

# Climate change and mental health

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## Introduction

The physical health impacts of climate change, especially infections, allergies and respiratory and cardiovascular diseases are now well recognized. However, the mental health impact of such change, especially in Asian countries became topical after the Asian tsunami. In this article, we attempt to look at the diverse aspects of climate and mental health: seasonal climate variation and its effect on mental health, extreme weather conditions and their psychological impact and specific climatic disasters and their consequences.

## Mood and climate

Seasonal variation of mood, characterized by onset of depression in winter/autumn and its remission or appearance of mania or hypomania in spring is a well-known entity described in the Diagnostic and Statistical Manual (DSM IV) as seasonal affective disorder (SAD). The etiology of cyclical changes of mood is believed to be the fluctuation in daylight hours throughout the year. This is supported by the use of light therapy in the treatment of these conditions.<sup>1,2</sup> The prevalence of this disorder varies with the

geographical distance from the equator. Hospital admission studies have shown that apart from seasonality, various climatic parameters including daily ambient temperature, relative humidity, atmospheric pressure, rainfall and hours of sunshine contribute to seasonal variations in bipolar disorder admissions.<sup>3-5</sup> Carney et al.,<sup>6</sup> reported that admission rates for mania were higher in the sunnier months with a longer average day length. They found that the current month's mean daily hours of sunshine and the mean day length correlated with admission rates.

## Suicide

It has been postulated that climate can influence rates of suicide. A study from Italy showed higher rates of suicidal behaviours in the country's northern towns where there was significant climatic variation. Northern towns, as indicated by their latitude, are less exposed to the sun and have lower mean temperatures (both minimum and maximum) than southern towns. Rainfall levels are higher in the north than in the south. This influence was more marked in the case of females. One can only speculate on the link between climates that are dry, little exposed to the sun, and therefore presumably cold and a higher incidence of suicides as seen in the case of SAD. It is possible that living in a place with low exposure to the sun might determine an abnormally persistent stimulation of circuits which use serotonin as a neurotransmitter, leading to adaptations of

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these circuits. This would result in their becoming less responsive to sudden variations in the discharge of serotonergic neurons. In a person who is vulnerable, climate contributes to this biological risk by modifying the responsiveness of the circuits that control mood and behaviour, and also the frequency and intensity of social interactions.<sup>7</sup> A total of 71 227 male suicides and 26 466 female suicides occurring in Italy from 1974 to 2003 were investigated and a significant peak was found in spring.<sup>8</sup> Of different climatic variables, temperature was found to be positively correlated with suicide rates. Some researchers have suggested that deviations of monthly mean temperatures from the expected mean temperature for that time of the year, rather than absolute ambient temperature, might be much more important for suicidal death.<sup>9</sup> Extrapolating from such preliminary findings, it is likely that global climatic changes may have a significant impact on various dimensions of mental health and well-being.

## Climate and psychosis

The association between acute psychosis and climatic variation is known, especially in tropical countries. One of the hypotheses of acute psychosis is an increased association with post-viral infections. *Borna virus* infection outbreaks have been associated with schizophrenia and mood disorders, obsessive compulsive disorders with streptococcal infections and algal toxins with cognitive impairment.<sup>10</sup> Studies from tropical countries like India suggest an increased prevalence of acute psychosis following viral fever, especially in winter.<sup>11</sup>

Studies undertaken in the Northern Hemisphere have shown a small but relatively consistent excess of winter and spring births of individuals who later develop schizophrenia compared with the general population.<sup>12</sup> Jablensky<sup>13</sup> noted that the season-of-birth effect was one of the most

robust findings in the epidemiology of schizophrenia. However, later comparisons from the Southern Hemisphere have not supported this relationship.<sup>14</sup> One of the speculations is that climatic factors other than seasonality need to be studied to support the season-of-birth effect.

The hospital admission rates for schizophrenia and “schizoaffective” patients are clearly increased in summer and fall respectively, as reported in an 11-year study from Israel. Schizophrenia patients’ mean monthly admission rates correlated with the mean maximal monthly environmental temperature, indicating that a persistently high environmental temperature may be a contributing factor for psychotic exacerbation in schizophrenia patients and their consequent admission to mental hospitals.<sup>15</sup>

## Extreme weather events and psychological sequelae

Extreme weather events include periods of very high temperature, torrential rains and flooding, droughts and storms. Hyperthermia, or heat stroke can present with neuropsychiatric symptoms including confusion, delirium and persisting neuropsychological deficits.<sup>16</sup> Persons with mental illness are more prone to heat stroke,<sup>17</sup> especially those on antipsychotic and anticholinergic medication. Extreme environments, both hot and cold, can affect human sleep and central stress pathways.<sup>18</sup> Extreme physical environments, combined with isolation and confinement, can additionally alter cognitive ability and create interpersonal tension and conflict.<sup>19</sup>

## Flooding

It is anticipated that severe flooding may become more frequent due to global warming. A study in southern England following severe flooding in the town of Lewes reported a four-time higher risk of psychological distress on

the 12-item General Health Questionnaire.<sup>20</sup> Despite the tremendous loss to life and property, displacement and other far-reaching adversities, the mental health impact of flooding has not been examined in most parts of the world. Around half the children and adolescents exposed to the 'supercyclone' in the state of Orissa in India reported symptoms of the post-traumatic stress disorder (PTSD) syndrome of different severity even after one year.<sup>21</sup>

## Drought

Another understudied area is the mental health impact of drought, a likely sequel of climate change. Drought affects farmers and can contribute to severe mental agony due to financial hardship from increased debt. It is difficult for farmers to plan for crops, stocking, improvements, breeding and succession. This affects other businesses, limiting their ability to expand and employ staff. Drought affects family relationships. Stress, worry and the rate of suicide increase. Drought can lead to isolation and increased workload as fewer workers take on more work, partners move off the farm for additional income or for school needs, and families can no longer afford social support.<sup>22</sup> The phenomenon of farmers' suicides in India<sup>23</sup> is a typical example of the consequences of climatic vagaries in poor, predominantly agrarian economies.

While floods and droughts are regularly-occurring disasters, the mental health implications of which have not been fully recognized, recent disasters, particularly the tsunami and hurricane Katrina have thrust mental health issues into the foreground.

## Disaster

In general populations, the 12-month prevalence rate of mild and moderate common mental disorders (e.g. mild and moderate depression and anxiety disorders, including PTSD) is on average about 10% in

countries across the world (World Mental Health Survey 2000 data). However, this rate is likely to rise possibly to 20% after exposure to severe trauma and resource loss. In case of severe mental disorders like psychosis, the 2-3% rate in general population may be expected to go up (e.g. to approximately 3-4%) after exposure to severe disaster. Trauma and loss (i) may exacerbate previous mental illness (e.g. may turn moderate depression into severe depression); and (ii) may cause a severe form of trauma-induced common mental disorder in some people.<sup>24</sup>

Following the Asian tsunami of 2005, the World Health Organization estimated that 20-40% of affected people suffered from short-lasting mild psychological distress and another 30-50% experienced moderate-to-severe psychological distress.<sup>24</sup>

In Indonesia there was a reported 15-20% increase in outpatients with anxiety and depression and a corresponding increase in the number of psychotropic prescriptions. Other consequences of disasters include an increase in alcohol and drug abuse.<sup>25</sup>

Disasters result in loss of life with its associated grief, loss of property and most of all, loss of homes. A home however poor and substandard, can symbolize years of personal and familial investment and memories.

An important outcome of the tsunami has been the development of national responses in many Asian countries through emphasis on mental health and psychosocial services and integrating emergency mental health services into disaster emergency services.<sup>26</sup>

Hurricane Katrina has been associated with a high prevalence of psychiatric morbidity. In a telephonic survey of a probability sample of 1043 affected residents, the 30-day prevalence of anxiety-mood disorders was found to be 49.1% and that of PTSD 26.4%.<sup>27</sup> In a longer-term evaluation of the mental health impact of Katrina in a representative

sample of 815 pre-hurricane residents, the prevalence of PTSD was found to have actually increased over time, as had attempts at self-harm. High prevalence of mental morbidity thus continued even two years after the hurricane.<sup>28</sup> Such calamities also disrupt the existing mental health services for persons with pre-existing mental disorders and limit treatment for new-onset cases. This illustrates the lack of disaster preparedness even in countries with relatively better developed mental health services.<sup>29</sup>

Several factors appear to determine mental health responses to natural disasters. Most of the literature in this area is from studies of post-disaster impact. One of the core issues that appears to determine psychological response is disaster preparedness. If an individual has come through prior disasters, having coped reasonably well, this prior experience confers knowledge, realistic expectations and a measure of self-efficacy and confidence. If an individual is generally prone to anxiety, or had a prior traumatic experience of a disaster situation, it is probable that in a future disaster situation this anticipatory anxiety or dread will erode both psychological and practical preparedness. Social support, group support, easily accessible network of services are also critical in ensuring better adjustment to an adversity.

Collectivist reactions and shared community beliefs are also critical. A study from Australia shows that residents of the coastal north have developed both a stoicism and elaborated mythology about how the weather affects behaviour during the onset of the wet season. Individual perceptions of their environments include regional beliefs that have both a stereotypic and normative character to them, which can subtly but powerfully influence the perceived reasonableness and/or legitimacy of expressing concerns or distress.<sup>30,31</sup> Research

on “place” meaning, attachment and identity over the past several decades and on the cultural contexts of risk perceptions and responses suggests that communities are deeply affected by such powerful and often devastating ‘acts of nature’ and engage a spectrum of sense-making, protective strategies and beliefs to make their world and their lives more secure and less unpredictable, threatening and unjust.

## Summary and conclusion

Climate is known to affect human health in different ways. The health impacts of climate change can occur through a number of direct and indirect causal pathways, and the severity is in part determined by the adaptive capacity of the population.<sup>32</sup> People living in poverty, those geographically vulnerable to extreme weather events, those highly dependent on agriculture for their livelihood and those vulnerable to develop mental illness are at high risk. The principal and direct concerns include injuries and fatalities related to severe weather events and heat waves; infectious diseases related to changes in vector biology, water and food contamination; allergic symptoms related to increased allergen production; respiratory and cardiovascular diseases related to worsening air pollution; and nutritional shortages related to changes in food production. Major concerns, for which data to support projections are less robust, more complex and have multiple determinants are the mental health consequences, population dislocation and civil conflict following the above-mentioned direct sequels.<sup>33</sup> Mental health consequences need to be studied from several dimensions: psychological distress *per se*; consequences of psychological distress including proneness to physical diseases as well as suicide; and psychological resilience and its role in dealing effectively with the aftermath of disasters.

## References

1. Rosenthal NE, Sack DA, Gillin JC, Lewy AJ, Goodwin FK, Davenport Y, et al. Seasonal affective disorder: a description of the syndrome and preliminary findings with light therapy. *Arch Gen Psychiatry*. 1984 Jan; 41(1): 72-80.
2. Boyce P, Parker G. Seasonal affective disorder in the southern hemisphere. *Am J Psychiatry*. 1988 Jan; 145(1): 96-9.
3. Mawson D, Smith A. Relative humidity and manic admissions in the London area. *Br J Psychiatry*. 1981 Feb;138:134-8.
4. Abdul-Rahim FA, Al-Sabai A, Al-Hamad AR, Bamgboye E. The seasonality of mania: preliminary findings. *Ann Saudi Med*. 1992 Sep; 12(5):472-5.
5. Salib E and Sharp N. Relative humidity and affective disorders. *Int. J. Psychiatry Clin. Pract*. 2002; 6: 147- 53.
6. Carney PA, Fitzgerald CT and Monaghan CE. Influence of climate on the prevalence of mania. *Br. J. Psychiatry*. 1988 Jun; 152: 820–823.
7. Preti A, Miotto P. Seasonality in suicides: the influence of suicide method, gender and age on suicide distribution in Italy. *Psychiatry Res*. 1998 Nov; 81(2): 219–231.
8. Rocchi MB, Sisti D, Cascia MT, Preti A. Seasonality and suicide in Italy: amplitude is positively related to suicide rates. *J Affective Disorders* . 2007 Jun; 100 (1-3): 129-36.
9. Marion SA, Agbayewa MO, Wiggins S. The effect of season and weather on suicide rates in the elderly in British Columbia. *Can. J. Public Health*. 1999 Nov-Dec; 90 (6): 418–22.
10. Jain S, Murthy P, Shankar SK. Neuropsychiatric perspectives from nineteenth-century India: the diaries of Dr Charles I Smith. *History of Psychiatry*. 2001 Dec; 12(48 Pt 4): 459-66.
11. Collins PY, Varma VK, Wig NN, Mojtabai R, Day R, Susser E. Fever and acute brief psychosis in urban and rural settings in north India. *Br J Psychiatry*. 1999 Jun;174:520-4.
12. Torrey EF, Miller J, Rawlings R, Yolken RH. Seasonality of births in schizophrenia and bipolar disorder: a review of the literature. *Schizophr Res*. 1997 Nov; 28(1): 1–38.
13. Jablensky A. Schizophrenia: the epidemiological horizon. In: Hirsch SR, Weinberger DR. Eds. *Schizophrenia*. Oxford: Blackwell Science, 1995: pp. 206–52.
14. McGrath JJ, Welham JL. Season of birth and schizophrenia: a systematic review and meta-analysis of data from the Southern Hemisphere. *Schizophrenia Research*. 1999; 35: 237-242.
15. Shiloh R, Shapira A, Potchter O, Hermesh H, Popper M, Weizman A. Effects of climate on admission rates of schizophrenia patients to psychiatric hospitals. *European Psychiatry*. 2005 Jan; 20(1): 61-4.
16. Romero JJ, Clement PF, Belden C. Neuropsychological sequelae of heat stroke: report of three cases and discussion. *Mil Med*. 2000 Jun; 165(6): 500-3.
17. Naughton MP, Henderson A, Mirabelli MC, Kaiser R, Wilhelm JL, Kieszak SM, Rubin CH, McGeehin MA. Heat related mortality during a 1999 heat wave in Chicago. *Am J Prev Med*. 2002 May;22(4): 221-7.
18. Buguet A. Sleep under extreme environments: effects of heat and cold exposure, altitude, hyperbaric pressure and microgravity in space. *J Neurol Sci*. 2007 Nov; 262(1-2): 145-52.
19. Palinkas LA, Suedfeld P. Psychological effects of polar expeditions. *Lancet*. 2008 Jan 12; 371(9607):153-63.
20. Reacher M, McKenzie K, Lane C, Nichols T, Kedge J, Iversen A, Hepple P, Walter T, Laxton C, Simpson J; Lewes Flood Action Recovery Team. Health impacts of flooding in Lewes: a comparison of reported gastrointestinal and other illness and mental health in flooded and non-flooded households. *Commun Dis Public Health*. 2004 Mar; 7(1): 39-46.
21. Kar N, Mohapatra PK, Nayak KC, Pattanaik P, Swain SP, Kar HC. Post-traumatic stress disorder in children and adolescents one year after a super-cyclone in Orissa, India: exploring cross-cultural validity and vulnerability factors. *BMC Psychiatry*. 2007 Feb 14; 7: 8.
22. Sartore GM, Kelly B, Stain HJ. Drought and its effect on mental health - How GPs can help. *Aust Fam Physician*. 2007 Dec; 36(12): 990-3.
23. Tata Institute of Social Sciences. *Causes of farmer suicides in Maharashtra: an enquiry*. Osmanabad: Tata Institute of Social Sciences, 2005. <http://www.tiss.edu/Causes%20of%20Farmer%20Suicides%20in%20Maharashtra.pdf> – accessed on 11 March 2008.
24. World Health Organization. *Mental health assistance to population affected by the Tsunami in Asia* [Internet]. Geneva: WHO, c2008. ([www.who.int/mental\\_health/resources/tsunami](http://www.who.int/mental_health/resources/tsunami) - accessed on 11 March 2008).

25. Math SB, Girimaji SC, Benegal V, Uday Kumar GS, Hamza A, Nagaraja D. Tsunami: psychosocial aspects of Andaman and Nicobar islands. Assessments and intervention in the early phase. *Int Rev Psychiatry*. 2006 Jun; 18(3): 233-9.
26. Ruzek JI, Young BH, Cordova MJ, Flynn BW. Integration of disaster mental health services with emergency medicine. *Prehosp Disaster Med*. 2004 Jan-Mar; 19(1): 46-53.
27. Galea S, Brewin CR, Gruber M, Jones RT, King DW, King LA, McNally RJ, Ursano RJ, Petukhova M, Kessler RC. Exposure to hurricane-related stressors and mental illness after Hurricane Katrina. *Arch Gen Psychiatry*. 2007 Dec; 64(12):1427-34.
28. Kessler RC, Galea S, Gruber MJ, Sampson NA, Ursano RJ, Wessely S. Trends in mental illness and suicidality after Hurricane Katrina. *Mol Psychiatry*. 2008, Jan 8 Epub ahead of print.
29. Wang PS, Gruber MJ, Powers RE, Schoenbaum M, Speier AH, Wells KB, Kessler RC. Disruption of existing mental health treatments and failure to initiate new treatment after Hurricane Katrina. *Am J Psychiatry*. 2008; 165 (1): 34-41.
30. Jull P. *The politics of northern frontiers in Australia, Canada and other 'first world' countries: a discussion paper*. Darwin: North Australian Research Unit, Australian National University, 1991.
31. Morrissey SA. *Seasonal affective disorder: characteristics and prevalence in North Queensland*. PhD Thesis. Townsville: James Cook University of North Queensland, 1995.
32. Confalonieri U, Menne B, Akhtar R, Ebi KL, Hauengue M, Kovats RS, Revich B, Woodward A. Human health. In: *Climate change 2007: impacts, adaptation and vulnerability*. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. ML Parry, OF Canziani, JP Palutikof, PJ van der Linden, CE Hanson. Eds. Cambridge: Cambridge University Press, 2007. pp. 391-431.
33. Frumkin H, Hess J, Lubet G, Malilay J, McGeehin M. Climate change: the public health response. *Am J Public Health*. 2008 Mar; 98(3): 435-45.

