

# Temperature, Myocardial Infarction, and Mortality: Effect Modification by Individual and Area-Level Characteristics

**Jaime Madrigano**, *Harvard School of Public Health, USA*

**Murray Mittleman**, *Beth Israel Deaconess Medical Center, USA*

**Andrea Baccarelli**, *Harvard School of Public Health, USA*

**Robert Goldberg**, *University of Massachusetts Medical School, USA*

**Steven Melly**, *Harvard School of Public Health, USA*

**Stephanie Von Klot**, *Helmholtz Zentrum Munchen-German Research Center for Environmental Health, Germany*

**Joel Schwartz**, *Harvard School of Public Health, USA*

**Background and Aims:** Many studies have reported associations between temperature and cardiovascular disease (CVD) mortality, but fewer have investigated the relation between temperature and CVD incidence rates and at risk groups. We examined the association between temperature and incidence of myocardial infarction (MI) and subsequent mortality in a population-based study of residents of central Massachusetts. We also examined patient vulnerability by individual and area-level characteristics.

**Methods:** Data for this study were obtained from the Worcester Heart Attack Study, a community-wide investigation of confirmed episodes of MI occurring during the 5 biennial study years of 1995, 1997, 1999, 2001, and 2003. Temperature measurements were obtained from a nearby airport. We used a case-crossover approach to examine the association between temperature and MI incidence, and subsequent all-cause mortality, while adjusting for PM<sub>2.5</sub> and humidity. We examined effect modification by individual and area-level socio-demographic characteristics, medical history, clinical complications, and surrounding physical environment.

**Results:** A total of 4,765 incident MIs were included in our analysis. A decrease in an interquartile range (IQR) in temperature on the same day was associated with an increased risk of MI [RR=1.15 (95% CI: 1.01, 1.32)]. Extreme cold during the 2 days prior was associated with an increased risk of MI [RR=1.36 (95% CI: 1.07, 1.74)]. Extreme heat during the two days prior was associated with an increased risk of mortality [RR=1.43 (95% CI: 1.05, 1.95)]. The effect of cold on MI incidence was stronger in individuals living in census tracts with the lowest median income and individuals with a previous MI. Individuals living within 400 m of a large water body were protected from the effect of cold on MI incidence.

**Conclusions:** Exposure to cold increased the risk of MI and exposure to heat increased the risk of mortality. Individual and area-level characteristics modified this association.