

Abstract

More extreme cold weather and larger weather variations have raised concerns regarding their effects on public health. Although prior studies assessed the effects of cold air temperature on health, especially mortality, limited studies evaluated wind chill temperatures on morbidity, and health effects under the current cold warning threshold. This study identified the thresholds, lag periods, and best indicators of extreme cold on cardiovascular disease (CVD) by comparing effects of wind chill temperatures and cold air temperatures on CVD emergency department (ED) visits in winter and winter transition months. Information was collected on 662,625 CVD ED visits from statewide hospital discharge dataset in New York State. Meteorological factors, including air temperature, wind speed, and barometric pressure were collected from National Oceanic and Atmospheric Administration. A case-crossover approach was used to assess the extreme cold-CVD relationship in winter (December–February) and transition months (November and March) after controlling for PM_{2.5}. Conditional logistic regression models were employed to analyze the association between cold weather factors and CVD ED visits. We observed CVD effects occurred when wind chill temperatures were as high as $-3.8\text{ }^{\circ}\text{C}$ ($25\text{ }^{\circ}\text{F}$), warmer than current wind chill warning standard ($\leq -28.8\text{ }^{\circ}\text{C}$ or $\leq -20\text{ }^{\circ}\text{F}$). Wind chill temperature was a more sensitive indicator of CVD ED visits during winter with temperatures $\leq -3.8\text{ }^{\circ}\text{C}$ ($25\text{ }^{\circ}\text{F}$) with delay effect (lag 6); however, air temperature was better during transition months for temperatures $\leq 7.2\text{ }^{\circ}\text{C}$ ($45\text{ }^{\circ}\text{F}$) at earlier lag days (1–3). Among all CVD subtypes, hypertension ED visit had the strongest negative association with both wind chill temperature and air temperature. This study recommends modifying the current cold warning temperature threshold given larger proportions of CVD cases are occurring at considerably higher temperatures than the current criteria. We also recommend issuing cold warnings in winter transitional months.