Office for National Statistics

Mortality Statistics: Metadata

July 2015

Office for National Statistics

A National Statistics publication

National Statistics are produced to high professional standards set out in the Code of Practice for Official Statistics. They are produced free from political influence.

The United Kingdom Statistics Authority has designated these statistics as National Statistics, in accordance with the Statistics and Registration Service Act 2007 and signifying compliance with the Code of Practice for Official Statistics.
Designation can be broadly interpreted to mean that the statistics:

- meet identified user needs
- are well explained and readily accessible
- are produced according to sound methods
- are managed impartially and objectively in the public interest

Once statistics have been designated as National Statistics it is a statutory requirement that the Code of Practice shall continue to be observed.

About us

The Office for National Statistics

We are the executive office of the UK Statistics Authority, a non-ministerial department which reports directly to Parliament and the UK government's single largest statistical producer. We compile information about the UK's society and economy, and provide the evidence-base for policy and decision-making, the allocation of resources, and public accountability.

The Government Statistical Service

The Government Statistical Service (GSS) is a network of professional statisticians and their staff operating both within the Office for National Statistics and across more than 30 other government departments and agencies.

Contacts

This publication

For information about the content of this publication,
contact Vital Statistics Outputs Branch
Tel: +44 (0)1329 444110
Email: vsob@ons.gsi.gov.uk

Other customer enquiries

ONS Customer Contact Centre
Tel: 0845 601 3034
International: +44 (0)845 601 3034
Minicom: 01633 815044
Email: info@statistics.gsi.gov.uk
Fax: 01633 652747
Post: Room D.265, Government Buildings,
Cardiff Road, Newport, South Wales NP10 8XG
www.ons.gov.uk

Media enquiries

Tel: 0845 604 1858
Email: press.office@ons.gsi.gov.uk

Copyright and reproduction

This document/publication is also available on our website at www.ons.gov.uk

Any enquiries regarding this publication should be sent to us at: info@statistics.gsi.gov.uk

Contents

1 Introduction

This document provides supporting information for Office for National Statistics (ONS) mortality statistics.

Publication dates for statistical releases are announced on the GOV.UK release calendar. Statistical bulletins are published alongside releases and provide commentary on main findings.

The registration of life events (births, deaths, marriages and civil partnerships) is a service carried out by the Local Registration Service in partnership with the General Register Office (GRO) in Southport. GRO has been part of the Identity and Passport Service since 1 April 2008.

1.1 Symbols and conventions

In ONS mortality outputs published from July 2014 onwards symbols used are:

: denotes not available
z denotes not applicable
0 denotes nil
c confidential
u low reliability

Rates are not calculated where there are fewer than 3 deaths in a cell, denoted by (u). It is ONS practice not to calculate rates where there are fewer than 3 deaths in a cell, as rates based on such low numbers are susceptible to inaccurate interpretation.

Rates in tables calculated from fewer than 20 deaths are denoted by (u) as a warning to the user that their reliability as a measure may be affected by the small number of events.

In ONS mortality outputs published prior to July 2014 symbols used were:

.. denotes not available
: denotes not appropriate/not applicable
- denotes nil
* suppressed to protect confidentiality

Also prior to July 2014:

- Rates were not calculated where there were fewer than 3 deaths in a cell, denoted by (:). It is ONS practice not to calculate rates where there are fewer than 3 deaths in a cell, as rates based on such low numbers are susceptible to inaccurate interpretation.
- Rates in tables calculated from fewer than 20 deaths were distinguished by italic type as a warning to the user that their reliability as a measure may be affected by the small number of events.

The new set of symbols used are being implemented across ONS outputs in order to improve harmonisation and consistency and facilitate understanding of data and comparability. For further information please refer to https://gss.civilservice.gov.uk/statistics/a-z-of-policies-and-guidance/guidance-use-data-markers/

The ONS policy on protecting confidentiality in birth and death statistics is available on the ONS website. This guidance was revised in January 2014.

1.2 Information collected at death registration

The information used in mortality statistics is based on the details collected when deaths are certified and registered. Most deaths are certified by a medical practitioner, using the Medical Certificate of Cause of Death (MCCD) shown in **Annex A**. This certificate is taken to a registrar of births and deaths by a person known as an informant – usually a near relative of the deceased.

Deaths should be registered within 5 days of the date of death, although there are a number of situations when the registration of a death will be delayed, as described fully in Section 2.6.

In certain cases deaths are referred to, and sometimes then investigated by, a coroner. The coroner sends information to the registrar, and this is used instead of that on the MCCD to register the death. In some cases additional information provided on Part B of the coroner's certificate (**Annex C**) is forwarded to ONS by the registrar. Accordingly, the information used in ONS mortality statistics normally comes from 1 of 4 sources.

1. details supplied by the **doctor** when certifying a death, for example, whether the body was seen after death, cause of death, when the deceased was last seen alive, whether a post-mortem was carried out.

2. details supplied by the **informant** to the registrar, for example, occupation of deceased, sex, usual address, date and place of birth, marital status, date of death, place of death.

3. details supplied by a **coroner** to the registrar following investigation, for example, cause of death (following post-mortem), place of accident (following inquest). In the case of deaths certified after inquest, the coroner supplies the registrar with all the particulars that would have been supplied by the informant.

4. details derived from information supplied by one or other of the above, for example, calculated age of deceased, interval since last seen alive, coded cause of death, coded occupation.

Details are also supplied by the **informant** on the spouse of the deceased (only if the deceased is either married or civil partnered), for example name, date of birth, occupation and employment status. If these details are supplied by the **coroner** rather than the informant then occupation and employment status will not be supplied.

Mortality data used and produced by ONS are summarised below:

- **death registrations** refer to the number of deaths registered in a period (see Section 2.2)

- **usual residence of deceased** is supplied by the informant and is the place where the deceased was normally resident (see Section 2.4). Deaths occurring in England and Wales of those usually resident outside England and Wales are included in total figures.

However, such deaths are excluded from any sub-division of England and Wales and presented separately in area tables (usual residence outside England and Wales)

- **age** is derived from the date of birth and from the date of death supplied by the informant, except after inquest, where the coroner supplies this information

- **sex** is as given by the informant (or coroner)

- **marital status** is supplied by the informant in confidence, under the Population (Statistics) Acts, and is not entered in the public register

- **place of occurrence** is given by the informant, except after inquest. This may be a hospital or some other establishment, in which case a unique code is assigned to it by the registrar. These codes are then classified by ONS to give the type of establishment. The place of occurrence could also be the deceased's own home, or elsewhere – possibly another private residence or not in a building. These deaths are summarised as "home" or "elsewhere" respectively – Section 2.5 provides further information

- **years of life lost** denote the number of years lost due to death at a "premature" age. The assumption is made here that there are suitable cut-off ages from which the age at death is subtracted. **Years of working life lost** are the number of years lost if death takes place before the end of the assumed working life; this is conventionally taken as 65. Section 2.21 provides more information

- the **underlying cause of death** is selected from the medical condition or conditions mentioned on the MCCD or on the coroner's certificate. More information can be found in Section 2.12

1.3 Publications

The ONS website provides a comprehensive source of freely available statistics on life events and other ONS products.

England and Wales:
To meet user needs, very timely but provisional counts of death registrations are published as follows:

- Provisional counts of weekly death registrations by age-sex group and region for England and Wales (published 11 days after the week ends)
- Provisional counts of monthly death registrations by local authorities in England and Wales (published on the fourth Tuesday of the following month)

Provisional figures have not been subject to the full quality assurance process. Figures remain provisional until they are updated to final figures following the publication of final annual statistics

Annual mortality statistics (based on deaths registered in a calendar year) are published in 3 separate packages to enable the timely release of statistics:

- the first release (Death registration summary tables) provides the main death registration statistics for the reference year

- Series DR provides detailed death registration statistics for the reference year by underlying cause of death (4 digit) classified using the Tenth Revision of the International Classification of Diseases and Related Health Problems (ICD-10).
- Mortality statistics: area of usual residence provides death registration statistics by area of usual residence (down to local authority level).

ONS also publishes more detailed annual mortality statistics in the following releases:

- 20th Century mortality files
- 21st Century mortality files
- Deaths involving Clostridium difficile (Wales only from 2013 data year onwards)
- Deaths involving MRSA (Wales only from 2013 data year onwards)
- Deaths related to drug poisoning
- Alcohol-related deaths in the UK
- Suicides in the UK
- Avoidable mortality
- Excess winter mortality

From 1974 to 2005, mortality statistics were published in the annual reference volumes, DH1, DH2 and DH4. From 1993 to 2006, figures were based on deaths occurring annually in England and Wales. Prior to 1993, figures were based on deaths registered in England and Wales in the reference year. In 2006, these 3 volumes were replaced by a single publication, Mortality statistics: Deaths registered in England and Wales (Series DR) based on deaths registered in a reference year.

The annual reference volume Child mortality statistics (formerly DH3) contains data on stillbirths, infant deaths and childhood deaths. It includes figures on infant deaths linked to their corresponding birth records.

International, UK and constituent countries: The annual time series data table in the Vital statistics: population and health reference tables provides mortality statistics for the UK and its constituent countries with some measures available back to 1838. This release also provides an international comparison of the crude death rate.

Scotland: in the Vital Events Reference Tables for Scotland.

Northern Ireland: in the Annual Report of the Registrar General for Northern Ireland.

A summary of mortality statistics data also appear in the World Health Organization World Health Statistics Annual and World Health Report.

2 Notes and definitions

2.1 Base populations

The population estimates used to calculate mortality rates are mid-year estimates of the resident population of England and Wales based on the Census of Population. ONS mid-year population estimates are updated figures using the most recent Census, allowing for births, deaths, net migration and ageing of the population.

The population estimates used are the most up-to-date when rates are produced. The specific population estimates used to calculate rates are detailed alongside published tables. Sometimes it is necessary to revise mortality rates following population estimate revisions. Any revisions to mortality rates are footnoted on tables. Further information on population estimates, and their methodology, can be found on the ONS website.

2.2 Occurrences and registrations and the standard dataset

Up to 1992, publications gave numbers of deaths registered in the period concerned. From 1993 to 2005, the figures in annual reference volumes relate to the number of deaths that occurred in the reference period. From 2006 onwards, all tables in Series DR are based on deaths registered in a calendar period. More details on these changes can be found in the publication Mortality Statistics: Deaths Registered in 2006 (ONS, 2008).

Although the majority of mortality publications are now based on registrations, ONS continue to take an annual extract of death occurrences in the autumn following the data year, which is used for seasonal analysis of mortality data and several infant mortality outputs.

The numbers of registrations for a year which actually occurred in previous years are shown in Table 1 below.

Table 1: Number of deaths that were registered and occurred in each calendar year England and Wales, 2001 to 2014

Annual Dataset Year for registrations	Number of registrations	Number registered which occurred in that year	Percentage of those registered that occurred in that year	Number registered which occurred in previous years	Percentage of those registered that occurred in previous years
2014	501,424	477,752	95.3	23,672	4.7
2013	506,790	482,658	95.2	24,132	4.8
2012	499,331	478,733	95.9	20,598	4.1
2011	484,367	463,450	95.7	20,917	4.3
2010	493,242	473,661	96.0	19,581	4.0
2009	491,348	471,113	95.9	20,235	4.1
2008	509,090	488,764	96.0	20,326	4.0
2007	504,052	485,068	96.2	18,984	3.8
2006	502,600	485,202	96.5	17,398	3.5
2005	512,993	497,603	97.0	15,390	3.0
2004	514,250	499,081	97.1	15,169	2.9
2003	539,151	524,827	97.3	14,324	2.7
2002	535,356	520,849	97.3	14,507	2.7
2001	532,498	517,010	97.1	15,488	2.9

Source: Office for National Statistics

Of the 501,424 deaths registered in 2014, 477,752 occurred in 2014, 21,474 occurred in 2013, 1,655 occurred in 2012 and 543 occurred prior to 2012.

Although the majority of mortality publications will be based on registrations, ONS will continue to take an annual extract of death occurrences in the autumn following the data year, which will therefore be available for seasonal analysis of mortality data and for infant

mortality publications. The numbers of late registrations not included in the death occurrence dataset are shown in Table 2 below.

Table 2: Number of late registrations not included in the annual death occurrence dataset England and Wales, 2001 to 2013

Year death occurred	Number of late registrations not included in occurrence dataset
2013	2,215
2012	3,670
2011	3,049
2010	3,022
2009	3,300
2008	3,466
2007	3,471
2006	1,725
2005	2,429
2004	2,248
2003	2,032
2002	1,758
2001	1,375

Source: Office for National Statistics

The number of late registrations by year of occurrence are subject to future revisions due to the likely addition of late registrations. These revisions could extend back a number of years. This table is updated annually. Figures last updated June 2015.

2.3 Area coverage

Published mortality statistics are based on deaths registered in England and Wales. No distinction is made between deaths of residents of England and Wales or other deaths (for example, residents of other UK countries or visitors). The deaths of those whose usual residence is outside England and Wales are included in total figures for England and Wales but excluded from any sub-division of England and Wales. Table 3 below gives recent numbers of deaths of non-residents for deaths from all causes.

Until the 2010 data year for deaths, ONS assigned “area of usual residence” using a look-up product (the National Statistics Postcode Directory). This product associated postcodes with a number of geographical levels (for example, local authority or region). The postcode was allocated to each level of geography using a point-in-polygon methodology. Although this method is spatially accurate, it does not provide the stable building blocks needed for comparing geographies at different levels.

From the 2011 data year for deaths, ONS has assigned “area of usual residence” by first linking each postcode to an output area using this same point-in-polygon methodology, and then linking to all higher geographies by using a population weighted, best-fit look-up to output area. This means that postcodes are allocated to a higher geography based on where the output area population weighted centroid lies. This is in line with the Geography Policy for National Statistics.

Switching to the new area allocation method has negligible impact on mortality statistics down to local authority level. However, the new method improves comparability of mortality statistics for subnational areas over time.

For more information about these methods, see National Statistics Postcode Products on the ONS website. A paper investigating the impact of the new method on life events data was published in March 2013.

Table 3: Number of deaths of non-residents registered in England and Wales 2010 to 2014

Number, per cent

	2010	2011	2012	2013	2014
Deaths from all causes	493,242	484,367	499,331	506,790	501,424
of which, deaths of residents outside England and Wales	1,028	1,079	1,050	1,100	1,110
Per cent of total	0.21	0.22	0.21	0.22	0.22

Source: Office for National Statistics

2.4 Usual residence of deceased

Details of the usual residence of the deceased are supplied by the informant to the registrar. Prior to 1993 there were rules determining the validity of one competing address over another for the purpose of registering the usual place of residence of the deceased. Previous annual reference volumes contain details of these rules. Since 1993, the informant can decide what address to give if more than one might be applicable. For example, a parent registering the death of a student in term time may give the parental home, or the university hall of residence, or the lodgings as the student's address. Another example might be where an informant considers that the deceased was not resident in a communal establishment (such as residential homes for the elderly) where the death took place, so instead they provide a private home address to the registrar, even where the deceased had lived at the communal establishment for many months.

2.5 Place of occurrence

Due to improvements in the classification and coding of communal establishments, the place of death definition used by ONS was revised in 2011. These changes were implemented for 2010 mortality statistics. In particular, the classification was changed to specifically identify local authority and non-local authority care homes and the categories for NHS and non-NHS psychiatric hospitals and other hospitals and communal establishments for the care of the sick have been replaced with a category for all hospitals. This reflects current user needs. Further improvements to how deaths are allocated to individual establishments and to how these are assigned to place of death categories is an ongoing exercise, which will improve the quality of this new classification.

The groups used for the place where death occurred are listed below:

i) Home

ii) Care Home
- Local Authority
- Non-Local Authority

iii) Hospitals and communal establishments for the care of the sick (excluding psychiatric hospitals and hospices)
- NHS
- other than NHS

Iv) Hospices
- NHS
- other than NHS

v) Other communal establishments: includes schools, convents and monasteries, nurses' homes, university and college halls of residence, young offender institutions, secure training centres, detention centres, prisons and remand homes

vi) Elsewhere: includes all places not covered above and people who are pronounced dead on arrival at hospital

2.6 Certification of cause of death

When a death occurs, the attending doctor completes a medical certificate of cause of death (MCCD) (**Annex A**). This is normally taken to the local registrar of births and deaths in the district in which the death occurred (Devis and Rooney 1999). Since April 1997, information may be provided to a registrar in a different district. This is known as the registration of deaths by declaration and is mostly used for the deaths of infants. Further details about deaths by declaration are provided below.

The certifying doctor must have seen the deceased person during the last 2 weeks of life to complete an MCCD. Once completed, it is normally delivered to the registrar by a person known as the informant (often a relative of the deceased), within 5 days of the date of death, as required by law. The majority of deaths are registered in this way. A specimen of the Medical Certificate of Cause of Death (MCCD) for ages 28 days and over is reproduced at **Annex A** and a specimen of the draft death entry completed by the registrar at the time of registration is reproduced at **Annex B** (old) and **Annex I** (new).

However, there are circumstances when a MCCD cannot be issued immediately, such as those deaths reported to a coroner, and the registration is consequently delayed. Some examples of these situations are given in the following paragraphs.

2.7 Referral to the coroner

For some deaths the doctor may certify the cause and report the case to the coroner, or the registrar may report it. Deaths that should be referred to a coroner include those where:

- the cause is unknown
- the deceased was not seen by the certifying doctor either after death, or within the 14 days before death
- the death was violent, or unnatural, or suspicious

- the death may have been due to an accident (whenever it occurred)
- the death may have been due to self-neglect or neglect by others
- the death may have been due to an industrial disease, or related to the deceased's employment
- the death occurred during an operation or before recovery from the effects of an anaesthetic
- the death may have been a suicide
- the death occurred during or shortly after detention in police or prison custody
- there was no doctor available who was legally qualified to certify the death

Coroners have a number of possible courses of action once a death has been referred. If they are satisfied that the death was due to natural causes and the cause has been correctly certified by a medical practitioner, the local registrar is notified (Form 100A – **Annex D**) and they can then register the death using the cause given on the MCCD. In rare cases where no medical certificate is available, the death will be registered as uncertified and the cause taken from Form 100A.

Alternatively, the coroner may order a post-mortem examination. This may happen if the death was sudden and the cause unknown, if there was no doctor in attendance, or if the death has been referred directly to the coroner by the police. If the post-mortem shows unequivocally that the death was due to natural causes, the coroner notifies the registrar that they do not intend to hold an inquest (Form 100B – **Annex E**). In such cases, the cause of death given by the coroner on Form 100B is based on the information from the post-mortem held by the pathologist.

2.8 Coroners' inquests

If an inquest is necessary, the death can usually be registered only after the inquest has taken place. In a small number of cases the coroner holds an inquest without a post-mortem. In most cases the inquest concludes the investigation and the death is then certified by the coroner (Form 99(REV) – **Annex C**). This provides the registrar with details of the deceased and the inquest findings as to cause of death.

If someone is to be charged with an offence in relation to the death, the coroner must adjourn the inquest until those legal proceedings are completed. Since 1978 (see Section 2.16) it has been possible to register these deaths at the time of adjournment, when the coroner issues Form 120 (**Annex F**). This form includes details of injuries that led to the death, but no verdict. In the case of motor vehicle incidents, there is enough information to code the cause of death. Other deaths, such as possible homicides, are given a temporary code for underlying cause of death until final information becomes available. This is supplied by the coroner to the registrar on Form 121 (**Annex G**).

2.9 Legally uncertified deaths

A very small proportion of deaths remain legally "uncertified" (Gastrell et al. 2004). In recent years this figure has remained around 0.3% of all deaths registered in England and Wales. ONS receives copies of at least 1 certificate of cause of death for these cases, which are registered and coded as normal. This group includes deaths for which the doctor, who completed the medical certificate, did not fulfil all the legal requirements for doing so. For example, where the doctor was not in attendance with the deceased during the last illness, or did not see the body, and the coroner did not order a post-mortem but issued Form 100A. It also includes deaths of foreign military personnel in England and Wales where the certifying

doctor was not a registered medical practitioner for the purpose of issuing medical certificates.

Table 4 below gives relevant numbers of deaths by type of certification for the years 2011 to 2014.

Table 4: Deaths by method of certification and registration
England and Wales, 2011 to 2014 **Number, per cent**

	2011		2012		2013		2014	
	number	%	number	%	number	%	number	%
Total deaths	484,367	100	499,331	100	506,790	100	501,424	100
Certified by doctor:	385,966	79.7	402,537	80.6	407,914	80.5	404,813	80.7
With coroner not involved,	293,292	60.6	306,980	61.5	310,964	61.4	307,867	61.4
without post-mortem, or post mortem information missing.	291,974	60.3	305,805	61.2	309,840	61.1	306,891	61.2
with post-mortem.	1,318	0.3	1,175	0.2	1,124	0.2	976	0.2
After referral to coroner,	92,674	19.1	95,557	19.1	96,950	19.1	96,946	19.3
registered with no post-mortem or inquest, or post-mortem information missing.	92,269	19.0	95,238	19.1	96,614	19.1	96,602	19.3
with post-mortem	405	0.1	319	0.1	336	0.1	344	0.1
Certified by coroner:	97,149	20.1	95,424	19.1	97,417	19.2	95,296	19.0
Coroner's post-mortem held, with no inquest	66,973	13.8	65,367	13.1	65,914	13.0	66,382	13.2
Coroner's inquest completed, with or without post-mortem, or post-mortem information missing	29,127	6.0	29,129	5.8	30,599	6.0	28,045	5.6
Coroner's inquest adjourned	1,049	0.2	928	0.2	904	0.2	869	0.2
Uncertified	1,252	0.3	1,370	0.3	1,459	0.3	1,315	0.3

Source: Office for National Statistics

2.10 Registration of deaths by declaration

For most deaths there is a legal requirement for an informant to visit the registrar's office in the district within which the death occurred to supply certain information about the deceased. Since April 1997, it has been possible for relatives to provide this information to a registrar in a different district from that in which the death occurred. This is known as registration of a death by declaration and is similar to the arrangement already in place for births. The registrar completes a Form 400 (**Annex H**)**,** as well as the usual Form 310 (**Annex B** or **Annex I**), and sends them to a registrar in the district where the death took place; the second registrar then carries out the actual registration.

There had been a gradual increase in the use of registration by declaration until 2006. Since then these have shown an overall decrease, with the percentage of deaths registered by declaration in 2014 being 0.8%.

Analysis of these deaths shows that they are most likely for infants, especially neonates: about 7% of all neonatal deaths are registered by declaration. Linked to this is the fact that the most common cause for deaths registered by declaration is a congenital anomaly, with around 2% of deaths from such a cause registered in this way in recent years. The greater frequency for infant deaths is explained by the practice of referring infants or pregnant women with serious or unusual health problems to regional care units where appropriate, which may often be some distance from the parents' home address.

2.11 Presumption of death

On 1 October 2014, the Presumption of Death Act 2013 came into force in England and Wales. This means that an application can be made to the High Court for a declaration (**Annex J**) that a missing person is presumed to be dead where, the person who is missing is thought to have died or has not been known to be alive for a period of at least 7 years.

Table 5: Number of presumed deaths
England and Wales, 2014

Annual Dataset Year for registrations	Total deaths	Number of presumed deaths
2014	501,424	0

Source: Office for National Statistics

2.12 Coding the underlying cause of death

Automated cause coding

Since 1993 the majority of ONS mortality data have been coded by Automatic Cause Coding Software. Specific text terms from the death certificate are converted to ICD codes and then selection and modification rules (see below) are used to assign the underlying cause of death. Using computer algorithms to apply rules increases the consistency and improves the international and temporal comparability of mortality statistics. The cause coding of deaths certified after inquest was done manually by experienced coders as the software could not code the free text format used by coroners.

ICD-10 was introduced in England and Wales in January 2001. Since then various amendments have been authorised by WHO. Amendments may (for example) correct errors in the software supporting automatic coding, accommodate new codes in response to new conditions, such as the H1N1 virus (swine flu), or incorporate advances in medical knowledge of the relationship between conditions.

Between 2001 and 2010, ONS used the Mortality Medical Data System (MMDS) ICD-10 version 2001.2 software provided by the United States National Center for Health Statistics (NCHS) to code cause of death. In January 2011, this was updated to version 2010, which incorporated most of the WHO amendments authorised up to 2009. The main changes in ICD-10 v2010 were amendments to the modification tables and selection rules. Overall, the impact of these changes is small although some cause groups are affected more than others. For further information, see the results of the bridge coding study on the ONS

website. There is also another study looking at the impact on stillbirths and neonatal deaths.

On 1 January 2014, ONS changed the software used to code cause of death to a package called IRIS (version 2013). The development of IRIS was supported by Eurostat, the statistical office of the European Union, and is now managed by the IRIS Institute hosted by the German Institute of Medical Documentation and Information in Cologne. IRIS software version 2013 incorporates all official updates to ICD-10 approved by WHO, which were timetabled for implementation before 2014. These updates include changes to the use of codes within the neoplasms (cancer) chapter (ICD-10 codes C00-D48). In addition a small number of changes were made to the coding of specific conditions, to bring previous coding practice in line with international coding rules and changes were made to the coding of neonatal deaths and stillbirths. Further information on the impact of the introduction of IRIS software is on the ONS website.

The death certificate (**Annex A**) used in England and Wales is compatible with that recommended by the World Health Organisation (WHO). It is set out in 2 parts. Part I gives the condition or sequence of conditions leading directly to death, while Part II gives details of any associated conditions that contributed to the death, but are not part of the causal sequence.

The selection of the **underlying cause of death** is based on ICD rules and is made from the condition or conditions reported by the certifier, as recorded on the certificate. The underlying cause of death is defined by WHO as:
a) the disease or injury that initiated the train of events directly leading to death
b) the circumstances of the accident or violence that produced the fatal injury

Deaths attributed to accidents, poisonings and violence are examined, firstly according to the **underlying cause** of death (**external cause**) and, secondly by the **nature of injury**, or **main injury**. External cause of injury codes are taken from Chapter XX of the ICD (prefixes U509 and V01 to Y89) and nature of injury codes are from Chapter XIX (prefixes S00 to T98), or from a smaller number of other post procedural codes not within Chapter XIX.

Selection and modification rules
The selection of the underlying cause of death is generally made from the condition or conditions entered in the lowest completed line of Part I of the MCCD. If the death certificate has not been completed correctly – for example, if there is more than one cause on a single line with no indication of sequence, or the conditions entered are not an acceptable causal sequence – it becomes necessary to apply one or more of the **selection rules** in the ICD-10.

Even where the certificate has been completed properly, there are particular conditions, combinations or circumstances when **modification rules** have to be applied to select the correct underlying cause of death. On some death certificates, for example, when two or more causes are listed and then linked together, these may point to another cause (not mentioned directly on the certificate) as underlying. Cases of “inferred” underlying causes are few though, and are most commonly related to diseases of the circulatory system and late effects of cerebrovascular disease. In other cases the underlying cause of death can be selected from Part II of the MCCD.

In summary, the purpose behind the selection and modification rules is to derive the most useful information from the death certificate and to do it uniformly so that:

- data will be comparable between places and times
- each death certificate produces one, and only one, underlying cause of death

Routine ONS mortality tables analyse the underlying cause of death. Ad hoc studies of all causes entered on death certificates – "mentioned causes" – have also been carried out in the past (GRO 1971). Coding rules ensure that each recorded item on the certificate is coded independently of all others on the same certificate. All mentioned causes have been coded routinely since 1993.

ICD-10 implementation
ICD-10 was implemented in England and Wales in 2001 The main differences between ICD-9 and ICD-10 (ONS 2002) are:

- a change in the format of the code and expansion in the number of codes used;
- a movement of some diseases and conditions between broad groups / ICD Chapters;
- changes to the rules governing the selection of the underlying cause of death, especially Rule 3, which had a large effect.

The vast majority of deaths in ICD-9 remained in comparable chapters in ICD-10 (Griffiths and Rooney 2003). However; there were some discontinuities in the data due to the application of new rules for assigning underlying cause in ICD-10, most notably for deaths due to pneumonia. See section 3.4 for further details about sources of information on the changes to ICD-10.

Historically, the rule that changed cause of death statistics most was the introduction of Rule 3 (see Section 3.3 for further details). In ICD-10 the list of conditions affected by Rule 3 is more clearly defined than in ICD-9 and is also broader in scope. Its impact is to reduce the number of deaths assigned to certain conditions such as pneumonia and to increase the number of deaths assigned to chronic debilitating diseases. In England and Wales, about 20% of deaths mention pneumonia so the effect of the change in Rule 3 is large. However, Rule 3 has very little impact upon those deaths from injury and poisoning and those deaths that are manually coded. Therefore, the clerical coding of deaths after inquest should be consistent with past practice and so intentional self-harm (suicide), assault and undetermined intent, which are coded based on the verdict of the coroner, do not change as a result of the move to ICD-10 (Griffiths and Rooney 2003). Further information about Understanding the changes to mortality statistics following the move to coding cause of death to ICD-10 can be found on the ONS website.

Deaths from 1979 to 2000, which appear in tables containing historical data, are coded to ICD-9 and have been grouped to reflect ICD-10 categories. To achieve this broad comparability, the ranges of ICD-9 codes used for some of the groupings differ from those published in annual volumes prior to 2001. Particular causes affected include leukaemia, diseases of the liver and land transport accidents.

Note on coding of acute rheumatic fever (ICD-9 390-392, ICD-10 I00-I02)
In 1999 ONS found that, in some circumstances, deaths from rheumatic and valvular heart diseases were wrongly coded to acute rheumatic fever by the automated cause coding system introduced in 1993. All deaths in 1998 and 1999 with any mention of acute rheumatic fever were checked and recoded manually if necessary. From 2000, routine checks were set in place to correct any deaths miscoded to acute rheumatic fever. Therefore, published data on deaths between 1993 and 1997 assigned to acute rheumatic fever should be regarded as highly unreliable.

Note on coding influenza due to identified avian or swine influenza virus (ICD-10 J09)
Following guidance from the World Health Organisation (WHO), the ICD-10 code J09 "Influenza due to identified avian influenza virus" has been used to record H1N1 swine influenza. For ease of use, J09 has been renamed to "Influenza due to identified avian or swine influenza virus" in the mortality tables since 2009.

The number of deaths with an underlying cause of "Influenza due to identified avian or swine influenza virus" (J09) differ from figures reported by Public Health England (PHE).

2.13 ONS short list of cause of death

The cause of death codes shown in detailed cause of death tables are those where at least one death was coded to that underlying cause during the relevant reference period.

Tables which use the ONS short list for cause of death are based on a standard tabulation list developed by ONS, in consultation with the Department of Health. This list of over 100 conditions was based on the following:

- all conditions given in the WHO basic tabulation list; with the exception of a few conditions that are so rare as certified causes of death in England and Wales that they could safely be excluded from the list;
- totals for each ICD-10 Chapter;
- conditions used in monitoring public health targets;
- other conditions often cited by ONS.

The aim was to provide a standard listing for tables of mortality statistics containing conditions frequently referred to by all users of the data. In this way, users could find the same conditions in different tables and in different annual reference volumes and reports.

Many tables also contain statistics for conditions in the standard list as well as others of particular interest. The standard listing is given in the table below. Note that from 1993 to 2000, conditions related to HIV infection were coded to ICD-9 042-044. This replaced the previously used ICD-9 code of 279.1 (deficiency of cell-mediated immunity) for these conditions. From 2001, conditions related to HIV infection have been coded to the ICD-10 codes B20–B24.

From 1 January 2007, a new ICD-10 code (U50.9) has been used by ONS for deaths involving adjourned inquests that would previously have been coded to Y33.9. This has made the tabulation of deaths from undetermined intent, and estimates of suicide, easier to produce.

ONS short list of cause of death codes, using ICD-10

A00–R99, U00-Y89	**All causes**
A00–B99	**I Certain infectious and parasitic diseases**
A00–A09	Intestinal infectious diseases
A15–A16	Respiratory tuberculosis
A17–A19	Other tuberculosis
A39	Meningococcal infection
A40–A41	Sepsis
B15–B19	Viral hepatitis
B20–B24	Human immunodeficiency virus [HIV] disease
B90	Sequelae of tuberculosis
C00–D48	**II Neoplasms**
C00–C97	Malignant neoplasms
C00–C14	Malignant neoplasms of lip, oral cavity and pharynx
C15	Malignant neoplasm of oesophagus
C16	Malignant neoplasm of stomach
C18	Malignant neoplasm of colon
C19–C21	Malignant neoplasm of rectosigmoid junction, rectum and anus
C22	Malignant neoplasm of liver and intrahepatic bile ducts
C23–C24	Malignant neoplasm of gallbladder and biliary tract
C25	Malignant neoplasm of pancreas
C32	Malignant neoplasm of larynx
C33–C34	Malignant neoplasm of trachea, bronchus and lung
C43	Malignant melanoma of skin
C44	Other malignant neoplasms of skin
C45	Mesothelioma
C46	Kaposi sarcoma
C50	Malignant neoplasm of breast
C53	Malignant neoplasm of cervix uteri
C54–C55	Malignant neoplasm of other and unspecified parts of uterus
C56	Malignant neoplasm of ovary
C61	Malignant neoplasm of prostate
C62	Malignant neoplasm of testis
C64	Malignant neoplasm of kidney, except renal pelvis
C67	Malignant neoplasm of bladder
C71	Malignant neoplasm of brain
C81	Hodgkin lymphoma
C82–C85	Non-Hodgkin lymphoma
C90	Multiple myeloma and malignant plasma cell neoplasms
C91–C95	Leukaemia
C97	Malignant neoplasms of independent (primary) multiple sites
D00–D48	In situ and benign neoplasms, and neoplasms of uncertain or unknown behaviour

D50–D89	**III Diseases of the blood and blood-forming organs and certain disorders involving the immune mechanism**
D50–D64	Anaemias
E00–E90	**IV Endocrine, nutritional and metabolic diseases**
E10–E14	Diabetes mellitus
F00–F99	**V Mental and behavioural disorders**
F01, F03	Vascular and unspecified dementia
F10–F19	Mental and behavioural disorders due to psychoactive substance use
G00–G99	**VI Diseases of the nervous system**
G00,G03	Meningitis (excluding meningococcal)
G12.2	Motor neuron disease
G20	Parkinson disease
G30	Alzheimer disease
G35	Multiple sclerosis
G40	Epilepsy
H00–H59	**VII Diseases of the eye and adnexa**
H60–H95	**VIII Diseases of the ear and mastoid process**
I00–I99	**IX Diseases of the circulatory system**
I05–I09	Chronic rheumatic heart diseases
I10–I15	Hypertensive diseases
I20–I25	Ischaemic heart diseases
I21–I22	Acute myocardial infarction
I26–I51	Other heart diseases
I60–I69	Cerebrovascular diseases
I60–I62	Intracranial haemorrhage
I63	Cerebral infarction
I64	Stroke, not specified as haemorrhage or infarction
I70	Atherosclerosis
I71	Aortic aneurysm and dissection
J00–J99	**X Diseases of the respiratory system**
J09	Influenza due to certain identified influenza virus
J10–J11	Influenza
J12–J18	Pneumonia
J40–J44	Bronchitis, emphysema and other chronic obstructive pulmonary disease
J45–J46	Asthma
K00–K93	**XI Diseases of the digestive system**

K25–K27	Gastric and duodenal ulcer
K40–K46	Hernia
K57	Diverticular disease of intestine
K70–K77	Diseases of the liver
L00–L99	**XII Diseases of the skin and subcutaneous tissue**
M00–M99	**XIII Diseases of the musculoskeletal system and connective tissue**
M05-M06, M08	Rheumatoid arthritis and juvenile arthritis
M80–M81	Osteoporosis
N00–N99	**XIV Diseases of the genitourinary system**
N00–N15	Glomerular and renal tubulo-interstitial diseases
N17–N19	Renal failure
N40	Hyperplasia of prostate
O00–O99	**XV Pregnancy, childbirth and the puerperium**
P00–P96	**XVI Certain conditions originating in the perinatal period**
Q00–Q99	**XVII Congenital malformations, deformations and chromosomal abnormalities**
Q20–Q28	Congenital malformations of the circulatory system
R00–R99	**XVIII Symptoms, signs and abnormal clinical and laboratory findings, not elsewhere classified**
R54	Senility
R95	Sudden infant death syndrome
R99	Other ill-defined and unspecified causes of mortality
S00–T98	**XIX Injury, poisoning and certain other consequences of external causes**
S00–S19	Injuries to the head and the neck
S20–S29	Injuries to the thorax
S30–S39	Injuries to the abdomen, lower back, lumbar spine and pelvis
S72	Fracture of femur
T20–T32	Burns and corrosions
T39.1	Poisoning by 4-Aminophenol derivatives
T40	Poisoning by narcotics and psychodysleptics [hallucinogens]
T42	Poisoning by antiepileptic, sedative-hypnotic and antiparkinsonism drugs
T43	Poisoning by psychotropic drugs, not elsewhere classified
T50.9	Poisoning by other and unspecified drugs, medicaments and biological substances

T51–T65	Toxic effects of substances chiefly nonmedicinal as to source
T58	Toxic effect of carbon monoxide
T71	Asphyxiation
T75.1	Drowning and nonfatal submersion
U50.9, V01–Y89	**XX External causes of morbidity and mortality**
V01–X59	Accidents
V01–V99, Y85	Transport accidents
V01–V89	Land transport accidents
W00–W19	Falls
W65–W74	Accidental drowning and submersion
X00–X09	Exposure to smoke, fire and flames
X40–X49	Accidental poisoning by and exposure to noxious substances
X41	Accidental poisoning by and exposure to antiepileptic, sedative-hypnotic, antiparkinsonism and psychotropic drugs, not elsewhere classified
X42	Accidental poisoning by and exposure to narcotics and psychodysleptics [hallucinogens], not elsewhere classified
X44	Accidental poisoning by and exposure to other and unspecified drugs, medicaments and biological substances
X59	Accidental exposure to unspecified factor
X60–X84	Intentional self-harm
X85–Y09	Assault
Y10–Y34	Event of undetermined intent
X60–X84, Y10–Y34[1]	Intentional self-harm; and event of undetermined intent
U50.9, X85–Y09[1]	Assault; death from injury or poisoning, event awaiting determination of intent (inquest adjourned)

1 The production of statistics on numbers of assault and intentional self-harm deaths occurring in a particular year is complicated by matters of definition and delay resulting from legal proceedings. Further details can be found in Section 2.17.

2.14 Two codes for certain conditions

The “dagger and asterisk” system

ICD-10 has continued the system introduced in ICD-9 whereby there are 2 codes for diagnostic descriptions that contain information about both an underlying generalised disease and a local manifestation in a particular organ or site that is a clinical problem in its own right. In such cases the underlying disease is given a dagger (†) code and the manifestation an asterisk (*) code. Conditions with dagger codes are used in assigning underlying causes. Conditions with asterisk codes are never used in this way so will not appear in tables.

Secondary causes

Deaths where the underlying cause is assigned to an external cause (ICD-10 Chapter XX, U50.9 to Y89) are also assigned at least one nature of injury code (Chapter XIX, S00 to T98) or a post-procedural code not within Chapter XIX. This means, it is possible to have more

than one nature of injury code for a single death. For example, a car occupant injured in a transport accident (V40–V49) may have suffered a fracture to the skull (S02) and femur (S72), as well as injuries of the spleen (S36). However, it is necessary to select which one of the nature of injury codes is to be identified as the one causing death. This **one** cause code is referred to by ONS as the **secondary cause**. To do this, WHO provides guidelines or "rules" to ensure that the most useful information is derived from the death certificate and that it is done uniformly.

The move from ICD-9 to ICD-10 had an impact on the allocation of secondary causes. ONS published an assessment of this impact (Griffiths and Rooney 2003). In ICD-10, when more than one body region is involved, coding is made to the relevant category of injuries involving multiple body regions (T00–T07). Therefore, in the above example of an occupant injured in a transport accident, under ICD-10 the secondary cause would be classified as "other specified injuries involving multiple body regions" (T06.8), whereas under ICD-9 the secondary cause would be more specifically classified as a fracture of the skull (ICD-9 800).

An update to by WHO was implemented for 2014 data whereby if, more than one serious injury is reported on the relevant part of the certificate the main injury must be selected from the Priority Ranking of ICD-10 Nature-of-Injury Codes list. The update indicates that when more than one of the serious injuries reported in the relevant part of the certificate have the same and highest rank, select the first mentioned of these injuries. However, prefer a specific injury over an injury from the block T00-T07 (Injuries involving multiple body regions) with the same priority rank.

Information on injuries is derived from the coroners' forms that are supplied to ONS, in particular the coroner's certificate of cause of death after inquest (Form 99 (Rev) A – **Annex C**). This form was revised in May 1993 to bring it into line with the MCCD and with WHO recommendations. Because the revised form no longer includes specific questions about type of injury and parts of body injured, some coroners now often provide less detail than before. The result is that some deaths are assigned to residual codes for nature of injury. For example, in ICD-10 the statement "head injury" is coded to "unspecified injury of head" (S09.9), whereas with more detail it might be assigned to "fracture of skull and facial bones" (S02.n).

2.15 Final cause of death

The conditions mentioned on the death certificate are used to derive an underlying cause of death. In some cases, more information on cause of death may become available at a later stage after the death has been registered, such that the underlying cause may be subsequently amended. Around 0.2% of deaths have their underlying cause amended (Table 6). This amended or final cause is used in mortality statistics. Sometimes the later information becomes available only after the annual extract has been taken. Users with access to individual records of deaths as shown in the public record (which is never amended) may consequently find some differences with published statistics.

Table 6: Number of deaths where original cause was amended for final cause
England and Wales, 2012

Deaths	Percent	Analysis
42	0.01	Original 'Diseases of the respiratory system' cause amended for final cause
50	0.01	Original 'Neoplasm' cause amended for final cause
51	0.01	Original 'Diseases of the circulatory system' cause amended for final cause
66	0.01	Other original cause amended for final cause
72	0.01	3-digit ICD-10 codes for original and final cause match
288	0.06	4-digit ICD-10 codes for original and final cause match
323	0.06	Pending verdict' deaths resolved and final cause submitted
489,439	99.82	No final cause information submitted (includes neonatal deaths)

Source: Office for National Statistics

In summary, further details on the causes of death can be obtained in one or other of the following ways:

- Deaths certified by doctors may have their cause amended as a result of a post-mortem, or of tests initiated before death. When the doctor indicates there has been a post-mortem or ticks box B on the back of the certificate, the registrar automatically sends a letter to the certifier asking for this additional information. The certifier sends this information directly to the cause coding team at ONS. The additional information is only used for statistical purposes and does not appear in the public record. Less than 1% of deaths certified by a doctor have a post-mortem, and in the majority of cases, the post-mortem does not change the certified cause. In addition, ONS coders of cause of death may contact the certifier for more information if the certificate is unclear or they cannot code the underlying cause. This is very rare.

- When a death has been certified by a coroner after post-mortem (with no inquest), further information may be available once they have results of bacteriology or histopathology. This is also very rare.

- Following an inquest, coroners may submit to ONS details of how a fatal accident occurred. However, this happens rarely, as coroners normally only certify the cause of death after their investigations are completed, so the first and only information ONS receives about these deaths is the final underlying cause.

- Coroners may also provide a final underlying cause of death and verdict much later for an accelerated registration following an adjourned inquest (see Section 2.16).

2.16 Accelerated registrations

On 1 January 1978, certain provisions of the Criminal Law Act 1977, the Coroners (Amendment) Rules 1977, and the Registration of Births, Deaths and Marriages (Amendment) Regulations 1977 came into force. There were 2 principal changes arising from the legislation. Firstly, the duty of a coroner’s jury to name a person it finds guilty of causing a death, and of a coroner to commit that person for trial, was abolished. Secondly, in cases where there was an inquest adjournment, provision was made for the death to be registered at the time of adjournment instead of having to await the outcome of criminal proceedings, as previously. This provision is referred to as accelerated registration.

Accelerated registrations that are not transport incidents are assigned to code U50.9 (event awaiting determination of event) for events registered from 1 January 2007, or to code Y33.9 (other specified events, undetermined intent) for events registered up to the end of 2006. Most of these are eventually reassigned to assault (X85–Y09), but the delays before this happens can affect the published figures in the under estimation of deaths from assault (Rooney and Devis 1999).

Accelerated registrations related to deaths involving motor vehicle incidents are assigned to a code in the range V01–V89 (land transport accidents) if sufficient information is available on the coroner's certificate of adjournment.

2.17 Assault and intentional self-harm

Numbers of deaths from assault (homicide in ICD-9)
It is possible to make alternative assessments about the number of deaths that may be attributed to assault. The 2 estimates presented in standard tables are:

(i) the number coded to X85–Y09. This is the basic ICD classification to which all assaults should eventually be assigned

(ii) the number coded to X85–Y09, plus those coded to U50.9 (event awaiting determination of intent). This takes account of accelerated registrations, most of which are eventually coded to an assault code (see Section 2.16)

Numbers of deaths from intentional self-harm (suicide in ICD-9)
As with assault, it is possible to make 2 separate estimates of the number of deaths annually from intentional self-harm:

(i) the number coded to X60–X84. This is the basic ICD classification to which all definite intentional self-harm verdicts are assigned

(ii) the number coded to X60–X84, plus those coded to Y10–Y34 (event of undetermined intent). This takes account of most deaths where an open inquest verdict was returned, but excludes all deaths that are pending investigation

2.18 Stillbirths

The Stillbirth (Definition) Act 1992 defines a stillbirth as "a child which has issued forth from its mother after the 24th week of pregnancy, and which did not at anytime after becoming completely expelled from its mother breathe or show other signs of life".

This definition has been in use since 1 October 1992. Prior to this, the Births and Deaths Registration Act 1953 defined a stillbirth as above, but at 28 or more weeks completed gestation. Figures for stillbirths from 1993 are, therefore, not comparable with those for previous years. From 28 May 2012, the restriction to register a stillbirth within 3 months from the date of occurrence has been removed and stillbirths can be registered at any time.

2.19 Infant deaths

- Infant deaths are defined as:
- Early neonatal – deaths under 7 days
- Perinatal – stillbirths and early neonatal deaths

- Neonatal – deaths under 28 days
- Postneonatal – deaths between 28 days and 1 year
- Infant – deaths under 1 year

Linked data refers to infant death records that have been successfully matched to their corresponding birth record; see the annual publication Child mortality statistics for further details.

2.20 Death rates, ratios and standardisation

Death rates are derived from total deaths registered in England and Wales and corresponding mid-year resident population.

Crude death rate is defined as total deaths per 1,000 population, or:

(Total deaths / Total population) x 1,000

Age-specific death rates may be calculated for each age group and these are defined as the number of deaths in the age group per 1,000 population in the same age group, or:

$M_k = (d_k/p_k) \times 1{,}000$

where M_k = age-specific death rate for age group k
d_k = deaths in age group k
p_k = population in age group k
k = age

Age-specific rates may be calculated separately for males and females, or for both sexes combined.

Age-standardised mortality rates (ASMRs) allow for differences in the age structure of populations. Using the direct method, the age-standardised rate for a particular condition is that which would have occurred if the observed age-specific rates for the condition had applied in a given standard population.

Thus: age-standardised rate = $\{\sum P_k m_k\} / \sum P_k$

where P_k = standard population in sex/age group k
m_k = observed mortality rate (deaths per million persons) in sex/age group k
k = age/sex group 0, 1 to 4, 5 to 9, ..., 85 to 89, 90 years and over

The age-standardised rate for “all causes” includes deaths at all ages, while the same rates for specific causes exclude neonatal deaths (infants aged under 28 days). Classification by underlying cause is not possible for neonatal deaths (see Section 2.22). The standard population used is the European Standard Population (ESP). It is the same for both males and females, so standardised rates may be compared for each sex, and between males and females. The ESP is a hypothetical population used to weight ASMRs. It enables comparisons between different countries, over time and between sexes.

The ESP was originally published in 1976 and was updated by Eurostat in 2013. The 2013 ESP structure allocates a greater weight to the older population to better reflect the ageing

population. This change has had a significant impact on ASMRs. Consequently ASMRs based on the 1976 ESP are not comparable with those based on the 2013 ESP. Further information about the change in methods can be found on the ONS website.

Distribution of the European Standard Population for 1976 and 2013

Age	1976 ESP[1]	2013 ESP[2]
Under 1	1,600	1,000
01-04	6,400	4,000
05-09	7,000	5,500
10-14	7,000	5,500
15-19	7,000	5,500
20-24	7,000	6,000
25-29	7,000	6,000
30-34	7,000	6,500
35-39	7,000	7,000
40-44	7,000	7,000
45-49	7,000	7,000
50-54	7,000	7,000
55-59	6,000	6,500
60-64	5,000	6,000
65-69	4,000	5,500
70-74	3,000	5,000
75-79	2,000	4,000
80-84	1,000	2,500
85+	1,000	z
85-89	z	1,500
90-94	z	800
95+	z	200
Total	**100,000**	**100,000**

Source[1]: http://ec.europa.eu/eurostat/documents/3859598/5926869/KS-RA-13-028-EN.PDF/e713fa79-1add-44e8-b23d-5e8fa09b3f8f
Source[2]: www.ons.gov.uk/ons/guide-method/user-guidance/health-and-life-events/revised-european-standard-population-2013--2013-esp-/index.html

For National Statistics publication of mortality and cancer incidence, ONS are currently using an abridged ESP with a 90 and over upper age band. National Statistics Population Estimates are only currently available for upper age limit of 90 years and over.

Perinatal mortality rate is the number of deaths at ages under 7 days (early neonatal deaths) plus stillbirths per 1,000 live births and stillbirths in the same period.

Infant mortality rate is the number of deaths at ages under 1 year per 1,000 live births.

Standardised mortality ratios (SMRs) compare mortality in one population with mortality in a “standard” population, while allowing for differences in age structure. Using the indirect method, the ratio is of “observed” to “expected” deaths. “Expected” deaths are the number that would have occurred if the sex and age-specific mortality rates of the standard year had

applied to the population of interest. SMRs for males and females separately are calculated using the appropriate sex- and age-specific standard rates. For persons, the SMRs are based on age-specific standard rates for males and females combined.

Thus: SMR = (observed deaths/expected deaths) x 100

where expected deaths = $\sum P_k M_k$

and P_k = population in age/sex group k in population of interest (e.g. an area, or period of time)
M_k = age-specific death rate for age group k for the standard population
k = age group (various groupings – see below)

For Series DR Table 10, the standard mortality rates used are based on the population estimates for England and Wales, 1950 to 1952. The age groups used in the calculation are 0 to 4, 5 to 14, 15 to 24, …, 65 to 74, 75 and over. Otherwise the standard mortality rates used are based on the most recent population estimates for England and Wales and the age groups used in the calculation are 0, 1 to 4, 5 to 9, 10 to 14, ..., 80 to 84, 85 and over.

2.21 Years of life lost

Analyses of the effects of premature death assume that everyone may live to a defined age and that death at a younger age means that some future years of life have been lost. Calculations of years of life lost are made for deaths from selected causes with the aim of illustrating the relative effects from different diseases. The “cut-off” ages used are 65, 75 and 85. These exclude deaths at high ages where the cause may be uncertain. This approach, but with a “cut-off” age of 65, is also used to calculate years of working life lost due to premature death. From 2012 data year onwards, the period of working life covers ages 16 to 64 for both males and females. Prior to 2012 data year, the period of working life covered ages 15 to 64. This change has a negligible impact on the comparability of statistics over time.

Total years of life lost = $\sum (A-a_i)d_i$

Years of working life lost = $[\sum (65-a_j)d_j] + 49 \sum d_k$

where d_i , d_j , d_k = number of deaths in age group i/j/k
a_i , a_j , a_k = age i/j/k + 0.5

A = 65 or 75 or 85
i = 0 to 64 or 0 to 74 or 0 to 84
j = 16 to 64
k = 0 to 15

Since there is no information on underlying cause of death when the deceased was aged under 28 days, the only category including both neonatal and non-neonatal deaths is that for “all causes”.

The mean age at death may be included as a further indicator of the relative effects of premature death. It is based on the sum of ages at death for each person.

$$\text{Mean age at death} = \frac{\sum(a_i\, d_i)}{d}$$

where a_i = age + 0.5
d_i = number of deaths at age i
i = single years of age 0 to 119, 120 and over
d = total number of deaths

2.22 Neonatal deaths

The tabulations of deaths by cause exclude neonatal deaths (deaths of infants aged under 28 days). In January 1986 a neonatal death certificate was introduced, from which it is not possible to assign an underlying cause of death. This certificate follows recommendations of the WHO in the ICD (WHO, 1992 to 1994), whereby causes of death are given separately in the following categories:

a. main diseases or conditions in fetus or infant
b. other diseases or conditions in fetus or infant
c. main maternal diseases or conditions affecting fetus or infant
d. other maternal diseases or conditions affecting fetus or infant
e. other relevant causes

While conditions arising in the mother that affected the fetus or infant could be mentioned on certificates prior to 1986, no provision was made for those cases in which the certifier considered that both maternal and fetal conditions contributed to the death. The certificate introduced in 1986 overcame this problem. However, since equal weighting is now given to main conditions in the fetus and in the mother, it is no longer possible to identify a single underlying cause of death for neonatal deaths (and stillbirths). For this reason ONS, together with a team of experts in the field, developed a hierarchical classification for classifying causes of neonatal deaths and stillbirths in ICD-10. This classification is known as “ONS cause groups”. More details can be found in Health Statistics Quarterly (Dattani and Rowan 2002) and the latest Child mortality statistics publication.

2.23 Further information

The ONS website (www.ons.gov.uk) provides a comprehensive source of freely available vital statistics and ONS products. More information on the ONS website can be obtained from the contact addresses found below.

Special extracts and tabulations of child mortality data for England and Wales are available to order (subject to legal frameworks, disclosure control, resources and agreement of costs, where appropriate). Such enquiries should be made to:

Vital Statistics Outputs Branch
Life Events and Population Sources Division
Office for National Statistics
Segensworth Road
Titchfield
Fareham
Hants
PO15 5RR
Telephone: +44 (0) 1329 444110

Email: vsob@ons.gsi.gov.uk
The ONS charging policy is available on the ONS website. In line with the ONS approach to open data, all ad hoc data requests will be published onto the website.

3 Background to mortality data

3.1 Redevelopment of mortality statistics

In the early 1990s, our predecessor, the Office of Population, Censuses and Surveys (OPCS) carried out an extensive redevelopment of its collection and processing systems for population, health and registration data – in particular, for births and deaths. For deaths this included: the progressive computerisation of registration in local offices, the move to a large deaths database to hold all deaths data from 1993; and the introduction of automated coding of cause of death. Further information about these changes is given below, with more details in the annual volume in the DH2 series for 1993 and 1994 (ONS 1996). Changes to the rules for selecting and coding cause of death brought England and Wales into line with international practice in 1993.

3.2 The deaths databases

In the deaths processing system that has been used within ONS since the early 1990s, there are 2 deaths databases, one for **register** information and the other for **statistical** data. The registration database contains mainly textual information that appears on the death certificate. This corresponds to most of the details supplied by informants to a registrar, available to applicants requesting a copy of the death certificate. The deaths statistical database contains only coded details of each death. When outputs are required, the statistical database can supply information on individual deaths or provide datasets for tabulation. The statistical database is continually updated and amended as further information becomes available.

In 1999, ONS developed a database to facilitate research into deaths related to drug poisoning and to aid the identification of specific substances involved in these deaths. The database currently contains data on all deaths on the annual data files for England and Wales between 1993 and the latest available year, where the underlying cause of death is regarded as resulting from drug-related poisoning, according to the current National Statistics definition. The database covers accidents and suicides involving drug poisoning, as well as poisonings due to drug abuse and drug dependence, but not other adverse effects of drugs.

ONS have compiled 2 other databases for England and Wales. The first, which contains details of deaths where methicillin-resistant staphylococcus aureus (MRSA) was reported as a contributory factor, provides data from 1993 to the latest available year. The second comprises deaths involving Clostridium difficile (C. difficile) and contains data for 1999 to the latest available year. Following the outcomes of the ONS consultation on statistical products 2013, ONS reporting on deaths associated with MRSA and C. difficile infection will be limited to Wales only.

3.3 Legislation

The existing provisions for the registration of deaths and the processing, reporting and analysis of mortality data appear in different legislation that reflects the distinct and separate roles of the Registrar General for England and Wales and the UK Statistics Authority.

The Registrar General is guided by the following:

- **Population (Statistics) Act 1938:** deals with the statistical information collected at registration
- **Births and Deaths Registration Act 1953:** covers all aspects of the registration of births, stillbirths and deaths
- **Population (Statistics) Act 1960:** makes further provision for collecting statistical detail at registration
- **Registration of Births and Deaths Regulations 1987:** cover further aspects of the registration of births and deaths
- **Coroners Act 1988:** sets out the procedures to be followed by coroners in handling deaths
- **Stillbirth (Definition) Act 1992:** which altered the definition of a stillbirth to 24 or more weeks completed gestation, instead of the previous definition of 28 or more weeks
- **Deregulation (Stillbirth and Death Registration) Order 1996:** allows for the registration of deaths by declaration
- **National Health Service Act 2006 (amended 2013) and National Health Service (Wales) Act 2006** consolidate legislation relating to the health service and separate provision of the health service in Wales from that in England. The Acts require notification of a birth or death to the local authority and the Clinical Commissioning Group (Local Health Board in Wales) where the birth or death occurred. Both Acts include provision for the supply of information on individual deaths to the National Health Service by the Registrar General
- **Presumption of Death Act 2013**: application can be made to the High Court for a declaration that a missing person is presumed to be dead where, the person who is missing is thought to have died or has not been known to be alive for a period of at least 7 years

The UK Statistics Authority is guided by the following:

- **Registration Service Act 1953 which in** Section 19 required the Registrar General to produce annual abstracts of the number of live births, stillbirths and deaths
- **Statistics and Registration Service Act 2007** which transferred some of the statistical functions of the Registrar General, including the production of an annual abstract, to the Statistics Board, also known as the UK Statistics Authority, and the Office for National Statistics which became the executive office of the UK Statistics Authority. The 2007 Act also provides the Registrar General with a power to disclose any information about a birth, death or a stillbirth to the UK Statistics Authority for statistical purposes. It also enables the UK Statistics Authority to produce and publish statistics relating to any matter. The Act also includes a provision for the UK Statistics Authority to supply individual birth and death records to the Secretary of State for Health and certain NHS bodies

When the **Statistics and Registration Service Act 2007** came into force on 1 April 2008, the arrangement where the National Statistician was also the Registrar General for England and Wales ended. At the same time, the General Register Office also stopped being part of the Office for National Statistics and was moved to the Identity and Passport Service. The National Health Service Central Register (NHSCR), formerly part of ONS, also transferred to the Health and Social Care Information Centre (HSCIC).

The responsibility for the production of mortality statistics is now a function of the UK Statistics Authority which is required to produce an annual abstract of mortality statistics in order that the Minister for the Cabinet Office can lay it before Parliament.

3.4 Historical changes in mortality data

Users should note certain changes to the collection and coding of deaths data over the years may affect their interpretation of trends in mortality. These changes include:

1979 **Introduction of the Ninth Revision of the International Classification of Diseases**. This replaced the Eighth Revision, which was used from 1968 to 1978. OPCS selected a 25% sample of death certificates for 1978, and coded these to both the Eighth and Ninth Revisions to give a guide to the effect of these changes on specific categories.

1981 to 1982 **Industrial action taken by registration officers** affected the quality of information about deaths from injury and poisoning. This action meant that details normally supplied by coroners were not available and the statistics were significantly affected. Figures on injury and poisoning for 1981, with the exception of suicides, must therefore be treated with caution. Categories such as “transport accidents” and “homicide” were significantly understated whereas “non-specific accidents” and “undetermined injuries” were overstated. Statistics relating to nature of injury were less affected by the absence of the coroners” information. Although industrial action extended into 1982 the coroners” information was collected retrospectively for that year, so enabling more accurate figures to be produced. However, complete details to help code the cause of death were still unavailable in 1982. This resulted in more deaths than usual being assigned to “unspecified” categories.

1984 OPCS decided to amend its **interpretation of WHO Rule 3** in the assignment of underlying cause of death. This amendment is covered in more detail in Series DR for 2006. It resulted in a decrease in the numbers of deaths coded to pneumonia and a few other causes, and an increase in deaths from many other conditions – most of the latter being small increases. The background to this change is given in the annual volume for 1984 in the DH2 series (OPCS, 1985), which includes a table assessing the numerical effects of changes, by underlying cause. Deaths from injury and poisoning were excluded from this exercise.

1986 Since January 1986, registrars have recorded the following information on the draft entry form:

- the date when the certifying doctor last saw the deceased alive

- whether the deceased was seen after death by a medical practitioner
- whether the death was reported to a coroner, and by whom
- whether the certifying practitioner indicated that death might have been linked to the deceased's employment

The first 3 items had been recorded on the medical certificate for many years for legal and administrative purposes. The fourth resulted from legislation passed in 1985, although it is not well reported or recorded (OPCS 1989).

1986 **New stillbirth and neonatal death certificates** were introduced in January 1986. The new neonatal certificate included both maternal and fetal conditions. This means that it is not possible to assign an underlying cause for deaths under 28 days. From 1986, therefore, tables of deaths by cause and age do not include neonates, although the all cause total for neonates is often given. Details of neonatal deaths by cause can be found in the annual volume on childhood, infant and perinatal mortality statistics, Child mortality statistics.

1993 OPCS decided to **revert to the internationally accepted interpretation of Rule 3** operating in England and Wales before 1984 (see Section 3.2).

1993 **Redevelopment of OPCS collection and processing systems**, which took effect on published mortality data from January 1993. Changes included:

- the computerisation of registration, with registrars in most local offices entering details on computers and supplying data to ONS on floppy disk
- the automation of cause of death coding, so that procedures for assigning codes to underlying cause are now automatic for about 80% of all deaths but not used for deaths certified after inquest
- the use of a dynamic database to hold all deaths data, for easy retrieval of up-to-date information. These and other changes are described in Section 4 and (in more detail) in a Population Trends article (Rooney and Devis 1996)

1993 **A revised coroner's certificate of cause of death after inquest** was introduced in May 1993, which resulted in less detail for many deaths from injury and poisoning (ICD-9 E800–E999) – both for the description of injury sustained and for the classification of some suicides. Following the introduction the revised certificate, problems were identified relating to the processing of deaths certified after inquest due to the non-receipt of some data that contained additional detail about some accidental deaths. This resulted in more deaths being assigned to residual categories such as "other and unspecified causes" (ICD-9 E928.9). For this reason, the number of deaths coded to suicide and self-inflicted poisoning by motor vehicle gas exhaust (ICD-9 E952.0) declined substantially, while those from suicide and self-inflicted poisoning by other carbon monoxide (ICD-9 E952.1) rose. To resolve this problem, ONS amended its systems and manually coded all deaths that resulted in a coroner's inquest or adjourned inquest. Data were re-coded where necessary for 1993 and 1994. Changes were concentrated in the external causes of the ICD, while the effect on other causes was limited.

1993 Ending of **medical enquiries** to obtain more precise information on the underlying cause of death.

1997 Provision for **registration of a death by declaration** was introduced in April 1997, whereby details of a death could be supplied to a registrar in a district other than that where the death took place. Analysis shows that this provision is most likely to be used for deaths of infants and for neonatal deaths in particular.

2001 **Introduction of the Tenth Revision of the International Statistical Classification of Diseases** for coding cause of death on 1 January 2001. This replaced the Ninth Revision used from 1979 to 2000. There are some significant differences between the ICD versions. The main differences are:

- a change in format of the code and an expansion in the number of codes used
- a movement of some diseases and conditions between broad groups called ICD chapters
- changes to the rules governing the selection and coding of the underlying cause of death, especially Rule 3, which has had a large effect

ONS coded the 1999 registration dataset to both the Ninth and Tenth Revisions to give a guide to the effect of changes on specific categories of cause of death. The results of this bridge-coding exercise were published in 2002 (ONS 2002). Research specifically examining the effect on injury and poisoning of moving to ICD-10 was published in (Griffiths and Rooney 2003).

2002 Introduction of the **General Register Office Network (GRONET)** to Register Offices began, allowing for births and deaths registration details to be sent directly to ONS via email.

2006 Introduction of **Registration online (RON)** pilot areas enabling registrars to record births, stillbirths, deaths and civil partnerships online instead of using **Registration Service Software (RSS)**.

2007 RON was implemented and due to significant performance problems suspended resulting in around half the registrars reverting back to using the previous electronic system, RSS.

2009 RON was fully implemented on 1 July 2009. 83% of registrations in 2009 were recorded on RON.

2010 All deaths recorded using RON.

2011 In January 2011, the software used for cause of death coding was updated from the International Classification of Diseases, Tenth Revision (ICD-10) v2001.2 to v2010. The main changes in ICD-10 v2010 are amendments to the modification tables and selection rules. Modification tables and selection rules are used to ascertain a causal sequence and consistently assign underlying cause of death from the conditions recorded on the death certificate. Overall, the impact of these changes is small although some cause groups are

affected more than others. For further information, see the results of the bridge coding study on the ONS website. There is also another study looking at the impact on stillbirths and neonatal deaths.

2014 On 1 January 2014 ONS changed the software used to code cause of death. The new IRIS software version 2013 incorporates official updates to ICD-10 that are approved by WHO. Further information on IRIS can be found in Section 2.12 and in the dual coding study looking at the impact on mortality statistics.

2014 On 1 October 2014, the **Presumption of Death Act 2013** came into force in England and Wales. This means that an application can be made to the High Court for a declaration that a missing person is presumed to be dead where, the person who is missing is thought to have died or has not been known to be alive for a period of at least 7 years.

4 Quality of mortality data

Mortality statistics in England and Wales are derived from the registration of deaths certified by a doctor or a coroner. The data pass through a number of processes before becoming usable for analysis. These processes are complex, and involve a wide range of people, organisations and computer systems.

To produce mortality outputs, annual extracts are taken from the deaths database. These extracts are then used to produce annual tables and files of individual death records for other government departments and health authorities, as provided for by relevant legislation.

4.1 Completing medical certificates of cause of death

For around three-quarters of deaths, one of the doctors involved in the patient's care for the illness from which they died completes a medical certificate of cause of death (MCCD). Many thousands of general practitioners (GPs), hospital consultants, junior doctors in training and doctors in other clinical posts all complete MCCDs. The nature and amount of training they have had in death certification vary greatly. Not all medical schools in the UK include questions on death certification in their exams. However, "issuing death certificates" is included as a competency that newly qualified doctors should be able to demonstrate during their training in Foundation Years 1 and 2. Doctors already in practice are required to keep their knowledge and skills up to date through continuous professional education. However, there are constant changes in clinical knowledge, practice and guidelines to keep abreast of, so death certification may not often be a priority.

Training materials on death certification developed by ONS in the late 1990s with the help and oversight of a wide range of stakeholders through the ONS Death Certification Advisory Group (DCAG) in the 1990s are available from ONS Titchfield (see Section 2.23 for address). These include a short video, "Death Counts", an associated training pack including test histories, and pocket cards for distribution to GPs and hospital doctors.

There have been several well publicised proposals for reform of death certification since the Shipman case in 1998 (TSO 2003, 2003a, 2004). Legislation implementing the reform of the process of death certification in England and Wales is included in the Coroners and Justice Act 2009, which received Royal Ascent on 12 November 2009. This will reform the process

of death certification by introducing a single unified system for both burials and cremations and appointing medical examiners to provide an independent scrutiny of the cause of death.

Guidance to doctors completing MCCDs in England and Wales was updated by the ONS Death Certification Advisory Group in June 2005 and again in November 2007. The guidance explains best practice under current legislation, and sets out numerous examples based on recent queries from certifiers and samples of good certification. In 2005 the Department of Health notified all registered doctors of the existence of the new guidance through Chief Medical Officer's (CMO) Update (CMO 2005). In 2007 CMO again drew the attention of doctors and senior NHS managers to the guidance in a letter about deaths involving health care associated infections.

Guidance for completion of MCCDs is being reviewed and updated as part of the implementation of death certification reform.

Coroners certify about a quarter of all deaths. Coroners can only certify cause of death following a post-mortem by a pathologist, an inquest or both. Training for coroners is organised through the Ministry of Justice. The process of referral to a coroner and how referred deaths are dealt with varies between coroners' areas.

4.2 Registration of the death

Data items other than the cause of death depend largely on information supplied by the informant. For deaths certified after inquest, police officers or other witnesses may supply this information, which cannot later be checked by the registrar. For some items of information, for example occupation, there may be no absolute way of checking its accuracy. For others, validity (age and date of birth), or "reasonableness" (age and cause of death) may be checked. Some details may also be verified later, for example date of birth, with records held at health service data sources.

4.3 Entry of data

Registration Service Software (RSS)

RSS was rewritten in 1998 and issued to Register Offices in 1999. It was replaced by the RON system on 1 July 2009. The deaths statistical fields used in RSS were validated in 3 respects:

a) range: checking that codes fall into an expected range of values
b) data type: checking that text appears where it should, and numeric values appear where they should
c) logic: cross-checking with values in one or more other fields

Cross-validations are carried out by checking logical consistency between various items recorded by the registrar. These include information collected on type of certification, referral to coroner, and whether a post-mortem was carried out.

Registration Online (RON)

In November 2006, a pilot for an online system of registering life events (RON) commenced in 5 registration districts. Following the success of this pilot, RON was implemented in most register offices on 26 March 2007. However, as a result of significant performance problems, the system was suspended on 10 April 2007 resulting in around half of registrars reverting back to using the previous electronic system, RSS. From 8 May 2007, almost all register

offices were submitting data electronically using either RON or RSS. Any remaining death registrations that were held only on paper at register offices were later entered onto the RON system by GRO, or by the local registration service. RON was fully implemented in register offices on 1 July 2009.

With the introduction of RON, it has become possible to carry out some additional validation checks at the point of registration, for example, validation of address and postcode.

4.4 Other checks made by the Registration Service

Checks are also made on death registration details at various times by registrars, superintendent registrars, and account managers from GRO. They are made on death registration data "in the field", prior to Quarterly Certified Copies (QCCs) being received at GRO in Southport. QCCs are copies of all entries made in each register and the QCC is used to maintain a central register of events. Prior to July 2009 a number of districts submitted their copies in this historic way, however, since then all districts have been required to submit their certified QCCs electronically to GRO, with the electronic copy used to form the central record.

At the time of registration

When someone attends to register a death, the registrar is instructed to make the following checks:

- the death is in their area
- the death occurred within the last 12 months
- the informant is qualified to give information
- the correct medical certificate has been used
- the certificate relates to the correct person
- the certificate has been filled in properly – that is, it is signed, not amended in any way, the doctor's qualifications filled in, the last date seen alive and whether or not the certifier saw the deceased after death is shown
- the death does not need to be referred to the coroner

The registrar then carries out the registration and reviews the recorded detail with the informant before the register page is signed by the informant and registrar. The signed register page is normally a computer generated print, replicating the detail held on computer, but when the computerised system is unavailable it is a handwritten page.

By superintendent registrars and account managers

Superintendent registrars carry out the following quarterly checks:

- the QCC entries agree with each register entry
- the entries appear to be in sequence
- there is a medical certificate/coroner's form to accompany each death entry, as appropriate
- each entry has been signed by an informant (if required) and by the registrar
- for any manual entries a general check on any apparent erasure, illegibility etc

Account managers visit registration districts on a periodic basis and as part of the process will typically include the following inspection activity:

- sitting in on actual registrations to check questioning technique

- examining a sample of register entries and supporting documentation and draft entries
- examination of computerised records held

4.5 Receipt of death registration data at ONS Titchfield

Details of deaths are received from register offices electronically. Routine and automated checks are carried out on each file and the combined data are then loaded on to the deaths database. Regular receipt and diagnostic reports are produced, resulting in weekly contacts with the identified registrars to resolve any problems.

Examples of checks include:

- identification of missing entries, so that death registration details are received in sequence
- checks for duplicate records
- checking for misplaced records, for example, verifying that each registrar is using the register allocated
- for paper records – that date of death and date of registration are in the correct range
- for paper records – records are checked for completeness prior to keying
- checks on registrars whose returns have not been received by the fourth working day after the end of each week

4.6 Validation processes

Once on the database, the data are passed through a series of validation processes which are carried out automatically with any inconsistencies highlighted. Simple validations include examination of dates or employment status to ensure that they are likely. More complicated validations include checks for consistency between dates of birth, death and registration, or between age and marital status.

4.7 Routine checks in Titchfield

All deaths accepted onto the database that need routine coding are identified and coded as required by the Survey and Life Events Processing Branch (SALEP). The detailed routine coding falls into 5 main areas:

- postcoding to give usual residence of deceased
- occupation, that is, the occupation of deceased/spouse/civil partner, where age of deceased is over 16 (last occupation if retired); the occupation of the mother and/or father, where age of deceased is under 16
- communal establishment coding for place of death of deceased
- place of birth of deceased
- cause of death (see below)

Causes of death are coded either through ACCS (see below) or by a manual process (for example, coroners' inquests). There are also routine checks of cause of death data. Those carried out monthly include:

- checking cause fields against inquest verdict fields for compatibility
- the presence or absence of original and final cause of death fields
- codes for ONS cause groups are present for neonatal deaths, and absent for non-neonatals (see Section 2.22)
- validity of suicides at very young ages

- mentioned conditions on death certificate are compatible with sex

Once coding of the cause of death is complete, checks are carried out on variables such as date of death, sex, year of birth, marital status and communal establishments. These checks evolve continuously during exploratory surveillance of data quality, and some of these are later incorporated as routine checks.

4.8 Automated Cause Coding System (ACCS)

ACCS processes data for most deaths (see Section 2.12) to derive codes for each medical condition on the certificate and to identify the underlying cause. The accuracy of automated coding is checked regularly within data quality check requirements. Periodical reports on persistent coding problems are referred to a medical epidemiologist and authors of the software to highlight areas of concern for the new releases.

4.9 Checks before and after extraction of data for analysis

The first of these are carried out as a final check of what is held on the deaths database before an annual extract of data is taken. These comprise frequency checks for a range of fields, covering age, sex, underlying cause, and area of residence. Also checked are possibly incorrect combinations of fields. Any apparent errors or inconsistencies result in checks of individual cases by coders who make amendments, as required. Some of these checks are also carried out routinely every month.

Further examinations are carried out once the data extract has been taken. They include checks similar to those done before extraction, to ensure that corrections made at that stage were properly carried out. After the annual extract used for mortality analyses has been produced as a dataset in a statistical computing package, a further set of frequency counts and 2-way tables are prepared to ensure that no new errors have been introduced at this stage. These checks are to ensure that the frequency distributions are both valid and plausible and broadly similar to those for the previous year's data.

4.10 Checks on routine outputs

These include:

- systematic checks of totals (row, column, and other) against known correct figures
- checks of individual cells against correct figures
- checking figures are consistent and plausible, that is, that they are what would be expected compared to the previous year's tables

These checks are carried out by the Primary Mortality Outputs team in Vital Statistics Outputs Branch in consultation with a medical epidemiologist.

References

Chief Medical Officer. CMO Update 42, (Summer 2005). London: Department of Health.

Dattani N and Rowan S (2002) 'Causes of neonatal deaths and stillbirths: a new hierarchical classification in ICD-10'. Health Statistics Quarterly 15, pp 16–22.

Devis T and Rooney C (1999) 'Death certification and the epidemiologist'. Health Statistics Quarterly 01, pp 21–33.

Gastrell J, Griffiths C and Devis T (2004) 'An analysis of legally uncertified deaths in England and Wales, 1979-2002'. Health Statistics Quarterly 24, pp 7–13.

General Register Office (1971) Registrar General's Statistical Review 1967, (part III Commentary) pp 97–107. HMSO: London.

Griffiths C and Rooney C (2003) 'The effect of the introduction of ICD-10 on trends in mortality from injury and poisoning in England and Wales'. Health Statistics Quarterly 19, pp 10–21.

Office for National Statistics (2008) Mortality statistics: Deaths registered in 2006, DR_06.

Office for National Statistics (2002) Report: 'Results of the ICD-10 bridge coding study, England and Wales, 1999'. Health Statistics Quarterly 14, pp 75–83.

Office for National Statistics (2011) Child Mortality Statistics 2009.

Office for National Statistics (1996) Mortality statistics: cause 1993 (revised) and 1994**,** series DH2 no 21.

Office of Population, Censuses and Surveys (1985) Mortality statistics: cause 1984, series DH2 no 11.

Office of Population, Censuses and Surveys (1989) Mortality statistics: general 1987, page v, series DH1 no 20.

Rooney C and Devis T (1996) 'Mortality trends by cause of death in England and Wales 1980-94: the impact of introducing automated cause coding and related changes in 1993'. Population Trends 86, pp 29–35.

Rooney C and Devis T (1999) 'Recent trends in deaths from homicide in England and Wales'. Health Statistics Quarterly 03, pp 5–13.

Secretary of State for the Home Department. Death certification and investigation in England, Wales and Northern Ireland. TSO: London, 2003. (Cm 5831.).

The Third Report of the Shipman Inquiry. Death Certification and the Investigation of Deaths by Coroners, 14 July 2003, TSO: London, 2003.

Secretary of State for the Home Department. Position paper: Reforming the coroner and death certification service, 2004, TSO: London.

World Health Organisation (1992–94) International Statistical Classification of Diseases and Related Health Problems, volumes 1, 2 and 3 (Tenth Revision). WHO: Geneva.

Glossary

Accelerated registrations
The process by which a death can be registered at the time of adjournment of an inquest instead of having to await the outcome of criminal proceedings.

ACCS
Automated cause coding system software developed by the National Center for Health Statistics (NCHS).

Age-standardised rates
A statistical measure to allow more precise comparisons between two or more populations by eliminating the effects in age structure by using a "standard population".

Annual extract
The dataset taken from the main deaths database from which tabulations are derived. Sometimes it is referred to as the "standard" extract.

Assault
The ICD-10 terminology referring to homicide and injuries inflicted by another person with intent to injure or kill, by any means (excluding deaths from legal intervention and operations of war).

Bridge coding
An exercise in which the same group of deaths are independently classified according to 2 different classifications or coding methods.

Comparability ratios
A measure, expressed as a ratio, ratios indicating the net effect of the change in classification (from ICD-9 to ICD-10) on a particular cause of death.

Coroner
Public official responsible for the investigation of violent, sudden or suspicious deaths.

DCAG
Death Certification Advisory Group.

Declaration
The method by which an informant can register a death in a different district from that in which the death occurred.

Dual coding
The coding of the same data twice, using different methods of coding in order to assess inconsistencies.

Early neonatal
Relating to infants aged under 7 days.

Epidemiologist
A person concerned with the incidence and distribution of diseases and other factors, including the environment, relating to health.

External cause
Death resulting from accident or violence. An alternative term for the underlying cause of death. ICD codes from Chapter XX; see Secondary causes.

GRO
General Register Office, located in Southport, England.

Hierarchical classification
ONS's method for classifying the causes of neonatal deaths and stillbirths using groups of ICD codes referred to as "ONS cause groups".

ICD
International Classification of Diseases.

Informant
The person who provides the registrar with the information required to register a death

Inquest
Inquiry into the cause of an unexplained, sudden or violent death held by a coroner.

MCCD
Medical Certificate of Cause of Death.

Modification rules
Rules used in ICD-10 applied rules to select the correct underlying cause of death.

MMDS
Medical Mortality Data Software developed by the NCHS in the USA and used in conjunction with ACCS.

NCHS
National Center for Health Statistics, USA, who developed ACCS.

Neonatal
Relating to infants aged under 28 days.

NHSCR
National Health Service Central Register.

ONS
Office for National Statistics.

OPCS
Office of Population Censuses and Surveys joined with the Central Statistical Office to

become ONS in 1996.

Perinatal
Includes stillbirths and early neonatal deaths.

QCC
Quarterly Certified Copy. Copies made of each Register, sent to the GRO at Southport.

Registrar
Statutory officer responsible for the registration of births, deaths and marriages.

Registrar General
Statutory appointment with responsibility for the administration of the registration Acts in England and Wales, and other related functions as specified by the relevant legislation.

Registration officer
Generic term for registrar, superintendent registrar and additional registrars.

RON
Registration Online. A web-based system which enables registrars to record births, stillbirths, deaths, marriages and civil partnerships online.

RSS
Registration Service Software. System of collecting data electronically at the registration of a birth or death. Used prior to RON.

Rule 3
One of the rules used to select the correct underlying cause of death; its different use in ICD-10 results in significant differences from ICD-9 for some causes; see Selection rules.

SALEP
Survey and Life Events Processing Branch (at ONS).

SAS
Statistics software package used for tabulation.

Secondary cause
The nature of injury, or main injury, that caused death (where the underlying cause is assigned to an external cause from Chapter XX in ICD-10, V01 to Y89). Nature of injury codes are taken mostly from Chapter XIX (prefixes S and T).

Selection rules
Rules used in the ICD to determine the correct selection of the underlying cause of death; see Rule 3.

Sequela (sequelae)
A condition (or conditions) reported as the result of a previous injury – a “late effect” (under ICD-9) or that occurs as a late effect one year or more after the originating event.

Standard population
Used in the calculation of the age-standardised death rates; an element of the population (such as age and sex) is “held constant” to control its effect, for example, the European Standard.

Stillbirth
Refer to the Stillbirth (Definition) Act 1992; a child born after 24 or more weeks completed gestation who did not show any signs of life at any time after being born.

Superintendent registrar
Statutory officer with responsibilities relating to births, deaths, marriage and other registration functions, as specified in the relevant legislation.

UK Statistics Authority
The UK Statistics Authority is an independent body operating at arms length from government as a non-ministerial department, directly accountable to Parliament. It was established on 1 April 2008 by the Statistics and Registration Service Act 2007.

Underlying cause of death
The cause of death selected for primary tabulation based on ICD rules.

VSOB
Vital Statistics Outputs Branch (at ONS).

WHO
World Health Organisation.

Annex A Medical Certificate of Cause of Death

BIRTHS AND DEATHS REGISTRATION ACT 1953
(Form prescribed by Registration of Births and Deaths Regulations 1987)

MEDICAL CERTIFICATE OF CAUSE OF DEATH

For use only by a Registered Medical Practitioner WHO HAS BEEN IN ATTENDANCE during the deceased's last illness, and to be delivered by him forthwith to the Registrar of Births and Deaths.

Registrar to enter No. of Death Entry .....

Name of deceased .....

Date of death as stated to me ..... day of ..... Age as stated to me .....

Place of death .....

Last seen alive by me ..... day of ....

1 The certified cause of death takes account of information obtained from post-mortem.

2 Information from post-mortem may be available later

3 Post mortem not being held.

4 I have reported this death to the Coroner for further action.

(See overleaf)

Please ring appropriate digit(s) and letter

a Seen after death by me.

b Seen after death by another medical practitioner but not by me

c Not seen after death by a medical practitioner.

CAUSE OF DEATH

The condition that ... the 'Underlying Cause of Death' should appear on the lowest completed line of Part I.

	These particulars not to be entered in death register
	Approximate interval between onset and death
I (a) Disease or condition directly leading to death†	.....
(b) Other disease or condition, if any, leading to: **I(a)**	.....
(c) Other disease or condition, if any, leading to: **I(b)**	.....
II Other significant conditions **CONTRIBUTING TO THE DEATH** but not related to the disease or condition causing it	.....

The death might have been due to or contributed to by the employment followed at some time by the deceased ☐ Please tick where applicable

† *This does not mean the mode of dying, such as heart failure, asphyxia, asthenia, etc: it means the disease, injury, or complication which caused death.*

I hereby certify that I was in medical attendance during the above named deceased's last illness, and that the particulars and cause of death above written are true to the best of my knowledge and belief.

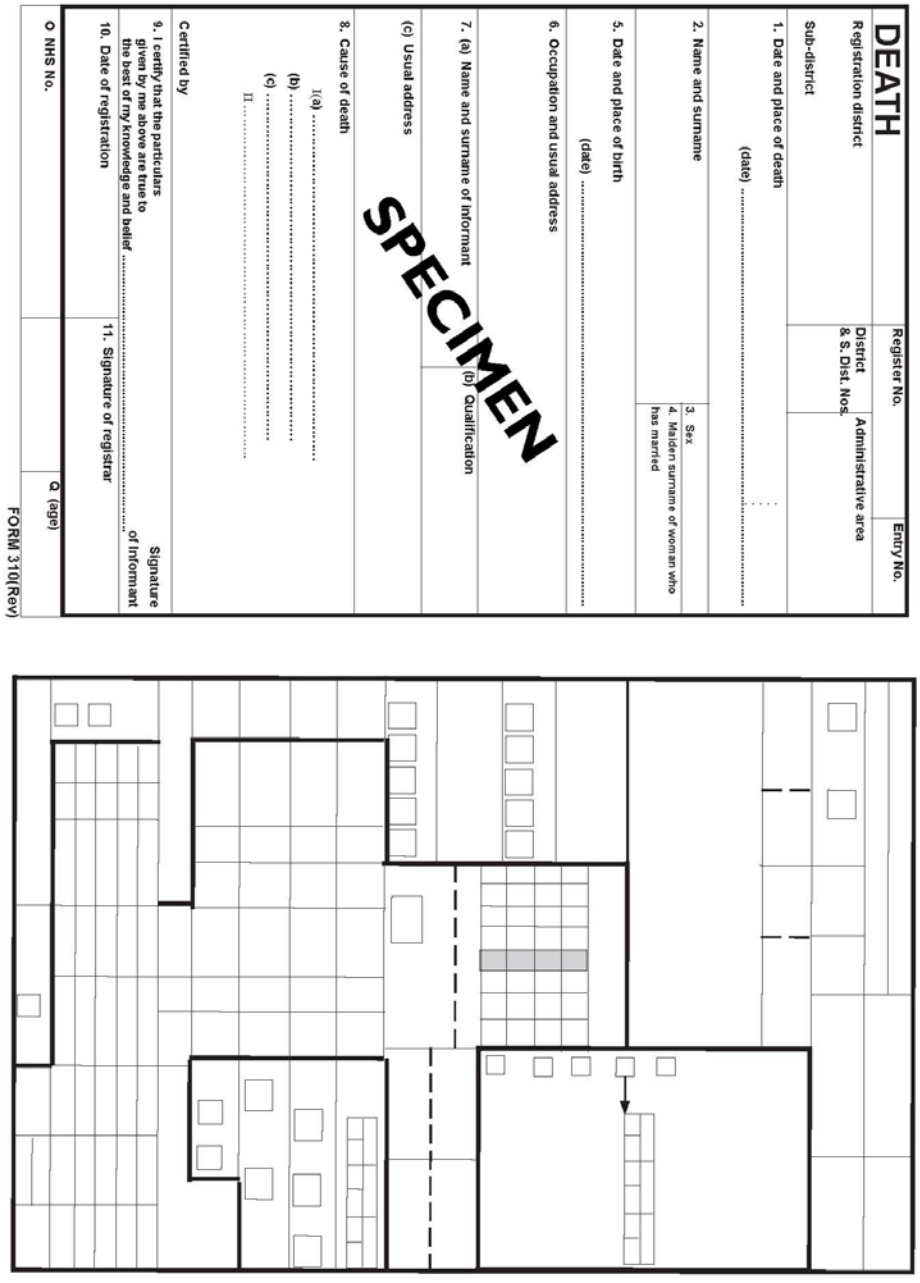
Signature ..... Qualifications as registered by General Medical Council .....

Residence ..... Date .....

For deaths in hospital: Please give the name of the consultant responsible for the above- named as a patient .....

Annex B Draft entry form previously used for registering deaths

Form 310 (Rev)



Annex C Coroner's certificate after inquest (Form 99(REV) A &B - white)

CORONER'S CERTIFICATE AFTER INQUEST
furnished under section 11(7) of the Coroner's Act 1988

To be completed by Registrar	
Register No.	
Entry No.	

To the _____ Registrar of Births and Deaths

Inquest held on
at
Was a post-mortem held?

PART I PARTICULARS OF DECEASED (Not still born - see separate Form 99A)

1 Date and place of death

2 Name and surname

3 Sex

4 Maiden surname of woman who has married

5 Date and place of birth

6 Occupation and usual address

Cause of death I(a)
(b)
(c)
II
Verdict

SPECIMEN

PART II VISITING FORCES
The inquest was adjourned on { *under section 7 of the Visiting Forces Act 1952 / *and has not been resumed

PART III BURIAL/CREMATION
I have issued†
on
to
of

†Enter Order for Burial/Certificate E for Cremation

PART IV MARITAL CONDITION etc. All persons aged 16 and over
Insert appropriate number in box. 1 Single 2 Married 3 Widowed 4 Divorced 5 Not Known

If married enter date of birth of surviving spouse

Day		Month		Year	

I certify that the findings of the inquest were as above.

Date Signed

Name

Appointment

Jurisdiction

*Delete as necessary

Form 99(REV)A
SB17/2a 1/93

Annex C – *continued*

Name and surname of deceased

To be completed by Registrar	
District & SD Nos.	
Register No.	
Entry No.	

PART V ACCIDENT OR MISADVENTURE (including deaths from neglect or from anaesthetics)

1. Place where accident occurred†
   0. Home
   1. Farm
   2. Mine or quarry
   3. Industrial place or premises
   4. Place of recreation or sport
   5. Street or highway
   6. Public building
   7. Resident institution
   8. Other specified place
   9. Place not known

2. To be completed for all persons aged 16 and over
   When injury was received deceased was†
   1. On way to, or from work
   2. At work
   3. Elsewhere

3. Details of how accident happened:

SPECIMEN

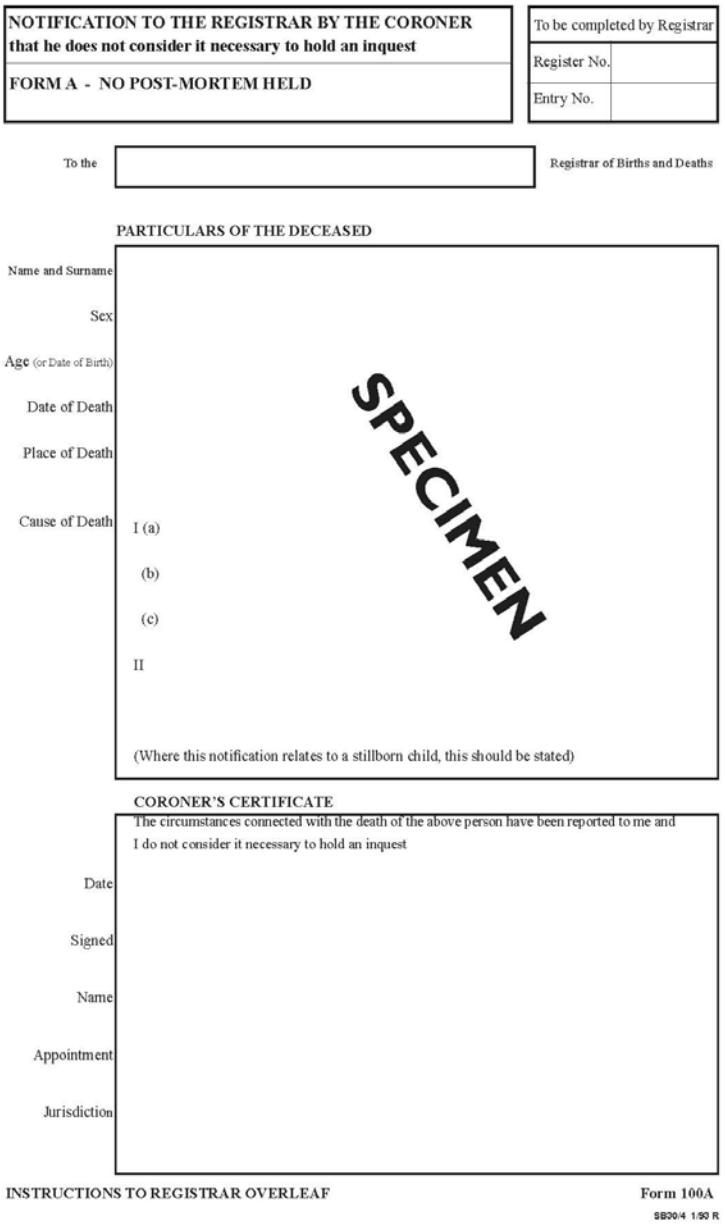
4. If motor vehicle incident, deceased was†
   0. Driver of motor vehicle other than motor cycle
   1. Passenger in motor vehicle other than motor cycle
   2. Motor cyclist
   3. Passenger on motor cycle
   4. Occupant of tram car
   5. Rider of animal; occupant of animal-drawn vehicle
   6. Pedal cyclist
   7. Pedestrian
   8. Other specified person
   9. Not known

5. Interval between injury and death†
   1. Less than one year
   2. One year or more

†Please insert appropriate number in box

Form 99(REV)B
SB17/2b 1/93

Annex D Notification to the registrar by the coroner that he does not consider it necessary to hold an inquest - no post-mortem held (Form 100A - salmon pink)



NOTIFICATION TO THE REGISTRAR BY THE CORONER
that he does not consider it necessary to hold an inquest

FORM A - NO POST-MORTEM HELD

To be completed by Registrar

Register No.

Entry No.

To the _____ Registrar of Births and Deaths

PARTICULARS OF THE DECEASED

Name and Surname

Sex

Age (or Date of Birth)

Date of Death

Place of Death

Cause of Death

I (a)

(b)

(c)

II

SPECIMEN

(Where this notification relates to a stillborn child, this should be stated)

CORONER'S CERTIFICATE

The circumstances connected with the death of the above person have been reported to me and I do not consider it necessary to hold an inquest

Date

Signed

Name

Appointment

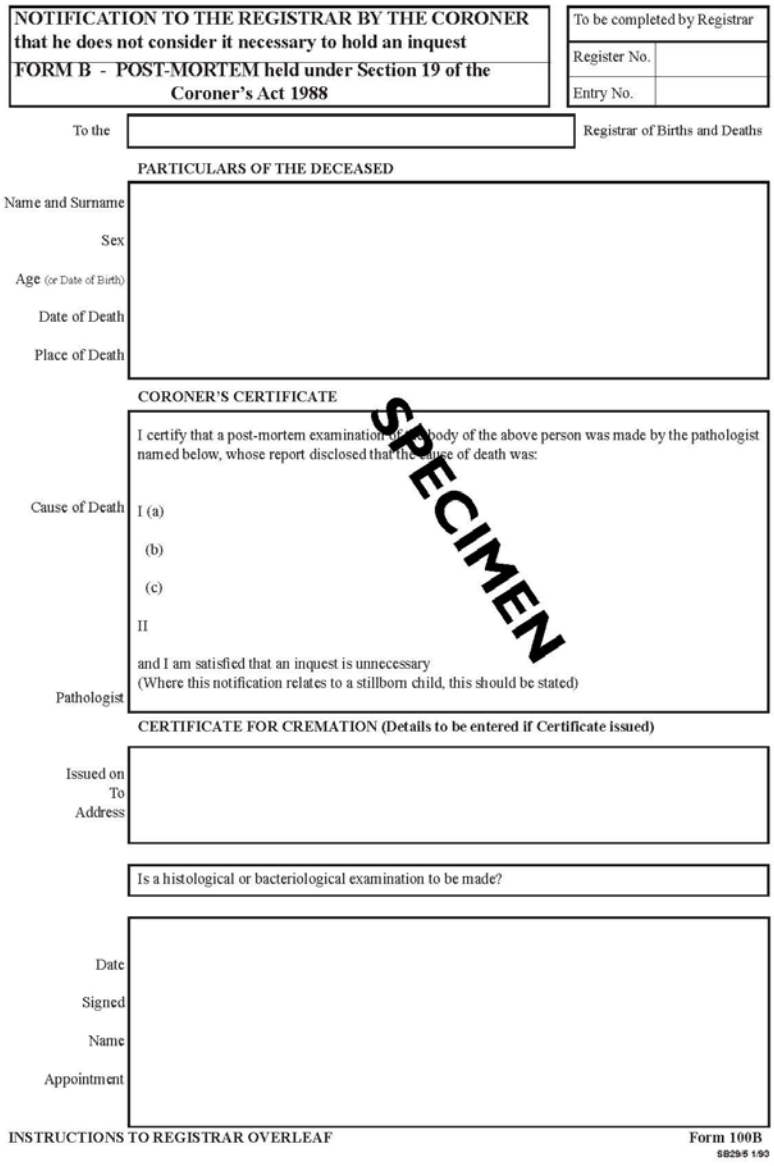
Jurisdiction

INSTRUCTIONS TO REGISTRAR OVERLEAF

Form 100A

SB30/4 1/90 R

Annex E Notification to the registrar by the coroner that he does not consider it necessary to hold an inquest - post-mortem held (Form 100B - pink)



NOTIFICATION TO THE REGISTRAR BY THE CORONER that he does not consider it necessary to hold an inquest

FORM B - POST-MORTEM held under Section 19 of the Coroner's Act 1988

To be completed by Registrar

Register No.

Entry No.

To the _____ Registrar of Births and Deaths

PARTICULARS OF THE DECEASED

Name and Surname

Sex

Age (or Date of Birth)

Date of Death

Place of Death

CORONER'S CERTIFICATE

I certify that a post-mortem examination of the body of the above person was made by the pathologist named below, whose report disclosed that the cause of death was:

Cause of Death

I (a)

(b)

(c)

II

and I am satisfied that an inquest is unnecessary

(Where this notification relates to a stillborn child, this should be stated)

Pathologist

SPECIMEN

CERTIFICATE FOR CREMATION (Details to be entered if Certificate issued)

Issued on

To

Address

Is a histological or bacteriological examination to be made?

Date

Signed

Name

Appointment

INSTRUCTIONS TO REGISTRAR OVERLEAF

Form 100B

SB29/5 1/93

Annex F Coroner's certificate after inquest adjourned (Form 120A&B - yellow)

CORONER'S CERTIFICATE AFTER INQUEST ADJOURNED
furnished under section 16(4) of the Coroner's Act 1988

To be completed by Registrar	
Register No.	
Entry No.	

To the _____ Registrar of Births and Deaths

Inquest held on
at
Was a post-mortem held?

PART I PARTICULARS OF DECEASED (Not still born - see separate Form 99A)

1 Date and place of death

2 Name and surname

3 Sex

4 Maiden surname of woman who has married

5 Date and place of birth

6 Occupation and usual address

Cause of death I(a)

(b)

(c)

II

SPECIMEN

PART III BURIAL/CREMATION
I have issued†
on
to
of

†Enter Order for Burial/Certificate E for Cremation

PART IV MARITAL CONDITION etc. All persons aged 16 and over
Insert appropriate number in box. 1 Single 2 Married 3 Widowed 4 Divorced 5 Not Known

If married enter date of birth of surviving spouse

Day		Month		Year	

I certify that the findings of the inquest were as above.

Date Signed

Name

Appointment

Jurisdiction

*Delete as necessary

Form 120A
SB19/2a 1/93

Annex F – *continued*

Name and surname of deceased	To be completed by Registrar	
	District & SD Nos.	
	Register No.	
	Entry No.	

PART V INCIDENT LEADING TO DEATH (Information for the statistical purposes of ONS only)

If motor vehicle incident, deceased was†

0. Driver of motor vehicle other than motor cycle
1. Passenger in motor vehicle other than motor cycle
2. Motor cyclist
3. Passenger on motor cycle
4. Occupant of tram car
5. Rider of animal; occupant of animal-drawn vehicle
6. Pedal cyclist
7. Pedestrian
8. Other specified person
9. Not known

†Please insert appropriate number in box

Form 120B
SB19/2b 1/93

Annex G Coroner's certificate (reporting on action subsequent to an adjourned inquest) (Form 121 - blue)

Certificate sent to registrar on .... *by post/otherwise than by post

To be completed by Registrar	
Dist & Sub. Dist. Nos.	
Register No.	

CORONERS' CERTIFICATE
furnished under section 16(5) or 16(7)(b) of the Coroners Act 1988

To the registrar of births and deaths for the sub-district of .....

in respect of the inquest touching the death of .....

at (place of death).....

which was adjourned under Section 16(1) of the Coroners Act 1988 on the.....

I hereby certify as follows:

***Part A**
The inquest has not been resumed.

*(1) No criminal proceedings were instituted in respect of this death.

*(But criminal proceedings were instituted in the case of the associated death on .....

of .....)

OR

*(2) Criminal proceedings were instituted on a charge of .....

.....

As a result of these proceedings the defendant was .....

.....

OR

*(3) Criminal proceedings were terminated by .....

.....

***Part B**
The inquest was resumed on .....

(1) The finding of the inquest as to the cause of death:

*(a) was as stated in my certificate furnished under Section 16(4) of the Coroners Act 1988, OR

*(b) was.....

.....

.....

.....

(please state cause of death as found at resumed inquest)

*(2) No criminal proceedings were instituted in respect of this death.

*(But criminal proceedings were instituted in the case of the associated death on

of.....)

OR

*(3) Criminal proceedings were instituted on a charge of .....

.....

and the outcome was.....

.....

.....

Date ..... Signature .....

HM Coroner for .....

**Delete as necessary*

Annex H Declaration of Particulars for the Registration of a Death

BIRTHS AND DEATHS REGISTRATION ACT 1953, Section 23A

DECLARATION of PARTICULARS for the REGISTRATION of a DEATH

I, , being a person qualified under the Births and Deaths Registration Act 1953 to give information for the registration of the death of the undermentioned, DO SOLEMNLY DECLARE that the particulars below are those which are required to be registered concerning such death, according to the best of my knowledge and belief.

1. Date and place of death	
2. Name and surname	3. Sex 4. Maiden surname of woman who has married
5. Date and place of birth	
6. Occupation and usual address	
7. (a) Name and surname of informant	(b) Qualification
(c) Usual address	
8. Cause of death	

SPECIMEN

And I make this declaration solemnly and deliberately, in pursuance of Section 23A of the Births and Deaths Registration Act 1953,

Signature ..... Date

Signed and declared by the above named declarant in the presence of } .....Registrar of Births and Deaths

..... Sub-district .....District

Death registered by me at Entry No. ....Registrar

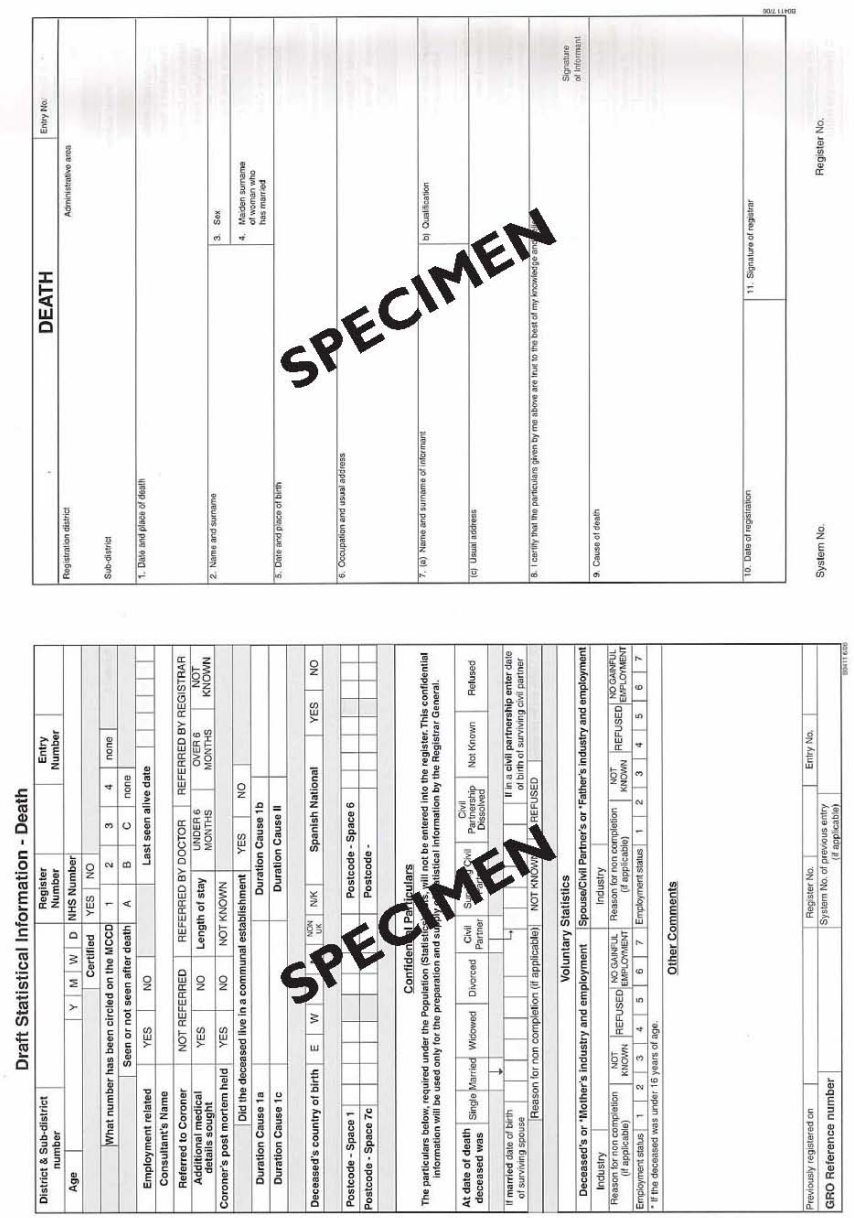
..... Sub-district .....District

NOTICE: By Section 4 of the Perjury Act 1911 it is an offence wilfully to make any false declaration for the purposes of any Act relating to the registration of births and deaths.

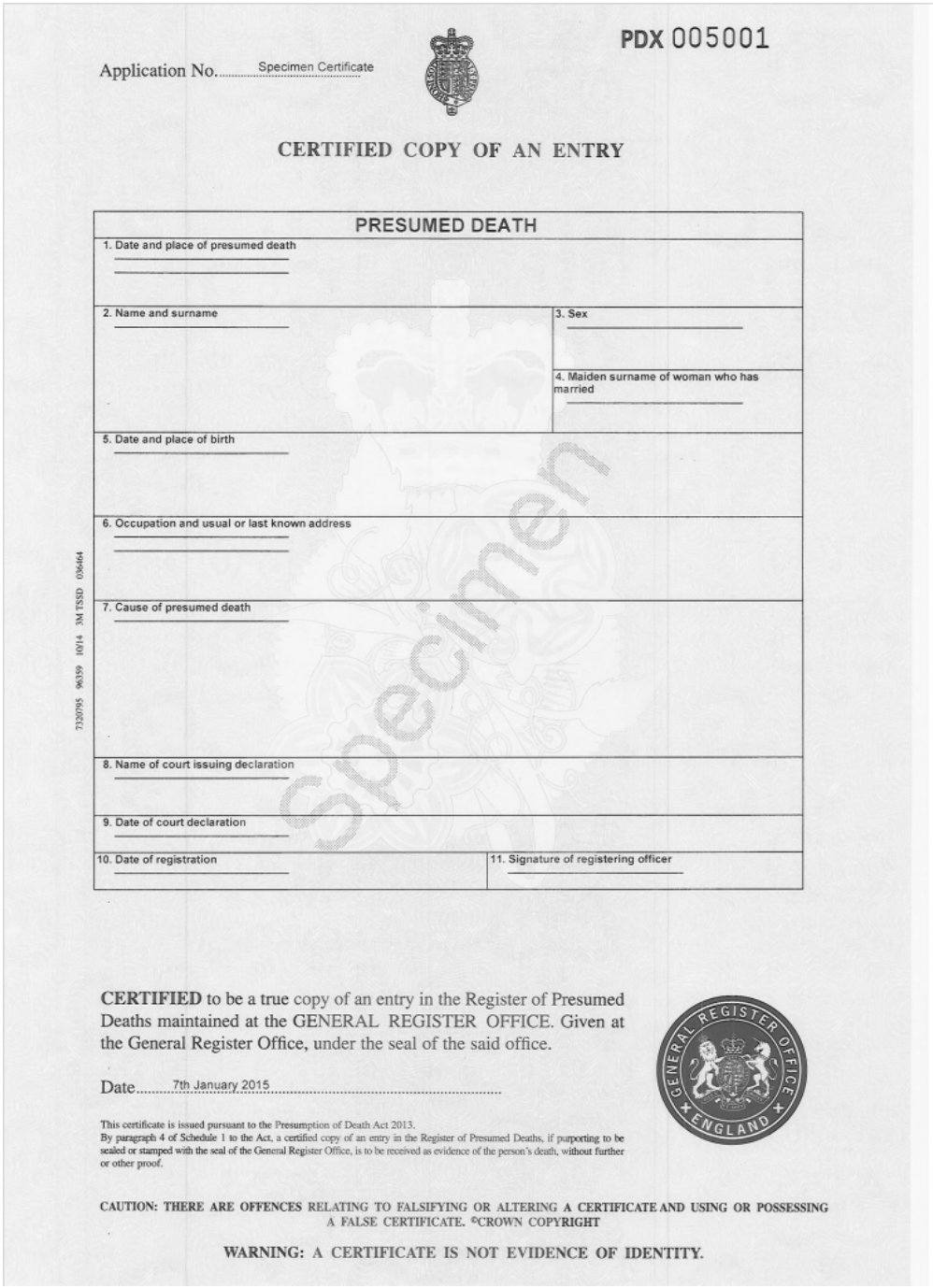
40/3 4/99

FORM 400

Annex I Draft entry form used by registrars for registering deaths online (Registration online) (Form 310 (RON))



Annex J Presumption of death certificate



Application No. Specimen Certificate

PDX 005001

CERTIFIED COPY OF AN ENTRY

PRESUMED DEATH

1. Date and place of presumed death

2. Name and surname

3. Sex

4. Maiden surname of woman who has married

5. Date and place of birth

6. Occupation and usual or last known address

7. Cause of presumed death

8. Name of court issuing declaration

9. Date of court declaration

10. Date of registration

11. Signature of registering officer

7320795 96359 10/14 3M TSSD 036464

Specimen

CERTIFIED to be a true copy of an entry in the Register of Presumed Deaths maintained at the GENERAL REGISTER OFFICE. Given at the General Register Office, under the seal of the said office.

GENERAL REGISTER OFFICE ENGLAND

Date 7th January 2015

This certificate is issued pursuant to the Presumption of Death Act 2013.
By paragraph 4 of Schedule 1 to the Act, a certified copy of an entry in the Register of Presumed Deaths, if purporting to be sealed or stamped with the seal of the General Register Office, is to be received as evidence of the person's death, without further or other proof.

CAUTION: THERE ARE OFFENCES RELATING TO FALSIFYING OR ALTERING A CERTIFICATE AND USING OR POSSESSING A FALSE CERTIFICATE. ©CROWN COPYRIGHT

WARNING: A CERTIFICATE IS NOT EVIDENCE OF IDENTITY.