

# Mortality and life-years lost due to alcohol: a comparison of acute and chronic causes

Tanya N Chikritzhs, Helen A Jonas, Tim R Stockwell, Penny F Heale and Paul M Dietze

A SMALL PROPORTION of the adult Australian population consistently drinks alcohol at levels considered by the National Health and Medical Research Council (NHMRC) to be hazardous to health.<sup>1,2</sup> Nine per cent of both male and female respondents to the 1998 National Drug Strategy Household Survey reported consuming alcohol at levels that pose long-term health risks.<sup>3</sup> By contrast, 46% of men and 32.5% of women reported drinking in one session more than six and four standard drinks, respectively, at least once a month,<sup>3</sup> an intake known to be associated with increased risk of serious injury.<sup>4</sup> In determining whether alcohol prevention policies should focus on the relatively small number of chronic high-risk drinkers or on the more prevalent "binge" drinking, it is important to consider the relative contributions of sustained (chronic) versus episodic (acute) hazardous drinking to alcohol-caused deaths and years of life lost.

In their large meta-analyses, English and colleagues identified 37 conditions leading to deaths and/or hospitalisations for which there was sufficient evidence to conclude that high-risk alcohol consumption was a causative factor.<sup>5</sup> High-risk alcohol consumption<sup>5</sup> has been implicated in both the long-term (chronic) development of disease states, and the occurrence of short-term (acute) events.

The World Health Organization (WHO) highlighted in a recent report the importance and practicality of distinguishing between these two major

## ABSTRACT

**Objectives:** (i) To estimate the numbers of deaths and person-years of life lost (PYLL) due to high-risk alcohol consumption in Australia during 1997, using current estimates of consumption. (ii) To compare the number of deaths and PYLL due to acute conditions associated with bouts of intoxication and chronic conditions associated with long-term misuse of alcohol.

**Methods:** All Australian deaths during 1997 related to conditions considered to be partially or wholly caused by high-risk alcohol consumption were extracted from the Australian Bureau of Statistics Mortality Datafile and adjusted by alcohol aetiologic fractions calculated for Australia in 1997. A life-table method was used to estimate the PYLL for deaths from alcohol-caused conditions.

**Main outcome measures:** Numbers of all deaths and PYLL due to chronic and acute alcohol-related conditions.

**Results:** Of the 3290 estimated alcohol-caused deaths in 1997, chronic conditions (eg, alcoholic liver cirrhosis and alcohol dependence) accounted for 42%, acute conditions (eg, alcohol-related road injuries and assaults) for 28% and mixed (chronic and acute) for 30%. Of the 62 914 estimated potential life years lost, acute conditions were responsible for 46%, chronic for 33% and mixed for 21%. The average number of years of life lost through deaths from acute conditions was more than twice that from chronic conditions, because the former mostly involved younger people.

**Conclusions:** In view of the societal burdens imposed by premature deaths, more effective public health strategies are needed to reduce the harm associated with occasional high-risk drinking (as well as sustained high-risk drinking), especially among young people.

MJA 2001; 174: 281-284

types of harmful drinking patterns and their consequences.<sup>6</sup> Moreover, new (draft) NHMRC guidelines on safe drinking levels specifically describe risk levels associated with short- and long-term drinking patterns and their outcomes.<sup>2</sup> The alcohol-related degenerative diseases, typified by chronic conditions such as organ failure (eg, liver cirrhosis) and the development of

cancer (eg, oropharyngeal cancer), tend to occur as a result of many years of alcohol abuse, while short bouts of drinking to intoxication (binge drinking) tend to be associated with acute conditions such as violent assaults, road injuries and drownings.

We report here our estimation and comparison of the numbers of deaths and person-years of life lost (PYLL) in Australia during 1997 due to acute and chronic alcohol-caused conditions. We used aetiologic fractions (the proportion of cases caused by exposure to a particular causal factor) calculated specifically for Australia in 1997, which made allowance for changes in per capita alcohol consumption between 1989 and 1997.

### National Drug Research Institute (NDRI), Perth, WA.

Tanya N Chikritzhs, BA(Hons) PGDipHlthSc, Research Fellow

Tim R Stockwell, F.D. MA(Oxon), Director

### Turning Point Alcohol and Drug Centre Inc, Melbourne, VIC.

Helen A Jonas, PhD MSt(Epidemiol) Research Fellow currently Senior Lecturer La Trobe University, and GSV

Penny F Heale, BSc, GDipAppSocPsych, Research Officer,

Paul M Dietze, PhD, BSc (Hons), Senior Research Fellow

Reprints: Ms Tanya Chikritzhs, National Drug Research Institute GPO Box U1987 Perth WA 6845

tanya@ndri.curtin.edu.au

## METHODS

**Alcohol-related deaths**

The Australian Bureau of Statistics (ABS) Mortality Datafile contains details of all Australian deaths, coded according to the *International classification of diseases, 9th revision, clinical modification* (ICD-9-CM).<sup>7</sup> All the deaths for 1997 with primary ICD-9-CM diagnosis codes or ICD-9-CM E-codes (external causes) corresponding to a condition caused partially or wholly by high-risk drinking<sup>5</sup> were extracted from the data set, together with information about each person's sex and age group (0-4 years, 5-9 years and so on to 85+ years).

**Aetiologic fractions**

The numbers of alcohol-related deaths in each category of age, sex and alcohol-related condition were multiplied by the alcohol aetiologic fraction specific for each age, sex and condition, and then further aggregated into sex and condition categories.

Since alcohol aetiologic fractions < 1 and > 0 are dependent on the prevalence of high-risk drinking in the population, the aetiologic fractions used in our study were adjusted to reflect approximate changes in levels of high-risk drinking by a method described in a recent WHO report.<sup>6</sup> Essentially, in the absence of current prevalence data, the method utilises changes in national per capita alcohol consumption to adjust all alcohol aetiologic fractions for conditions partially attributable to alcohol consumption.<sup>6,8</sup>

The previous estimate of the alcohol aetiologic fraction for falls (based on case series studies) was 0.34 for all fall injuries regardless of age or sex of the person.<sup>5</sup> However, this aetiologic fraction greatly overestimates the involvement of alcohol in fall injuries among the elderly.<sup>9</sup> Therefore, in keeping with recent convention and in the absence of officially updated age- and sex-specific estimates, an aetiologic fraction of zero was assigned to all falls occurring in people over 65 years of age.

**Person-years of life lost (PYLL)**

A life-table method — person-years of life lost (PYLL) — was used to estimate the approximate loss of years of life through premature alcohol-related death. This method allowed direct comparison with earlier comprehensive estimates for Australia.<sup>5</sup> Statistical software for the calculation of PYLL (Rates Calculator) was supplied by the Western Australian Health Department.<sup>10</sup> It was the same as that used by English et al,<sup>5</sup> but updated to include a current 1996 life table. We calculated separate estimates for men and women by type of condition. Again, in keeping with previous methods employed for an Australian population, only deaths to age 69 years were included.<sup>5</sup> However, given the increase in average life expectancy in the past decade in Australia, this may have slightly underestimated current estimates. Detailed explanations of PYLL methodology and the merits of life-table methods are in English et al<sup>5</sup> and in the recent WHO publication.<sup>6</sup>

**Grouping of alcohol-caused conditions**

Groupings for chronic and acute conditions largely followed the classifications identified by WHO<sup>6</sup> and are shown in the Box. Few alcohol-caused conditions are entirely acute or chronic in nature, although their overall characteristics are such that they are usually the consequence of a particular type of harmful drinking pattern. However, stroke and suicide can not be generally categorised as either acute or chronic. Both drinking to intoxication and long-term alcohol misuse have been demonstrated as risk factors contributing to the development of stroke (particularly haemorrhagic stroke).<sup>11</sup> Similarly, while intoxication is often present among people who commit suicide, there is also a link between heavy regular drinking and depression.<sup>6</sup> Therefore, stroke and suicide were designated as "mixed" conditions, indicating strong associations with both acute and chronic types of harmful drinking patterns.

## RESULTS

The estimated numbers of deaths and PYLL due to high-risk alcohol consumption in Australia in 1997 are shown in the Box.

Overall, chronic conditions were responsible for most (42%) of the alcohol-caused deaths in 1997, compared with 28% for acute conditions, 22% for stroke and 8% for suicide. Conversely, acute conditions accounted for the greatest proportion (46%) of years of life lost (PYLL) due to premature alcohol-caused death, compared with 33% for chronic conditions, 6% for stroke and 14% for suicide. The average number of years of life lost prematurely for each alcohol-caused death was twice as high for acute conditions (32 years) as for chronic conditions (15 years). The average number of years of life lost prematurely was also high for suicide (34 years).

Assuming that alcohol-caused suicides and strokes could be attributed equally to chronic and acute problem drinking, then the overall proportion of alcohol-caused deaths arising from chronic versus acute conditions would be 57% (42% + 15%) and 43% (28% + 15%), respectively. Likewise, the overall proportions of PYLL attributable to chronic and acute conditions would be 44% (33% + 10%) and 56% (46% + 10%), respectively.

## DISCUSSION

The largest number of deaths attributable to high-risk alcohol consumption in Australia during 1997 was associated with long-term alcohol misuse resulting in conditions such as alcoholic liver cirrhosis and alcohol dependence. In direct contrast, the largest number of years of life lost was attributable to acute alcohol-related conditions such as road accidents and assaults. This discrepancy results from the different age distributions among acute and chronic alcohol-caused deaths.

Older people (40+ years) are more likely to die from chronic alcohol-caused conditions, while deaths from acute alcohol-caused conditions occur largely among young people aged 15-29 years.<sup>8</sup> Historically, chronic alcohol-

caused conditions such as alcoholic liver cirrhosis have contributed to the bulk of deaths caused by high-risk alcohol consumption.<sup>5</sup> However, because of the young age at death of the vast majority of victims of acute alcohol-related conditions, the overall outcome in terms of prematurely lost years of life is substantial. This has implications for the economic burden of alcohol-related harm as well as the planning of public health interventions.

A recent estimate of alcohol-caused deaths by the Australian Institute of Health and Welfare<sup>12</sup> used the same aetiological fractions applied by English and colleagues for Australia in 1992,<sup>5</sup> without any adjustment for changes in drinking levels. (English et al used estimates of the prevalence of drinking from 1989 data to determine alcohol aetiological fractions.) However, since then, national per capita consumption has fallen by about 11%.<sup>13</sup> A sensitivity analysis revealed that 5% fewer alcohol-caused deaths were estimated based on aetiological fractions adjusted for an 11% decline in per capita alcohol consumption between 1989 and 1997, compared with the number of deaths estimated using aetiological fractions based on 1989 prevalence levels.

We assigned an alcohol aetiological fraction of zero for falls in people over 65 years of age. After discussions on recent unpublished work conducted by the Australian Institute of Health and Welfare, we estimate that, for our report, any error in the estimate of the true number of fall deaths would be minimal. This change also has significant implications for comparisons with previous studies that estimated a large proportion of alcohol-related deaths attributable to elderly people experiencing fall injuries.<sup>5</sup>

There is no doubt that the bulk of the economic burden on society as a result of alcohol misuse arises from productivity losses due to premature death. Estimates of the cost of productivity losses far outweigh any costs associated with health-related medical and hospital treatments incurred from alcohol-caused disease and injury.<sup>14,15</sup> Thus, simply counting numbers of deaths fails to describe adequately the wider impact of alcohol-related harm on a community. Public health and safety initiatives also

**Estimated number of alcohol-caused deaths and person-years of life lost (PYLL) in Australia by sex and acute, chronic, and mixed (both acute and chronic) alcohol-related conditions, 1997**

Condition	Males		Females		Total	
	Deaths	PYLL	Deaths	PYLL	Deaths	PYLL
<b>Acute</b>						
Road injuries	343	13 751	75	3 423	418	17 174
Assault	84	2 919	40	1 462	124	4 381
Drowning	61	1 909	12	325	73	2 234
Alcoholic psychosis	40	358	11	35	51	393
Falls*	35	992	6	145	41	1 137
Aspiration	34	498	23	116	57	614
Ethanol toxicity	30	1 118	7	301	37	1 419
Fire injuries	24	446	11	203	35	649
Acute pancreatitis	20	126	18	57	38	183
Alcohol abuse	10	309	3	96	13	405
Supracardial dysrhythmias	5	22	9	5	14	27
Occupational and machine injury	4	127	0	3	4	130
Alcoholic gastritis	2	44	2	40	4	84
Other ethanol/methanol poisoning	2	87	0	0	2	87
Gastro-oesophageal haemorrhage	1	0	0	0	1	0
Child abuse	0	10	0	31	0	41
Low birthweight	0	1	0	1	0	2
<b>Subtotal</b>	<b>695</b>	<b>22 743</b>	<b>217</b>	<b>6 243</b>	<b>912</b>	<b>28 986</b>
<i>Percentage of total</i>	<i>30.3%</i>	<i>46.7%</i>	<i>21.8%</i>	<i>43.0%</i>	<i>27.7%</i>	<i>46.0%</i>
<i>Mean no. years lost/death</i>		<i>33</i>		<i>29</i>		<i>32</i>
<b>Chronic</b>						
Alcoholic liver cirrhosis	539	8 313	144	2 795	683	11 108
Alcohol dependence	204	3 300	53	1 035	257	4 335
Alcoholic cardiomyopathy	98	1 343	11	138	109	1 481
Liver cancer	50	540	15	119	65	659
Oropharyngeal cancer	48	576	7	61	55	637
Oesophageal cancer	46	485	8	47	54	532
Laryngeal cancer	28	280	3	20	31	300
Epilepsy	19	509	12	285	31	794
Hypertension	19	167	19	49	38	216
Chronic pancreatitis	8	107	5	44	13	151
Oesophageal varices	2	28	0	0	2	28
Female breast cancer	0	0	51	715	51	715
Cholelithiasis†	-1	-4	0	-2	-1	-6
<b>Subtotal</b>	<b>1 060</b>	<b>15 675</b>	<b>328</b>	<b>5 309</b>	<b>1 388</b>	<b>20 984</b>
<i>Percentage of total</i>	<i>48.2%</i>	<i>32.2%</i>	<i>33.0%</i>	<i>39.6%</i>	<i>42.2%</i>	<i>35.3%</i>
<i>Mean no. of years lost/death</i>		<i>16</i>		<i>16</i>		<i>15</i>
<b>Mixed</b>						
Stroke	312	2 236	414	1 783	726	4 019
Suicide	228	7 836	36	1 149	264	8 985
<b>Subtotal</b>	<b>540</b>	<b>10 076</b>	<b>450</b>	<b>2 932</b>	<b>990</b>	<b>13 004</b>
<i>Percentage of total</i>	<i>23.5%</i>	<i>20.7%</i>	<i>45.2%</i>	<i>20.2%</i>	<i>30.1%</i>	<i>20.7%</i>
<i>Mean no. of years lost/death</i>		<i>19</i>		<i>17</i>		<i>18</i>
<b>Total</b>	<b>2 295</b>	<b>48 433</b>	<b>995</b>	<b>14 481</b>	<b>3 290</b>	<b>62 914</b>
<b>Total all conditions</b>	<b>67 752</b>	<b>587 348</b>	<b>61 598</b>	<b>321 548</b>	<b>129 350</b>	<b>908 896</b>
<i>Percentage caused by alcohol</i>	<i>3.4%</i>	<i>8.2%</i>	<i>1.6%</i>	<i>4.5%</i>	<i>2.5%</i>	<i>6.9%</i>
<i>Mean no. years lost/death</i>		<i>21</i>		<i>15</i>		<i>19</i>

\* Alcohol aetiological fraction for people aged 65+ years assigned to zero.

† High levels of alcohol consumption exert a protective effect.

Estimates of PYLL for sex-specific totals and subtotals are calculated separately and are not equal to the sum of individual conditions/categories.

need to be particularly sensitive to age differences and the associated underlying drinking patterns.

**CONCLUSION**

Assuming that the numbers of deaths and PYLL from deaths due to stroke and suicide were equally apportioned between acute and chronic conditions, the overall proportions of deaths and PYLL due to acute conditions in Australia in 1997 were 43% and 56%, respectively. This suggests that prevention policies should give equal weight to strategies discouraging occasional high-risk drinking and sustained high-risk drinking — but not at the expense of strategies discouraging problematic long-term drinking.

**ACKNOWLEDGEMENTS**

We relied heavily on the use of aetiological fraction estimates developed by English and colleagues.<sup>8</sup> We also gratefully acknowledge the assistance of Dr Jim Codde, Director of Epidemiology and Analytical Services at the Health Department of Western Australia, for his assistance in calculating PYLL and the use of Rates Calculator.<sup>12</sup> We would also like to thank Mr Bruno

Ridolfo, Senior Research Officer, for his assistance and information regarding new estimates for aetiological fractions currently being developed by the Australian Institute of Health and Welfare. This research was funded by the National Drug Strategy.

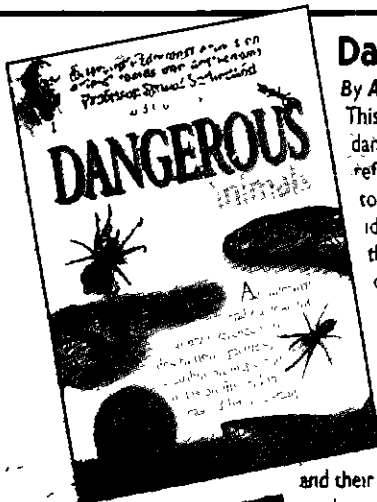
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(Received 8 Aug, accepted 18 Dec. 2000)

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