

Review Article

The Effects of Climate Change on Mental Health

Annika Walinski*¹, Julia Sander*¹, Gabriel Gerlinger, Vera Clemens, Andreas Meyer-Lindenberg*², Andreas Heinz*²

*¹These authors contributed equally to this paper.

*²These authors share last authorship.

German Association for Psychiatry, Psychotherapy and Psychosomatics, Berlin: Annika Walinski, M. Sc, Dr. phil. Julia Sander, Dr. rer. medic. Gabriel Gerlinger, Prof. Dr. med. Andreas Meyer-Lindenberg, Prof. Dr. med. Dr. phil. Andreas Heinz
University Hospital Ulm: Prof. Dr. med. Vera Clemens

Central Institute of Mental Health (CIMH), Mannheim: Prof. Dr. med. Andreas Meyer-Lindenberg

Charité—Universitätsmedizin Berlin: Prof. Dr. med. Dr. phil. Andreas Heinz

Summary

Background: All over the world, climate change is exerting negative and complex effects on human living conditions and health. In this narrative review, we summarize the current global evidence regarding the effects of climate change on mental health.

Methods: A systematic literature search concerning the direct effects of acute extreme weather events (floods, storms, fires) and chronic stresses (heat, drought) due to climate change, as well as the indirect effects of climate change (food insecurity, migration), on the diagnoses of mental disorders, psychological distress, and psychiatric emergency admissions was carried out in PubMed and PsychInfo, and supplemented by expert selection. 1017 studies were identified, and 128 were included.

Results: The heterogeneity of study methods does not permit any overall estimate of effect strength. The available evidence shows that traumatic experiences due to extreme weather events increase the risk of affective and anxiety disorders, especially the risk of post-traumatic stress disorder. Heat significantly increases the morbidity and mortality attributable to mental illness, as well as the frequency of psychiatric emergencies. Persistent stressors such as drought, food insecurity, and migration owing to climate change can also be major risk factors for mental illness.

Conclusion: The consequences of climate change are stress factors for mental health. Therefore, as global warming progresses, an increasing incidence and prevalence of mental illness is to be expected. Vulnerable groups, such as the (already) mentally ill, children, and adolescents, need to be protected. At the same time, there is a need for further systematic research on the mechanisms of action and effects of climate change on mental function.

Cite this as:

Walinski A, Sander J, Gerlinger G, Clemens V, Meyer-Lindenberg A, Heinz A:
The effects of climate change on mental health. *Dtsch Arztebl Int* 2023; 120: 117–24.
DOI: 10.3238/arztebl.m2022.0403

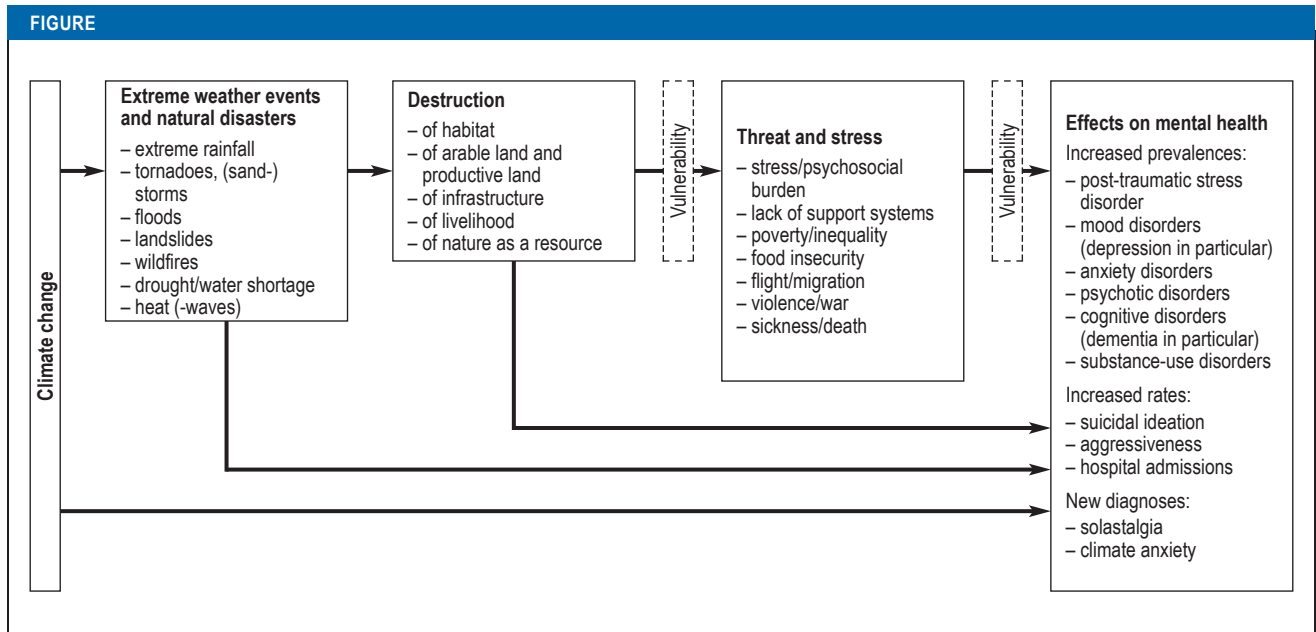
Climate, the Earth's ecosystems, their biodiversity, and human civilization are all closely linked. Climate change is man-made, the consequences of which exceed the capacity of the various ecosystems to adapt. The loss and damage caused (1) is becoming an increasingly palpable and visible threat to human health (2, 3).

Although it may not be possible to establish a clear causal relationship, climate change has nevertheless led to an increase in frequency and intensity of natural disasters and extreme weather events. These are having a most obvious impact on human health and are used in the scientific literature to operationalize climate change (2, 4). This overall situation is also associated with long-term changes to living conditions which can have a stressful impact on mental well-being (3).

In this narrative review, we summarize current global evidence of the direct and indirect effects of climate change on mental health, underlining available information about those particularly vulnerable groups such as children and adolescents.

cme plus +

This article has been certified by the North Rhine Academy for Continuing Medical Education. Participation in the CME certification program is possible only over the internet: cme.aerzteblatt.de. The deadline for submission is 23 February 2024.



Schematic representation of the association between climate change and mental health

Methods

Using the literature databases PubMed and PsycINFO, a systematic search was conducted for the direct effects (natural disasters, i.e., floods, storms, fires; extreme weather conditions, i.e., heat and drought) and indirect effects (climate-related migration, food insecurity) of climate change on mental health (ICD-10/DSM-5 diagnostic codes; mental distress; psychiatric hospital admissions). It was concluded on November 16, 2021.

Additional literature recommendations were formulated by a panel of experts from the German Association for Psychiatry and Psychotherapy, Psychosomatics and Neurology (DGPPN) on the subject of climate change and mental health (*eMethods*). The search included studies involving all human populations, worldwide. After removing any duplicates, a total of 1017 articles published between 2000 and 2021 were screened, leaving 128 articles for final inclusion (*eFigure*). A detailed description of the methodology used can be found in the *eMethods*.

Results

In the following, we will first present the evidence covering the direct effects on mental health of acute and chronic exposure to climate change, followed by their indirect effects. The *Figure* provides a schematic representation of the association between the effects of climate change and mental health. The results of the most important studies mentioned are presented in detail in *eTables 1–3*, while *Tables 1 and 2* contain brief accounts. Preference is given to reports of systematic reviews and results of meta-analyses.

Direct effects: Acute exposure

Floods

Climate change has led to an increase in flood events, which in turn are particularly associated with an increased prevalence of anxiety disorders, post-traumatic stress disorders (PTSD) as well as symptoms of depression (5–9).

A meta-analysis of the consequences of flooding in the United Kingdom showed that, six to 12 months after the extreme weather event of flooding, the point prevalence for PTSD was significantly increased in those affected in comparison with the lifetime prevalence in the general population (30.36% versus 7.4%) (5). Even three years after a flood disaster, the health-related quality of life of those directly affected by flooding is severely restricted in comparison with unaffected persons with regard to anxiety/depression (odds ratio [OR] = 4.30; 95% confidence interval [2,48; 7,72]) (10). The main predictors of developing a mental health condition after a flood disaster are socioeconomic vulnerability, long-term displacement (7), persistent material damage (9), and insurance-related problems (8) (*eTable 1*). The buffer effect of social support after a flood disaster is reduced by the severity of the impact of the floods (11). Vulnerable personal living conditions result in a greater risk of developing symptoms of depression (12). However, tourists who had been exposed to flooding and then returned to an unaffected home country also demonstrated long-term symptoms of PTSD, depending of the severity of their exposure (13, 14). Children and adolescents are particularly vulnerable (15). It is assumed that they have at their disposal fewer coping

TABLE 1

Evidence of the direct effects of acute exposure to natural disasters on mental health

Study design	Exposure/region	Dependent variable	Population	Follow-up	Effects	Evidence level
Floods and inundations						
Meta-analysis/narrative review (5)	Flood/UK	Anxiety disorder, depression, PTSD	n = 1522 affected	6 to 12 months	Point prevalences of anxiety disorder 19.78% [7.42; 32.15]; depression 21.35% [9.04; 33.65]; PTSD 30.36% [11.68; 49.05]	low
Cross-sectional study/case-control study (6)	Flood/Spain	PTSD	n = 70 affected, n = 91 unaffected		PTSD OR = 8.18 [3.99; 17.59] directly affected vs. unaffected	low
Cross-sectional study (7)	Flood/Australia	Anxiety disorder, depression, PTSD, suicidal ideation	n = 2180 affected	6 months	Point prevalences of anxiety disorder 16%, depression 15%, PTSD: 15%, suicidal ideation: 7%	moderate
Cross-sectional study (13)	Tsunami/Southeast Asia	PTSD	Scandinavian tourists n = 124 unaffected, indirectly affected, directly affected	6 to 14 months	Unaffected: z = 0.00 (SD = 1.00), indirectly affected: z = 1.01 (SD = 1.25), directly affected: z = 1.53 (SD = 1.27)	low
Storms						
Cross-sectional study (19)	Hurricane/USA	Anxiety disorder/affective disorder, PTSD	n = 1043, population survey		30 day prevalences of anxiety disorder/mood disorder 49.1% (directly affected), 26.4% (indirectly affected), p <0.001; PTSD: 30.3% (directly affected), 12.5% (indirectly affected), p <0.001	low
Longitudinal study (20)	Hurricane/USA	Psychological distress (PD), serious mental illness (SMI), PTSD	n = 438 affected low-income mothers	pre, post in years 1, 3–4, 10–12	Point prevalences (pre, post 1 year, 3–4 years, 10–12 years) PB: 23.95%, 35.16%, 30.14%, 28.54%; SMI: 6.1%, 11.6%, 10.7%, 10.7%; PTSD: –, 43.84%, 31.96%, 16.67%	moderate
Longitudinal study (28)	Hurricane/USA	Steroid hormones at age 3–4 years, neurobehavioral profile	Mother-child dyads: n = 144 PNSS(–) pregnant before/after hurricane Sandy; n = 85 PNSS(+) pregnant during hurricane Sandy		PNSS(+) vs. PNSS(–): cortisol levels (111.11 vs. 76.49 pg/mg, p = 0.001); dehydroepiandrosterone (DHEA) levels (13.11 vs. 20.25 pg/mg, p = 0.02) cortisol:DHEA ratio (13.81 vs. 6.87; p = 0.01); anxiety (54.19 vs. 49.85; p = 0.002); aggression (48.89 vs. 46.45; p = 0.04)	low
Fires						
Scoping review (33)	Wildfires and bushfires/worldwide	PTSD, depression, anxiety disorder	General population (children, adolescents, adults) in communities devastated by wildfires	pre, 3, 6 and 18 months, 3 and 10 years	Point prevalences, children and adolescents: PTSD (subacute: 92%; 6 months: 9–29.4%; 12 months: 27–37%; after 20 years no increased lifetime prevalence); depression (6 months 4.7–20%; 18 months: 33.3%); anxiety disorder (6 months: 14.1%; 18 months: 27%; after 20 years significantly increased lifetime prevalence)	very low
Cross-sectional study/case-control study (34)	Wildfire/USA	PTSD, depression, anxiety disorder	n = 725 (1) no exp. = learned about it, (2) indirect = witnessed it, (3) direct = happened to me	6 months	Comparison with those not exposed: PTSD (f ² = 0.06; p <0.05); depression (direct f ² = 0.01; p <0.05, indirect f ² = 0.02; p <0.05); anxiety disorder (direct f ² = 0.01; p <0.05, indirect f ² = 0.01; p <0.05)	low
Longitudinal study (35)	Bushfire/Australia	PTSD, any DSM-IV disorder	n = 529 bushfire exposed in childhood; n = 464 matched control group	20 years, 1983 and 2003	1-month point prevalence rate: DSM-IV disorder 15.2% vs. 11.0%; RR = 1.42 [1.02; 1.98]; p = 0.04, PTSD: 3.2% vs. 2.4%; RR = 1.35 [0.63; 2.90]; p = 0.44; lifetime prevalence: DSM-IV disorder 36.7% vs. 31.7%; RR = 1.14 [0.96; 1.36]; p = 0.14, PTSD: 7.5% vs. 5.8%; RR = 1.36 [0.84; 2.19]; p = 0.21	low

DSM, Diagnostic and Statistical Manual of Mental Disorders; exp., exposure; OR, odds ratio; PNSS, Prenatal Sandy Stress; PTSD, post-traumatic stress disorder; RR, relative risk; SD, standard deviation; UK, United Kingdom

strategies after traumatic flood disasters and experience less self-efficacy (16). In particular, children prone to rumination have an increased risk of developing symptoms of depression after experiencing a flood (17).

Storms

Storms and tornadoes cause damage and destruction and, consequently, mental stress to patients with pre-existing mental disorders. They can also create new psychiatric disorders in previously healthy individuals (in particular anxiety-mood disorders, PTSD) (18–21).

After hurricane Katrina in 2006 in New Orleans (USA), the 30-day prevalence of anxiety-mood disorders, including PTSD, rose to 49.1% in those directly affected (19). Hurricane-related post-traumatic stress symptoms are still measurable up to 12 years after the event (*Table 1, eTable 1*) (20, 22).

The likelihood of posttraumatic symptoms and depression increases with the severity of exposure, even more so in the case of physical injury, death or serious injury to household members, low income, and storm-related property damage (22). Other risk factors for depression and post-traumatic symptoms include loss of social support and socioeconomic decline (23–26).

The expansion of deserts worldwide has resulted in more frequent adverse health effects from dust storms, the consequences of which are similar to those of fine particulate air pollution (27).

Even prenatal exposure to hurricanes can result in increased anxiety and elevated cortisol levels (111.11 versus 76.49 pg/mg, $p < 0.001$) in early childhood (28). Adolescents and young adults with family dysfunction and other traumatic experiences are particularly vulnerable (25, 29). Between 20.3% and 49.4% of health-care first responders after a hurricane reach, or even exceed, the clinical cut-off score for PTSD (30, 31). The mentally ill are also particularly at risk from destroyed supply chains and infrastructure: Following hurricane Katrina in the USA, the successful treatment completion rate among discharged patients with a comorbid mental disorder declined significantly from 36.8% to 18.7% (32).

Fires

A recent review shows high prevalences of PTSD (15.6–60%), depression, and generalized anxiety in adults between the post-acute phase (three months) and up to years after a wildfire or bushfire (33) (*Table 1, eTable 1*). The principle risk factor is the fire trauma itself, i.e., a high level of exposure to a fire has a stronger effect on mental health than a low level of exposure (34).

An increased rate of mental disorders (PTSD during the subacute phase after a wildfire: 92 %, depression after 18 months: 33.3 %, anxiety disorder after 18 months: 27 %) was also found after wildfires and bushfires in the child population of the mentioned review (33). An Australian longitudinal study showed that experiencing bushfires in childhood can be most

stressful. In adulthood, 20 years later, the prevalence of lifetime anxiety disorder is greater than in an unaffected control group (21.5% versus 16%, relative risk [RR] = 1.37 [1.05; 1.78], $p < 0.05$). Lifetime and point prevalence rates after 20 years for depression and eating disorders were not significantly increased as a result of experiencing a fire in childhood (35). If other traumatic experiences are added to the fire event during further life, however, there is an increased prevalence of lifetime PTSD for children (7.8% versus 5.8%, RR = 1.80 [1.11; 2.93], $p < 0.05$), but not without this cumulative effect (35).

The negative income development in areas after a fire disaster can lead to increased violence, especially against women, resulting in negative effects on their mental health several years after the fire disaster (36). A systematic review of the consequences for the health of firefighters confronted with wildland fires came to the result that 10 to 20% of responders reported post-traumatic stress symptoms (37). Other vulnerable groups are elderly people with dementia, inhabitants of rural communities, and indigenous populations (38).

Direct effects: Chronic exposure

Heat

Heat is associated with increased morbidity, a surge in psychiatric emergencies, and a significantly increased risk of dying from mental disorders: Thus, the morbidity of mood disorders, organic mental disorders, schizophrenia, and neurotic and anxiety disorders increases with high outdoor temperatures and during heatwaves (39, 40). For example, the risk for mental morbidity during heatwaves was increased by 6.4% (39) (*Table 2, eTable 2*).

Heat is associated with increasing numbers of psychiatric emergencies and (emergency) admissions to psychiatric hospitals (e1, e2). There is a notable positive association between heat and hospital admissions, especially for psychoses (39) and dementia (e3). The availability of outpatient healthcare services and of green open spaces, on the other hand, appears to be a protective factor (e4).

Mental disorders are also among the most important risk factors for heat-related deaths, tripling (OR = 3.61) the risk of dying during a heatwave (39, e5, e6). In extreme heat, the use of alcohol, medications, and illegal drugs is associated with an increased risk of mortality. A systematic review also shows in 15 of 17 studies a positive association between higher temperatures and the incidence of suicides (RR = 1.04–1.37) (*eTable 2*) (e7). In the week after moderate and extreme heat, there is an approximately twofold increased (cumulative) risk of mortality from suicide (RR = 1.8 and 2.16, respectively) (e8). Until the beginning of a national suicide prevention program in Finland, temperature variations explained more than 60% of suicide variance (e9). For several decades in North America, suicide rates were associated with the average monthly temperature, in-

TABLE 2

Evidence of the direct effects of chronic exposure to extreme weather on mental health

Study design	Exposure/region	Dependent variable	Population	Effects	Evidence level
Heat					
Systematic review/meta-analysis (39)	Heat/worldwide	Mortality, morbidity for mental disorders and suicides (ICD-10)	General population	Per 1° C increase in ambient temperature RR = 1.022 [1.015; 1.029] for mental health-related mortality (organic mental disorders RR = 1.033 [1.020; 1.046], suicide and self-harm RR = 1.012 [1.003; 1.021]) RR = 1.009 [1.007; 1.015] for mental health-related morbidity (RR = 1.011 [1.003; 1.018] mood disorders, RR = 1.008 [1.001; 1.015] organic mental disorders, RR = 1.007 [1.002; 1.011] schizophrenia, RR = 1.007 [1.001; 1.013] neurotic and anxiety disorders) Heatwaves: RR = 1.064 [1.006; 1.123] for mental health-related morbidity	moderate
Meta-analysis (e5)	Heatwaves/worldwide	Deaths	n = 1065 deaths n = 1485 controls	Risk factors for heat-related death: pre-existing psychiatric illness OR = 3.61 [1.3; 9.8]	low
Longitudinal analysis (e8)	Temperature, relative humidity/Brussels	Suicides	Population of Brussels aged 5 years or older n = 1891 suicides	Cumulative RR for suicide in the week after moderate heat 1.8 [1.27; 2.54], after extreme heat 2.16 [1.28; 3.63]	low
Longitudinal analysis (e9)	Ambient temperature/Finland	Suicides	n = 94 356 suicides	1751–1990 (1990–2005 national suicide prevention program); r = 0.79 (P = 0.0044; R ² = 62.4) Temperature (30-year average values) associated with suicide rates	very low
Longitudinal analysis (e10)	Temperature/USA, Mexico	Suicides	n (USA) = 851 088 suicides n (Mexico) = 611 366 suicides	Rise in suicide rates by 0.68% [0.53%; 0.83%] (USA 1968–2004 and 2.1% [1.2%; 3%] (Mexico 1990–2010) for a 1° C increase in average monthly temperature	high
Drought					
Cross-sectional study (e15)	Drought/Australia	Depression/ "mental health problems"	n = 8000 adults in rural and regional areas	OR = 1.26 [1.07; 1.49] for psychological problems during drought (13.3% vs. 10.8%), increased risk for farmers (17.8% vs. 13.8%, p >0.05, OR = 1.36 [0.98; 1.87] and farm workers (11.9% vs. 5.5%, p <0.001, OR = 2.24 [1.40; 3.60])	very low
Longitudinal analysis (e17)	Temperature, drought/Australia	Suicides	General population from the age of 10 years	RR = 1.15 [1.08; 1.22], p <0.001 Increased RR of suicide for rural males (aged 30–49 years) with rise in drought index (HDI) from 1st to 3rd quartile. 4.01 suicides per year [2.14; 6.05], p <0.001 in rural males aged 30 to 49 years are associated with drought, accounting for 9% of the total number of suicides in that group. Suicides in 30 to 49-year-old rural females: -0.72 [-1.32; -0.01], p <0.05)	high
Cross-sectional study (e20) Follow-up: e21	Drought/Australia	Emotional distress, awareness and perceptions of drought	Children and adolescents (11–17 years and remote regions, n = 334 for questionnaires, n = 84 for focus groups	Children and adolescents in regions affected by drought report of more emotional distress than the normal sample (t(329) = 1.55, p >0.05). More emotional distress in children on farms vs. those living in rural regions, no statistical significance (t(328) = 0.43, p >0.05)	very low
Cross-sectional study (e21) Follow-up to (e20), 3 years later	Drought/Australia	Emotional distress, awareness and perceptions of drought	(e20), n = 111 for questionnaires, n = 61 for focus groups	Adolescents in regions affected by drought report of more emotional distress than the comparative population (t [152] = 4.34, p <0.01) and more than the population in the study 3 years previously (t [191] = 2.80, p <0.01), 12% (versus 10% in normal sample) have emotional distress in the potentially clinically relevant range, exposure to/experience of drought is correlated with emotional distress (r = 0.40, p <0.001)	very low

OR, odds ratio; RR, relative risk

creasing by 0.7% (USA) and 2.1% (Mexico) for a 1° C temperature increase (e10).

There are comparatively few studies available on children and adolescents. However, a deterioration of mental health and increase in emergency department contacts for mental disorders with rising temperatures was also demonstrated for this young group (e11–e14).

Drought

People who are, or were, affected by drought have a 26% higher likelihood (OR = 1.26; $p < 0.01$) of mental problems than those not affected (13.3% versus 10.8%) (e15). The direct and indirect, and especially economical, effects of drought promote the development of depression and anxiety disorders as well as increased alcohol and substance use (e16). Drought is also associated with increased suicide rates. Australian long-term data revealed that, with increased values of the drought index, there was a 15% increased risk of suicide for rural middle-aged men (e17).

As a result of malnutrition and loss of livelihood, as well as due to economic factors (e16), droughts have the effect of potentially chronic psychological stress factors (e19), especially for those working in agriculture (e18). In addition, there is a potential for increased family tension, emotional stress, and domestic or intimate-partner violence (e16, e20, e21).

Indirect effects

Apart from the direct effects of environmental pollution and natural disasters or extreme weather events, climate change is also associated with indirect and systemically mediated health effects (e22).

Food insecurity

Not only can drought be the cause of food shortage and the destruction of, or alteration to, agricultural areas (e16), but the nutritional content and quality of cereal crops may also decrease, resulting in the development of deficiency symptoms (e23).

Poor nutrition can impair cognition and also cause mental symptoms, such as fatigue, lethargy, depression, manias, and psychoses (e23, e24). Food insecurity in British families, for example, was associated with maternal depression, psychotic disorders, domestic violence, and behavioral problems in children (e25), see *eTable 3* for details.

Malnutrition in children can impair (neuronal) development, resulting in an increased risk of mental illnesses such as depression and attention deficit hyperactivity disorder (e23). Other vulnerable groups include women and the elderly in whom a particularly strong dose-dependent relationship is evident between food insecurity and distress (e26, e27) as well as mental disorders (e28, e29).

Climate-related migration

Economic and institutional crises can also arise from climate change. The destabilization of states, groups,

and regions induced by climate change can lead to violent conflicts and wars, acting as a driver of environmentally induced migration (e30).

The forced, permanent displacement of people increases the probability of their developing anxiety and affective disorders (e31–e34). Negative experiences and difficulties in the adjustment process after migration also lower self-esteem, promote depressive symptoms, and increase the risk of suicide (e35). Refugees also have a higher risk of developing psychotic disorders than non-refugee migrants (e36).

Children and adolescents in particular suffer from migration-related stressors. In a systematic review, Kien and colleagues (2019) report of point prevalences of between 19% and 52.7% for PTSD, 10.3 to 32.8% for depression, 8.7 to 31.6% for anxiety disorders, and 19.8 to 35% for emotional and behavioral problems (e37) (*eTable 3*).

Flight and migration are considerable psychological stressors (e22, e30, e38). Apart from those stress factors which initially forced people to migrate, their experience of migration itself can be characterized by numerous material and psychological losses. Stress, separation and loneliness, loss of identity, no sense of belonging, lack of social values and networks with no support and socioeconomic resources are significant risk factors for mental health (e16, e30, e31, e39). Children can be separated from their parents during flight (e40) and are particularly at risk of experiencing violence during (e41, e42), as well as after, flight (e43).

An uncertain residence status, with its associated restricted rights, and difficulties with integration are additional stress factors during migration to a foreign country (e44, e45). At the same time, there are also barriers to accessing psychiatric health care (e45, e46).

Environmental migration often involves moving from rural to urban areas, thus often depriving those affected of an environment with green spaces as a protective factor and putting a strain on mental health with additional city-specific risk factors, such as air pollution and noise (e31, e47). Added to this, there is often deterioration in living and working conditions (e48).

Discussion

These results indicate that, with progressive global warming, a greater mental health burden on the general population and an increased need for care for mental disorders are to be expected. Heat makes many mental disorders worse, with subsequent increases in morbidity and mortality. Natural disasters raise the prevalence of, above all, PTSD, depression and anxiety disorders of those affected.

The effects of climate change on health are unequally distributed (e49–e52). Increased geographical exposure, the underlying health status, and limited adaptive and coping capacities can increase the vulnerability of individuals or populations. Mentally ill people as well as children and adolescents belong to those groups of people who are particularly vulnerable to the effects of climate change (e50).

Climate change-related disasters can destroy infrastructures of the health care system and, at the same time, raise demands on health care (e55). Germany too is affected by an increasing number of natural disasters and weather extremes; a progressive disease burden of mental health is to be expected as a result of climate change (e53, e54).

There is further need for research on the newly developed syndromes brought on by climate change, including “solastalgia” (emotional reaction to the destruction of the environment) and “climate anxiety” (expectation of future involvement) (e56, e57).

Adaptations of the care systems to the anticipated increased psychiatric and psychotherapeutic needs and to the expanded spectrum of diagnoses resulting from climate change appear to be an urgent necessity.

Limitations

It should be added by way of caveat that studies looking at the mental health effects of climate change cannot be randomized and only minimally controlled. As a result, their level of evidence is usually low to moderate. Furthermore, the quantitative summary of evidence is difficult in that operationalizing climate change effects has so far been very heterogeneous and often indirect. There is a need for studies with comparable methodology and coverage of mental disorders (according to DSM-5/ICD-10) as well as specific mechanisms of action.

Conclusions

These available studies demonstrate that the consequences of climate change are stress factors for mental health. Therefore, as global warming progresses, an increasing incidence and prevalence of mental illnesses are to be expected. The slowing down of climate change by reducing CO₂ emissions and measures to also counteract the long-term effects of climate change (for example, green areas in towns, heat protection in hospitals) are urgently needed. Health resilience programs at individual and societal levels are needed to at least attempt to address the impending stresses on humanity’s mental health from climate change (e55).

Acknowledgement

We would like to thank all the members of the DGPPN task force “Climate change and mental health” who provided us with their literature collection and expertise for this review: Prof. Dr. med. Mazda Adli, Dr. med. Barbara Bornheimer, Dr. med. Lasse Brandt, Prof. Dr. med. Dr. phil. René Hurlmann, Julie Holzhausen, Dr. med. Sebastian Karl, PD Dr. med. Hans Knoblauch, Prof. Dr. med. Christoph Nikendei, Sandy Pistol, Prof. Dr. med. Steffi G. Riedel-Heller, Dr. med. Nina Marsh, Anna-Karina Schomburg M. A., Dr. med. Kirsten Shukla, Dr. med. Dr. PH Stefan Weinmann, Dipl.-Psych. Franziska Welzel.

Conflict of interest statement

Prof. Meyer-Lindenberg has taken on paid and unpaid work for the foundation “Hector Stiftung II”, for Janssen-Cilag GmbH, MedinCell, Sage Therapeutics, Anna-Monika Stiftung, the German Association for Psychiatry, Psychotherapy and Psychosomatics, the German Research Foundation, the Permanent Senate Commission on Key Questions in Clinical Research, the Heinrich Lanz Center, Leopoldina, and the European College of Neuropsychopharmacology.

The other authors confirm that no conflict of interest exists.

Manuscript received on 30 June 2022, revised version accepted on 07 December 2022.

Translated from the original German by Dr. Grahame Larkin, MD

References

1. IPCC: IPCC. Climate change 2022: synthesis report. Contribution of working groups I, II and III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change. Geneva 2022.
2. Cianconi P, Betrò S, Janiri L: The impact of climate change on mental health: a systematic descriptive review. *Front Psychiatry* 2020; 11: 74.
3. Clayton S: Climate change and mental health. *Curr Envir Health Rep* 2021; 8: 1–6.
4. Hayes K, Blashki G, Wiseman J, Burke S, Reifels L: Climate change and mental health: risks, impacts and priority actions. *Int J Ment Health Syst* 2018; 12: 28.
5. Cruz J, White PCL, Bell A, Coventry PA: Effect of extreme weather events on mental health: a narrative synthesis and meta-analysis for the UK. *Int J Environ Res Public Health* 2020; 17: E8581.
6. Fontalba-Navas A, Lucas-Borja ME, Gil-Aguilar V, Arrebola JP, Pena-Andreu JM, Perez J: Incidence and risk factors for post-traumatic stress disorder in a population affected by a severe flood. *Public Health* 2017; 144: 96–102.
7. Matthews V, Longman J, Berry HL, et al.: Differential mental health impact six months after extensive river flooding in rural Australia: a cross-sectional analysis through an equity lens. *Front Public Health* 2019; 7: 367.
8. Mulchandani R, Smith M, Armstrong B, English National Study of Flooding and Health Study Group, Beck CR, Oliver I: Effect of insurance-related factors on the association between flooding and mental health outcomes. *Int J Environ Res Public Health* 2019; 16: E1174.
9. Mulchandani R, Armstrong B, Beck CR, et al.: The English National Cohort Study of Flooding & Health: psychological morbidity at three years of follow up. *BMC Public Health* 2020; 20: 321.
10. Robin C, Beck C, Armstrong B, Waite TD, Rubin GJ, Oliver I: Impact of flooding on health-related quality of life in England: results from the National Study of Flooding and Health. *Eur J Public Health* 2020; 30: 942–8.
11. Amberg FK, Hultman CM, Michel P-O, Lundin T: Social support moderates posttraumatic stress and general distress after disaster. *J Trauma Stress* 2012; 25: 721–7.
12. Furusawa T, Pitakaka F, Gabriel S, Sai A, Tsukahara T, Ishida T: Health and well-being in small island communities: a cross-sectional study in the Solomon Islands. *BMJ Open* 2021; 11: e055106.
13. Heir T, Sandvik L, Weisæth L: Hallmarks of posttraumatic stress: symptom z-scores in a tsunami-affected tourist population. *Psychopathology* 2009; 42: 157–64.
14. Heir T, Rosendal S, Bergh-Johannesson K, et al.: Tsunami-affected Scandinavian tourists: disaster exposure and post-traumatic stress symptoms. *Nord J Psychiatry* 2011; 65: 9–15.
15. Mambrey V, Wermuth I, Böse-O'Reilly S: [Extreme weather events and their impact on the mental health of children and adolescents]. *Bundesgesundheitsblatt Gesundheitsforschung Gesundheitsschutz* 2019; 62: 599–604.
16. Baggerly J: International interventions and challenges following the crisis of natural disasters. In: Webb NB (eds.): *Play therapy with children in crisis: individual, group, and family treatment*, 3rd ed New York, NY: The Guilford Press 2007; 345–67.
17. Felton JW, Cole DA, Martin NC: Effects of rumination on child and adolescent depressive reactions to a natural disaster: the 2010 Nashville flood. *J Abnorm Psychol* 2013; 122: 64–73.
18. Bozick R: The effects of hurricane Harvey on the physical and mental health of adults in Houston. *Health Place* 2021; 72: 102697.
19. Galea S, Brewin CR, Gruber M, et al.: Exposure to hurricane-related stressors and mental illness after hurricane Katrina. *Arch Gen Psychiatry* 2007; 64: 1427.
20. Raker EJ, Lowe SR, Arcaya MC, Johnson ST, Rhodes J, Waters MC: Twelve years later: the long-term mental health consequences of hurricane Katrina. *Soc Sci Med* 2019; 242.
21. Shultz JM, Galea S: Preparing for the next Harvey, Irma, or Maria—addressing research gaps. *N Engl J Med* 2017; 377: 1804–6.
22. Schwartz RM, Gillezeau CN, Liu B, Lieberman-Cribbin W, Taioli E: Longitudinal impact of hurricane Sandy exposure on mental health symptoms. *Int J Environ Res Public Health* 2017; 14: E957.

23. Joseph NT, Matthews KA, Myers HF: Conceptualizing health consequences of hurricane Katrina from the perspective of socioeconomic status decline. *Health Psychol* 2014; 33: 139–46.
24. Pietrzak RH, Van Ness PH, Fried TR, Galea S, Norris FH: Trajectories of posttraumatic stress symptomatology in older persons affected by a large-magnitude disaster. *J Psychiatr Res* 2013; 47: 520–6.
25. Robertson AA, Morse DT, Baird-Thomas C: Hurricane Katrina's impact on the mental health of adolescent female offenders. *Anxiety Stress Coping* 2009; 22: 433–48.
26. Zwiebach L, Rhodes J, Roemer L: Resource loss, resource gain, and mental health among survivors of hurricane Katrina. *J Trauma Stress* 2010; 23: 751–8.
27. Lee H, Jung J, Myung W, et al.: Association between dust storm occurrence and risk of suicide: case-crossover analysis of the Korean national death database. *Environ Int* 2019; 133: 105146.
28. Nomura Y, Rompala G, Pritchett L, Aushev V, Chen J, Hurd YL: Natural disaster stress during pregnancy is linked to reprogramming of the placenta transcriptome in relation to anxiety and stress hormones in young offspring. *Mol Psychiatry* 2021; 40: 204–16.
29. Yang P, Yen C-F, Tang T-C, et al.: Posttraumatic stress disorder in adolescents after Typhoon Morakot-associated mudslides. *J Anxiety Disord* 2011; 25: 362–8.
30. Powell TM, Yuma PJ, Scott J, et al.: In the aftermath: the effects of hurricanes Harvey and Maria on the well-being of health-care and social service providers. *Traumatology* 2020; 26: 298–307.
31. Tosone C, McTighe JP, Bauwens J: Shared traumatic stress among social workers in the aftermath of hurricane Katrina. *Br J Soc Work* 2015; 45: 1313–29.
32. Shuler M, Suzuki S, Podesta A, Qualls-Hampton R, Wallington SF: A post-hurricane Katrina examination of substance abuse treatment discharges with co-occurring psychiatric and substance use disorders. *J Dual Diagn* 2017; 13: 144–56.
33. To P, Eboireim E, Agyapong VIO: The impact of wildfires on mental health: a scoping review. *Behav Sci* 2021; 11: 126.
34. Silveira S, Kornbluh M, Withers MC, Grennan G, Ramanathan V, Mishra J: Chronic mental health sequelae of climate change extremes: a case study of the deadliest Californian wildfire. *Int J Environ Res Public Health* 2021; 18: 1487.
35. McFarlane AC, Van Hooff M: Impact of childhood exposure to a natural disaster on adult mental health: 20-year longitudinal follow-up study. *Br J Psychiatry* 2009; 195: 142–8.
36. Molyneaux R, Gibbs L, Bryant RA, et al.: Interpersonal violence and mental health outcomes following disaster. *BJPsych Open* 2019; 6: e1.
37. Groot E, Caturay A, Khan Y, Copes R: A systematic review of the health impacts of occupational exposure to wildland fires. *Int J Occup Med Environ Health* 2019; 32: 121–40.
38. Farugia TL, Cuni-Lopez C, White AR: Potential impacts of extreme heat and bushfires on dementia. *J Alzheimers Dis* 2021; 79: 969–78.
39. Liu J, Varghese BM, Hansen A, et al.: Is there an association between hot weather and poor mental health outcomes? A systematic review and meta-analysis. *Environ Int* 2021; 153: 106533.
40. Chen N-T, Lin P-H, Guo Y-L: Long-term exposure to high temperature associated with the incidence of major depressive disorder. *Sci Total Environ* 2019; 659: 1016–20.

Corresponding author

Prof. Dr. med. Andreas Meyer-Lindenberg
 Central Institute of Mental Health (CIMH)
 J 5, 68159 Mannheim
 Andreas.Meyer-Lindenberg@zi-mannheim.de

Cite this as:

Walinski A, Sander J, Gerlinger G, Clemens V, Meyer-Lindenberg A, Heinz A: The effects of climate change on mental health. *Dtsch Arztebl Int* 2023; 120: 117–24. DOI: 10.3238/arztebl.m2022.0403

► **Supplementary material**

eReferences, eMethods, eTables, eFigure, eBoxes:
www.aerzteblatt-international.de/m2022.0403

Supplementary material to:

The Effects of Climate Change on Mental Health

by Annika Walinski, Julia Sander, Gabriel Gerlinger, Vera Clemens, Andreas Meyer-Lindenberg, and Andreas Heinz

Dtsch Arztebl Int 2023; 120: 117–24. DOI: 10.3238/arztebl.m2022.0403

eReferences

- e1. Xu R, Zhao Q, Coelho MSZS, et al.: Socioeconomic level and associations between heat exposure and all-cause and cause-specific hospitalization in 1,814 Brazilian cities: a nationwide case-crossover study. *PLoS Med* 2020; 17: e1003369.
- e2. Ho HC, Wong MS, Yang L, et al.: Spatiotemporal influence of temperature, air quality, and urban environment on cause-specific mortality during hazy days. *Environ Int* 2018; 112: 10–22.
- e3. Culqui DR, Linares C, Ortiz C, Carmona R, Díaz J: Association between environmental factors and emergency hospital admissions due to Alzheimer's disease in Madrid. *Sci Total Environ* 2017; 592: 451–7.
- e4. Kurji N: Impact of heat-related illness and natural environments on behavioral health related emergency and hospital utilization in Florida. University of South Florida 2020.
- e5. Bouchama A, Dehbi M, Mohamed G, Matthies F, Shoukri M, Menne B: Prognostic factors in heat wave-related deaths: a meta-analysis. *Arch Intern Med* 2007; 167: 2170–06.
- e6. Åström DO, Schifano P, Asta F, et al.: The effect of heat waves on mortality in susceptible groups: a cohort study of a mediterranean and a northern European city. *Environ Health* 2015; 14: 30.
- e7. Thompson R, Hornigold R, Page L, Waite T: Associations between high ambient temperatures and heat waves with mental health outcomes: a systematic review. *Public Health* 2018; 161: 171–91.
- e8. Casas L, Cox B, Nemery B, Deboosere P, Nawrot TS: High temperatures trigger suicide mortality in Brussels, Belgium: a case-crossover study (2002–2011). *Environ Res* 2021; 207: 112159.
- e9. Helama S, Holopainen J, Partonen T: Temperature-associated suicide mortality: contrasting roles of climatic warming and the suicide prevention program in Finland. *Environ Health Prev Med* 2013; 18: 349–55.
- e10. Burke M, González F, Baylis P, Heft-Neal S, Baysan C, Hsiang S: Higher temperatures increase suicide rates in the United States and Mexico. *Nat Clim Chang* 2018; 28.
- e11. Xu Y, Wheeler SA, Zuo A: Will boys' mental health fare worse under a hotter climate in Australia? *Popul Environ* 2018; 40: 158–81.
- e12. Basu R, Gavin L, Pearson D, Ebisu K, Malig B: Examining the association between apparent temperature and mental health-related emergency room visits in California. *Am J Epidemiol* 2018; 187: 726–35.
- e13. Sugg MM, Dixon PG, Runkle JD: Crisis support-seeking behavior and temperature in the United States: Is there an association in young adults and adolescents? *Sci Total Environ* 2019; 669: 400–11.
- e14. Eisenman D, McCaffrey S, Donatello I, Marshal G: An ecosystems and vulnerable populations perspective on solastalgia and psychological distress after a wildfire. *Ecohealth* 2015; 12: 602–10.
- e15. Edwards B, Gray M, Hunter B: The impact of drought on mental health in rural and regional Australia. *Soc Indic Res* 2015; 121: 177–94.
- e16. Vins H, Bell J, Saha S, Hess J: The mental health outcomes of drought: a systematic review and causal process diagram. *Int J Environ Res Public Health* 2015; 12: 13251–75.
- e17. Hanigan IC, Butler CD, Kocik PN, Hutchinson MF: Suicide and drought in New South Wales, Australia, 1970–2007. *Proc Natl Acad Sci U S A* 2012; 109: 13950–5.
- e18. Daghigh Yazd S, Wheeler SA, Zuo A: Key risk factors affecting farmers' mental health: a systematic review. *Int J Environ Res Public Health* 2019; 16: E4849.
- e19. Yusa A, Berry P, J Cheng J, et al.: Climate change, drought and human health in Canada. *Int J Environ Res Public Health* 2015; 12: 8359–412.
- e20. Dean J, Stain HJ: The impact of drought on the emotional well-being of children and adolescents in rural and remote New South Wales. *J Rural Health* 2007; 23: 356–64.
- e21. Dean JG, Stain HJ: Mental health impact for adolescents living with prolonged drought. *Aust J Rural Health* 2010; 18: 32–7.
- e22. Kjellstrom T, McMichael AJ: Climate change threats to population health and well-being: the imperative of protective solutions that will last. *Glob Health Action* 2013; 6: 20816.
- e23. Adan RAH, van der Beek EM, Buitelaar JK, et al.: Nutritional psychiatry: towards improving mental health by what you eat. *Eur Neuropsychopharmacol* 2019; 29: 1321–32.
- e24. Lassale C, Batty GD, Baghdadli A, et al.: Healthy dietary indices and risk of depressive outcomes: a systematic review and meta-analysis of observational studies. *Mol Psychiatry* 2019; 24: 965–86.
- e25. Melchior M, Caspi A, Howard LM, et al.: Mental health context of food insecurity: a representative cohort of families with young children. *Pediatrics* 2009; 124: e564–72.
- e26. Carter KN, Kruse K, Blakely T, Collings S: The association of food security with psychological distress in New Zealand and any gender differences. *Soc Sci Med* 2011; 72: 1463–71.
- e27. Friel S, Berry H, Dinh H, O'Brien L, Walls HL: The impact of drought on the association between food security and mental health in a nationally representative Australian sample. *BMC Public Health* 2014; 14: 1102.
- e28. Trudell JP, Burnet ML, Ziegler BR, Luginaah I: The impact of food insecurity on mental health in Africa: a systematic review. *Soc Sci Med* 2021; 278: 113953.
- e29. Sorsdahl K, Slopen N, Siefert K, Seedat S, Stein DJ, Williams DR: Household food insufficiency and mental health in South Africa. *J Epidemiology Community Health* 2011; 65: 426–31.
- e30. Shultz JM, Rechkemmer A, Rai A, McManus KT: Public health and mental health implications of environmentally induced forced migration. *Disaster Med Public Health Prep* 2019; 13: 116–22.
- e31. Ayeb-Karlsson S: 'When we were children we had dreams, then we came to Dhaka to survive': urban stories connecting loss of well-being, displacement and (im)mobility. *Clim Dev* 2021; 13: 348–59.
- e32. Munro A, Kovats RS, Rubin GJ, et al.: Effect of evacuation and displacement on the association between flooding and mental health outcomes: a cross-sectional analysis of UK survey data. *Lancet Planet Health* 2017; 1: e134–41.
- e33. Hori M, Schafer MJ: Social costs of displacement in Louisiana after hurricanes Katrina and Rita. *Popul Environ* 2010; 31: 64–86.
- e34. Sastry N, VanLandingham M: One year later: mental illness prevalence and disparities among New Orleans residents displaced by hurricane Katrina. *Am J Public Health* 2009; 99: S725–31.
- e35. Yearwood EL, Crawford S, Kelly M, Moreno N: Immigrant youth at risk for disorders of mood: recognizing complex dynamics. *Arch Psychiatr Nurs* 2007; 21: 162–71.
- e36. Brandt L, Henssler J, Müller M, Wall S, Gabel D, Heinz A: Risk of psychosis among refugees: a systematic review and meta-analysis. *JAMA Psychiatry* 2019; 76: 1133.
- e37. Kien C, Sommer I, Faustmann A, et al.: Prevalence of mental disorders in young refugees and asylum seekers in European countries: a systematic review. *Eur Child Adolesc Psychiatry* 2019; 28: 1295–310.
- e38. Schwerdtle P, Bowen K, McMichael C: The health impacts of climate-related migration. *BMC Med* 2018; 16: 1.
- e39. Heaney AK, Winter SJ: Climate-driven migration: an exploratory case study of Maasai health perceptions and help-seeking behaviors. *Int J Public Health* 2016; 61: 641–9.
- e40. Lustig SL, Kia-Keating M, Knight WG, et al.: Review of child and adolescent refugee mental health. *J Am Acad Child Adolesc Psychiatry* 2004; 43: 24–36.
- e41. Syam H, Venables E, Sousse B, Severy N, Saavedra L, Kazour F: With every passing day I feel like a candle, melting little by little. Experiences of long-term displacement amongst Syrian refugees in Shatila, Lebanon. *Confl Health* 2019; 13: 45.

- e42. Derluyn I, Lippens V, Verachtert T, Bruggeman W, Broekaert E: Minors travelling alone: a risk group for human trafficking? *Int Mig* 2009; 48: 164–85.
- e43. Jensen T, Skar A, Andersson E, Birkeland M: Long-term mental health in unaccompanied refugee minors: pre- and post-flight predictors. *Eur Child Adolesc Psychiatry* 2019; 28: 1671–82.
- e44. Eisen EM: The impact of post-migration factors on PTSD and depressive symptoms among asylum seekers in the United States. *The George Washington University* 2017.
- e45. Samarasinghe K, Fridlund B, Arvidsson B: Primary health care nurses' conceptions of involuntarily migrated families' health. *Int Nurs Rev* 2006; 53: 301–7.
- e46. Lindert J, Schouler-Ocak M, Heinz A, Priebe S: Mental health, health care utilisation of migrants in Europe. *Eur Psychiatry* 2008; 23: s114–20.
- e47. Wolsko C, Marino E: Disasters, migrations, and the unintended consequences of urbanization: what's the harm in getting out of harm's way? *Popul Environ* 2016; 37: 411–28.
- e48. Ayeb-Karlsson S, van der Geest K, Ahmed I, Huq S, Warner K: A people-centred perspective on climate change, environmental stress, and livelihood resilience in Bangladesh. *Sustain Sci* 2016; 11: 679–94.
- e49. Berry HL, Hogan A, Owen J, Rickwood D, Fragar L: Climate change and farmers' mental health: risks and responses. *Asia Pac J Public Health* 2011; 23: 119–132.
- e50. Ebi KL, Hess JJ: Health risks due to climate change: inequity in causes and consequences. *Health Aff* 2020; 39: 2056–62.
- e51. Hall NL, Crosby L: Climate change impacts on health in remote indigenous communities in Australia. *Int J Environ Health Res* 2020; 32: 1–16.
- e52. Levy BS, Sidel VW, Patz JA: Climate change and collective violence. *Annu Rev Public Health* 2017; 38: 241–57.
- e53. Brasseur GP, Jacob D, Schuck-Zöller S (eds.): *Klimawandel in Deutschland*. Berlin, Heidelberg: Springer 2017.
- e54. Deutsche Bundesregierung: Auswirkungen des Klimawandels: Konsequenzen für Deutschland und die Welt. www.bundesregierung.de/breg-de/themen/klimaschutz/auswirkungen-klimawan-del-1669160 (last accessed on 30 June 2019).
- e55. Randolph R, Chacko S, Morsch G: Disaster medicine: public health threats associated with disasters. *FP Essent* 2019; 487: 11–6.
- e56. Albrecht G: „Solastalgia“: a new concept in health and identity. *PAN Philos Act Nat* 2005; 3: 41–55.
- e57. Clayton S: Climate anxiety: psychological responses to climate change. *J Anxiety Disord* 2020; 74: 102263.

eMETHODS

Methods

The systematic literature review was completed on 16 November 2021.

Topics currently under discussion in the scientific literature dealing with the association between climate change and mental health were identified and defined using a deductive approach.

The effects of heat, drought, floods, storms, fires, and air pollution were grouped together under direct effects.

Indirect effects included long-term impacts and consequences of the destruction of habitats and ecosystems, in particular with respect to climate change-related migration, food shortage, climate justice, and vulnerable groups.

Inclusion criteria

The inclusion criteria were as follows:

- Article in German or English
- Published from 2000 (to November 2021)
- Human populations with no age restriction

Direct effects

- Heat, floods, storms, fires, drought, air pollution
- Psychiatric diagnosis (ICD-10/DSM-5 diagnoses, including mental distress) or psychiatry-relevant indicators (for example, psychiatric emergency admission, specific symptoms as an indicator for deterioration of mental health) as dependent variables
- Original studies, quantitative data
- Also: systematic reviews or reviews containing a systematic literature search

Indirect effects

- Not necessarily psychiatric diagnoses (but also psychological impacts)
- Including qualitative data, but not exclusively original studies
- Relevance for the association between climate change and mental health and/or psychiatric care
- Search strategy

eBox 1 shows the search concepts for the systematic review in the Pubmed literature database. The review produced $n = 239$ hits for direct effects and $n = 76$ hits for indirect effects (as of 16.11.2021) (*eBox 1*).

eBox2 shows the search terms used for the systematic review in the literature database PsycINFO. The review produced $n = 356$ hits for direct effects and $n = 392$ for indirect effects (as of 16.11.2021) (*eBox 2*).

Over and above the systematic literature search, literature suggestions were also taken into account as formulated by participants of an expert committee of the DGPPN on the subject of climate and mental health. A total of 113 additional articles were subjected to the inclusion and exclusion criteria.

Data extraction

The following information was extracted from the full text review and used for the inclusion and exclusion decision:

- Authors and year of publication
- Region
- Study design
- Sample
- Independent variable/exposure
- Dependent variable

Screening process

eFigure: PRISMA flow diagram

Narrative synthesis and evaluation

The present review was developed by applying a predefined concept of keywords and search strategy, and a precise examination of titles, abstracts and, where relevant, the full text of articles. It is not, however, claimed to be a full systematic review. A full systematic report of the results was made difficult by the large number of very diverse operationalized surveys. However, good systematic review articles and meta-analyses have already been published on some topics, such as overheating. The synthesis of the findings is therefore based, where possible, on systematic reviews as well as on a selection of relevant publications and outcomes. A selection is presented in more detail in the *eTables 1–3* and assessed using the four-level GRADE evaluation system.

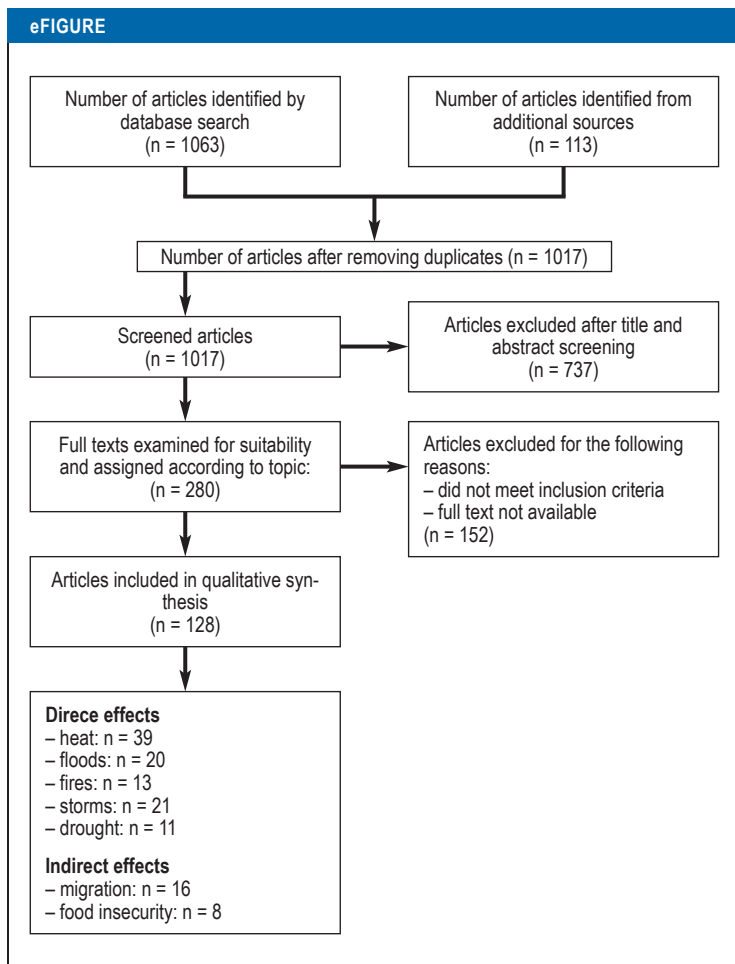
It should also be noted that the topics of climate injustice and increase in air pollution, which are less a consequence than a corollary of climate change and were initially intended to be addressed as a separate supplement in this review, could not be included in the narrative synthesis due to the large amount of evidence and for reasons of space.

DGPPN panel of experts

The DGPPN set up a task force covering the subject of “Climate Change and Mental Health”, with their first meeting taking place in September 2021. Five more meetings were held in the following 12 months. Under the direction of two members of the DGPPN board of directors, appropriate experts from psychiatric research and clinical practice were invited to participate.

The 16 members of the task force are:

Prof. Dr. Dr. Andreas Heinz, Prof. Dr. Andreas Meyer-Lindenberg, Prof. Dr. Mazda Adli, Dr. Barbara Bornheimer, Dr. Lasse Brandt, Prof. Dr. Dr. René Hurlmann, Dr. Sebastian Karl, PD Dr. Hans Knoblauch, Dr. Nina Marsh, Prof. Dr. Christoph Nikendei, Sandy Pistol, Prof. Dr. Steffi Riedel-Heller, Anna-Karina Schomburg, Dr. Kirsten Shukla, Dr. Dr. Stefan Weinmann, Franziska Welzel.



PRISMA flow diagram

eBOX 1

PubMed search terms

Direct effects

“Climatic Processes/adverse effects”[Mesh] OR “Climate Change”[Mesh:NoExp] OR “Global Warming”[Mesh] OR “Greenhouse Effect”[Mesh] OR “climate change”[tw] OR “global warming”[tw] OR “greenhouse effect”[tw] OR “environmental change” OR “air pollution”[tw] AND “Natural Disasters”[Mesh] OR flood*[tw] OR flooding*[tw] OR storm*[tw] OR hurricane*[tw] OR cyclone*[tw] OR tornado*[tw] OR wildfire*[tw] OR drought*[tw] OR “extreme weather”[tw] OR heat[tw] OR “heat wave”[tw] OR “natural disaster”[tw] OR “hot temperature”[tw] AND “Mental Health”[Mesh] OR “Mental Disorders”[Mesh] OR “Suicide”[Mesh] OR “mental health”[tw] OR “mental illness”[tw] OR “mental disorder”[tw] OR “psychiatric disorder”[tw] OR “psychological effect”[tw] OR “psychological consequence”[tw] OR suicide[tw] OR psychiatry[tw] OR “mentally ill”[tw] OR “psychiatric emergenc”[tw] OR “psychiatric hospital admission”[tw]

Indirect effects

“Climatic Processes/adverse effects”[Mesh] OR “Climate Change”[Mesh:NoExp] OR “Global Warming”[Mesh] OR “Greenhouse Effect”[Mesh] OR “climate change”[tw] OR “global warming”[tw] OR “greenhouse effect”[tw] OR “environmental change” OR “air pollution”[tw] AND “Mental Health”[Mesh] OR “Mental Disorders”[Mesh] OR “Suicide”[Mesh] OR “mental health”[tw] OR “mental illness”[tw] OR “mental disorder”[tw] OR “psychiatric disorder”[tw] OR “psychological effect”[tw] OR “psychological consequence”[tw] OR suicide[tw] OR psychiatry[tw] OR “mentally ill”[tw] OR “psychiatric emergenc”[tw] OR “psychiatric hospital admission”[tw] AND “Human Migration/psychology”[Mesh] OR “Biodiversity”[Mesh:NoExp] OR “climate migration”[tw] OR “climate-induced migration”[tw] OR “climate-related migration”[tw] OR “displacement”[tw] OR “internal displacement”[tw] OR relocation[tw] OR “food security”[tw] OR “food insecurity”[tw] OR “climate justice”[tw] OR “environmental justice”[tw] OR “environmental migration”[tw] OR biodiversity[tw] OR “biodiversity loss”[tw] OR “Refugees/psychology”[Mesh] OR “environmental refugee”[tw]

eBOX 2

PsycINFO search terms

Direct effects

TX (adverse climatic processes or climate change or global warming or greenhouse effect or environmental change or air pollution) AND TX (natural disasters or flood* or flooding or storm or hurricane or cyclone or tornado or wildfire or drought or extreme weather or heat or heat wave or natural disaster or hot temperature) AND TX (mental health or mental disorders or suicide or mental health or mental illness* or mental disorder* or psychiatric disorder or psychiatric illness or psychological effect or psychological consequence* or suicide or psychiatry or mentally ill or psychiatric emergenc* or psychiatric hospital admission*).

Indirect effects

TX (adverse climatic processes or climate change or global warming or greenhouse effect or environmental change or air pollution) AND TX (mental health or mental disorders or suicide or mental health or mental illness* or mental disorder* or psychiatric disorder or psychiatric illness or psychological effect or psychological consequence* or suicide or psychiatry or mentally ill or psychiatric emergenc* or psychiatric hospital admission*) AND TX (human migration psychology or biodiversity or climate migration or climate-induced migration or climate-related migration or displacement or internal displacement or relocation or food security or food insecurity or climate justice or environmental justice or environmental migration or biodiversity or biodiversity loss* or refugees psychology or environmental refugee).

Questions on the article in issue 8/2023:

The Effects of Climate Change on Mental Health

The submission deadline is 23 February 2024. Only one answer is possible per question. Please select the answer that is most appropriate.

Question 1

A meta-analysis in the United Kingdom shows an increased point prevalence of post-traumatic stress disorder in those affected 6–12 months after a flood event in comparison with the lifetime prevalence of the general population. Which point prevalence was reported (those affected versus general population)?

- a) 3% versus 1%
- b) 15% versus 4%
- c) 30% versus 7%
- d) 40% versus 20%
- e) 50% versus 25%

Question 2

Prenatal exposure to hurricanes can have impacts on health in early childhood. For which parameters does the text report an increase?

- a) Depression and bedwetting
- b) Cardiac arrhythmia and aggressiveness
- c) Serotonin levels and depression
- d) Cortisol levels and anxiety
- e) Dopamine levels and autism

Question 3

For which of the following psychiatric/neurological disorders does the text report a positive association between heat and hospital admissions?

- a) Psychosis and dementia
- b) Depression and psychosis
- c) Schizophrenia and depression
- d) Mania and dementia
- e) Epilepsy and psychosis

Question 4

Which term describes the emotional reaction to environmental destruction?

- a) Envirostalgia
- b) Orbistalgia
- c) Terrastalgia
- d) Atmostalgia
- e) Solastalgia

Question 5

For which group was an increased risk of suicide by 15% reported in long-term Australian data in association with an increased drought index?

- a) Elderly women living in rural areas
- b) Middle-aged men living in rural areas
- c) Elderly men living in urban areas
- d) Middle-aged women living in urban areas
- e) Middle-aged men living in urban areas

Question 6

Which treatment is mentioned in the text as having a lower success rate following the hurricane Katrina in the USA?

- a) Treatment of addiction
- b) Treatment of anorexia
- c) Treatment of anxiety disorders
- d) Treatment of hypertension
- e) Treatment of migraine

Question 7

In a scoping review of wildfires (worldwide), how high was the point prevalence of subacute post-traumatic stress disorder in children and adolescents?

- a) 27%
- b) 35%
- c) 52%
- d) 73%
- e) 92%

Question 8

Up to what time after a hurricane were hurricane-related posttraumatic stress symptoms identified in the reviews cited in the article?

- a) 2 years
- b) 4 years
- c) 6 years
- d) 10 years
- e) 12 years

Question 9

Apart from PubMed, which database mentioned in the text can be used for literature reviews in the field of psychology?

- a) NeurlNFO
- b) PsycMed
- c) PsycINFO
- d) NeuroMed
- e) NervINFO

Question 10

According to the text, which of the following groups is particularly at risk of developing symptoms of depression after experiencing flooding?

- a) Children with pre-existing obesity
- b) Children with pre-flooding rumination
- c) Children from urban areas
- d) Children without siblings
- e) Children who cannot swim