EUROPEAN JOURNAL OF PUBLIC HEALTH 1998: 8: 43–51

Alcohol-related mortality by age and sex and its impact on life expectancy

Estimates based on the Finnish death register

PIA MÄKELÄ *

The level of alcohol-related mortality has been estimated for several populations, but few studies have reported plausible results on the connection between alcohol-related mortality and age and sex. The Finnish death register includes information on both the underlying and contributory causes of death and it yields an individual-level estimate of the contribution of alcohol in mortality. The data for 1987–1993 are used to examine alcohol-related mortality by cause of death, age and sex and to estimate the impact of excessive alcohol use on life expectancy by sex. According to the results, 6% of all deaths were alcohol related. These deaths were responsible for a 2 year loss in life expectancy at age 15 years among men and 0.4 years among women, which explains at least one-fifth of the difference in life expectancies between the sexes. In the age group of 15–49 years, over 40% of all deaths among men and 15% among women were alcohol related. In this age group, over 50% of the mortality difference between the sexes results from alcohol-related deaths. The use of data on contributory causes of death, the organization of the Finnish death certification system and the relatively high proportion of alcohol-related deaths suggest that these data do not underestimate alcohol-related deaths to such an extent as has been the case in earlier studies using data from death certificates. This study shows that alcohol consumption is an important public health issue in Finland and a significant determinant of male premature mortality.

Key words: alcohol drinking, alcoholic intoxication, mortality, life expectancy, registries

The level of alcohol-related mortality has been estimated in several studies.[1–3] However, most studies producing such estimates fail to report plausible results on the connection between alcohol-related mortality and sex and age. The standard method used is to estimate for each cause of death an alcohol-attributable fraction (AAF) on the basis of clinical case studies and epidemiological studies. This method is not ideal for studying group differentials in alcohol-related mortality, mainly because a reliable estimation of group and cause-specific AAFs requires larger sample sizes in clinical case studies and alcohol consumption surveys than it is usually possible to have. As an example, the most widely used set of AAFs, published by the Centers for Disease Control and Prevention (CDC),[3] simply assumes equal AAFs for men and women and for most ages in almost every cause of death category, although attributable fractions should generally be larger in groups with heavier alcohol consumption. This erroneous assumption produces incorrect estimates of the relation between alcohol-related mortality and sex and age.

Finland has a death register that covers the whole population and includes data on the contributory causes of death as well as on the underlying cause of death. The data yield an estimate of alcohol involvement in the deaths of a total population on the basis of individual-level evaluations. These data offer a good possibility for estimating group differentials in alcohol-related mortality.

In Finland the ratio of male to female mortality is high[4] due to a rather high level of mortality among men and intermediate mortality among women in comparison with other industrial countries. The intention here is to give a quantitative estimate of the contribution of alcohol consumption to the sex difference in life expectancy. Hence, the aims of this study are to examine alcohol-related mortality by cause of death, age and sex and to estimate the impact of alcohol abuse on life expectancy by sex.

DATA AND METHODS

The data used in this study have been obtained from the official death register maintained by Statistics Finland (permission TK–53–133–95). The analysis comprises men and women aged 15–89 years, an age group that should more or less cover the whole range of alcohol-related deaths. The focus is on the period from 1987 to 1993: 1987 saw the introduction of the Finnish Classification of Diseases 1987 (FCD) and data on alcohol consumption as a contributory cause of death became available. The FCD is based on the Ninth Revision of the International Classification of Diseases (ICD), but each category is classified with a 5-digit code.

Deaths caused by alcohol are operationalized as those where there is a reference to alcohol in the death certi-

* Correspondence: Pia Mäkelä, Researcher, M.Sc., Population Research Unit, Department of Sociology, P.O. Box 18, 00014 University of Helsinki, Finland, tel. +358 9 1912 3897, fax +358 9 1912 3967, e-mail: pia.makela@helsinki.fi

ficate. They are here called alcohol-related deaths. These comprise, first of all, deaths which are 'directly attributable to alcohol' or where the underlying cause of death explicitly mentions alcohol. These include ('FCD' indicates that the code differs from the ICD code) alcoholic thiamine deficiency (FCD 265.0A), alcoholic psychoses (291), alcohol dependence syndrome (303), alcoholic polyneuropathy (357.5), alcoholic cardiomyopathy (425.5), alcoholic gastritis (535.3), alcoholic diseases of the liver (571.0–571.3), alcoholic diseases of the pancreas (FCD 577.0D–F, 577.1C–D), accidental poisoning by alcohol (FCD E851) and accidental poisoning by medicinal agents in combination with alcohol (FCD E849). In addition, deaths where the underlying cause is 'injury undetermined whether accidentally or purposely inflicted' (here called 'undetermined injury'; FCD E970–9) and which were caused by poisoning by alcohol or by alcohol in combination with medicinal agents are included in directly alcohol-attributable deaths. Here, these are called 'undetermined alcohol poisonings'.

The second category of alcohol-related deaths are deaths where the underlying cause of death is not directly attributable to alcohol, but at least one of a maximum of three contributory causes is either alcohol intoxication (305.0) or one of the directly alcohol-attributable diseases listed above. Deaths which have alcohol-related underlying *and* contributory causes are not included in this group of deaths but in 'deaths directly attributable to alcohol'. When several contributory causes are alcohol related, the first is used in the classification or if this is not alcohol-related the second is used.

The loss in life expectancy at age 15 years due to alcohol is calculated using cause-elimination life tables.[5] This measure represents the change in life expectancy that would be obtained under the hypothetical elimination of all alcohol-related deaths, assuming that the mortality risk to alcohol-related causes is independent of all other mortality risks.

To summarize the differences between causes of death in distributions of age at death, multiple decrement life tables[5] are used. These yield the expected years to be lived by the persons alive at age 15 years who will eventually die from the specified cause of death i (e_{15i}).

RESULTS

There were approximately 21,200 alcohol-related deaths in the data altogether or over 3,000 alcohol-related deaths annually (*table 1*): below, all numbers of deaths are given as annual averages. The proportion of alcohol-related deaths was 6% in the whole population, 11% among men and 2% among women. Of alcohol-related deaths 86% occurred among men. Age adjustment had a negligible effect on the mortality difference between the sexes. Four out of 10 alcohol-related deaths were directly attributable to alcohol, another four were accidental and violent deaths with alcohol-related contributory causes of death, and the rest were deaths from diseases with alcohol-related contributory causes of death.

Deaths directly attributable to alcohol

Approximately 60% of the directly alcohol-attributable deaths were diseases and 40% poisonings (*table 2*). Alco-

Table 1 Alcohol-related deaths in age group 15–89 years in 1987–1993, in the whole period and annually, by sex and by type of alcohol-related cause of death

	Men			Women			All		
	Period 1987–1993	Annual average	%	Period 1987–1993	Annual average	%	Period 1987–1993	Annual average	%
All alcohol-related deaths	18,345	2,621	100	2,866	409	100	21,211	3,030	100
Deaths directly attributable to alcohol	6,876	982	37	1,408	201	49	8,284	1,183	39
Deaths with alcohol as a contributory cause of death when underlying cause of death is									
A disease	4,007	572	22	547	78	19	4,554	650	21
Accidental or violent	7,462	1,066	41	911	130	32	8,373	1,196	40
All deaths in age group 15–89 years	164,482	23,497		153,683	21,955		318,165	45,452	
All deaths	172,766	24,681		173,711	24,816		346,477	49,497	
Person years in age group 15–89 years (1,000)	13,479	1,926		14,613	2,088		28,092	4,013	
Proportion of alcohol-related deaths of all deaths	10.6			1.7			6.1		
Alcohol-related mortality in age group 15–89 years (per 100,000 person years)	136.1			19.6			75.5		
Age-standardized alcohol-related mortality	137.4			19.6			75.5		

Table 2 Directly alcohol-attributable deaths, annual averages in the period between 1987 and 1993, men and women aged 15–89 years

	Men		Women	
Cause of death	N	%	N	%
All directly alcohol attributable	982	100	201	100
Directly alcohol-attributable diseases	573	58	119	59
Alcohol dependence syndrome	58	6	8	4
Alcoholic psychoses	28	3	4	2
Alcoholic cardiomyopathy	88	9	12	6
Alcoholic diseases of the liver	326	33	87	43
Alcoholic diseases of the pancreas	65	7	7	3
Other directly alcohol-attributable diseases	9	1	2	1
Directly alcohol-attributable accidents and violence	409	42	82	41
Accidental poisoning by alcohol	302	31	53	26
Accidental poisoning by medicinal agents and alcohol	85	9	23	11
Undetermined alcohol poisoning	22	2	7	4
Mortality from directly alcohol-attributable causes (per 100,000 person years)	51.0		9.6	

Table 3 Number of deaths from diseases other than those directly attributable to alcohol, the number and proportion of these which are alcohol-related[a], and the proportion of alcohol-related deaths where the contributory cause of death is alcohol intoxication, by cause of death, in men and women aged 15–89 years: annual averages in 1987–1993

	Men					Women				
	All deaths	Alcohol-related		Percentage of alcohol-related deaths	Percentage with alcohol intoxication	All deaths	Alcohol-related		Percentage of alcohol-related deaths	Percentage with alcohol intoxication
Cause of death	N	n	%			N	n	%		
All diseases excluding directly alcohol-attributable diseases	19,790	572	2.9	100	43	20,675	78	0.4	100	38
Cancers	5,018	27	0.5	5	6	4,653	3	0.1	4	8
Cancer of the upper aero-digestive tract[b]	207	3	1.4	0	10	136	0	0.0	0	0
Other cancers of the digestive tract	1,345	12	0.9	2	1	1,599	1	0.1	2	10
Other cancer	3,466	12	0.4	2	11	2,919	2	0.1	2	8
Diseases of the circulatory system	11,063	388	3.5	68	55	11,455	45	0.4	57	53
Coronary heart disease	7,303	262	3.6	46	59	5,993	26	0.4	33	60
Acute myocardial infarction	5,016	97	1.9	17	45	4,099	7	0.2	9	40
Other coronary heart disease	2,287	165	7.2	29	68	1,894	19	1.0	24	68
Cerebrovascular diseases	2,128	35	1.6	6	21	3,335	6	0.2	7	23
Haemorrhagic stroke	574	20	3.4	3	29	721	3	0.4	4	30
Ischaemic stroke	995	11	1.1	2	13	1,687	2	0.1	3	21
Other stroke	560	4	0.7	1	7	928	1	0.1	1	0
Other diseases of the circulatory system	1,632	91	5.6	16	55	2,127	13	0.6	17	52
Other disease	3,709	158	4.3	28	20	4,566	30	0.7	38	20
Pneumonia and influenza	927	56	6.1	10	10	1,057	10	0.9	12	6
Diseases of the digestive system	483	27	5.6	5	13	696	5	0.7	6	9
Other	2,299	74	3.2	13	31	2,814	16	0.6	20	32
Alcohol-related mortality (per 100,000 person years)	29.7					3.7				

a: Here, alcohol-related means that contributory causes of death include alcohol intoxication or an alcohol-related disease
b: Cancer of the upper aero-digestive tract: cancers of the lip, oral cavity, pharynx, larynx and oesophagus (ICD 140–150, 161)

holic liver diseases were the most common of alcoholic diseases. Approximately three-quarters of all alcohol-related poisonings were accidental poisonings by alcohol. Both the diseases and poisonings were approximately five times more common among men than among women.

Deaths from diseases with an alcohol-related contributory cause

Deaths from diseases with an alcohol-related contributory cause were eight times more common among men than among women (*table 3*). In approximately 40% of the deaths the alcohol-related contributory cause was alcohol intoxication and in 60% an alcoholic disease.

In the majority of these deaths the underlying cause was a disease of the circulatory system, in particular coronary heart disease (CHD) and, of these, particularly chronic CHD. Approximately 3% of all deaths from diseases among men aged 15–89 years and 0.4% among women had an alcohol-related contributory cause. The proportion was the largest in deaths from chronic CHD, circulatory diseases other than CHD or stroke, pneumonia and influenza and diseases of the digestive system. In deaths from the former two of these causes, alcohol intoxication contributed to death more frequently than did alcoholic diseases, whereas in other causes of death the situation was reversed. Alcohol-related contributory causes of death were rare when the underlying cause of death was cancer, even when it was cancer of the upper aero-digestive tract.

Accidental and violent deaths with an alcohol-related contributory cause

Among both sexes the proportion of alcohol-related deaths was the largest in deaths caused by fire and flames, excessive heat and cold, drownings, water transport accidents and homicide (*table 4*). In other transport accidents than water transport accidents the proportions were relatively small. Owing to a high overall mortality, the largest numbers of alcohol-related deaths came from suicides, water transport accidents and drownings, falls and motor-vehicle accidents.

In 9 out of 10 cases the alcohol-related contributory cause of death was alcohol intoxication. In the remaining 10% the contributory cause was most often alcohol dependence syndrome and the underlying cause fall or suicide.

Alcohol-related accidental and violent deaths were almost 9 times more common among men than among women. Since non-alcohol-related accidental and violent deaths were also more common among men, the male:female ratio of the proportions of alcohol-related deaths was only slightly over 3 (39:12%). The male:female ratio of age-standardized alcohol-related mortality rates was the largest in water transport accidents, drownings, poisonings and suicides and the least in homicides, undetermined injuries and deaths caused by fire, heat and cold.

Alcohol-related mortality, age and life expectancy

Alcohol-related mortality peaked in the age group 60–64 years among men and 50–54 years among women (*figure 1*). Alcohol-related accidental and violent mortality was

Table 4 Number of accidental and violent deaths excluding those directly attributable to alcohol, the number and proportion of these which are alcohol-related,[a] and the proportion of alcohol-related deaths where the contributory cause of death is alcohol intoxication, by cause of death, in men and women aged 15–89 years: annual averages in 1987–1993

	Men					Women				
	All deaths	Alcohol-related		Percentage of alcohol-related deaths	Percentage with alcohol intoxication	All deaths	Alcohol-related		Percentage of alcohol-related deaths	Percentage with alcohol intoxication
Cause of death	N	n	%			N	n	%		
All accidents and violence excluding those directly attributable to alcohol	2,726	1,066	39	100	90	1,079	130	12	100	89
Accidents	1,376	532	39	50	89	696	64	9	49	88
Motor vehicle accidents	392	104	26	10	98	178	12	7	9	99
Water traffic accidents and drownings	223	140	63	13	99	24	10	41	7	99
Other traffic accidents	44	12	28	1	98	14	2	13	1	92
Accidental poisonings	53	17	33	2	43	14	1	10	1	50
Falls	373	122	33	11	74	348	14	4	11	65
Fire, flames, heat and cold	128	97	76	9	94	40	17	43	13	93
Other	164	40	24	4	83	77	8	11	6	97
Suicide	1,121	403	36	38	91	297	37	13	29	89
Homicide	103	67	66	6	96	42	16	37	12	94
Undetermined injury	125	64	51	6	77	44	13	30	10	81
Alcohol-related mortality (per 100,000 person years)	55.4					6.2				

a: Here, alcohol-related means that contributory causes of death include alcohol intoxication or an alcohol-related disease

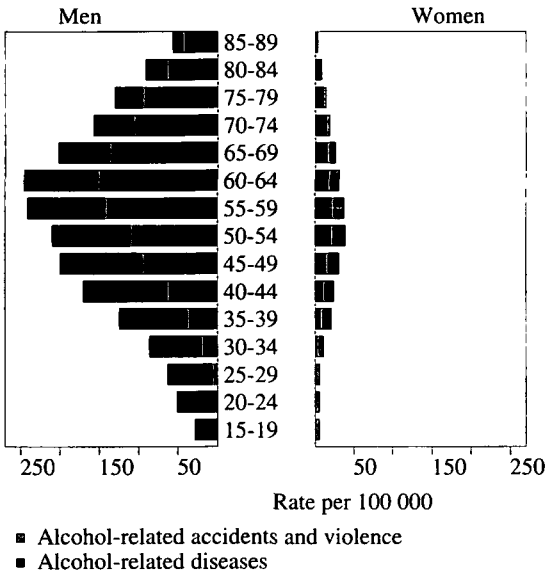

Figure 1 Alcohol-related mortality per 100,000 person years by age, sex and alcohol-related cause of death category in 1987–1993

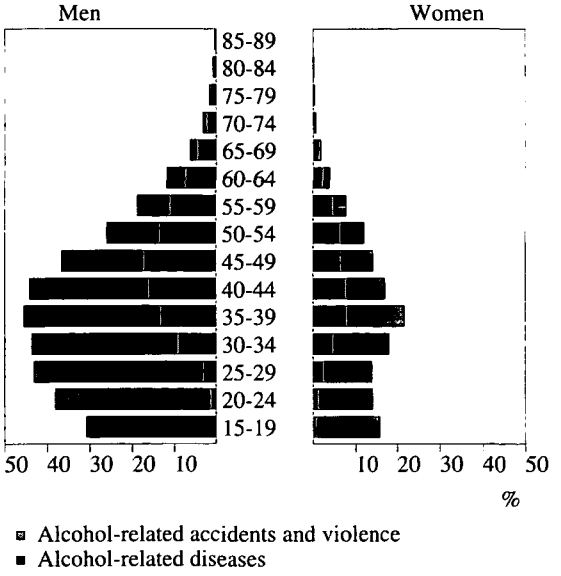

Figure 2 Percentage of alcohol-related deaths by age, sex and alcohol-related cause of death category in 1987–1993

much more evenly distributed across the age groups than alcohol-related diseases and it reached its peak at a younger age. The proportion of alcohol-related deaths was the largest in the age group 35–39 years in both sexes (*figure 2*). The proportion was around 40% in the male age groups of 20–49 years, and around 15% in the female age groups of 15–49 years. The percentage of alcohol-related deaths that were accidental or violent deaths increased the younger the age group was. It ranged from 20 to nearly 100% and was over 50% in all age groups under 50 years.

The life expectancy at age 15 years among those who eventually died from alcohol-related causes was 37 years among men and 38 years among women (*tables 5 and 6*), which means that the expected age at death in this population was approximately 52 and 53 years, respectively. In alcohol-related accidental and violent deaths the life expectancy at age 15 years was 32 years among men and 33 years among women and in alcohol-related diseases 43 years among both men and women. These expectancies are substantially lower than those in the respective non-alcohol-related causes of death, particularly in women (*tables 5 and 6*). The age distribution of alcohol-related motor vehicle accidents was the most concentrated in young age groups: the life expectancy at age 15 years was as low as 23 years among men and 19 years among women, 14 and 22 years less than in non-alcohol-related cases, and the highest rate occurred in the 5 year age groups 15–19 and 20–24 years. The largest difference in life expectancies between the alcohol-related and non-alcohol-related deaths (22 and 28 years) occurred in accidental falls, where the life expectancy at age 15 years in the alcohol-related cases was the highest (40 and 42 years). Fatal falls are most common in old people, among whom falls were seldom related to alcohol use, but in younger age groups falls were among the most closely alcohol-related causes of death, together with drownings and water transport accidents, deaths caused by fire, excessive heat and cold and homicide (*tables 5 and 6*).

The male:female ratio of alcohol-related mortality was the lowest in the age group 30–54 years (*table 6*). Yet, in all five-year age groups between 25–49 years, alcohol-related mortality was responsible for as much as 50–60% of the difference in the mortality rate between the sexes, whereas it was responsible for 16% of the age-adjusted mortality difference in the population aged 15–89 years. In Finland women's life expectancy at age 15 years exceeds that of men by almost 7.7 years (*table 7*). Alcohol-related deaths shorten men's life expectancy by 2.0 years but women's by only 0.4 years. Hence 1.6 years or 21% of the sex difference in life expectancy can be attributed to excessive alcohol use. Over 60% of this alcohol-attributable difference is due to alcohol-related accidents and violence.

DISCUSSION

Summary of the main findings and comparison with external data

A death register covering practically all deaths in Finland in 1987–1993 was used for examining the impact of alcohol on mortality. The register included over 3,000 alcohol-related deaths annually or over 21,000 altogether, constituting approximately 6% of all deaths. This proportion is somewhat higher than those estimated for the US in 1987 (5%[3]) and Canada in 1974 (6% of all deaths between ages 1 and 70 years[1]), but lower than the estimate of the Royal College of General Practitioners for the UK in 1984[6] (7–8% of all deaths in the population aged ≥15 years) or that for France in 1985 (10% of all deaths in the population aged ≥20 years[2]).

Alcohol-related mortality was responsible for a 2 year loss in life expectancy at age 15 years among men and a loss of 0.4 years among women. This result was obtained on the assumption that the mortality risk to alcohol-related causes is independent of all other mortality risks. Given the correlation between many behaviours with adverse health effects, this calculation probably overestimates to some extent the impact of the potential elimination of alcohol. For the sake of comparison, it can be inferred from the figures presented by Valkonen and Van Poppel[7]

Table 5 The number of deaths, the proportion of these which are alcohol related[a], and rate of alcohol-related mortality, by age group and cause of death, and life expectancy at age 15 years by cause of death and by connection to alcohol: men, annual averages in 1987–1993

	15–34 years			35–54 years			55–69 years			70–89 years			Life expectancy at 15 years[b]	
Cause of death	All deaths	Percentage alcohol-related	Rate of alcohol-related mortal.	All deaths	Percentage alcohol-related	Rate of alcohol-related mortal.	All deaths	Percentage alcohol-related	Rate of alcohol-related mortal.	All deaths	Percentage alcohol-related	Rate of alcohol-related mortal.	Alcohol-related deaths	Difference to non-alc-rel. deaths
All causes	1,049	40	58.6	3,413	36	171.2	6,966	11	232.0	12,069	2	129.6	37	–22
All diseases	252	18	6.2	2,165	23	69.6	6,326	7	141.3	11,620	1	88.4	43	–17
All accidents and violence	798	48	52.3	1,248	59	101.5	640	47	90.6	449	13	41.2	32	–11
Causes directly attributable to alcohol	83	100	11.4	542	100	74.6	298	100	90.4	59	100	40.6	38	–
Alcoholism and alcohol psychoses	4	100	0.6	41	100	5.7	28	100	8.5	12	100	8.4	43	–
Other directly alcohol-attributable diseases	22	100	3.0	261	100	35.9	171	100	51.9	34	100	23.5	40	–
Accidental alcohol poisoning	32	100	4.5	176	100	24.2	83	100	25.2	11	100	7.6	36	–
Other alcohol-related poisonings	25	100	3.4	65	100	8.9	16	100	4.8	2	100	1.2	30	–
Other diseases	226	9	2.7	1,863	11	28.1	6,127	4	81.0	11,573	1	56.6	45	–15
Cancer	59	0	0.0	487	1	0.7	1,852	1	4.7	2,620	0	4.7	50	–7
Diseases of the circulatory system	58	14	1.1	1,030	13	17.7	3,500	6	58.4	6,474	1	39.9	46	–14
Other disease	109	10	1.5	346	20	9.7	775	8	17.8	2,479	1	11.9	42	–21
Other accidents and violence	740	44	44.5	1,008	49	68.4	541	37	60.6	436	11	32.4	31	–13
Motor vehicle accidents	168	33	7.6	93	35	4.4	65	21	4.2	66	4	1.7	23	–14
Water traffic accidents and drownings	49	61	4.2	98	71	9.6	58	61	10.6	18	30	3.6	33	–6
Falls	23	58	1.9	87	62	7.5	90	45	12.4	172	8	9.3	40	–22
Fire, flames, heat and cold	17	81	1.9	58	84	6.7	33	77	7.8	20	45	6.0	38	–11
Other accidents	45	24	1.5	94	39	5.1	70	26	5.5	51	7	2.5	36	–10
Suicide	370	43	21.8	471	40	25.7	185	26	14.6	95	10	6.6	26	–9
Homicide	34	63	3.0	50	74	5.1	14	52	2.1	4	36	1.1	27	–5
Undetermined injury	33	56	2.6	56	57	4.4	26	43	3.3	10	24	1.7	30	–7
Alcohol-related deaths	424			1,244			765			188				
All deaths	1,049			3,413			6,966			12,069				
Person years (1,000)	724			727			330			145				

a: Here, alcohol related means deaths directly attributable to alcohol and deaths where contributory causes of death include alcohol intoxication or an alcohol-related disease
b: Life expectancy at age 15 years among those who will eventually die from the specified cause of death
Rate of alcohol-related mortal.: Rate of alcohol-related mortality
Difference to non-alc-rel. deaths: Difference to non-alcohol-related deaths

Table 6 The number of deaths, the proportion of these which are alcohol related[a], and rate of alcohol-related mortality, by age group and cause of death, and life expectancy at age 15 years by cause of death and by connection to alcohol: women, annual averages in 1987–1993

	15–34 years			35–54 years			55–69 years			70–89 years			Life expectancy at 15 years[b]	
Cause of death	All deaths	Percentage alcohol-related	Rate of alcohol-related mortal.	All deaths	Percentage alcohol-related	Rate of alcohol-related mortal.	All deaths	Percentage alcohol-related	Rate of alcohol-related mortal.	All deaths	Percentage alcohol-related	Rate of alcohol-related mortal.	Alcohol-related deaths	Difference to non-alc-rel. deaths
All causes	311	16	7.1	1,286	15	27.8	3,534	4	31.4	16,823	0	13.7	38	–27
All diseases	148	5	1.1	982	9	12.3	3,324	2	18.0	16,340	0	10.5	43	–23
All accidents and violence	164	25	6.0	304	36	15.4	210	25	13.4	484	2	3.2	33	–22
Causes directly attributable to alcohol	13	100	1.9	104	100	14.8	68	100	17.0	16	100	5.5	39	–
Alcoholism and alcohol psychoses	1	100	0.2	4	100	0.6	4	100	0.9	3	100	0.9	43	–
Other directly alcohol-attributable diseases	4	100	0.6	54	100	7.7	38	100	9.6	11	100	3.6	40	–
Accidental alcohol poisoning	4	100	0.6	29	100	4.1	18	100	4.4	2	100	0.6	37	–
Other alcohol-related poisonings	4	100	0.5	17	100	2.4	8	100	2.1	1	100	0.3	35	–
Other diseases	142	2	0.3	924	3	4.1	3,282	1	7.5	16,326	0	6.0	45	–20
Cancer	54	0	0.0	513	0	0.1	1,303	0	0.4	2,784	0	0.4	49	–9
Diseases of the circulatory system	27	2	0.1	233	5	1.8	1,441	1	4.8	9,755	0	4.4	48	–19
Other disease	62	3	0.3	178	9	2.2	538	2	2.2	3,788	0	1.2	41	–27
Other accidents and violence	156	22	4.8	258	24	8.9	184	15	6.9	481	1	2.2	31	–24
Motor vehicle accidents	48	13	0.9	40	12	0.7	37	3	0.3	53	0	0.0	19	–22
Water traffic accidents and drownings	3	65	0.3	9	61	0.8	6	29	0.4	5	3	0.0	30	–18
Falls	2	47	0.2	13	37	0.7	28	19	1.3	305	1	0.8	42	–28
Fire, flames, heat and cold	3	79	0.4	11	70	1.1	10	55	1.3	17	11	0.6	38	–21
Other accidents	9	14	0.2	22	31	1.0	21	14	0.8	52	1	0.2	35	–22
Suicide	65	17	1.6	128	15	2.7	67	10	1.6	37	2	0.3	29	–8
Homicide	15	37	0.8	19	41	1.1	6	38	0.6	3	0	0.0	26	–5
Undetermined injury	10	35	0.5	16	41	0.9	9	26	0.6	9	7	0.2	29	–13
Alcohol-related deaths	49			196			125			40				
All deaths	311			1,286			3,534			16,823				
Person years (1,000)	694			705			397			292				
Male:female ratio of alcohol-related mortality rates	8.3			6.2			7.4			9.5				

a: Here, alcohol related means deaths directly attributable to alcohol and deaths where contributory causes of death include alcohol intoxication or an alcohol-related disease

b: Life expectancy at age 15 years among those who will eventually die from the specified cause of death

Rate of alcohol-related mortal.: Rate of alcohol-related mortality

Difference to non-alc-rel. deaths: Difference to non-alcohol-related deaths

that in 1985–1989 smoking reduced the life expectancy at age 15 years by 2.6 years among men and 0.3 years among women in Finland. Hence, the impact of alcohol on life expectancy compared to that of smoking seems to be somewhat smaller among men and at least the same among women.

Moderate alcohol use may prevent deaths from CHD[8] and ischaemic stroke[9] and therefore increase life expectancy. On the basis of an earlier study on CHD mortality and alcohol consumption[10] and similar unpublished calculations on ischaemic stroke mortality and alcohol consumption based on[11–15] it can be estimated that moderate use of alcohol may increase the life expectancy at age 15 years by approximately 0.4 years among men and by around 0.1 years among women, i.e. approximately one-quarter of the adverse effects of alcohol on longevity may be compensated for by the positive effects. The estimated annual number of deaths prevented by alcohol use is larger than one-quarter of the deaths caused by alcohol abuse, but because the preventive effect comes into play at an older age than when the deaths caused by alcohol abuse occur the impact on life expectancy is attenuated.

Alcohol-related mortality was approximately 7 times higher among men than among women. Among people aged under 50 years, alcohol-related mortality accounted for over 50% of the difference in the mortality rate between the sexes. Of the total difference in life expectancies between the sexes, one-fifth was attributable to alcohol-related mortality, compared to approximately 30% which is attributable to tobacco.[7] If the two effects were additive, approximately 50% of the difference in life expectancies between the sexes would be attributable to smoking and alcohol use. However, it is likely that the effects of alcohol use and smoking overlap somewhat.

According to the death register, alcohol-related mortality is highest in men in their 60s. The level of alcohol-related mortality is lower among men aged under 50 years, but the relative influence of alcohol is even more important: over 40% of all deaths in this age group are alcohol related. Among women the situation is better, although the role of alcohol is far from negligible. In alcohol-related causes of death, the distributions of ages at death among men and women are surprisingly similar considering that women in general die at a much older age than men.

Reliability of the results

Numerous studies report a gross underestimation of alcohol-related mortality in death certificates,[16–18] e.g. a 90% underestimation of alcohol-related deaths in motor vehicle accidents.[16] However, these studies give no evidence that the data of the present study are unreliable. Some of the studies used data on the underlying cause of death only. Among the other reasons given for the observed underestimation were the following.[16,17]

- 'Inadequate training of physicians'.

In Finland medicolegal autopsies were carried out in more than 90% of all accidental and violent deaths in 1987–1993 and in 97% among people aged under 75 years.[19] Medicolegal autopsies are carried out by a small group of well-trained forensic pathologists.

- 'The death certificate is written before obtaining autopsy findings'.

In Finland temporary death certificates are written where necessary and the autopsy findings are available when writing the final certificate.

- 'Failure to query physicians regarding adequate diagnoses'.

In Finland death certificates are first checked by legal medical officers at the county level and then at the coding phase by Statistics Finland. Further information is requested in cases of incomplete and conflicting certificates.

- 'Social reasons for concealing alcohol-related causes of death'.

Judging from the fact that 80% of all deaths from chronic liver conditions were reported in death certificates to be alcohol related and over 90% among men, the influence of social pressure cannot be very strong. The effect should be particularly small in medicolegal autopsies because forensic pathologists usually do not know the deceased personally.

Finally and related to the point mentioned above,

- 'The death certificate is considered a public document', which is not the case in Finland.

Alcohol-related diseases are likely to be more underestimated than alcohol-related accidental and violent deaths, because autopsies are carried out less often and certificates are written by a large number of physicians with possibly different practices of recording multiple causes of death. In addition, epidemiological studies show that the mortality from some diseases (e.g. oesophageal cancer and stroke) is higher among heavy drinkers than among non-drinkers, but in general these alcohol-related deaths cannot be identified using death certificates. External data can be used to assess the approximate magnitude of this underestimation. When the AAFs estimated by the CDC for the US[3] (where the per capita alcohol consumption is close to that of Finland[20]) were applied to the Finnish deaths from diseases, the number of alcohol-attributable deaths differed significantly from the figures presented here only in the case of cancers and strokes. Among men these amounted to 330 additional alcohol-attributable deaths. Because

Table 7 Life expectancies at age 15 years and the estimated loss in life expectancy due to alcohol abuse by sex, 1987–1993

	Life expectancy at age 15 years	Loss due to alcohol		
		Total	Deaths from diseases	Accidental and violent deaths
Men	56.9	2.0	0.8	1.2
Women	64.6	0.4	0.2	0.2
Difference (%)	7.7 (100)	1.6 (21)	0.6 (8)	1.0 (13)

the AAFs were not sex specific, the age-specific male: female ratios of alcohol-related mortality observed in this study were used to infer the number of additional alcohol-attributable deaths among women (65 deaths). These additional deaths increased the estimated loss in life expectancy due to alcohol consumption by 7% among both men and women (to 2.2 and 0.4 years). In accidental and violent deaths the AAFs of the CDC differed significantly from our estimates. These AAFs are closely connected to alcohol consumption patterns and usual drinking contexts in society. Researchers should be critical towards the mechanical application of AAFs to a different population than where the estimates are obtained from, particularly in accidental and violent mortality.

The results presented in this study show that alcohol consumption is a major determinant of male premature mortality and that a significant proportion of the difference in life expectancy between the sexes is attributable to alcohol abuse. They show that alcohol use is an important public health issue in Finland.

The author wishes to thank the Finnish Foundation for Alcohol Studies for their support and Tapani Valkonen and Tuija Martelin for their valuable comments on early versions of this paper.

This paper was presented at the 22nd Annual Alcohol Epidemiology Symposium of the Kettil Bruun Society for Social and Epidemiological Research on Alcohol in Edinburgh, UK, June 3–7, 1996 and at the International Conference of the European Association of Population Studies 'European Population: Variations on Common Themes' in Cracow, Poland, 11–13 June, 1997.

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Received 23 May 1996, accepted 17 September 1996