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Original Research

Using an Emergency Department Syndromic Surveillance System to investigate the impact of extreme cold weather events



H.E. Hughes ^{a,*}, R. Morbey ^a, T.C. Hughes ^{b,c}, T.E. Locker ^{c,d}, T. Shannon ^e,
C. Carmichael ^f, V. Murray ^f, S. Ibbotson ^a, M. Catchpole ^g, B. McCloskey ^h,
G. Smith ^a, A.J. Elliot ^a

^a Real-time Syndromic Surveillance Team, Public Health England, Birmingham, UK

^b Emergency Department, Oxford Radcliffe Hospitals NHS Trust, Oxford, UK

^c The College of Emergency Medicine, London, UK

^d Emergency Department, Sheffield Teaching Hospitals NHS Foundation Trust, Sheffield, UK

^e Emergency Department, Leeds Teaching Hospitals NHS Trust, Leeds, UK

^f Extreme Events and Health Protection, Public Health England, London, UK

^g Centre for Infectious Disease Surveillance and Control, Public Health England, London, UK

^h Global Health, Public Health England, London, UK

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ABSTRACT

This report describes the development of novel syndromic cold weather public health surveillance indicators for use in monitoring the impact of extreme cold weather on attendances at EDs, using data from the 2010–11 and 2011–12 winters.

A number of new surveillance indicators were created specifically for the identification and monitoring of cold weather related ED attendances, using the diagnosis codes provided for each attendance in the Emergency Department Syndromic Surveillance System (EDSSS), the first national syndromic surveillance system of its kind in the UK. Using daily weather data for the local area, a time series analysis to test the sensitivity of each indicator to cold weather was undertaken.

Diagnosis codes relating to a health outcome with a potential direct link to cold weather were identified and assigned to a number of 'cold weather surveillance indicators'. The time series analyses indicated strong correlations between low temperatures and cold indicators in nearly every case. The strongest fit with temperature was cold related fractures in females, and that of snowfall was cold related fractures in both sexes.

Though currently limited to a small number of sentinel EDs, the EDSSS has the ability to give near real-time detail on the magnitude of the impact of weather events. EDSSS cold weather surveillance fits well with the aims of the Cold Weather Plan for England, providing information on those particularly vulnerable to cold related health outcomes severe enough to require emergency care. This timely information aids those responding to

* Corresponding author. Real-time Syndromic Surveillance Team, Public Health England, 6th Floor, 5 St Philip's Place, Birmingham B3 2PW, UK. Tel.: +44 (0) 121 232 9215; fax: +44 (0) 121 236 2215.

E-mail address: helen.hughes@phe.gov.uk (H.E. Hughes).

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and managing the effects on human health, both within the EDs themselves and in the community as a whole.

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Introduction

There is a substantial evidence base demonstrating both the direct and indirect impact of cold weather on health.¹ Increases in both morbidity (e.g. incidence of respiratory disease, heart attacks, falls and injuries, hypothermia) and mortality are observed during winter each year.^{2–5} Periods of extreme cold weather, where temperatures are significantly lower than what is usual for the time of year, even for a short period of time, have the potential to further impact on human health through direct exposure to lower temperatures, and associated adverse conditions, such as snow and ice.⁶

Public Health England (PHE) plays a major role in the UK public health planning for extreme weather events, including flooding, drought and extreme hot and cold temperatures.^{4,7} PHE syndromic surveillance systems have been used successfully to monitor the public health impact of hot weather as part of the Heatwave Plan for England.^{8,9} More recently, PHE syndromic surveillance systems have also been feeding into the recently established Cold Weather Plan for England,¹⁰ with the provision of near real-time information during extreme cold weather events.¹¹

The Cold Weather Plan is a cross government plan, developed by the Department of Health, PHE and the Met Office. It aims to reduce preventable mortality and morbidity due to severe (hazardous) cold weather through a series of Met Office generated cold weather alerts, which link to a number of public health actions. The public health recommendations range from long-term planning and preparation, to major incident emergency response.

Syndromic Surveillance is the (near) real-time collection, analysis, interpretation and dissemination of health-related data to enable the early identification of the impact (or lack of impact) of threats to human or veterinary health requiring public health action.¹² PHE coordinates a programme of syndromic surveillance including systems utilizing data from a telephone health advice service, a general practitioner (GP) network and a GP out of hours service to routinely monitor the emergence and spread of common infectious diseases, and the public health impact of non-infectious events, in the community, in near real-time.¹³ This report describes the development of novel syndromic surveillance cold weather indicators in the Emergency Department Syndromic Surveillance System (EDSSS)^{14,15} for use in monitoring the direct impact of extreme cold weather on attendances at EDs, using data from the 2010–11 and 2011–12 winters. The aim of this work was to establish the effectiveness of the EDSSS in detecting and monitoring in near real-time the health impact of extreme cold weather and to develop new ‘cold weather indicators’ for integration into routine surveillance, in support of the Cold Weather Plan.

Methods

EDSSS reporting

Attendance data from emergency departments participating in the EDSSS were selected for this study based upon two criteria: continued, uninterrupted daily reporting during the study period (November 1, 2010 to March 31, 2011 and November 1, 2011 to March 31, 2012); and use of a detailed clinical diagnosis coding system with sufficient detail to allow the construction of cold weather specific syndromic indicators. Two EDs (both located within the same, large, English city) met these criteria, having begun reporting to EDSSS during July 2010, reporting diagnosis codes from an internationally recognized coding system (SNOMED CT).¹⁶

Descriptive epidemiology

Anonymized ED attendance data were analysed according to patient demographics of age and sex, and the reported diagnosis. Time series plots were constructed for the different variables.

Cold weather syndromic indicators

A number of new syndromic indicators were created specifically for the identification and monitoring ED attendances likely to be related to cold weather. The development of each indicator was based upon the findings of the initial descriptive data analysis; each indicator consisted of a group of clinical codes for diagnoses considered to be potentially related to the effects of cold weather. Diagnoses thought to be related to cold weather both directly (hypothermia, frostbite and selected bone/joint injuries) and indirectly (cardiac events and respiratory diagnosis, both infectious and non-infectious) were included in the preliminary analysis.

Meteorological data

Daily weather data for the area local to the two EDs were obtained from the UK Met Office, taken from the nearest available observation station, including daily minimum temperature (°C) and daily snow depth (centimetres; cm). The Cold Weather Plan uses a number of levels based on predicted weather to guide public health action (temperatures below 2 °C, heavy snow and widespread ice).¹⁰ Periods of cold weather were similarly defined here as days where the minimum temperature fell to <2 °C, with a second threshold of <0 °C. Snowfall was defined as days with a snow depth >0 cm and for the purposes of this investigation ‘heavy snow’ was defined as snow depth >5 cm. Information on ice was not available.

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