

PROJECTION OF TEMPERATURE IN RELATION TO CARDIOVASCULAR DISEASE USING BIAS CORRECTION METHOD

(Unjuran Suhu dalam Hubungan dengan Penyakit Kardiovaskular
Menggunakan Kaedah Pembedahan Pincang)

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ABSTRACT

Climate and weather have significant influences on human health. Climate change together with natural phenomena and human activities have the tendency to impact the environment and debilitates human well-being in various ways. Extreme temperature, which is often associated with climate change, has some negative implications on human health, potentially resulting in diseases such as cardiovascular disease. The aim of this study is to analyze the impacts of temperature projection on the mortality rates of cardiovascular disease based on daily average temperature projection using bias correction method. Downscaling approach can be used to downscale the global climate model outputs that are available at coarse resolution. However, to study the impact of climate change need meteorological data or information at finer resolution. In this study, statistical downscaling is used to downscale the GCM's temperature to local scale's temperature. The observed daily mean temperature data in 5 years (1970- 1974), the historical GCM data (1976-1980) and the projection data (2076-2080) under RCP4.5 and RCP8.5 were used. However, the global climate model outputs produce biases when applied due to its coarse estimate, hence lead to erroneous results. Thus, bias correction method was used to correct the biases in global climate model outputs to project the future of extreme temperature, and eventually calculate the mortality rate of the cardiovascular diseases. The mortality rate of the cardiovascular disease is calculated by using attributable daily deaths formula. Results revealed that quantile mapping technique is able to capture the variability in global climate model as well as quantifying the biases. The projected trend of heat-related deaths under RCP4.5 is lower than the deaths under RCP8.5.

Keywords: global climate model; bias correction method; quantile mapping; temperature; mortality

ABSTRAK

Iklim dan cuaca mempunyai pengaruh yang penting terhadap kesihatan manusia. Perubahan iklim bersama dengan fenomena semula jadi dan aktiviti manusia mempunyai kecenderungan memberi impak kepada persekitaran dan mengganggu kesihatan manusia dalam pelbagai cara. Suhu yang melampau yang selalu dikaitkan dengan impak perubahan iklim, membawa implikasi negatif terhadap kesihatan manusia termasuk berpotensi menyebabkan penyakit seperti penyakit kardiovaskular. Tujuan kajian ini adalah untuk menganalisis impak unjuran suhu ke atas kadar kematian penyakit kardiovaskular berdasarkan unjuran suhu purata harian menggunakan kaedah pembedahan pincang. Pendekatan penurunan skala boleh digunakan untuk penurunan output dari model iklim global yang boleh didapati pada resolusi kasar. Walau bagaimanapun, untuk mengkaji impak perubahan iklim memerlukan maklumat meteorologi pada skala yang lebih kecil. Dalam kajian ini, pendekatan penurunan secara statistik digunakan untuk menurunkan suhu model iklim global kepada suhu pada skala tempatan. Nilai purata harian yang dicerap untuk 5 tahun (1970-1974), data sejarah purata suhu harian model iklim global (1976-1980) dan data peramalan purata suhu harian untuk RCP4.5 dan RCP8.5 telah diguna. Bagaimanapun output daripada model iklim global adalah pincang kerana ia bersifat anggaran kasar dan boleh

mengakibatkan keputusan yang salah. Oleh itu, kaedah pembetulan pincang telah digunakan untuk memperbaiki output daripada model iklim global untuk unjuran suhu melampaui masa akan datang, dan seterusnya diguna dalam pengiraan kadar kematian disebabkan oleh penyakit kardiovaskular. Kadar kematian penyakit kardiovaskular dikira dengan menggunakan rumus kematian harian diatribut. Keputusan menunjukkan bahawa teknik pemetaan kuantil berupaya menangani kebolehubahan dalam model iklim global serta mengira kepincangan. Trend unjuran kematian berkaitan dengan suhu untuk RCP4.5 didapati lebih rendah daripada yang RCP8.5.

Kata kunci: model iklim global; kaedah pembetulan pincang; pemetaan kuantil; suhu; kematian

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