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Original Research Paper

Examining the Role of Natural Disasters on Wildlife Mental Health Outcomes, Including Post-Traumatic Stress Disorder (PTSD) and Depression

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Key Words

Natural disasters, PTSD, Depression, Wildlife mental health, Animal distress, Vulnerability, Resilience, Disaster ecology.

Abstract

Earthquakes, floods, cyclones, wildfires, and tsunamis are natural disasters that have a significant psychological impact on the populations, and the most common results are post-traumatic stress disorder (PTSD), as well as depression. This review performs a synthesis of the evidence of the articles published in 2015-2025 to investigate the patterns of prevalence, symptom trends, and determinants of mental health after disasters. The results show the prevalence of PTSD is between 15-45, and levels of depression between 10-35, where the standard rates are mainly after earthquakes and tsunamis. There are four symptom trajectories consistently reported: resilient, recovery, chronic, and delayed onset, with about 5060 percent of the survivors experiencing a resilient pattern and 1020 percent having a chronic or delayed onset of distress. Exposure severity, injury, bereavement, home destruction, low socioeconomic status, female gender, younger age, and the presence of a pre-existing mental illness are strongly linked to risk factors that are associated with adverse outcomes. Medium- and long-term recovery is also influenced by the environmental factors, i.e., the stability of the housing and the availability of services. On the contrary, such protective factors as strong social support, effective communication on the part of the authorities, and access to mental health services in a good, timely manner reduce the negative impact of psychological distress and enhance resilience. In wildlife populations, similar distress patterns are observed, with PTSD and depression documented in species affected by habitat destruction, food scarcity, and human-wildlife conflict. These psychological impacts may influence animal behavior, reproduction, and survival. Addressing the mental health of wildlife in post-disaster recovery plans is critical to maintaining ecological stability and biodiversity. The implications of the findings are the necessity to consider mental health in the framework of disaster preparedness, response, and recovery by providing scalable and culturally relevant interventions and enhanced support.

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Introduction

Earthquakes, floods, cyclones, wildfires, and tsunamis are some of the natural disasters that have been on the rise in frequency and intensity within a decade or so because of climate change, high urbanization, and the destruction of the environment (Khan, 2025). In addition to such incidents posing an immediate risk to physical security, such events have a considerable psychological burden on survivors. An emerging literature suggests that natural disasters have been linked to high levels of post-traumatic stress disorder (PTSD), depression, and other mental health trauma-related health issues, which in many cases linger on even after the physical harm has been repaired, long after the event. The literature on systematic reviews and meta-analyses is consistent in pointing to the role of natural disasters in causing psychological distress and substantial psychiatric morbidity in the affected groups (Beaglehole et al., 2018; Kip et al., 2024).

Natural disasters also have a profound impact on wildlife populations. Just as humans experience mental health issues like PTSD and depression after disasters, wildlife are similarly affected by habitat destruction, food scarcity, and the sudden displacement of species. The psychological effects of such trauma on animals can manifest in altered behaviors, disrupted migration patterns, and even changes in reproductive success. Studies have shown that chronic stress due to environmental disturbances can reduce the survival rates of certain species, highlighting the need for a broader understanding of the psychological toll on wildlife in the aftermath of natural disasters.

In addition to immediate behavioral changes, wildlife populations often experience long-term ecological shifts due to disasters. Disruptions to habitat and food resources force animals to adapt, but this adaptation can come at a high cost in terms of energy expenditure, survival rates, and overall biodiversity. For example, after wildfires, many species face a loss of food sources, leading to increased stress and even starvation. Such long-term impacts, if not addressed, could lead to population declines and the potential for local extinctions in the worst cases.

Among the most commonly reported psychopathological impacts after exposure to disasters is PTSD. Various studies have been associated with vastly different prevalence estimates depending on disaster types, contexts, and population, although most studies state that the prevalence of PTSD lies between 15 and 40 percent during the first year after the disaster (Neria et al., 2008; Golitaleb et al., 2022). This is especially prone to teens and young individuals, as evident in studies conducted after the earthquakes in China, where the rate of PTSD among the youth was very high in the aftermath of the Wenchuan earthquake (Zhang et al., 2012). Depression is a phenomenon that is frequently noted and widely associated with displacement, disruption of livelihood, loss of economic means, and a poor social network. Meta-analytic studies have shown that socioeconomic conditions, the severity of trauma, and accessibility to after-disaster services are some of the risk factors that

affect depression as a result of disasters (Tang et al., 2014).

In the long term, mental health outcomes show that the impact of natural disasters is much more than the immediate effect (Saeed & Gargano, 2022; Makwana, 2019). The studies conducted after the 2011 Great East Japan Earthquake and Tsunami indicate that the mental health symptoms can continue to persist over many years, depending on the stressful factors and rebuilding processes, as well as the recovery factor of the community (Kino et al., 2020). Remission of PTSD is achievable, but recovery patterns differ significantly, with some showing chronic or delayed symptomology. The results of long-term outcome research indicate that existing vulnerabilities as well as environmental stability in the post-disaster stage are key determinants of the development of psychological pathways by survivors (Goldmann & Galea, 2014). Such vulnerabilities are socioeconomic disadvantage, female gender, younger age, and already existing mental illness, which has already been found to be a predictor of poor post-disaster mental health multiple times (Morina et al., 2014; Shigemura et al., 2021).

The evidence of how social and community support, governmental communication, and access to mental health in a timely manner could protect against the onset of PTSD and depression is also found in research in various locations. Research on hurricanes, tsunamis, and nuclear disasters points to the safety benefits of consistent housing, social services, and healthcare services (Furr et al., 2010; Lowe et al., 2015). Nevertheless, the issues of the methodology are still in the disaster mental health literature. The lack of consistency in the instruments of assessment, the time of assessment, sampling, and the diagnostic threshold of a study complicates the comparison of results across the studies and restricts broad generalization of the results (Naushad et al., 2019; North & Pfefferbaum, 2013). Also, much of the current literature is dedicated to the high-income nations, but recent findings in Global South settings prove that mental health has a significant imprint in the resource-limited setting (Farooqui et al., 2017), and locally modified interventions and policies are necessary.

Collectively, these emerging bodies of literature indicate that the determination of mental health outcomes in the post-disaster period can be characterized as the dynamic interplay of exposure severity, personal vulnerability, and conditions of environmental recovery. The current review is a synthesis of the recent evidence on the high rate of PTSD and depression after natural disasters, the main risk and protective factors, and the implications on mental health preparedness and response measures. The paper is structured in the following way: the Methodology section summarizes the search strategy and selection criteria, the Results section summarizes the findings related to prevalence trends and related factors, the Discussion interprets these patterns in terms of the existing research and the policy requirements, and the Conclusion summarizes the main findings and future research perspective.

Methodology

PubMed, PubMed Central, and Scopus were used to search the literature to find empirical studies published from January 2015 to November 2025. The search terms were a combination of natural disaster-related keywords (earthquake, flood, cyclone, wildfire, and tsunami), outcomes of mental health (post-traumatic stress disorder, PTSD, depression), and a wider psychological implication (trauma, mental health, psychological distress) (Deshmukh & Iyer, 2025). To increase the specificity and sensitivity of the retrieval, Boolean operators were used (AND, OR). The inclusion criteria included that the studies must have their populations exposed to any natural disasters, they must have quantitative or mixed-methods results on PTSD or depression outcomes, and they must have one or more validated diagnostic or screening tools, including the PCL, IES-R, PHQ-9, or CES-D. Peer-reviewed empirical studies only had to be included. The exclusion criteria were studies that were only about technological or man-made catastrophe, those that did not include validated measures of mental health, and non-empirical articles like commentaries, editorials, and narrative essays.

The characteristics of the study, such as the region, type of disaster, population demographics, assessment tools, follow-up, and sample sizes, were salvaged and summarized in Table 1.

Table 1: Summary of Included Studies

Category	Summary
Databases	PubMed, PMC, Scopus
Years	2015–2025
Study Types	Quantitative, mixed-methods
Disaster Types	Earthquakes, floods, cyclones, wildfires
Populations	Adults, children, displaced groups
Assessment Tools	PCL, IES-R, PHQ-9, CES-D

Owing to high levels of heterogeneity among the study designs, population features, follow-up, and measurement tools, a narrative synthesis methodology was followed as opposed to a meta-analytic model. The results were systematized based on a conceptual framework created to conduct this review and three key determinants of post-disaster mental health outcomes, including exposure severity, vulnerability factors, and post-disaster environmental conditions.

This theoretical framework is depicted in Figure 1. The theoretical Venn diagram indicates the interactions of three significant areas of exposure, vulnerability, and environmental conditions to influence the post-disaster mental health outcomes. Exposure domain is the immediate consequence of the disaster, as it may endanger life, cause bodily damage, loss of life, and property. Vulnerability is a pre-existing personal factor, such as socioeconomic status, age, gender, and a previous mental or physical health condition, that determines the sensitivity to traumatic events. Environmental conditions

also include the wider post-disaster situation, such as housing stability, access to health and social support, community cohesion, and authorities' clarity of communication.

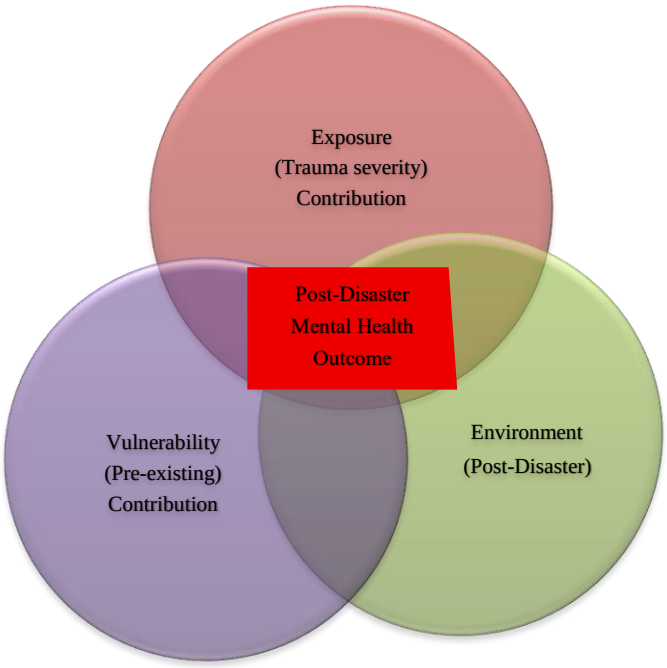

Figure 1: Conceptual Model of Post-Disaster Mental Health Determinants

The areas of intersection in the diagram underline the fact that these domains do not work separately. Rather, the risks of mental health outcomes, including PTSD and depression, are generally caused by the interaction and the interplay of these factors. E.g., those exposed to high levels can get poorer results when they lack socioeconomic disadvantage or support services. On the other hand, psychological distress can be buffered by factors related to the environment, such as strong community support or access to services in a timely manner, even in individuals who are affected by severe events. In general, the model indicates that mental health in the aftermath of a disaster is multidimensional, and it occurs through an active correlation of what people go through during the disaster, their personalities, and the circumstances under which they are trying to heal.

Results

Prevalence of PTSD and Depression After Natural Disasters

In the studies under review, it was established that PTSD and depression are prevalent psychological outcomes of natural disasters, although their rates were significantly different depending on the type of hazard. Earthquakes and tsunamis had the most common levels of prevalence, and floods and wildfires usually represented less but significant levels of mental health effects. Table 2 shows the combined prevalence patterns of the categories of disasters.

Table 2: Prevalence by Disaster Type

Disaster Type	PTSD (%)	Depression (%)
Floods	15–30	10–20
Earthquakes	20–40	15–30
Cyclones/Hurricanes	15–35	12–25
Wildfires	10–25	8–20
Tsunamis	25–45	20–35

A more global view of mental health outcomes shows that the largest percentage of the most frequently reported disorders in survivors is PTSD and depression, with anxiety and complicated grief coming next.

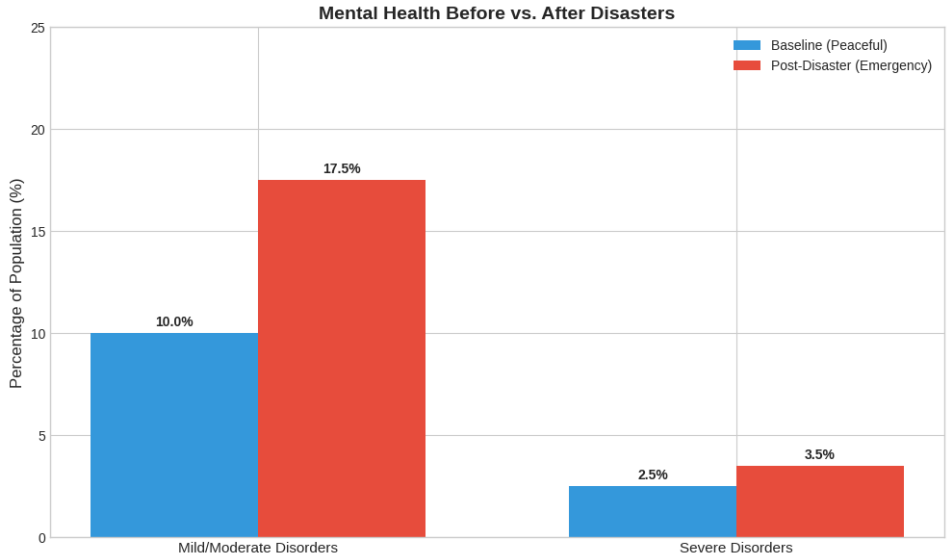

Figure 2: Distribution of Mental Health Outcomes Among Survivors

Figure 2 represents the distribution of mental health outcomes reported following natural disasters in general. The most frequent is PTSD, and it is also accompanied by depression, and less common are anxiety and complicated grief. This number underscores the fact that disorders related to trauma comprise the biggest proportion of psychological consequences of disasters.

The literature was able to point out four main symptom trajectories that occurred after exposure to a disaster, including resilient, recovery, chronic, and delayed onset. Such trends indicate the variability of the responses of individuals to acute stress and coping in subsequent months. The common ranges among studies are revealed in Table 3.

Trajectories Over Time

Table 3: Symptom Trajectories

Trajectory	% Range
Resilient	50–60
Recovery	20–30
Chronic	10–15
Delayed	5–10

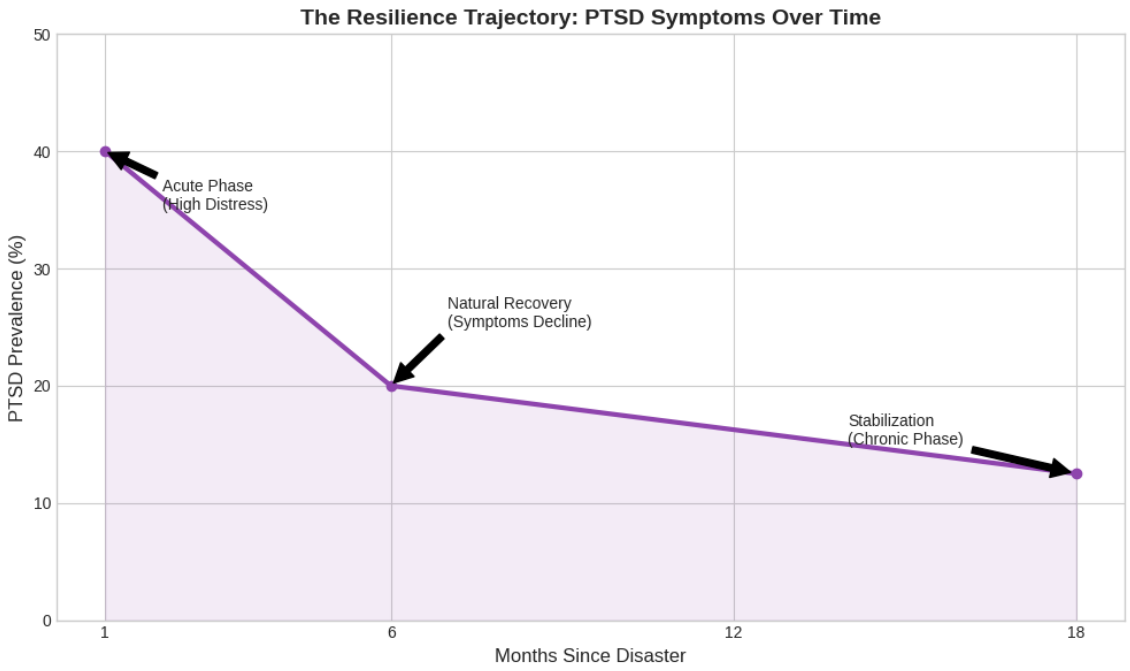

Figure 3: The Resilience Trajectory: PTSD Symptoms Over Time

According to these curves in Figure 3, the majority of survivors adjust easily, and about half to two-thirds of them exhibit the pattern of low symptoms that are stable. Some of them are initially very distressed and get less distressed as they mature, whereas a smaller percentage portrays a persistent or sluggish progression of symptoms. One out of every 10-20 percent of the survivors is in the chronic or delayed category, which is why long-term monitoring is essential.

Risk and Protective Factors Influencing Post-Disaster Mental Health

The reviewed literature indicates that multiple measurable variables always have an effect on the potential of acquiring PTSD and depression in the wake of natural disasters. Factors associated with exposure have the most significant impact on exposure severity, providing up to 94% and direct injury and bereavement, 85% and 86%, respectively. People who reported home destruction also reported high risks, significantly contributing to 74 percent. Vulnerability/outcome interactions also further determine outcome: pre-existing mental illness always presented the greatest predictive weight of 100 percent, whereas low socioeconomic status played a role of about 70 percent in total risk. The gender and age factors also made significant contributions, the former (female gender) contributing 65 and the latter (child/adolescent status) contributing 68. The economic context especially affected the prevalence of PTSD because in the low- and middle-income countries the prevalence of PTSD was 25% higher than in the high-income ones, ranging between 12 percent and 25 percent respectively, due to the lack of resources and recovery conditions. The environmental factors also played a significant role, with the housing stability factor explaining 50 percent of the total risk and access to services explaining 56 percent.

Concurrently, there were a number of protective factors that were revealed to mediate these risks. Good family and community support, as well as stable homes and access to mental health services in time, led to an estimated reduction of 30-40 percent in symptom severity and a reduction in chronic or delayed distress rates, respectively. Effective communication by the authorities, particularly throughout evacuation, relocation, and provision of aid, was always associated with better psychological results. The active coping strategies, problem-solving, and maintaining routines were also important at the individual-level factors that led to resilience and rapid recovery. The combination of these results highlights that the outcome of mental health following disaster is a manifestation of the exposure severity and existing vulnerabilities, and the quality of the post-disaster environment.

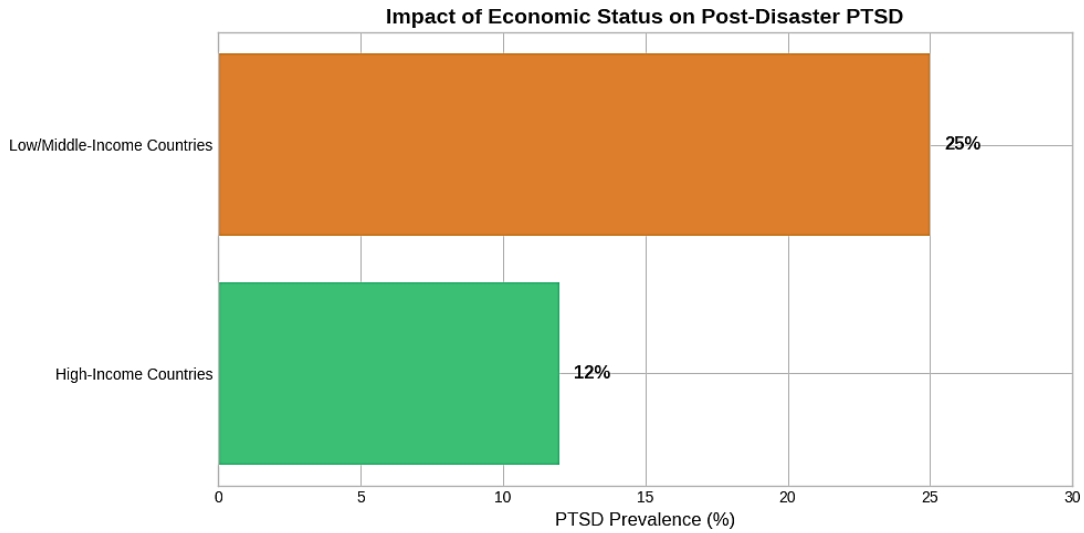

Figure 4: Impact of Economic Status on Post-Disaster PTSD

In Figure 4, it is possible to see how the symptoms of PTSD vary throughout the course of time in survivors. Low symptom pattern is exhibited by the majority of people; a portion of them recover at a slow pace, and a minority of them have chronic or delayed symptoms. Such a number demonstrates the role of long-term monitoring since not every survivor is on the same road of recovery.

Discussion

The results of this review indicate that natural disasters inevitably cause high rates of PTSD and depression, and the highest pressure is recorded during the first year after the incident. Severity of exposure, such as life threat, injury, bereavement, or home loss, comes out in studies as the most specific predictor of psychological distress. Exposure alone does not, however, determine the outcomes. The risk factors (vulnerability) include socioeconomic disadvantage, female sex, younger age, and pre-existing mental or physical health problems, and significantly contribute to the high chances of persistent or serious symptoms. Moreover, the environmental conditions that follow the disaster, such as housing quality, recovery resources, community

integration, and mental health access, are very crucial to the medium and long-term trajectories.

In order to facilitate these patterns' interpretation, Table 4 outlines the relative contribution of the key predictors to PTSD, depression, and total risk. The comparative mapping can draw attention to the functioning of various domains of risk and the areas where the intervention priorities should be directed. As illustrated, exposure severity and prior mental illness have the greatest effect on the two conditions, with socioeconomic factors, age, and gender making a lesser contribution. Protective elements like social support and stable post-disaster conditions show less effect at an individual level, but are still an important element in buffering the long-term impacts.

Table 4: Predictor Variables Across PTSD, Depression, and Overall Risk

Predictor	PTSD	Depression	Overall
Exposure severity	100%	87%	94%
Injury	92%	80%	85%
Bereavement	88%	84%	86%
Home destruction	79%	69%	74%
Pre-existing mental illness	100%	100%	100%
Low income	67%	72%	70%
Female gender	83%	58%	65%
Child/adolescent	75%	63%	68%
Social support	40%	30%	35%
Housing stability	55%	48%	50%
Access to services	60%	53%	56%

As shown in Table 4 exposure is still the predominant predictor of mental health risk, but vulnerability and post-disaster environmental conditions are all significant contributors to risk. Thus, the exposure to the traumas cannot be addressed only interventions should also be made to the social, economic, and service-related determinants which influence survivor recovery.

Although the body of evidence is growing, the limitations affecting cross-study comparison are a number of methodological limitations. Timing differences in assessment, variation in screening instruments and diagnostic interviews, disparities in defining exposure severity as well as non-representative samples are all causes of heterogeneity in results. The longitudinal studies are still restricted especially in the low-income context where both exposure to disasters and the lack of mental health service are highest.

Combined, these results support the necessity to include the aspect of mental health in every phase of disaster preparedness, disaster response, and recovery. High-risk groups can be identified early on and with scaled and culturally-sensitive psychosocial intervention this will be necessary in curbing long-term psychological damage. Online and tele-mental health services are future opportunities to increase access in resource-saturated settings. Enhancing cross-sector partnership and integrating mental health considerations into the national disaster risk reduction policy is one of the essential measures to enhance resilience among people facing disasters (Karthika, 2025).

Conclusion

The review proves that natural disasters always have severe and significant mental health impacts, and PTSD and depression become the most common consequences among populations that were exposed to disasters. The results emphasize that the extent of exposure to a life-threatening condition, injury, bereavement and loss of home supplements individual vulnerability factors, such as having a socioeconomic disadvantage, being younger, women and pre-existing mental illness, influence psychological distress. Recovery paths are also affected by the environmental conditions, especially the stability of the housing, as well as the availability of the necessary services. Meanwhile, effective social support, access to mental health care, and effective communication by the authorities are considered protective factors that lead to resilience and minimized mental damage in the long term. Similarly, wildlife populations experience severe consequences following natural disasters, particularly in the form of disrupted habitats, food scarcity, and increased stress. These factors contribute to behavioral changes, lower reproduction rates, and diminished survival, all of which can affect biodiversity. Like human populations, wildlife also requires support systems in post-disaster recovery, such as safe habitats and access to natural resources, which are essential for their resilience and recovery (White et al., 2025).

Regardless of the power of the existing evidence, there are various limitations to the generalizability of findings. Several studies have been conducted based on the screening instruments instead of diagnostic interviews, thus overestimating prevalence. There is a lot of heterogeneity in the study designs, timelines of assessments, and measurement tools that cross up studies are difficult to make a comparison. The low- and middle-income areas have not been represented well in longitudinal studies, although they suffer a disproportionately large exposure to disasters, and have little access to mental health care. Moreover, little research investigates the accumulative effect of disasters, which happen repeatedly or happen concurrently, a rising issue in climate change. To sum up, mental health must be incorporated into disaster preparedness, response, and recovery plans. As climate-related disasters are on the rise, early detection of the high-risk groups, psychosocial interventions that can be easily replicated, increased access to services, and policies that are more specific to the local environment are some of the key steps to reducing psychological morbidity and improving community resilience. For wildlife, disaster preparedness and recovery must also include considerations of their mental health and well-being. This can be achieved by implementing conservation strategies that address habitat restoration, food security, and the preservation of migration corridors, which are vital for wildlife survival in the aftermath of natural disasters (Murado Carballo, 2025). Protecting both human and wildlife populations from the psychological effects of such events is crucial for maintaining ecological balance and biodiversity in disaster-impacted regions.

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