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Locating the built environment within existing empirical models of climate change and mental health: protocol for a global systematic scoping review

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ABSTRACT

Introduction Where a person lives, the characteristics of their housing and neighbourhood environment influence their exposure to climate-related hazards and vulnerability to associated mental health impacts. This suggests that the built environment may be a promising focus for integrated policy responses to climate change and public mental health challenges. However, few empirical studies have focused on the role of the built environment as an important mediator of climate-attributable mental health burden. The proposed scoping review seeks to identify and synthesise existing conceptual models and frameworks linking climate change to mental health via built environment pathways. We aim to provide a preliminary overview of the housing and neighbourhood pathways through which climate change may impact mental health, which will inform future empirical work in this emerging area of research.

Methods and analysis A systematic scoping review of the global peer-reviewed and grey literature will be conducted in accordance with Arksey and O'Malley's methodological framework and Joanna Briggs Institute recommendations. Included articles must present a conceptual model or framework incorporating relevant built environment pathways through which climate change may impact mental health and well-being. Relevant models and frameworks will be identified through systematic searches (for English-language reports) of Medline, PsycINFO, Embase, Scopus, Web of Science and grey literature databases. Two reviewers will independently screen the article titles, abstracts and full texts, with conflicts resolved by a third reviewer. Data extraction will occur using a predefined template. The presentation of findings will conform to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses Extension for Scoping Reviews, including a narrative synthesis of the role of housing and neighbourhood factors in the relationship between climate change and mental health, as identified from the existing literature. The review will lay essential foundations for future empirical research and place-based policy responses to the mental health consequences of a changing climate.

Ethics and dissemination The scoping review will be a secondary analysis of published data, for which ethics approval is not required. The results will be disseminated through a peer-reviewed publication and targeted distribution to stakeholders involved in climate change, built environment and health research and policymaking.

Study registration Open Science Framework: doi.org/10.17605/OSF.IO/XR74C.

STRENGTHS AND LIMITATIONS OF THIS STUDY

⇒ This protocol and the proposed review will conform to the rigorous methodological and reporting guidelines of the Joanna Briggs Institute and the relevant Preferred Reporting Items for Systematic Reviews and Meta-Analyses.
⇒ The research team is multidisciplinary, spanning the fields of mental health, architectural design and planning, community development, housing services and public policy.
⇒ To ensure practical application and policy relevance, the authors will engage a policy and community advisory network of experts and industry leaders, including those with lived experience of climate change and housing impacts, to provide feedback and guidance to the research team at each stage of the review process.
⇒ Searches will be limited to English-language publications for the purpose of feasibility, which may preclude the inclusion of the relevant global literature published in other languages.

INTRODUCTION

There is increasing global recognition that mental health and well-being over the lifespan is inextricably linked to the characteristics of the physical and social environments in which we live and develop.[1–3] Key examples of this are growing international efforts to embed well-being into departments outside

the health portfolio, including planning and infrastructure, such as Australia's Measuring What Matters Framework and the Welsh Well-being of Future Generations Act and related commission.[4 5] Growing evidence highlights the importance of understanding and addressing the broader social and environmental determinants of mental health, including living conditions and housing instability, income inequality and emerging climate challenges.[1 3 6] By interacting with other key determinants, climate change disrupts the conditions known to support mental health and well-being and, in doing so, exacerbates existing social inequalities and vulnerabilities.[7–12]

Global climate change has led to an increased frequency and intensity of extreme weather events and natural disasters including floods, droughts and wildfires.[13] While the mental health impacts of these acute climate change-related events are relatively well-characterised, emerging evidence highlights the impacts of longer-term chronic climate exposures, including sustained shifts in temperature and rainfall patterns, rising sea levels and prolonged heatwaves and drought.[8 14] In addition to the trauma-related impacts of acute climate hazards (such as post-traumatic stress disorder), chronic climate change also appears to exert generalised effects on mental health, involving negative emotions such as fear and grief and non-specific psychological distress.[8 15 16] However, there is limited research clarifying the causal links between longer-term patterns of climate change and population mental health.

Existing models and frameworks describe the direct and indirect causal pathways through which climate change may impact mental health and well-being.[8 14 16 17] In their widely endorsed causal systems framework, Berry *et al*[14] proposed a 'direct pathway' involving traumatic exposures to environmental hazards and extreme weather events, which may entail immediate physical danger, reduced access to resources and distress arising from damage to valued land. Proposed 'indirect pathways' occur via impacts to physical health and communities, with the latter involving social and economic disruption arising from environmental and agricultural damage.[14] More recently, conceptual work has sought to integrate the numerous interacting pathways and complex systems through which climate change exerts adverse effects on mental health and well-being.[16 17] However, existing models fail to specify the pathways through which clinicians and policymakers may facilitate psychological, social and infrastructural resilience to climate change.[18] Crucially, they fall short by overlooking the central role of the built environment in understanding and addressing the mental health impacts of climate change. Within the environmental health risk framework, the built environment cuts across each of the components of vulnerability to these impacts, namely *exposure*, *susceptibility* and capability to cope and recover (*adaptive capacity*).[19] Further research is required to establish these underlying causal mechanisms, as this will move research and policy toward a more holistic approach, which incorporates the individual, community and broader societal-level systems involved.[15 17]

The role of the built environment

Where we live critically influences our exposure and vulnerability to climate-related hazards, with the built environment acting as both a key contributor to climate change and moderator of its mental health effects.[8 20–22] Urbanisation is rapidly increasing on a global scale, with urban populations particularly susceptible to distress arising from associated increases in air pollution, energy expenses, exposure to heat, stress-related illness and mortality.[23 24] Rural, coastal and drought-prone areas are also associated with unique risks in the context of climate change.[22 25] Yet importantly, even within the same geographic region, neighbourhood and housing characteristics influence vulnerability to the physical and mental health impacts of climate change exposure.[9 11 20] Neighbourhood built environment indicators of vulnerability seem to include population density, distribution of green and blue space, density of buildings and impervious surfaces and distance from sources of pollution.[20 26–29] Further, access to community infrastructure and services (eg, healthcare, public transportation, cooling public spaces) significantly modifies sensitivity to climate-related health risks and adaptive capacity of communities.[20 29]

Safe and secure housing is widely recognised as a key determinant of mental health and is increasingly important in the context of climate change and global urban expansion.[30 31] Housing is involved in several psychological processes integral to mental health and well-being, including sense of safety, privacy and belonging to place.[22 32] Each of these processes may be disrupted by climate change, with structural housing issues and a compromised ability to control privacy and safety through housing increasing anxiety and depression.[33] Further, poor-quality housing is more susceptible to weather-related damage, indirectly impacting mental health by degrading resident physical health.[11 14 32] Other housing factors such as affordances (eg, access to air-conditioning), passive design aspects (eg, insulation), overcrowding, building material and thermal performance have been identified as indicators of vulnerability to the mental health impacts of climate change.[9 20] Climate change creates new risks to the value of housing as an asset and the cost and availability of insurance, with implications for the financial well-being of homeowners.[34 35]

Unequal distribution of risk

Built environment risk factors are unequally distributed among the global population. Compounding individual and community-level vulnerabilities to climate change can amplify mental health inequalities, particularly among the already disadvantaged.[14] Individuals living in poverty or socioeconomic disadvantage, with disability or pre-existing health conditions and those otherwise socially marginalised (eg, LGBTIQ+) are more likely to

live in 'hazardous' areas and precarious housing environments, experiencing disproportionate health burdens from climate change.[9 11 14 36] For example, lower-income individuals are more likely to reside in poorly-designed houses and neighbourhoods subject to higher temperatures, as well as being more exposed to outdoor heat during heatwaves, compounding their vulnerability to extreme heat.[9 37 38] Low-income households are particularly vulnerable to energy poverty in the face of climate change and increasing energy costs, with one Australian study finding that social housing frequently operated outside of health and safety temperature limits, negatively impacting resident health and well-being.[37] Further, lower-income homeowners may be unable to afford efficient housing or to retrofit existing homes, while renters and public housing residents often have limited resources to protect themselves as insecurity of tenure creates barriers to adaptive capacity.[36 39] Individuals experiencing homelessness are often unable to control temperature and other conditions in their living environment and are limited in their access to secure shelter for respite, putting them at an increased risk of harm during extreme weather events.[40]

Critically, climate change forms a part of a vicious circle which drives further socioeconomic inequality, thus greater inequity in future climate risk.[19] The points of intervention to reduce inequalities intersect multiple sectors of societies, economies and responsibilities of government including social security, employment, education and health.[19] It is important to note that while the socioeconomic factors determining exposure, susceptibility and adaptive capacity are critical for redressing the impacts of climate change, they are also important in determining health and well-being in general. For this reason, they represent critical areas of intervention for social and climate justice.

The relationship between a person's local built environment and their mental health critically relies on their subjective perception of that environment, which can be understood as a sense of 'place'. The concept of 'place' refers to physical spaces imbued with social and emotional significance, with one's sense of place tied intimately to identity, comfort and well-being more broadly.[41] A place encompasses geographical location, physical landscape and infrastructure, as well as individual and shared meaning imparted by human social activity and psychological attachments.[41] A place is formed by the shifting interaction of factors within and outside of its boundaries.[42] Climate change, as a global phenomenon with differentiated local and regional impacts, is articulated and experienced through place. The role of place is central to socioecological approaches increasingly adopted in the field of public health, which view mental health as shaped by dynamic interactions between the individual and broader environmental influences across the lifespan.[43 44] Contextual or place-based risk and protective factors operate at multiple nested levels of influence, with the home and local environment exerting the most immediate influence on health and well-being. A supportive environment facilitates adaptive responses to adversity and, as such, one's psychological resilience to climate change is seen as inseparable from the resilience of their total social and built environments.[18]

The built environment is integral to understanding the mental health impacts of climate change and is a potential policy lever through which governments and organisations can support populations in developing resilience to climate change. However, mental health, housing and climate change policy and service systems remain siloed and pay insufficient attention to unequal distribution of risk.[10–12] This work will provide practical support to new global urban policy to ensure our future physical and social environments are well-designed and managed in a way that does not compromise on mental health outcomes.

Proposed scoping review

The proposed scoping review seeks to identify and synthesise existing conceptual work describing built environment mechanisms through which climate change may impact mental health and well-being, with a focus on housing and neighbourhoods. By providing an initial overview of the literature as it pertains to this emerging interdisciplinary research area, the review will lay an essential foundation for future empirical research and policymaking. A preliminary search of existing registries and databases was conducted, and no underway or published reviews incorporating climate change, mental health and the built environment were identified.

METHODS AND ANALYSIS

Due to the exploratory nature of the proposed review, the breadth of the research topic and lack of existing synthesis, the scoping review methodology was chosen to provide a comprehensive preliminary overview of the built environment pathways through which climate change may influence mental health and well-being.[45] This scoping review protocol has been registered with The Open Science Framework (available at doi.org/10.17605/OSF.IO/XR74C) and is reported in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses Protocols (PRISMA-P) and Joanna Briggs Institute (JBI) recommendations.[45 46] The scoping review will be conducted in accordance with seminal methodology proposed by Arksley and O'Malley alongside updated guidance by Levac *et al* and the JBI[45 47 48] and will conform to the reporting standards of the PRISMA extension for Scoping Reviews (PRISMA-ScR).[49] This protocol is organised according to the six stages of Arksley and O'Malley's iterative approach to scoping and reviewing the literature,[47] each of which is expanded on below.

Patient and public involvement

From the outset, this project involves iterative engagement and consultation with relevant stakeholders about study

planning, synthesis, interpretation, findings and dissemination, forming an essential component of the scoping review methodology.[48] For example, two built environment industry stakeholders have been involved with the project since inception and provided expertise, guidance and authorship on this protocol document. We will next bring together and consult with a policy and community advisory network involving a range of experts and industry leaders across the health and built environment sectors, including peak bodies and individuals representing those with lived experience. The expert advisory network will be engaged to provide regular advice and guidance to the research team throughout the research process, review findings and identify gaps and opportunities for applicability as well as any additional research to be undertaken. As such, the voices of key representatives spanning practice, policy and lived experience will be embedded into all stages of the research process to ensure relevance and practicality, and findings will be disseminated across sectors to enhance knowledge on a broad scale.

Defining the research question

The proposed scoping review will be undertaken to answer the following exploratory research questions:

1. What existing conceptual models and frameworks describe built environment pathways linking climate change to mental health outcomes?
2. How do housing and neighbourhood factors influence the relationship between climate change and mental health, as proposed in identified models and frameworks?

Key concepts in our question/s include 'climate change', 'mental health', 'frameworks and models' and 'built environment', each of which is expanded on below.

Climate change

Climate change-related events and exposures are categorised along a spectrum from acute (ie, rapid-onset disasters and extreme events such as floods and hurricanes) to chronic (ie, slow-onset and long-term events such as shifts in average temperature and sustained drought).[14] While acute and chronic events are inter-related (eg, chronic changes in temperature and precipitation are associated with increases in acute floods and wildfires), it is useful to distinguish between them for the purpose of delineating the differential impacts to mental health and respective causal pathways.

Mental health

Mental health refers to the dynamic state of emotional, psychological and social well-being and functioning of each individual and forms a critical component of health more broadly.[50] It is conceptualised as a continuum encompassing the vast range of experiences and outcomes associated with better or worse mental health, not merely by the presence or absence of clinical disorder.[50]

Frameworks and models

Although used interchangeably in the literature, frameworks and models are distinct but related tools for conceptualising a phenomenon of interest and guiding research inquiry, differing primarily in level of abstraction.[51] For the purposes of this review, we use frameworks and models to refer to any conceptual organisation of key elements and pathways accounting for the effects of climate change on mental health and well-being.

Built environment

The built environment refers to all human-made elements of the physical environment supporting human activity, including buildings, roads, and transportation systems as well as the larger-scale neighbourhoods and cities they comprise.[21] Here, we focus on the built environment as it pertains to housing and neighbourhoods, as well as a broad range of relevant concepts and sectors (eg, urban planning, sustainable development and housing policy).

Identification of relevant studies

Search strategy

In line with JBI recommendations, a three-step approach to search strategy development will be employed, involving (1) an initial limited search to inform the development of a full strategy, (2) adaptation of the search strategy to multiple databases and (3) screening of reference lists for additional sources.[45] As the proposed research is interdisciplinary in nature and pertains to non-academic spheres (eg, policymaking), the search strategy aims to locate all the relevant peer-reviewed and grey literature across a range of multidisciplinary databases.

We propose a comprehensive search strategy involving a range of keyword search terms (and relevant index terms, where applicable) capturing each of our key concepts: 'climate change' (eg, climate hazards, extreme weather and global warming), 'mental health' (eg, mental disorder, psychological distress and emotional well-being), 'frameworks and models' (eg, causal pathways and schematic model) and 'built environment' (eg, housing quality, urban planning and neighbourhood design). Search strategies will be adapted to the controlled vocabularies of Medline (Medical Subject Headings (MeSH)), Embase (Emtree) and PsycINFO (PsycINFO thesaurus), and relevant index terms will be included alongside keyword search terms. Search terms will be combined within each concept using the Boolean operator 'OR' and combined concepts using the Boolean operator 'AND'. All keywords and index terms will be systematically searched across five major peer-reviewed databases: Medline (Ovid), PsycINFO (Ovid), Embase, Scopus and Web of Science. A preliminary search strategy was drafted in consultation with an academic librarian, and search terms were refined to increase precision and breadth of coverage as familiarity with the literature increased.[48] A full preliminary search strategy for Medline (including MeSH terms) is presented in online supplemental appendix 1.

Additionally, we will use a modified keyword-only search strategy to locate the grey literature through Google, Google Scholar, Open Grey, Analysis and Policy Observatory and WHO databases. Google and

Google Scholar results will be limited to the first four pages, with 50 results per page. For grey literature databases only, we will use the broader term 'health' (as opposed to 'mental health'), as government and policy reports often include mental health in their scope while only using the umbrella term 'health' in the title and abstract. Further, while this strategy is unfeasible for peer-reviewed databases due to the volume of identified articles, grey literature searches retrieve a manageable number of results.

Inclusion and exclusion criteria

We aim to include all the published literature that presents a conceptual framework or model describing built environment pathways linking climate change to mental health and well-being, including but not limited to those presented in original empirical studies, systematic and narrative reviews, government publications and policy reports. Frameworks and models must describe or imply causality in the relationship between climate change and mental health and may (but not necessarily) test this proposed framework empirically. Non-theoretical models (eg, mathematical models and animal models) will be excluded. We will include frameworks and models describing any climate-related and weather-related environmental exposures associated with climate change but exclude vicarious exposures (eg, through the media). There will be no limitations on the mental health and well-being outcomes considered, including psychiatric and clinical outcomes (eg, symptoms and diagnoses of mental disorders), as well as general psychological and behavioural indicators of mental health (eg, stress, substance use and sleep disturbances). Relevant built environment pathways may be incorporated either explicitly or implicitly and may comprise only a small component of the overall framework or model. For feasibility, included articles must be published in English.

Evidence selection and screening

All identified articles from the final searches will be collated and uploaded into EndNote and deduplicated. Using Covidence software, two independent reviewers will double screen articles for eligibility based on the inclusion and exclusion criteria identified in stage 2. An initial title and abstract screening will be followed by a full text screening. Discrepancies at either stage will be discussed and resolved with input from a third reviewer. Where applicable, primary reasons for exclusion will be recorded by reviewers and reported in the scoping review. All included articles will be retrieved, and citation details will be uploaded into a Microsoft Excel extraction spreadsheet which has been specifically designed for this purpose.

Data extraction

We will use the Excel spreadsheet to extract author and publication details from each included article, such as publication date; setting; the rationale for the development of the model/framework; intended audience for the models/frameworks (policymakers, researchers and the general public); definitions of our key concepts as provided by authors; specific components of the models/frameworks, such as the 'direction' between variables. We will also extract data specific to frameworks and models including theoretical basis, mental health outcomes of interest, methodology for framework or model development, strengths and limitations and relevant built environment elements or pathways. To ensure that all information relevant to the research questions and the objective is being captured, the extraction tool will be pretested by two independent reviewers against a sample of included articles, with any necessary modifications documented and detailed in the resultant scoping review. All remaining data will be extracted by at least one reviewer. Where required, authors of included resources will be contacted for additional information or clarification.

Collating and reporting results

The final stage involves data analysis, reporting of results in line with the research questions and objectives and discussion of implications for future research, practice and policy.[48] Findings from the review will be reported in line with PRISMA-ScR guidelines, with the flow of study identification and screening information presented in a PRISMA flow diagram. First, we will provide a descriptive summary of the nature and scope of relevant conceptual frameworks and models identified in the literature, mapping the number and names of the frameworks and models, their methodological and theoretical foundations, intended purpose and the research context in which they are presented, as well as an overview of relevant built environment elements and pathways. Narrative synthesis will be adopted to further elaborate on qualitative findings as they relate to research question 2; describing specific housing and neighbourhood factors identified as being involved in the pathways linking climate change to mental health and their place within the context of a broader conceptual framework or model. We also plan to use results to identify stakeholders and experts that are important to engage with in future work on this topic area and how these may be different from what we had previously anticipated. For example, we may find that the significantly impacted are more often from regional areas or lower socioeconomic backgrounds, and so the considerations of policy application of this research may be different when taking into account stakeholder needs. Finally, if feasible, we hope to integrate findings into a schematic of the built environment pathways linking climate change to mental health which may be used to guide future empirical research and policymaking in the area. We will document and

detail the rationale for any changes made to analysis and reporting in the scoping review.

DISCUSSION

Place is integral to understand the mental health impacts of climate change, with the built environment representing an important target for place-based policy strategies addressing household and community-level risk factors. However, place does not currently occupy a formal role in standard policy and practice approaches to climate change and mental health, so there is a need to collate and synthesise existing theoretical frameworks and models to bridge the research-to-policy divide.

To our knowledge, this is the first review of frameworks and models of the mental health impacts of climate change. Limitations of the planned project include that searches will be limited to English-language publications for the purpose of feasibility, which may preclude the inclusion of the relevant global literature published in other languages.

By synthesising existing frameworks and models through a built environment lens, the proposed scoping review will provide a comprehensive overview of housing and neighbourhood pathways involved in the relationship between climate change and mental health. In doing so, it will lay a necessary conceptual foundation for future longitudinal research investigating the causal mechanisms underlying these pathways. With a focus on housing and neighbourhoods, findings will further inform the development of policy, prevention and intervention strategies aimed at supporting populations to develop psychological, social and infrastructural resilience in the face of growing climate change.[18]

ETHICS AND DISSEMINATION

The scoping review will be a secondary analysis of published data, for which ethics approval is not required. The results will be disseminated through a peer-reviewed publication and targeted distribution to stakeholders involved in climate change, built environment and health research and policymaking.

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Patient consent for publication Not applicable.

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