

ONS - Defining alcohol-related deaths

Note: This document was used for discussion with selected topic experts between November 2005 and January 2006.

Release on National Statistics website: 18 July 2006

1. Summary

In recent years ONS has reported on alcohol-related deaths using a definition intended to identify those causes regarded as being most directly the result of alcohol consumption. In England and Wales between 1979 and 2000 these deaths were identified using the Ninth Revision of the International Classification of Diseases (ICD-9). From 2001 onwards ONS has coded all deaths using the Tenth Revision of the ICD (ICD-10). ONS has continued to report on alcohol-related deaths using a provisional definition in ICD-10 which most closely approximates to that used in ICD-9.

As ONS is now planning to report on trends and geographical variations in alcohol-related mortality in the United Kingdom, it is taking this opportunity to consider again which causes it is appropriate to include in a definition of these deaths.

This discussion paper details the current definition, notes comparability between the Ninth and Tenth Revisions of the ICD, and considers if there are causes not currently included in the definition which may be regarded as being alcohol-related.

Comments on the contents of this paper, and other suggestions for defining alcohol-related deaths, are invited. Responses should be returned by 10th January 2006 and should be sent by e-mail to: mortality@ons.gov.uk

2. The ONS Definition – ICD-9

The definition of alcohol-related deaths which has been used by ONS only includes those causes regarded as being most directly due to alcohol consumption. It does not include other diseases where alcohol has been shown to have some causal relationship, such as cancers of the mouth, oesophagus and liver.

From 1979 to 2000 ONS coded all causes of death using the Ninth Revision of the International Classification of Diseases (ICD-9) The causes of death regarded as being alcohol-related in the definition used by ONS are listed in Table 1 below. This definition has been used to report on trends and geographic variations in these deaths^{1,2} as well as to respond to Parliamentary Questions and media and ad-hoc requests.

Apart from deaths due to accidental poisoning with alcohol, the definition excludes any other external causes, such as road traffic deaths and other accidents, and suicides and homicides where alcohol may have played a role in the circumstances leading to death. The definition also does not include any proportions of causes where alcohol has been shown to have some causal link. Using the definition employed by ONS there were 6,581 alcohol-related deaths registered in England and Wales in 2004.

Estimates of the annual total number of deaths in which alcohol has played a role, can however vary widely depending on the criteria used. For example, a report by the Prime Minister’s Strategy Unit for the National Alcohol Harm Reduction Strategy reports an estimate of 15-22,000 each year.³ This figure does include estimates based on proportions of selected causes where alcohol has been shown to have a causal link. It includes for example 3.5 per cent of all cancer deaths (around 5,000 deaths a year) as well as around 1,700 deaths from accidents and 1,000 suicides.

The definition used by ONS in ICD-9 includes all deaths from chronic liver disease and cirrhosis, even when alcohol is not specifically mentioned on the death certificate, on the assumption that in England and Wales many of them were caused by alcohol, even if this was not explicitly stated. A number of reasons have been identified to account for known under reporting of alcoholism on death certificates. These include the certifier of the death not being aware of previous alcoholism, or being uncertain of its relationship with the cause of death. A report examining mortality from liver disease in the West Midlands included deaths from 1993 to 2000.⁴ For deaths from liver disease of unspecified cause, case notes were analysed to search for underlying causative factors. This found that 67 per cent (44 of 66 deaths in the analysis) were judged to be the result of alcohol misuse. The definition of alcohol-related deaths used in Scotland has however traditionally reported only deaths from chronic liver disease and cirrhosis where alcohol was mentioned (ICD-9 codes 571.0 to 571.3).

Table 1

**Underlying causes of death related to alcohol consumption,
International Classification of Diseases, Ninth Revision**

<u>ICD-9 Code</u>	<u>Description</u>
291	Alcoholic psychoses
303	Alcohol dependence syndrome
305.0	Non-dependent abuse of alcohol
425.5	Alcoholic cardiomyopathy
571	Chronic liver disease and cirrhosis
571.0	Alcoholic fatty liver
571.1	Acute alcoholic hepatitis
571.2	Alcoholic cirrhosis of liver
571.3	Alcoholic liver damage, unspecified
571.4	Chronic hepatitis
571.5	Cirrhosis of liver without mention of alcohol
571.6	Biliary cirrhosis
571.7	Other chronic nonalcoholic liver disease
571.8	Unspecified chronic liver disease without mention of alcohol
E860	Accidental poisoning by alcohol

3. The ONS Definition – ICD-10

From 2001 onwards ONS has coded causes of death according to the Tenth Revision of the International Classification of Diseases (ICD-10). In order to examine the impact of the

change in classification on causes of death all deaths registered in 1999, which had already been cause coded using ICD-9, were coded independently to ICD-10.

There were not clear equivalent codes in ICD-10 for all of the causes used in the ONS definition of alcohol-related deaths in ICD-9. The codes which were considered to most closely approximate to the same causes were however identified in order to inform further analysis. These codes are listed in Table 2.

The bridge coded mortality data from 1999 were used to consider the equivalence of the definition of alcohol-related deaths in ICD-9 and ICD-10 and results were reported in an article in Health Statistics Quarterly.¹

The HSQ article noted that the ICD-10 definition was provisional and that ONS intended to discuss it further with others who have been examining trends in alcohol-related deaths. The definition has been used however to report on geographical variations in these deaths⁵ and to respond to Parliamentary Questions.

Table 2

**Underlying causes of death related to alcohol consumption,
International Classification of Diseases, Tenth Revision**

<u>ICD-10 Code</u>	<u>Description</u>
F10	Mental and behavioural disorders due to use of alcohol
I42.6	Alcoholic cardiomyopathy
K70	Alcoholic liver disease
K73	Chronic hepatitis, not elsewhere classified
K74	Fibrosis and cirrhosis of liver
X45	Accidental poisoning by and exposure to alcohol

4. Comparisons between ICD-9 and ICD-10

Using the definition of alcohol-related deaths in ICD-9 and the suggested definition in ICD-10, deaths were selected from the 1999 bridge coded data. The total number selected using the ICD-9 codes was 5,473, compared to 5,480 using ICD-10 codes. While the overall numbers of deaths selected using the two definitions were very similar, there were however changes in which deaths were assigned to particular causes within the alcohol group, and also movements of deaths into and out of the alcohol group itself. These shifts are illustrated in Table 3.

This table shows, for example, that of the 319 deaths coded to ICD-9 303 (alcohol dependence syndrome) in 1999, 223 (70 per cent) were coded to ICD-10 F10 (mental and behavioural disorders due to use of alcohol). A further 62 deaths (19 per cent) were classified to ICD-10 codes also included in the alcohol definition. However 34 of the deaths (11 per cent) in ICD-9 were coded to causes not included in the alcohol-related definition in ICD-10. Thus although the overall numbers of deaths selected using the two definitions were very similar, they do not actually relate to all the same deaths. Considering alcohol-related deaths as a whole, 356 of the deaths (7 per cent) which were selected by the definition of alcohol-related causes used in ICD-9 would not have been included if ICD-10 had been used in 1999.

Similarly, 363 deaths (also 7 per cent) which had not been included using the ICD-9 definition would have been selected if the ICD-10 definition suggested here had been used.

The majority of the deaths which moved out of the alcohol group in ICD-10 relate to chronic liver disease and cirrhosis (ICD-9 571). Of these deaths which did not mention alcohol, 254 were excluded – 202 were coded to K76 (other diseases of liver) with 52 assigned to other causes. All but 35 of the deaths which mentioned alcohol were included in the alcohol group in ICD-10.

The majority of deaths which were included by the ICD-10 definition, but not by ICD-9, had been coded to bronchopneumonia / unspecified pneumonia in the earlier revision. These were included in ICD-10 because of a change in WHO Rule 3 which governs the selection of the underlying cause of death from all the conditions which are mentioned on the death certificate.

Table 3

Numbers of deaths for alcohol-related causes defined in ICD-9, by ICD-10 codes, England and Wales, 1999.

ICD-9 Codes	ICD-10 Codes					Totals ICD-9
	F10	I42_6	K70, K73-4	X45	Other	
291	17	0	0	0	2	19
303	223	2	59	1	34	319
305.0	119	0	15	7	28	169
425.5	10	131	4	0	1	146
571	27	7	4,348	4	289	4,675
E860	22	0	0	121	2	145
Other	47	2	309	5	---	363
					356	
Totals ICD-10	465	142	4,735	138		5,480

Total deaths with ICD-9 definition - **5,473**

Total deaths with ICD-10 definition - **5,480**

Deaths in alcohol definition in ICD-9 but not in ICD-10 - 356

Deaths in alcohol definition in ICD-10 but not in ICD-9 - 363

5. Considering a revised definition of alcohol-related deaths

In reviewing a potential revision to the definition used by ONS of alcohol-related deaths a number of options could be considered:

1. Causes of deaths with a clear causal relationship to alcohol consumption which have not previously been included in the ONS definition.
2. Causes where some causal relationship with alcohol consumption has been demonstrated and there is enough evidence to support the inclusion of all deaths, or a proportion of all deaths, in the definition.
3. Inclusion of all deaths where an alcohol-related cause is mentioned on the death certificate rather than just those where it is the underlying cause of death.

5.1 Causes with a clear causal relationship

The causes included in the ONS definition have never been an exhaustive list of the conditions which mention alcohol in either ICD-9 or ICD-10. The causes excluded have however tended to have only a small annual number of deaths. A list of additional potential codes in ICD-10 was examined and the numbers of deaths in 1999 and 2004 extracted. These are presented in Table 4.

Table 4

ICD-10 codes which mention alcohol

	<u>Numbers of deaths</u>	
	1999	2004
G31.2 Degeneration of nervous system due to alcohol	7	11
G62.1 Alcoholic polyneuropathy	1	0
K29.2 Alcoholic gastritis	5	2
K86.0 Alcohol induced chronic pancreatitis	34	46
X65 Intentional self-poisoning by and exposure to alcohol	2	2
Y15 Poisoning by and exposure to alcohol, undetermined intent	5	5

Alcohol-induced chronic pancreatitis was coded separately for the first time in ICD-10 (K86.0). There were 46 cases in 2004 where this was the underlying cause of death. There were also 34 deaths in 1999 and the bridge coded data shows that all of these cases were coded to other alcohol-related conditions in ICD-9 (303, 305.0, 571.0-571.3).

5.2 Causes with some causal relationship

Beside the causes already included in the ONS definition alcohol has been demonstrated to be associated with a proportion of deaths from other causes, including haemorrhagic stroke and cancers of the mouth, oesophagus, and liver.⁶

Alcohol is also associated with external causes of death, with estimates ranging from 1 in 3 to 1 in 7 accidental deaths being linked to alcohol.³ Heavy alcohol consumption is also associated with poorer mental health and so alcohol may be linked to suicides. As excessive alcohol consumption can lead to violent behaviour some homicides will also be alcohol-related.

As consumption of alcohol is infrequently reported on death certificates where there was an external cause of death it is not possible to produce reliable statistics using routinely collected mortality data. (Apart from deaths from alcohol poisoning, alcohol is however also frequently mentioned on drug-related poisoning deaths. ICD coding rules mean though that these deaths are always assigned an underlying cause which is based on the drug poisoning rather than on the alcohol consumption.)

Some of the diseases associated with alcohol consumption could however be considered for inclusion in a wider definition of alcohol-related deaths. To investigate further evidence, three cancers were selected which medical literature suggests have an association with alcohol. Their recent mortality trends were examined to see if they showed a similar relationship to other alcohol-related deaths. The cancers selected, and the number of deaths registered in England and Wales in 2004, are listed in Table 5 and their mortality rates illustrated in Figures 1 and 2.

Table 5

ICD-10 Code	Cause of death	Number of deaths
C00-C14	Malignant neoplasms of lip, oral cavity and pharynx	1,720
C15	Malignant neoplasm of oesophagus	6,299
C22	Malignant neoplasm of liver and intraheptic bile duct:	2,332

Figure 1 - Male age-standardised death rates, England & Wales, 1991-2003

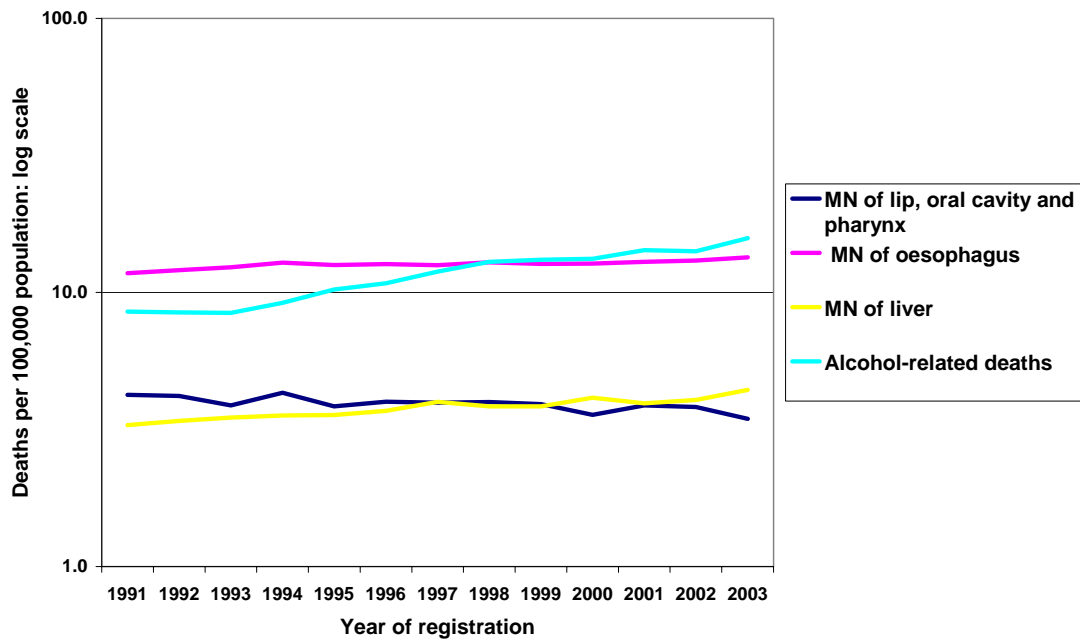
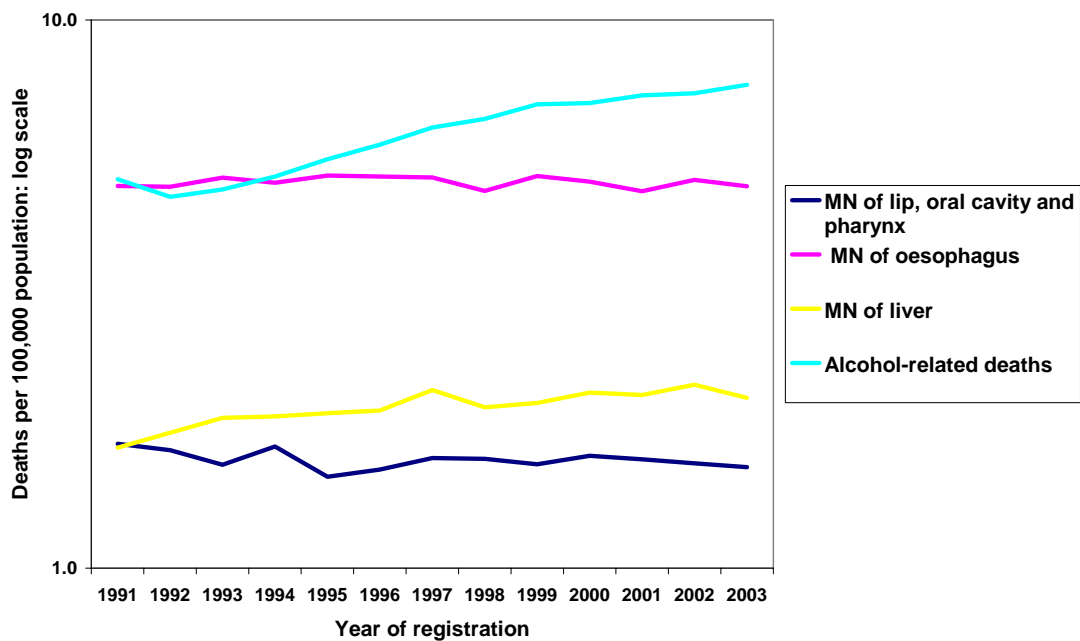


Figure 2 - Female age-standardised death rates, England & Wales, 1991-2003



5.3 Mentions of alcohol-related deaths

ONS currently reports only the numbers of alcohol-related deaths where one of the causes in its definition is the underlying cause. The selection of the underlying cause from all those mentioned on the death certificate is governed by World Health Organisation rules. These rules changed between the Ninth and Tenth Revisions of the ICD. Thus some of the deaths from the 1999 bridge coded data which had an underlying cause in ICD-10 of alcoholic liver disease had had an underlying cause in ICD-9 of pneumonia.

The bridge coded data were used to extract the numbers of deaths, in both the ICD-9 and ICD-10 definitions, where an alcohol-related condition was mentioned on the death certificate. These are shown in Table 6.

Table 6

Numbers of deaths where an alcohol-related condition is mentioned on the death certificate, England and Wales, 1999.

ICD-9 Code	Underlying cause	Mentioned
291	19	45
303	319	1,168
305.0	169	861
425.5	146	174
571	4,675	7,086
E860	145	496
Total	5,473	9,178

ICD-10 Code	Underlying cause	Mentioned
F10	465	2,172
I42.6	142	173
K70	2,954	3,200
K73	81	175
K74	1,700	3,202
X45	138	465
Total	5,480	8,732

The figures for mentions in Table 6 do not add up to the totals included. This is because some deaths may be counted more than once. For example, a death may have mentions of both ICD-9 codes 291 and 571. The totals in the table however count deaths with any mention of an alcohol-related cause only once.

Reporting the number of 1999 deaths with a mention of an alcohol-related cause in ICD-9 would have led to an increase of 3,705 cases, a rise of almost 68%. Using mentions in ICD-10 in 1999 would have resulted in an increase of 3,252 cases, a rise of 59%.

There is a greater increase for ICD-9 than ICD-10 mostly because of those deaths with mentions of chronic liver disease and cirrhosis without mention of alcohol, in particular ICD-

9 codes 571.8 and 571.9. The majority of these were coded to K76 (other diseases of liver) which was not included in the provisional definition of alcohol-related deaths in ICD-10.

When looking at the underlying cause of death there were similar proportions of deaths which were included in the alcohol-definition in ICD-9 but not ICD-10, and vice versa (about 7% in 1999). The proportions are not the same however when looking at mentions. Of those deaths where the underlying cause was pneumonia in ICD-9, the great majority had a cause mentioned which was alcohol-related in ICD-10.

Thus from the bridge coded data 9,178 deaths were selected which had a mention of an alcohol-related cause in ICD-9. From this sample 8,571 had a mention which was alcohol-related in ICD-10 (difference of 607). Conversely 8,732 deaths were selected which had a mention of an alcohol-related cause in ICD-10 and from this sample there were 8,571 records which also had a mention which was alcohol-related in ICD-9 (difference of 161). Thus the total number of mentions in ICD-9 and ICD-10 were 9,178 and 8,732 respectively (difference of 446: 607-161).

6. Discussion

ONS requires a single, statistically and medically defensible definition, of alcohol-related mortality with which to report on trends in these deaths, to answer Parliamentary Questions, and to respond to media and other ad-hoc requests for information. ONS plans to report on trends in alcohol-related deaths in the UK from 1991-2003, reporting rates sub-nationally in Scotland, Wales and Northern Ireland, and sub-regionally in England.. For this analysis it is seeking to agree a definition which can be applied across the UK. Agreement to this definition would not however preclude any of the constituent countries also reporting on their deaths using an alternative measure.

The existing ONS definition in ICD-9 and the provisional definition in ICD-10 currently provide a means of measuring these deaths which allows for reasonably consistent comparisons to be made over time. Ideally any definition developed using ICD-10 should allow trends to be considered using ICD-9. ONS is interested however in views on the benefits of reporting using alternative definitions, including the three suggestions presented in Section 5.

The provisional ICD-10 definition does not currently include deaths from alcohol-induced chronic pancreatitis. As the bridge coded data from 1999 showed that all of these deaths were coded to other alcohol-related conditions in ICD-9 it would seem sensible to now include these deaths in a revised definition. Including the other causes with a clear causal relationship with alcohol, shown in Table 4, would also add around 20 deaths a year to the national total for England and Wales.

Although including deaths (or proportions of deaths) from other causes which have been shown to have some causal relationship with alcohol may provide a more realistic estimate of the total number of deaths in which alcohol has played some part, such an approach raises a number of challenges for a measure which will be used as a monitoring tool. For example, of the three causes examined in Section 5.2, only death rates for cancer of the liver show a clear upward trend. This may reflect the fact that cancers of the lip, oral cavity, pharynx and oesophagus, although shown to be related to alcohol use, are also strongly related to smoking.

Including such causes in a definition would risk confounding the pattern of alcohol-related deaths.

ONS considers that considerably more work would be needed to assess if robust estimates could be made of numbers of deaths from all causes where there is a potential relationship with alcohol. An approach would be needed similar to work done to estimate numbers of smoking-related deaths, such as in the recent report from the Health Development Agency.⁷ Such an approach would estimate the number of deaths attributable to alcohol, calculated using relative risks from epidemiological research applied to information on the prevalence of exposure, such as survey data on alcohol consumption. Such an approach would still be questionable however where external causes of death are concerned. The calculation of sex and age-specific estimates would also be likely to be challenging.

Table 6 illustrates how the number of deaths would increase if any mention of an alcohol-related cause on the death certificate were counted, rather than just selecting the underlying cause. Traditionally however ONS has carried out mortality analyses based on the underlying cause of death as this is the disease or injury which initiated the train of events directly leading to death, and is generally the most useful single cause for public health purposes.

One additional obstacle to using counts of mentions of alcohol-related conditions would be the discontinuity in trend data if the existing definition in ICD-9 and the provisional definition in ICD-10 were used. Using these with the underlying cause of death the number of alcohol-related deaths increased from 5,543 in 2000 to 6,020 in 2001. Using the same definitions to count mentions of alcohol-related causes the number decreased from 9,684 in 2000 to 9,551 in 2001, for the reasons detailed in section 5.3.

7. Conclusion

ONS is proposing to monitor trends in alcohol-related deaths since 2001 using the existing definition in ICD-10 which is listed in Table 2. To these causes it is however also proposed to add the additional causes listed in Table 4 which are clearly alcohol-related. There is no intention to change the definition which has been used in ICD-9. ONS is also intending to continue monitoring these deaths using the underlying cause, rather than mentions of any alcohol-related conditions.

Views on these proposals, or any other comments or recommendations on how alcohol-related deaths should be defined by ONS are now invited. These should be returned by 10th January 2006 and sent by e-mail to: **mortality@ons.gov.uk**

References

1. Baker A and Rooney C (2003). Recent trends in alcohol-related mortality, and the impact of ICD-10 on the monitoring of these deaths in England and Wales. *Health Statistics Quarterly* **17**, pp 5-14. Available on the internet at: <http://www.statistics.gov.uk/cci/article.asp?ID=495&Pos=2&ColRank=1&Rank=1>
2. Griffiths C, Fitzpatrick J, Kelleher M and McEvoy S, Descriptive analysis of geographic patterns and trends in adult mortality by cause of death. In *Geographic Variations in Health*, DS No 16, The Stationery Office, 2001.
3. Prime Minister's Strategy Unit Alcohol Harm Reduction project. Interim Analytical Report. Available on the internet at: http://www.number10.gov.uk/files/pdf/SU%20interim_report2.pdf
4. Fisher N, Hanson J, Philips A, Rao J and Swarbrick E (2002). Mortality from liver disease in the West Midlands, 1993-2000: observational study. *BMJ* **325**, pp 312-313.
5. Office for National Statistics. Alcohol-related death rates in England and Wales, 2001-2003. Online report at: <http://www.statistics.gov.uk/cci/nugget.asp?id=1091>
6. Room R, Babor T and Rehm J. Alcohol and public health (2005). *The Lancet*, **365**, 519-530.
7. Twigg L, Moon G, Walker S. *The smoking epidemic in England*. Health Development Agency, London, 2004.