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Developing global recommendations for action on climate change and mental health across sectors: A Delphi-style study

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Abstract

Climate change is causing far-reaching yet underappreciated worsening of outcomes across the mental health and wellbeing spectrum. Despite increasing attention to the mental health impacts of climate change, an absence of a clear, cross-sectoral agenda for action has held back progress against the dual and interconnected challenges of supporting human and planetary health. This study aims to serve as an essential first step to address this gap. Harnessing the expertise of a diverse panel of 61 participants, representing 24 nationalities, this study developed and prioritized recommendations for action on climate change and mental health across the relevant sectors of research, policy, healthcare and the third sector, and used a Delphi-style methodology to examine their feasibility and importance. Broadly, the prioritized recommendations highlighted the need to expand the evidence base, work collaboratively across sectors, and raise awareness. While broadly there was consensus on recommendation importance, there was greater variation in the reported feasibility of the recommendations, which differed across settings. Other common themes included the need for cultural and resource contextualization, raising awareness of and addressing mental health co-benefits via climate action, and working with communities with lived experience to develop and implement the findings. As there may be some interdependencies between the recommendations, further work needs to identify how best to implement them. The recommendations serve as a robust and evidence-based framework that can be used as a foundation to devise locally appropriate, concrete implementation strategies matching levels of need and resource. These also serve as a clear call to action for investment from leaders across sectors to ensure they are realized.

Structured abstract

INTRODUCTION: Climate change is causing far-reaching yet underappreciated worsening of outcomes across the mental health and wellbeing spectrum. Despite increasing attention to the mental health impacts of climate change, an absence

of a clear, cross-sectoral agenda for action has held back progress against the dual and interconnected challenges of supporting human and planetary health. This study aims to serve as an essential first step to address this gap.

METHODS: Harnessing the expertise of a diverse panel of 61 participants, representing 24 nationalities, this study developed and prioritized recommendations for action on climate change and mental health across the relevant sectors of research, policy, healthcare and the third sector, and used a Delphi-style methodology to examine their feasibility and importance.

RESULTS: Broadly, the prioritized recommendations highlighted the need to expand the evidence base, work collaboratively across sectors, and raise awareness. While broadly there was consensus on recommendation importance, there was greater variation in the reported feasibility of the recommendations, which differed across settings. Other common themes included the need for cultural and resource contextualization, raising awareness of and addressing mental health co-benefits via climate action, and working with communities with lived experience to develop and implement the findings. As there may be some interdependencies between the recommendations, further work needs to identify how best to implement them.

CONCLUSION: The recommendations serve as a robust and evidence-based framework that can be used as a foundation to devise locally appropriate, concrete implementation strategies matching levels of need and resource. These also serve as a clear call to action for investment from leaders across sectors to ensure they are realized.

Keywords

Climate change, mental health, policy, planetary health, health, healthcare, climate anxiety, Delphi.

Introduction

Climate change is having substantial impacts across the mental health spectrum [1]. Climate change stressors such as heat and extreme weather events have been linked to multiple adverse mental health outcomes such as increased rates of suicide and psychological distress, worsened symptoms of psychiatric disorders, and heightened mortality among people with mental health problems [2]. Beyond the direct impacts of climate change, concerns over the climate crisis are also leading to the emergence of various psychological reactions such as climate anxiety [3]. Climate change is impacting mental health directly, for example by making exposure to traumatic events more prevalent due to more frequent and intense extreme weather events, as well as indirectly, by worsening known social determinants of mental health such as poverty [4, 5].

The latest International Panel on Climate Change report in 2022 stated that there is "high confidence" that climate change has adversely affected the mental health of people in the assessed regions [6]. Similarly, the World Health Organization (WHO) policy brief on climate change and mental health states that "climate change is increasingly having stronger and longer-lasting impacts on people, which can directly and indirectly affect their mental health and psychosocial well-being" [7].

Despite increasing focus on the topic, the impacts of climate change on mental health have traditionally received less attention when compared to the literature on the relationship between climate change and other health outcomes such as infectious diseases [8, 9]. There has also been a lack of political attention and policies that consider the relationship between climate change and mental health [10]. This has led to calls for more research on the topic and for more action based on the existing research [7, 9, 11, 12]. However, among other barriers, this has been hampered by the current lack of a clear and coherent agenda for action on climate change and mental health across sectors in what is a complex and interdisciplinary area with multiple pathways to impact [1].

Various recommendations for action have been put forward in several documents, including those developed by Lawrance et al., the American Psychological Association, and the WHO [1, 7, 13]. The WHO policy brief, for example, recommends five key approaches to address the impacts of climate change on mental health, including integration of climate change considerations into policies and programs for mental health, and implementation of multi-sectoral and

community-based approaches to reduce vulnerabilities and address the mental health and psychosocial impacts of climate change [7].

However, while informed by evidence and by experts, these priorities were not developed as part of a formal consensus-building process and are not part of the formally peer-reviewed literature. For example, the recommendations in Lawrance et al.'s (grey literature) briefing paper were developed by the Global North-based authors, in consultation with a small pool of experts. Some examples of formal consensus-building exercises for climate change and mental health do however exist. One Delphi study explored global priorities for climate change and mental health research by collecting data from 22 experts from multiple sectors and identified 10 key research priorities [12]. Another Delphi study identified consensus for 20 research priorities for mental health and psychosocial support (MHPSS) research in the context of climate change by consulting 91 experts [14]. However, these studies focused only on the research sector and were not developed in the context of other relevant sectors that are key for climate change and mental health action, such as policymaking, healthcare, or the third sector (although research priorities may still be relevant to these sectors).

The current study aims to address these limitations by developing recommendations for action on climate change and mental health across and between the sectors of research, policy, healthcare, and the third (non-governmental, non-profit) sector, based on global expert consensus of importance and feasibility. It also seeks to identify the recommendations which are deemed the greatest priority to action. The need for cross-sectoral perspectives and collaborations was a strong message from the 2022 Intergovernmental Panel on Climate Change (IPCC) reports, and we therefore suggest that cross-sectoral approaches are necessary when developing recommendations for action [6, 15]. We contend that such approaches may help increase the chance of collaboration in the delivery phase and reduce the risk of siloed, less efficient actions. To the best of our knowledge, this is the first study to present cross-sectoral (involving multiple, overlapping sectors) perspectives and examine the perceived feasibility of cross-sectoral recommendations. Due to regional and national-level differences in needs, resourcing and context, these recommendations are intended to serve as an essential first step for leaders in the development of concrete and locally-appropriate action plans, rather than a one-size-fits-all approach. Such an approach is also necessary given the variation in climate impacts and population vulnerability around the world.

Methods

Study design

This study applied a modified Delphi methodology to reach a consensus among an international, cross-sectoral group of experts on globally-applicable priorities for action on the interconnections between climate change and mental health. The Delphi process is a research technique used to reach consensus on a topic and involves recruiting a panel of experts and asking them to respond to rounds of questions until consensus within the group is reached [14]. Although other methods are applied in the literature, the Delphi methodology is one of the most commonly used approaches to achieve consensus. This technique has also been used in the field of climate change and mental health, demonstrating appropriateness for the aims of this study, and was therefore selected to achieve consistency [12, 14, 16]. In this study we used an initial email questionnaire survey to co-design a set of recommendations that were then prioritized using a Delphi methodology in a subsequent email survey round. The research was conducted online between January and May 2022, and participation was voluntary and unpaid. This project received ethics approval from the Imperial College London Ethics Committee (reference number 21IC7327).

Participants and recruitment

To be eligible to participate in the study, individuals needed to (i) have had a minimum of one year's experience working in mental health and/or climate change across at least one of the healthcare, research, policymaking or third sectors; (ii) be fluent in English; (iii) have an affiliation with an organization that includes mental health, climate change, or other relevant sectors; (iv) and be over the age of 18.

Potential participants were identified through snowball and purposive sampling through the authors' networks. The aim was to recruit a similar number of participants from each sector to reduce potential bias, and to maximize geographic and demographic diversity. Prospective participants were emailed a survey to express interest in participating in the study, to confirm they met the eligibility criteria, and to assess whether their level of expertise was appropriate for the study. Individuals were asked demographic questions (age, gender, nationality); affiliation; sector of work; scale of work (local, regional, national, international); experience in climate change and/or mental health, and number of years worked in these fields. Individuals could also nominate up to six further individuals in this survey.

As the literature does not specify an agreed acceptable minimum, or optimal number of participants for a Delphi study, all individuals who expressed interest in participating in the study were included and a target was set to recruit a minimum of 35 participants. This target sample size was set in line with previous Delphi studies [19]. Recruited participants were provided with a participant information sheet and gave informed consent through a consent form prior to study commencement.

Survey and recommendations development

The first survey was designed to facilitate the development of a set of recommendations to be prioritized in the second (Delphi) survey. An initial set of published recommendations (based on Lawrance et al.[1]), grouped by four sectors (healthcare, policymaking, research, and third sector/community organizations) were included in a survey. The survey asked participants whether they had any suggested edits to each of the recommendations (free text), and whether they believed each should be included in the prioritization exercise in the following survey ("yes"/"no"/"don't know"). The survey also asked participants whether they had any further recommendations they believed should be added to the list.

The qualitative and quantitative feedback was then analyzed sequentially in multiple rounds by the study team, including assessment and review of over 350 comments. In the first round, one author (JA) identified whether any of the recommendations did not receive sufficient support (<50% agreement) for inclusion in the second survey and therefore should be removed, and then identified emergent common themes in the free text feedback. The qualitative feedback was then reviewed a second time by two study authors (JA & AM) who then made suggested edits to the existing recommendations based on recurring feedback. The adjustments included simplifying the recommendations to use clear and consistent language so that they could be read and understood by individuals from different contexts; removing explanatory examples of a particular instance of the recommendation that participants considered superfluous; separating recommendations that were deemed distinct; merging those that had substantial conceptual overlap, and adding or removing specific content from the recommendations based on recurring feedback from participants. The amendments were then considered by all authors to ensure agreement. Through this process a set of novel recommendations was produced.

The revised recommendations, organized by sector (healthcare, policymaking, research, and third sector/community organization) were then presented to participants in a second survey. Participants were asked to rate the extent to which they believed each recommendation is important and, separately, feasible, using a five-point Likert scale: strongly disagree, disagree, neither agree nor disagree, agree, strongly agree. Participants had the option to justify each rating in a free text box, and any such qualitative feedback was captured. In a second stage, participants were then asked to select their top three priorities for each sector.

Data analysis

The data were analyzed using Qualtrics and Microsoft Excel, where the answers from the Likert scale were converted into a numerical score: (1) strongly disagree, (2) disagree, (3) neither agree nor disagree, (4) agree, (5) strongly agree. The mean, range, and standard deviation were calculated to measure the relative agreement level with each recommendation's importance and feasibility. The Likert scale values were then collapsed into three categories of "agree" (scores of 4 or 5), "neutral" (scores of 3), and "disagree" (scores of 1 and 2). A recommendation was determined as not reaching consensus if less than 75% of participants agreed (i.e. score 4 or 5) that it is important or feasible [14].

The top three recommendations for each sector were identified as those that had the highest share of respective participant votes for the prioritization exercise.

Results

Participant characteristics

Sixty-one participants were recruited, representing 24 nationalities. Of these, 60 (98%) participated in developing the recommendations (survey 1), and 48 (79%) participated in the Delphi prioritization survey (survey 2). Forty-seven (77%) participants completed both surveys. The reduction in participation can be explained by natural attrition. Participants' demographic information is shown in Table 1.

Priorities for the four sectors

Following qualitative analysis of the feedback received from participants in survey 1, in which 352 comments were assessed, 36 recommendations were developed, including 7 that were novel. 11 recommendations were developed for the healthcare sector from the initial eight existing recommendations; nine were developed for policymakers from the initial seven; nine were developed for the research sector from the initial eight; and seven were developed for the third sector and community organizations from an initial six. The initial recommendations were substantially edited following extensive feedback from participants and all received sufficient support (>50%) and were therefore included in the prioritization exercise.

The results of the subsequent Delphi survey in which these recommendations were ranked and rated in terms of importance and feasibility are shown in Tables 2-5.

The following sections will describe the three priorities that were most commonly selected in the top three of participants' rankings for each of the four sectors. We include examples of feedback where the qualitative data adds valuable nuance and perspectives.

Priorities for the healthcare sector

All healthcare sector recommendations were deemed important and reached consensus, with over 90% agreement in each case and the mean Likert values above 4.5 (Table 2). While all recommendations also reached consensus on feasibility, there was greater variability in the responses as demonstrated by higher standard deviation scores for all but one of the recommendations.

Following participants' selection of their top three priorities, four leading recommendations emerged (with two recommendations in joint third place), which are described in the text below. These four recommendations also received the highest mean score for importance and feasibility.

Recommendation 1: Take immediate action to build sustainable and climate-resilient healthcare systems that mitigate and adapt to climate change and therefore reduce the harmful impacts of climate change on physical and mental health.

This recommendation received the highest share of participants' top three priorities (37.5%) and also had the highest mean importance (M = 4.9, SD = 0.31). Its feasibility was also rated high (M = 4). However, there was greater variation compared with participants' perceptions of importance (SD = 0.69). Participants noted the urgency of this recommendation but that feasibility will vary between countries, dependent on resources and political will, with particular challenges in low and middle-income countries (LMICs). LMICs can be categorized using the World Bank definition [17].

"Taking immediate action to build sustainable and climate-resilient healthcare systems in LMICs will be difficult as this is in most cases not included in their political commitment" - Male, Bangladeshi

Recommendation 2: Partner with those who have lived experience of climate change impacts, and who are at greater risk of future impacts, in the development, research and delivery of services in response to climate change and related mental health needs.

Over a third of participants selected this in their top three priorities (35.4%). This recommendation was also rated as the most feasible for this sector (M = 4.56, SD = 0.57) and was considered highly important (M = 4.85, SD = 0.35). Several participants commented on the need to include the perspectives of those from LMICs, who are at greater risk of current and future impacts of climate change, for example due to living in areas more prone to extreme weather events, being more dependent on the land for livelihood, and having been more subjected to extractive practices from wealthier countries. Other at-risk groups identified by participants included women, young people, Indigenous communities, climate/environmental scientists, and marginalized communities.

Recommendation 3 (joint 3rd): Raise awareness of the mental health impacts of climate change, and the opportunities for mental health gains from climate action, among the public to increase people's capacity to recognize, plan for and respond to these impacts on themselves and their community.

Respondents to survey 1 identified the government as a key actor in fulfilling this recommendation, via public sector messaging. A third of participants selected this in their top three priorities (33.3%). Although this was perceived as important (M = 4.54, SD = 0.71) and feasible, there was greater variation in feasibility ratings (M = 4.38, SD = 0.83). Participants suggested that feasibility of communicating these key messages rests on first improving the evidence base for effective interventions. Several participants suggested that a challenge will be improving public understanding of this complex and nuanced subject, while another participant commented that materials tailored for different demographics may help to better reach and engage audiences.

"Raising awareness is very feasible but scientific literacy and science communication need to be improved too for the public to understand the impact and ROI [return on investment] of appropriate actions" - Male, Malaysian

Recommendation 4 (joint 3rd): Strengthen mental healthcare systems to increase preparedness and resilience to climate-related disruptions, and ensure continuity of care.

This recommendation ranked joint third in the prioritization exercise (33.3%). It received a high mean score for importance (4.69, SD = 0.55) but there was greater variability in opinions of feasibility (M = 4.19, SD = 0.9) and agreement on feasibility was lower than for other recommendations (79.2% agreement, the second lowest for this sector). While recognizing the importance of this recommendation, respondents commented that its feasibility depended on having the budget and resources to implement it. For example, training first aiders and expanding digital mental health service provision could increase capacity and reduce access gaps, even in the context of climate shocks, but would involve implementation costs and additional resourcing. Several commented that this recommendation should be part of wider efforts to strengthen all health, including mental healthcare.

"Heavily depending on money being made available - in the NHS [National Health Service] given current waiting times and low level of care availability, not realistic" - Female, German

"Very doable and likely to be very expensive. We will need to ensure we have viable, testable costings of both action and inaction" - Female, Australian

Priorities for policymakers

The results of the Delphi questionnaire for the policymaker sector are shown in Table 3. All policymaker recommendations were deemed important and reached consensus, with over 85% agreement in each case and mean values above 4.35. One recommendation did not reach consensus on feasibility (66.7% agreement, see Table 3).

The top three recommendations from the prioritization exercise are described below. The top recommendation, as selected by the highest number of participants, also had the highest mean for importance (M = 4.83, SD = 0.37). The two recommendations considered most feasible were not among the top three priorities.

Recommendation 1: Ensure that the impacts of climate change on mental health are integrated into national adaptation and mitigation plans.

This received the highest share of votes for inclusion in the top three (60.4%), the highest mean (4.83), least variance (SD = 0.37), and all participants agreed that it was important. It also received the second highest score for feasibility (M = 4.5, SD = 0.71), with 87.5% of participants agreeing that it is feasible. Comments included the apparent low priority of mental health among policymakers, and the need for more evidence on climate change's impacts on mental health.

Recommendation 2: Develop, resource, and implement locally appropriate, community-driven climate change mitigation and adaptation policies that provide mental health co-benefits and greater resilience to climate change, with a particular attention to reducing existing inequities and addressing climate injustice.

Almost four in 10 participants selected this in their top three priorities (39.6%). Almost all participants (98%) agreed that this recommendation is important. It received a high mean score for importance (M = 4.71, SD = 0.5) and feasibility (M = 4.48, SD = 0.68). Participants' comments indicated that political buy-in and local level action are needed.

Recommendation 3: Ensure active participation of those with lived experience and who are particularly at risk from the mental health impacts of climate change, alongside mental health providers, researchers, local communities and other relevant stakeholders, in the development of policies related to climate change and mental health.

Over a third of participants selected this in their top three priorities (35.4%). All participants agreed that this recommendation is important (M = 4.73, SD = 0.44), and feasible (M = 4.44, SD = 0.7). Several participants noted the need to appropriately enact this recommendation to avoid the risk of further marginalization.

"May be difficult for the practical reason that, among and within countries, these people are often disenfranchised and excluded." - Female, Australian

Priorities for research

The results of the Delphi questionnaire for the research sector are shown in Table 4. All research recommendations reached consensus on importance (>75% agreement) but two failed to reach consensus on feasibility (with low agreement on importance also) and were excluded (7 recommendations remaining). The top three prioritized recommendations also received the highest mean score for importance and feasibility.

Recommendation 1: Conduct interdisciplinary, collaborative and participatory research on the interconnections between climate change and mental health to strengthen the evidence base and facilitate the design of effective interventions.

Six in 10 participants selected this in their top three priorities (60.4%). This recommendation also received the highest mean score for feasibility (4.58, SD = 0.64), a high mean for importance (M = 4.71, SD = 0.5) and almost all respondents agreed that it is important (97.92%). One expert highlighted the need for funders to recognize the value of multi-disciplinary collaborations, so that researchers can work together to tackle this issue.

Recommendation 2: Develop, identify, evaluate, and facilitate the scale-up of effective programs and interventions to support individuals and communities whose mental health is at risk from or has been affected by the climate crisis.

Almost half of participants selected this in their top three priorities (47.9%). Although there was 100% agreement on the importance of this recommendation and it received the highest mean score for importance (4.77, SD = 0.42), there was greater variability in perceptions of feasibility (M = 4.33, SD = 0.77), with 12.5% neutral on its feasibility and 2.08% disagreeing. Participants commented that having the necessary resources to implement this recommendation would be a feasibility barrier and that more evidence is required to identify programs and interventions that are most likely to be successful, and to determine when to implement them.

"We need a strategic decision-making framework to help guide which programs to choose and when." - Female, Australian

Recommendation 3: Ensure active participation of those with lived experience and who are particularly at risk from the mental health impacts of climate change, alongside mental health providers, policy-makers, local communities and other relevant stakeholders, in research and innovation activities.

Almost half of participants selected this in their top three priorities (45.8%). Almost all (97.9%) agreed this was important with the remaining neutral (M = 4.75, SD = 0.48). There was slightly more variability in perceptions of feasibility (M = 4.42, SD = 0.67) and a greater proportion of people were neutral (10.4%). Participants' feedback highlighted the need for people to be empowered to overcome barriers to participating in research.

"Lived experience examples are very powerful evidence pieces." - Male, UK

Priorities for third sector/community organizations

The results of the Delphi questionnaire for the third sector are shown in Table 5. All third sector recommendations were deemed important and reached consensus, with over 89% agreement in each case and mean values above 4.5. One recommendation did not reach consensus on feasibility (68.6% agreement).

The recommendation that received the highest mean scores for importance and feasibility was not among the top three prioritized (*Raise awareness among policymakers, the health sector and the public of the interconnections between mental health and climate change*). This recommendation was similar to recommendations in the other sectors and therefore may not be deemed as a priority for this sector, which was reflected in participants' feedback.

Recommendation 1: Incorporate mental health and psychosocial support as a key pillar of emergency responses, particularly in assessing risk, planning, preventing and responding to climate-related disasters and slower onset impacts.

Two-thirds of participants selected this recommendation in their top three (66.6%), and almost all (93.7%) agreed it was important (M = 4.71, SD = 0.58). Its mean score for feasibility was slightly lower (M = 4.46, SD = 0.71), as was agreement (87.5%). Participants expressed that rather than training emergency responders to be mental health experts, this recommendation should be implemented by building it into existing infrastructure, for example by strengthening referral pathways.

Recommendation 2: Establish cross-organizational and cross-sector collaborations to develop and share knowledge, and replicate best practices to prevent, mitigate and adapt to the impact of climate change on mental health.

Half of participants selected this in their top three (50%). All participants agreed this recommendation was important, with the second highest mean (M = 4.75, SD = 0.43). Most agreed that it is feasible (87.5%), with the remaining neutral. Such collaborations could include those with community responders, health professionals, academics, policymakers, and the media. Participants highlighted potential difficulties in getting buy-in due to a potential lack of defined leadership, and the need to identify "higher-order benefits" [i.e, benefits shared across sectors] to all parties to "overcome turf protecting".

Recommendation 3: Identify and respond to implementation gaps where the co-benefits of climate action on mental health are not being acted upon and where third sector and community organizations are particularly well-placed to lead and collaborate.

Almost half of participants selected this in their top three (47.9%). Almost all participants agreed this was important (95.8%) with the remaining neutral. It had the same mean score for importance as the first recommendation in this sector (4.71) and similar variance (SD = 0.54). Agreement for feasibility was slightly lower (89.6%) with the remaining neutral. Its mean was fourth highest for this sector (4.38, SD = 0.67). The majority of participants' comments reflected the need for additional resources, particularly funding.

Discussion

To our knowledge, this is the first peer-reviewed study to provide a comprehensive list of recommendations from across a variety of sectors simultaneously, and as part of a formal consensus-building process, to address the interconnections between climate change and mental health. These recommendations largely achieved consensus on perceived importance and feasibility, and therefore serve as a framework for action across sectors. As the causes and consequences of the connections between climate change and mental health cut across all levels and sectors of society, including healthcare, research, policy and the third sector, ensuring actions are coordinated and connected across sectors is essential.

Despite increasing attention on climate change and mental health, there has been very little to guide decision-makers and practitioners at different levels and prior efforts are largely non-peer-reviewed [7]. And while other organizations have developed guidelines for practice, these have not been specific to the subject of climate change and mental health, do not target the whole sector, and were not developed through global expert consensus [18]. These recommendations fill these gaps and are a much-needed starting point. However, as well as resource investment, their success will depend on skilled and collaborative implementation.

Recommendations were developed and refined in a first round of engagement with the diverse expert cohort, which resulted in 36 recommendations across the four sectors. The subsequent Delphi-style exercise checked for consensus on importance and feasibility for the recommendations, with 32 reaching consensus across the group. While the remaining four were unanimously deemed important, they were not considered feasible as it was considered by some participants unlikely that their implementation would be successful, particularly in low-resource settings. Participants were also asked to select their top three priorities for each sector. Examining the top three priorities with the highest share of votes for each sector revealed 13 priority recommendations (two ranked jointly).

As corroborated by the differences in perceptions of feasibility, the recommendations are not intended to be a one-size-fits-all approach and implementation will require consideration of context. Decision-makers will therefore need to consider how the recommendations apply to their local and regional needs, and resourcing. However, their easy adaptation is strengthened by the diverse group of experts that contributed to their development, which benefited from wide geographical and sectoral representation.

Broadly, the prioritized recommendations highlighted the need to: 1) expand the current evidence base to better identify and implement successful strategies to mitigate and respond to the interconnections between climate change and mental health (i.e. interventions); 2) work collaboratively across sectors; 3) raise awareness of the current underappreciated evidence base and examples of good practice. Our priorities largely confirm and provide additional empirical support to the research and policy priorities identified in other recommendation pieces [5, 10]. They however also provide new evidence concerning priorities in sectors that have not been previously systematically assessed, such as the health and third sectors.

Several of the prioritized recommendations also emphasize the need to involve people with lived experience of climate-related mental health impacts, or communities most affected, in decision-making, research, policy, and implementation. This will help to ensure that mitigation and adaptation approaches are tailored to the needs of those most affected, increasing their likelihood of success. For instance, communities living in areas at high risk of extreme weather events could help develop mitigation strategies, such as investment in and implementation of early warning systems. This reduces the impact of disasters, including on mental health and wellbeing and is in line with the recommendation from WHO to "implement [...] community-based approaches to reduce vulnerabilities and address the mental health and psychosocial impacts of climate change"

All recommendations that were not cut out as a result of survey 1 had high levels of perceived importance in survey 2. However, given the high levels of agreement as well as rates of importance and feasibility across most recommendations, possible ceiling effects may have biased the results.

There was divergence in perceived feasibility of recommendations that appeared largely to relate to whether the expert was from a high or a low-resource setting, with some recommendations only deemed feasible in the former. In addition

to resource constraints, other potential obstacles to implementation included the need for buy-in from governments and the public, and barriers to effective awareness-raising strategies.

While resource constraints were expressed as even more challenging in LMICs, participants reported that mental health can be a low priority even in high-resource contexts. For instance, for the healthcare sector, the recommendation "Strengthen mental healthcare systems to increase preparedness and resilience to climate-related disruptions, and ensure continuity of care" ranked highly in terms of priority and importance, yet participants vocalized concerns over implementation driven by high costs and limited funding of mental healthcare, even in high-income settings. Participants also noted that mental healthcare systems are already stretched without having to adapt to climate impacts. This means the win-win opportunities are even more pressing to highlight to decision-makers, as many of the changes required to address the interrelationship between climate change and mental health are also those that are needed to strengthen existing services, for example by focusing on sustainable healthcare delivery and community-based interventions. Participants advocated for investment now to reduce the threat of climate change and prepare for its impacts. Such investment may pay for itself in the long run by reducing the far-reaching consequences of climate change on mental health.

Underpinning successful action is a strengthened evidence base - not only to better identify who is most affected and why, but also to identify which interventions are most likely to work in different contexts, for different communities, and at different times. Learning from current practice, particularly in low-resource settings, will help to ensure that successful interventions are replicated while failures avoided, contributing to cost savings. The importance of strengthening the evidence base for mental health interventions in the context of climate change has also been noted in other consensus-building exercises [10].

The recommendations outlined in this report will require skilled and collaborative implementation, as well as resource investment. Leaders across sectors should invest in toolkits for implementation of these recommendations that can be tailored to different settings, including case studies of success stories and co-developed with experts by lived experience. This should be done in tandem with efforts to: 1) achieve buy-in for the recommendations at the highest level of policy and practice (e.g. via the WHO or United Nations Framework Convention on Climate Change [UNFCCC]); 2) ensure that there are enough resources to build pathways for implementation (e.g. via dedicated funding through national health departments, research funders, and philanthropic organizations); and 3) to draw on learning from best practice where this is already happening (e.g. via international conferences, collaborations and engagement with local stakeholders).

Some recommendations will have the benefit of triggering a domino effect, where enacting some will enable others to be done more easily. Efforts are therefore also required to map any ordering effects between synergistic strategies, outline co-beneficial relationships where recommendations can achieve more if conducted simultaneously, and to make links between the recommendations and other existing relevant climate policies and/or mental health policies. For instance, the top recommendation for healthcare was decarbonizing the sector. For that to be seen as a priority, it helps to have climate-conscious healthcare leaders, which would require investment in educational initiatives for health system leaders. This could also be funneled into the development of networks to share knowledge and best practice.

This study has some limitations. Although participants were diverse, the sample may have been subject to recruitment bias and the authors were all from institutions in the Global North, which could potentially have led to some bias in the interpretation of the results. The study also excluded non-English speakers, which may limit generalizability. Some recommendations were relevant for multiple sectors and were therefore repeated across different sectors, which may have biased participants' responses. There may also be other important recommendations which were not surfaced by the current study. While consensus was achieved in the perceived importance and feasibility of most recommendations, heterogeneity in the prioritization exercise was observed, which future studies could seek to explain through subgroup analysis. This is not interpreted as a lack of consensus and differences may reflect the diversity of the backgrounds of participants. This study did also not include overarching recommendations to be applied generally across all sectors.

Future research efforts should focus on developing a better understanding of the nature of barriers to implementation in particular geographical or contextual settings, which was out of the scope of this study's design.

Conclusion

Through a Delphi methodology, this study has identified and prioritized a number of recommendations across sectors to address the dual and deeply interconnected crises of climate change and mental health and wellbeing. These recommendations, considered to be important and feasible, serve as a robust and evidence-based framework to guide decision-makers and practitioners as they devise, prioritize, and implement urgently-needed strategies in these areas, and tailor these to their local needs and contexts. Although the proposed recommendations lay the essential groundwork for strategy development to the interconnected needs of caring for people and for the climate, their success rests on sufficient investment from leaders and collaborative execution across sectors and with people already affected. As the impacts of these crises will only worsen with passivity and procrastination, it is up to leaders to take heed of these recommendations and act now to both mitigate and prevent the exacerbation of these dual challenges, or pay the likely swollen price of tackling their far-reaching future consequences.

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Demographic characteristic	Survey 1		Surveys 1 and 2		Survey 2	
	Total	Proportion	Total	Proportion	Total	Proportion
Gender						
Female	31	51.7%	25	53.2%	25	52.1%
Male	28	46.7%	21	44.7%	22	45.8%
Other	1	1.7%	1	2%	1	2%
Sector						
Healthcare	30	50%	25	53.2%	26	54.2%
Research-research funding	45	75%	36	76.6%	37	77.1%
Policymaking	21	35%	17	36.2%	18	37.5%
Third sector/community organisation	26	43.3%	22	46.8%	22	45.8%
Nationality by income group						
Low-middle income	23	34.3%	19	40.4%	20	41.7%

country

High-income country	44	65.7%	33	70.2%	33	62.5%
Years of experience in mental health and/or climate change						
1-5	27	45%	21	44.7%	22	45.8%
6-10	10	17%	9	19.1%	9	18.8%
11+	23	38%	17	36.2%	17	35.4%

Table 1. Demographic information of participants across both surveys. The number of participants in the sectors and nationalities categories is greater than the sum of participants due to numerous participants working across multiple sectors, and some participants holding dual nationality.

Recommendation	Top priorities	Importance					Feasibility				
		Disagree	Neutral	Agree	Range	Mean ± SD	Disagree	Neutral	Agree	Range	Mean ± SD
Take immediate action to build sustainable and climate-resilient healthcare systems that mitigate and adapt to climate change and therefore reduce the harmful impacts of climate change on physical and mental health.	37.5%*	0.0%	0.0%	100%	4-5	4.9 ± 0.31**	2.1%	14.6%	83.3%	2-5	4.06 ± 0.69
Partner with those who have lived experience of climate change impacts, and who are at greater risk of future impacts, in the development, research and delivery of services in response to climate change and related mental health needs.	35.4%*	0.0%	0.0%	100%	4-5	4.85 ± 0.35	0.0%	12.5%	87.5%	3-5	4.56 ± 0.7**
Raise awareness of the mental health impacts of climate change, and the opportunities for mental	33.3%*	2.1%	6.3%	91.7%	2-5	4.54 ± 0.71	6.3%	4.2%	89.6%	2-5	4.38 ± 0.83

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health gains from climate action, among the public to increase people's capacity to recognize, plan for and respond to these impacts on themselves and their community.											
Strengthen mental healthcare systems to increase preparedness and resilience to climate-related disruptions, and ensure continuity of care.	33.3%*	0.0%	4.2%	95.8%	3-5	4.69 ± 0.55	6.3%	14.6%	79.2%	2-5	4.19 ± 0.9
Advocate for and promote the mental and physical health gains from climate action, and costs of inaction, to policymakers, including at relevant global gatherings such as the United Nations Climate Change Conference.	31.3%	0.0%	0.0%	100%	4-5	4.75 ± 0.43	0.0%	4.2%	95.8%	3-5	4.56 ± 0.57**
Facilitate and/or join cross-sector collaborations to co-develop, evaluate, and scale-up successful and locally appropriate interventions that focus on prevention, support, and promotion of mental health in relation to climate change.	27.1%	0.0%	0.0%	100%	4-5	4.79 ± 0.41	0.0%	8.3%	91.7%	3-5	4.5 ± 0.65
Train healthcare workers and volunteers, particularly those in mental health, and equip them with the tools and resources needed to identify, manage and support individuals and communities experiencing the mental health impacts of climate change.	25.0%	0.0%	6.3%	93.8%	3-5	4.54 ± 0.61	2.1%	12.5%	85.4%	2-5	4.23 ± 0.74

Recommendation	Top priorities	Disagree	Neutral	Agree	Range	Mean	Disagree	Neutral	Agree	Range	Mean
Incorporate the evidence on the mental health impacts of climate change in (1) quantifying current and future risks and (2) identifying future needs for mental healthcare systems.	25.0%	0.0%	8.3%	91.7%	3-5	4.6 ± 0.64	0.0%	12.5%	87.5%	3-5	4.35 ± 0.69
Collaborate nationally and internationally with researchers across disciplines to strengthen the evidence base on the impacts of climate change on mental health, to help prevent and respond to the effects of climate change.	22.9%	2.1%	6.3%	91.7%	2-5	4.54 ± 0.71	0.0%	6.3%	93.8%	3-5	4.5 ± 0.61
Partner with community-driven climate change mitigation and adaptation programs that provide mental health co-benefits and greater resilience to climate change, with a particular focus on reducing existing inequities and addressing climate injustice.	22.9%	0.0%	4.2%	95.8%	3-5	4.73 ± 0.53	0.0%	22.9%	77.1%	3-5	4.27 ± 0.81
Provide psychological support for the emotional and wellbeing impacts on healthcare professionals of responding to climate-related mental health needs, and proactively equip them with appropriate coping skills.	6.3%	0.0%	8.3%	91.7%	3-5	4.56 ± 0.64	2.1%	18.8%	79.2%	2-5	4.21 ± 0.82

Table 2. Results from survey 2 for the healthcare sector. All recommendations that were presented to participants are shown in column 1. The second column labelled 'Top priorities' shows the proportion of participants who selected a recommendation among their top three. The recommendations which received the highest share of votes are indicated by (*). The proportion of participants who disagreed (selected 'strongly disagree' or 'disagree'), were neutral (selected 'neither agree nor disagree'), or agreed (selected 'strongly agree' or 'agree') that a recommendation was important or feasible are shown in the following columns. The range and mean of answers are presented as a numerical score,

alongside the standard deviation (SD). Those that received the highest mean score for importance and feasibility are highlighted by (**).

Recommendation	Top priorities	Importance					Feasibility				
		Disagree	Neutral	Agree	Range	Mean ± SD	Disagree	Neutral	Agree	Range	Mean ± SD
Ensure that the impacts of climate change on mental health are integrated into national adaptation and mitigation plans.	60.4%*	0.0%	0.0%	100.0%	4-5	4.83 ± 0.37**	0.0%	12.5%	87.5%	3-5	4.5 ± 0.71
Develop, resource and implement locally appropriate, community-driven climate change mitigation and adaptation policies that provide mental health co-benefits and greater resilience to climate change, with a particular attention to reducing existing inequities and addressing climate injustice.	39.6%*	0.0%	2.1%	97.9%	3-5	4.71 ± 0.5	0.0%	10.4%	89.6%	3-5	4.48 ± 0.68
Ensure active participation of those with lived experience and who are particularly at risk from the mental health impacts of climate change, alongside mental health providers, researchers, local communities and other relevant stakeholders, in the development of policies related to climate change and mental health.	35.4%*	0.0%	0.0%	100.0%	4-5	4.73 ± 0.44	0.0%	12.5%	87.5%	3-5	4.44 ± 0.7
Ensure that the co-benefits of climate, and mental health interventions are clearly articulated and fully incorporated into cost-benefit calculations	33.3%	0.0%	2.1%	97.9%	3-5	4.79 ± 0.45	2.1%	10.4%	87.5%	2-5	4.4 ± 0.76

for climate- and health- focused policies. Conversely, the costs and risks associated with inaction across sectors must also be incorporated.											
Collaborate with researchers and other stakeholders, ensuring appropriate global and disciplinary representation, to build policy based on current evidence around climate change and mental health so that it can be applied in practice.	31.3%	0.0%	4.2%	95.8%	3-5	4.69 ± 0.55	2.1%	8.3%	89.6%	2-5	4.44 ± 0.73
Allocate ample research funding to generate the evidence base needed to identify and monitor actions that build resilience to, and manage the mental health impacts of, climate change, with a focus on those most at risk.	29.2%	0.0%	0.0%	100.0%	4-5	4.65 ± 0.48	6.3%	14.6%	79.2%	2-5	4.23 ± 0.92
Ensure that the mental health impacts of climate change are adequately represented by relevant stakeholders at global climate change gatherings, including the United Nations Climate Change Conference, so that decision-makers are aware of these impacts and the opportunities for solutions.	29.2%	0.0%	0.0%	100.0%	4-5	4.79 ± 0.41	0.0%	4.2%	95.8%	3-5	4.58 ± 0.57**
Develop effective and locally-appropriate education and campaign strategies that communicate climate change in a way that supports people's wellbeing and	25.0%	0.0%	6.3%	93.8%	3-5	4.71 ± 0.58	0.0%	8.3%	91.7%	3-5	4.58 ± 0.64**

	Top priorities	Disagree	Neutral	Agree	Range	Mean ± SD	Disagree	Neutral	Agree	Range	Mean ± SD
encourages action at multiple levels.											
Facilitate and guide the development or selection of standardized mental health and wellbeing metrics to track the effectiveness of policies that attempt to address the impacts.	16.7%	0.0%	14.6%	85.4%	3-5	4.35 ± 0.72	6.3%	27.1%	66.7%	2-5	3.85 ± 0.87

Table 3. Results from survey 2 for the policymaking sector. All recommendations that were presented to participants are shown in column 1. The second column labelled 'Top priorities' shows the proportion of participants who selected a recommendation among their top three. The recommendations which received the highest share of votes are indicated by (*). The proportion of participants who disagreed (selected 'strongly disagree' or 'disagree'), were neutral (selected 'neither agree nor disagree'), or agreed (selected 'strongly agree' or 'agree') that a recommendation was important or feasible are shown in the following columns. The range and mean of answers are presented as a numerical score, alongside the standard deviation (SD). Those that received the highest mean score for importance and feasibility are highlighted by (**).

		Importance					Feasibility				
Recommendation	Top priorities	Disagree	Neutral	Agree	Range	Mean ± SD	Disagree	Neutral	Agree	Range	Mean ± SD
Conduct interdisciplinary, collaborative and participatory research on the interconnections between climate change and mental health to strengthen the evidence base and facilitate the design of effective interventions.	60.4%*	0.0%	2.1%	97.9%	3-5	4.71 ± 0.5	0.0%	8.3%	91.7%	3-5	4.58 ± 0.64**
Develop, identify, evaluate and facilitate the scale-up of effective programs and interventions to support individuals and communities whose mental health is at risk from or has been affected by	47.9%*	0.0%	0.0%	100.0%	4-5	4.77 ± 0.42**	2.1%	12.5%	85.4%	2-5	4.33 ± 0.77

the climate crisis.											
Ensure active participation of those with lived experience and who are particularly at risk from the mental health impacts of climate change, alongside mental health providers, policy-makers, local communities and other relevant stakeholders, in research and innovation activities.	45.8%*	0.0%	2.1%	97.9%	3-5	4.75 ± 0.48	0.0%	10.4%	89.6%	3-5	4.42 ± 0.67
Co-develop and communicate a globally inclusive research agenda for climate change and mental health, identifying priority research questions through a consensus-building process with experts, policymakers, civil society groups and members of the public, especially those most at risk to the negative impacts of climate change.	41.7%	0.0%	8.3%	91.7%	3-5	4.42 ± 0.64	0.0%	20.8%	79.2%	3-5	4.21 ± 0.76
Develop equitable funding opportunities that broadly consider the interconnections between climate change and mental health and explore interventions that address these areas in tandem.	35.4%	0.0%	4.2%	95.8%	3-5	4.73 ± 0.53	4.2%	18.8%	77.1%	2-5	4.29 ± 0.91
Develop training and education programs for relevant stakeholders to increase awareness, share effective interventions and best practices, and build capacity to mitigate, prevent and respond to the mental health	22.9%	0.0%	4.2%	95.8%	3-5	4.6 ± 0.57	0.0%	14.6%	85.4%	3-5	4.38 ± 0.73

Recommendation	Top Priorities	Disagree	Neutral	Agree	Range	Mean ± SD	Disagree	Neutral	Agree	Range	Mean ± SD
impacts of climate change.											
Develop or select metrics to ensure standardization of research and evaluation in this field, which can be applied at scale and tailored to local contexts.	18.8%	4.2%	18.8%	77.1%	2-5	4.13 ± 0.86	10.4%	22.9%	66.7%	2-5	3.92 ± 1
Provide psychological support for the emotional and wellbeing impacts of climate change among researchers and members of research organizations working in the field, and equip them with appropriate coping skills.	16.7%	6.3%	16.7%	77.1%	2-5	4.19 ± 0.93	0.0%	27.1%	72.9%	3-5	4.15 ± 0.82
Train researchers to effectively share and communicate evidence of the interconnections between climate change and mental health.	10.4%	2.1%	14.6%	83.3%	2-5	4.44 ± 0.81	4.2%	12.5%	83.3%	2-5	4.4 ± 0.86

Table 4. Results from survey 2 for the research sector. All recommendations that were presented to participants are shown in column 1. The second column labelled 'Top priorities' shows the proportion of participants who selected a recommendation among their top three. The recommendations which received the highest share of votes are indicated by (*). The proportion of participants who disagreed (selected 'strongly disagree' or 'disagree'), were neutral (selected 'neither agree nor disagree'), or agreed (selected 'strongly agree' or 'agree') that a recommendation was important or feasible are shown in the following columns. The range and mean of answers are presented as a numerical score, alongside the standard deviation (SD). Those that received the highest mean score for importance and feasibility are highlighted by (**).

Recommendation	Top Priorities	Importance					Feasibility				
		Disagree	Neutral	Agree	Range	Mean ± SD	Disagree	Neutral	Agree	Range	Mean ± SD
Incorporate mental health and psychosocial support as a key pillar of emergency responses, particularly in assessing risk, planning,	66.7%*	0.0%	6.3%	93.8%	3-5	4.71 ± 0.58	0.0%	12.5%	87.5%	3-5	4.46 ± 0.71

preventing and responding to climate-related disasters and slower onset impacts.											
Establish cross-organizational and cross-sector collaborations to develop and share knowledge, and replicate best practices to prevent, mitigate and adapt to the impact of climate change on mental health.	50.0%*	0.0%	0.0%	100%	4-5	4.75 ± 0.43	0.0%	12.5%	87.5%	3-5	4.44 ± 0.7
Identify and respond to implementation gaps where the co-benefits of climate action on mental health are not being acted upon and where third sector and community organizations are particularly well-placed to lead and collaborate.	47.9%*	0.0%	4.2%	95.8%	3-5	4.71 ± 0.54	0.0%	10.4%	89.6%	3-5	4.38 ± 0.67
Stimulate, support and amplify the efforts of healthcare professionals, policymakers and researchers to increase climate change resilience through mitigation and adaptation interventions, focusing on actions that reduce inequities in how climate change impacts mental health.	39.6%	0.0%	8.3%	91.7%	3-5	4.56 ± 0.64	4.2%	27.1%	68.8%	2-5	4.02 ± 0.9
Raise awareness among policymakers, the health sector and the public of the interconnections between mental health and climate change.	39.6%	0.0%	2.1%	97.9%	3-5	4.77 ± 0.47**	0.0%	6.3%	93.8%	3-5	4.63 ± 0.6**

Recommendation	Top priorities										
Provide psychological support for the emotional and wellbeing impacts on third sector workers supporting the mental health needs of those affected by climate change, and ensure all staff are proactively equipped with appropriate coping skills.	31.3%	4.2%	6.3%	89.6%	2-5	4.5 ± 0.79	2.1%	22.9%	75.0%	2-5	4.23 ± 0.87
Ensure that health-related organizations, their staff and volunteers, and those caring for at risk groups are informed of the mental health impacts of climate change; and trained to respond appropriately and in a coordinated way.	25.0%	0.0%	8.3%	91.7%	3-5	4.6 ± 0.64	0.0%	14.6%	85.4%	3-5	4.31 ± 0.71

Table 5. Results from survey 2 for the third/community sector. All recommendations that were presented to participants are shown in column 1. The second column labelled 'Top priorities' shows the proportion of participants who selected a recommendation among their top three. The recommendations which received the highest share of votes are indicated by (*). The proportion of participants who disagreed (selected 'strongly disagree' or 'disagree'), were neutral (selected 'neither agree nor disagree'), or agreed (selected 'strongly agree' or 'agree') that a recommendation was important or feasible are shown in the following columns. The range and mean of answers are presented as a numerical score, alongside the standard deviation (SD). Those that received the highest mean score for importance and feasibility are highlighted by (**).

Author agreement statement

We the undersigned declare that this manuscript is original, has not been published before and is not currently being considered for publication elsewhere.

We confirm that the manuscript has been read and approved by all named authors and that there are no other persons who satisfied the criteria for authorship but are not listed. We further confirm that the order of authors listed in the manuscript has been approved by all of us.

We understand that the Corresponding Author is the sole contact for the Editorial process. They are responsible for communicating with the other authors about progress, submissions of revisions and final approval of proofs.

Declaration of interests

☒ The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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