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| **Author** | **Period** | **Objective** | **Study design** | **Results** |
| Mortality | | | | |
| Rocklöv 2008(9) | 1998-2004 | Describe seasonal patterns of natural mortality in Stockholm.  Describe temperature-mortality relationship and the lag structure for effects of high and low temperatures. | Time series analysis | Peak mortality in winter season. The MMT was 11–12 ̊C. Above this temperature, the cumulative RR corresponded to a 1.4% (95% CI: 0.8–2.0) increase per oC, and below this temperature the cumulative RR corresponded to a 0.7% (95% CI: 0.5–0.9) decrease per oC. |
| Åström 2013(10) | 1901-2009 | Investigate whether sensitivity to episodes of extreme heat and cold has changed in Stockholm | Time series analysis | Total daily mortality was higher during heat extremes in all decades, with a declining trend over time in the relative risk associated with heat extremes, leveling off during the last three decades. The relative risk of mortality was higher during cold extremes for the entire period, with a more dispersed pattern across decades. Unlike for heat extremes, there was no decline in the mortality with cold extremes over time. |
| Rocklöv 2014(11) | 1990-2002 | Study the associations between mortality and temperature and heat and cold wave duration, stratified by age and individual and medical factors in Stockholm County | Time stratified case-crossover | Warm season: Gradual increases in summer temperatures were associated with mortality in people older than 80 years, and with mortality in groups with a previous myocardial infarction and with chronic obstructive pulmonary disease (COPD) in the population younger than 65 years. Duration of heat waves mainly affects population <65 years.  Cold season: Decreasing temperatures in winter were more strongly associated with mortality in ages 65 and above for men, people living in wealthier municipalities, non-hospitalized populations, and persons with pre-existing myocardial infarction. Duration of cold waves appeared to affect the very elderly population the most. |
| Åström 2018(12) | 1901-2013 | investigate if mortality attributable due to non-optimal temperatures changed across the twentieth century in Stockholm County, Sweden | Time series analysis | Total mortality attributable to non-optimal temperatures varied between periods and cold consistently had a larger impact on mortality than heat. Cold-related attributable fraction (AF) remained stable over time whereas heat-related AF decreased. AF on cold days remained stable over time, which may indicate that mortality during colder months may not decline as temperatures increase in the future. |
| Åström 2020(13) | 1990-2014 | 1. Investigate if set thresholds in the Swedish heat-wave warning system are valid for all parts of Sweden 2. If the heat-wave warning system captures a potential increase in all-cause mortality and coronary heart disease (CHD) mortality. 3. Whether neighbourhood deprivation modifies the relationship between heat waves and mortality. | Case-crossover in 14 Swedish municipalities | On a national as well as a regional level, heat waves significantly increased both all-cause mortality and coronary heart disease mortality by approximately 10% and 15%, respectively. While neighbourhood deprivation did not seem to modify heat wave-related all-cause mortality, it may modify the risk of mortality due to coronary heart disease in Sweden. |
| Fonseca-Rodríguez 2020(14) | 1991-2014 | Investigate the association of weather types with cause-specific mortality in two southern (Skåne and Stockholm) and two northern (Jämtland and Västerbotten) locations in Sweden. | Time stratified case-crossover | During summer, in the southern locations, the Moist Tropical (MT) and Dry Tropical (DT) weather types increased cardiovascular and respiratory mortality at shorter lags. The cumulative effect of MT, DT and heat events lagged over 14 days was particularly high for respiratory mortality in all locations except in Jämtland, though these did not show a clear effect on cardiovascular mortality. During winter, the dry polar and moist polar weather types and cold events showed a negligible effect on cardiovascular and respiratory mortality. |
| Fonseca-Rodríguez 2023(15) | 1991-2014 | Estimating future mortality due to extremely hot and cold weather types under different climate change scenarios for one southern (Stockholm) and one northern (Jämtland) Swedish region. | Time series analysis | A global climate model (MPI-M-MPI-ESM-LR) and two climate change scenarios (RCP 4.5 and 8.5) were used to project the occurrence of hot and cold days from 2031 to 2070. In Stockholm, for the RCP 4.5 scenario, the mean number of annual deaths attributed to heat increased from 48.7 (CI 32.2–64.2; AF = 0.68%) in 2031–2040 to 90.2 (56.7–120.5; AF = 0.97%) in 2061–2070, respectively. For RCP 8.5, heat-related deaths increased more drastically from 52.1 (33.6–69.7; AF = 0.72%) to 126.4 (68.7–175.8; AF = 1.36%) between the first and the last decade. Cold-related deaths slightly increased over the projected period in both scenarios. In Jämtland, projections showed a small decrease in cold-related deaths but no change in heat-related mortality. |
| Cardiovascular health | | | | |
| Wichmann 2013(16) | 1985-2010 | Investigate the association between daily ambient temperature and acute myocardial infarction hospitalisations in Gothenburg. | Case-crossover | A 3% and 7% decrease in acute myocardial infarction hospitalisations was observed for an inter-quartile range (IQR) increase in the 2-day cumulative average of temperature during the entire year (11°C) and the warm period (6°C), respectively, with and without adjustment for PM10, NO2, NOx or O3. |
| Mohammad 2018(17) | 1998-2013 | Determine if weather is associated with day-to-day incidence of myocardial infarction using a Swedish nationwide coronary care unit registry. | Time series analysis | In 274 029 patients with symptoms of acute coronary syndrome, the mean (SD) age was 71.7 (12) years. Incidence of myocardial infarction increased with lower air temperature, lower atmospheric air pressure, higher wind velocity, and shorter sunshine duration. The most pronounced association was observed for air temperature, where a 1-SD increase in air temperature (7.4°C) was associated with a 2.8% reduction in risk of myocardial infarction. Results were consistent for non–ST-elevation MI as well as ST-elevation MI and across a large range of subgroups and health care regions |
| Fonseca-Rodríguez 2021(18) | 1991-2014 | Investigate the effect of extreme cold or warm weather types on daily hospitalisations for cardiovascular and respiratory causes in 4 Swedish counties | Time series analysis | Exposure to hot weather types appeared to reduce cardiovascular hospitalizations while increased the risk of hospitalizations for respiratory diseases. In winter, the effect of cold weather on both cause-specific hospitalizations was small. |
| Mental health | | | | |
| Carlsen 2019(19) | 2012-2017 | Investigate the association between ambient temperature and psychiatric emergency visits (PEV) in an urban region in a temperate climate (in Gothenburg) | Case-crossover | In the analysis, temperatures at the 95th percentile were associated with 14% (95% confidence interval (CI): 2%, 28%) increase in PEVs at lag 0–3 and 22% (95%CI: 6%, 40%) for lags 0–14 during the warm season, relative to the seasonal minimum effect temperature (MET). During the cold season temperatures at the 5th percentile were associated with 25% (95% CI: −8%, 13%) and 18% (95% CI: −30%, 98%) increase in PEVs at lags 0–14 and 0–21 respectively. |
| Pregnancy outcomes | | | | |
| Bruckner 2014(20) | 1915-1929 | Testing the relation between cold ambient temperature during pregnancy and four pregnancy outcomes in Uppsala, Sweden.  Outcomes include: stillbirth, preterm birth, birth weight for gestational age, birth length. | Longitudinal with time-to-event and linear regression analysis | We observed an inverse relation between temperature and stillbirth (HR 0.92 for 1°C increase in temperature, 95% CI: 0.86 to 0.996). We found no linear relation between temperature over gestation and preterm birth (HR 0.99 for 1°C increase in temperature, 95% CI: 0.95 to 1.04). However, for preterm birth: temperatures below the 25th percentile, we find a HR of 0.60 (95% CI: 0.51 to 0.71) for each 1°C increase in temperature. Above the 75th percentile, the risk of preterm increased with temperature (HR 1.52; 95% CI: 1.22 to 1.90). Birth weight for gestational age did not vary with temperature during gestation (Table 3: coef. = −0.24; 95% CI, −0.66 to 0.18). Birth length (in cm) increased with temperature (coef. = 0.11; 95% CI, 0.07 to 0.15). |
| Vicedo-Cabrera 2015(21) | 1998-2006 | To explore the potential association between both heat and cold during late pregnancy and an increased risk of preterm birth in the northern location of Stockholm, Sweden. | Time series analysis | The risk of preterm birth increased by 4%–5% when the mean temperature reached the 75th percentile (moderate heat) four weeks earlier (reference: the annual median value), with a maximum cumulative risk ratio of 2.50 (95% confidence interval: 1.02–6.15). Inconsistent associations were obtained for cold and extreme heat. |
| Karlsson 2021(22) | 1880-1950 | Investigate the association between ambient temperature a week before birth and stillbirth risk among a historical population in northern Sweden | time-stratified case-crossover | We observed that the stillbirth risk increased both at low and high temperatures during the extended summer season (April to September), at −10°C, and the RR was 2.3 (CI 1.28, 4.00) compared to the minimum mortality temperature of +15°C. No clear effect of temperature during the extended winter season (October to March) was found. Climate vulnerability was greater among the male fetus compared to the female counterparts. |
| De Bont 2022(23) | 2014-2019 | Investigate associations of short-term exposure to high ambient temperature in the week before birth with preterm birth in Sweden, applying three complementary analytical approaches. | Longitudinal with case-crossover, time-to-event, quantile regression analysis | A total of 1924 births were extremely preterm (0.4%), 2636 very preterm (0.5%), and 23,664 moderately preterm (4.2%). Consistent across all three analytical approaches (case-crossover, quantile regression and time-to-event analyses), higher ambient temperature (95th vs 50th percentile) demonstrated increased risk of extremely preterm birth, but associations did not reach statistical significance. |
| Infant health | | | | |
| Junkka 2021(24) | 1880-1950 | Investigate the association between ambient temperature and neonatal mortality in a historical population in northern Sweden. | Longitudinal with a time-to-event analysis | Neonatal mortality was 32.1 deaths/1000 live births, higher in boys than in girls, and decreased between 1880 and 1950, with high inter-annual variability. Mean daily temperature was +2.5 °C, ranging from −40.9 °C to +28.8 °C. At −20 °C, the OR of neonatal death was 1.56 (CI 1.30–1.87) compared to the reference at +14.5 °C. Among girls, the OR of mortality at −20 °C was 1.17 (0.88–1.54), and among boys, it was 1.94 (1.53–2.45). A temperature increase from +14.5 to +20 °C was associated with a 25% increase of neonatal mortality (OR 1.25, CI 1.04–1.50). Heat- and cold-related risks were lowest between 1900 and 1929. |