UK Health Security Agency

Climate change and mental health: thematic assessment report

Contents

Foreword

Climate change is one of the most significant threats to health security and societal wellbeing. It is intensifying environmental hazards such as flooding, heatwaves, wildfires, and droughts, and is influencing the spread of infectious diseases. Even under optimistic decarbonisation scenarios, warming will continue until at least mid-century, and risks for health are expected to increase in the absence of adaptation interventions. These changes are reshaping the landscape of public health, making climate one of the defining contexts in which we must now protect communities from both environmental and infectious disease threats.

The health impacts of climate change are well known and the UK Health Security Agency (UKHSA)'s 'Health Effects of Climate Change in the UK' report published in 2023 outlined how climate change is impacting on health in the UK. One of the main pathways by which climate change impacts health is through changing weather patterns, including more frequent and severe weather events such as heatwaves and flooding. The 'Health Effects of Climate Change in the UK' report found that the greatest health impact of flooding is on mental health and highlighted a wider gap on understanding how climate change impacts mental health outcomes.

This report builds on that work to synthesise the growing evidence base on climate change and mental health. It is a direct response to calls from local authorities, government partners, civil society, industry and other partners for evidence to support policy and action. It considers the varied pathways by which climate change and adverse weather can affect mental health, who is at greatest risk, and what interventions are effective. The report is an important step forward, highlighting key findings and implications for policy, not only within the health and care sector but across sectors such as education, environment, housing, emergency response, insurance and justice.

This report is part of a programme of UKHSA activities under the National Adaptation Programme aimed at synthesising the evidence base on the health effects of climate change. Our Centre for Climate and Health Security, launched in 2022, provides leadership and coordination to protect the health of the UK population from emerging risks associated with climate change. Findings from this current report will provide the case for action to support interventions and targeted action to protect mental health in the UK in a changing climate.

The report finds that the evidence on the mental health impacts of climate change is wide ranging, including increases in depression, anxiety and suicide. The impacts will not be felt equally among the population, with certain groups such as farmers, those who depend on the land, and children and young people particularly at risk. Addressing these interconnected risks requires urgent, coordinated action across health systems, policy, and society, but there is much we can do to minimise the adverse health impacts from climate change on mental health. We hope that this report provides the basis for further action to protect population health.

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Background

Mental health is a vital component of overall health and refers to a state of mental wellbeing that enables people to cope with life stress, realise their abilities, learn and work well and contribute to their communities (1). It is important to protect and promote good mental health and wellbeing, as well as provide care to address the needs of people with mental health conditions, which can range from mental disorders and psychosocial disabilities as well as other mental states associated with significant distress, impairment in functioning, or risk of self-harm (1). However, mental health has traditionally been overlooked, resulting in it being referred to as a 'hidden pandemic'. Data suggests that the prevalence of poor mental health is increasing in England, with the proportion of 16 to 64 year olds identified with a common mental health condition increasing from 17.6% in 2007, to 18.9% in 2014 and 22.6% in the year 2023 to 2024 (2). The impact of mental health difficulties is highlighted in economic analyses, which estimated that in the UK during 2019, mental health conditions accounted for 7% of all ill health, costing approximately £117.9 billion (3). More recent analysis has estimated the economic and social cost of negative mental health impacts in England during 2022 to be £300 billion (4), significantly exceeding the annual costs of cardiovascular disease in England (£15.8 billion) (5) and lung conditions and respiratory illness in the UK (£11 billion) (6).

Climate change is a primary context in which health (including mental health) will need to be protected by governments as well as health and social care organisations now and in future, requiring continuous adaptation as climate change progresses. For the UK, climate-related risks are projected to increase through factors such as rising ambient temperatures and greater frequency and intensity of extreme weather events such as flooding (7). Increased climate risks will substantially affect health and wellbeing, in relation to both physical and mental health, which, in turn will impact health and social care systems within the UK. As such, climate change and mental health can be considered as 2 substantial and overlapping health crises.

Research and understanding into the potential mental health impacts from climate change has rapidly expanded in recent years. Mental health can be impacted by climate change both directly and indirectly through various mediating pathways which have been identified for both acute extreme weather events and slower-onset, longer lasting events. For example, there are clear links between flooding and mental health impacts (8 to 15), with impacts lasting far longer than the duration of the event itself. There are links between greater suicide risk and higher mental health-related hospital attendance associated with increases in ambient temperature (16). With projections stating that there will likely be an increase in frequency and intensity of these acute weather events due to climate change (7), it is likely that mental health impacts will also increase, which will result in higher health and social care demand and cost in future. Climate change affects the wider determinants of health, including compromised access to food, livelihoods, income security, and home security, all of which can have a knock-on effect on mental health (17 to 20). An awareness of climate and environmental change can also lead to emotional or psychological responses, such as eco-anxiety, a term used to describe the distress and worry caused by the threat of climate change, and solastalgia, which refers to the distress

experienced as a result of environmental change (including climate change) negatively impacting on someone's home or sense of place (21, 22). It is likely that climate mitigation and adaptation activities will create both risks and opportunities for mental health through the changing of both natural and built environments. It will be important to ensure a just transition as we adapt to and mitigate the impacts of climate change.

Mental health impacts associated with climate change will differentially impact certain populations, depending on the hazards they are exposed to and underlying vulnerabilities (for example, age or socioeconomic circumstances). It will therefore be important to map these climate-related differential risks and identify those who may require the most support and what support can be provided. Mental health difficulties affect a significant proportion of the population, with substantial variation across England (and the wider UK) for both populations affected and accessibility of services (23). There is, therefore, a growing need to understand how best to prepare and adapt for increased psychosocial resilience to promote and protect good mental health in relation to climate change.

The 'Health Effects of Climate Change in the UK' report (2023) identified a range of pathways for various climate-related mental health risks (19). Whilst, no formal synthesis or assessment of the mental health-related evidence was included, it was recommended that the mental health impacts from climate change requires additional research and focus in a future thematic report (19). As such, this report provides a focused assessment of climate change and mental health, answering the following questions:

1. In what ways (via what mechanisms) can climate change affect mental health?
2. Which populations are most at risk from the mental health impacts of climate change in the UK?
3. What evidence is there to support potential interventions or adaptations to address the mental health impacts of climate change in the UK, or from other countries that could be adopted for the UK?

This report begins to address some of these questions, with an emphasis on evidence relevant to the UK. It addresses several research priorities which were identified in the 'Global Research and Action Agenda for Climate Change and Mental Health' report (24), published in July 2024. The research agenda sets out 4 high-level research priorities for mental health and climate change including: impacts, risks and protective factors; pathways and mechanisms; mental health interventions in the context of climate change; and mental health benefits and risks of actions. It further splits each of these areas into priority research questions. The 'Global Research and Action Agenda for Climate Change and Mental Health' report additionally identifies how to link research into policy and practice through increasing awareness among key partners and decision-makers, which this report will do through the summary for policymaker's chapter.

The report does not provide a quantitative estimate of the relative burden of climate change on mental health, rather a synthesis of evidence in relation to this, with an assessment of

confidence in the findings. This report acts as a resource for public health and other professional bodies and groups, government departments and local authorities, and interested partners working to protect and improve health in the face of a changing climate. It will help to inform policy, research, service planning, professional development needs, practice and funding.

Methodology

Understanding how climate change impacts mental health

Comprehensive literature searches were undertaken using search terms for the concepts of climate change, mental health and vulnerable populations in Organisation for Economic Co-operation and Development (OECD) countries. Searches were carried out in a range of academic databases and grey literature sources. A machine learning-based priority screening function (prediction-based classifier) was used for title and abstract screening (25), with references ranked by relevance and then screened in order of priority until further screening was estimated to be unlikely to identify new relevant studies. Due to the large number of primary studies (n=2,600), inclusion criteria focused on UK-based primary studies and reviews that included data from OECD countries (they may also have included information on non-OECD countries) were included to ensure that all potential pathways were captured. Full texts were screened in duplicate.

Data extraction and critical appraisal were carried out in EPPI-Reviewer using an abductive coding method, whereby an initial code set was developed from knowledge and understanding of the literature and refined and adapted, with concepts being added or merged as required. Data was extracted on climate-related hazard, populations at risk, mental health and wellbeing outcomes and the economic, social, individual, cultural and services pathways to impacts (see Appendix 1 for further information on data extraction codes). Mental health is termed throughout the report as encompassing both clinical mental health diagnoses and broader wellbeing. Data in relation to populations outlined in the CORE20 PLUS framework from NHS England was extracted where possible. CORE20 PLUS includes those in the most deprived 20% of the population identified by the index of multiple deprivation (IMD) in England and an additional number of populations including those with protected characteristics as defined by the Equality Act 2010 such as ethnic minority communities, people with disabilities (including learning disabilities), LGBTQ+ populations; people experiencing geographic inequalities; and inclusion health groups such as asylum seekers, refugees and undocumented migrants. CORE20 PLUS was used as a framework for extracting data around populations who may experience additional social vulnerabilities, other countries may not classify deprivation in the same way. However, we still extracted data based on the understanding that deprivation may increase vulnerability to some climate-related hazards.

Critical appraisal was carried out using an adapted version of AMSTAR-2 for reviews and the Mixed-Methods Appraisal Tool (MMAT) for UK primary studies A thematic analysis approach was used to synthesise the evidence, pulling all data into a spreadsheet and carrying out a familiarisation exercise, before identifying and grouping data into key themes. Detailed key findings statements under each theme were then generated through thematic analysis of the extracted literature and grouped based on the overarching theme that they were most relevant

to. Studies contributed to multiple key findings statements where there was sufficient data to support more specific statements (for example, around different climate hazards, specific populations or specific modes of delivery for interventions).

Interventions for mental health and climate change

We adapted and updated a scoping review that was published in 2024, which mapped the range of mental health and psychosocial interventions implemented in response to climate-related stressors (26). For the current review, the scope was refined to focus on interventions relevant to populations at risk in OECD countries. Studies included in the previous scoping review were reviewed, and were incorporated into the current review if they involved a formal evaluation and reported mental health outcomes (26). This approach aimed to ensure that confidence assessments of key findings were informed by the most comprehensive and relevant evidence base available. Comprehensive literature searches were undertaken using search terms for the concepts of climate change, mental health, interventions and vulnerable populations in OECD countries. Additional records were identified through checking the reference lists of relevant reviews. Screening was carried out using EPPI-Reviewer software. During screening for the pathways review intervention studies were coded separately with titles, abstracts and full texts screened in duplicate.

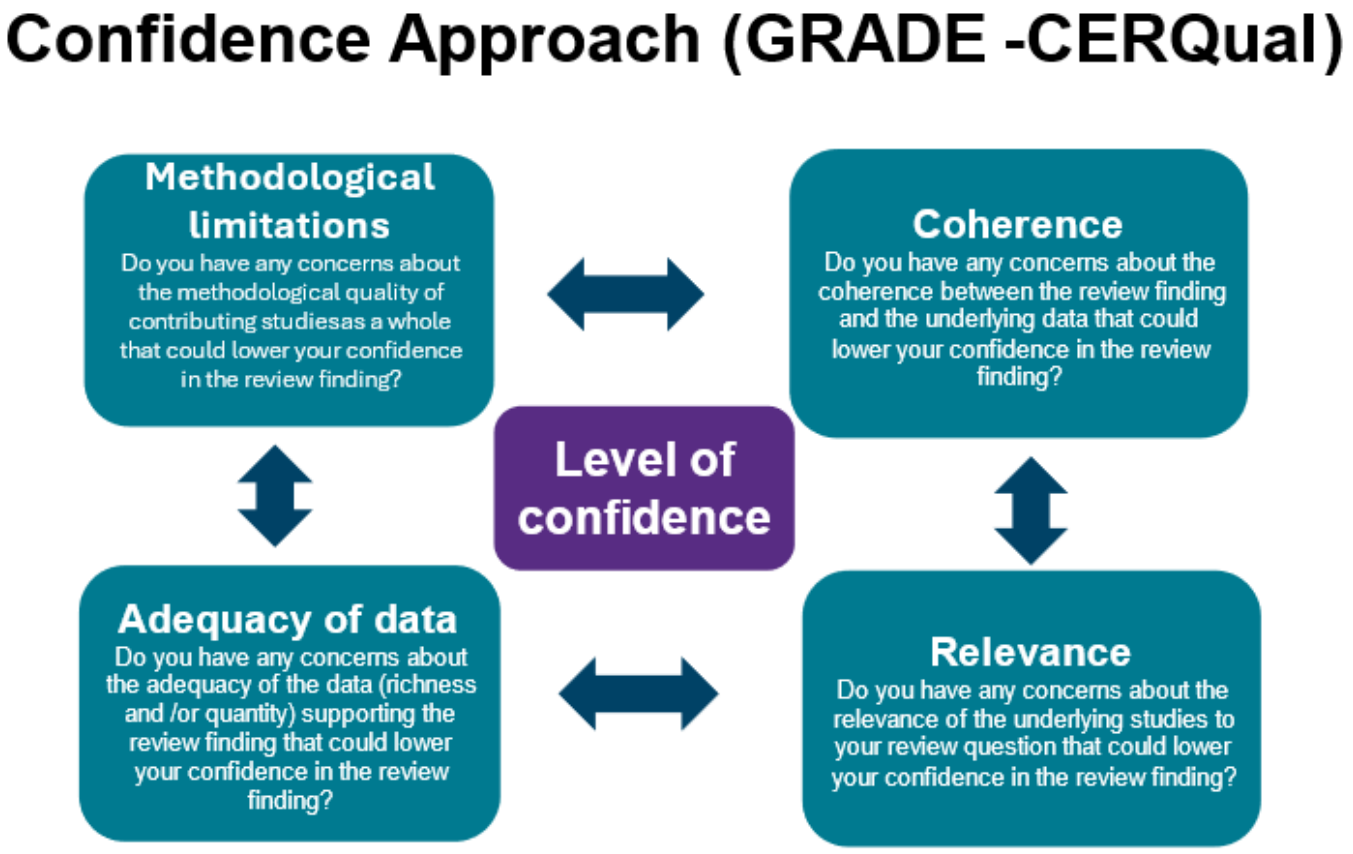
Data was extracted on study type, setting, climate-related hazard, target population, and intervention characteristics, including aim, type of intervention, level of action, delivery setting, materials used, mental health and wellbeing outcomes, and evaluation findings. The term ‘intervention’ is used throughout the report in a broad sense and refers to any organised programme or activity designed to promote mental health or psychosocial wellbeing, or to prevent or reduce negative mental health outcomes in the context of climate change. Where reported, co-design processes and implementation considerations were also noted. Additional literature identified through the searches was included as supplementary material where it informed intervention development or delivery or provided links to relevant support resources. Where available, information on population groups at risk of health inequalities, including interventions targeted for these groups or differential effects of interventions for these groups, were extracted and considered to inform key finding statements and the identification of evidence gaps. The Core20PLUS framework, developed by NHS England, was used to guide the identification of these groups. Critical appraisal was conducted for all included studies using study design-appropriate tools. These included the Critical Appraisal Skills Programme (CASP) Qualitative Studies Checklist, CASP Randomised Controlled Trial (RCT) Checklist, CASP Cohort Study Checklist, CASP Economic Evaluation Checklist, and the AACODS Checklist for grey literature. Methodological strengths and limitations were recorded for each study. As described above, key findings statements were generated through thematic analysis of the extracted literature and grouped under relevant themes. Studies contributed to multiple key findings statements where there was sufficient data to support more specific statements (for example, around different climate hazards, specific populations or specific modes of delivery for interventions).

See Appendix 1 for additional detail on methodology, including databases searched, inclusion and exclusion criteria and critical appraisal.

Confidence assessment

A confidence assessment was undertaken on the key findings statements from both the pathways and interventions review using an adapted GRADE-CERQual approach (27). Studies contributing to each key statement were assessed across 4 domains: methodological limitations (28), coherence (29), adequacy (30) and relevance (31) (see Figure 1). For every statement, the 4 domains were individually rated with a level of concern (no or very minor concerns, minor, moderate or serious concerns) in relation to the review questions. For each statement, an overall assessment of confidence was given of either high, moderate, low or very low. Importantly, low or very low confidence does not imply that a result is not significant, and instead often reflects gaps or limitations in the available evidence. These statements have been included throughout the report for completeness, to demonstrate potential pathways between climate change and mental health outcomes where there may be a lack of evidence for the UK. Please see Appendix 2 for additional information on confidence assessment for each statement.

Figure 1. Simplified diagram of the GRADE-CERQual confidence assessment approach, adapted from (32)



Call for case studies

To capture UK-relevant interventions that were not in the public domain and that demonstrate examples of implementation, we published a call for case studies related to mental health and climate change on the gov.uk website. We sought submissions that demonstrated a provision of mental health interventions in relation to climate change and extreme weather events, using a broad definition of interventions (for example, strategies, tools, resources, programmes, practices or approaches), including clinical or non-clinical interventions. Eligible interventions included those designed at the population or group level, but could be targeted at any level, such as individual, community or the wider system. The call for evidence ran from 4 November 2024 until 17 January 2025. Case study submissions did not contribute to evidence statements but were used to provide case examples of implementation.

Climate change and mental health

Summary of key findings

Climate change is negatively impacting mental health and wellbeing (Figure 2). The mental health impacts of climate change are not distributed equally; they are likely to have the greatest impact among those already experiencing poor health or health inequalities.

The findings in this report are based on the following literature and resources:

- 43 UK primary studies (30 conducted in England, 2 in England and Wales and 11 UK-based) and 130 reviews that included data from OECD countries detailing the pathways in which mental health can impact climate change (see Appendix 2)
- 30 studies detailing interventions, all except for 1 from outside of the UK (see Appendix 2)
- 22 UK-based case studies demonstrating interventions for mental health in response to climate change (see Appendix 3)

A table of resources providing information on mental health intervention implementation, materials, and delivery that were identified during the review process are presented in Appendix 3.

A glossary of terms used throughout the report can be found in Appendix 4.

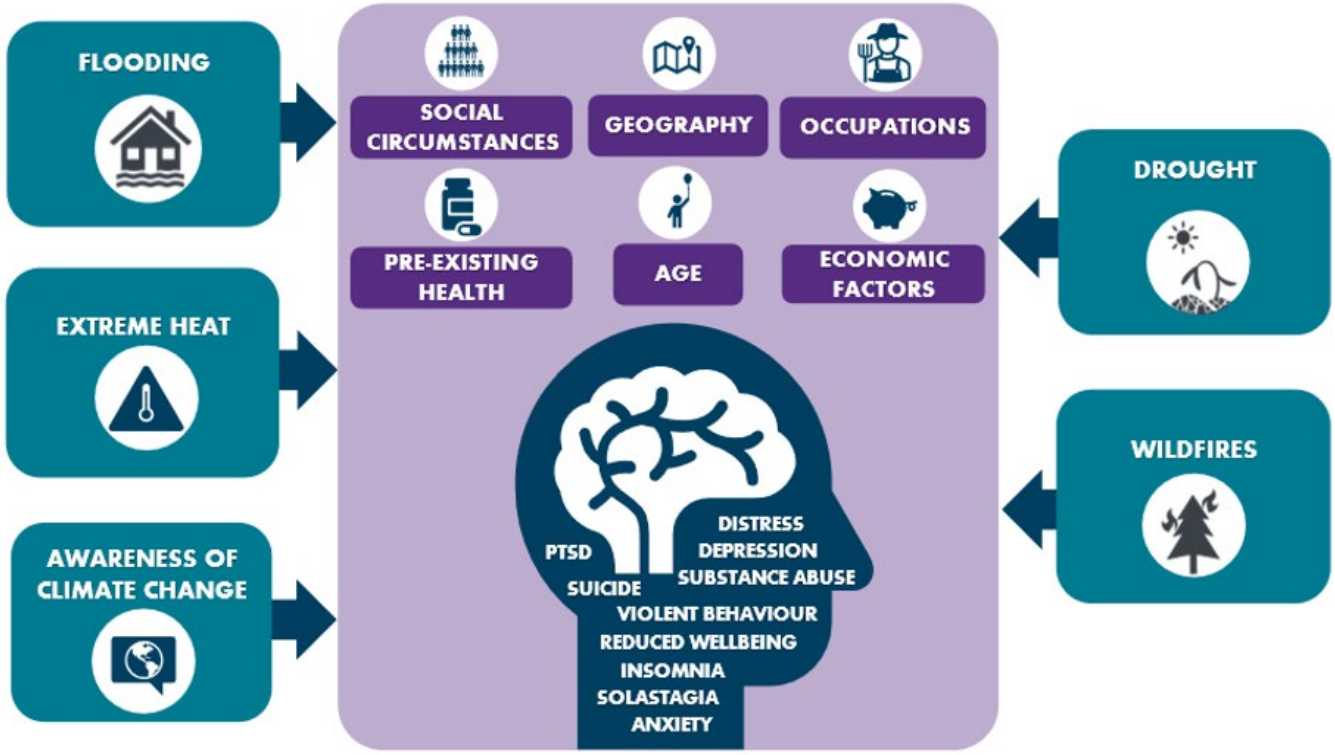
Seven overarching themes emerged from the included literature:

1. Climate change is impacting mental health and wellbeing
2. Climate change impacts the social and economic determinants of mental health and wellbeing.
3. Some occupational populations are at heightened risk from the mental health and wellbeing impacts of climate change.
4. Children and young people are at heightened risk from the mental health and wellbeing impacts of climate change.
5. Those with pre-existing health difficulties are at heightened risk from the mental health impacts of climate change.
6. Impacts on mental health and wellbeing from climate change can be long-lasting.
7. Protective pathways can help to minimise or buffer mental health and wellbeing impacts from climate change.

For each theme, we present the relevant key statements from the pathways review with the level of confidence given to the corresponding evidence, followed by intervention evidence and current gaps in the scientific literature. The studies contributing to each of the statements are provided in a series of tables, one for each of the themes, in Appendix 2. We have also

provided names of case studies which relate to the theme, and further details for each case study can be found in Appendix 3.

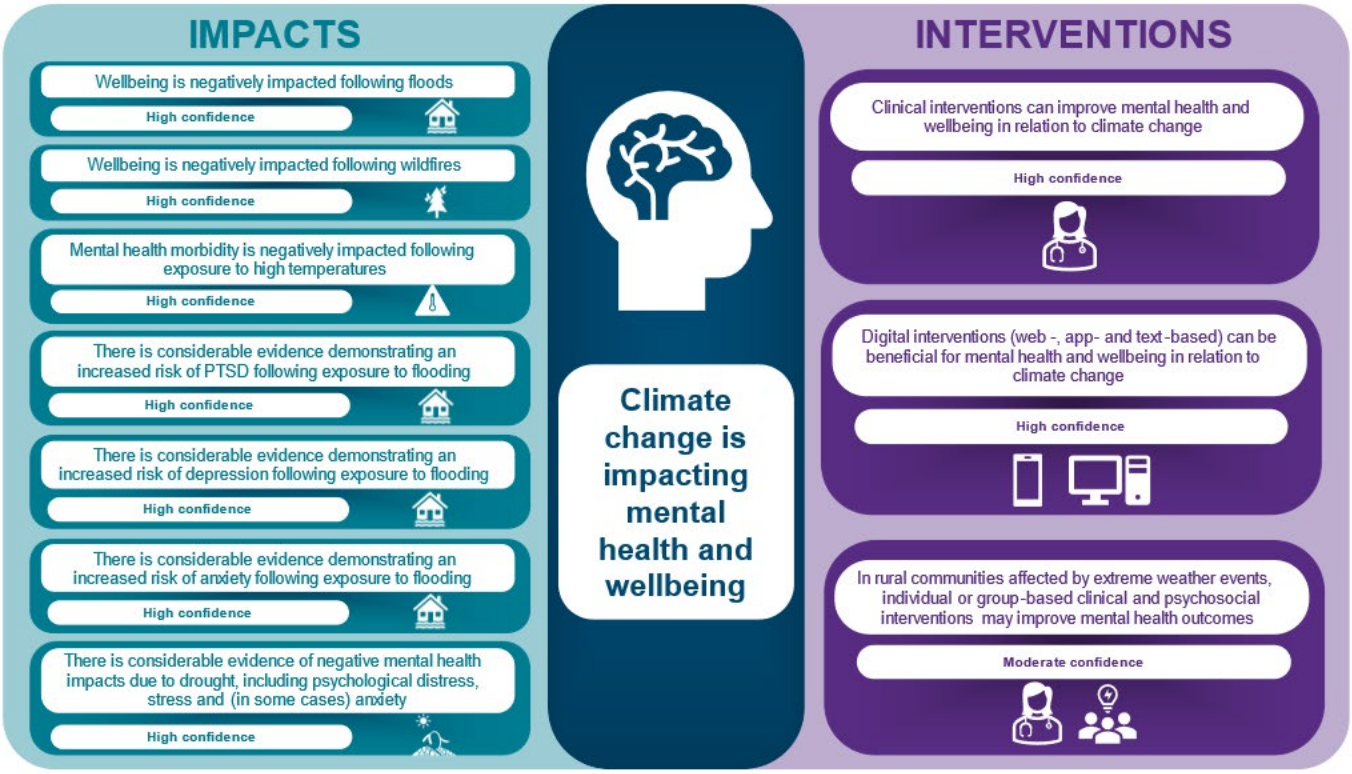
Figure 2. Overview of the ways that climate change impacts mental health



1. Climate change is impacting mental health and wellbeing

There are 10 key statements in this theme which demonstrate the pathways in which climate change is impacting mental health, followed by 3 statements describing interventions (Figure 3)

Figure 3. Impacts of climate change on mental health and wellbeing
(Due to the number of impact-related key statements contributing to this theme, only high confidence statements are show.)



1.1 Wellbeing is negatively impacted following floods [high confidence], wildfires [high confidence] and droughts [moderate confidence], and mental health morbidity is negatively impacted following exposure to high temperatures [high confidence]

Negative wellbeing impacts include stress, sleep difficulties, reduced quality of life, reduced life satisfaction, loss of ability to concentrate or continue daily activities, worry, hopelessness, fear, distress, uncertainty, paranoia and behavioural problems. There are also exposure-specific impacts, such as increased obsessive behaviours (checking the weather forecast and water levels for constant reassurance, for example) following flooding, loss of access to water-based wellbeing activities (such as use of waterways for boating or for gardening), and concerns over access to water for healthcare, such as kidney dialysis during droughts. Worries over increased societal tensions and conflict during times of water scarcity (for example in relation to temporary use bans) and the potential health risks associated with switching to private water supplies have

also been reported, although beneficial impacts such as community team building and working together have also been noted. In addition, a meta-analysis of 26 studies around the impact of heat has suggested that for every 1°C increase above ambient temperature there was a 0.9% increase in mental health-related morbidity (33), and the risk for mental morbidity increases by 6.4% during heatwaves (34). Mechanisms for the relationship between temperature and mental health-related morbidity are complex but may include changes in hormone levels, cognitive function, sleep disruptions and adaptive capacity.

Statement 1.1 is supported by 17 UK primary studies and 47 reviews.

1.2 An overarching awareness of climate change is negatively impacting mental health and wellbeing contributing to eco-anxiety [moderate confidence] and solastalgia [moderate confidence]

Awareness that the climate is changing can lead to feelings of sadness, fear, anger, worry, low mood, sleep disorders, panic attacks and helplessness. These can even impact individuals who have not directly experienced a climate-related event themselves, as well as those who have experienced such events. Within the literature there are considerable differences in terminology used across reviews and studies. Eco-anxiety, though recognised, is not clearly defined and there are discrepancies in terms of what eco-anxiety encompasses and indeed, whether it is independent from other mental health conditions, and there is also a lack of validated measurement scales for eco-anxiety specifically. For this report eco-anxiety is used as a broad term to include other emotions such as eco-distress, eco-anger, eco-fear and eco-grief. Elements of eco-anxiety can be considered a rational and partially adaptive response to the climate crisis for most people. Whilst eco-anxiety prevalence studies are mixed in terms of findings, a correlation between higher rates of eco-anxiety with other symptoms of negative mental health has been suggested (21, 35, 36), particularly for symptoms such as depression, anxiety, stress, insomnia, psychological distress and lower self-rated mental health (21). In a large survey of young people, 26% of UK respondents reported eco-anxiety impacting on their daily functioning (37). Mental health service providers have observed increases in clients reporting that climate change worry is negatively impacting their mental wellbeing (22, 38, 39). In addition, there is evidence that eco-anxiety is influencing reproductive choices for some individuals, as 39% of UK survey respondents described that climate change made them feel hesitant to have children due to concerns over the children's future quality of life (37), and therapists in Australia have seen an increased number of people acknowledging that climate change is impacting their mental health and wellbeing and contributing to uncertainty over their future family planning due to future safety and resources (38). It must be noted that changes in reproductive choices can be an adaptive and rational response to environmental factors, but that these decisions can be associated with feelings of pressure and guilt (21) and therefore should be navigated with appropriate support and information. Environmental change can increase psychological distress, substance misuse and solastalgia. Feelings of solastalgia can be predictive of negative mental health, including anxiety and depression (22). Evidence from post-wildfire populations has demonstrated that 35% of people scored indicative for depression or anxiety and increased feelings of solastalgia were linked with increased psychological

distress (40). Pathways identified included breakdown in community cohesion and individual factors contributing to increased feelings of solastalgia (41). There is some suggestive evidence for gender differences in eco-anxiety suggesting females may experience higher levels compared to males, however evidence is mixed and inconclusive. Additionally, those in different socioeconomic circumstances may feel the impacts of eco-anxiety differently but the evidence is again, mixed and inconclusive.

Statement 1.2 is supported by 6 UK primary studies and 25 reviews.

1.3 There is considerable evidence demonstrating an increased risk of post-traumatic stress disorder (PTSD) following exposure to flooding [high confidence] and wildfires [moderate confidence]

Individuals in several English regions who experienced flood water in their home reported significantly higher levels of probable PTSD (22%) compared to those whose houses were not flooded (2%) (42), and residents in southern England who were exposed to floodwater depths of 100cm or more resulted in 15 times higher likelihood of PTSD compared to those unaffected by flooding (8). Two years after a flood in the UK, there was a probable PTSD prevalence of 24.5% in individuals who had been flooded, compared to 8.9% in individuals who had been disrupted (homes not flooded, but lives disrupted) (12). Similarly in Australia, probable PTSD was identified in 15.6% of people living in areas highly affected by wildfires compared with 7.2% in medium and 1% of people in low-affected areas (43), and it was the most common condition among firefighters exposed to a major woodland fire (44). A reduction in PTSD prevalence over time has been reported, but some individuals may experience symptoms up to 3 years post-flood (9) and even up to 10 years post-wildfire (40). It is not only those who experience flooding or wildfires in their own home or community who are at risk from PTSD, as tourists who experienced a flood event in another country also showed elevated levels (34) and individuals not exposed to wildfires can demonstrate symptoms suggestive of PTSD through exposure to media reporting (45).

Statement 1.3 is supported by 12 UK primary studies and 31 reviews.

1.4 There is considerable evidence demonstrating an increased risk of depression following exposure to flooding [high confidence] and wildfires [moderate confidence]

An increased risk of depression has been reported after flooding events. For example, the English National Study of Flooding and Health demonstrated increased likelihood of probable depression for those flooded or disrupted by flooding compared to those who were unaffected at 1, 2 and 3 years follow-up (8, 9, 13). An increased risk of depression after wildfires is reported across multiple reviews. In one example, secondary school-aged children who were impacted by a Canadian wildfire reported a 31% elevated level of probable depression 18 months later (46). Statement 1.4 is supported by 14 UK studies and 25 reviews.

1.5 There is considerable evidence demonstrating an increased risk of anxiety following exposure to flooding [high confidence] and wildfires [moderate confidence]

The National Study of Flooding and Health reported an 11.7% prevalence of probable anxiety 3 years after a flood event for those who had been flooded and evacuated compared to 7.1% in those disrupted and 3.5% of those unaffected by flooding (9). Increases in anxiety have also been reported following exposure to wildfires. For example, secondary school-aged children in Canada reported a 27% increase in probable anxiety 18 months following the Fort McMurray wildfire (46), and 27% of adults met the criteria for generalised anxiety disorder (GAD) 3 months after the same wildfire (40).

Statement 1.5 is supported by 19 UK primary studies and 22 reviews.

1.6 There is considerable evidence of negative mental health impacts due to drought including psychological distress, stress and (in some cases) anxiety and depression [high confidence]

Elevated levels of psychological distress, anxiety, depression and stress due to drought are reported, with many of these studies coming from Australia. A cross-sectional survey from Australia demonstrated that psychological distress due to drought was elevated in rural communities, but not urban communities (47). Another study reported that people affected by drought have a 26% higher likelihood of mental health-related problems than those not affected (34).

Statement 1.6 is supported by one UK study and 27 reviews.

1.7 Exposure to heat can lead to increases in mental health-related hospital attendance [moderate confidence]

All reviews presented evidence that increases in temperature correlate with increases in mental health-related hospital attendance although the findings on some specific conditions were statistically insignificant (48). A UK study investigating dementia-related hospital admissions in England during 1998 to 2009 found a 4.5% increase risk of admissions for every 1°C rise in temperature above 17°C in England (49). Emergency admissions for dementia in England were associated with high temperatures on the same day and 3 to 4 days after the high temperatures, suggesting some delayed heat effects (49). Heat-attributable dementia hospital admissions in England are projected to increase by 214% (244) by 2030 and by 263% (298) by 2040 based on a low (RCP2.6) emissions scenario, and by 194% (238) by 2030 and by 294% (360) by 2040 based on high (RCP8.5) emission scenarios (49). A meta-analysis of 3 studies found that a heatwave (daily maximum temperatures of at least 35°C for at least 3 days) corresponded to a 9.7% higher incidence of hospital attendance or admission for mental health difficulties than non-heatwave periods (16). One review suggested that the availability of outpatient healthcare services and the presence of green open spaces can be protective factors

(34). Dementia-related admissions have also been considered here to ensure health services implications are captured.

Statement 1.7 is supported by one UK study and 22 reviews.

1.8 There is some evidence to demonstrate increased suicide risk for those who experience flooding [very low confidence], drought [low confidence], wildfires [low confidence] and heat events [moderate confidence]

There is mixed evidence for suicide risk due to flooding, with some studies reporting an increased risk of suicide after a flood event and others finding no difference, contributing to very low confidence around the statement. One study reported that the risk of suicide was strongest in the year that the flood occurred, and had reduced by year 5, suggesting that risk may be highest immediately after the event (50). Review evidence of suicide risk due to drought is mixed and often statistically insignificant. Potential increases in risk have been reported, but the evidence base is limited as the same few primary studies from Australia are referenced across multiple reviews. One study cited in multiple reviews reported that an increase in the drought index led to a 15% increase in suicide for middle-aged rural males and an increase in monthly maximum temperature led to a 3% increase in suicide risk (34, 51 to 53). Eighteen months after a Canadian wildfire, secondary school-aged children affected by the event showed a 31% higher likelihood of probable depression and suicidal ideation (46). There has also been links with increased risk or incidence of suicide with heat events. One primary study that investigated suicide in England and Wales found an increase in the relative risk of violent and non-violent suicide for each 1°C rise in temperature beyond 18°C (54). Another review found a two-fold increase in the risk of mortality from suicide in the week following moderate and extreme heat (34).

Statement 1.8 is supported by 3 UK studies and 39 reviews.

1.9 There is evidence suggesting potential increases in violent behaviour following wildfires [moderate confidence], flooding [low confidence], heat events [moderate confidence] and during droughts [moderate confidence]

There is evidence that exposure to adverse weather can increase the likelihood of violent behaviour, which can have indirect mental health impacts for those affected. Wildfires were described in one review as ‘catalysts’ for new or increased relationship violence (55). Women in high wildfire risk communities experienced higher levels of violence than non-impacted communities (56), and regions with high wildfire impact reported significantly higher domestic violence (DV) than low wildfire impact areas (55). Many studies in relation to flooding and increased violence and domestic violence are from low- and middle-income countries. However, one review highlights increased sexual assaults after a flood in Canada, and in Australia, increases in DV incidents during a previous flood event heightened worry about DV occurring

during future flood events (57). Stress permeating into households because of drought-related pressures can potentially increase domestic abuse (58). Eight reviews report a linear relationship between hot weather and more aggressive and hostile behaviour. One review cites examples of increased aggression in both mental health facilities and within the general population (59), whilst 2 reviews report increases in gender-based violence in the days following temperature spikes (55, 56). Another review, however, described a statistically significant U-shaped relationship in Dallas, USA, where violence increased with temperatures up to 90 degrees Fahrenheit (approximately 32°C) and then dropped off at higher temperatures, likely due to people seeking refuge in cooler spaces, thus reducing social interactions and crime (55).

Statement 1.9 is supported by one UK study and 16 reviews.

1.10 There is evidence to suggest an increased risk of substance misuse following exposure to flooding [moderate confidence], wildfires [moderate confidence] and during drought [low confidence]

Increases in alcohol and substance misuse to cope with the impacts of flooding have been reported. One UK study reported that 7% of participants increased their alcohol or drug intake (60), and another reported that just under 40% of respondents had used alcohol to cope with the impact of flooding (61). In a different review, participants with pre-existing mental health problems were more likely to drink alcohol to cope with the impacts of flooding compared to those without (24% vs 8%) (62). Eight reviews mentioned substance misuse following wildfires, with some only referring to ‘substance misuse’ whilst others were more specific. Increased alcohol consumption following wildfires has been reported, whereby the rate of heavy alcohol use was 17% in a Canadian community at 3 months post-wildfire (40). Whilst some studies have found that wildfire exposure increased tobacco and drug use, other studies have reported no association between substance or alcohol use, suggesting that the relationship between wildfires, mental health and substance use is complex, with a number of factors including genetic and environmental risk factors at play (40). Drought-related economic pressures may in some cases lead to substance or alcohol misuse as a coping mechanism (58, 63).

Statement 1.10 is supported by 3 UK studies and 13 reviews.

What we know about interventions

1.11 Clinical interventions can improve mental health and wellbeing in relation to climate change [high confidence]

Cognitive behavioural therapy (CBT), Acceptance and Commitment Therapy (ACT) and dynamic psychotherapy-based interventions for psychological distress associated with both climate-related weather hazards and general awareness of climate change significantly reduced PTSD, depression, anxiety, stress, and in some cases, insomnia and improved functioning. Interventions targeted children, adolescents, and adults affected by wildfires, floods, hurricanes, drought and eco-anxiety, and were predominantly delivered within a year post-exposure. For

example, a randomised controlled trial found that self-help based online CBT significantly reduced PTSD, depression and insomnia symptom severity in wildfire evacuees compared to a waitlist control group (64), and an open treatment study of trauma-focused CBT delivered to 19 flood-affected children reduced PTSD diagnoses (full or subclinical, based on clinical interview) from 89.5% to 0% over 12 months (65). Similarly and over a 6-week period, CBT-informed text messages were associated with reduced mean scores for depression by 12% and anxiety by 14.6% among wildfire-affected adults (66). At the end of the 6-week intervention period, participants who had received the supportive text messages had 30% lower depression and anxiety scores, and 60% lower suicidal ideation scores than a control group who had not yet received the messages (66). Lastly, dynamic psychotherapy delivered to 2 firefighters with diagnosed PTSD following Portugal wildfires was associated with sustained reductions in PTSD symptoms from high levels to below clinical thresholds over 40 to 48 weeks, with continued improvement at 3-month follow-up (67). Engagement (how much of the intervention participants completed) was moderate to high where assessed and in some studies a dose response effect was observed (where people who completed more of the intervention had greater reductions in psychological distress) (64, 68).

Statement 1.11 is supported by 12 studies from Australia, Canada, Portugal, Sweden and the USA.

1.12 Digital interventions (web-, app- and text-based) can be beneficial for mental health and wellbeing in response to climate change [high confidence]

Digital interventions (both clinical and psychosocial) significantly reduced symptoms of depression, anxiety, PTSD and stress, and improved wellbeing, emotional functioning and self-compassion. Programmes targeted diverse populations, including adults experiencing climate-related distress, adult and adolescent wildfire evacuees, flood-affected adults and drought-affected farmers. Interventions included web-based CBT, mobile mindfulness apps, text-based supportive messaging, and fully automated ACT platforms, and most targeted diagnosed or self-reported existing symptoms, with fewer focusing on prevention or early intervention. These incorporated a range of therapeutic principles and techniques, including support for self-care, resilience building, stress management, and cognitive strategies such as managing negative thoughts, mindfulness and self-compassion practices. Practical coping techniques were also provided, such as youth-specific content addressing school-related stress and peer relationships, and advice on issues such as sleep, conflict resolution, drought-related stress and nature connectedness. A CBT-based text service was associated with 12% to 15% reduced depression and anxiety among wildfire-affected adults (66), and a fully automated ACT platform for farmers reduced psychological distress and improved wellbeing over 6 months (69). Where measured, feasibility and acceptability were high, and in one study over 90% said they would recommend the interventions (69). Engagement strongly predicted outcomes in several studies, suggesting a potential dose-response effect (64, 68, 70), however other factors such as proactive coping behaviours, supportive environments, or intervention features that independently influenced both engagement and outcomes may have contributed to this

observation. Reported barriers were mostly practical, such as limited time or internet access, rather than dissatisfaction with content.

Statement 1.12 is supported by 7 studies from Australia, Canada, Germany and Sweden.

1.13 In rural communities affected by extreme weather events, evidence suggests that individual or group-based clinical and psychosocial interventions may improve mental health outcomes [moderate confidence]

In rural communities affected by drought, wildfires, floods and hurricanes, individual and group-based psychosocial and clinical interventions were associated with significant reductions in symptoms of PTSD, anxiety, and depression, and in some cases, improvements in wellbeing and functioning. Interventions targeted children, adults, and farmers and were delivered through school-based therapy, automated digital platforms, community development programmes, and lay led psychosocial support. Approaches included trauma-focused CBT, ACT, and multi-component programmes offering emotional skills-building, cognitive restructuring, and social connection. For example, PTSD cases fell from 89.5% to 0% among 19 flood-affected children receiving CBT in rural communities (65), while psychological distress reduced among 77 farmers on standardised measures following an online mental health intervention, with greatest improvements in those with highest baseline distress (69). However, both studies lacked control groups, which prevents determination of whether improvements were due to the interventions or natural recovery over time. Improvements were generally observed within 3 months of intervention (71, 72), with one digital programme sustaining effects at 6-month follow-up (69). Acceptability was also high where reported, for example, farmers rated an ACT app-based intervention positively on satisfaction and usability measures, and the majority indicated that they would recommend it to others (69).

Statement 1.13 is supported by 5 studies from Australia and the USA.

What we don’t know about interventions

Current gaps in the evidence base include:

- the range of climate-related hazards addressed by interventions is currently narrow as most interventions have been evaluated in response to acute weather-related events (such as floods, hurricanes, and wildfires); increased understanding of application to longer term hazards (such as drought) and recurrent events is required as the evidence is currently limited
- increased understanding is needed on intervention effectiveness for several hazards for which we found no evidence, such as extreme heat and cold, changes to air quality, or other climate related health risks

- most interventions address the impact of specific climate change-related hazards, such as flooding or wildfires and there was limited evidence identified on interventions to address the negative mental health impacts of awareness of climate change and general climate-related distress (such as eco-anxiety and solastalgia)
- most identified studies focused on clinical interventions and there was limited evidence on system-level or structural interventions, such as those embedded within routine health and social care services, limiting our understanding of how integrated approaches may support mental health in the context of climate change
- evaluations mostly report outcomes immediately post-intervention or within 3 months, and there is limited evidence on longer-term outcomes, durability of benefits, or risk of relapse
- Core20PLUS populations are under-represented, and participants are typically self-selected
- equity is largely overlooked as few evaluations report accessibility for groups at higher risk of adverse climate mental health outcomes, groups living in rural locations and places with relatively high levels of deprivation, and people living and working in closed communal settings (such as prisons, residential care facilities, or remote work camps), or on cultural appropriateness. Most studies also fail to report outcomes by demographic characteristics, limiting understanding of differential impacts
- some interventions are under-represented, for example, community-based or informal approaches, interventions focused on social networks, interventions in less traditional research settings or delivered by professionals with limited research culture or capacity)
- there is limited evidence on which types of interventions, such as in person, digital, group-based or individual, are most effective, in which settings, or for which groups
- due to the limited number of interventions identified that addressed diverse population groups, and were implemented in varied settings, and in response to different climate-related weather hazards, it is not possible to make meaningful comparisons of the relative effectiveness or acceptability across intervention types
- few studies explored how interventions achieved effects, such as whether improvements in mental health outcomes were mediated by improved coping skills.

Relevant case studies

The following case studies are relevant to this theme (see Appendix 3 for more details):

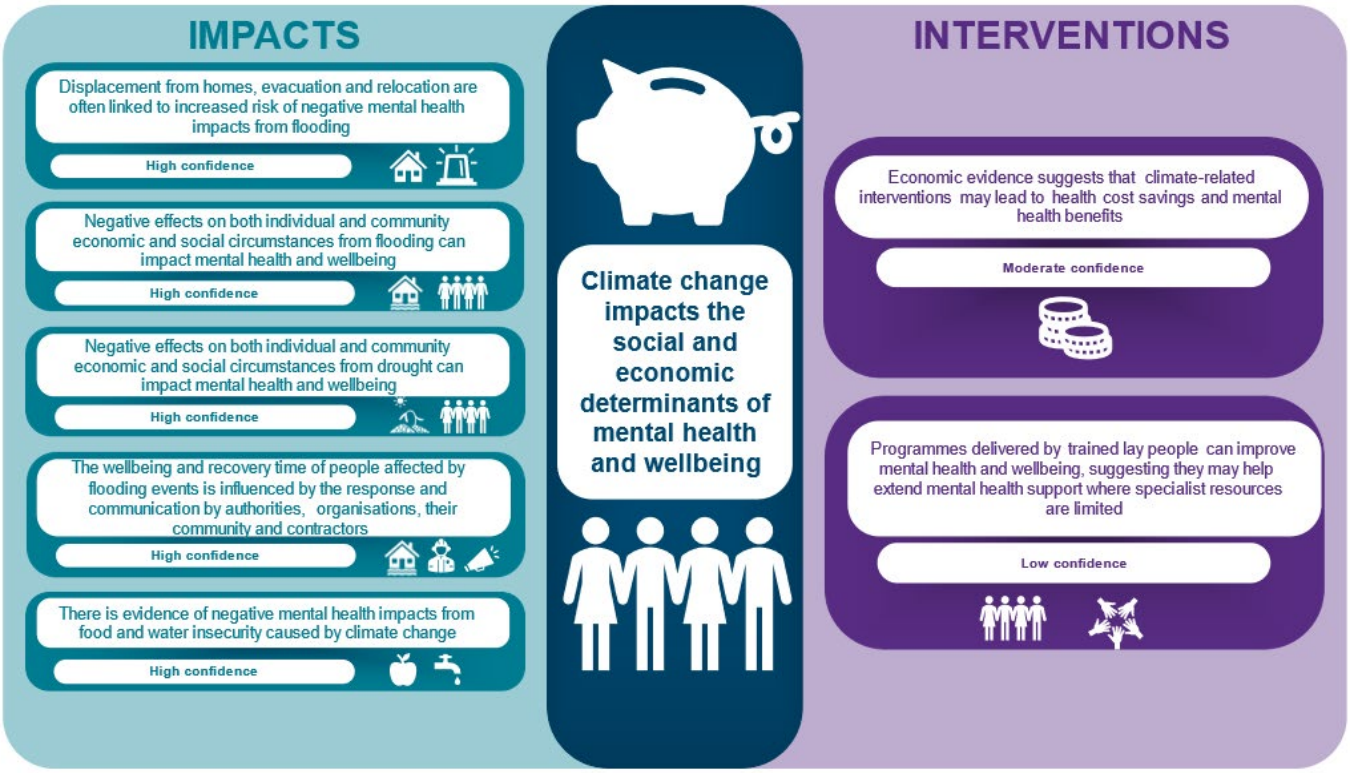
- ID01: Therapeutic support (submitted by Gareth Morgan, Climate Psychology Alliance)
- ID02: Climate Cafe for EMDR trauma therapists (submitted by Martina Leeven, EMDR Association UK)
- ID03: C-Change Conversations (submitted by Steve Killick)
- ID04: Borrowed time (submitted by Andii Bowsher)
- ID05: Mental health support during a flood (submitted by Geraldine Bruce)

- ID07: Positive Imaginings, Under the Sky and The Climate Wellbeing Project (submitted by Lucy Power)
- ID08: The Sustainables Academy: climate mental health resource and curriculum plan intervention and tools (submitted by Louise Robertson)
- ID09: The Resilience Project: supporting the next generation of youth climate leaders (submitted by Daniella Watson)
- ID10: Youth Support Spaces (submitted by Gareth Morgan)
- ID11: Parenting Circles (submitted by Gareth Morgan)
- ID12: Guided activities: offline and online – to help young people process their climate-related emotions, protect their mental health and build climate agency (submitted by Emma Lawrance)
- ID14: Force of Nature: from anxiety to agency (submitted by Sacha Wright)
- ID15: Eco-emotions workshops (submitted by Louise Edgington)
- ID16: Climate psychology webinars and talks (submitted by Louise Edgington)
- ID17: Climate wellbeing groups (submitted by Paul Reeve)
- ID18: Recovery and wellbeing college climate anxiety educational course (submitted by Vinuri Semini Fernando)
- ID19: Climate distress in the community: development of interventions and materials (submitted by Rosemary Randall)
- ID20: Living with the Climate Crisis materials and groups (submitted by Rebecca Nestor)
- ID21: Climate Café listening Circles (submitted by Rebecca Nestor)
- ID22: Impact of Norfolk and Waveney Mind sUStain Project from 2021 (submitted by Ruth Taylor and Paula Colombo)

2. Climate change impacts the social and economic determinants of mental health and wellbeing

There are 10 key statements in this theme which demonstrate the pathways in which climate change is impacting mental health, followed by 3 statements describing interventions (Figure 4). Social and economic determinants were classed as any social, economic or wider environmental or structural influence on mental health and wellbeing including how authorities may respond to climate related hazards.

Figure 4. Impacts of climate change on the social and economic determinants of mental health. Due to the number of impact-related key statements contributing to this theme, only high confidence statements are shown



2.1 Displacement from homes, evacuation and relocation are often linked to increased risk of negative mental health and wellbeing impacts from flooding [high confidence]

Displacement from homes due to flooding events has been reported to increase the risk of psychological distress, anxiety, depression and PTSD. Lower general wellbeing has also been reported. Qualitative evidence demonstrates that some people experience feelings associated with solastalgia and lose their sense of place or home and feel like a stranger in their own house or town due to changes being made within their home upon returning, or through being in temporary accommodation in their own town (73 to 76). Additionally, a qualitative study in

children and young people reports about not being able to meet friends as usual and social networks being impacted in this way by the flood.

Statement 2.1 is supported by 12 UK studies and 7 reviews.

2.2 Disruptions to services from flooding can negatively impact mental health and wellbeing [moderate confidence]. Specifically, disruptions for vulnerable populations can lead to reduced wellbeing and increased risk of anxiety [moderate confidence]

Disruptions to services due to flooding can include utilities, transport, health and social care services, work or education and shops or leisure facilities. For example, loss of access to health and social care led to much higher likelihood of experiencing PTSD and increased likelihood of psychological morbidity, anxiety and depression (8, 52). One study reported that vulnerable populations (either those having limited physical mobility or who lived alone with dependents) were unable to access local bus services and needed to cancel appointments, missed prescription pick-ups and could not attend daytime care (77).

Statement 2.2 is supported by 9 UK studies and 8 reviews.

2.3 Negative effects on both individual and community economic and social circumstances from flooding [high confidence] and drought [high confidence] can impact mental health and wellbeing

A lack of insurance, insufficient insurance or working through claims and disputes with insurance companies following flooding has demonstrated negative impacts on mental health. One study reported that those experiencing severe stress from insurance-related difficulties had a higher likelihood of PTSD compared to those with no/mild stress due to insurance-related difficulties (15). Property and possession loss also leads to increased risk of mental health impacts. For example, the loss of sentimental items during a flood led to higher likelihood of PTSD (11). Perceived reduction in the value of homes meant that people were not able to move away and felt trapped in a flood risk area (78 to 80). The impacts of flooding on economic and social circumstances can lead to breakdowns in personal relationships and reduced wellbeing. Impacts reported include increased arguments and in some cases divorce (74), reduced social support from partners, increased intimate partner violence, negative impacts on family relationships, reduced intimacy or negative impacts on sexual activity and loss of time to be able to spend with family. Loss of community spirit and cohesion, potentially due to displacement and uneven recovery, can also negatively affect community relationships. Multiple reviews demonstrate that drought increases financial pressures on farmers and rural communities, for example through loss of employment or livelihoods, persistent crop and livestock loss, and lower production outputs from farms. This can lead to increasing workloads and increased debts that negatively impact mental health (58, 81). Financial pressures can also lead to additional concerns about food security (63, 81, 82).

Statement 2.3 is supported by 17 UK studies and 28 reviews.

2.4 The wellbeing and recovery time of people affected by flooding events is influenced by the response and communication by authorities, organisations, their community and contractors [high confidence]

How action is carried out (rather than what action is carried out) can have implications for mental wellbeing. For example, how evacuation procedures are communicated and the types of information provided to those being evacuated can influence wellbeing (83). It has been reported that a lack of co-ordination and inappropriate management of responses from volunteers and organisations providing support can negatively impact wellbeing (80, 84). Multiple studies have highlighted concerns about service provision from contractors, such as those undertaking building work for insurance claims, in terms of how the work has been carried out (for example, not seeming to care about the local environment or not being sensitive to people's homes) (73, 85). How flood risk is communicated and the warning systems in place can also potentially negatively impact mental health if they are not appropriate (79). Warnings that come late or without sufficient time have been associated with increased risk of psychological distress (86). How the authorities deal with flood risk in terms of implementing flood alleviation schemes or programmes can lead to loss of confidence for future events and increase anxiety (74, 76, 84).

Statement 2.4 is supported by 8 UK studies and 8 reviews.

2.5 Flooding can lead to an increase in demand for both formal and informal mental health resources and support [moderate confidence]

Demand increases for formal and informal care include access to GP appointments for mental health, increases in prescription medications for anxiety and depression and increased demand for informal support resources such as voluntary services or through social connections. It is noted in some studies that this is likely to be an underestimate of need. For example one study found that a substantial proportion of those with probable mental health needs did not seek psychological help over a 3 year period showing 15% in year 1, 33.3% in year 2 and 40.3% in year 3 (it is thought the increase across time may demonstrate the difference in wording of questions, where in years 1 participants were asked about help seeking generally and in years 2 and 3 were asked about help-seeking in relation to stress-related, emotional or mental health problems) (87). Some evidence demonstrates that informal support through social connections and communities can provide more trusted and accessible support than that from authorities and services for some people (77, 80) (see statement 7.3).

Statement 2.5 is supported by 8 UK studies and 8 reviews.

2.6 There is a higher risk of mental health impacts from flooding for those with higher levels of deprivation [moderate confidence], inclusion health populations [very low confidence] and ethnic minority populations [very low confidence]

Lower socioeconomic status has been associated with poor mental health outcomes after flood exposure (34, 50, 61, 75, 86). Additionally, those who had lower household income or higher deprivation levels have been shown to have a higher risk of suicide-related mortality post-flood event (50). This may be due to lack of stable housing and inadequate insurance or financial capacity to recover after the event. Inclusion health populations included homeless populations and migrant populations, however, review level evidence for these populations relevant for the UK is lacking (88, 89). Whilst there is some evidence suggesting that ethnic minority populations may be at increased risk for the mental health impacts from flooding events, the confidence around this statement is very low as evidence is scarce and too generic to draw conclusions. One UK-based study did report that a subgroup of ethnic minority women (Pakistani respondents) were at a higher risk of mental health conditions than non-Pakistani respondents, but this could also be explained by potential gender-based mechanisms (74).

Statement 2.6 is supported by 4 UK studies and 12 reviews.

2.7 There are potential differences in psychological distress from flooding events for different population characteristics, including gender [low confidence], older adults [low confidence] and children [moderate confidence]

Females may be more likely to report psychological distress following a flooding event though evidence is mixed and insufficient for higher confidence around these statements. One review reported higher levels of PTSD in male police officers compared to female officers responding to a flood event (90). There is suggestive evidence that older adults may be at increased risk of mental health impacts from flooding. However, conclusions are general and contradictory with some evidence demonstrating higher resilience in older adults. Children and young people have also been identified as potentially at higher risk due to disruptions to education and home life, experiencing stress and family relationship changes and this is likely to be dependent on age and stage of development when exposed to climate-related hazards.

Statement 2.7 is supported by 7 UK studies and 19 reviews.

2.8 There is evidence of negative mental health impacts from food and water insecurity caused by climate change [high confidence]

Reduced crop yields and changes in water supply and use during drought periods can lead to increased food prices, increased food insecurity, and negative mental health impacts. One UK-based study raised this as a concept from qualitative interviews (91). Evidence from Australia demonstrates that exposure to drought strengthens the association between food insecurity and

psychological distress (51, 63). Loss of employment due to climate change-related events such as drought can exacerbate financial insecurities leading to food insecurity as a result (92). Decreased food availability or increases in food costs can impact mental health negatively, particularly for those with lower socio-economic status (63). Food insecurity and depression have been shown to follow a dose-response relationship whereby increasing food insecurity levels are associated with increases in risk of depression (82).

Statement 2.8 is supported by one UK study and 10 reviews.

2.9 Climate migrant populations may be at higher risk of negative mental health impacts [very low confidence]

Displacement and migration, leading to loss of sense of place and cultural bereavement, can contribute to poorer mental health outcomes including increased stress, anxiety, depression and lower life satisfaction in climate migrant populations. However, evidence remains scarce and insufficient to support higher confidence in the overall review finding. Migration from rural to urban areas due to climate-related events such as repeated flooding or drought (causing loss of livelihood for those connected to the land) can lead to an increased risk of mental health impacts. The type of migration is also important in terms of the mental health impacts, including within-country or cross-border migration, planned compared to emergency migration, and forced compared to voluntary migration. For example, planned migration can have better outcomes for the mental health of those affected compared to forced migration (22). Migrant children are at particular risk from increased mental health impacts due to many years of legal hurdles in countries of settlement, being bullied in school, victimisation and discrimination. Whilst statement 2.9 is supported by 11 reviews, only a small number of studies relate to Europe (and none based in the UK) and it is also unclear in some cases the extent that the migration is due to climate change.

2.10 There is some evidence to demonstrate increased mental health risks for people who are pregnant or have recently given birth [moderate confidence]

There is evidence to demonstrate a potential increased risk of pre-natal and postpartum caregiver stress, depression, anxiety and PTSD, though the evidence base largely focuses on hurricane events outside of the UK.

Statement 2.10 is supported by 9 reviews.

What we know about interventions

2.11 There is evidence that opportunistic mental health symptom screening integrated into routine post-disaster contacts, coupled with immediate triaging and referral to services, can lead to mental health improvements [very low confidence]

Integrated screening and referral approaches were associated with improved access to care and mental health outcomes among populations affected by floods and hurricanes, although there were only 3 studies contributing limited data, including one with a small sample size, and some concerns over methodological limitations, resulting in very low confidence in the finding. Interventions involved phone-based or school-based PTSD screening followed by rapid referral into services and demonstrated feasibility and potential for scale. In Queensland Australia, a phone-based PTSD screening programme for flood affected populations led to 907 positive screens and 700 referrals out of 7,315 adults, and 207 referrals from 290 children, demonstrating feasibility at scale and high uptake, at a cost of AUD $5.66 per screen (93). Also in Queensland, a school-based screening and treatment pathway identified 19 high-risk children who then received trauma-focused CBT, which was associated with large reductions in PTSD, anxiety, and depression at 12 months (65). Finally, in the USA, a quasi-experimental study found significant post-intervention reductions in PTSD, depression, anxiety, and stress among Hurricane Sandy survivors as part of a linkage intervention and referral into care, with no change in the matched control group (94). Together, these studies suggest that targeted mental health screening and referral programmes, particularly when delivered at scale and followed by interventions, may be both feasible and effective in reducing psychological symptoms following climate change-related disasters (65, 93, 94).

Statement 2.11 is supported by 3 studies from Australia and the USA.

2.12 Economic evidence suggests that climate-related interventions may lead to health cost savings and mental health benefits [moderate confidence]

Economic evaluations across a range of intervention types, including screening and referral systems and structural adaptations, suggest these approaches may offer good value for money and, in some cases, generate cost savings. A Canadian cost-utility analysis simulated wildfire-related PTSD outcomes over 5 years (95). Screening followed by trauma-focused CBT or treatment with an antidepressant drug was compared to no screening, and found that from a societal perspective, both interventions were cost-saving, with the trauma-focused CBT yielding the highest net monetary benefit of $181,787 CAD (95). However, neither were cost effective from a healthcare payer perspective using a $50,000/QALY threshold (95). In Australia, a post-flood screening and referral system reached over 205,000 callers, with 3,882 adults screened and 907 referred, at a cost of $53,284 AUD (or $5.66 per screen) (93). While clinical outcomes were not tracked, authors highlighted this as a demonstration of a low-cost, high-reach service

delivery following a disaster (93). Finally, a randomised trial of home energy efficiency structural adaptations for 984 low-income older adults in Victoria, Australia reported improvements in indoor temperature, mental health and quality of life (96). Linked administrative data showed a $887 AUD per person reduction in winter healthcare costs, suggesting a partial cost offset for this adaptation, although a full economic evaluation was not conducted (96).

Statement 2.12 is supported by 3 studies from Australia and Canada.

2.13 Early evidence suggests that programmes delivered by trained lay people can improve mental health and wellbeing, suggesting they may help extend mental health support where specialist resources are limited [low confidence]

Interventions delivered by trained lay people were associated with improvements in PTSD, anxiety, depression, and emotional wellbeing among people affected by climate change-related disasters, suggesting that trained laypersons may play a role in post-disaster mental health support, particularly where access to professionals is limited (71, 97). In Australia, a randomised controlled trial (RCT) of the Skills for Life Adjustment and Resilience (SOLAR) programme involved 56 trained lay providers delivering 5 psychosocial sessions to adults affected by wildfire, drought, and COVID-19 (71). Participants in the intervention group showed statistically significant reductions in PTSD, anxiety, and depression between baseline and post-intervention, relative to the self-help group, although the differences were not sustained at 2-month follow up (71). In California, a trauma-informed yoga programme was offered to 2,000 adults impacted by wildfires, with sessions delivered by 60 trained instructors (97). Participants reported high satisfaction and perceived benefits for PTSD, grief, and emotional regulation (97).

Statement 2.13 is supported by 2 studies from Australia and the USA.

What we don’t know about interventions

Current gaps in the evidence base include:

- there is a lack of evidence on mental health impacts of system interventions or adaptation measures, such as improvements in housing quality or infrastructure resilience
- almost all evidence identified on climate-related mental health interventions was from non-UK contexts, with limited evidence from UK settings. It remains unclear how findings on intervention effectiveness, differential impacts across groups at risk of health inequalities, or effects on wider determinants of health are generalisable to UK populations, healthcare systems, and policy contexts
- there is limited evidence of how mental health support related to climate change and extreme or adverse weather could be embedded into routine public services

- there is limited evidence focused on populations or places facing overlapping vulnerabilities such as coastal and rural communities and inclusion health groups
- while deprivation and income were sometimes reported, socioeconomic gradients are rarely analysed as moderators of intervention outcomes
- although most participants of intervention studies were women, few studies examined how gender roles (or other characteristics) during weather-related events influence mental health needs or outcomes. Intervention evaluations also focused on individual outcomes, with no evidence reported on intervention impacts on households or communities

Relevant case studies

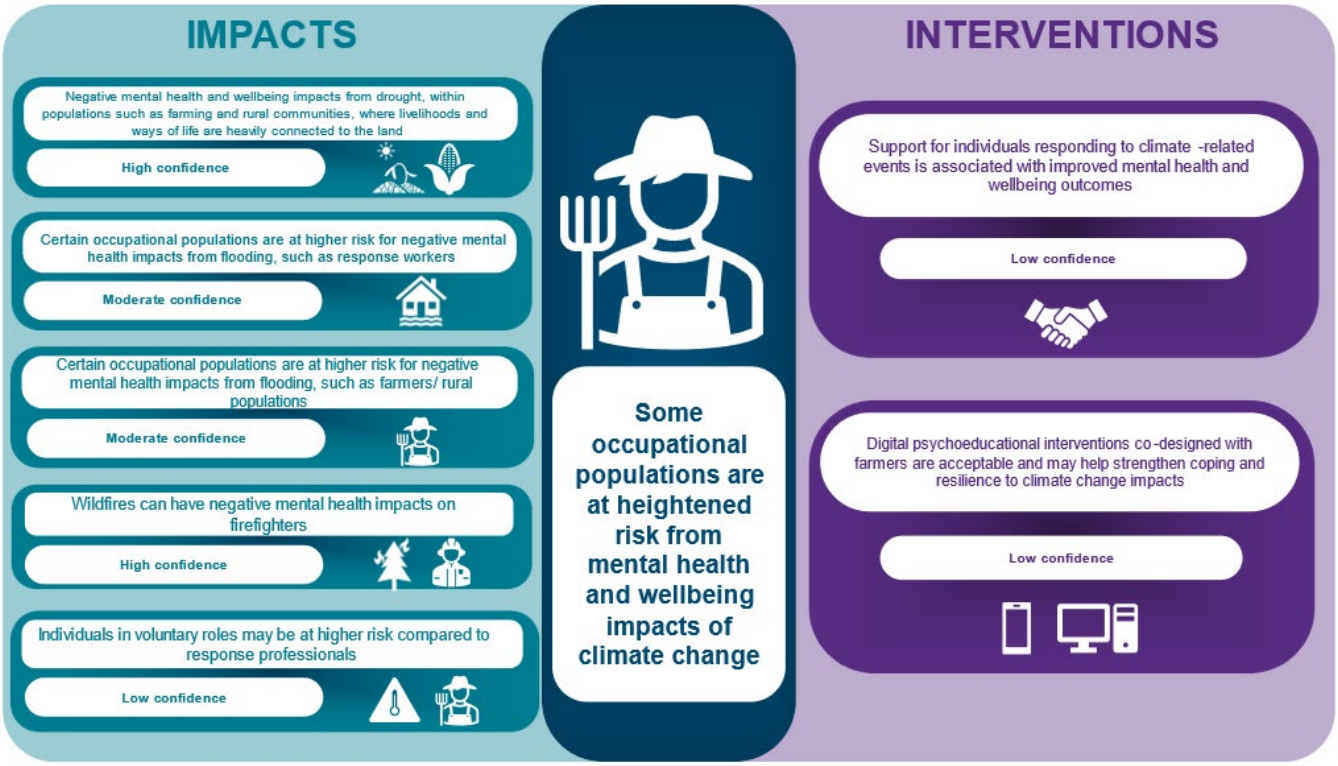
The following case studies are relevant to this theme (see Appendix 3 for more details):

- ID04: Borrowed Time (submitted by Andii Bowsher)
- ID05: Mental health support during a flood (submitted by Geraldine Bruce, Hertfordshire County Council Public Health Team)

3. Some occupational populations are at heightened risk from the mental health and wellbeing impacts of climate change

There are 6 key statements in this theme which demonstrate the pathways in which climate change is impacting mental health, followed by 2 statements describing interventions (Figure 5).

Figure 5. Impacts of climate change on mental health of certain occupational populations



3.1 There is emerging evidence suggesting that some occupations (such as farmers, outdoor workers and front-line responders) are at increased risk from heat-related mental health impacts [very low confidence]

Extreme heat can negatively impact farmers' mental health as during periods of extreme hot weather, farmers have no choice but to carry on working. Loss of crops can also impact mental health, with one study finding suicide amongst farmers increasing by 4.8% as a result of a decline in agricultural productivity due to increased temperature (98). One review focusing on the impact of a heat dome on emergency service providers in Canada found that they faced highly stressful work conditions including record-breaking call volumes, increased mental health-related claims, and exhausting heat-related physiological stress, where they were unable to take breaks and had significant challenges accessing mental health resources (99). Most of the evidence supporting this statement comes from non-OECD countries, and there is no current evidence from the UK, which has resulted in very low confidence for this finding.

Statement 3.1 is supported by 4 reviews.

3.2 There is considerable evidence for negative mental health and wellbeing impacts from drought, particularly within certain populations such as farming and rural communities, where livelihoods and ways of life are heavily connected to the land [high confidence]

Many studies highlight the impact of drought on the mental health of rural communities. For example, a cross-sectional survey from Australia demonstrated that psychological distress as a result of drought was elevated in rural communities, but not urban communities (47). Additionally, farmers report strong associations between drought and stress and higher levels of psychological morbidity (100), with farmers or spouses of farmers in drought-affected areas displaying significantly higher levels of distress than the broader national and rural population (101). These impacts can also permeate further into families within rural communities (63).

Statement 3.3 is supported by one UK study and 13 reviews.

3.3 There is evidence that certain occupational populations are at higher risk for negative mental health impacts from flooding such as response workers [moderate confidence] and farmers/rural populations [moderate confidence]

Response workers have been identified as particular occupations at risk of mental health impacts from flooding. Studies have reported support workers having very high workloads, leading to exhaustion and stress (102, 103). Several studies reported PTSD in first responders. For example, a cross-sectional study of rescue squads 7 years after a flood response demonstrated 11.8% had full PTSD, 11.8% had subthreshold PTSD with impairment and 17.6% experienced subthreshold PTSD without impairment (104). Additional studies of disaster relief workers have reported increases in PTSD, though it is noted that the evidence also includes hurricanes as well as flooding (105, 106). Mental health professionals and healthcare workers have also been highlighted as at-risk groups as they are often involved in assisting populations exposed to adverse weather events, which can impact their mental health (103, 106). Similar to the impacts from drought, farmers are identified as an at-risk occupational population from flooding due to their connection to the land and financial pressures. However, evidence for this within the UK is sparse.

Statement 3.3 is supported by one UK study and 10 reviews.

3.4 There is evidence suggesting wildfires can have negative mental health impacts on firefighters [high confidence]

Five reviews reported psychiatric morbidity in firefighters. Impaired sleep was noted as a particular issue for firefighters responding to an incident, with no improvement documented

during rest days (44, 107). Several reviews highlighted the risk of PTSD, with some studies estimating prevalence of 10% to 20% (34, 45), whilst another found PTSD prevalence of 28% to 47.6% in firefighters between 2 and 7 years post-bushfires (108). Interestingly, one review reported an increase in prevalence over time from 30% at 2.5 years post-fire to 47.6% at 3.5 years following wildfires, although it was noted that participant numbers reduced over the course of the study (from 447 to 337) (108).

Statement 3.4 is supported by 5 reviews.

3.5 There is suggestive evidence that those who work in voluntary roles may be at higher risk compared to response professions [low confidence]

Volunteers may be at greater risk of negative mental health impacts because unlike professional responders, they generally have less exposure of traumatic situations (90, 105). For example, when responding in disaster relief efforts, the main issues reported by professions are predominantly related to resources and structural issues, whilst voluntary workers are more likely to report structural and psychological difficulties (105). In addition, lower prevalence of PTSD has been reported among police officers compared to other groups including local residents, civilian staff and volunteers (90). Volunteers may also be less likely to receive organisational support after responding to an event, compared to those employed in response professions (105).

Statement 3.5 is supported by 2 reviews.

What we know about interventions

3.6 Support for individuals responding to climate-related events is associated with improved mental health and wellbeing outcomes [low confidence]

Psychological interventions targeting frontline and emergency responders reduced PTSD, anxiety, depression, and secondary traumatic stress following weather-related disasters. Interventions for people already experiencing mental health symptoms included structured group-based programmes and individual trauma-informed psychotherapy, delivered either in person or through standardised psychological support protocols. A non-randomised cluster trial in the USA evaluated the Resilience and Coping for the Healthcare Community programme, delivered to 476 health and social care workers in Texas and Puerto Rico following Hurricanes Harvey and Maria and found significant reductions in PTSD and secondary traumatic stress (109). A smaller case study in Portugal followed 2 wildfire-affected firefighters with PTSD while receiving trauma-informed psychotherapy, and at 15 months follow-up, both had PTSD symptoms below the diagnostic threshold, along with reductions in depression and anxiety (67).

Statement 3.6 is supported by 2 studies from the USA and Portugal.

3.7 Emerging evidence suggests that digital psychoeducational interventions co-designed with farmers are acceptable and may help strengthen coping and resilience to climate change impacts [low confidence]

Co-designed digital ACT tools may be feasible, well received and potentially effective in helping farmers manage climate related stress. A study of 228 farmers evaluated the ifarmwell digital ACT programme, which was co designed with farmers to reflect drought stress and farm life (69). Participants completed 5 online self-guided modules, with results showing significant reductions in psychological distress and increased wellbeing, with improvements sustained at 6 months (69). Earlier prototype testing with 157 users involved a 9-stage co-design process, where participants reported high satisfaction and valued the programme's practicality, relevance, and privacy, as well as describing improved coping, self-reflection, and emotional regulation (110).

Statement 3.7 is supported by 2 studies from Australia.

What we don't know about interventions

Current gaps in the evidence base include:

- evidence on the effectiveness of interventions tailored to high-risk occupational groups is limited, and most studies do not assess occupational status as a moderator of intervention effectiveness, nor do they investigate whether uptake or effectiveness varies according to differences such as gender or ethnicity.
- workplace-related factors are not addressed in interventions; for example, there were no interventions identified that accounted for how conditions like shift work or trauma exposure may influence mental health needs or responses
- no studies evaluated workplace level interventions aimed at preventing or mitigating climate- or weather-related mental health impacts
- there is limited evidence on how interventions address the link between occupational risk and factors such as rural working conditions or deprivation

Relevant case studies

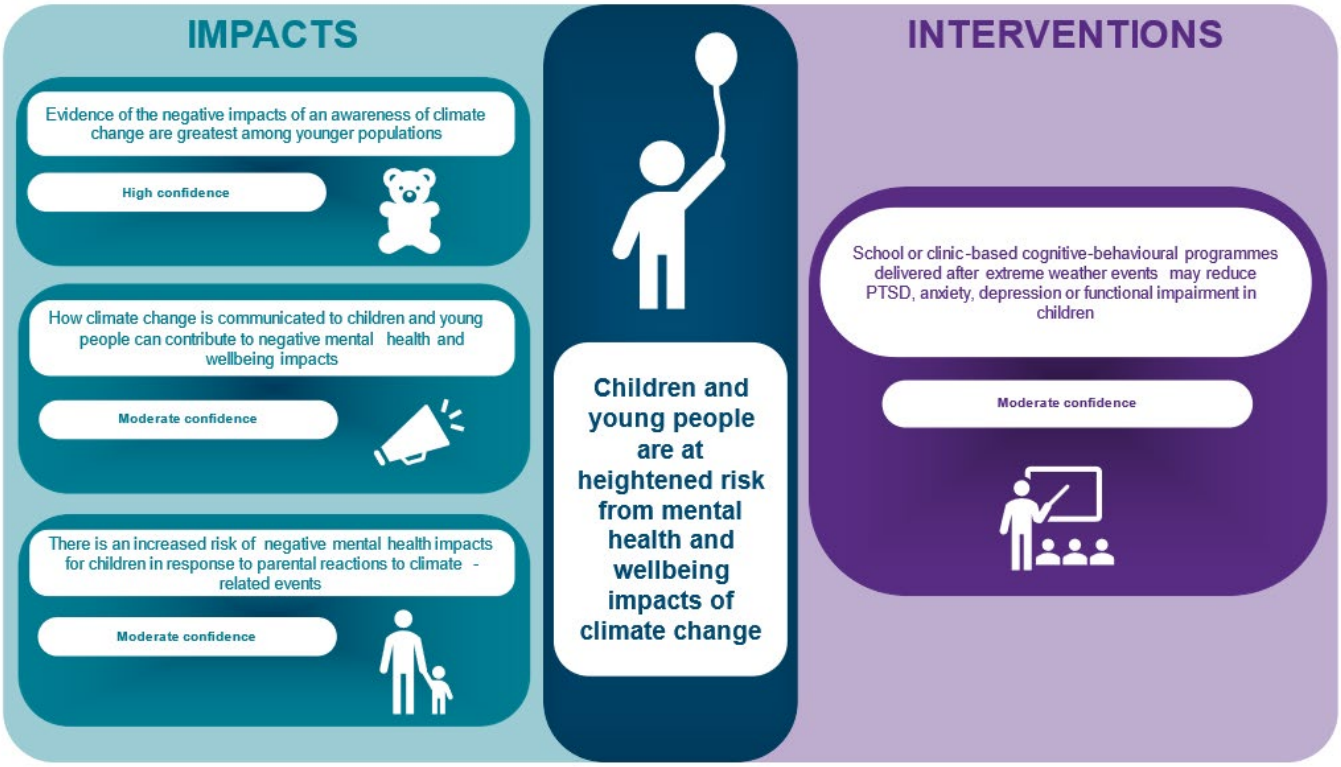
The following case studies are relevant to this theme (see Appendix 3 for more details):

- ID02: Climate Cafe for EMDR trauma therapists (submitted by Martina Leeven, EMDR Association UK)
- ID06, Climate Staffroom for teacher support (submitted by Louise Edgington, ClimatEdPsych)
- ID07: Positive Imaginings, Under the Sky and The Climate Wellbeing Project (submitted by Lucy Power, Rowanbank Environmental Arts and Education)

4. Children and young people are at heightened risk from the mental health and wellbeing impacts of climate change

There are 4 key statements in this theme which demonstrate the pathways in which climate change is impacting mental health, followed by one statement describing interventions (Figure 6).

Figure 6. Impacts of climate change on children and young people



4.1 Evidence of the negative impacts of an awareness of climate change are greatest among younger populations [high confidence]

Children and young people can be particularly at risk of mental health impacts from climate change associated with their awareness of climate change and the potential implications during their lifetime. In a survey of 1000 children in the UK, 50% reported either feeling extremely worried or very worried about climate change and 28% reported this impacted their daily lives and functioning (37). Children and young people can often feel a sense of age-related powerlessness with perceived ability (or lack of) to carry out actions able to make a difference – this can be through their ability or inability to vote or make household purchases (111, 112) and lack of inclusion or representation in decision-making (113). Many children and young people have felt dismissed when talking about climate change and that not enough action is being taken by authorities (37). There is evidence suggesting varying impacts throughout different age categories of young people, with higher climate anxiety reported in older adolescents and young

adults (36, 112, 114). Additional pathways for this may include differing levels of self-efficacy and agency due to different levels of physical and cognitive development across this age group.

Statement 4.1 is supported by 3 UK studies and by 13 reviews.

4.2 There is evidence to suggest how climate change is communicated to children and young people can contribute to negative mental health and wellbeing impacts [moderate confidence]

Higher levels of exposure to information (for example, through media such as news programmes, films and social media) and information seeking (intentional finding of information related to climate change), have been linked to higher eco-anxiety. News around climate change has been perceived as stressful and catastrophising in UK young people, with studies reporting increased eco-anxiety in relation to social media stories and negative news coverage specifically (113). Environmental education has also been reported to contribute to overwhelmed feelings and worry in one review, when not provided with adequate space to learn about actions that can be taken (115). Young people's perceptions of climate inaction by authorities and organisations can increase negative feelings in relation to climate change, leaving young people with feelings of powerlessness, action paralysis and learned hopelessness and eco-anxiety has been correlated with a perception of inadequate response from the government (37, 113, 115). In a survey of young people in the UK, 39% of respondents reported feeling dismissed when talking about climate change concerns (37). It is therefore important that the way messaging is provided is carefully considered, and appropriate support is provided to those who may need it when learning or hearing about climate change.

Statement 4.2 is supported by 3 UK studies and 5 reviews.

4.3 There is an increased risk of negative mental health impacts for children in response to parental reactions to climate-related events [moderate confidence]

Evidence demonstrates that children may be at increased risk of mental health impacts from climate-related events if their parents demonstrate adverse mental health impacts (116 to 122). For example, psychological distress of a parent or caregiver has been shown to act as a significant mediator of associations between instability and wellbeing in relation to extreme weather driven disasters (117), and climate change-related events leading to altered parenting styles and levels of parental support for children, therefore impacting children's mental health and wellbeing (116, 121, 122). There is additional evidence to demonstrate the impact of climate-related events on family relationships and interactions, which can impact mental health for both children and parents (see statement 2.3).

Statement 4.3 is supported by 10 reviews.

What we know about interventions

4.4 There is evidence that school- or clinic-based cognitive-behavioural programmes after extreme weather events, may reduce PTSD, anxiety, depression or functional impairment in children [moderate confidence]

Following exposure to extreme weather events, CBT-informed interventions delivered in child-focused settings were associated with significant improvements in PTSD, depression, anxiety, and functional outcomes. Interventions were delivered by trained clinicians in schools or clinics between 1 and 3 years after floods or hurricanes and used trauma-focused or transdiagnostic CBT approaches. Intervention components varied across studies and included individual sessions with workbooks, imaginal exposure (storytelling), cognitive restructuring, emotion regulation, and behavioural activation. Parent involvement was also included, ranging from offering optional sessions to increase trauma awareness and family support, and addressing inconsistent discipline, overprotection, criticism, and emotional modelling through structured parent modules. While some mental health symptoms remained above clinical thresholds after the intervention, the positive direction of effect was consistent across all studies (65, 72, 123).

Statement 4.4 is supported by 3 studies from the USA and Australia.

What we don’t know about interventions

Current gaps in the evidence base include:

- few interventions were identified that were designed for specific developmental stages such as early adolescence or young adulthood, making it difficult to assess age-appropriate content, delivery or outcomes
- similarly, no evidence was identified on effective training programmes for teachers and educators to communicate about climate change in developmentally appropriate ways that support mental health and build resilience rather than increase anxiety
- there is limited evidence on the effectiveness of strategies designed to empower young people in climate action for mental health and wellbeing outcomes, or on how to communicate climate information in ways that build agency without increasing anxiety
- interventions co-produced with children and young people were limited; few studies captured their views on acceptability or priorities, and no peer-led or youth-delivered approaches were identified
- most studies report only short-term symptom improvements so there is limited evidence on whether benefits are sustained over time or across multiple climate-related events
- intersectional inequalities for young people were not addressed, for example young people with additional vulnerabilities such as care experienced children and young peoples, living in deprivation or children and young people with neurodivergence

- no evidence on embedding support into routine education or digital platforms commonly used by young people was identified
- few interventions were identified in relation to eco-anxiety compared to intervention after a climate change-related event however, case studies and resources in this report do provide some information to fill this gap

Relevant case studies

The following case studies are relevant to this theme (see Appendix 3 for more details):

- ID06: Climate Staffroom for teacher support (submitted by Louise Edgington, ClimatEdPsych)
- ID08: The Sustainables Academy – Climate mental health resource and curriculum plan intervention and tools (submitted by: Louise Robertson)
- ID09: The Resilience Project: supporting the next generation of youth climate leaders (submitted by Daniella Watson, Imperial College London)
- ID10: Youth Support Spaces (submitted by: Gareth Morgan, Climate Psychology Alliance)
- ID11: Parenting Circles (submitted by Gareth Morgan, Climate Psychology Alliance)
- ID12: guided activities – offline and online – to help young people process their climate-related emotions, protect their mental health and build climate agency (submitted by: Emma Lawrance, Climate Cares Centre)
- ID13: submitted by: Youth Social Action (submitted by Claire Arnott, Global Action Plan)
- ID14: Force of Nature: from anxiety to agency (submitted by Sacha Wright, Force of Nature).

5. Those with pre-existing health difficulties are at heightened risk from the mental health and wellbeing impacts of climate change

There are 5 key statements in this theme which demonstrate the pathways in which climate change is impacting mental health, followed by 1 statement describing interventions (Figure 7).

Figure 7. Impacts of climate change on those with pre-existing health difficulties

5.1 There is considerable evidence that heat exposure increases the risk of mortality (excluding suicide) for those with mental health conditions [high confidence]

The risk of mortality from heat for people with mental health conditions is greater than compared to the general population. For example, it has been reported that for every 1°C temperature increase above 24°C, the likelihood of mentally unwell patients dying increased by 5.5%, compared with 1.9% in the general population (22, 98). Another review reported that for people with psychiatric illnesses, the likelihood of dying during heatwaves was 3 times higher for people with psychiatric illness than for people with cardiovascular disease during heatwaves (22). The drivers for this can be linked to certain psychotropic medications (see statement 5.5), as well as people with mental health conditions struggling to recognise signs of heat exhaustion and being less likely to protect themselves from heat. The impact of heat exposure on suicide risk is discussed in Statement 1.8.

Statement 5.1 is supported by 11 reviews.

5.2 There is increased risk from heat for individuals with pre-existing mental health conditions [moderate confidence], especially those affected by schizophrenia [high confidence] or cognitive conditions such as dementia [high confidence]

Exposure to high temperatures can adversely impact cognitive function, mood state, and mental performance, and individuals with dementia or diminished cognitive function and coping ability may have greater difficulties in managing stressful environmental situations (33). An English study demonstrated a 4.5% increase risk of dementia-related hospital admissions for every 1°C rise in temperature above 17°C (49). Similarly, agitated behaviour in people with dementia significantly increased when the mean temperature went above 22.6°C (48, 124). Neuro-inflammation due to heat stress may play a role in conditions such as depression, psychosis and cognitive impairment (33). A study of people with schizophrenia in a psychiatric ward found that patients' core symptoms were positively and significantly correlated with ward temperature, and agitation was significantly correlated with the amount of hours individuals were exposed to temperatures below 20°C or above 26°C (124). One possible driver is that certain mental health-related medicines alter the body’s ability to regulate temperature, which can impact health by increasing the risk of heatstroke and even death (22).

Statement 5.2 is supported by one UK study and 17 reviews.

5.3 There is evidence that some populations are at higher risk for negative mental health impacts from flooding, including those with pre-existing health conditions and disabilities [high confidence]

Populations with pre-existing mental health conditions may be at higher risk of worsening existing mental health problems due to experiencing flooding, along with the development of new mental health symptoms (22, 62, 75, 121). For example, flood victims with previous mental health problems and PTSD were at a higher risk of suicide (125). Individuals with poor physical health may also be at increased risk of mental health impacts from flooding. Individuals who experienced flooding in Brisbane, Australia for example had higher likelihood of psychological distress if they had pre-existing health difficulties compared to those with good health (126). Similarly, those who reported poor health were between 2 and 4.2 times more likely to meet PTSD, anxiety and depression criteria following a flood event than those who reported good health, suggesting that poor physical health is associated with poorer psychological outcomes following a disaster (127). It has been suggested that disruptions to health services and support during and following a flood event will predominantly impact those with pre-existing health conditions, which may be a factor contributing to this higher risk of mental health impacts (128). People with disabilities reported communication barriers with accessing health and community services after experiencing flooding (129).

Statement 5.3 is supported by 4 UK studies and 11 reviews.

5.4 People with pre-existing mental health conditions or with a history of trauma are particularly at risk from the mental health impacts of wildfires [moderate confidence]

A prior history of mental health problems along with experiencing financial stress increased the likelihood of developing, or having more severe symptoms of, PTSD, depression, insomnia, anxiety and drug or alcohol dependency following a fire (81). A survey of Australian residents in postcodes that had experienced high levels of smoke-related air pollution during bushfire season found the odds of mental health symptoms were greater among persons with pre-existing mental health diagnoses (107). Similarly, there may be an increased risk of the development of new conditions for those with pre-existing mental health conditions. individuals with pre-existing anxiety were at 5 times higher risk of PTSD 6 months after a wildfire and nearly 6 times higher risk 18 months after a wildfire compared to individuals without pre-existing anxiety (62), although it should be noted that the same review also cited studies where there was no differences in risk of conditions between those with and without pre-existing mental health conditions. When comparing adolescents with experience of previous trauma versus those who were experiencing trauma for the first time through the wildfire, adolescents with previous trauma showed higher rates of depression and anxiety but there was no significant difference in anxiety or suicidal ideations between the 2 groups (46).

Statement 5.4 is supported by 6 reviews.

5.5 Heat events increase the risk of additional health impacts for people taking certain medications for mental health conditions [moderate confidence]

People taking certain psychotropic medications (including hypnotics, anxiolytics and antipsychotics) (47) can be at increased risk of death and other physical health impacts including heatstroke, nervous system changes, temperature regulation issues and dehydration. It is thought that certain medications can affect the body's ability to regulate temperature, meaning that individuals taking these medications are at increased risk of the heat-related symptoms described above (22, 47, 49, 130, 131) due to certain bodily mechanisms affected by the medication.

Statement 5.5 is supported by 5 reviews.

What we know about interventions

5.6 Evidence indicates that climate-related mental health interventions are beneficial for those who have pre-existing mental health conditions [moderate confidence]

Interventions included therapist supported internet-delivered CBT (64, 68), mobile app-based self-help (132), and care navigation programmes linking participants to local services (94) were associated with improvements in PTSD, depression, anxiety, stress, and wellbeing. A care navigation programme was delivered in response to Hurricane Sandy, and involved proactive outreach, identifying barriers to treatment, and providing personalised assistance, such as appointment coordination and transport reimbursement to support individuals in accessing care, which may have been particularly helpful for participants with prior mental health needs (94). In the USA, a mobile app designed for people affected by wildfires featured daily mood tracking, psychoeducation on PTSD and disaster recovery, and audio-guided tools tailored to difficulties like grief, anger, and peer relationships, with most participants having previously received mental health care (132). Studies reported improvements in mental health outcomes, including statistically significant reductions in PTSD, depression, anxiety, and stress symptoms (64, 68, 94), as well as increases in wellbeing and emotional support (64, 68, 132). Across studies, participants with prior mental health diagnoses or treatment histories made up between 16% and 65% of samples.

Four studies from the USA and Sweden contributed to statement 5.6.

What we don’t know about interventions

Current gaps in the evidence base include:

- intervention effectiveness for people with multiple or long-term health conditions is underexplored as there were no studies identified that evaluated outcomes for individuals with long term physical or mental health conditions or comorbidities, and very few reported disaggregated findings by baseline health status
- tailored approaches for individuals with long-term or multiple health conditions were not identified
- studies did not explore how pre-existing health conditions may shape engagement with or adherence to interventions
- no evidence was identified on the differential effects of medication when used to address mental health symptoms associated with climate-related distress, how climate-related distress is treated pharmacologically and its associated effectiveness, or how existing medication use for pre-existing mental health conditions may influence responses to climate-related stressors

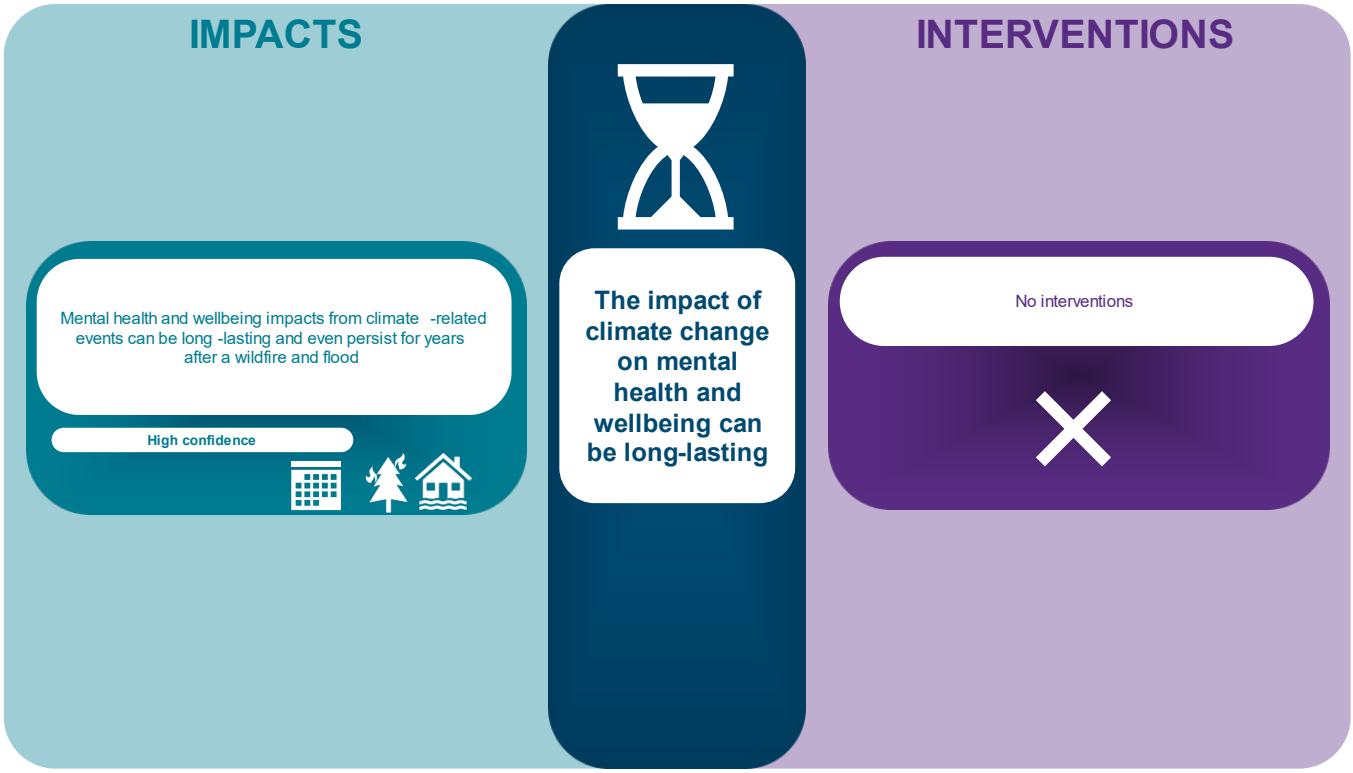
Relevant case studies

No relevant case studies were submitted.

6. The impact of climate change on mental health and wellbeing can be long-lasting

There is one key statement in this theme which demonstrate the pathways in which climate change is impacting mental health, and there were no studies identified which detail interventions (Figure 8).

Figure 8. The impacts of climate change on mental health and wellbeing can be long-lasting



6.1 Mental health and wellbeing impacts from climate-related events can be long-lasting and even persist for years after a wildfire [high confidence] or flood [high confidence]

Mental health conditions themselves can be chronic and long-lasting. In relation to climate-related hazards, long-lasting mental health impacts, extending for years after the wildfire or flood have been extensively documented. For example, 6 months post-wildfire, 14% to 54% of evacuated children in Canada presented with PTSD (46) and in one year post-fire in an Australian community, 42% of the population displayed psychiatric morbidity, which was more the double seen in a non-exposed population (45). Some studies suggest that impacts can last for much longer, with effects decreasing over time but persisting up to a decade or more in some cases. For example, psychological distress prevalence in an Australian population was 7.9% at 2 to 4 years after bushfires, decreasing to 5.2% at 5 to 7 years after and to 4.6% after more than 7 years after bushfires (108). However, even after 20 years, 75% of a wildfire-exposed group reported some degree of distress in relation to the wildfire (45). In the UK, the

National Study of Flooding and Health demonstrated lasting mental health impacts for flooded participants compared to unaffected participants 3 years after the event (9). Although a decline in probable PTSD, anxiety and depression was noted for flooded participants, prevalence remained higher compared to unaffected residents (9). Evidence has additionally documented PTSD prevalence among response workers to be elevated even 7 years after a flood event (104). Much of the evidence on drought only measures mental health symptoms during a drought period. Yet long-term mental health impacts can be assumed from drought due to its nature as a chronic, slow-onset hazard across long time periods. Measuring health impacts from longer term follow-up to a drought is more difficult than for a flood because there is less often a clear ‘start’ and ‘end’ to the drought event, challenging long-term studies and limiting the evidence base.

Statement 6.1 is supported by 14 UK studies and 24 reviews.

What we know about interventions

Some climate-related mental health interventions show benefits sustained for at least 3 to 12 months post-intervention (64, 65, 70, 133), suggesting effects may extend beyond the immediate term. However, no identified studies followed participants beyond 12 months post-intervention.

What we don’t know about interventions

Current gaps in the evidence base include:

- long-term impacts are unclear as most studies did not follow participants beyond 6 months, which limits understanding of sustained symptom improvement, relapse, or delayed onset of mental health conditions
- cumulative exposures are overlooked and there is limited evidence on how mental health outcomes evolve following repeated or compounding climate-related events
- there were no studies identified which examined whether individuals may seek or benefit from support after the event
- functional outcomes are limited as few studies assess long-term impacts on daily functioning, including quality of life, employment or education
- it is unclear whether interventions delivered later (for example, 6 months post-exposure) can be effective, or if there are critical periods when support is most impactful
- there is no evidence of climate-related interventions being linked to follow up systems or integrated care pathways that support sustained recovery over time

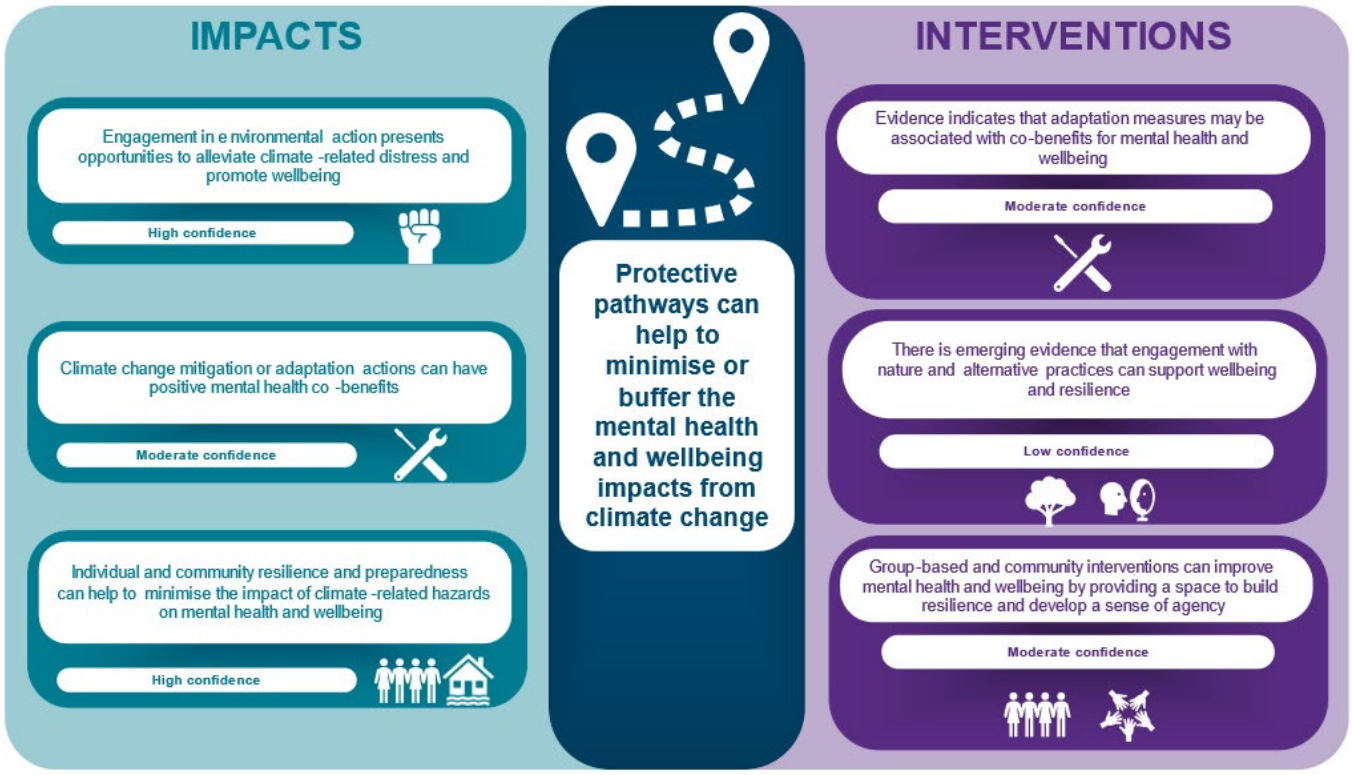
Relevant case studies

No relevant case studies were submitted.

7. Protective pathways can help to minimise or buffer mental health and wellbeing impacts from climate change

There are 3 key statements in this theme which demonstrate potential pathways in which mental health and wellbeing can be protected from the impacts of climate change, followed by 4 statements describing interventions (Figure 9).

Figure 9. Potential protective pathways can help to minimise or buffer the mental health and wellbeing impacts from climate change. Statements displayed were prioritised with high confidence findings being displayed first



7.1 Engagement in environmental action presents opportunities to alleviate climate-related distress and promote wellbeing [high confidence]

In some cases, eco-anxiety is seen as a rational and partially adaptive response to the climate crisis (22, 134), promoting behavioural change or action. Evidence suggests that those who experience difficult feelings due to their awareness of (or worry about) climate change may be more active in positive climate-related behaviours such as conservation or response activities, activism or campaigning, which therefore can help to build resilience and promote wellbeing as a result. Eco-anxiety has been associated with pro-environmental behaviours (21, 135), and higher levels of climate distress are associated with positive impacts of taking climate action and climate activism (113), which may buffer the symptoms of major depressive disorder and

leave people with higher sense of control, community and wellbeing (21). However, there is suggestive evidence that those who are more engaged in climate action may be more likely to have higher levels of eco-anxiety, making it difficult to disentangle a direction of effect. Nevertheless, environmental action can present opportunities for the management of difficult climate related emotions, whilst providing environmental co-benefits, although it must be noted that as a persistent long-term stressor it could lead to negative mental health impacts for some (see statement 1.2).

Statement 7.1 is supported by 3 UK studies and 8 reviews.

7.2 Climate change mitigation or adaptation actions can have positive mental health co-benefits [moderate confidence]

Interventions designed to adapt to or mitigate the impacts of climate change, including heat adaptation and air pollution reduction interventions, reduce the risk of mental health difficulties because they reduce the hazard and have demonstrated positive mental health co-benefits to people in some cases. For example, some urban design strategies such as flood and heat prevention strategies have demonstrated improvements to mental health through increasing physical activity, shaded areas and social connectivity (136). Flood prevention measures which are predominantly aimed at protecting communities from flooding and responses such as planned shelters have reduced the impact that flooding will have on the population's mental health, providing mental health co-benefits (137). A review of green infrastructure projects designed mainly for stormwater or flood management found no evidence that mental health outcomes were measured, highlighting a gap in understanding the potential mental health co-benefits of these climate adaptation efforts (138).

Statement 7.2 is supported by 5 reviews.

7.3 Individual and community resilience and preparedness can help to minimise the impact of climate-related hazards on mental health and wellbeing [high confidence]

Protective pathways from preparedness include advanced warning systems, flood defences and preparation such as timely evacuation and dissemination of information. Though it is noted these must be carried out in a sufficient manner to avoid unintended consequences (see statement 2.4). Social capital, social support, community resilience and cohesion were strongly highlighted across multiple reviews and primary studies, acting as a buffer for mental health impacts from climate-related hazards (including depression, subjective wellbeing, psychological distress and life satisfaction); and breakdown of these social systems seen to be detrimental for mental health and wellbeing (see statement 2.3). One UK-based study quantified a path model between 'resilience' and psychological distress, and demonstrated that resilience factors including family nearby and perceived social cohesion, were strongly associated with reductions in psychological distress (139). Another reported in a survey of 1,000 participants affected by flooding in Somerset and Boston that "the community spirit made it easier to cope with the

flooding" and "the local community provided support that was not available from the authorities" in 84% and 87% of responses respectively (80). Additionally, during drought periods, adolescents reported increased community connectedness in Australia (122). Social relationships may be particularly important for populations who are known to experience inequalities. For example, for people with disabilities, strong social support and resource connections helped coping with extreme weather events (129) and in the USA, social cohesion reduced mental health impacts for those in low- and moderate-income categories (47). There is also evidence to show that level of parental and family support for children is important in reducing the risk of mental health impacts from flooding (see also statement 4.3).

Statement 7.3 is supported by 10 UK studies and 25 reviews.

What we know about interventions

7.4 Evidence indicates that adaptation measures may be associated with co-benefits for mental health and wellbeing [moderate confidence]

Adaptation initiatives may yield secondary mental health benefits, especially when designed with behavioural or environmental engagement components. Adaptation initiatives have been associated with improvements in stress reduction, emotional wellbeing, sense of purpose and social connection. Interventions included energy efficiency upgrades in low-income housing, a citizen science biodiversity monitoring programme, and nature prescribing embedded in routine care. A large RCT found that energy efficiency upgrades in low-income households led to statistically significant improvements in mental health and social care quality of life (including personal comfort, feeling safe, control over daily life and living environment, and accommodation comfort), alongside improved thermal comfort, reduced energy use and a reduction in winter healthcare costs (96). A second RCT found statistically significant increases in self-efficacy and nature relatedness following participation in a biodiversity monitoring programme (140), while qualitative findings indicated perceived mental health benefits despite no change in overall wellbeing scores. A qualitative study explored clinician experiences of delivering nature prescribing in 5 Australian states, with participants describing positive outcomes such as reduced stress and improved social connectedness, particularly when linked to conservation activities (141).

Statement 7.4 is supported by 3 studies from Australia.

7.5 There is emerging evidence that engagement with nature and alternative practices can support wellbeing and resilience [low confidence]

Engagement with nature and alternative practices may support wellbeing and resilience by strengthening emotional regulation, self-belief, and connection to others and the environment. Nature-based and alternative practices include activities such as citizen science, trauma informed yoga and meditation, and nature prescribing. These activities have been shown to

support wellbeing and resilience in the context of biodiversity loss, eco-anxiety, and wildfire-related trauma (97, 140, 141). Quantitative findings showed significant increases in self-belief (confidence in one's ability to cope and take action) and nature-relatedness (feeling connected to the natural environment) following the citizen science intervention, particularly among those without prior volunteering experience (140). In California, 85% of 2,000 wildfire-affected participants engaging in a yoga intervention reported perceived improvements in PTSD symptoms, grief, and emotional regulation (97). A third qualitative study involving 13 clinicians from 5 Australian states found that nature prescribing activities (such as spending time in the forest, gardening, walking) were perceived to reduce stress (141). These findings suggest that nature-based and identity-oriented practices may offer accessible approaches to support emotional wellbeing and resilience in climate-affected populations.

Statement 7.5 is supported by 3 studies from Australia and the USA.

7.6 There is evidence that educational interventions which aim to improve climate literacy and teach coping strategies may be beneficial for mental health and wellbeing and additionally raise awareness around the mental health impacts from climate change [very low confidence]

Engaging in educational interventions which aimed to improve climate literacy and teach coping strategies by fostering social connection, emotional processing, and collective action showed some association with improved mental health and wellbeing in evidence from Australia and Canada. However, the studies report contrasting findings, which resulted in very low confidence assessment of the statement. For example, in Australia, community-led workshops conducted in rural New South Wales used structured group dialogue to explore climate distress and coping through collective action, with participants describing increased connection, purpose, and reduced anxiety through shared engagement (142). Similarly, a large-scale community intervention in drought-affected rural Australia trained over 3,000 people in mental health literacy, which was reportedly associated with greater mental health awareness, reduced stigma, and high acceptability (143). However, a school-based programme in Canada integrating emotion-focused and meaning-focused strategies such as mindfulness, and climate coping into climate education for students aged 11 to 14 (144) found no significant changes in positive or negative emotions. While positive emotions remained highest throughout the intervention, emotional detachment increased significantly, which the authors cautioned could indicate either increased emotional awareness or problematic disengagement from climate issues (144).

Statement 7.6 is supported by 3 studies from Australia and Canada.

7.7 There is evidence that group-based and community interventions can improve mental health and wellbeing by providing a space to build resilience and develop a sense of agency [moderate confidence]

Participating in group and community-based activities, including yoga, citizen science, and climate cafés, was associated with reduced psychological distress and helped people process climate-related emotions through shared experience and support. One large non-randomised trial of a group-based intervention conducted with health and social care workers affected by hurricanes reported statistically significant reductions in PTSD, anxiety, and secondary traumatic stress at follow-up (109). A randomised trial in Australia found that an 8-month citizen science programme improved nature relatedness and self-efficacy, particularly among first-time volunteers, psychological factors that may benefit mental health and support mental health resilience in the context of climate change (140). In California, a large-scale trauma-informed yoga programme reached 2,000 wildfire affected adults, with perceived mental health benefits such as helping with recovery from 'grief, loss and PTSD', as reported by participants (97). A smaller qualitative study found that online climate cafés in the UK supported emotional processing and connection among those experiencing eco distress by providing spaces to acknowledge and process difficult emotions related to climate change, and fostering a sense of community and shared experience (145), while a rural Australian drought programme combining mental health training, outreach, and local engagement was associated with reduced stigma and increased awareness, based on reported outcomes (143).

Statement 7.7 is supported by 5 studies from Australia, the UK and the USA.

What we don't know about interventions

Current gaps in the evidence base include:

- while protective mechanisms like social connection, nature engagement, climate literacy and self-efficacy are often discussed, they are rarely tested as mediators or mechanisms of change
- most studies did not disaggregate outcomes by baseline resilience or coping capacity for example, so it is unclear who benefits from interventions the most
- most interventions did not include outcome measures that assess changes in protective factors over time
- although nature-based interventions sometimes mentioned co-benefits such as increased social connection, few studies examined whether or how these co-benefits serve as protective factors for mental health

Relevant case studies

The following case studies are relevant to this theme (see Appendix 3 for more details):

- ID04: Borrowed Time (submitted by Andii Bowsher)
- ID02: Climate Cafe for EMDR trauma therapists (submitted by Martina Leeven, EMDR Association UK)
- ID03: C-Change Conversations (submitted by Steve Killick)
- ID06: Climate Staffroom for teacher support (submitted by Louise Edgington, ClimatEdPsych)
- ID07: Positive Imaginings, Under the Sky and The Climate Wellbeing Project (submitted by Lucy Power, Rowanbank Environmental Arts and Education)
- ID08: The Sustainables Academy - Climate mental health resource and curriculum plan intervention and tools (submitted by: Louise Robertson)
- ID09: The Resilience Project: supporting the next generation of youth climate leaders (submitted by Daniella Watson, Imperial College London)
- ID11: Parenting Circles (submitted by Gareth Morgan, Climate Psychology Alliance)
- ID12: Guided activities – offline and online – to help young people process their climate-related emotions, protect their mental health and build climate agency (submitted by: Emma Lawrance, Climate Cares Centre)
- ID13: Youth Social Action (submitted by Claire Arnott, Global Action Plan)
- ID14: Force of Nature: from anxiety to agency (submitted by Sacha Wright, Force of Nature).
- ID15: Eco-emotions workshops (submitted by Louise Edgington, ClimatEdPsych)
- ID16: Climate Psychology webinars and talks (submitted by Louise Edgington, ClimatEdPsych)
- ID17: Climate wellbeing groups (submitted by Paul Reeve, Climate Mind)
- ID18: Recovery and wellbeing college climate anxiety educational course (submitted by Vinuri Semini Fernando, Central North West London NHS Recovery and Wellbeing College)
- ID19: Climate distress in the community: development of interventions and materials (submitted by Rosemary Randall, Cambridge Climate Therapists)
- ID20: Living with the Climate Crisis materials and groups (submitted by Rebecca Nestor, Climate Psychology Alliance)
- ID21: Climate Cafe Listening Circles (submitted by Rebecca Nestor, Climate Psychology Alliance)
- ID22: Impact of Norfolk and Waveney Mind sUStain Project from 2021 (submitted by Ruth Taylor, Norfolk and Waveney Mind).

Discussion

This report has identified and assessed the evidence of pathways between climate change and mental health impacts relevant to the UK, identifying the most at-risk populations. It also investigated whether there is evidence of interventions or adaptations that are used in the UK or that could be adapted for the UK from other OECD countries to prevent or reduce harm from mental health impacts associated with climate change. The extent of the evidence demonstrates some clear pathways by which climate change and adverse weather can impact mental health and wellbeing within the UK and the populations that may be particularly affected. It identifies intervention studies that have been carried out predominantly in OECD countries that could be applied to UK settings and provides several UK-based case studies that provide examples of interventions to improve mental health outcomes. A particular contribution of this report is inclusion of assessment of confidence in the evidence for key findings. Results not only highlight populations at higher risk but also gaps where evidence is currently lacking.

Whilst this report focuses on the impact of climate change on mental health in the UK, much of the evidence comes from other OECD countries. This is particularly applicable to drought and wildfire impacts, as there were no UK-based studies identified and evidence cited in the report comes predominantly from Australian and Canadian studies. Confidence assessment considers the 'relevance' of the findings in relation to the UK context (for example, in terms of severity of hazard and particular population or cultural factors), and where there were concerns around the applicability of the evidence in relation to the UK setting, the confidence level was downgraded (for example, downgraded from high to moderate confidence). Including evidence from outside of the UK allows for us to prepare for threats such as droughts and wildfires which are currently not a major risk for the UK but may increase in the coming years. Within the UK evidence base, much of the data identified comes from England, with very little coming from other UK nations. However, a health impact assessment of climate change in Wales was published in 2023 and considers mental health (146) and more recently, a review published in May 2025 reviewed the emerging evidence for Scotland's context, demonstrating the implications of climate change and mental health for Scotland (147).

There is considerable evidence suggesting increased risk of depression, anxiety, PTSD, suicide, substance misuse and violent behaviour, as well as reduced wellbeing and difficult climate emotions. These impacts can be long-lasting, ranging from months, years and even decades. There is evidence, however, that clinical interventions (such as CBT), psychosocial interventions (with or without clinical components), and complementary and alternative therapies delivered both in person and digitally (through applications or text message-based) can reduce the negative impacts of climate change on mental health, and climate change mitigation and adaptation actions can have positive mental health co-benefits. In addition, climate change awareness can result in individuals taking climate action, which may alleviate climate-related distress and promote wellbeing, creating a sense of control and community. In relation to interventions, there is a need for further evaluation of complementary and alternative therapies for mental health impacts from climate change: for example, nature engagement and

mindfulness; educational interventions for increasing climate literacy; and interventions that aim to address the wider social and economic determinants of mental health that may not have been captured within this report. It is important to note when considering nature-based approaches that whilst engagement with nature has positive mental health and wellbeing impacts, effectiveness depends on ensuring equitable access to natural spaces and nature-based programs for all populations. Within this review, many studies included were based on clinical therapies that provide more measurable mental health outcomes, but this is likely due to the nature of study designs in which these interventions or therapies can be tested and the inclusion criteria employed in this report. Provision of case studies alongside a review of published interventions allows for examples of a broader range of interventions to be considered.

Although cold weather was included within the search terms and inclusion criteria for this report, there was very little data in relation to cold weather and mental health identified. In future, although there will likely be fewer very cold days in the UK, there will be periods of moderate cold weather which will affect health, for example, cold-related deaths are projected to increase in future due to the UK's ageing population (148). The evidence base around cold and mental health appears to be limited to indoor environments; for example, 28% of young people are likely to be at risk of multiple mental health symptoms due to be living in a cold home (149). As such, the impact that outdoor cold temperatures can have on mental health requires further investigation. In addition to this, exposure to hurricanes was not included in the pathways review for pragmatic reasons, however, studies in relation to hurricanes were included in the interventions review where they met inclusion criteria. Although the UK does not experience hurricanes, in terms of the interventions for mental health, it is likely that response actions will be similar, and we could learn from established emergency preparedness, resilience and response (EPRR) processes and adapt these where possible.

Responses to climate-related events and communication by authorities and contractors (among others) can impact the mental health and wellbeing of people affected by flooding and dealing with the financial implications of such events through insurance claims, for example, has been highlighted as a key driver of negative mental health. In addition, disruption and displacement can be significant drivers of negative mental health impacts. No interventions were identified targeting the financial implications of climate-related events, such as financial aid packages and policies in place to help during times of climate-related events (for example, government funding to help farmers manage water resources). Building social, community and emotional resilience appears to be a key buffer to mental health impacts from climate change, demonstrating that building trust and strengthening local communities and processes will aid in improving psychosocial resilience to future climate-related hazards.

Certain occupations are at particular risk of mental health impacts, including farmers, outdoor workers and frontline responders. However, there is less UK-specific evidence for occupational groups. There is also a lack of evidence around other occupations that may be impacted by climate change. For example, only one review highlighted individuals in environmental roles may be at increased risk due to increased demand and pressure (150). Additionally, there may

be impacts on those providing care within the community during adverse weather events, including occupational populations such as social care workers. It would therefore be suggestive that those working in the media or journalism and working in climate change research may also be at risk despite there being no current research-level evidence identified to support this. Children and young people are demonstrating negative impacts of climate change awareness, and connected to this, messaging and communication around climate change is particularly important and should be considered by parents and educators. It is important that young people are given emotional support and the ability to learn coping strategies and develop agency, as well as be given the opportunity to take meaningful action, whilst still learning about changes in our climate. Some useful resources for parents and educators have been included in Appendix 3. Individuals with pre-existing mental and physical health difficulties are at heightened risk due to their vulnerability and potential limited capacity to adapt, and it is important that health professionals and local authorities are aware and tailor messaging to protect these individuals.

Several statements with either low or very low confidence have been included in this report as these statements demonstrate potential pathways that have been identified within the literature but where evidence may be lacking in amount or strength. Statements where there appears to be an absence of evidence are in relation to populations that may be considered vulnerable under the CORE20PLUS framework including ethnic minority populations and other inclusion health populations (for example those experiencing homelessness or climate migrants). Other populations are those working in climate change-based roles (including environmental workers or researchers), those in media or journalism and those in voluntary response-based roles. Moderator effects based on gender and age are uncertain, with mixed effects, and evidence for suicide is mixed across the literature in relation to certain climate-related hazards. It is important that the risks to these populations are still considered however, as an absence of evidence resulting in low confidence does not imply evidence of absence or low risk.

Limitations of the approach

Whilst the report provides a comprehensive overview of key pathways to mental health impacts from climate change and identifies key interventions that have been applied for mental health in relation to climate change, there are some limitations. When running literature searches for the pathways review over 101,000 studies were identified for title and abstract screening, thus a machine learning priority screening approach was used. Whilst this approach has been shown to have some success previously, it is possible that some relevant reviews were missed in the screening process.

Similarly, due to the large evidence base identified for the pathways review, UK-based primary studies were focused on, complimented by a ‘review of reviews’ (also termed umbrella review). This has meant that many findings have been reported at review level, and there may be some duplication in the data contributing to statements. As far as possible this was managed by ensuring that primary studies referenced within a review were checked for duplication and

confidence statements were adjusted accordingly – for example, where the same one or two primary studies were contributing across multiple reviews, adequacy was downgraded to reflect the lower volume of primary data contributing to that statement. However, with a high volume of reviews contributing to some statements this may have been missed in some cases. In addition, as many results were reported at the review level, definitions of mental health outcomes are reported in line with how the study reported these to remain consistent, however, this may mean some differing definitions across reviews, and it must be recognised that mental health, mental illness and mental distress are defined inconsistently across the literature more generally.

The interventions inclusion criteria required studies to report measured mental health outcomes, leading to the exclusion of interventions that may have had mental health benefits but did not formally assess or report such outcomes. Additionally, interventions were included if they were in relation to a climate-related hazard or for anticipatory impacts such as ecoanxiety, literature on effective mental health interventions for similar issues or indeed from other types of humanitarian/disasters contexts have not been included in the scope of this report, within which there may be applicable learning. Of the intervention evidence that was identified, this predominantly focused on acute weather events with limited coverage of interventions for slower-onset hazards such as drought. Evaluations also only reported short-term outcomes (within 3 months), which provided limited insight into the durability of benefits, risk of relapse, or effectiveness following repeated climate-related hazards. Additionally, case studies presented within this report have not been appraised but do provide case examples of implementation in different areas.

The intervention evidence base also had substantial evidence gaps in population representation. Core20PLUS populations and those facing multiple or intersecting vulnerabilities, such as inclusion health groups, high-risk occupation groups and those with pre-existing health conditions were under-represented across all intervention types. The perspectives of children and young people were also under-represented and no co-production or peer-led approaches for these groups were identified. This may be partly attributable to the exclusion of studies that did not report on mental health outcomes, which may have been more likely to be community-based or lay-led interventions. The quality of evidence was variable across interventions, with many studies demonstrating weak statistical analyses, poor reporting of methods and a lack of adjustment for confounding factors. In addition, studies rarely examined mechanisms of change, used climate-contextualised measures of distress (such as eco-anxiety) and often overlooked equity considerations. Together, these limitations prevent us from determining which interventions work best, for whom, in what contexts and over what timeframes.

In conclusion, this report provides a detailed overview and assessment of the impacts of climate change on mental health for the UK that will be important for preparing and building resilience in the context of our warming world.

Acronyms and abbreviations

Abbreviation	Meaning
AACODS	Authority, accuracy, coverage, objectivity, date, significance
ACT	Acceptance and commitment therapy
AMSTAR-2	a measurement tool to assess systematic reviews
CASP	Critical Appraisal Skills Programme
CBT	Cognitive behavioural therapy
DV	Domestic violence
IMD	Index of multiple deprivation
MMAT	Mixed-Methods Appraisal Tool
NHS	National Health Service
OECD	Organisation for Economic Co-operation and Development
PTSD	Post-traumatic stress disorder
QALY	Quality Adjusted Life Years
RCP	Representative concentration pathway
RCT	Randomised controlled trial
SOLAR	Skills for Life Adjustment and Resilience programme

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