

Temperature

Extremes of temperature are hazardous to health, and mortality rates are higher on very hot and very cold days. Higher temperatures stress the body in several ways, primarily through sweat loss and consequent reduction in plasma volume, leading to an increase in the concentration of clotting factors, and an increase in mortality from cardiovascular diseases. Vulnerability to such diseases may be increased by age and pre-existing illness. In addition, with increased temperatures, ground-level ozone¹ may be expected to increase. Ground-level ozone is a respiratory irritant, and mortality may therefore increase further on hot days. Specific characteristics of urban centres, including the capacity of certain buildings to retain heat and the relative lack of vegetation, contribute to further increases in temperatures that persist into the evening time. This 'heat-island' effect may be expected to further increase the heat stress suffered by city dwellers.

In contrast, cold temperatures, acting mainly through the autonomic nervous system, result in increased blood pressure, and alterations in the clotting factors in the blood, leading to an increase in cardiovascular mortality. Respiratory mortality also increases in cold weather. It is not surprising, therefore, that extremes of temperature result in increases in mortality and morbidity in susceptible people. A U-shaped curve may therefore be seen when the relationship between mortality and temperature is examined, with mortality rates higher at extremes of hot and cold temperatures. A range of temperatures between these extremes where mortality is lowest is also evident (Figure 1).

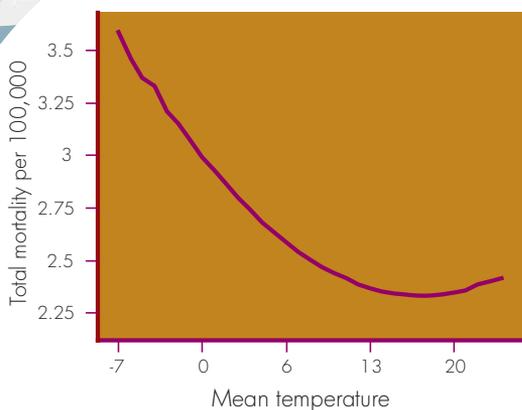


Figure 1: Mortality and daily mean temperature (degrees Celsius) in Ireland today²

Mortality rates in cold weather in Ireland are substantially higher than mortality rates in warm weather. Furthermore, the temperature experienced on the majority of days in Ireland at present occurs on the colder side of this U-shaped curve. Mortality rates in Ireland in winter are substantially higher than in many European countries, even in those countries with colder winters than Ireland. This high cold-related mortality is largely avoidable and results from our response to cold rather than to cold itself, and may principally be accounted for by fuel poverty and poor housing standards.

Climate change, by increasing mean temperatures, may be expected to reduce the high winter mortality and benefit overall mortality rates in Ireland, in particular mortality from respiratory and cardiovascular diseases. Nevertheless, the increases in temperature that will occur may also be expected to impact adversely on health, resulting in increases in mortality from cardiovascular or respiratory diseases, particularly in people living in cities.

¹Ground-level ozone is formed from Volatile Organic Carbons (VOCs) in the presence of sunlight. VOCs are carbon containing compounds that evaporate easily and are found, amongst other places, in the exhaust emissions of motor vehicles.

²Dr E. Cullen, paper in preparation.

Food and water-related diseases

Bacteria multiply in the heat, and it is well established that the incidence of food-borne diseases, namely salmonella, campylobacter and E. Coli increases in the summer months in Ireland. The relationship between mean temperatures and salmonella in Ireland is depicted in Figure 2.

The incidence of food-borne disease may be expected to increase with higher temperatures, principally in summer time, in the absence of adequate food-hygiene practices.

The greatest adverse impact on health resulting from climate change may result from changed precipitation patterns. Heavy rainfall and flooding will stress poorly managed water treatment systems, particularly in the North and West. As a result, the safety of drinking water, from public supplies where the maintenance is unsatisfactory, and from private schemes where the quality of drinking water is already lower, is at risk. In addition, recreational use of surface and marine waters may be associated with an increased risk of water-related illnesses, as a result of increased run-off and warmer temperatures. The growth of algal blooms may be enhanced, and the formation of trihalomethanes, formed when chlorinated water comes into contact with organic compounds, will increase. Episodes of flooding will be more frequent, and in addition to the risk of physical trauma and morbidity resulting from microbiological and chemical pollution, the psychological distress arising from flooding may be substantial, particularly if it occurs in the dark and without warning. An increased risk of Legionnaires' disease may arise from increased exposure to air-conditioning systems.

In Eastern areas, where a reduced rainfall pattern is expected, the rising population and the increase in demand for water that may be expected with warmer temperatures will place severe pressure on water supplies. The implementation of the Drinking Water Regulations and the Water Framework Directive are crucial public health measures in reducing the impact of water-related diseases.

Other indirect effects

In the absence of an increase in protective behaviour patterns, the incidence of skin cancer will increase; and in addition, the patterns and seasonality of allergies, including hay-fever, may also change. Although the mosquito that carries the plasmodium organism is currently present in Ireland, and mean temperatures will be sufficient to allow plasmodium vivax to multiply in this mosquito, the lack of sufficient habitats and a robust public health infrastructure renders it unlikely that malaria will become a public health problem.



The diversity of impacts that climate change will have on health reflects the need for inter-sectoral collaboration between health authorities, local authorities, the meteorological service and researchers, in order that those most vulnerable to the adverse impacts of climate change on health be protected.

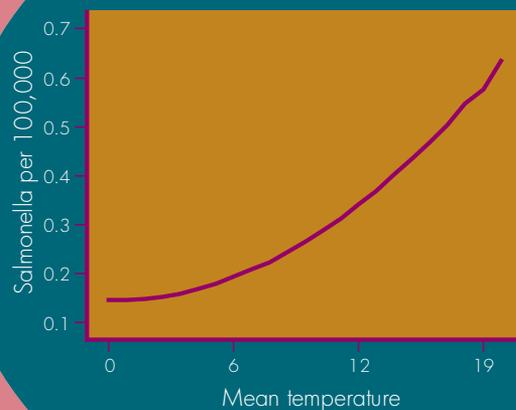


Figure 2: Salmonella and mean temperature (degrees Celsius) in Ireland today²



7th Scientific Statement Climate Change and Health in Ireland

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