red Hook neighborhood of Brooklyn, New York, mobilized in the absence of a timely formal public health response after Hurricane Sandy [35].

3.2.2. Reaching vulnerable populations

The theme of reaching vulnerable populations emerged in 71.3% of papers, with “vulnerable” being the term most consistently used. Most described a specific population, such as age [33], economic status [36], Indigeneity [20], migration status [33], type of work [37], or geographic location [38]. Others that satisfied this theme did not report on a particular community or location, but spoke to the importance of prioritizing vulnerable communities.

Many of these papers described initiatives that redirected resources toward populations most at-risk to the health impacts of the climate crisis [33,37–42] and highlighted the role of primary health care providers in designing and implementing public health strategies. Given that this and community engagement were the two most common themes, it is not surprising that many of these papers discussed strategies that localized solutions, explicitly including affected community members in generating solutions through intersectoral collaborations. Two papers stood out because they identified health care providers as vulnerable. These directly explored strategies to care for the health and resilience of healthcare professionals during this crisis [43,44].

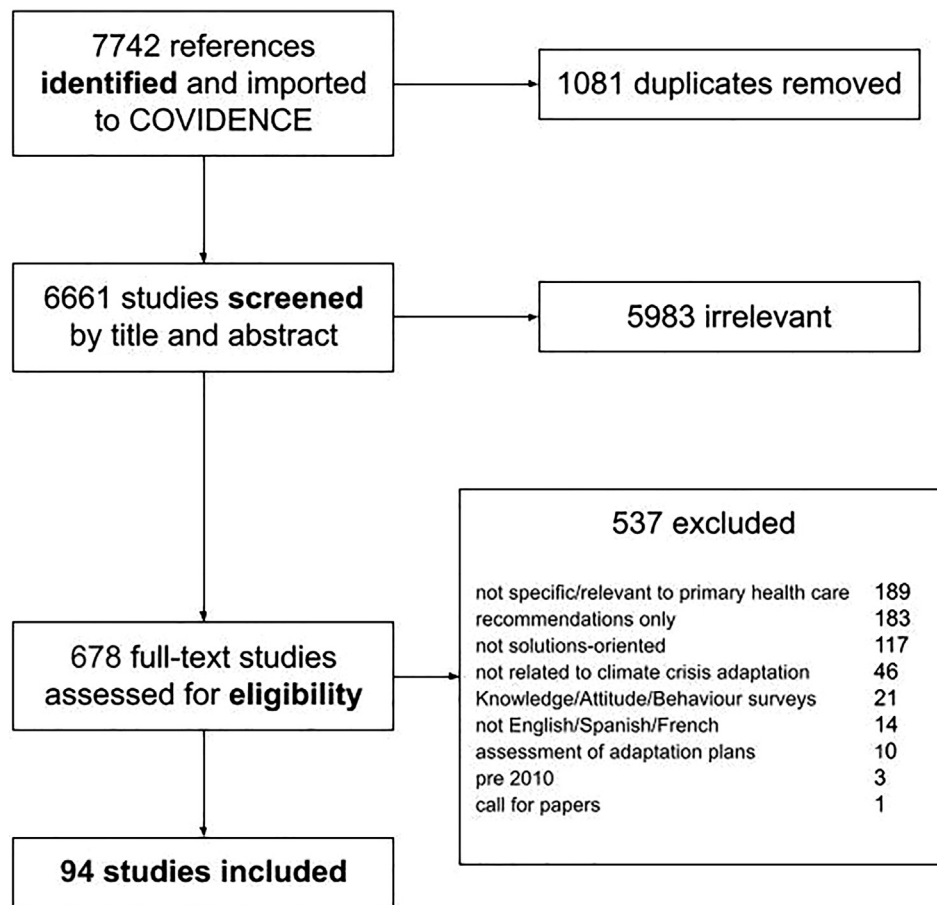


Fig. 1. PRISMA flow diagram.

The conduct of research requires rigorous attention to ethics to avoid exploitation or other harms; this is even more critical when working with vulnerable communities [45]. Methods by which authors sought to minimize harms were identified. Community-based participatory research (CBPR) methodologies, which have been shown to be effective in fostering self-determination among community members and avoiding exploitation, were explicitly described in five papers. Approaches that appeared to approximate CBPR were mentioned in an additional eight. Seven papers described community-led initiatives; the research teams of three of these included a member of that community. All papers but one that focused on communities in vulnerable geographic regions ($n=17$) included a research team member from that region. A “Two-Eyed Seeing” methodology was used in two papers to weave together Indigenous and non-Indigenous approaches [46,47].

3.2.3. Research, surveillance

Papers were given the code of “research” if the intervention was explicitly related to the process of data collection and analysis (43.6%). Most of these engaged community members in this process. Although the focus of this review was on solutions-oriented publications, papers that used a CBPR approach were included if they focused on documenting concerns, such as community-based surveillance strategies [34,48], or to monitor the effects of climate change [32,49].

The research papers that were not community based included projects that engaged subject matter professionals to create institutional strategies or calls for more engagement in scholarship on planetary health [50–53]. A small selection were protocols for future research [54,55].

3.2.4. Transdisciplinary and intersectoral collaboration

Transdisciplinary and intersectoral collaborations were highlighted in 45.7% of papers. This theme included strategies that spanned or dismantled silos dividing healthcare practitioners from one another, from community members, or from policymakers. All of the papers that met this theme overlapped with community engagement. Several described initiatives that sought to engage with community members to implement health promotion and disease prevention strategies. These included local initiatives supported by federal funding programs in the United States [56,57] and Canada [58], transdisciplinary approaches to health promotion among primary care partnerships in Australia [59], and a unique collaboration between physicians and veterinarians in an underserved area of the US rooted in the One Health framework [60].

3.2.5. Pluralism

The theme of pluralism (40.4%) captured diverse ways of knowing beyond what is typically understood in dominant paradigms of health and health care. This theme was particularly evident among papers with and about Indigenous communities, for example documentation of the relationship between the health of humans and Land as described by Elders, knowledge keepers, and community members in an Anishinaabe community in Northern Ontario [46]. The importance of the availability of local food and medicine to community health, as well as the protection and transfer of knowledge to the next generation, was an important theme identified in several papers [61–65]. These emphasized the importance of cultural identity and practices to resilience.

The theme of pluralism was also reflected in papers that expanded on who can and should engage in health care [66,67]. Fewer than a

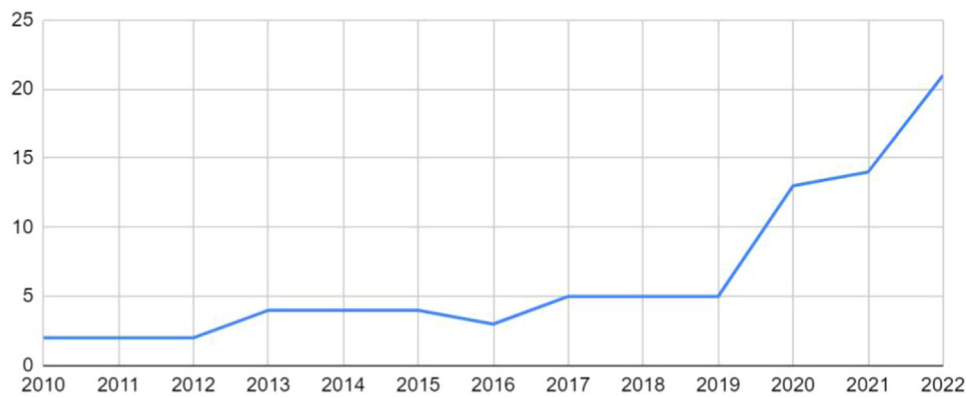


Fig. 2. Publications by year; 2023 was excluded since the extraction was conducted in the first part of the year.

quarter of papers in this review focused on physicians, nurses and conventional healthcare systems. Nearly one quarter explored community-based approaches to primary health care; an additional 20% were specific to Indigenous communities. This theme often overlapped with papers that described transdisciplinary approaches. Some emphasized partnerships between conventional health systems and the community; some described community responses without “trained” health care providers, often describing a reliance on traditional practices. Several papers described strategies to expand the scope of practice of regulated health care providers to increase access to care; some described training community members in both biomedical and traditional ways to achieve the same.

Pluralistic approaches to research also emerged, such as a “Two-Eyed Seeing” methodology which is an explicitly pluralistic approach that “centers the working together of Indigenous and non-Indigenous knowledges and peoples and demands respectful relationship building” [46,47].

3.2.6. Redefining health

Pluralism was also reflected in the theme of redefining health, which emerged in 16.0% of papers. A qualitative study done among

community members of Vanuatu revealed an expansive definition of health, one that inherently relates to social and environmental determinants [68]. Studies of strategies to support those forced to evacuate or migrate highlighted place as a determinant of health and the necessity of considering the unique needs and vulnerability of each community served [33].

3.2.7. Clinical strategies

Clinical level strategies to promote planetary health emerged as a theme in 44.7% of papers. Some described leveraging strategies with co-benefits, such as promoting local, sustainable diets [38], or active transportation [69]. Four papers focused on clinical strategies to address mental well-being specifically [70–73]. Others described adaptation of clinical approaches to reduce health impacts during and after natural disasters, such as strategies to reduce vector-borne disease [74], or to maintain optimal infant feeding practices [75].

3.2.8. Benefits of nature

The healing benefits of nature were acknowledged in 29.8% of papers; these described the use of nature immersion or natural

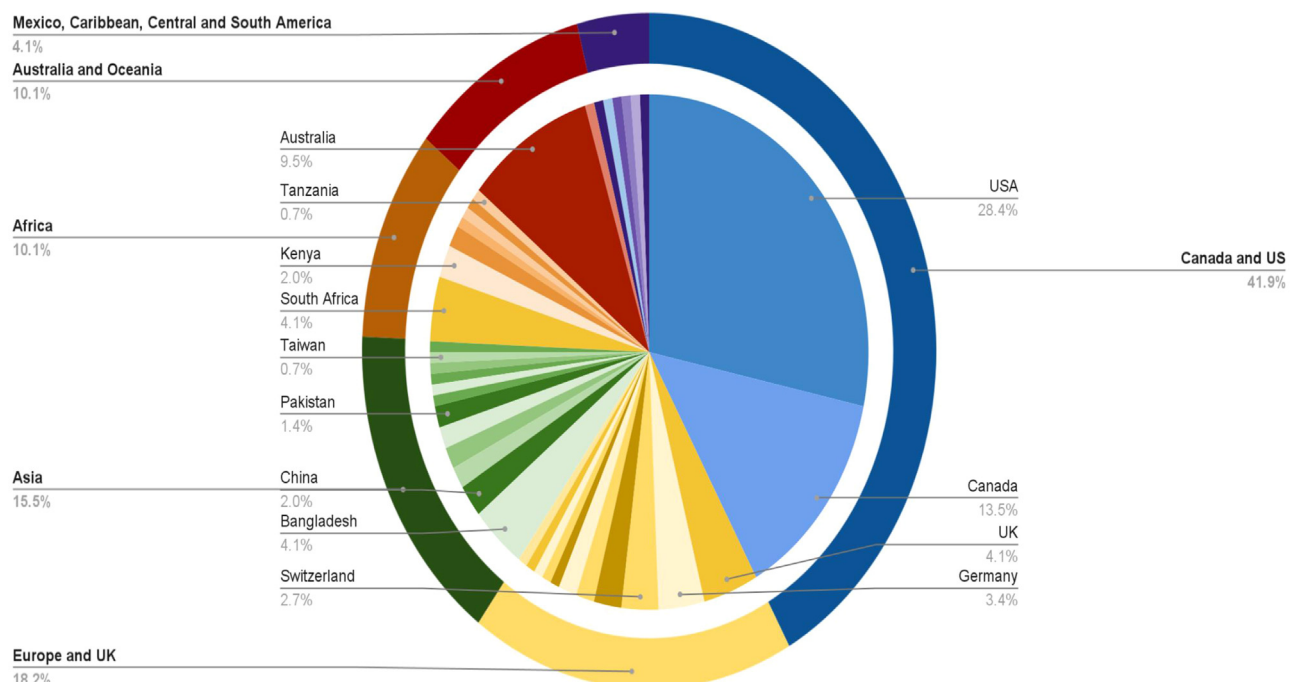


Fig. 3. Distribution of locations of researchers.

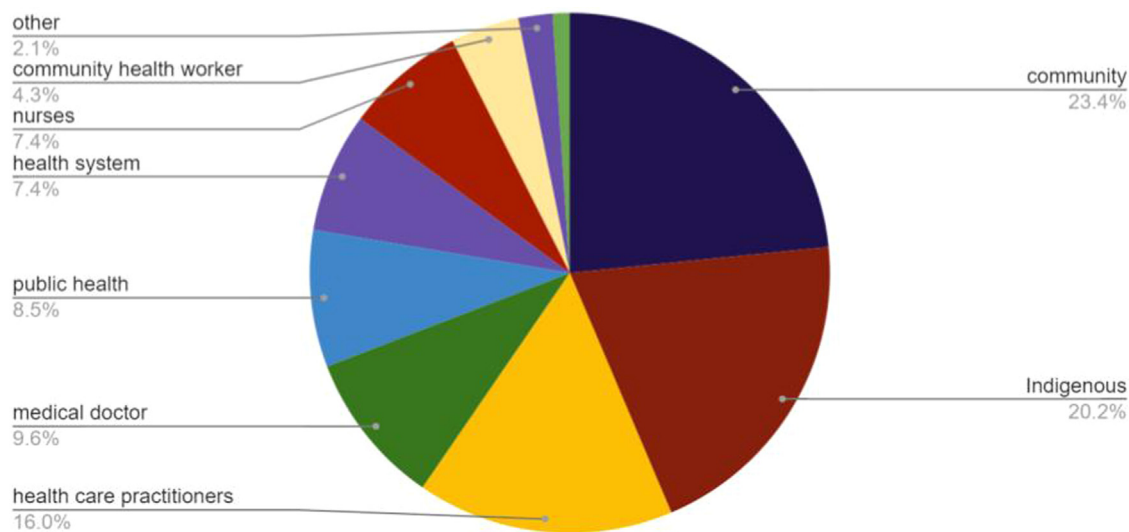


Fig. 4. Type of health care provider.

materials to promote health. Many also fell under the theme of clinical strategies.

3.2.9. Educating patients/public

Strategies by which health care providers sought to educate community members of the links between the climate crisis and health emerged in 33.0% of papers. Many of these overlap with the themes of “research” and “conservation.” Two papers described and tested intersectional approaches to climate communication by health practitioners [76,77]. Another conducted a pilot study of a mindfulness-based adult education program to promote pro-environmental behaviors [78].

3.2.10. Infrastructure resilience

A selection of papers (20.2%) focused on the role of formal health-care systems and institutions. These included adaptations to extreme weather events within formal healthcare infrastructure, such as the expansion of telehealth in the aftermath of Hurricane Sandy [79,80].

Two described training activities for members of the health promotion workforce [81,82].

3.2.11. Impact of healthcare

Papers that explored strategies to reduce the harmful impacts of healthcare systems constituted 9.6% of papers. These included innovations for sustainable practice, position papers and toolkits by and for health care providers [83,84].

3.2.12. Conservation

The collection of papers that emphasized humans’ reliance on a healthy environment inspired the theme of “conservation” (18.1%). This was a particularly strong theme within communities whose wellbeing is more explicitly tied to the health of the local environment. These interventions sought to empower community members to care for their environment as a means of caring for their health [38,49,85]. Several other papers described conservation strategies but were less explicit or holistic about the relationship of land and place to human health, such as the documentation of traditional medicine use among communities [21,86–93].

3.2.13. Advocacy

In 18.1% of papers, the role of health care providers as advocates was emphasized, such as position papers and organizing strategies generated by professional associations [83,42,94]. Jaffe explicitly linked economic policy to health outcomes and the role of health care providers in advocating for such strategies [95].

3.2.14. Wellbeing of providers

Some papers (13.8%) spoke directly to the importance of health care provider wellbeing in this work, both for their own sake, and for the wellbeing of the communities they serve.

3.2.15. Continuing education and community of practice

Interventions designed to build the capacity of health care providers, community members and non-conventional providers to participate in healthcare inspired the theme of continuing education and community of practice (30.9%). Many described curricula and pedagogical approaches that were explicit about taking an expansive, pluralistic, and community-based approach to promoting planetary health [52,96–102].

Table 1
Themes of included papers.

	Total papers satisfying theme	Percentage of total (n=94)
Community engagement	72	76.6%
Reaching vulnerable populations	67	71.3%
Transdisciplinary and intersectoral collaboration	43	45.7%
Clinical strategies	42	44.7%
Research, surveillance	41	43.6%
Pluralism	38	40.4%
Educating patients/public	31	33.0%
Continuing education and community of practice	29	30.9%
Benefits of nature	28	29.8%
Infrastructure resilience	19	20.2%
Advocacy	17	18.1%
Conservation	17	18.1%
Redefining Health	15	16.0%
Wellbeing of providers	13	13.8%
Impact of healthcare	9	9.6%

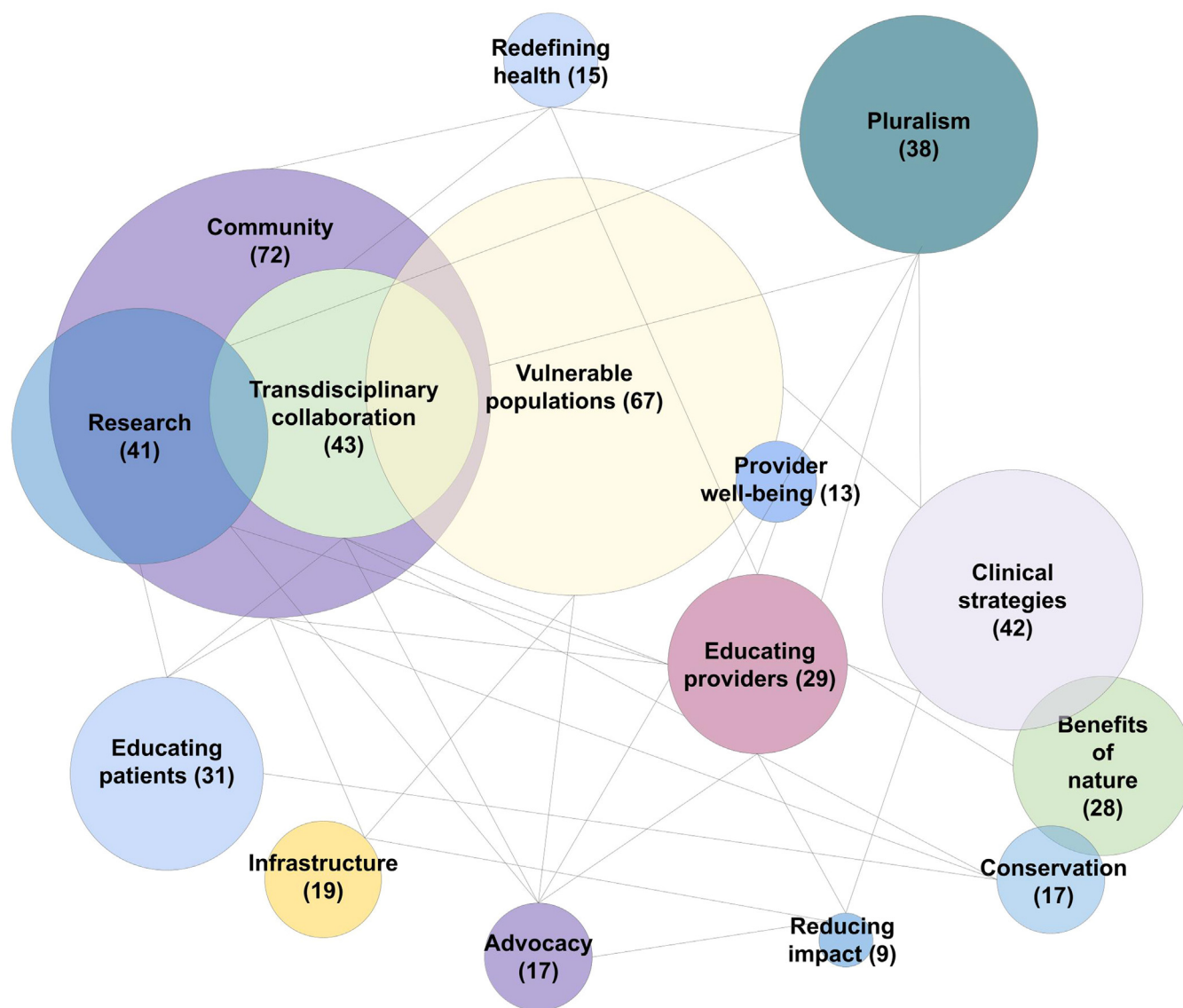


Fig. 5. Impression of relationships between themes based on overlap between papers; the size of circles are proportional to the frequency of the theme's appearance.

4. Discussion

This review attempted to identify strategies that have emerged from within primary health care to respond to the climate crisis. A diverse array of approaches emerged, which is fitting given the complexity of the problem and thus the necessary solutions. Given the preponderance of papers that emphasized community engagement and the importance of localizing solutions and that a problem as complex as the climate crisis cannot be solved with simple solutions, themes rather than specific strategies were described.

The themes that emerged seemed to parallel the five principles of Primary Health Care as described by Muldoon (accessibility, public participation, health promotion, appropriate skills and technology, and intersectoral collaboration [12]), which underscores the relevance of this sector to responding to the climate crisis. The themes are not siloed; the overlap between concepts reflects the complexity of the planetary health crisis and necessary solutions. Effective primary health care systems enable communities to receive the care they need where they live, work and play, which helps mitigate health inequities, including those perpetuated by the climate crisis, and has the potential to increase community capacity for adaptation and mitigation [103].

The strong themes of community engagement and centering vulnerable populations speaks to the principles of public participation and accessibility, including through research, education, and conservation. Intersectoral collaboration was clearly represented in our results, and is also reflected in themes of pluralism, whether within healthcare, research, or cultural relevance. Ensuring resilience of infrastructure and health systems helps maintain accessibility during and after climate related disasters.

While ensuring the provision of primary health care is as sustainable and relevant as possible is a necessary response, investing more in disease prevention and health promotion may be more impactful by reducing the need for secondary and tertiary healthcare services, which are not only greater contributors to carbon emissions, but are inequitably accessible. Health promotion strategies emerged in this review within the themes of redefining “health,” drawing on nature as a clinical tool, and advocating for environmental conservation.

The themes of advocacy and education are mechanisms by which primary health care providers can promote these concepts at an individual and systemic level. This is a particularly important strategy by which vulnerable populations can more effectively be supported. Although the planetary health crisis affects everyone, it is an amplifier of pre-existing systemic inequity and vulnerability [104].

Communities that are most responsible are the least affected, and vice versa [105]. The Canadian National Collaborating Center for Determinants of Health describes health inequities as “systematic, unfair, avoidable, and modifiable ... caused by decisions on how resources and opportunities are distributed” [106]. Primary health care providers have a role to play in the creation of policies that benefit both environmental and human health [107], such as is reflected in the Health in All Policies approach [108]. A systems approach that includes primary health care professionals and is grounded in ecological sustainability may enable a more comprehensive assessment of community health. Components include determinants, processes, stakeholders, negative environmental impact and imperatives for health systems planning and resource redistribution [109].

It is important to consider that the dominant biomedical paradigm has been built on the same foundations that underpin the planetary health crisis [109–111]. This limits its effectiveness, accessibility and acceptability for many, has contributed to health inequities both locally and globally [112–114], and has marginalized traditional systems of knowledge [115,116]. As underscored by the Astana declaration, ensuring the competence and full scope of practice of all health care providers is necessary to ensure access to effective, culturally-relevant healthcare. Several papers in this review described strategies by which the competence and scope of practice were enriched in ways that more effectively met the primary health care needs of communities. Inclusivity of pluralistic approaches to primary health care requires robust humility to different ways of knowing in order to avoid perpetuating bias. It is also critical to avoid distorting traditional knowledge with a biomedical or capitalistic paradigm.

Indigenous communities are particularly affected by this constellation of drivers and impacts [58]. Colonization, imperialism, destruction of land, and cultural disruption have significantly impacted Indigenous culturally-specific determinants of health. As Rankoana states: “changing climatic conditions ... impact the availability and accessibility of water, food and preventive medicine as the basic determinants of indigenous [sic] health promotion ... compromising health promotion practices; the scarcity of these resources has forced community members to resort to modern technological practices; this type of health promotion mechanism is not beneficial to the community” [65]. Indigenous Knowledge Systems, as illustrated in this review, tend to center a reciprocal relationship between planetary and human health—caring for nature is caring for ourselves. Several papers described strategies of stewarding and utilizing local foods and medicine, grounding health in the cultivation of community and traditional practices; the observations of Lunda et al. of the Land-based transfer of knowledge from elders to children is a beautiful example [62].

Core frameworks of planetary health underscore the necessity of integrating and elevating Indigenous perspectives in this work [117]. “Two-Eyed Seeing” is an approach to healthcare and knowledge generation that “sees from one eye with the strengths of Indigenous knowledge and ways of knowing, and from the other eye with the strengths of western knowledge, respectfully embracing both” [118]. This approach actively honors the validity and value of the ways of being, knowing, and healing of Indigenous communities, seeking to increase equity and effectiveness of healthcare not only for Indigenous communities and individuals, but for all creation.

non-Indigenous lens, we preface the Indigenous lens. When we read your article we recognized the following from an Indigenous perspective:

Considering that the majority of [included] articles are authored by non-Indigenous authors, we are hopeful that overall their findings identify primary concepts that are central to Indigenous knowledge; that their findings point to the importance of holistic thought when addressing global health and wellness; that they recognize concepts of interconnection and interdependence in the relationship between global health and our environments; that they recognize that community health is dependent upon participation of community members and local knowledge about health, healing and wellness. We found ourselves thinking that the authors of these articles are rediscovering Indigenous knowledge of health, healing and wellness. However, they are by and large doing so from a non-Indigenous worldview. Consequently they are rediscovering the components of Indigenous Knowledge in pieces, like puzzle pieces that hopefully will eventually reshape into a holistic worldview.

What is hopeful for us is that the importance of Indigenous knowledge about health and wellness is beginning to reemerge as of value for the sustainability of all humans and all of creation. All humans have relied upon Indigenous Knowledge for most of our existence; Indigenous communities with limited contact with non-Indigenous people have survived for thousands of years relying upon their knowledge of health, healing and wellness in concert with their environments. It is amazing to us that in a very short period of time a large portion of the human population who have shaped their thinking to non-Indigenous forms, have almost totally disowned the knowledge that has supported their sustainability for thousands of years. Yet the non-Indigenous knowledge we have formed is based on our Indigenous knowledge. Indigenous Knowledge is the foundation of the worldview that will sustain humans and all of creation upon mother earth.

The overall message points to the fact that the combination of Indigenous and non-Indigenous knowledge about health, healing and wellness can benefit all. This of course has been referred to by our Indigenous communities as ‘Two-Eyed Seeing’ which from our perspective identifies that both forms of knowledge have value and that we preface the knowledge that we are most familiar with and that fits our culture and our environment.

As we write our thoughts, our niece and granddaughter, age 3 and a half, has been sitting by our side. She draws to mind why it’s so important that we pass on our knowledge about health and wellness that will contribute to supporting a more sustainable world for the generations to come.”

While the theme of research as a solution emerged in this review, generating and disseminating high quality research is time- and resource-consuming, inequitably feasible, and often fails to benefit the communities that are most in need of solutions [119]. We also question the relevance of rigorous research into specific strategies, given the strong emphasis in this review of local, community-based solutions. This requires macro-level support and resources directed by people on the ground; this review revealed a good collection of examples of this type of redistribution. Those who have influence on policy, governance and distribution of resources, generally biomedical practitioners and academics, can—we argue, must—contribute through strategies of advocacy and solidarity. It behooves primary health care providers to advocate for a shift in the system—not only within healthcare systems but for Health in all systems and policies [120].

This does not negate the value of continued research, but there are some important caveats that this review suggests. Thoughtful steps must be taken to avoid exploitation of members and researchers within vulnerable communities. Bracken-Roche et al. offer an excellent analysis of best practices in research ethics to avoid this [121], and principles and practices of community-based participatory methodologies are well-worth considering given their demonstrated benefit to communities. A consideration of “Two-Eyed Seeing” is important when collaborating with Indigenous communities and scholars. There is an onus on researchers and institutions in higher-income countries to take steps to make access to academia more equitable; in this review, the presence of authors from higher-income regions on the teams of papers with a focus on lower-income regions suggests an effort towards justice. Keeping with the theme of trans-disciplinary solutions and intersectoral collaboration, those with academic skills can support using quality improvement methodologies. Information technology provides opportunities for communication, redistribution of resources, and relationship building. Although it

Given the strong themes related to Indigenous Knowledge Systems, the absence of Indigenous members on our team, and the importance of centering Indigenous voices conversations about Planetary Health, we invited a review of our paper by a father-daughter team. Ed and Sarah Connors are of Mohawk (from Kahnawà: ke Mohawk Territory) and European ancestry; Ed is a psychologist; Sarah is a naturopathic doctor.”

It is important that we identify that our review is primarily through an Indigenous knowledge lens. While we have the capacity to use both an Indigenous and

(continued)

was beyond the scope of this review to do a systematic gray literature search, it was evident from a scan and hand-sorting that there are an abundance of resources available online, many of which are freely accessible, including case studies for education, tool kits for practitioners, networking platforms for collaboration, and global sources of funding (Appendix C).

Our findings are similar to those of Walker et al. [53] and Chersich et al. [122]. However, our results capture a more recent reflection of the body of literature, given the acceleration of publications on this topic, and take a global view. Their results, like ours, emphasize the importance of health communication, community building and using a primary health care approach with a focus on health promotion, intersectoral collaboration, and health equity.

Given the complexity of the planetary health crisis, the plethora of impacts on human and community health, and the diverse nature of primary health care around the world, this was a complicated review to structure and execute. The effort to embody principles of collaboration and pluralism in the process meant that our team navigated different time zones, epistemic biases, professional definitions, and competing priorities. As a result, the results of our process may differ from what another team would have discovered. This review is also limited by the absence of a systematic grey literature review; given the potential value of a more rapid generation and dissemination of knowledge and innovation, and given our own experience in this field, we anticipate that more is happening in this realm than the peer-reviewed literature reveals.

4.2. Recommendations and Next Steps

Health care providers—particularly those involved in primary health care given their position on the front lines—are responsible for taking action on the climate crisis [123]. How can we move forward with hope and bring others along? This review reveals some key recommendations for future strategies for adaptation and mitigation.

- Solutions should be localized, culturally-relevant and community driven, and resourced adequately by institutions.
- A pluralistic approach to primary health care is critical, which requires ensuring all providers are able to practice to the fullest scope of their training; this necessitates cultural humility, and active dismantling of oppressive systems.
- Steps must be taken to uphold Indigenous self-determination, and humbly seek to cultivate integration between Indigenous and non-Indigenous ways of knowing. Redvers et al. describe determinants of planetary health from an Indigenous perspective [124].
- Solutions must be rooted in an expansive view of health, which includes an acknowledgement and honoring the reciprocity of Planetary and human health, and a greater investment in improving social and ecological determinants (upstream) as opposed to an emphasis on reactionary care (downstream).
- Skills of advocacy must be elevated as a critical role for all primary health care providers. This includes recognizing historical injustices and fostering inclusive, equitable approaches to primary health care [119].
- Health profession education must adapt to ensure primary health care providers have the competence to meet these challenges [125–127]. It also requires cultivation of self- and community care skills necessary to effectively cope with the impact of this great responsibility.

5. Conclusion

The climate crisis is a health crisis with inequitable impacts; it is urgent; it is human created, and it can be mitigated. This review

illustrates approaches that are being taken globally by primary health care providers to combat this crisis including engaging communities, particularly those most affected by the crisis, cultivating transdisciplinary partnerships, and honoring pluralism. Those who hold power in the current dominant primary health care system have a responsibility to cede space, give voice, and redistribute resources in order to empower, return agency and effectively innovate. Walking with communities disproportionately affected by climate change impacts increases the resilience of healthcare systems, universality of access, and effectiveness of climate solutions for the health and well-being of all.

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Declaration of competing interest

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

- SG is past president-elect of the Canadian Association of Physicians for the Environment
- JAS is past president of the Canadian Association of Nurses for the Environment
- JS is past Researcher at Divecha Centre for Climate Change and is currently employed by the UNEP Copenhagen Climate Centre
- LS is co-founder and chair of Naturopathic Doctors for Environmental and Social Trust
- Other than these, we declare no financial interests or personal relationships which could have influenced this work.

CRediT authorship contribution statement

Jacqueline Avanthay Strus: Writing – review & editing, Writing – original draft, Visualization, Supervision, Software, Resources, Project administration, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Joshitha Sankam:** Writing – original draft, Methodology, Conceptualization. **Samantha Green:** Writing – review & editing, Methodology, Data curation, Conceptualization. **Mckenzie Piper:** Writing – review & editing, Methodology, Investigation, Formal analysis. **Sabrina Richards:** Writing – review & editing, Investigation, Formal analysis, Data curation. **Kasey Knowles:** Writing – review & editing, Methodology, Investigation, Formal analysis, Data curation. **Katie North:** Writing – review & editing, Writing – original draft, Investigation. **Leslie Solomonian:** Writing – review & editing, Writing – original draft, Supervision, Resources, Project administration, Methodology, Investigation, Formal analysis, Data curation, Conceptualization.

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Supplementary materials

Supplementary material associated with this article can be found in the online version at doi:10.1016/j.joclim.2025.100440.

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