

Alcohol-related codes: Mapping ICD-9 to ICD-10



Health Department

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Technical Report

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INTRODUCTION

Researchers investigating the epidemiological impact of drugs on health routinely use aetiologic fractions to estimate drug-caused morbidity and mortality. Australia-specific aetiologic fractions for this purpose were developed by Holman et al in 1990. They determined the conditions for which there was adequate evidence that drugs were a contributing factor and the extent to which drugs contributed to the disease or injury by conducting meta-analyses of published scientific literature. The alcohol-related conditions and aetiologic fractions were revised by English et al in 1995, and again by Ridolfo and Stevenson in 2001.¹

Underpinning the aetiologic fraction methodology is the identification of deaths or admissions from drug-related conditions using standard codes, i.e. the International Classification of Diseases (ICD). The drug-related conditions identified in the three reports were all defined using well established ICD-9-CM² codes. Since these publications, however, the coding of causes of death and reasons for presentation to hospital have changed to ICD-10.³ Due to this major overhaul in the coding system, it has been necessary to establish a new set of ICD-10 codes for drug-related diseases and conditions.

A working group from the National Drug Research Institute (NDRI) and the Department of Health, Western Australia (DOH, WA) have been addressing the problems involved in mapping alcohol-related conditions from ICD-9 to ICD-10. This report documents the issues identified and provides a summary of the consensus recommendations reached by the two centres.

¹ In this report, the latest version of the aetiologic fractions was used.

² CM stands for clinical modification. Reference to ICD-9 in this report should be taken to include ICD-9-CM.

³ ICD-10 was first used to code Australian mortality records in 1999, although data from 1997 is now available in ICD-10 format.

NSW, ACT, Victoria, and the Northern Territory introduced a slightly modified version of ICD-10 (ICD-10-AM) to hospital morbidity coding systems around the same time (1998/99). The remaining states (Queensland, South Australia, Western Australia, and Tasmania) introduced ICD-10-AM in 1999/00. Reference to 'ICD-10' in this report should be taken to include ICD-10-AM.

PROCEDURAL OVERVIEW

Attempts were originally made to match ICD-9 and ICD-10 codes using the mapping software from the Australian Commonwealth Department of Health and Family Services, and 1998/99 AIHW morbidity data (which contained both ICD-9 and ICD-10 codes). However, these proved to be of limited value and the final concordance tables were compiled by manually matching codes and discussion between members of the working group. The concordances were validated independently by NDRI for each state and territory using AIHW hospital morbidity data from 1993/94 to 1998/99. Trends in numbers of hospital admissions were examined separately for each alcohol-related condition and for each jurisdiction to determine whether any discrepancies in magnitude were apparent. A similar method was applied to Western Australian mortality and morbidity data by the DOH, WA.

SUMMARY OF FINDINGS

When updating the aetiologic fractions, Ridolfo and Stevenson (2001) based their work on the ICD-9 codes identified by English et al (1995). Although many of the fractions were revised using more recent prevalence and relative risk data, the major differences which affected code allocations for alcohol-related conditions were:

- ischaemic heart disease and heart failure were included,
- ischaemic and haemorrhagic stroke were distinguished, and
- road traffic injuries were split into pedestrian and non-pedestrian.

Table 1 lists the ICD-10 codes identified by the working group as compatible with the ICD-9 codes for alcohol-related conditions. Efforts were made to ensure that the ICD-9 and ICD-10 codes were as consistent as possible, and for several conditions it was necessary to expand or adjust ICD-9 codes used by Ridolfo and Stevenson (2001) to be compatible with code definitions in ICD-10.

Table 2 identifies where changes have been made to the ICD-9 alcohol-related codes listed in Ridolfo and Stevenson's report. Explanatory notes are included and some conditions are examined in more detail later.

Table 1: ICD-9 and ICD-10 alcohol-related code concordance

Condition	ICD-9 Codes	ICD-10 Codes
Oropharyngeal cancer	141,143-146,148,149	C01-C06, C09- C10, C12-C14
Oesophageal cancer	150	C15
Liver cancer	155	C22
Laryngeal cancer	161	C32
Female breast cancer	174	C50 (females only)
Alcoholic psychosis	291	F10.3-F10.9
Alcohol dependence	303.9	F10.2
Alcohol abuse	305.0, 303.0	F10.0, F10.1
Epilepsy	345	G40, G41
Alcoholic poly neuropathy	357.5	G62.1
Hypertension	401-405	I10-I15
Alcoholic cardiomyopathy	425.5	I42.6
Supraventricular cardiac dysrhythmias	427.0, 427.2, 427.3	I47.1, I47.9, I48
Stroke – haemorrhagic ^b	430-432	I60-I62, I69.0-I69.2
Stroke – ischaemic ^b	433-435, 437, 362.34	G45, I63, I65-I67, I69.3
Stroke – unspecified ^b	436, 438	I64, I69.4, I69.8
Oesophageal varices	456.0-456.2	I85, I98.20, I98.21
Gastro-oesophageal haemorrhage	530.7	K22.6
Alcoholic gastritis	535.3	K29.2
Alcoholic liver cirrhosis	571.0-571.3	K70
Unspecified liver cirrhosis	571.5-571.9	K74.3-K74.6, K76.0, K76.9
Cholelithiasis	574	K80
Acute pancreatitis	577.0	K85
Chronic pancreatitis ^c	577.1	K86.1
Alcohol-induced chronic pancreatitis ^c	Not available	K86.0
Spontaneous abortion	634	O03
Low birth weight	656.5, 764, 765	O36.5, P05, P07
Psoriasis	696.1	L40.0-L40.4, L40.8, L40.9
Ethanol toxicity ^a	980.0	See Alcohol poisoning
Methanol toxicity ^a	980.1	See Alcohol poisoning
Alcoholic beverage poisoning ^a	E860.0	See Alcohol poisoning
Other eth/meth poisoning ^a	E860.1, E860.2, E860.9	See Alcohol poisoning
Alcohol poisoning ^c	980.0, 980.1, E860.0, E860.1, E860.2, E860.9	X45, Y15, T51.0, T51.1, T51.9
Ischaemic heart disease	410-414	I20-I25
Heart failure	428-429	I50, I51, I97.1
Road traffic injuries – non-pedestrian ^{b,c}	E810-E819 (excluding .7)	V12-V14 (.3 -.9), V19.4-V19.6, V19.9, V20-V28 (.3 -.9), V29-V79 (.4 -.9), V80.3-V80.5, V81.1, V82.1, V82.9, V83.0-V86 (.0 -.3), V87.0-V87.9, V89.2, V89.3, V89.9
Road traffic injuries–pedestrian ^{b,c}	E810-E819 (.7 only)	V02-V04 (.1, .9), V06.1, V09.2, V09.3
Fall injuries	E880-E888, E848 ^e	W00-W19
Fire injuries	E890-E899	X00-X09
Drowning	E910	W65-W74
Aspiration	E911	W78-W79
Occupational & machine injuries	E919, E920, E928.8 ^e	W24-W31, W45, W60 ^d
Suicide	E950-E959	X60-X84, Y87.0
Assault ^c	E960- E969, E904.0 (age >14)	X85-Y09, Y87.1 (age >14)
Child abuse ^c	E960- E969, E904.0 (age <15)	X85-Y09, Y87.1 (age <15)

^anot available with ICD-10; ^bnew sub-category distinguished by Ridolfo and Stevenson; ^csee special notes below; ^dmay be necessary to include W49 for some jurisdictions; ^eCodes E848 and E928.8 may only be applicable to some states, eg. NSW

Table 2: Suggested changes to ICD-9 alcohol-related codes used by Ridolfo and Stevenson (2001) required to concord with ICD-10

Affected conditions	ICD-9 codes used by Ridolfo & Stevenson	Suggested ICD-10 codes	Suggested changes to ICD-9 codes
Alcohol abuse/ Alcohol dependence	305.0 / 303.0, 303.9	F10.0, F10.1/ F10.2	Combine 305.0 and 303.0 and combine as "Alcohol abuse" leave 303.9 as "Alcohol dependence"

Explanation:

In ICD-9 alcohol abuse and alcohol dependence were completely separate conditions. Alcohol abuse only included "drunkenness", "excessive drinking NOS", "inebriety" and "hangover" and specifically excluded "acute alcohol intoxication in alcoholism". However, alcohol dependence did contain a sub-category concerned with intoxication defined as "acute alcoholic intoxication"(303.0) – this code being specific to dependence syndrome. Under ICD-10 the code F10.0 combines "acute drunkenness in alcoholism" and "drunkenness" under the definition of "acute intoxication". Therefore it is no longer possible to separate out dependent and non-dependent cases of acute intoxication under ICD-10. Our suggestion is to include the ICD-9 codes, 305.0 and 303.0 as alcohol abuse which are equivalent to ICD-10 codes F10.0 and F10.1 (this category may also be perceived as "acute intoxication"). The alcohol dependence category remains and includes ICD-9 code 303.9, equivalent to ICD-10 code F10.2.

Alcohol and alcohol beverages poisoning/ Other Ethanol and methanol poisoning/ Ethanol toxicity/ Methanol toxicity	E860.0 / E860.1, E860.2 / 980.0 / 980.1	X45	Combine all four categories of poisoning by alcohol into "Alcohol poisoning". Include E860.9
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Explanation:

Codes such as E860.9 are now captured by the combination ICD-10 code X45. All "accidental poisonings by and exposure to alcohol" are now captured under X45 that includes and does not distinguish between ethyl/methyl/other types of alcohol. Since ICD-10 no longer distinguishes between these alcohols it is also necessary to combine all ICD-9 codes for ethanol toxicity/methanol toxicity/other eth and meth poisoning and alcoholic beverage poisoning. We suggest combining all poisonings due to alcohol identified by Ridolfo and Stevenson using ICD-9 under the new category "alcohol poisoning."

Assault/Child abuse	E960, E965, E966, E968, E969 / E967	X85-Y09, Y87.1 (age >14)/ X85-Y09, Y87.1 (age <15)	Include E960-E969 and E904.0 for both assault and child abuse (use age to specify)
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Explanation:

Assault using substances such as chemicals, pesticides, gases, medication or biological substances (E961-E962) was excluded from the alcohol-related conditions, as was assault by hanging, strangulation and drowning (E963-E964). With the advent of ICD-10 we suggest widening the codes applicable to assault to include these categories. This requires additional ICD-9 codes (ie. E961-E964) to concord with the less specific ICD-10 codes (see Table 1).

Child abuse was identified using the ICD-9 code E967. For reasons unknown code E904.0 was omitted (see above). ICD-9 code E968.4 defined as "criminal neglect; abandonment of child, infant, or other helpless person with intent to injure or kill" was also placed under "assault" rather than "child abuse". Morbidity and mortality records sometimes code an injury to "assault" even where the event involved a person under 15 years of age. Thus, we suggest using similar ICD-9 and ICD-10 codes for both assault and child abuse and distinguishing between the two conditions using age criteria (see Table 1).

E904.0 is defined as "abandonment or neglect of infants and helpless persons" which now corresponds to Y06.9 in ICD-10 (neglect and abandonment by unspecified person). E904.0 was originally omitted from the alcohol codes for reasons unknown. In order to identify children, only those aged under 15 should be included among both ICD-9 and ICD-10 records (age <15).

It is also suggested the ICD-9 code E904.0 be included among assault conditions where age is 15 years or older (age >14).

Falls	E880 – E888	W00 – W19	Include E848
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Explanation:

Note: We have identified that the issue described below only appears to affect NSW. It is unlikely to apply where the activities related to the specific type of fall is less prevalent.

E848 defined as “Accidents involving other vehicles, not elsewhere classifiable involving non-motor or non-road vehicle” now corresponds to loosely to W02 in ICD-10 defined as “Fall involving ice-skates, skis, roller-skates or skateboards.” Since the ICD-9 code E848 did not stipulate falls it is not surprising that it was not included in the alcohol codes for falls. This has created a discrepancy between the numbers of falls identified using ICD-9 and ICD-10 for some jurisdictions. One solution is to include E848 among ICD-9 codes for falls. However, there is some over estimation in including all E848 cases since this code also corresponds with non-fall codes. We estimate that by including E848, total estimates of falls for NSW were over-estimated by about 1.1%, not including them would have resulted in an overall under-estimate of 5.2%. Again, this may vary from region to region and independent assessments will need to be made on whether to proceed with the inclusion of ICD-9 code E848 for falls for any specific area.

Occupational machine injuries	E919, E920	W24 – W31, W45, W60,	E928.8 to be included
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Explanation:

Note: We have identified this as mainly a problem for NSW.

The ICD-9 code, E928.8 defined as “Other accidents: other and unspecified environmental and accidental causes.” appears to concord with ICD-10 code, W49 “exposure to other and unspecified inanimate mechanical forces” – a sub category of “Exposure to inanimate mechanical forces”. For the larger states, it also appears to explain some of the discrepancy between the numbers of cases of occupational machine injuries identified using ICD-9 and ICD-10. Again, including all E928.8 cases will result in overestimation since this code also corresponds with non-W49 codes. Independent judgements will need to be made as to whether to include E928.8 among ICD-9 occupational machine injury codes.

Stroke	All Stroke 430 – 438	Ischaemic G45 – G45, I63, I65 – I67, I96.3	Divide All stroke codes into the following categories
		Haemorrhagic I60 – I62 I69.0 – I69.2	Ischaemic 433 – 435, 437, and include 362.34
		Unspecified (to be apportioned) I64, I69.4, I69.8	Haemorrhagic 430 – 432
			Unspecified (to be apportioned) 436, 438

Explanation:

In their updated alcohol aetiologic fractions, Ridolfo and Stevenson distinguished between ischaemic and haemorrhagic stroke, making it necessary to categorise ICD-9 and ICD-10 codes into these two types of stroke. However, some stroke codes do not fall readily into either category and it is suggested these conditions be apportioned according to the overall ischaemic/haemorrhagic stroke proportions. This should be done separately for deaths and hospitalisations as the proportions vary according to outcome.

Code 362.34 is defined by ICD-9 as “Disorders of the eye and Adnexa, Retinal vascular occlusion, Amaurosis fugax” Thus this was not an obvious code for inclusion in “Stroke”. However, coders using ICD-10 now indicate that 362.34 corresponds to G45.3 defined in ICD-10 as “Episodic and Paroxysmal disorders, transient cerebral ischaemic attacks and related syndromes, Amaurosis fugax.” – an ischaemic stroke. Thus, for comparability between ICD-10 and ICD-9, 362.34 should be included among ICD-9 codes for ischaemic stroke.

Road traffic injuries	All road traffic injuries E810 – E819	Pedestrian E810 – E819 where 4 th digit is “7” (e.g. E814.7)	Divide All road traffic injuries into the following categories:
		Non-pedestrian E810 – E819 where 4 th digit is not “7” (e.g. E814.0)	Pedestrian V02.1, V02.9 V03.1, V03.9 V04.1, V04.9 V06.1, V09.2, V09.3

Non-pedestrian
 V12-V14 (.3 -.9), V19.4-
 V19.6, V19.9,
 V20-V28 (.3 -.9), V29-
 V79 (.4 -.9), V80.3-V80.5,
 V81.1, V82.1, V82.9,
 V83.0-V86 (.0 -.3), V87.0-
 V87.9, V89.2, V89.3,
 V89.9

Explanation:

In their updated alcohol aetiologic fractions Ridolfo and Stevenson distinguish between pedestrian and other types of road traffic injuries (as well as between injuries resulting in death and hospitalisation), making it necessary to categorise ICD-9 and ICD-10 codes into these two types of road traffic injuries.

See below for more issues relating to road traffic injuries.

Special Notes

Chronic pancreatitis and alcohol-induced chronic pancreatitis

With ICD-9 it was impossible to separate out alcohol-caused chronic pancreatitis from other types of chronic pancreatitis, as there was only one code (577.1) for all chronic cases. Ridolfo and Stevenson (2001) applied an alcohol aetiologic fraction of 0.84 to chronic pancreatitis cases to estimate the number of alcohol-caused cases. In ICD-10 there is a new code (K86.0) for *alcohol induced chronic pancreatitis*, which by definition is wholly attributable to alcohol so has an aetiologic fraction of 1.0. However, there is another ICD-10 code (K86.1) for *other chronic pancreatitis*. Since it is not possible to identify cases of *alcohol induced chronic pancreatitis* prior to ICD-10, we suggest that cases due to *other chronic pancreatitis* (K86.1) and *alcohol induced chronic pancreatitis* (K86.0) be combined and an aetiologic fraction of 0.84 be applied to the total number of cases.

Road traffic injuries

Motor vehicle traffic accidents (MVTAs) are identified as ICD-9 external cause codes E810 to E819. These codes include injuries to both pedestrians and others (i.e. drivers, passengers) that occurred on a public highway, but exclude *motor vehicle non-traffic accidents* (E820 to E825). Motor vehicle non-traffic accidents include accidents involving off-road vehicles and motor vehicle accidents that do not occur on a public highway. Although non-traffic injuries do not currently have an alcohol aetiologic fraction, it is probable that, like their traffic injury counterparts, they are partially attributable to

alcohol. However, we are not aware of any evidence supporting the generalisation of alcohol aetiologic fractions for road traffic injuries (derived from studies involving traffic crashes) to non-traffic injuries, and further research in this area is necessary.

Like English et al, Ridolfo and Stevenson (2001) continued to use the ICD-9 codes E810 to E819 to select only MVTAs, but refined the fractions by distinguishing between pedestrians and others. Although Ridolfo and Stevenson (2001) reverted to the baseline alcohol level used by Holman et al (1990) of zero consumption (abstinence) to calculate most of the alcohol aetiologic fractions, for road injuries they used the legal blood alcohol concentration as the reference level. We suggest using abstinence as the baseline for road traffic injuries as there is evidence that low levels of alcohol consumption increase the risk of accidents at some ages (Lloyd, 1992)

When the morbidity data were analysed, substantial declines in hospital admissions for road *traffic* injuries were found with the introduction of ICD-10, while at the same time, the numbers of admissions for *non-traffic* road injuries increased. This issue is discussed further in the Appendix. We suggest that where numbers of admissions for road traffic injuries are estimated, and particularly where trends incorporating both ICD-9 and ICD-10 codes are presented, that a qualifying note about changes to coding practices be included.

CONCLUSION

In summary, during the course of creating a valid set of ICD-10 codes to identify alcohol-related conditions the working group found that:

- the mapping software currently available was inadequate to accurately translate ICD-9 codes to ICD-10. The only reliable way was to manually map codes for each specific condition.
- the codes identifying external causes of hospitalisation or death (such as road injuries, assaults, and falls) presented the most difficulties and, to some degree, remain problematic.
- several alcohol-related conditions required slight changes to the ICD-9 codes previously identified in order to concord with ICD-10 code definitions.

Many of the aetiologic fractions presented in the Ridolfo and Stevenson (2001) report are different to earlier versions, because they have been calculated using updated prevalence and relative risk data. Furthermore, the aetiologic fractions for alcohol have been recalculated using abstinence as the baseline instead of low levels of alcohol consumption (used by English et al, 1995), so that alcohol-related benefits as well as harm can be quantified. This means that old data must be recalculated using the new aetiologic fractions before comparing them to recent estimates of alcohol-caused deaths and hospital admissions.

The DOH, WA is currently mapping between ICD-9 and ICD-10 for both tobacco and other drug-related conditions and has encountered similar problems, particularly for other drugs.

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APPENDIX

Road traffic injuries (additional information)

When the morbidity data were analysed, substantial declines in the numbers of recorded hospital admissions for road traffic injuries occurred in all states and territories that introduced ICD-10 in 1998/99 [see Table 3]. At the same time, the numbers of admissions for non-traffic road injuries increased. However, the total number of admissions for all road injuries (traffic and non-traffic) was similar, i.e. the fall in admissions for traffic injuries was largely matched by the increase in those for non-traffic injuries. Closer investigation revealed a range of traffic and non-traffic codes that were affected.

Table 3: Number of recorded traffic and non-traffic road injury hospitalisations by jurisdiction, 1994/95-1998/99

	NSW ^a	Vic ^a	Qld	SA	WA	Tas	NT ^a	ACT ^a
Traffic								
1994/95	N/A	7,213	7,252	2,994	3,451	854	N/A	405
1995/96	11,736	7,150	7,735	3,154	3,380	944	563	413
1996/97	11,546	6,793	7,543	2,915	3,425	850	468	391
1997/98	11,918	7,234	7,312	2,933	3,586	850	480	372
1998/99	9,941	6,418	7,607	3,013	3,625	857	N/A	345
Non-traffic								
1994/95	N/A	809	1,025	359	486	91	N/A	32
1995/96	1,606	746	1,103	420	557	128	51	40
1996/97	1,657	748	1,287	423	701	147	70	45
1997/98	1,798	921	1,602	419	651	141	70	32
1998/99	3,787	2,174	1,627	474	829	135	N/A	107
% Non-traffic								
1994/95	N/A	10.08	12.38	10.71	12.34	9.63	N/A	7.32
1995/96	12.04	9.45	12.48	11.75	14.15	11.94	8.31	8.83
1996/97	12.55	9.92	14.58	12.67	16.99	14.74	13.01	10.32
1997/98	13.11	11.29	17.97	12.50	15.36	14.23	12.73	7.92
1998/99	27.59	25.30	17.62	13.59	18.61	13.61	N/A	23.67

^a Jurisdictions that introduced ICD-10 to hospital morbidity records in 1998/99.

No declines in the numbers of admissions for traffic injuries were found in 1998/99 for the remaining jurisdictions that introduced ICD-10 in 1999/00, but anomalies are expected to appear in these areas as 1999/00 data becomes available. The DOH, WA examined the numbers of traffic and non-traffic hospital admissions for WA in 1999/00 (which were

coded in ICD-10) and found a similar decline in recorded traffic injuries and a corresponding increase in non-traffic injuries.

Interestingly, this phenomenon did not occur for road traffic injury deaths in WA. This may reflect differences in coding systems between the AIHW, who map morbidity data from the ICD-9 code to the ICD-10-AM⁴ equivalent, and the ABS, who use the text field to code mortality data to its ICD-10 value. Or it may be that the relatively small number of deaths concealed any atypical fall in numbers of cases.

In addressing these declines, one possible short-term solution is to adjust the numbers of recorded hospitalisations for traffic injuries according to the percentages expressed in Table 3. For instance, in Victoria, the proportion of all road injuries (traffic and non-traffic) that were traffic remained relatively constant between 1994/95 and 1997/98, and in 1997/98 was about 89% (100% – 11.29%). For the problematic year 1998/99, the number of traffic injuries which were expected to have occurred could be estimated by multiplying the total number of traffic and non-traffic hospitalisations for 1998/99 by a factor of 0.89 (the proportion expected to have been traffic in the previous year). However, this solution may become less viable as the years progress – that is, the expected proportion of traffic injuries may vary in future years. Traffic and non-traffic proportions may even return to their previous levels as the use of ICD-10 is fine-tuned in hospital coding systems.

Of course, it may be that the ICD-10 version provides the most accurate estimate of numbers of traffic and non-traffic injury hospitalisations and that previous estimates using ICD-9 were overestimated (although the mortality data does not appear to have been affected).

⁴ This is a version of ICD-10 that has been modified for use in Australia.