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Review

Pediatric climate distress: A scoping review and clinical resource

Jeremy D. Wortzel[a,*], Ver-Se Denga[b], Jeshtha Angrish[c], Larissa Dooley[d], Iliana Manjón[e], Sherwin Shabdar[f], Amy D. Lykins[g], Suzie Cosh[g], Paul A. Bain[h], Andrew Toyin Olagunju[b], James McKowen[i]

[a] Brigham and Women's Hospital, Department of Psychiatry, Harvard School of Medicine, 75 Francis Street, Boston MA, 02115, USA
[b] McMaster University, Department of Psychiatry and Behavioral Neurosciences, 100 West 5th St, Hamilton, Ontario, L8N 3K7, Canada
[c] Defense Institute of Psychological Research, DRDO, Ministry of Defence, Lucknow Rd, Timarpur, Delhi, 110054, India
[d] Climate Mental Health Network, 1212 S Highland Avenue, Los Angeles CA 90019, USA
[e] University of Arizona College of Medicine- Phoenix, Department of Psychiatry, 475 N. 5th Steet Phoenix, AZ, 85004, USA
[f] Western Michigan University School of Medicine, 300 Portage Street, Kalamazoo, MI, 49007, USA
[g] University of New England, School of Psychology, Tablelands Clinical School, 110 Butler St, Armidale NSW 2350, Australia
[h] Countway Library, Harvard Medical School, 10 Shattuck St, Boston, MA 02115 USA
[i] Massachusetts General Hospital, Department of Psychiatry, Harvard Medical School, 15 Parkman St 8th Floor Suite 850, Boston MA, 02114, USA

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ABSTRACT

Introduction: Climate change is the public health crisis of our time, with young people particularly at risk. Climate change has been associated with increased prevalence of psychiatric disorders. Psychological concerns pertaining to the Earth's future have also been cited as contributing to negative emotions now termed 'climate distress'. While previous reviews have addressed the various ways climate change affects pediatric mental health, this scoping review aims to specifically explore pediatric climate distress and its implications for clinical practice.
Methods: 2548 articles were extracted from multiple databases, titles, abstracts, and full texts were screened blinded and in duplicate using the web-based platform Covidence. Quantitative and qualitative original research papers published in English between January 1, 2000 and April 29, 2024 that studied pediatric climate distress were included.
Results: Forty-two articles met the inclusion criteria, along with 10 additional grey literature sources. Among quantitative studies, 81 % found that 50 % or more of respondents reported negative climate emotions and 86 % of qualitative studies reported that "all" or "most" respondents expressed negative climate emotions. Additionally, 63 % of studies measuring distress severity reported high distress levels. Therapeutic interventions addressing climate distress were found to be effective and were categorized thematically into three groups: Education-Emotion Focused, Nature-Engagement Based, and Activism-Civic Related.
Conclusions: This review shows that while there is a growing body of literature that illustrates how young people have negative emotions pertaining to climate change, there is need for increased diagnostic and therapeutic approaches to clinically address these growing challenges.
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1. Introduction

As the effects of anthropogenic climate change shape the future of Earth, human health is being impacted [1]. Environmental changes such as extreme temperatures and increased storm severity impact not only physical health [1] but also psychiatric health [2]. Higher temperatures alone have been associated with increased suicide attempts, manic episodes, and increased violent assaults in adults [2].

Several reviews have been conducted delineating the ways climate change impacts adult mental health [2]. However, pediatric populations have not been adequately studied and yet are more vulnerable to the effects of climate change due to being exposed to the consequences at an earlier, more influential stage of development and through a larger proportion of their life course [3]. These factors increase the risk for more chronic psychiatric consequences.

Climate change can also generate emotional stressors on mental health such as existential anxiety and fear about the future [4–7]. Many terms have been suggested to provide clarity for these emotions, the most common of which is "Eco-Anxiety." This term is defined by the American Psychiatric Association as "a chronic fear of

* Corresponding author.
E-mail address: jwortzel1@mgb.org (J.D. Wortzel).

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environmental doom" [8]. Climate anxiety, eco-anxiety, climate grief, and solastalgia are common terms often used interchangeably in the literature. Others have suggested broader terms such as 'Climate Distress' as it can serve as an umbrella term for many negative emotions pertaining to climate change. Climate distress can be inclusive of all the above terms and will therefore be used in this review [9,10].

For many young people, climate distress is a natural response to a real, existential threat; for some youth, it can greatly impact their psychiatric, social, and educational functioning [11]. Climate change can exacerbate pediatric vulnerability to the development of Post-Traumatic Stress Disorder, sleep problems, cognitive and executive challenges, as well as suicidal behavior and aggression [12]. Further, studies have highlighted the inequity of climate change disproportionately impacting children of color, youth living in the Global South and those already challenged by multiple social determinants of health [13–15].

Though articles have attempted to highlight how climate change can impact pediatric mental health [16,17], how emotions are assessed and addressed, vary widely. Practically, there is also little to guide clinicians on how to talk with their pediatric patients about climate change, reliably assess the potential emotional toll, and guide them as to which evidence-based interventions for working with climate-related distress exist. The goal of this scoping review was therefore to 1.) examine the psychological impact of climate change on pediatric emotional health, 2.) assess how climate emotions are measured, and 3.) determine which interventions are supported for youth with climate distress. We specifically aim to understand potential gaps in the literature and provide recommendations for clinical practice.

2. Methods

This scoping review was guided by a predetermined protocol (Appendix 1) following Joanna Briggs Institute (JBI) guidance [18]. The creation of this report was guided by the Preferred Reporting Items for Systematic Reviews and Meta-Analyses for scoping reviews (PRISMA-ScR) [19].

2.1. Identification of studies

Reports that considered the impact of climate change on pediatric mental health were identified by searching the electronic databases MEDLINE (Ovid), Embase (Elsevier), Web of Science Core Collection (Clarivate), APA PsycINFO (EBSCO), Global Health (EBSCO), and the World Health Organization's Global Index Medicus. The search strategy included terms for the concepts of climate change and mental health, limited to studies reporting on children or adolescents (Appendix 2). Controlled vocabulary terms were included when available. Searches were created and carried out by a medical librarian (PAB) on April 29, 2024, and were limited to material published after January 1, 2000. Duplicate records were removed in the reference manager EndNote (Clarivate), and screening was assisted and completed using the Web-based application Covidence (Veritas Health Innovation). To supplement the database searches, *The Journal of Climate Change and Health* was manually searched. Additionally, grey literature (non-peer reviewed reports or white papers) was snowball searched independently of the procedure above. We included in our search national or international agencies or organizations reporting on climate change and mental health, written in the English language.

2.2. Study selection criteria

Authors JW, JM, IM, SS, VD, LD, SC, AL, and JA participated in the initial screening of titles and abstracts, as well as full text articles blinded and in duplicate. Data was also extracted based on outcomes that are relevant to the study objectives using Covidence (Veritas Health Innovation). Examples of information extracted included demographic information of study and population, study design, and main results. Any conflicts between pairs of authors screening or extracting data were then reconciled by JW or JM. *The Journal of Climate Change and Health* was manually searched blinded and in duplicate, any conflicts between pairs of authors were then reconciled by JW.

2.3. Inclusion criteria

Studies that met the following criteria were included: (1.) Population less than or equal to 18 years of age (can have mix of adults and youth if youth are reported separately); (2.) Must relate to the emotional and psychological impact of climate change and/or relationship between climate and mental health excluding specific direct or indirect climate change impacts (i.e. extreme weather events, temperature changes, forced migration, infectious disease etc.); (3.) Must include reported mental health outcomes such as DSM-V diagnoses, self-reported distress symptoms, validated or non-validated measures of eco-anxiety or other related terms such as climate distress, eco-grief etc.; (4.) Must be peer-reviewed, qualitative, quantitative, and/or mixed methods analysis (excluding narrative reviews); (5.) Published between the year January 1st, 2000, to April 29th, 2024; (6.) Written in the English language. Inclusion criteria were initially tested by 2 authors (JM and JW) on a 5 % sample of the studies to assess for internal validity prior to the official screening process. Inclusion criteria were edited until a 95 % consensus was established between these two authors.

2.4. Quality assessment

To accurately represent the landscape of this academic literature, all included studies were peer reviewed. However, due to the scoping nature of this review, a formal critical appraisal of the included studies was not conducted [20].

2.5. Data synthesis

All data synthesis and figure generation were performed in Microsoft Excel and Microsoft PowerPoint. Zotero (version 6.0.37) was used as the citation manager.

3. Results

3.1. Study results

Electronic database searching returned 2548 unique records following the removal of duplicates. From these records, 406 studies were sought for retrieval and 401 were obtained, 5 were not able to be acquired. Full text examination excluded 360, leaving 41 original research studies for inclusion. Additionally, one study was found to meet inclusion criteria from *The Journal of Climate Change and Health* which was also included for a total of 42 original research studies. Grey literature searching identified 10 additional reports. In the end, 52 eligible studies and reports were included in the final review for analysis and data extraction (Fig. 1).

3.2. Study characteristics

Forty-two original research studies were deemed eligible and included. Many studies (67 %) used a cross-sectional survey approach, followed by Quasi-Experimental Studies (22 %). A minority of the studies utilized Longitudinal Cohort methods (5 %), Case Studies (2 %), Ethnographic approaches (2 %), or Hybrid Participatory Action-research approaches (2 %).

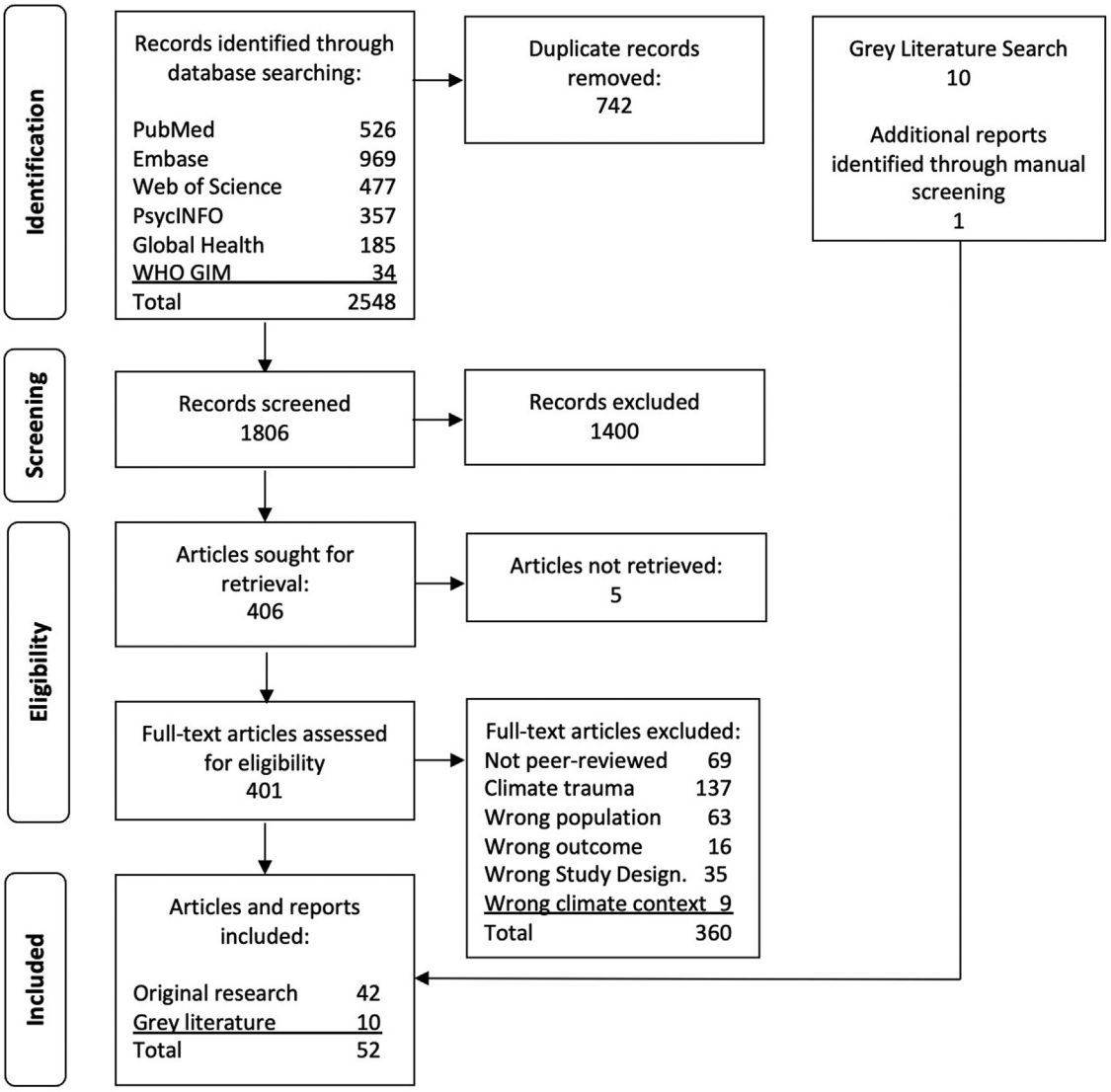


Fig. 1. Flow diagram of Selection of Studies.

Twenty-four unique countries were represented. Countries from North America (n = 19) were most represented, including the United States (n = 11) and Canada (n = 8) (Fig. 2). Many also originated from the European Union (n = 13), the United Kingdom (n = 7), and Australia (n = 7). Overall, most of the countries represented (76 %) were high-income countries, with 6 % from upper middle income, and 9 % from lower middle income, and 9 % from low-income countries (World Bank Classifications).

There were no included studies published between 2000 and 2011. There was an increasing trend in the number of studies published since 2019. Due to the search end date, the full complement of studies published in 2024 is not captured (Fig. 3).

Population size varied widely from 3 to 128,484 subjects. There were notably four studies whose samples were ≥ 1.5 times the interquartile range and were therefore classified as outliers [21–24]. Excluding these outliers, the mean sample size was 823 with a standard deviation of 1165, and a median of 50.

Participant recruitment varied, with several employing multiple recruitment methods concurrently. Twenty-eight studies (67 %) used online sampling techniques. Fifteen (36 %) used professional or scholastic networks such as school systems, and 5 (12 %) used snowball sampling strategies. Only 2 (5 %) exclusively used face-to-face recruitment sampling.

3.3. Assessment of climate emotions

Twenty-eight studies used quantitative approaches, 17 utilized qualitative methods, and three incorporated both quantitative and qualitative methods. Fourteen quantitative studies included seven unique validated measures of climate-related emotions while 17 studies utilized non-validated surveys. Qualitative methods employed a diverse array of open-ended questions. Many measures of climate emotions, including validated scales, non-validated quantitative surveys, and qualitative assessments, considered similar themes, grouped as follows (Fig. 4):

1) *Awareness*: A person's knowledge of climate change.
2) *Negative Emotions*: Anxiety, worry, hopelessness, anger, sadness, depression, grief, guilt, shame, and concern for future.
3) *Positive Emotions*: Optimism, hope, or positive coping strategies.
4) *Level of Worry*: A rating of the severity of climate concern.
5) *Functional Impact*: A person's ability to complete activities of daily living.
6) *Agency*: An individual's perceived ability to have impact on climate change including engagement with climate positive social actions (e.g. striking) or pro-environmental behaviors (PEB) (e.g. recycling, using fewer fossil fuels etc.)

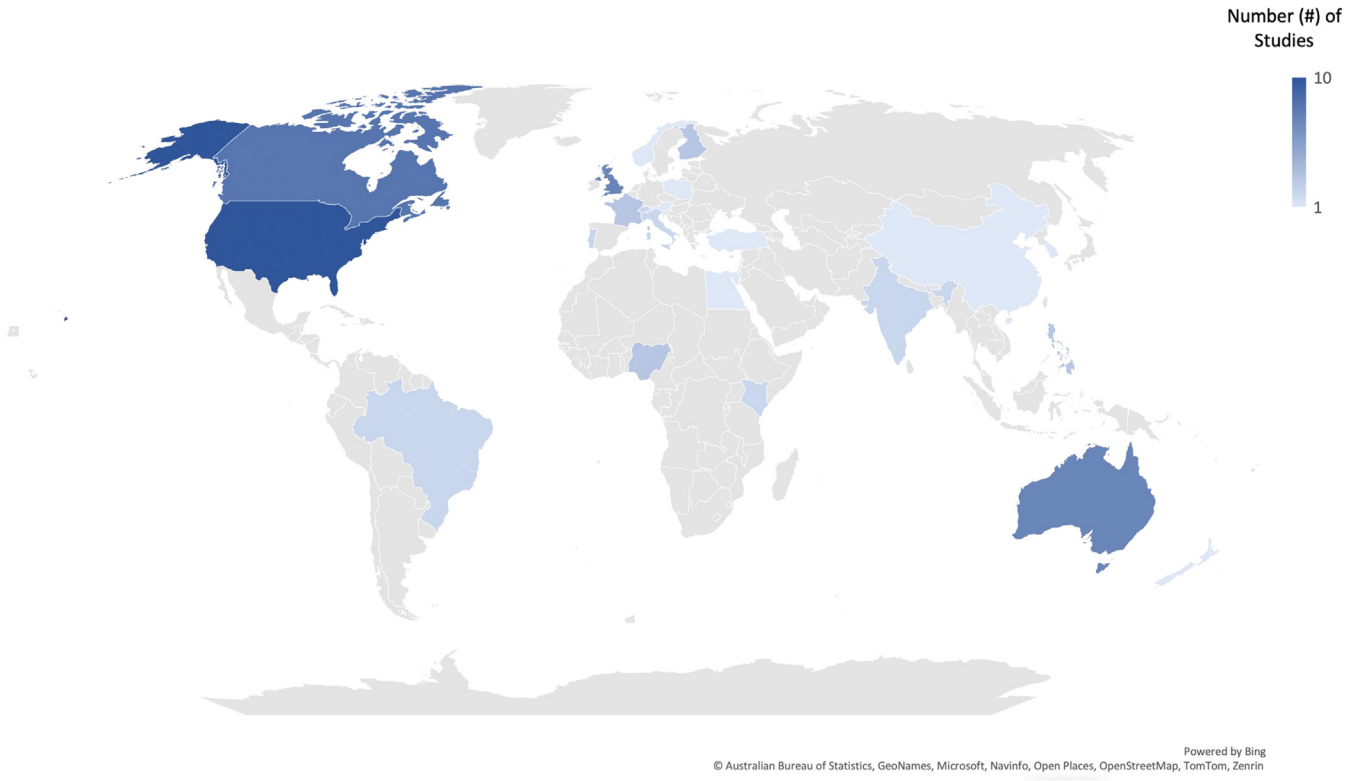


Fig. 2. Global Distribution of included studies.

3.3.1. Climate emotion scales

The seven identified unique validated scales (Table 1) included the Climate Change Anxiety Scale (CCAS) (n = 5); the Climate Anxiety Scale-Short-form (CCAS-S) (n = 1); the Climate Change Hope and Distress Scale (CCHD) (n = 1); the Climate Change Attitudes Survey (n = 1); the Environmental Responsibility Scale (ERS) (n = 1); the Attitudes Towards Climate Change and Science Instrument (ACSI) (n = 2), and the Climate Change Distress Scale (CCDS) (n = 2). Five of these scales were specifically created and tested for a pediatric population including the CCHDS, the Climate Change Attitudes Survey, ERS, the ACSI and the CCAS-S [25].

Six of these established scales (86 %) asked about an individual's agency to become involved in PEB. Two of these scales (29 %) inquired about negative emotions pertaining to climate change. The negative emotions included sadness, grief, hopelessness, and anxiety. Two scales (29 %) specifically assessed the child's level of worry as well as the subject's awareness of climate change. Only the CCAS and CCAS-S (29 %) specifically asked about functional impairments (i.e. working/schooling caring for self or others), while the CCHDS was the only scale to assess positive emotions.

3.3.2. Non-validated assessment

Seventeen quantitative studies utilized a non-validated Likert-scale survey. Seven of these surveys (41 %) inquired about similar themes to the established scales including asking about negative emotions, with seven surveys (41 %) specifically inquiring about level of worry. Seven surveys (41 %) inquired about positive emotions. Three surveys (18 %) asked about climate change awareness, and four surveys (24 %) inquired about the agency to engage in PEB. Four separate studies utilized a survey developed by Hickman et al. (2021), which was the only scale to assess feelings about governmental climate response [21,24,26,27].

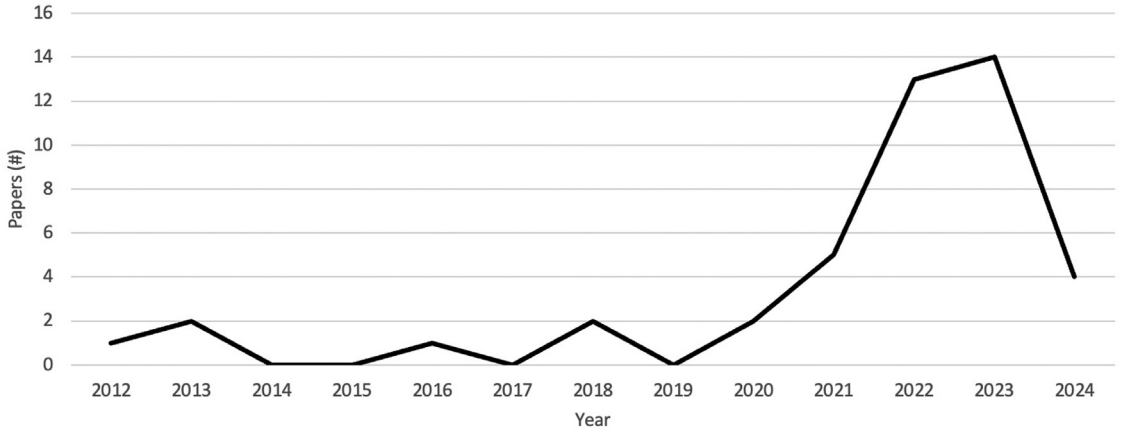


Fig. 3. Timeline of included articles published by year. Depiction represents data from January 1, 2000 to April 29, 2024.

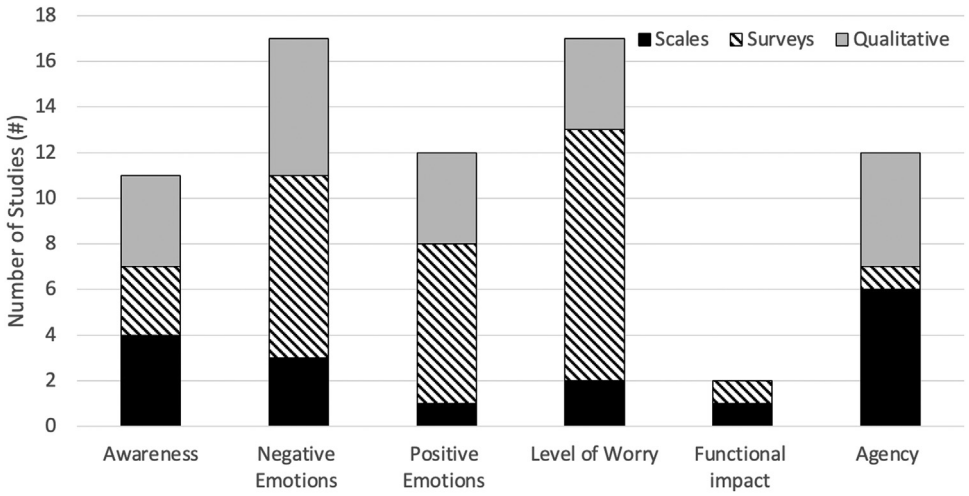


Fig. 4. Climate Emotion themes identified by study. Quantitative scales refer to validated scales, quantitative surveys refer to independently developed Likert scales (not validated), and qualitative represents interviews and open-ended questionnaires where questions were listed in the article.

3.3.3. Qualitative approaches

Nine qualitative studies (53 %) listed specific open-ended questions. Five (56 %) asked about negative emotions and four (44 %) asked about positive emotions. Four (44 %) specifically inquired about the level of worry. Five (55 %) asked about agency to engage in PEB. Four (44 %) assessed awareness of climate change.

3.4. Prevalence of climate emotions

Twenty-seven studies (64 %) focused on assessing the prevalence of climate change related negative and positive emotions (Appendix 3). This includes 20 quantitative studies, and seven qualitative studies. The scope of emotions included ranged widely by article (Fig. 5, Appendix 4).

3.4.1. Negative emotions

Not all studies provided statistics on the percentage of the population experiencing climate distress, thus four studies were excluded from our summary results but discussed separately [28–31]. Of the 16 quantitative studies that did provide such statistics, 13 (81 %) found that 50 % or more of their respondents reported experiencing negative climate emotions. Only three (18 %) found that <50 % of respondents reported negative climate emotions [22,32,33]. Additionally, eight assessed the severity of climate emotion, and six of these (63 %) reported high levels of distress. Seven qualitative studies also described the prevalence of climate distress as six (86 %) reported that "all" or "most" respondents conveyed negative climate emotions. Only one study (14 %) reported "some" levels of climate distress [34] (Fig. 5).

3.4.2. Positive emotions

Not all studies inquired about positive emotions. One validated scale, four non-validated quantitative surveys, and seven qualitative studies asked questions pertaining to positive emotions. Five (19 %) reported that members of their cohorts had positive emotions related to climate change. These included feelings of optimism

Table 1
Summary of Pediatric Climate Emotion Scales.

Measurement:	Reference	Description	Age Rage	Included Articles (#)
Attitudes towards Climate Change and Science Instrument (ACSI)	Dijkstra 2012	A 63-item scale used to measure students' pro-environmental behavior, their climate change knowledge and their attitudes towards school science, societal implications of science, scientists, a career in science and the urgency of climate change.	12–19 yo	2
Environmental Responsibility Scale	Powell et al. 2011	A 24-item scale developed to measure environmental responsibility, character development and leadership, and attitudes toward school for environmental education programs.	10–15 yo	1
Climate Change Anxiety Scale (CCAS)	Clayton 2020	A 13-item scale measuring climate distress including both psychological symptoms and behavioral impairment.	18 - 65+ yo*	5
Climate Change Anxiety Scale - Short-form (CCAS-S)	Wu et al. 2022	A 4-item scale adapted from the CCAS developed to assess levels of climate concern in adolescents.	16–17 yo	1
Climate Change Distress Scale	Resser et al. 2019	A 7-item scale developed to monitor climate change related risk perceptions, understandings and responses in Australia and the UK. The items are intended to probe subclinical (adaptive) levels of distress at the prospect and implications of global climate change.	15–65+ yo	2
Climate Change Hope and Distress Scale	Stevenson 2016	A 22-item scale developed to examined how climate change hope, despair, and concern predict pro-environmental behavior.	11–15 yo	1
The Climate Change Attitudes Survey	Christensen 2016	A 15-item scale developed to measure students' beliefs and intentions toward the environment with a focus on climate change.	10–14 yo**	1

(*) The study that utilized this scale (Simon et al. 2022) used this scale for a population characterized as 'adolescents' with a mean age of 19.18 ± 0.99years even though scale is not validated for youth under the age of 18yo. (**) Age described as 'middle school students' between 5th and 8th grade in the US. No formal age range was provided and therefore national age ranges for those grades were used for clarity.

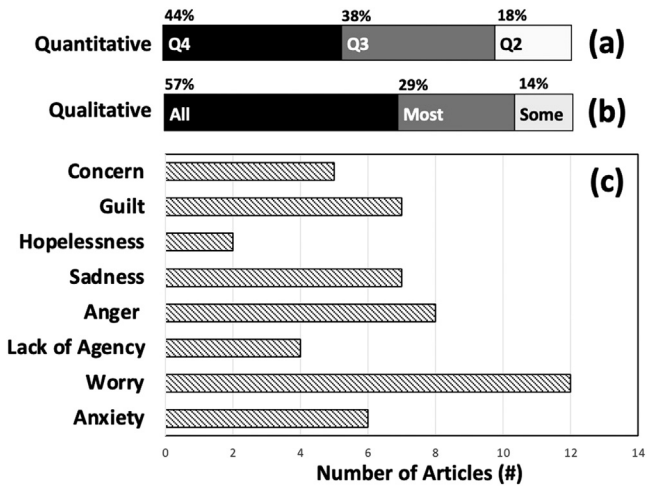


Fig. 5. Prevalence and Distribution of Negative Climate Emotions; (a) Prevalence of Climate Distress in Quantitative Studies (N = 16) Q1 - Q4 represent population quartiles reporting at least some levels of climate distress. Q1: ≤ 25 %, Q2: 26 – 50 %, Q3: 51 – 75 %, Q4: > 75 %. No studies were classified as Q1 (b) Prevalence of Climate Distress in Qualitative Studies (N = 7) Negative climate emotions were reported by "All" (entire cohort), "Most" (many, but not entire cohort), or "Some" (not many). (c) Distribution of Negative Emotions Assessed (N = 27).

[24,34] hope [34,35,32], and positive coping strategies [36]. Seven (26 %) also commented that participants had a desire to engage with PEB [31,37–42].

3.4.3. Gender and climate emotions

Some gender-related themes were notable. Eight studies (30 %) observed that individuals who identified as female were more likely to show negative emotions towards climate change [22,24,37,43,44,26,23] or were more likely to engage in PEB [31]. Additionally, one study (4 %) observed that males were significantly less worried about climate change [29].

3.4.4. Age and climate emotions

Participants ranged in age from 5 to 18 years old. The largest age group represented was 14–18yo (47 %), followed by 11–13yo (20 %), with 5–10yo being least represented (8 %). While populations over 18 years old were excluded from this review, many studies (40 %) also included young adults in their cohorts (ages 19–24+ years old) and provided separated age-stratified analyses. Several studies noted trends regarding climate emotions and age. Four observed that older adolescents (15–18yo) reported more negative emotions towards climate change than younger participants [22,24,29,38]. One study observed that younger members of their cohort (5–12 yo) were less aware of climate change and tended to be more focused on direct climate impacts (e.g. extreme weather events), while older members of the cohort reported more abstract concerns [34].

3.4.5. Sociodemographic variables and climate emotions

Eight studies commented on the impact of socioeconomic status (SES) on climate-related emotions. Specifically, Clayton et al. (2023) and Hickman et al. (2021) observed that either functional impairment or negative climate emotions expressed towards climate change were more prevalent in countries in the Global South [21,24]. Teo et al. (2024) also noted that marginalized populations such as gender diverse and Indigenous Peoples tended to have more severe climate concerns relative to the general population [23]. Additionally, finances may play an unclear role in feelings toward climate change. Chou et al. (2023) showed that wealthier individuals reported more concerns about climate change [34] while Leonhardt et al. (2022) reported that young people who perceived that their family's finances were poor expressed more negative emotions about climate change [22]. Education status also may play a role as Brugger et al. (2020), Editz and Yanik (2023), and Leonhardt et al. (2022) all observed that individuals with higher education or with parents with higher education were more likely to either participate in PEB or report more significant concern about climate change [22,31,41]. Finally, location and urbanization of participants may also be relevant as Prati et al. (2022) and Leonhardt et al. (2022) reported that individuals located in urban environments compared those in more rural communities showed increased negative climate emotions [22,29].

3.5. Intervention or programs to mitigate climate emotions

Seventeen studies were identified describing a range of interventions, approaches, or programs implemented to address climate emotions. There were a variety of approaches (Appendix 5) used to support youth with climate distress. Demographic characteristics, including participant age, geographic location, and publication date, of this subset parallel the entire cohort as reported in Section 3.2. However, study design distribution did differ. Cross-sectional studies predominated, used by eleven studies (65 %), and represented a single timepoint assessment. Quasi-experimental interventions, including a pre and post survey to assess the impact of an intervention, were used by six studies (35 %). Only two Quasi-experimental studies also included a 15-week longitudinal follow up assessment [45,46].

All 17 intervention studies reported positive results suggesting that the intervention tested appeared to successfully help youth navigate their climate-related emotions. These programs and interventions naturally fell into three thematic groups: 1.) Education-Emotion Focused, 2.) Nature-Engagement based, and 3.) Activism-Civic related.

3.5.1. Education-Emotion focused programs (n = 8)

Ojala et al. explored climate emotions among a group of Swedish youth [47,48]. Focusing on the exploration of coping strategies, they found that meaning-focused coping was positively related to improving well-being and optimism. Stevenson et al. (2018) demonstrated that message framing impacted youth climate emotions and hopefulness, but this varied depending on the type of language used as well as the frame – more contextually relevant messages and language were shown to be more impactful in modifying climate distress [37]. Similarly, Trott et al. (2022) reported that the role of climate education enhanced youth climate action motivation and emotional resilience through a program designed to focus on understanding climate language and attitudes [46]. Additionally, Spitzer et al. (2024), in two studies, found aligned messaging based on a person's motivations and needs had differential impact on their climate anxiety [49]. Finally, work by Tian et al. (2023) found involving children in climate communication impacted their anxiety as well as conservation behaviors, but also of importance, their parent's behavior [50]. Taken together, these studies suggest meaning-focused coping of climate emotions, the role of motivation, and language framing of emotion exploration are a common theme.

3.5.2. Nature-Engagement based programs (n = 2)

MacDonald et al. (2016) worked with Inuit youth and explored connections with land, traditional culture, and nature as buffers against climate distress [51]. Nabhan et al. (2000) discussed how engaging youth living in low-income urban households in nature restoration projects, such as green space expansion, wetland improvement, and tree planting, improved climate distress [52]. Taken together, connections with land and restoration of habitat are important avenues for coping in youth.

*3.5.3. Activism-civic engagement related programs (*n = *7)*

Brugger et al. (2020) studied activist youth and looked at the role of a collective action model in mitigating climate stress as well as hope generation. They found anger and worry to be motivating, but it was unclear if action shifted stress [31]. However, Budzisewka et al. (2021) and Trott et al. (2021, 2022) found engaging in activism improved climate distress, hopefulness, and empowerment to tackle climate change [45,46,53]. Importantly, however, Udas et al. (2021) caution that activism can lead to youth burnout without proper support and understanding of climate-related emotions and general well-being [54]. Romano et al. (2023) looked at the relationship between climate emotions and PEB mediated by social media [55]. They found that higher anxiety was associated with more social media PEB content, and consequent engagement in PEB. This relationship was more evident in boys.

3.6. Grey literature

Agencies varied on the extent to which climate change impacting mental health was discussed, with very few specifically addressing impacts on youth (Appendix 6). Most agencies discussed direct effects (disaster, flood, drought heat etc.), with few covering the psychological effects such as climate distress or the existential fears. Only the mental health-focused organizations made suggestions on assessing mental health in the context of climate change and how to intervene using specific coping or therapeutic interventions. Management of psychiatric medication in the context of climate change was not covered by any agency. Many agencies identified were in the Global North, specifically, the United States.

4. Discussion

This scoping review explored the existing original and grey literature that investigates the emotional impacts of climate change on child and adolescent mental health. We identified 42 original studies published between 2000 and 2024 as well as 10 pieces of grey literature that assessed climate change emotions, the prevalence of climate distress, or the impact of therapeutic interventions designed to address climate distress.

4.1. Climate distress prevalence

This literature consistently points to young people having negative emotional responses to the climate crisis. This trend is seen globally and in very large sample populations. Several additional trends stood out pertaining to age, gender, and SES. Older youth were more likely to experience negative emotions. This is consistent with other findings observing that anxiety and mood disorders tend to present in late adolescence [3]. As climate change can be an abstract fear, the "Ontogenetic Parade" described by Marks et al. (2023) could help explain the natural progression of more complex and nuanced fears with development [56]. Additionally, respondents who identified as female tended to report more severe emotional responses to climate change. Research suggests that individuals who identify as female may develop higher levels of emotional awareness earlier in development [57], while individuals who identify as male may experience more restrictive emotional norms, potentially leading to less emotionally charged reports [58]. It is important to note, however, that a limitation in many of these surveys is that they do not explore the nuances of sex and gender and did not include options beyond the gender binary. Finally, lower SES countries reported higher levels of distress compared to higher SES countries. However, on a population level, higher SES individuals expressed more negative emotions about climate change. This could be due to lower SES countries having more direct experience with climate-related disasters, with higher SES individuals having better access to climate education [59].

4.2. Climate distress assessment

Several validated scales exist for young people, but few studies use them, opting instead for non-validated surveys. This may be because many of these scales were only recently established and with time, the validated measures will be incorporated. Additionally, within these validated scales and non-validated surveys, several key gaps have been identified. First, while many negative emotions were assessed, positive emotions should be included in these scales. Including positive emotions in these surveys would help assess levels of apathy or engagement and determine whether hope and proactive attitudes offer protective benefits. Similarly, only one study examined functional impairment. Including this aspect would be valuable for understanding the full spectrum of climate distress.

Finally, while all studies assess what emotions young people are feeling pertaining to climate change, only Hickman et al. (2021) incorporated questions asking why young people were feeling those emotions. In this study, a lack of governmental response was hypothesized to be a significant contributor to negative emotions. In this way, a major gap in these assessment tools is asking more questions pertaining to what triggers these emotions. This is particularly relevant as distress in youth may emerge from a sense that adults are not doing enough to address this problem, and by extension, do not seem to care about them or their future [60].

4.3. Therapeutic interventions

There is a paucity of literature examining effective programs to support youth climate distress. Certainly, there are several programs that exist in the climate space for youth; however, we must endeavor as a field to examine the effectiveness of such programs. While programs frequently assessed climate distress initially, or immediately pre and post interventions, only two studies examined longitudinal impacts. Further, most programs were focused on the teenage years suggesting a need to expand programs to younger children to understand how to build resilience across the shifting developmental spectrum.

This review suggests that educational programs seem to be the most prevalent approach. These interventions endeavor to increase understanding and awareness of the climate crisis to build action. However, improving knowledge alone is insufficient to spur action and can exacerbate anxiety in the absence of tools to cope [61,62]. Some studies also included components to support emotional resilience likely providing potential model programs to replicate. Educating youth on climate issues has been shown to increase parental awareness and action [63], thereby creating a positive "contagion" effect.

Surprisingly, few nature-based programs were identified, despite evidence supporting engaging youth in natural settings enhances coping, mental health, and resilience [64,65]. The number of articles in the past few years connected to climate change and youth has grown substantially; therefore, we may see more nature-based intervention programs soon. One study did explore the emotions of Indigenous Youth, showing the importance of nature connection and culture for ameliorating climate-related distress – certainly a critical population for future study, given that Indigenous Youth are often at the frontlines of climate change impacts, despite having contributed little to climate change.

In terms of the role of activism, our search identified several studies supporting PEB. There are important therapeutic benefits to activism engagement as well as community and policy changes; however, some scholars caution that youth may risk burnout without adequate attention to emotional support tools [53]. What activism looks like beyond the protest march, which is often seen as the only form of activism, will be important to examine in youth as possible avenues for meaning-making and emotional coping. For example, while this

Table 2
Climate distress clinical recommendations.

Climate Distress: An open-ended term that captures the natural and appropriate constellation of emotions (including anxiety, anger, grief, sadness etc.) that an individual feels about the climate crisis.	
Assessment of Climate Emotions:	
Diagnosis: Currently, there is no pathological disorder to describe what is considered by many to be a proper and appropriate distress response to a growing crisis. However, individuals may experience a range of functional impairment because of these stressors, which should be addressed with the help of medical and mental health professionals. **Climate Emotions Sales:** There are several validated self-report pediatric tools to assess climate emotions (See Tale 1 for details). The University of California San Fransisco (UCSF) has provided a concise summary of several of these tools as well which can be referenced as more scales are developed (a).	**How to ask about climate related emotions via Open-ended Questions:** • Tell me about your thoughts on climate change and how it may affect you, your family, future and/or community? • When you think about climate change, do you have much hope for the future? • When you experienced that panic attack during the last heatwave, do you wonder if it's related to feelings you may have about climate change? • Are you aware that climate change has been shown to affect people's stress levels, is this something you have thoughts about or experienced?
Interventions for Climate Distress:	
Emotional Support: • Validate their experience. • Normalize climate related emotions. • Build awareness that this response shows care for others and the world. • Offer resources for emotional coping tools – awareness building, meaning-focused coping, mindfulness, breathing, climate counseling if necessary (b).	**Example Interventions:** • Suggest connecting with others with similar experiences or seeking professional climate aware providers (c). • Talk about engaging in climate change related organizations in their community or on social media (d). • Offer resources for nature-engagement like Park Rx or Walk-with-a-Doc (e).
(a) https://www.stressmeasurement.org/climate-stress (b) https://www.climatepsychology.us/climate-therapist (c) https://www.climatepsychiatry.org/; https://www.climatepsychologyalliance.org/ (d) https://www.climatepsychiatry.org/resources-to-mitigate-climate-distress (e) https://www.climatementalhealth.net; https://www.sunrisemovement.org (f) https://www.parkrx.org	

pediatric population is ineligible to participate in voting in local or national elections, signing petitions, local organizing, volunteering for environmental restoration projects, or social media coalition building may be equally beneficial and accessible. We have increasingly seen policies aimed to curtail climate change activism and protest in many countries, setting a concerning precedent for civil liberties as well as likely exacerbating youth distress.

4.4. Clinical recommendations

Climate distress is currently not recognized by mental health professionals as a disorder. Many experts in the field even contend that these negative climate emotions are not only natural, but appropriate given the severity of the climate crisis and may motivate people to enact change [31]. However, it is clear that many young people are finding climate change and its consequences negatively contributing to their daily life and emotions, some studies even suggesting it can lead to functional impairment [66]. While more research is needed to further clarify the severity and pathological framework of climate distress, one of the aims of this review is to provide recommendations for health professionals to assess young people and provide basic recommendations (Table 2).

First, regarding terminology, along with others, it was found that "climate distress" provides a comprehensive term that is inclusive of the complex range of emotions that young people feel on this topic. Second, when assessing climate distress, there are several validated scales to quantify climate emotions (Table 1). Exploring one of these scales could be a starting point with a patient who may be affected by this topic. Age of the patient may be a factor in choosing the most appropriate scale and notably, at this time, no scale is currently developed specifically for clinical settings. However, using simple open-ended questions such as "tell me about your thoughts and feelings concerning climate change" can start the conversation. Involving the parents of younger children may be helpful to explore this topic as well. Finally, regarding interventions, within a clinical setting there are several emotional support strategies including providing validating and normalizing comments towards the patient's experience as well as drawing their attention to the large community working to address this issue. Specific interventions can be explored outside of the clinic as well. These may include helping the patient connect with youth-led communities experiencing similar issues or engaging with climate activism to feel part of a solution. Importantly, if patients are experiencing extreme levels of distress leading to functional impairment (i.e. difficulty focusing in school, isolating, constantly doom-scrolling at the expense of activities etc.), or a patient meets criteria for a known mental health diagnosis, please refer to formalized guidelines for further assessment, treatment, and therapeutic interventions.

4.5. Strengths and limitations

The main strength of this study is the quantity of articles and the inclusion of specific clinical recommendations that, to the best of these authors' knowledge, has not yet been provided in the literature. Additionally, this work provides a detailed analysis of many of the assessment tools used to document climate emotions in children which also provides a novel lens. Finally, the team that was established to conduct this research included a diverse group of professionals with several international members allowing for a more global approach.

There are many limitations. First, the search was designed to capture literature dealing with the impacts of climate change at large rather than the direct impacts of climate related phenomena such as hurricanes or floods. Secondly, it was difficult to exclusively study youth under 18 years old. Older populations were included if the analysis provided separate statistical assessment. Many of these studies also did not use validated pediatric scales. This is certainly a limitation when focusing on youth and speaks to the need for more pediatric scales. Similarly, only a limited number of electronic databases were included in the literature search. Although we included health-related databases with broad scope and a general science database, it is possible the literature in some domains was not covered completely. Given that we only included articles written English, papers published in communities such as the Global South may have

been unintentionally excluded from our study thus decreasing the generalizability. Given the scoping nature of this review, a quality assessment of the included articles was not conducted to be more inclusive but may limit the validity of the included studies. Additionally, the lack of global geographical distribution of this research serves as a key limitation and highlights one of the largest research gaps. Lastly, it is important to consider potential publication bias in this study, which could inflate the reported prevalence of climate distress or success of threptic interventions.

5. Conclusions

The reality of climate change has created a significant mental health burden on young people. There is a continued need for assessment tools to be developed for pediatric populations and for clinical assessment. Most research assessed the prevalence of climate distress, with less exploring positive emotions young people may be feeling. Therapeutic interventions are greatly lacking to address growing climate distress and more studies are needed to further characterize and evaluate therapeutic approaches in both clinical and non-clinical settings. This scoping review demonstrates a notable step forward in understanding the mental health implications of climate change and highlights key priorities for future work in this field.

Declaration of generative AI and AI-assisted technologies in the writing process

During the preparation of this work, the author(s) utilized ChatGPT for spell checking, grammar refinement, and certain calculations. After using this AI tool, the author(s) carefully reviewed and edited the content as necessary and assume(s) full responsibility for the publication's content.

Declaration of competing interest

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

Co-author Andrew Toyin Olagunju is an Associate Editor for the Journal of Climate Change and Health and was not involved in the editorial review or the decision to publish this article. All other authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

CRediT authorship contribution statement

Jeremy D. Wortzel: Writing – review & editing, Writing – original draft, Visualization, Supervision, Project administration, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Ver-Se Denga:** Visualization, Investigation, Formal analysis, Data curation. **Jeshtha Angrish:** Investigation, Formal analysis, Data curation. **Larissa Dooley:** Investigation, Formal analysis, Data curation. **Iliana Manjón:** Investigation, Formal analysis, Data curation. **Sherwin Shabdar:** Investigation, Formal analysis, Data curation. **Amy D. Lykins:** Writing – review & editing, Formal analysis, Data curation. **Suzie Cosh:** Writing – review & editing, Formal analysis, Data curation. **Paul A. Bain:** Data curation. **Andrew Toyin Olagunju:** Writing – review & editing, Supervision. **James McKowen:** Writing – review & editing, Writing – original draft, Supervision, Project administration, Methodology, Investigation, Formal analysis, Data curation, Conceptualization.

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Supplementary materials

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