Office for National Statistics

Winter mortality in England and Wales QMI

Quality and methodology information for winter mortality in England and Wales detailing the strengths and limitations of these data, methods used and data uses and users.

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To be announced

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1 . Output information

- National Statistic: yes

- Data collection: death occurrences

- Frequency: annual

- How compiled: administrative data processing

- Geographic coverage: England and Wales

- Last revised: 19 January 2023

2 . About this Quality and Methodology Information report

This quality and methodology report describes the quality characteristics of the data underlying the winter mortality series (including the European Statistical System five dimensions of quality) as well as the methods used to create it.

The information in this report will help you to:

- understand the strengths and limitations of the data

- learn about existing uses and users of the data

- understand the methods used to create the data

- help you to decide suitable uses for the data

- reduce the risk of misusing data

3 . Important points

- [Winter mortality (WM)](#) measures the difference in the number of deaths in the winter period compared with the average number of deaths occurring in two adjacent non-winter periods.

- It is an important measure as it allows users to assess whether policies are having an impact on mortality risks during the winter period.

- The Office for National Statistics (ONS) standard method defines the winter period as December to March and the two non-winter periods as the preceding August to November and the following April to July.

- The WM index expresses the difference in deaths that occurred in the winter period as a percentage of the average deaths occurring in the non-winter periods to allow demographic and geographic comparisons.

- The data used to calculate WM figures are death occurrences taken from routinely collected death registration data, which cover all deaths in England and Wales.

- Until 2009, these figures were published as an annual report in the ONS journal [Health Statistics Quarterly](#), but since 2010 they have been published as a [statistical bulletin](#).

- In recent publications, we have excluded deaths occurring in 2020 from our five-year averages to provide a comparison of the deaths expected in a usual (non-pandemic) period.

- Figures in the bulletin include COVID-19 deaths; data excluding COVID-19 deaths are available in the accompanying [dataset.](#)

4 . Quality summary

Overview

In common with other countries, England and Wales experience higher levels of overall mortality in the winter than in the summer. To measure this increase, the Office for National Statistics (ONS) calculates the number of winter deaths compared to non-winter deaths and the winter mortality (WM) index.

Both metrics provide an informative summary of the comparative levels of mortality during the winter and non-winter periods in England and Wales and should not be interpreted as the number of people who died directly as a result of colder weather occurring during December to March.

The [annual publication](#) provides main findings and commentary on the most recent winter using provisional data and updates the previous winter using final data. A [dataset](#) with time series WM figures from 1950 to 1951 for England and Wales combined and a time series from 1991 to 1992 by country, sex, age, cause of death, and place of usual residence is published alongside.

Uses and users

The main external users of our WM statistics include:

- the Department of Health and Social Care

- UK Health Security Agency

- the Welsh Government

- clinical commissioning groups and Welsh health boards

- Public Health Wales

- local authorities

- charities such as Age UK and National Energy Action

- academics

Research suggests that mortality during the winter increases more in England and Wales compared with other European countries with colder climates. The elderly are more vulnerable than others during the winter, hence policies aimed at tackling WM have been implemented, such as government winter fuel payments and NHS influenza vaccinations, which have a particular focus on older people. The annual WM figures allow users to assess whether these policies are having an impact.

National Records of Scotland (NRS) produces an annual report on Winter Mortality.

The Northern Ireland Statistics and Research Agency (NISRA) produces an annual report on Winter Mortality.

5 . Quality characteristics of the winter mortality data

Relevance

The data used to calculate winter mortality (WM) figures are deaths by date of occurrence. These data is drawn from routinely collected death registration data for England and Wales, supplied to the Office for National Statistics (ONS) by registrars and coroners. More general information on the collection, production and quality of mortality data is available in Mortality metadata (PDF, 2.46MB).

Provisional WM figures are produced for the most recent winter using an estimation method to adjust for late registrations and are rounded to the nearest 100. Final WM figures for the previous winter are rounded to the nearest 10.

Individual deaths are assigned to geographical areas by linking the postcode of usual residence of the deceased to the National Statistics Postcode Lookup, using the latest boundaries in place at the time.

Local area WM figures for the most recent winter are not produced, as populations are too small to provide reliable estimates for adjusting provisional numbers.

WM figures by country are available from 1991 to 1992 onwards. Historical WM data for England and Wales combined are available from 1950 to 1951 onwards. It is not possible to calculate WM before this time, as electronic death records are not available.

Accuracy and reliability

The mortality data from which these WM figures are calculated are routinely collected under various Acts of Parliament. The legal requirement to register all deaths occurring in England and Wales means that death registrations data cover nearly all deaths in England and Wales and are considered of high quality. Most deaths are certified by a doctor using the Medical Certificate of Cause of Death, but some deaths, for example, those that were violent or unexpected, are certified by a coroner.

As with all administrative sources of data, there are several potential sources of error in death registrations data, including:

- the death certificate was completed incorrectly by the doctor or coroner

- incorrect information was supplied by the informant at death registration

- some information may be missing, for example, if the informant does not know the deceased's date of birth

- a death may have been registered twice, so the database contains duplicate records

- the exact date of death may not be known (for example, if the deceased is discovered some time after death)

- errors were made by the registrar when registering the death

- errors in the automatic coding system used to code the cause of death

- errors were made by Office for National Statistics (ONS) coders when coding cause of death or other variables (for example, occupation)

Quality checks are in place to minimise these errors, which include checks that are carried out at the time of registration, data entry checks, coding validation checks and pre- and post-analysis frequency checks. Risk is minimised as the coding is carried out by highly trained, experienced ONS staff who apply standardised International Classification of Diseases (ICD) coding rules.

Data for the current year come in the form of an extract of occurrences taken from the live death registration database and have not been through all these rigorous quality checks. Therefore, provisional WM figures will be less accurate than final figures.

A small number of deaths that occurred during the reference periods, but have not yet been registered, will be missing from the data used to calculate WM. ONS mortality data are "complete" in the sense that eventually all deaths occurring in England and Wales will be entered onto the ONS death registration database. Almost 95% of deaths are registered within one month of the date of occurrence. However, deaths that need further investigation from a coroner can take much longer. More details of the estimation methods used to minimise this issue in our provisional data can be found in the Methods used to produce winter mortality data section.

Although a small number of deaths that occurred in previous years will be registered after final WM figures are published, these figures are not updated as the impact of these late registrations on WM figures is likely to be minimal. More information on the impact of registration delays is available.

Figures based on a small number of events are subject to random fluctuations, therefore the WM index is presented with 95% confidence intervals. A 95% confidence interval is a measured range within which there is a 95% probability that the true population value lies. It is a standard way of expressing the statistical accuracy of a calculated estimate.

As the interval around an estimate widens, the level of uncertainty about where the true value lies increases. The size of the interval around the estimate is strongly related to both the number of deaths and the size of the underlying population.

The overall level of error at a national level will be minor compared with the error associated with a local authority or a specific age and sex group. Therefore, the size of the confidence intervals reported in this release will differ.

More information about the quality assurance and accuracy of the underlying mortality data can be found in Mortality metadata (PDF, 2.46MB) and the Mortality statistics in England and Wales QMI.

Output quality

WM statistics are based on both final and provisional death occurrences in a 12-month period.

Using this provisional dataset allows the ONS to publish the data to a timelier schedule, rather than waiting over a year after the end of the winter period in question for the finalised data. The disadvantage of using the provisional WM data is that late registrations (for example, deaths that have been referred to a coroner) will not appear in the data. This means that the WM deaths and index produced in the bulletin for the current year are based on provisional data and therefore we cannot guarantee 100% accuracy.

Coherence and comparability

The method used by the ONS to calculate WM is consistent with that of the World Health Organization Regional Office for Europe. This standard method is used to calculate Winter Mortality by National Records of Scotland (NRS) and to calculate Winter Mortality by Northern Ireland Statistics and Research Agency (NISRA). This method has also been used in several academic papers researching factors related to WM, for example, Excess winter mortality in Europe: a cross country analysis identifying key risk factors, Healy, (2003).

WM figures for England, Wales, and Northern Ireland are based on death occurrences. Therefore, WM figures for Northern Ireland and England and Wales are broadly comparable.

However, figures for Scotland are based on death registrations and are therefore a more complete data source. In Scotland, a death must be registered within eight days and fact of death can be registered (with a cause given as unascertained, pending investigations) before the Procurator Fiscal has completed their investigations. Therefore, Scottish mortality data are not subject to the same registration delays as mortality data for England and Wales. WM figures from Scotland are broadly comparable with ONS figures for England and Wales.

This WM method has been applied consistently for all time periods, so data for England and Wales by sex, age, cause of death and place of residence are available from 1991 to 1992 winter onwards. UK-wide figures are not available as the ONS only hold and own death registration data for England and Wales

Within England and Wales, the number of winter deaths compared to non-winter deaths is likely to vary based on the size, sex, and age structure of the population. Large local authorities, such as Birmingham, Sheffield, and Leeds, will have higher WM, simply because there are more people living there and so have more deaths overall throughout the year.

The WM index expresses the difference in winter deaths as a percentage of the average deaths occurring throughout the rest of the year. This means that the variations in the absolute number of deaths will not bias this statistic and makes objective comparison between areas possible. It is for this reason that the WM index, not the difference in number of winter deaths compared with non-winter deaths should be used when comparing areas or examining trends over time.

Some local public health departments and clinical commissioning groups use ONS mortality data to calculate WM for their local area. These figures are likely to differ from ONS figures because they are based on provisional death registration data that have not been through the same quality assurance as the final death occurrences data used by the ONS. In addition, the ONS adjusts provisional figures for the most recent winter using a calculated factor; other organisations may not apply this factor.

Concepts and definitions

Winter deaths compared with non-winter deaths

The ONS standard method compares the number of deaths that occurred in the winter period, December to March, with the average number of deaths occurring in two non-winter periods, the preceding August to November and the following April to July:

$$\text{Winter deaths compared to non winter deaths} = \text{winter deaths} - \text{average non winter deaths}$$

Winter mortality (WM) index

The WM index is expressed as a percentage and is calculated so that comparisons can be made between groups:

$$\text{WM Index} = \frac{\text{Winter deaths compared to non winter deaths}}{\text{Average non winter deaths}} \times 100$$

The WM index is presented with 95% Confidence Intervals (CI), which are calculated as:

$$95\% \, \text{CI} = \text{WM Index} \pm 1.96 \times \left[\frac{\text{WM Index}}{\sqrt{\text{Winter deaths compared to non winter deaths}}} \right]$$

Geography

The Winter Mortality release covers:

- England and Wales combined and separately

- English regions

- England and Wales local authorities

- English clinical commissioning groups and Welsh health boards

- England and Wales Parliamentary constituencies

Cause of death

We produce figures for some causes of death in the WM release. The International Classification of Diseases 10th Edition (ICD-10) definitions are as follows: circulatory diseases (I00 to I99), respiratory diseases (J00 to J99), dementia and Alzheimer's disease (F01, F03 and G30), and coronavirus (COVID-19) (U07.1, U07.2, and U10.9). For deaths involving COVID-19, ICD-10 code U09.9 is also included.

Accessibility and clarity

Our recommended format for accessible content is a combination of HTML webpages for narrative, charts, and graphs, with data being provided in usable formats such as CSV and Excel. Our website also offers users the option to download the narrative in PDF format. In some instances, other software may be used, or may be available on request.

Available formats for content published on our website but not produced by us, or referenced on our website but stored elsewhere, may vary. For further information, please refer to the contact details at the beginning of this report.

For information regarding conditions of access to data, please see:

- terms and conditions for ONS website use

- accessibility statement for ONS

Timeliness and punctuality

Each October, the ONS produces an annual file showing death occurrences in the previous year. This extract is taken approximately five months after the annual "death registrations" extract to give more time for late registrations (for example, deaths that have been referred to a coroner) to appear in the data. At the same time, a special extract of all deaths occurring between January and July of the current year is taken from the live death registrations database.

Compared with the annual death occurrences file, the special extract of provisional mortality data for the current year undergo fewer quality checks and do not include late registrations. However, it means provisional WM figures can be made available much earlier than final figures.

Information from these two datasets is combined and provisional WM figures are produced using the number of deaths occurring each month between August of the previous year and July of the current year. Final figures are produced using the same period one year earlier. Provisional WM figures for the most recent winter and final figures for the previous winter are published annually around November.

Provisional WM figures are published eight months after the end of the winter period and four months after the end of the non-winter period. Final WM figures are released 20 months after the end of the winter period and 16 months after the end of the non-winter period. These delays are because of the large amount of quality checking that must be performed on the underlying mortality data.

The provisional release date of the statistical bulletin on WM is announced in the GOV.UK statistical release calendar. The date is then finalised at least four weeks before publication. In the unlikely event of a change to the pre-announced release schedule, public attention will be drawn to the change and the reasons for the change will be explained fully at the same time, as set out in the Code of Practice for Statistics.

Why you can trust our data

The ONS is the UK's largest independent producer of statistics and is the country's national statistics institute. The Data Policies, available on the ONS website, detail how data are collected, secured and used in the publication of statistics. We treat the data that we hold with respect, keeping it secure and confidential, and we use statistical methods that are professional, ethical, and transparent.

6 . Methods used to produce the winter mortality data

Main data sources

All Office for National Statistics (ONS) mortality data come from information collected when a death is certified and registered. We code all the causes mentioned on a death certificate using the International Statistical Classification of Diseases and Related Health Problems, 10th Revision (ICD-10). From all the causes mentioned, an underlying cause of death is selected using ICD-10 coding rules.

Most deaths (around 95%) are registered within one month of the date of occurrence, although violent or unexpected deaths, which need further investigation from a coroner, can take much longer.

The Winter mortality bulletin is created using death occurrence data. These are part of the national mortality database for England and Wales, which is held by the ONS. The death occurrences database is updated each year to include the previous year's final figures.

Further details about how ONS mortality data are collected and coded can be found in Mortality metadata (PDF, 2.46MB) and the Mortality statistics in England and Wales QMI.

How we process and analyse the data

Winter mortality (WM) is calculated by comparing the number of deaths occurring in winter with the number of deaths occurring in two adjacent non-winter periods. A special mortality dataset is generated in October for deaths that were registered by this time, but which occurred up to the end of July for the present year. This dataset contains provisional death occurrence data for January to July of the current year.

As this special mortality dataset is provisional, deaths that were referred to a coroner or for which an inquest was held may not be included in the extract if they were registered after October, even if the death occurred between January and July. This means that the figures contained in the dataset underestimate the true number.

To compensate for this, a factor is calculated using the number of deaths from the previous year's provisional and final datasets. The factor represents the percentage of deaths per month that were registered by the time the final dataset was created but were not registered at the time the provisional dataset was created. These factors are created for the total number of deaths per month and then applied to each corresponding month in the current year's provisional dataset (Example 1). We also calculate factors by week and cause of death.

This results in an estimated number of final deaths for January to July in the current year.

Example 1: Calculation of winter mortality adjustment factors, England and Wales combined

| Month | 2017 to 2018 | | | | 2018 to 2019 | |
	Provisional deaths	Final deaths	Percentage not registered	Rounded factor	Provisional deaths	Adjusted deaths
January	59,149	60,021	1.47	1.01	50,248	50,750
February	47,892	48,852	2.00	1.02	44,375	45,263
March	51,527	52,887	2.64	1.03	43,831	45,146
April	41,502	43,124	3.91	1.04	42,198	43,886
May	39,383	41,441	5.23	1.05	40,380	42,399
June	36,473	38,902	6.66	1.07	37,268	39,877
July	37,266	40,283	8.10	1.08	37,655	40,667

Winter deaths compared to non-winter deaths and the WM index can then be calculated for the most recent winter (Example 2). As these figures are provisional, they are rounded to the nearest 100 and are broken down by age, sex, underlying cause of death, place of death, and region. Provisional WM figures are not produced for areas smaller than regions of England. Final WM figures are calculated using all final data for the previous winter. They are rounded to the nearest 10 and are broken down by age, sex, underlying cause of death, place of death, and region. Final WM figures are also available for local areas.

Example 2: Calculation of provisional winter mortality figures, using the adjusted deaths from Example 1, in England and Wales combined

Period	Winter mortality
Winter period: **December 2018 to March 2019 deaths**	188,073
Pre non-winter period: **August to November 2018 deaths**	162,844
Post non-winter period: **April to July 2019 deaths**	166,829
Average non-winter deaths	164,837
Winter deaths compared to non-winter deaths **= winter deaths – non-winter deaths**	188,073 – 164,837 = 23,236
Rounded provisional winter deaths compared to non-winter deaths	23,200
WM Index = (winter deaths compared to non-winter deaths / average non-winter deaths) x 100	(23,236 / 164,837) x 100 = 14.1

Previously for instances where winter deaths compared to non-winter deaths were zero or minus, a WM index was not presented. However, for data years 2020 to 2021 and 2021 to 2022, a WM index has been calculated. A negative WM index means there were higher deaths in the non-winter periods than the winter period.

How we quality assure and validate the data

Quality assurance is carried out at all stages of production. Specific procedures include:

- independent extraction of base mortality and population data by two research officers

- independent analyses by two research officers and use of check sheets to match analyses before writing up results

- plausibility checking of new estimates through cross-referencing with past publications and more widely with what we know about the general trend in mortality

- identification of outliers in subnational estimates

How we disseminate the data

WM data are available online for England and Wales separately back to 1991 to 1992, and from 1950 to 1951 for England and Wales combined.

The release calendar makes the release date and location of each new release easy to locate. The WM bulletin can be downloaded free of charge as a PDF and the WM datasets in Microsoft Excel format. The underlying data for the charts and tables in the bulletin can be downloaded, while the digital interactive maps can be embedded into other media.

Other data not published on the web are available on request by emailing health.data@ons.gov.uk. Metadata describing the limitations of the data for more detailed tables are provided with each individual request. Most queries can be answered from the website datasets or supporting methods documents. Any additional enquires regarding winter mortality can be made by emailing health.data@ons.gov.uk.

Other information

Here are some useful links to other sources of data:

[ONS deaths and mortality publications](#)

[User guide to mortality statistics](#)

[Disclosure Control Policy for birth and death statistics](#)

National Records of Scotland: [Winter mortality](#)

[Northern Ireland Statistics and Research Agency: Winter mortality](#)

7 . Cite this QMI

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