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Threat Severity and Threat Susceptibility Are Significantly Correlated with Climate Distress in Australian Mothers

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Abstract: Climate change presents a critical global crisis, characterized by rising temperatures, extreme weather events, and shifting climate patterns. Vulnerable populations bear a disproportionate share of these impacts, with women at heightened risk due to unequal access to resources, decision-making power, and social roles. Postpartum women specifically face further unique challenges as they strive to protect their children, amplifying the psychological toll of climate change. The current study explores climate distress in a sample of 101 postpartum women in Australia (M_{age} = 31.14 years), whose youngest child was (on average) 5 months of age, examining factors associated with their psychological responses to climate threats. Correlational analyses reveal that perceptions of threat severity (r = 0.621, $p \leq 0.01$) and susceptibility (r = 0.695, $p \leq 0.01$) are strongly linked to climate distress. These findings highlight the need to further investigate the distinct psychological pathways climate-related anxiety operates through in postpartum women. The study underscores the importance of targeted interventions to support this vulnerable population as they face increasing climate-related stressors.

Keywords: climate distress index; Australian mothers; climate change; climate distress

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1. Introduction

Climate change is a critical and escalating global crisis, characterized by rising temperatures, increased frequency and severity of extreme weather events, and shifting climate patterns. The Intergovernmental Panel on Climate Change (IPCC) reports that global temperatures have increased by over one-degree Celsius since pre-industrial times, with predictions indicating a further rise if greenhouse gas emissions are not drastically reduced [1]. This warming is contributing to more intense heatwaves, prolonged droughts, and more frequent and severe storms, which in turn lead to devastating impacts on not only natural ecosystems, but also human societies. These changes have far-reaching consequences, impacting food and water security, escalating disease prevalence, worsening social and economic inequalities, and profoundly affecting both individual physical and psychological health [2]. It is important to note that the communities most impacted by climate change, especially in developing countries, contribute the least to greenhouse gas emissions. This discrepancy highlights significant justice and equity concerns, as those least responsible for climate change often bear the brunt of its consequences [1]. Addressing these justice implications is essential to understanding the full scope of climate change's social and ethical impacts.

The impacts of climate change disproportionately affect not only those economically disadvantaged, but also women and children [3–7]. Vulnerable populations often lack the resources to adequately prepare for, respond to, and recover from extreme weather events, making them more susceptible to the adverse effects of climate change [8]. Children are particularly at risk due to their developing bodies and dependence on adults for protection and care [9], making them also at risk of psychological impacts. Women, especially those

in low- to middle-income countries, are at a heightened risk, partly due to the unequal distribution of roles, resources, and decision-making power [10]. Mothers, in particular, face unique challenges as they strive to protect and care for their children amidst increasing climate-related threats, amplifying the physical and emotional stress they experience [6,11].

The psychological impact of climate change on women, particularly those of reproductive age, is profound and multifaceted [12,13]. Emotionally, the stress and anxiety associated with climate change can significantly affect mental health, especially for women who are primary caregivers and may already experience heightened levels of stress [4,6,11]. These women often face the dual burden of managing varied responsibilities while coping with the uncertainties and threats posed by a changing climate. New mothers often prioritize long-term considerations due to their dual responsibility for both their own well-being and the future of their children [6,11]. This may heighten their sensitivity to the potential consequences of climate change. As climate change intensifies, women are likely to encounter even greater psychological challenges related to food insecurity, displacement, and the overall safety and well-being of their families. This ongoing stress can lead to increased rates of anxiety, depression, and other mental health issues, highlighting the need for targeted support and interventions to help women navigate the psychological toll of climate change [4,11,14]. Understanding and addressing the unique vulnerabilities of women in the context of climate change is crucial for developing effective adaptation and resilience strategies.

In summary, reproductive-aged women are uniquely susceptible to the impacts of climate change [15], both physiologically and emotionally. The postpartum period is characterized by its own challenges and impacted by many factors including socioeconomic status, fluctuating hormone levels, access to care, mental health history, availability of social support, built environment, and traumatic events—to name a few [4]. Depending on the level and proximity of the exposure, extreme weather events (EWEs) can be quite traumatic. Trauma, in turn, is associated with myriad negative mental health consequences in the perinatal population and beyond [16]. However, we know little about the constellation of factors that are associated with climate distress (and therefore recovery from extreme weather exposure) in pregnant and postpartum women. Until the drivers of climate-related anxiety are understood, we cannot support women appropriately. To address this gap, the current research embarked on an investigation of factors associated with climate distress in a convenience sample of postpartum women in Australia.

2. Materials and Methods

2.1. Design

Participants, recruited through purposive sampling, completed a brief cross-sectional quantitative survey. Demographic information along with data on maternal functioning, depression, climate distress, and social support as reported by the participants were collected within this survey. Ethical approval for the study was granted by the James Cook University Human Ethics Committee (approval number H8916).

2.2. Recruitment

Participants were recruited through online social media platforms (Twitter, Facebook, and Reddit) as well as university networks. They were given a URL to access the Information Sheet, provide their consent, and complete the survey. Participants were provided with detailed information about the study and informed consent procedures that emphasized the voluntary nature of their participation. In cases where the survey questions were distressing, participants were offered access to mental health resources, including referrals to local support services and hotlines. Additionally, participants were informed that they could withdraw from the study at any point without penalty, further mitigating potential stress. These steps were integral to the study design to ethically address the potential for increased distress in this vulnerable group. To be eligible, participants needed to be at least 18 years old, reside in Australia, and have a baby 12 months old or younger. The

recruitment was focused on gathering data to investigate the relationship between climate distress and postpartum maternal functioning. The anonymous survey was conducted on the Qualtrics online platform and was available from April 2023 to December 2023. Statistical analyses were carried out using SPSS version 27.

2.3. Data Collection

2.3.1. Sociodemographic Variables

The demographic variables of the study sample included age, relationship status, number of children, age of youngest child, area of residence (rural, metropolitan, remote), and Australian state of residence.

2.3.2. Threat Severity

The perceived severity of climate-related threats was measured using the adapted Risk Behavior Diagnosis Scale (RBDS) [17]. The RBDS, originally designed to measure threat perceptions in the context of health risks, was adapted to reflect climate change threats in this study. Participants indicated their agreement with three statements regarding their perceived severity of climate change threats. Ratings were provided on a 7-point Likert scale, ranging from 1 = *Strongly disagree* to 7 = *Strongly agree*, with higher scores indicating greater perceived severity. Statements such as "*Climate change is a serious threat*" were used to assess this construct. The Cronbach's alpha for the present study sample was 0.955, indicating good reliability.

2.3.3. Threat Susceptibility

Threat susceptibility was also assessed using an adapted version of the Risk Behavior Diagnosis Scale. This construct assessed participants' beliefs about their likelihood of experiencing adverse effects from climate change via three questions on a 7-point Likert scale, ranging from 1 = *Strongly disagree* to 7 = *Strongly agree.* Higher scores indicated greater perceived susceptibility of the threat. Example items included statements such as "*I am susceptible to the negative affects of climate change*". The Cronbach's alpha for the present study sample was 0.947, indicating good reliability.

2.3.4. Self-Efficacy

Self-efficacy, or participants' confidence in their ability to perform behaviors that mitigate climate-related threats, was measured using the adapted Risk Behavior Diagnosis Scale. Participants rated their confidence on a 7-point Likert scale, ranging from 1= *Strongly disagree* to 7= *Strongly agree.* Higher scores indicated higher levels of self-efficacy. Statements such as "*I am able to perform pro-environmental behaviours (for example, saving water, recycling) to prevent climate change*" were used to assess this variable. The Cronbach's alpha for the present study sample was 0.913, indicating good reliability.

2.3.5. Response-Efficacy

Response-efficacy, or the belief in the effectiveness of recommended actions to mitigate climate-related threats, was also measured using the adapted Risk Behavior Diagnosis Scale. Participants indicated their agreement with statements regarding the effectiveness of various responses to climate change questions on a 7-point Likert scale, ranging from 1 = *Strongly disagree* to 7 = *Strongly agree*. Higher scores reflected greater confidence in the efficacy of the recommended responses. Example items included statements such as "*Performing pro-environmental behaviours (for example, saving water, recycling) prevents climate change*". The Cronbach's alpha for the present study sample was 0.923, indicating good reliability.

2.3.6. Consideration of Future Consequences

The Consideration of Future Consequences Scale (CFC) [18] is a 12-item scale that measures immediate and distant outcomes of behavior with questions such as, "*I only act to*

satisfy immediate concerns, figuring the future will take care of itself". The scale is scored on a 5-point Likert Scale from 1 = *Extremely uncharacteristic* to 5 = *Extremely characteristic*. Items 3, 4, 5, 9, 10, 11, and 12 were reverse scored, with all items summed for a total score, with higher scores indicating a greater consideration of future consequences. The Cronbach's alpha for the present study sample was 0.866, indicating good reliability.

2.3.7. Climate Distress

The Climate Distress Index-17 (CDI-17) was completed by all participants with the intent of gauging distress due to climate change/extreme weather (see Figure 1 for full measure). The measure is available in a 16- or 17-item format, with the only difference being that this item—"*The media coverage (t.v., news articles, etc.) of climate change is helpful*" —is excluded from the CDI-16 (but included in the CDI-17). Respondents are asked to rate their experience on items such as "*Future generations will protect the environment*" and "*Climate change has affected my health or safety*" on a 7-point Likert scale, where 0 = *Strongly Disagree* and 6 = *Strongly Agree*. The full measure is shown in Figure 1. To score the CDI-17, items 1-7 must be reverse-coded before the 17 items can be summed. The range for the CDI-17 total score ranges from 0 to 102, with higher scores representing greater levels of climate distress. The Cronbach's alpha for the CDI-17 was 0.83 in the present study, indicating good reliability. Previous studies using the CDI-16 have also indicated good reliability ($\alpha = 0.81$) [11].

Please **circle the number** that best represents your feelings. Please try to answer each question as honestly as possible.

	Strongly Disagree	**Disagree**	**Somewhat Disagree**	**Neutral**	**Somewhat Agree**	**Agree**	**Strongly Agree**
1. There is enough time to stop or slow climate change.	0	1	2	3	4	5	6
2. My community is prepared to deal with the effects of climate change.	0	1	2	3	4	5	6
3. Government officials are doing their best to stop or slow climate change.	0	1	2	3	4	5	6
4. Other people (in society) are doing their best to stop or slow climate change.	0	1	2	3	4	5	6
5.Future generations will protect the environment.	0	1	2	3	4	5	6
6. I am doing my part to protect the environment (recycling, etc.).	0	1	2	3	4	5	6
7. The media coverage (t.v., news articles, etc.) of climate change is helpful.	0	1	2	3	4	5	6
8. I'm concerned that climate change will affect our food supply.	0	1	2	3	4	5	6
9. I'm concerned that climate change will harm nature and animals.	0	1	2	3	4	5	6
10. I'm concerned that climate change will affect my ability to enjoy the outdoors.	0	1	2	3	4	5	6
11. I'm concerned that the earth will not be livable for future generations.	0	1	2	3	4	5	6
12. Climate change has caused financial problems for me/my family.	0	1	2	3	4	5	6
13. I'm concerned that climate change will cause financial problems for me/my family in the future	0	1	2	3	4	5	6
14. Climate change has affected my health or safety.	0	1	2	3	4	5	6
15. Climate change has affected the health or safety of someone I care about.	0	1	2	3	4	5	6
16. I'm concerned that climate change will affect my health or the health of someone I care about in the future.	0	1	2	3	4	5	6
17. I live in an area that is at high risk for extreme weather (heat, wildfires, storms, drought).	0	1	2	3	4	5	6

For questions on the CDI-17, please contact Dr. Jennifer Barkin. Email: barkinj@gmail.com

Figure 1. Climate Distress Index (CDI-17).

2.3.8. Maternal Functioning

The Barkin Index of Maternal Functioning (BIMF) [12,13,19] was used to assess maternal functioning in the postpartum period. The BIMF comprises 20 items, with response options on a 7-point Likert scale, where 0 = *Strongly Disagree* and 6 = *Strongly Agree*. Participants are asked to select the response that best reflects their experience over the past two weeks on statements such as "*I am able to relax and enjoy time with my baby*". After reverse-coding items 16 and 18, the overall maternal functioning score ranges from 0 to 120, with a score of 120 representing optimal functioning. A Cronbach's alpha of 0.84 for the current study sample indicates good reliability and is similar to that of the original validation study ($\alpha = 0.87$).

2.3.9. Depression

The Center for Epidemiologic Studies Depression Scale (CES-D) [20] was used to assess depressive symptomology. The CES-D comprises 20 items, with response options on a 5-point Likert Scale, where 0 = *Rarely or none of the time (less than 1 day)* and 4 = *Most or all of the time (5–7 days)*. The overall score ranges from 0 to 60, with higher scores representing the presence of greater depressive symptomology. The Cronbach's alpha for the CES-D in the present sample was 0.92, indicating good reliability.

2.3.10. Social Support

The Multidimensional Scale of Perceived Social Support (MSPSS) [21,22] was implemented to assess participants' perceived level of social support with family, friends, and significant others. The MPSS comprises 12 items divided into three sub-scales: Family, Friends, and Significant Other. Items are assessed on a 7-point Likert Scale ranging from 1 = *Very strongly disagree* to 7 = *Very strongly agree*. Respondents are asked to indicate how they feel about statements such as: "*There is a special person who is around when I am in need*". Scores were averaged for the total scale and for each subscale, with higher scores indicating greater levels of perceived social support. The Cronbach's alpha for the MSPSS was 0.94 for the total scale, 0.94 for the Friends subscale, 0.91 for Family subscale and 0.95 for the Significant Other subscale, indicating strong reliability.

2.3.11. Analytic Approach

In analyzing the data, we employed a variety of statistical methods to understand the intricacies of climate distress among the new motherhood populations. Descriptive statistics were first calculated to summarize the sample's demographic information, including age, relationship status, number of children, and area of residence. In examining the construct validity of the CDI, the relationships between climate distress and consideration of future consequences, maternal functioning, depression, perceived social support, self-efficacy, response-efficacy, threat susceptibility, threat severity, and demographic factors such as age and the age of the youngest child were also explored using Pearson correlation analyses. Additionally, a one-way ANOVA was conducted to assess the impact of relationship status on climate distress and location variables, including state and area classifications.

3. Results

3.1. Sample Characteristics

The study sample consisted of 101 Australian mothers, with an average age of 31.14 years (*SD* = 5.51) (see Table 1 for state-based distribution). A majority of 85 participants (84.2%) were partnered, while the remainder were single mothers. The average age of the participants' youngest child was 5.93 months (*SD* = 3.17). Out of the total sample, forty mothers (39.6%) had two or more children, whereas the rest had only one child. Sixty-seven participants lived in metropolitan areas, twenty-three in rural areas, six in remote areas, and five were uncertain about their area's classification.

Table 1. Participant location based on Australian state.

State	*n*	%
Queensland	42	41.6
New South Wales	15	14.9
South Australia	15	14.9
Northern Territory	13	12.9
Victoria	7	6.9
Western Australia	7	6.9
Tasmania	1	1
Australian Capital Territory	1	1

3.2. Correlates of Climate Distress

Climate Distress (CDI) was significantly, positively, and strongly correlated with threat severity ($r = 0.621$, $p \leq 0.01$) and threat susceptibility ($r = 0.695$, $p \leq 0.01$) (Table 2). Specifically, levels of climate distress increased with higher ratings of threat severity and threat susceptibility. The CDI was also significantly (but weakly) correlated with the Consideration of Future Consequences Scale score ($r = 0.235$, $p \leq 0.05$). Uncorrelated variables included maternal functioning, depression, perceived social support, self-efficacy (related to climate change behaviors), and response-efficacy (also related to climate change behaviors). There were no significant correlations between CDI scores on demographic variables (e.g., age and age of youngest child). See Table 2 for all correlations between all variables of interest and the CDI.

Table 2. Correlation coefficients between all variables of interest and CDI (n=101).

	BIMF	CES-D	MSPSS Total	CFC	Threat Severity	Threat Susceptibility	Self-Efficacy	Response-Efficacy
Climate Distress	–0.068	−0.093	0.004	0.235 *	0.621 **	0.695 **	0.054	0.063

Note: * $p < 0.05$; ** $p < 0.001$.

A one-way ANOVA was also conducted to explore whether relationship status had any impact on CDI scores. Results found a significant difference between those who reported they were single ($M = 64.27$, $SD = 13.57$), partnered ($M = 60.93$, $SD = 14.35$), and other ($M = 33.50$, $SD = 19.09$) on CDI scores ($F_{(2,98)} = 4.09$, $p = 0.20$), with those who were single experiencing more climate distress. There were no significant differences on CDI scores between location variables (state and area classifications).

4. Discussion

This study offers critical insights into the psychological impacts of climate change on a sample of geographically diverse postpartum women, a demographic that is particularly vulnerable yet often overlooked in climate change research. Specifically, the current study sought to examine the factors associated with climate distress in a sample of Australian postpartum women. This study aimed to underscore the importance of acknowledging and addressing climate-related psychological stressors in mothers, as they hold profound implications for maternal mental health and, by extension, family wellbeing. The absence of work to date between climate distress and other mental health variables such as maternal functioning, depression, and perceived social support highlights the complexity of climate-related psychological responses and suggests the need for further exploration into the unique pathways through which climate distress impacts this population.

The significant and strong correlations between climate distress and threat severity ($r = 0.621$, $p < 0.001$) and threat susceptibility ($r = 0.695$, $p < 0.01$) provide critical insight regarding factors associated with climate distress. These results support the existing literature that links perception of environmental threats with increased psychological

distress (e.g., Clayton, 2020 [23]). They also indicate that the mother's perception of both her own vulnerability to the effects of climate change and personal degree of risk (severity) influence distress levels. These two strong, significant relationships are intuitive and the direction of the relationships (i.e., level of distress increases as threat susceptibility increases) are as you would expect—providing evidence of the construct validity of the CDI-17.

The positive relationship between the consideration of future consequences (CFC) and the CDI-17 can be attributed to several factors related to this population's unique life circumstances. New mothers are typically highly attuned to future-oriented thinking, as they are not only responsible for their own well-being but also for the future well-being of their children [19]. This forward-looking perspective may make this population more sensitive to the long-term impacts of climate change, thus increasing their climate distress. Mothers often assume the role of primary decision-makers in managing family health, and this heightened responsibility contributes to their increased sensitivity to health-related concerns [4]. New mothers may perceive climate change as a direct threat to the future security and stability of their families, which could contribute to their increased levels of anxiety and concern in this context overall. Furthermore, in Australia, a country that is particularly vulnerable to the effects of climate change, such as extreme weather events, the immediacy and severity of these threats may further intensify climate-related distress among mothers who are deeply concerned about the future.

The non-significant associations between climate distress and other variables such as maternal functioning, depression, and perceived social support warrants further investigation. These findings do not undermine the construct validity of the CDI-17, but rather suggest that climate distress may operate through distinct psychological pathways where perceived vulnerability to threat and perceived degree of threat are more influential than other factors. One possible explanation is that climate distress is a unique form of anxiety that is specifically tied to environmental concerns and is not necessarily linked to general mental health issues [24]. However, the authors are cautious in forming any conclusions based on one study, involving participants from only one country—cultural differences may influence results and the relationship between climate change and maternal mental health is not yet well explored or understood. Alternatively, it may be that existing mental health measures do not adequately capture the nuances of climate-related anxiety. The current findings highlight the need for more comprehensive programming for maternal mental health that integrate environmental stressors, considering that new mothers face the dual burden of parenting and navigating a changing climate.

Strengths and Limitations

In this study, a uniquely vulnerable subgroup of the population regarding climate change (new mothers) was studied. Often referred to as "the last therapeutic orphan", mothers (and their needs/perspectives) are often neglected in favor of an almost myopic focus on the health and wellbeing of children [4]. In that regard, it addresses an under-explored and unnavigated topic that directly impacts the health of the family unit as a whole. Stated differently, how will we protect the "CEO of family health" [25] from the more devastating effects of extreme weather? Additional strengths include the number of variables/indicators of the mother's perspective that were collected and the (within-country) geographic diversity of this sample of Australian women. Limitations include the cross-sectional nature of the study design and that there was no ascertainment of the women's level of recent exposure to extreme weather events.

5. Conclusions

In our sample of Australian mothers, two factors appear to be most directly correlated with increased climate distress: (1) the mother's perception that climate change is a sincere and real threat to her personally, and (2) the belief that the negative effects of climate change are proximal and potentially devastating. Simply put, on average, the mothers that believed that climate change was a clear and present danger were more stressed about it than those

who did not have similar beliefs. The present conclusion hints at the possibility that while, in reality, all populations will be impacted by climate change, those that have greater awareness of the threats will suffer more emotionally and earlier. In this case, accurate threat appraisal may also indicate greater vulnerability to related mental health issues.

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