WEATHER AND EXTREME HEAT IN ASSOCIATION TO MENTAL DISORDERS

The case of Hanoi, Vietnam

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Akademisk avhandling

som med vederbörligt tillstånd av Rektor vid Umeå universitet för avläggande av medicine doktorsexamen framläggs till offentligt försvar i sal 135, Allmänmedicin, byggnad 9A, fredagen den 24 mars, kl 09.00. Avhandlingen kommer att försvaras på engelska.

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**Background:** Vietnam suffers consequences of global warming. There is limited data of the relationship between weather, extreme heat and potential mental health problems. It is therefore crucial to study heat-related mental illnesses and to establish good solutions with relevant adaptations to global warming. The adaptation measures should give attention to people that live in areas facing annual extreme weather, and protecting health in general and more specifically mental health of citizens. The study aimed to examine relationships between weather patterns, extreme heat or heatwaves, and mental disorders, and to investigate factors contributing to increased vulnerability and susceptibility.

**Methods:** The thesis includes a systematic review and a hospital-based study using data from the Hanoi Mental Hospital for five years (2008 – 2012), with mental disorders diagnosed by ICD10 (F00-99) to estimate the effects of weather variation, seasonality, increased temperatures, and heatwaves on hospital admissions for depression and other mental disorders. A negative binomial regression model accounting for yearly study period, time trends, and day of the week was used to analyze the relationship between seasonality, heatwaves, and monthly and daily mental disorder hospitalizations.

**Results:** Our findings showed (i) a general tendency for more admissions between May and December, with a seasonal bi-annual high between May-June and November-December, and elevated ambient temperature was significantly related to increasing admissions for depressive disorders; (ii) the number of hospital cases for mental disorders increased in the summer season especially in June, and two percent of cases emerged during elevated temperature of one degree Celsius; and (iii) when compared with non-heatwave periods, heatwaves amounted to increasing risks for admission for the whole group of mental disorders (F00-79), and admissions for mental disorders among residents in rural communities and in the elderly population increased significantly during heatwaves.

**Conclusion:** There were associations between hospital admissions for depression and other mental disorders and seasonality, weather patterns, elevated temperatures, and heatwaves. The associations grew stronger with the length of the heatwaves and particularly the elderly appeared more sensitive to seasonality, hot weather and heatwaves.

**Key words:** Depressive disorders, mental disorders, weather patterns, elevated temperature, and heatwaves.