Lung & Asthma Information Agency

Changes in the coding of respiratory deaths

Respiratory diseases are an important cause of death in the United Kingdom: between 2001 and 2005, the respiratory chapter accounted for 13% of all deaths and lung cancer contributed another 6%. The Office for National Statistics (ONS) reported that between 1999 and 2003, 31% of all death certificates in England and Wales mentioned a respiratory disease. In addition, respiratory diseases are the second most common cause of death in the elderly. Other research has found that influenza and pneumonia combined are in the top ten causes of death for children aged 1-14 years and for both men and women aged over 55 years.

Epidemiologists, and others interested in trends in mortality, need to consider changes in the classification of deaths over time. Across the world the International Classification of Diseases (ICD) is used to code cause of death and this is coordinated by the World Health Organisation (WHO).

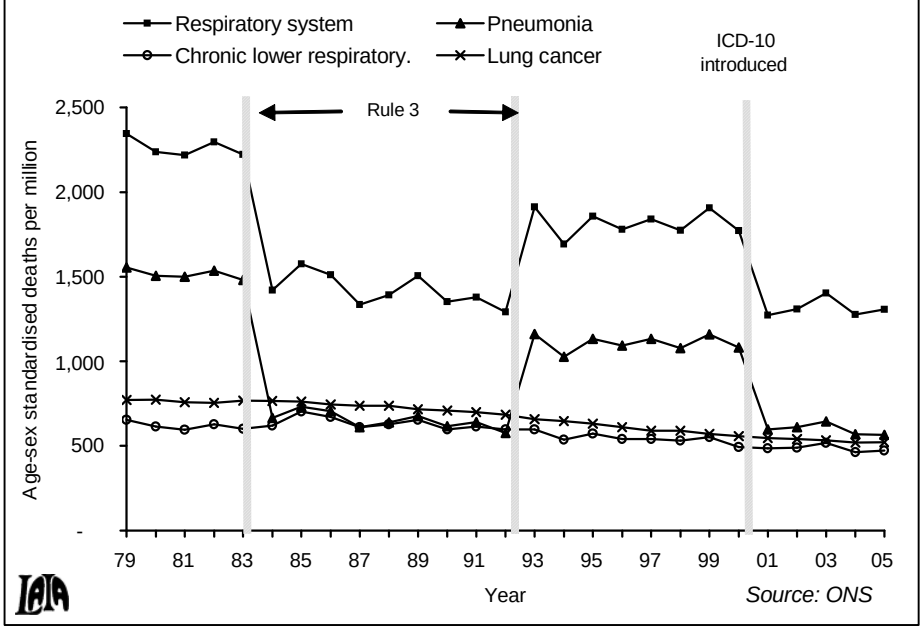
The ICD classifies diseases into broad groups known as chapters and its worldwide use enables deaths from different causes to be compared both between countries and over time. The current revision, ICD-10, is the biggest change in the ICD for many years and was introduced for coding deaths in England and Wales in 2001, in Scotland in 2000 and in Northern Ireland in 2001. Most respiratory diseases continue to be coded together in the respiratory chapter in ICD-10. These include acute respiratory infections, pneumonia, influenza, chronic lower respiratory diseases such as asthma and COPD, and pneumoconioses. Other respiratory diseases such as tuberculosis, respiratory cancers and cystic fibrosis are coded in other chapters.

Further information on the coding of deaths can be found in our companion factsheet LAIA 2008/2, available from our website. This includes a list of respiratory ICD codes.

Respiratory mortality trends

Each time the ICD is changed, or coding rules governing the classification of deaths are re-interpreted, there can be artefactual 'step' changes in the numbers of deaths coded to different diseases. Figure 1 shows trends in respiratory mortality rates in England and Wales since 1979. The large contribution of pneumonia to respiratory system deaths can be seen clearly - in 2005, deaths attributed to pneumonia accounted for 43% of all respiratory system deaths. There have been three sharp changes in rates for all respiratory diseases and pneumonia which followed changes in the way that deaths were coded and cause of death assigned.

Figure 1: Trends in respiratory mortality, England & Wales, 1979-2005



Between 1984 and 1992 a revised interpretation of Rule 3 (see Footnote) was used in England and Wales which led to a sharp fall in the number of deaths attributed to pneumonia and hence total respiratory deaths. In 1993, automated cause coding software was introduced which reversed this change and the numbers of pneumonia deaths returned to their pre-1984 levels. In 2001, when ICD-10 was introduced for coding mortality statistics, the interpretation of Rule 3 was again changed leading to another sharp fall in the number of deaths coded to pneumonia and hence total respiratory system deaths. In comparison, rates for chronic lower respiratory diseases and lung cancer have seen a steady decrease over the 25 years relatively unaffected, apparently, by the changes in coding systems.

Supported by: **British Thoracic Society** www.brit-thoracic.org.uk **British Lung Foundation** www.lunguk.org **AsthmaUK** www.asthma.org.uk

The introduction of ICD-10

To look at how the move to using ICD-10 in 2001 affected the coding of mortality statistics, the ONS carried out a bridge coding exercise on the 1999 England & Wales data. This means that all deaths registered in 1999 in England and Wales were independently coded to both ICD-9 and ICD-10 and the numbers of deaths coded to causes in each revision were compared. This showed that whilst most deaths remained in similar Chapters in ICD-10, there were a few major movements in and out of Chapters. The remainder of this factsheet presents the results of the bridge coding exercise for the respiratory chapter. More information on the bridge coding exercise and the introduction of ICD-10 can be found on the ONS website. Results for similar bridge coding exercises carried out in Scotland (1999 deaths) and in Northern Ireland (2003 deaths) can be found on the relevant websites (see sources).

Respiratory deaths

Table 1 shows how the 1999 respiratory chapter deaths were coded under both ICD-9 and ICD-10. Under ICD-9 there were 96,453 deaths coded to the respiratory chapter compared with only 74,831 deaths under ICD-10. The second column of Table 1 shows that 73,775 (76%) ICD-9 respiratory deaths remained coded to the respiratory chapter under ICD-10. An age-analysis carried out by ONS showed that there were fewer deaths remaining in the respiratory chapter among those aged over 85 years compared with deaths among those aged under 75 years. A total of 8,217 (9%) deaths were re-coded to circulatory disease: of these, nearly a third went to unspecified stroke (I64) and a quarter to heart failure (I50). The other cause chapters which gained were mental & behavioural disorders, diseases of the nervous system and neoplasms. These movements were mostly due to the change in interpretation of Rule 3 to code underlying cause of death. There were 1,056 new deaths coded to the respiratory chapter under ICD-10 and the fourth column of Table 1 shows which chapters these deaths came from. Overall there was a loss of 22,678 deaths and a gain of 1,056 deaths resulting in a net loss of 21,622 respiratory deaths between ICD-9 and ICD-10 or 22% of the ICD-9 deaths.

Pneumonia

Pneumonia is the respiratory condition most affected by the use of ICD-10 due to the re-interpretation of Rule 3. Table 1 also shows the number of pneumonia deaths under ICD-9 and ICD-10. Under ICD-9 there were 58,449 deaths coded to pneumonia, but only 36,241 deaths under ICD-10, a net loss of 22,208. 35,044 (60%) ICD-9 pneumonia deaths remained coded to pneumonia under ICD-10. Just over 8,000 (14%) were re-assigned to circulatory disease, such as stroke not specified, heart failure and other cerebrovascular disease. The re-assignment of pneumonia deaths was found to vary with age. The highest rate of re-coding was found in people aged 70-79. Over the age of 80 an increasing proportion of deaths remained as pneumonia, although about one quarter of deaths over the age of 90 were still re-assigned away from pneumonia. There were nearly 1,200 new deaths coded to pneumonia under ICD-10, about half coming from 'pulmonary congestion and hypostasis', an old ICD-9 code.

Table 1: Deaths coded to the respiratory chapter and pneumonia by their ICD-9 and ICD-10 codings

	Total ICD-9 deaths	ICD-10 deaths		Total ICD-10 deaths	ICD-9 deaths		Net gain/loss	
Respiratory disease	**96,453**	**73,775**	76%	**74,831**	**73,775**	99%		
Circulatory system		8,217	9%		349	<1%		
Mental & behavioural disorders		4,675	5%		111	<1%		
Nervous system		3,658	4%		103	<1%		
Neoplasms		3,295	3%		70	<1%		
Other		2,833	3%		423	<1%		
Loss/gain		**-22,678**			**1,056**		**-21,622**	**-22%**
Pneumonia	**58,449**	**35,044**	60%	**36,241**	**35,044**	97%		
Circulatory diseases		8,006	14%		162	<1%		
Mental & behavioural disorders		4,573	8%					
Nervous system		3,633	6%					
Neoplasms		3,187	5%					
Pulmonary congestion & hypostasis					664	2%		
Other respiratory		1,468	3%		151	<1%		
Other		2,538	4%		220	<1%		
Loss/gain		**-23,405**			**1,197**		**-22,208**	**-38%**

Source: ONS

Chronic lower respiratory diseases

This group includes chronic bronchitis, emphysema, other chronic obstructive pulmonary diseases (COPD) and asthma. Table 2 shows that under ICD-9 there were 27,909 deaths coded to chronic lower respiratory diseases compared with 28,813 deaths under ICD-10. There was a loss of 667 deaths and a gain of 1,571 deaths resulting in a net gain of 904 deaths; 1,300 of these new deaths came from pneumonia. However, there are different patterns for the individual diseases and these are discussed below.

Chronic bronchitis & emphysema

There were 3,389 deaths coded to chronic bronchitis & emphysema under ICD-9 compared with only 2,388 deaths under ICD-10, a net loss of 1,001 (30%). The majority of the ICD-9 deaths were re-assigned to other specified COPD, a new code in ICD-10. This re-assignment of deaths from chronic bronchitis & emphysema to other specified COPD is due to a clearer ICD-10 definition of coding these deaths. This states that if both chronic bronchitis and emphysema are mentioned on the death certificate, then the death is coded to other specified COPD.

Asthma

Overall, the number of deaths coded to asthma increased under ICD-10 by 2%. However whilst female deaths increased by 6%, male deaths decreased by 4% (Table 2). This was the only respiratory cause of death where there was a difference by sex. In males, the number of deaths coded to asthma decreased from 498 to 480. Some deaths were lost to the new code 'other specified COPD' (10%) and there was a gain from deaths previously coded to 'bronchopneumonia, organism unspecified' (6%). In females, asthma deaths increased from 858 to 906. As with the males, there was a loss of deaths to 'other specified COPD' (6%), and there was a gain from 'bronchopneumonia, organism unspecified' (8%).

Table 2: Deaths coded to chronic lower respiratory diseases by their ICD-9 and ICD-10 codings

	Total ICD-9 deaths	ICD-10 deaths		Total ICD-10 deaths	ICD-9 deaths		Net change	
Chronic lower respiratory diseases	**27,909**	**27,242**	98%	**28,813**	**27,242**	95%		
Other respiratory disorders (J98)		306	1%					
Pneumonia		104	<1%		1,298	5%		
Other causes		257	<1%		273	<1%		
Loss/gain		**-667**	**-2%**		**1,571**		**+904**	**+3%**
Chronic bronchitis & emphysema	**3,389**	**2,189**	65%	**2,388**	**2,189**	92%		
Other specified COPD (J44.8)		1,096	32%					
Acute bronchitis (J20)		18	<1%					
Pneumonia					153	6%		
Other causes		86	3%		46	2%		
Loss/gain		**-1,200**			**199**		**-1,001**	**-30%**
Asthma, males	**498**	**444**	89%	**480**	**444**	93%		
Other specified COPD (J44.8)		48	10%					
Bronchopneumonia unspecified					27	6%		
Other		6	1%		9	2%		
Loss/gain		**-54**			**36**		**-18**	**-4%**
Asthma, females	**858**	**797**	93%	**906**	**797**	88%		
Other specified COPD (J44.8)		51	6%					
Bronchopneumonia unspecified					68	8%		
Other		10	1%		41	5%		
Loss/gain		**-61**			**109**		**+48**	**+6%**

Source: ONS

Summary

- **There has been a gradual decline in the numbers of deaths attributed to respiratory disease in the last 25 years.**
- **Changes in the way that deaths are coded have had a large effect on deaths attributed to pneumonia and thus to all respiratory disease.**
- **ICD-10 was introduced for coding deaths in England & Wales in 2001, in Scotland in 2000 and in Northern Ireland in 2001. Bridge coding exercises were carried out by all the UK countries to examine how this move affected the numbers of deaths attributed to different causes.**
- **The bridge coding exercise on the England & Wales 1999 deaths data showed that the introduction of ICD-10 led to a net loss of 21,622 deaths coded to the respiratory chapter. This is mostly due to the change in the interpretation of Rule 3.**
- **Pneumonia is the respiratory condition most affected by the use of ICD-10 and deaths have fallen by 40%.**
- **There was little change in the overall number of deaths coded to chronic lower respiratory diseases. For asthma, female deaths increased by 6% whereas male deaths decreased by 4% under ICD-10.**
- **Sensible assessments of changes in mortality statistics should be judged over long periods of time.**

Footnote

Rule 3

When coding a death various coding rules are applied to decide on the cause of death from the conditions mentioned on the death certificate. Rule 3 is an ICD-9 coding rule that has continued, with clarifications, in ICD-10. It is the changes to this Rule that have had a particularly big impact on respiratory deaths. Further information about this can be found in our companion factsheet on the coding of deaths, LAIA 2008/2.

Sources

ICD-10 for mortality: www.statistics.gov.uk/about/classifications/icd10/default.asp

The impact of introducing ICD-10 on analysis of respiratory mortality trends in England and Wales, Health Statistics Quarterly 29, Spring 2006. National Statistics. www.statistics.gov.uk//downloads/theme_health/HSQ29.pdf

Results of the ICD-10 bridge coding study, England and Wales, 1999. Health Statistics Quarterly 14, Summer 2002. National Statistics. www.statistics.gov.uk/downloads/theme_health/HSQ14_v4.pdf

General Register Office for Scotland: www.gro-scotland.gov.uk
Annual Reports: www.gro-scotland.gov.uk/statistics/publications-and-data/annual-report-publications/index.html
The bridge coding exercise for Scotland is covered in Appendix 2 of the 2000 Annual Report.

Northern Ireland Statistics and Research Agency: www.nisra.gov.uk
Annual Reports: www.nisra.gov.uk/demography/default.asp22.htm
The bridge coding exercise for Northern Ireland is covered in Appendix 6 of the 2003 Annual Report.