Indicators and trends

Monitoring climate change adaptation

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Indicator name				Version
CRS8 Excess deaths due to extreme temperatures				**31/03/16**

Indicator type:	**Risk/opportunity**	**Impact**	**Action**
		X	

SCCAP Theme	SCCAP Objective	CCRA risk/opportunity
Climate Ready Society	S1: Understand the effects of climate change and their impacts on people, homes and communities S2: Increase the awareness of the impacts of climate change to enable people to adapt to future extreme weather events	HE1: Summer mortality due to higher temperature HE5: Decline in winter mortality due to higher temperatures

At a glance

- Excess deaths due to cold (in winter) – now frequently described as seasonal increase in mortality - has been falling steadily and significantly (70%) over the last 60 years.
- Increases in mean and especially minimum winter temperatures as a result of climate change (together with a projected fall in relative humidity) would suggest that winter increases in mortality will continue to fall further.
- Improvements in housing, improved health care, higher incomes and greater awareness of the risks of cold suggest that the link between winter temperatures and increased winter mortality may no longer be as strong as before.
- Premature deaths due to extreme heat are not considered to be a significant climate-related health risk until the 2050s; the numbers that will be affected are estimated to be in the low to mid-hundreds.

Latest Figure	Trend
Seasonal increase in mortality (winter 2013/14): 1,600*- the 2nd lowest since records began in 1951/52 *rounded to 2 significant figures	Winter Mortality: downward

Why is this indicator important?

The most direct effect of climate change on public health is expected to be changes in the mortality and morbidity rates associated with exposure to ambient temperature.

Increasing winter temperature is presented as beneficial in The UK Climate Change Risk Assessment (CCRA) (HM Treasury, 2012), with the potential to see a decline in winter mortality and morbidity. This indicator considers mortality, measured in terms of changes in the *seasonal increase in winter mortality*, (or the *number of excess winter deaths*).

By contrast, while Summer temperatures similar to those seen in the 2003 UK heat-wave probably will become more common, excessive heat is not considered a significant climate-related risk in the current assessment and the consequences are considered low until the second reference period centred on 2050 (HR Wallingford, 2012).

Health protection measures in general will need to be far more nuanced to take account of the regional differences in winter (and summer) temperature (as well as precipitation and propensity to pluvial, fluvial and coastal flooding; and storms and disruption of services) (NHS Health, 2010; Scottish Government, 2011; Hames & Vardoulakis, 2012).

The International Statistical Classification of Diseases and Related Health Problems, Tenth Revision (ICD-10) [WHO 1990] provides a systematic, internationally understood classification scheme for recording deaths and diseases. A number of these codes are relevant here: ICD10 code J09-J11 is used to record deaths where influenza is the underlying cause; code T68 is used to record *hypothermia as a contributory cause* while X31 is used to record death from *exposure to excessive natural cold.*

Related Indicators:
CRS9: Number of hospital admissions resulting from extreme weather events

What is happening now?

There were 18,675 deaths registered in Scotland in the four months of winter in 2013/14 (December through March), compared with 19,908 in winter 2012/13. This is the lowest in any of the 63 winters for which data are available going back to 1951/52 (National Records of Scotland, 2014a).

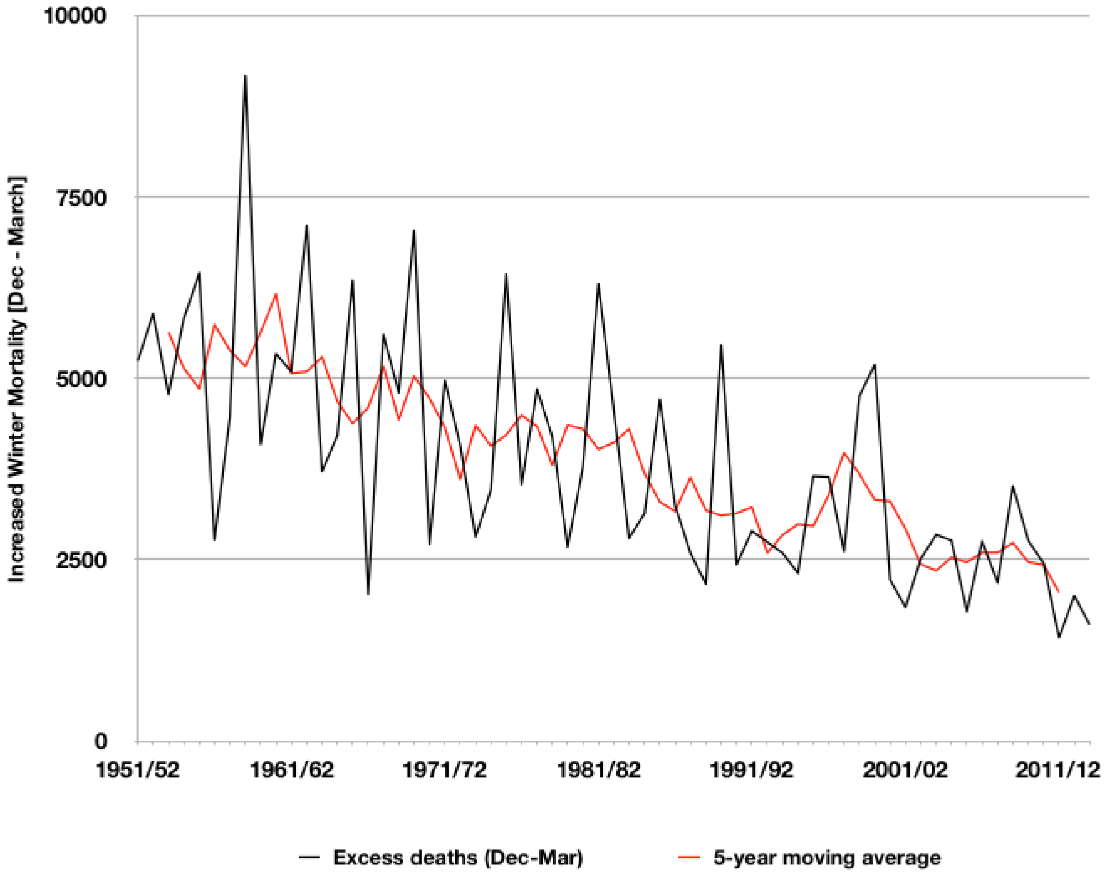
There were 1,600 excess deaths in the winter of 2013/14, 400 below the same period in 2012/13 and the second lowest for the 63 winters in the time series.

There is no single identifiable cause for 'excess' deaths in winter. Very few cases are caused by hypothermia, less than 1% in 2012/13 (see below). In a very small number of cases - just under 3% in 2012/13 - the underlying cause is identified as influenza like illness (ILI). Most (71%) are from chronic respiratory and circulatory diseases such as pneumonia, coronary heart disease and stroke.

What has happened in the past?

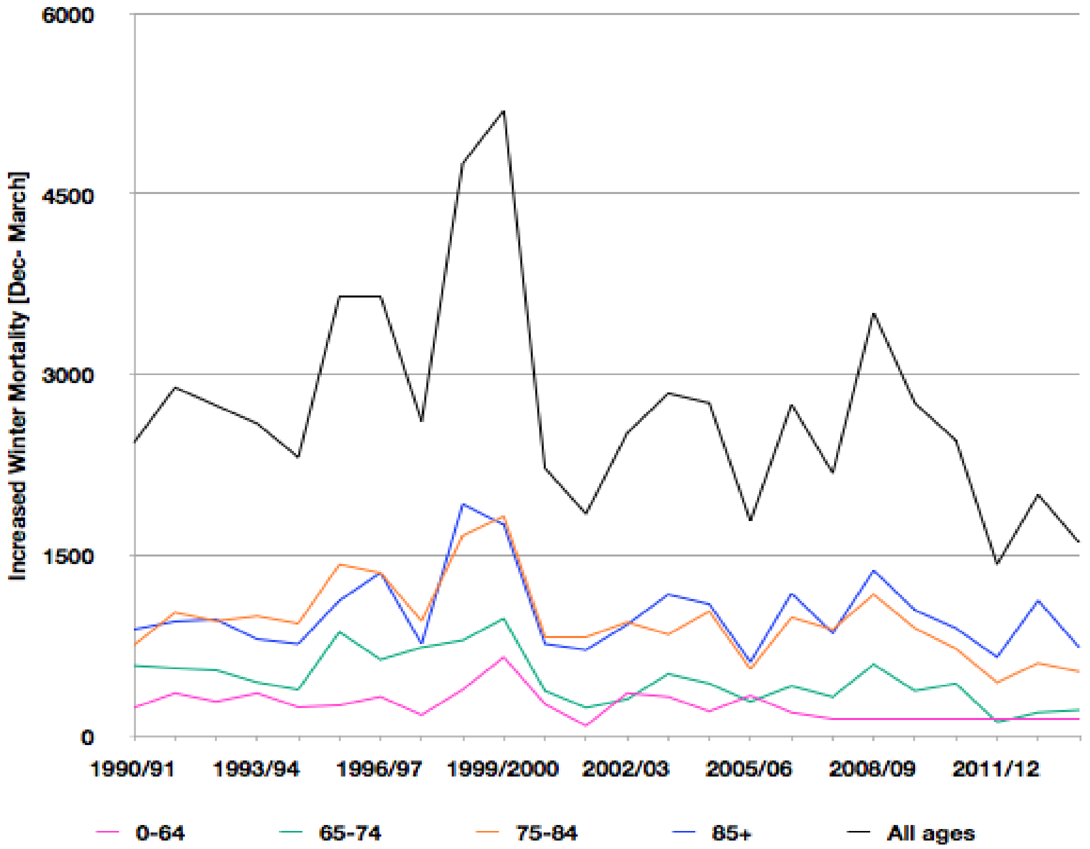
Over the 63 years for which records have been kept, the average number of excess winter deaths is 3,870, ranging from a maximum of 9,170 in 1958/59 – the year of the flu pandemic - to a minimum of 1,420 in 2011/12 (Figure 1). The 5-year moving average which smooths annual fluctuations has changed little since the early 2000s: the number of deaths in 7 of the last 12 years is within 100 of the average (2,400) and year-on-year changes in the range -7% to +5%.

As might have been expected, the majority of these seasonal increases occur in those over 75 years of age (79% for 2013/14). By contrast, for the zero-to-sixty-four age group, seasonal increased deaths have remained flat at 140 since 2007 (Figure 2).



(adapted from NRS, 2014a)

Figure 1: Excess deaths (winter) 1951 – 2013



(adapted from NRS, 2014a)

Figure 2: Seasonal Increase in Winter Mortality by Age Group [1991 -2013]

The relationship between winter mortality and mean winter temperature[1] is more complex. The downward trend in excess winter deaths appears to (inversely) mirror mean winter temperature (Figure 3) although no account has been taken here of lag times (Roklöv & Forsberg, 2008; Braga et al., 2001). Several studies recognise that increasing mean temperatures do not generally mitigate against death resulting from temperature extremes, which continue to occur (Åström et al., 2013).

While the relationship between temperature and mortality is well established, more detailed analysis of the delayed effects of cold snaps would be required to identify any causal effects (Anderson & Bell, 2009; Bacchini, 2008 and Rocklöv et al., 2008 – all cited in Åström et al., 2013).

[1] http://www.metoffice.gov.uk/climate/uk/summaries/datasets

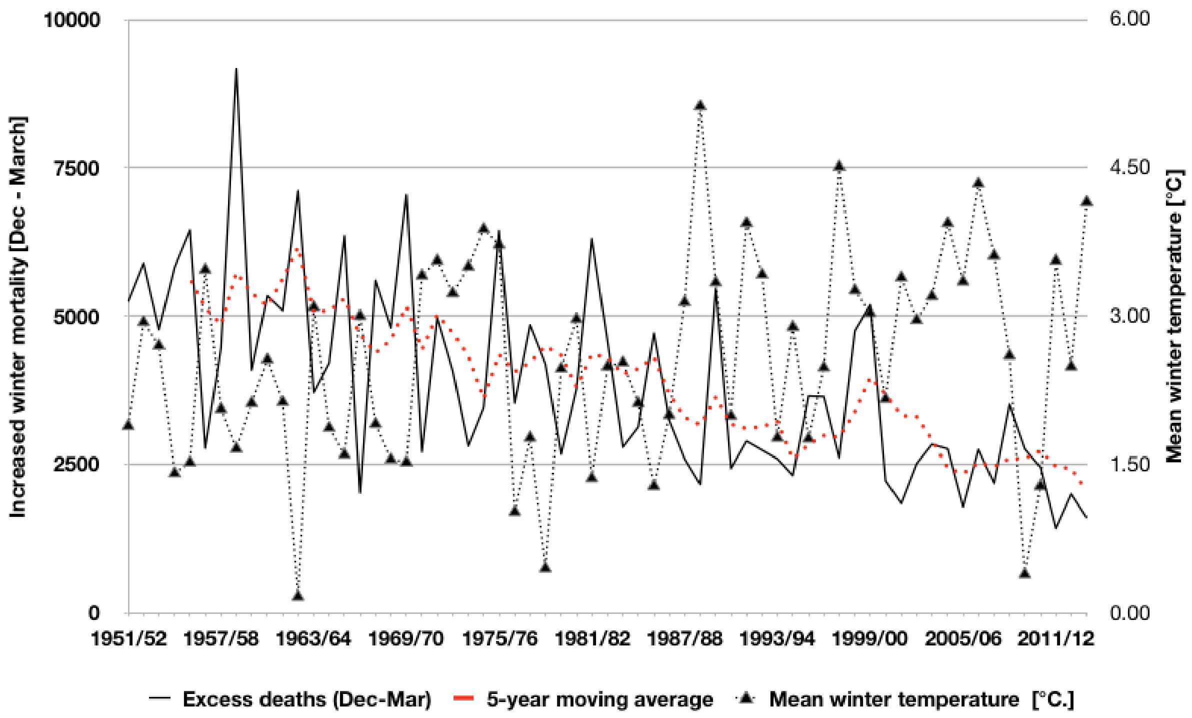


Figure 3: Time series of excess (winter) deaths and mean winter temperature

Additionally, while excess winter deaths are well correlated with influenza activity, the actual number of deaths from influenza-like illnesses is very low, with a maximum of 131 or 2.5% of increased winter mortality in 1999/2000.

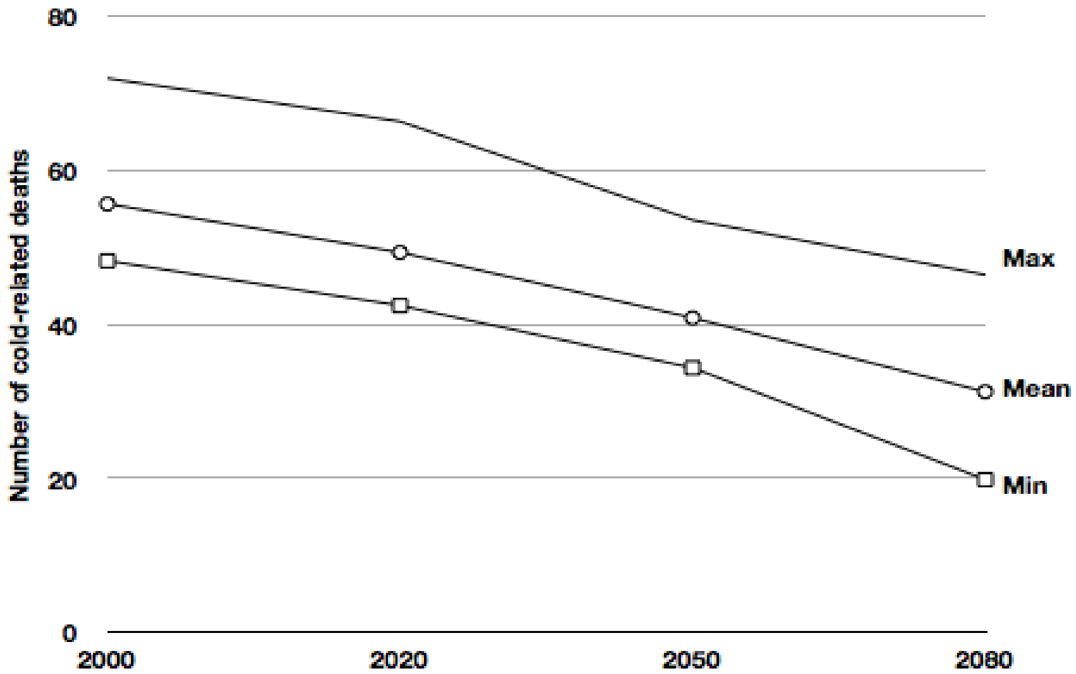
The number of deaths where hypothermia is identified as the underlying cause is similarly low. Over the period 2000 through 2013 the average number of deaths each year due to exposure to excessive natural cold was 27, 38.9% of who were aged 75 years or over, with a bias towards males in four of those years. In 2013 the total number of deaths from hypothermia was 25. This represents just 1% of excess winter deaths across Scotland. For comparative purposes, less than 0.4% of the total cold-related deaths annually for England and Wales are from hypothermia (ICD10 code X31) (Office of National Statistics, 2015).

The majority of excess (winter) deaths (71%) result from respiratory and circulatory diseases such as pneumonia, coronary heart disease and stroke.

What is projected to happen in the future?

The effect of milder winters on seasonal mortality is contested.

Some studies suggest that this will lead to a decrease in the number of premature deaths as a result of prolonged exposure to cold by between 550 and 890 by 2050s (HPA, 2012; HR Wallingford et al., 2012), representing a drop of between 34% and 56% against the 1,600 excess winter deaths reported in 2013/14 (National Records of Scotland, 2014a). This trend is confirmed in UK-wide studies of cold–related deaths, aggregating the evidence from multiple climate change models in the absence of adaptation (Figure 4).



(adapted from Hajat, 2014)

Figure 4: Projected Trends in Cold-related Deaths per 100K of the population in Scotland through 2080

On the other hand, others argue that there is no evidence to suggest that seasonal mortality will decrease as a result of milder winters because of simultaneous improvements in a range of factors which have already resulted in the recognition that the "association of year-to-year variations in [excess winter deaths] with the number of cold days in winter below 5°C evident until the 1970s has disappeared" (Staddon, 2014)

As noted previously, premature deaths from extreme heat are not considered a significant climate-related risk in the initial reference period centred on 2020 (HR Wallingford, 2012). In the later two reference periods, 100 heat-related (premature) deaths per year are estimated through to 2050 based on current population size, 10% higher based on future growth projections, and 200 by the 2080s: "these projected increases in deaths are very small in relation to the number of deaths likely for all causes in any particular year" (ibid, p170).

Patterns of change

Projections of population growth and historical and projected changes in temperature are both relevant here.

In June 2013, Scotland's population was 5.3 million. This is projected to rise by 9% over the next 25 years to around 5.78 million by 2037 although there will be distributional differences. The demographic trend is to an older population across all local authority regions with an additional 300,000 citizens of pensionable age overall, with the largest increases in West Lothian (+47%) and the Shetland Islands (+44%) (NRS, 2014b). Consequently, policy will need to consider the distributional effects of changing temperature and temperature extremes on both older urban *and* rural populations.

The minimum and mean winter temperatures for Scotland as a whole rose by an average of around 1.3°C between 1961 and 2006[2] which, together with the falling trend in heating degree days over the 45 years from 1961 – 2006, indicates a trend of milder winters that is projected to continue in future. Over the last half century (1961-2011) the following trends have been apparent (Sniffer, 2014):

- The average temperature has increased for all seasons for all regions by between 1.0 - 1.6°C, with a statistically significant trend for spring, summer and autumn.
- The maximum temperature has increased for all seasons for all regions by between 1.2 - 1.9°C, with a statistically significant trend in all seasons.
- The minimum temperature has increased for all seasons for all regions by between 0.7 - 1.4°C, with a statistically significant trend for spring, summer and autumn.
- Spring has seen the largest temperature increase with Scotland's spring average temperature increasing by 1.5°C.
- The length of winter cold spells reduced by 7.5 days across Scotland, a statistically significant trend.
- The length of summer heat waves increased by 5.5 days across Scotland, however this was not a statistically significant trend.

UKCP09 data provides the following central estimate (50% as likely as not) projections (UKCP09, 2009):

- Mean annual winter temperatures will continue to increase for all regions under all emissions scenarios during each of the three 30-year reference climate periods to 2080.

  In the East of Scotland, mean daily winter minimum temperature is as likely as not to rise from around 0.5°C for any of the emissions scenarios in 2020 to somewhere between 1.6°C (Low Emissions scenario) and 2.3°C (High Emissions scenario) by 2080. It is very unlikely that the coldest winter days will be much below -1.3°C (High Emissions scenario) in the last twenty years of the millennium.

  Mean daily winter minimum temperature in the West will as likely as not rise from around 1.9°C for all emissions scenarios in the period centred on 2020 to 4.3°C (High Emissions scenario) by 2080. It is very unlikely that the coldest winter days will be much below 0°C (High Emissions scenario) in the period centred on 2080.

  In the North, mean daily winter minimum temperature is as likely as not to rise from around 1°C in the 2020 period to 2.7°C (High Emissions scenario) by 2080. It is very unlikely that the coldest winter day would fall below -1.5°C (Medium Emissions scenario) by 2080.

  As noted above, there is a reasonable correlation between mean winter temperature and increased winter deaths (r=-0.5), recognising that winter deaths can also be influenced by other extreme weather events and indeed by non-climate factors.

- Mean annual summer temperatures also will continue to increase for all regions under all emissions scenarios during each of the three 30-year reference climate periods to 2080.

  Mean daily summer maximum temperature in the East is very likely to rise from around 19.5°C to 20.0°C across all emissions scenarios in the period 2010-2039 (centred on 2020) to somewhere between 22.5°C (Low Emissions scenario) to 26.4°C (High Emissions scenario) by the final reference period of the millennium centred on 2080.

  In the West, the mean daily summer maximum temperature is very likely to rise from around

[2] http://ukclimateprojections.metoffice.gov.uk/23036

18°C for any of the emissions scenarios to a high of 25.5°C (High Emissions scenario).

Heat-waves are more likely to be most intense further away from the coasts and based on observed trends are probably more likely to be in the south-east and north-east.

For strategic planning purposes the distributional effects are important.

Interpretation of indicator trends

The trend in increased winter mortality is downwards. The number of recorded cases in winter 2013/14 was the second lowest in record for the 63 winters since 1951, only 2011/12 being lower. The extent to which a decrease in winter mortality can be meaningfully correlated with mean winter temperature is contested. More importantly perhaps, it is more likely that both deaths avoided (winter) and premature deaths (summer) will result from cold snaps and heat-waves rather than from prolonged exposure to extreme temperature (Roklöv & Forsberg 2008). However, identifying causation is difficult here too (Åström et al., 2013).

The majority (74%) of deaths where hypothermia was a contributory cause (T68) also have a different underlying cause of death such as mental or behavioural disorders 'due to the use of psychoactive substances (e.g. chronic alcoholism), heart disease, a stroke, pneumonia, alcoholic liver disease or a fall' (National Records of Scotland, 2014a). Consequently, climate-related, winter mortality data relating to *exposure to excessive natural cold* (X31) were used, as the attribution to extreme weather events is stronger (than T68) although still an area of considerable uncertainty. Even so, the total number of deaths is low: 25 in 2013 around a third (32%) of who were aged 75 or older with a slight bias towards males (15 male / 10 female). While this is an increase of 66% over 2012 the low number of cases requires consideration of long-term trends rather than annual variations[3].

Further, linking this trend to a climate signal is difficult. The first-order driver for increased winter mortality may or may not be climate or even weather related: fuel poverty for example could equally well be the causal factor[4]. A number of studies have concluded that winter mortality is due in no small part to the population not being able to protect themselves adequately from the effects of temperature rather than the effects of temperature itself (Eurowinter Group, 1997; Gemmell et al., 2000). Indeed, while decadal averages have fallen from over 5,400 excess winter deaths in the 1950s to just over 2,500 in the 2000s, a 53% fall in 6 decades, Staddon (2014) argues that better housing, improved health care, higher incomes and greater awareness of the risks of cold is more likely to be the cause and that the link between winter temperatures and increased winter mortality may no longer be as strong as before.

As noted above, the number of premature deaths due to exposure to excess heat has not been considered here.

[3] See also *Fluctuations in and possible unreliability of death statistics for small areas, small sub-groups of the population, or for short periods*, http://www.gro-scotland.gov.uk/statistics-and-data/statistics/statistics-by-theme/vital-events/deaths/deaths-background-information/fluctuations-in-and-possible-unreliability-of-death-statistics

[4] Anecdotally, the highest numbers of increased winter mortality consistently occur in the Greater Glasgow & Clyde or Lothian Health Boards. Glasgow City contains 148 of the datazones in the first vigintile [5%] of (extreme) deprivation measured by the Scottish Multiple Index of Deprivation [SIMD]. However, the relatively low number of deaths provides insufficient evidence to establish a causal relationship. Further a number of studies have found no correlation between social deprivation and winter mortality [GRO (2013)].

Limitations
Data on the actual cause of death are available from the National Records of Scotland (NRS, 2014a). The majority of winter deaths are from respiratory and circulatory diseases such as pneumonia, coronary heart disease and stroke rather than hypothermia or influenza-like illnesses. This data is dependent on the completeness of the patient record coded using ICD10. Any supporting narrative in the patient record would be useful in helping to determine the primary driver: whether for example death was due to being in a cold home (fuel poverty) or being outside in freezing conditions (extreme weather event) or indeed any of the other myriad underlying causes of death. It is unlikely that this data will be made available due to confidentiality issues and the likelihood of deductive disclosure. Indeed, given the low numbers of deaths and with the expectation that mean winter temperatures will continue to rise and the current downward trend in increased winter mortality, the benefits of any such narrative analysis are themselves likely to be marginal. Consequently, the data on climate-related seasonal mortality is too sparse to be able to identify any statistically significant trends or draw any definitive conclusions. The decrease in winter mortality due to prolonged exposure to extreme cold alleviated by increasing mean winter temperatures will probably be offset by the rise in heat-related deaths by the third reference period centred on 2080. The data are collected at national scale using a standardised recording system and have been provided at the same scale to avoid 'deductive disclosure'. This masks distributive effects – both the patterns in the epidemiology and how they map to the (projected) changes in climate related events (UKCP09, 2009). Trends in population size and demography (increasingly large proportion of people aged 75+) may mean future analyses should not be based on counts, rather rates with some form of standardisation.

References

Åström, D.O., Forsberg, B., Ebi, K.L., and Rocklöv, J. (2013) Attributing Mortality from Extreme Temperatures to Climate Change in Stockholm, Sweden. *Nature Climate Change* 3: 1050-1054

Braga A.L., Zanobetti A. and Schwartz J. 2001. The Time Course of Weather-Related Deaths. *Epidemiology* (12) pp. 662-667

The Eurowinter Group (1997). Cold exposure and winter mortality from ischaemic heart disease, cerebrovascular disease, respiratory disease, and all causes in warm and cold regions of Europe. *The Lancet*, 349: 1341 – 1346

Gemmell I, McLoone P, Boddy FA, Dickinson GJ, and Watt GCM (2000). Seasonal variation in mortality in Scotland. *International Journal of Epidemiology*, 29: 274 – 279

Hajat, S. et al (2014) Climate change effects on human health: projections of temperature-related mortality for the UK during the 2020s, 2050s and 2080s, *J. Epidemiol Community Health* (0) pp. 1-8.

Hames, D & Vardoulakis, S. (2012) *Climate Change Risk Assessment for the Health Sector*. DEFRA GA0204, H.R. Wallingford, Wallingford, Oxfordshire.

HPA (2012) *Health Effects of Climate Change in the UK 2012,* Health Protection Agency, London, 2012; available at http://www.hpa.org.uk/hecc2012.

HM Treasury (2012) *UK Climate Change Risk Assessment: Government Report*. January 2012; available at: www.gov.uk/government/publications/uk-climate-change-risk-assessment-government-report

HR Wallingford, AMEC Environment & Infrastructure UK Ltd, The Met Office, Collingwood Environmental Planning, Alexander Ballard Ltd, Paul Watkiss Associates (2012) *A Climate Change Risk Assessment for Scotland*, DEFRA; available at: http://randd.defra.gov.uk/Document.aspx?Document=10069_CCRAforScotland16July2012.pdf (Accessed 24 April 2014).

National Records of Scotland (NRS) (2014a) *Winter Mortality Statistics*; available at: www.nrscotland.gov.uk/statistics-and-data/statistics/statistics-by-theme/vital-events/deaths/winter-mortality (Accessed 02 Feb 2015).

National Records of Scotland (NRS) (2014b) *Population Projections for Scottish Areas;* available at: http://www.nrscotland.gov.uk/news/2014/population-projections-for-scottish-areas and www.nrscotland.gov.uk/statistics-and-data/statistics/statistics-by-theme/population/population-projections/sub-national-population-projections/2012-based (Accessed 24 Jan 2015).

NHS Health Scotland (2010) *Climate Change Adaptation Consultation*; available at: www.healthscotland.com/documents/4537.aspx

Office of National Statistics (2015) *Mortality Statistics: Deaths Registered in England & Wales*, available at: http://www.ons.gov.uk/ons/rel/vsob1/mortality-statistics--deaths-registered-in-england-and-wales--series-dr-/index.html (Accessed January 26th 2015)

Roklöv, J & Forsberg, B (2008) The Effect of Temperature on Mortality in Stockholm 1998-2003: A study of lag structures and heat-wave effects. *Scand. J. Public Health* 26: 516-523

Scottish Government (2011) *Health and Well-being Sector Action Plan*; available at: www.gov.scot/Topics/Environment/climatechange/scotlands-action/adaptation/AdaptationFramework/SAP/Health

Sniffer (2014) *Scotland's Climate Trends Handbook*, available at: www.environment.scotland.gov.uk/climate_trends_handbook/index.html

Staddon, P.L. et al. (2014) Climate Warming will not decrease winter mortality*, Nature Climate Change* 4: 190-194.

UKCP09 (2009) *The Climate of the United Kingdom and Recent Trends*; available at: http://ukclimateprojections.metoffice.gov.uk/media.jsp?mediaid=87933&filetype=pdf (Accessed 23 Jan 2015).

WHO (1990) *International Classification of Diseases, Tenth Revision*; available at: www.who.int/classifications/icd/en/ (Accessed 26 June 2014).

Further information

General Register of Scotland (GRO) (2013) Increased Winter Mortality – Background. Available at: http://www.gro-scotland.gov.uk/files2/stats/increased-winter-mortality/increased-winter-mortality-background-info.pdf

Health Protection Scotland (HPS) (2014) *Technical Document: Reporting Rates of Influenza (flu) from General Practitioners in Scotland*. Available at:

www.documents.hps.scot.nhs.uk/respiratory/seasonal-influenza/expanded-technical-2014-2015.pdf

Met Office. *Climate Summaries*. Available at: http://www.metoffice.gov.uk/climate/uk/summaries/datasets

National Records of Scotland (NRS) (2014c) *Winter Mortality in Scotland 2013/14*. Available at: www.nrscotland.gov.uk/files/statistics/winter-mortality/2013-2014/winter-mortality-2013-14.pdf

National Records of Scotland (NRS). *Vital Events Reference Tables* provide data on causes of death over the most recent decade. Available at: www.nrscotland.gov.uk/statistics-and-data/statistics/statistics-by-theme/vital-events/general-publications/vital-events-reference-tables/2013/section-6-deaths-causes and in the archive for data going back to the decade 1991-2000: www.nrscotland.gov.uk/statistics-and-data/statistics/statistics-by-theme/vital-events/general-publications/vital-events-reference-tables/archive

Studies on excess winter deaths in the EU. Available at: http://ec.europa.eu/health/climate_change/extreme_weather/cold_weather/index_en.htm

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Appendix One: Indicator metadata and methodology

Table 1: Indicator metadata

	Metadata
Title of the indicator	CRS8: Excess deaths due to extreme temperatures
Indicator contact: Organisation or individual/s responsible for the indicator	ClimateXChange
Indicator data source	National Records of Scotland
Data link: URL for retrieving the indicator primary indicator data.	www.nrscotland.gov.uk/statistics-and-data/statistics/statistics-by-theme/vital-events/deaths/winter-mortality

Table 2: Indicator data

	Indicator data
Temporal coverage: Start and end dates, identifying any significant data gaps.	**Mortality data:** 1951/52 to 2013/14 no data gaps. **Influenza activity data:** *Fluspotter* was used 1971 through 2008 was superseded by the *Pandemic Influenza Primary Care Reporting (PIPeR)* in 2004. Since 2009/10 the Scottish Influenza Surveillance Reporting Scheme (SISRS) has provided aggregate level data on GP consultation for ILI (see Methodology). Note: 'fluspotter' and 'SISRS' systems measure activity using different methods and definitions; their results are not directly comparable. Data for deaths where influenza is the underlying cause are available from 1991, noting that the coding system changed from ICD9 (code 487) to ICD10 (code J09-J11) in 1999. The reported increased winter mortality data for the zero-to-sixty-four age group have remained flat since 2007 (Figure 2); the data quality therefore probably needs validating.

Frequency of updates: Planned or potential updates	Annually, 12 month lag time
Spatial coverage: Maximum area for which data is available	Scotland
Uncertainties: Uncertainty issues arising from e.g. data collection, aggregation of data, data gaps	Attribution to the climate signal is weak
Spatial resolution: Scale/unit for which data is collected	Local Authority and Health Board
Categorical resolution: Potential for disaggregation of data into categories	Local Authority/Health Board; Age; Gender.
Data accessibility: Restrictions on usage, relevant terms & conditions	Publicly accessible and free. Crown copyright.

Table 3 Contributing data sources

Contributing data sources Data sets used to create the indicator data, the organisation responsible for them and any URLs which provide access to the data.
National Records of Scotland: winter mortality statistics www.nrscotland.gov.uk/statistics-and-data/statistics/statistics-by-theme/vital-events/deaths/winter-mortality/winter-mortality-in-scotland-201314/tables-and-figures

Table 4 Indicator methodology

Indicator methodology The methodology used to create the indicator data
The primary data source for the indicator is the time series for excess winter deaths. Sources for additional data are documented below, covering influenza-like illness, hypothermia and mean winter temperatures Excess winter deaths (seasonal increase in mortality in the winter) is defined as the difference between the number of deaths in the four-month 'winter' period (December to March, inclusive) and the average number of deaths in the two four-month periods which precede winter (August to November) and follow winter (April to July). This is a standard definition that is used by the Office for National Statistics, the World Health Organisation and others who may describe it as - e.g. 'excess winter deaths' or 'excess winter mortality' [see: National Records of Scotland 2014c]. Data on influenza-like illnesses (ILIs) has been collated since 1971. The *fluspotter* surveillance scheme ran from 1971 to 2008 under the control of Health Protection Scotland. It was superseded by the *Pandemic Influenza Primary Care Reporting* (PIPeR) sentinel system, started in 2004 and obsoleted by a change in the software used in GP Practice in 2011/12. Since 2009/10 the Scottish Influenza Surveillance Reporting Scheme (SISRS) has provided aggregate level data on GP consultation for ILI,

based on automated software extracts from 99% of Scottish GP practices. These data are now used for routine surveillance of ILI in Scotland, and data from the PIPeR sentinel scheme have been used retrospectively to calculate comparable historical rates for SISRS for the period 2003/04 to 2008/09. The 'SISRS' data replaced the 'PIPeR-based' figures that appeared in the previous edition of this publication. A technical guide providing more details on SISRS data is available from the HPS website on seasonal influenza surveillance[5].

Data on deaths from ILI (ICD10 J09-11) is taken from the National Records of Scotland Vital Events database www.nrscotland.gov.uk/statistics-and-data/statistics/statistics-by-theme/vital-events/general-publications/vital-events-reference-tables/2013 [Section 6] for data back to 2003 and the archive www.nrscotland.gov.uk/statistics-and-data/statistics/statistics-by-theme/vital-events/general-publications/vital-events-reference-tables/archive for data back to 1991; note ILI was coded through ICD9 (487) before 1999.

Mean winter temperatures are taken from the Met Office regional summaries for Scotland[6].

[5] http://www.hps.scot.nhs.uk/resp/influenzasurveillancesystems.aspx

[6] http://www.metoffice.gov.uk/climate/uk/summaries/datasets