

The Impact of the Implementation of IRIS Software for ICD-10 Cause of Death Coding on Mortality Statistics in Scotland

Main Findings

- In January 2017, National Records of Scotland (NRS) implemented new software (IRIS) for coding the cause of death, replacing the previous MMDS software.
- There is a large degree of agreement between the two versions of software in allocating causes of death to ICD chapters. Almost 96% of deaths were coded to the same ICD-10 chapter using both versions of the software.
- There is an increase (7.5%) in the number of deaths where dementia is the underlying cause and a subsequent decrease (4.8%) in deaths from respiratory diseases.

Background

Since January 2000, National Records of Scotland has coded causes of deaths in accordance with the World Health Organisation's International Statistical Classification of Diseases and Related Health Problems, Tenth Revision (ICD-10). Deaths are coded using specialist software, and manually checked by highly trained coders. Until recently the software used by NRS was the Mortality Medical Data System (MMDS) which was provided by the United States National Center for Health Statistics (NCHS).

The World Health Organisation (WHO) issues regular updates to the International Classification of Diseases (ICD) to take account of advances in medical knowledge; to accommodate new conditions; and to correct errors in the software supporting automatic coding. Whilst adopting these updates will allow us to code more accurately, they can introduce discontinuities into the trend data we produce, so we generally only take account of ICD updates every few years.

The last time NRS changed its software to take account of WHO updates was in January 2011 - when we switched from using the ICD-10 v2006 version to the ICD-10 v2010 version of the MMDS software. The impact of these changes can be seen in the ['Changes to the coding of causes of death between 2010 and 2011'](#) paper on the NRS website.

Since then, a new cause of death software package (IRIS) has been developed, supported by Eurostat, which uses the ICD-10 v2013 WHO updatesⁱ. IRIS was developed to provide a common automated cause of death coding system which could work in any language. IRIS is now used in a large number of countries, across Europe and internationally.

From January 2017, NRS has changed its software for coding cause of death from MMDS (ICD-10 v2010) to IRIS (ICD-10 v2013). This brings us into line with the

Footnote

i) There are now versions of IRIS which use more recent updates of ICD, but we have adopted the ICD-10 v2013 version to stay in line with ONS.

Office for National Statistics (ONS) – who have been using IRIS since 2014 – therefore making our mortality figures more comparable with those for England and Wales and further afield.

The Impact of IRIS on Scottish mortality statistics

Ideally, a full dual-coding exercise would have been carried out by coding a year's worth of data on both types of software to identify the impact of the change. However, time and resources did not permit a full year of dual-coding to be carried out. Instead, a sample of 3,822 deaths registered in January 2017 were selected for dual-coding.

This sample is not large enough to provide an accurate indication of the impact of the software on the less common causes of death. However, a similar dual-coding exercise was carried out by ONS (with a sample of 38,718) before they began using IRIS software in 2014. It is reasonable to expect that their findings will also apply to the Scottish data and our limited dual-coding exercise should help to confirm whether we are seeing the same results for the more common causes of death. The ONS paper [Impact of the Implementation of IRIS Software for ICD-10 Cause of Death Coding on Mortality Statistics, England and Wales](#) is available on the ONS website.

Coding Causes of Death

When a death is registered, it is common for a number of diseases or conditions to be recorded on the death certificate. We apply the WHO rules to determine which of these conditions is the **underlying cause of death**. This is defined by the WHO as “the disease or injury which initiated the train of morbid events leading directly to death” or “the circumstances of the accident or violence which produced the fatal injury”.

The underlying cause is the basis on which most of our published statistics are based. The analysis in this paper is therefore focussed on the underlying cause of death.

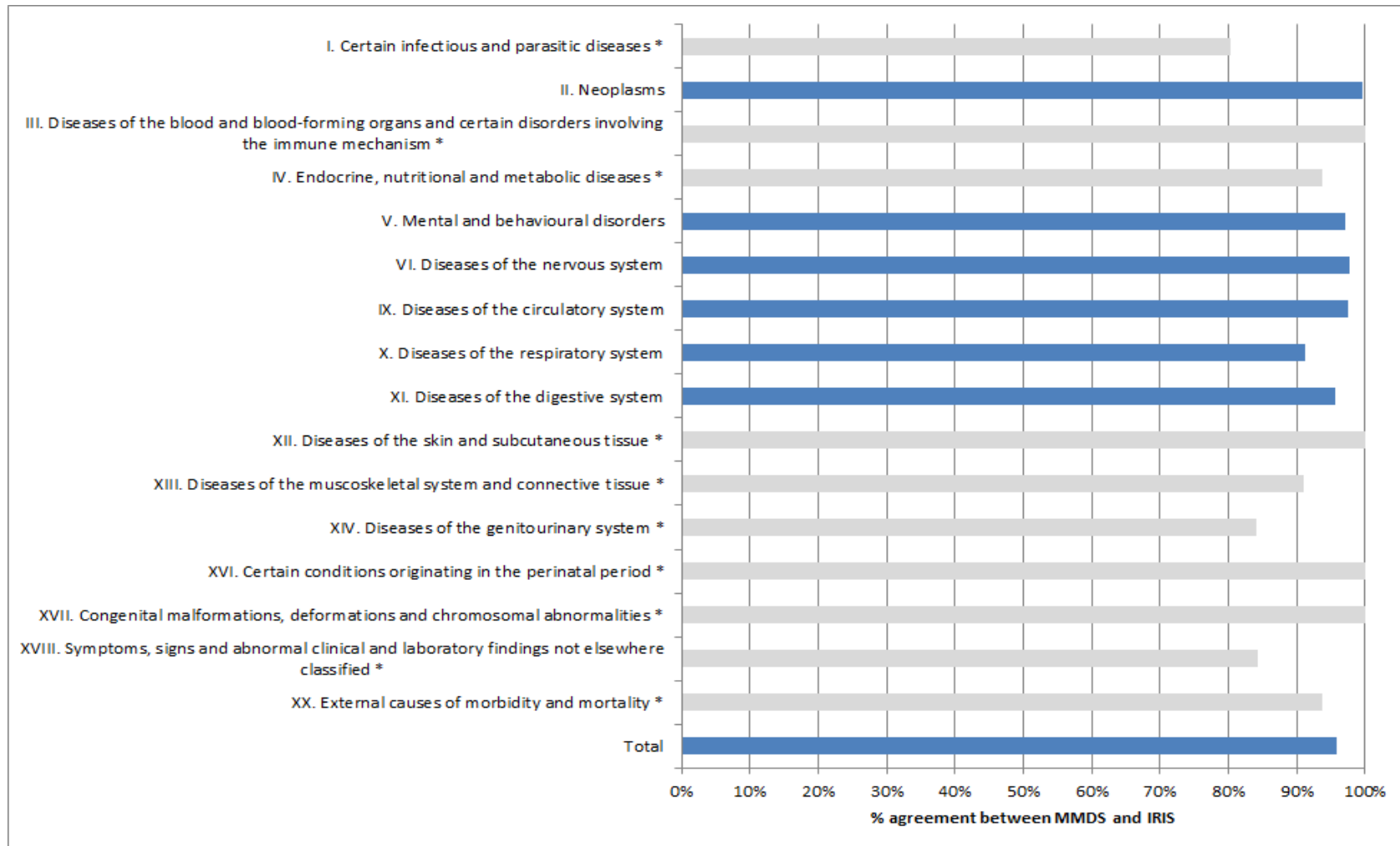
Results

It should be noted that many of the differences in results are due to the fact that IRIS uses a more recent version of the WHO ICD-10 updates than MMDS (version ICD-10 v2013 compared with version ICD-10 v2010) rather than due to differences in the two software packages themselves.

At a chapter level, the degree of agreement between MMDS and IRIS is very high – almost 96% of deaths are coded to the same chapter using both types of software. ONS found similar results, with over 95% agreement.

The chart below shows how this level of agreement varies across ICD chapters. Asterisks identify causes of death where the numbers were too low to give reliable results in the dual coding exercise. Detailed discussion is only included in this paper for those chapters with a large enough sample size.

Level of agreement between MMDS and IRIS software



* asterisks indicate chapters where the number of deaths was too small to allow meaningful comparisons

II. Neoplasms (C00-D48)

The number of deaths assigned to neoplasms increased very slightly by 0.7% (the ONS figure was 0.3%). Changes which affect coding **within** the neoplasms chapter mainly involve the discontinued use of code C97 (malignant neoplasms of independent (primary) multiple sites). Instead of using this code, IRIS codes each cancer mentioned and then assigns the underlying cause to the first mentioned cancer. Deaths that were previously assigned an underlying cause of C97 are now distributed throughout the malignant neoplasm codes.

Additionally, under MMDS any cancer that was described as metastatic would be amended from a secondary cancer code to the appropriate primary code, if it was the only cancer mentioned on the death certificate. In IRIS these codes are only amended to the primary cancer code if the cancer site is not recognised as a common site for metastases. Cancers that are recognised as ones that commonly metastasise remain as secondary codes and are assumed to be due to an unknown carcinoma. As a result, the number of deaths with underlying cause of C80 (malignant neoplasms, without specification of site) has increased.

V Mental and behavioural disorders (F00-F99)

The number of deaths allocated to this chapter increased by 6.2% (the ONS figure was 7.0%). Most of the increase comes from deaths previously assigned to respiratory causes being allocated to dementia.

The main reason for this is in the change of coding of chest infections. Deaths which mention both a chest infection (J98) and dementia (F01 or F03) are now allocated to dementia as the underlying cause whereas previously the chest infection would have been the underlying cause.

There has been an additional change to deaths where both aspiration pneumonia (J69) and dementia (F01 or F03) are mentioned. Previously the underlying cause was assigned to J69 but IRIS assigns dementia to the underlying cause. This is because aspiration pneumonia is considered an obvious consequence of conditions that affect swallowing, and in ICD-10 v2013, dementia was added to the list of conditions that affect swallowing.

As a result, there has been a 7.5% increase in the number of deaths from dementia (F01, F03) due to the switch to IRIS (the ONS figure was 7.1%).

VI. VII. & VIII. Diseases of the nervous system and the sense organs (G00-H95)

There was an increase of 4.1% in the number of deaths allocated to this chapter. The ONS figure was much smaller (0.4%). The ONS paper identifies a number of coding changes affecting this chapter which (for the England & Wales data) largely cancel each other out.

As mentioned above, the changes in coding for chest infections (J98) and aspiration pneumonia (J69) will also apply if these conditions are mentioned along with a disease of the nervous system such as Alzheimer's disease (G30), Parkinson's disease (G20) or other degenerative diseases of the nervous system, not elsewhere classified (G31). These deaths will now be assigned to the disease of the nervous system as the underlying cause.

The ONS paper also mentioned a change where deaths which mentioned both pneumonia (J12-J18) and a disease of the nervous system which now results in pneumonia being selected as the underlying cause. This is because of changes in how diseases are now considered to be as a consequence of another condition. This movement did not show up in the dual coding exercise we carried out on the Scottish data, but is likely to be due to our small numbers rather than a difference in practice, so we can expect to see this effect in future when larger numbers of records have been coded.

IX. Diseases of the circulatory system (I00-I99)

There was an increase of 0.9% in deaths from circulatory diseases, in contrast to a decrease of 0.7% for ONS. This percentage is small, but given the large number of deaths from circulatory diseases, it should not be dismissed. Of the deaths which switched to circulatory diseases using IRIS, most would have been coded as respiratory or genitourinary diseases under MMDS. It is difficult to draw many conclusions from these findings due to the small numbers involved, but this can be investigated further when we have more data.

X. Diseases of the respiratory system (J00-J99)

There was a decrease of 4.8% in the number of deaths allocated to this chapter. The reasons for this have been discussed above – mainly due to the switch of deaths from chest infections and aspiration pneumonia to dementia and diseases of the nervous system. The ONS paper also mentions some cases switching from respiratory diseases to neoplasms.

XI. Diseases of the digestive system (K00-K93)

There was an increase of 2.2% in deaths allocated to this chapter. This contrasts with a decrease of 2.2% for ONS. Given the relatively small numbers involved in our dual coding study, this should be assumed to be an unreliable result. The ONS paper notes that there has been a change in the way post-operative conditions are coded resulting in some deaths which would previously have been assigned to a digestive disease now being assigned to a respiratory or circulatory disease as the underlying cause of death.

Conclusions

The impact of the new software is relatively small with less than five per cent of deaths being coded differently. However, for certain causes the impact is greater, particularly for dementia, Alzheimer's and respiratory diseases. This should be taken into account when examining trends over a period of time.