Alcohol-Related Mortality in California, 1980 to 1989

ABSTRACT

Objectives. This study sought to examine the impact of alcohol use and misuse on mortality in California during the 1980s.

Methods. Alcohol-Related Disease Impact estimation software and California vital statistics data were used to calculate alcohol-related mortality, mortality rates, and years of potential life lost. Statistical tests were applied to detect significant differences in death rates by sex and race/ethnicity. Time trends in death rates for a subset of alcohol-defined diagnoses were examined using regression analysis.

Results. An estimated 6.2% of all deaths for California residents during 1989 were related to alcohol, making it one of the top 10 leading causes of death. Injury diagnoses were major contributors to the total estimated number of alcohol-related deaths and years of potential life lost before age 65. Alcohol-related mortality rates were significantly higher for men and for Blacks. However, age-adjusted death rates for alcohol-defined diagnoses declined significantly from 1980 to 1989.

Conclusions. A structured database approach to analyzing mortality data represents an important advance for alcohol research that has implications for policy and program planning. Future refinements and enhancements to the disease impact estimation methodology will add precision to determining how alcohol use and misuse affect public health in California. (*Am J Public Health.* 1993;83:817–823)

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Introduction

Alcohol, the most prevalent substance of use and abuse in the United States, is responsible for pervasive health, social, and economic consequences.[1,2] In *Healthy People 2000*, the US Public Health Service targets the reduction of alcohol-related mortality as part of its national strategy for disease and injury prevention and health promotion.[3] During the 1980s, substantial progress was made toward increasing public awareness of the risks associated with alcohol use. Nationwide reductions in per capita alcohol consumption, alcohol-related motor vehicle accident fatalities, and alcoholic cirrhosis deaths have since been reported by the Centers for Disease Control and Prevention (CDC).[4]

In 1991, as part of ongoing analyses of the health status of its residents, the California Department of Health Services completed a review of deaths from a broad array of alcohol-related causes. The department examined time trends in deaths from those causes specifically defined as alcohol attributable (100% associated with alcohol use) for 1980 to 1989, and it provided a focused analysis of alcohol-related mortality for 1989 from all causes for which alcohol use and misuse are risk factors. Alcohol-related years of potential life lost (YPLL) were also calculated. Patterns of alcohol-related mortality and YPLL were examined by gender and race/ethnicity. Calculations were performed using Alcohol-Related Disease Impact (ARDI) software developed for the CDC.[5] This paper discusses the methodological issues in applying alcohol-attributable fractions to mortality data and the implications of study findings for future research efforts.

Methods

Data Sources

Mortality data by diagnosis, 5-year age group, race/ethnicity, sex, and place of residence were extracted from the California Department of Health Services' Death Statistical Master Files for 1980 through 1989. The cause of death used for tabulations was the underlying cause, defined as "(a) the disease or injury which initiated the train of events leading directly to death, or (b) the circumstances of the accident or violence which produced the fatal injury."[6] Race-, sex-, and 5-year age group–specific population data used to compute rates came from the California Department of Finance.[7] California abridged life table data were used to calculate YPLL based on current life expectancy.[8]

All calculations except for statistical tests were performed using the ARDI software, whose design features and methodology have been described elsewhere.[5,9]

Alcohol-Related Diagnoses and Attributable Fractions

Alcohol use and misuse are risk factors for numerous chronic diseases and injuries.[10–14] The alcohol-attributable frac-

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tion represents a best estimate of the proportion of disease or injury deaths that would be reduced if these risk factors were eliminated.[9] The set of fractions used in this study are those developed for ARDI software from epidemiological studies, clinical case series, and injury surveillance reports. In the absence of strong evidence that supports a causal link between alcohol use and a specific diagnosis, calculation of the alcohol-attributable fraction value may not be based on robust relative risk estimates and alcohol-exposure prevalence measures. The ARDI software developers and the CDC have made a concerted effort to present an unbiased review of data supporting or refuting a relationship between alcohol and a specific diagnosis, and the authors acknowledge that comorbidity and overlapping conditions do exist among many "alcohol-related" deaths.[2,5,9]

The alcohol-attributable fraction values used in this study may potentially overestimate or underestimate the number of deaths attributed to alcohol use and misuse in California. This is because no definitive work has been accomplished as yet using California data to derive more precise state-specific values.

Two types of diagnoses are distinguished in this study. Twelve diagnoses are definitionally related to alcohol use and misuse and are referred to as "alcohol-defined" diagnoses. All mortality and YPLL due to these diagnoses are directly attributable to alcohol, and the alcohol-attributable fraction value is set to 1.0 (100%). Twenty-four additional diagnoses, for which alcohol use and abuse are contributing risk factors, have alcohol-attributable fractions of less than 1.0 (range: 0.05 to 0.75). In this discussion, the expression "alcohol-related" diagnoses refers to the combination of all 36 diagnoses. Alcohol-related diagnoses, alcohol-attributable fraction values, and age ranges used in this study are presented in Table 1.

Alcohol-Related Measures

For each alcohol-related diagnosis, total numbers of deaths for men and women in 5-year age groups, for all races combined or for individual race/ethnic groups, were entered into ARDI. For each age-race-sex group, the number of deaths for each diagnosis was multiplied by the corresponding alcohol-attributable fraction value to calculate alcohol-related mortality:

$$\text{Alcohol-related mortality} = \text{Deaths} \times \text{Alcohol-attributable fraction}$$

ARDI also calculated age-specific and age-adjusted mortality rates using the direct method.[15]

Alcohol-related mortality for 1989 was calculated separately by sex and by race/ethnicity (Asian/Other, Black, Hispanic, White), and mortality rates were compared using the procedure outlined by Kleinman for testing the difference between independent rates.[16] A binomial approximation formula was used to calculate the 95% confidence interval of this difference. If the 95% confidence interval did not include the value zero, the difference between the two rates was considered statistically significant at the .05 level.

Alcohol-Defined Measures

For the subset of 12 alcohol-defined diagnoses, numbers of deaths were tabulated in 5-year age groups, by sex, for Blacks and non-Blacks for 1980 to 1989. Crude mortality rates and race- and sex-specific rates by cause of death were calculated for California residents aged 15 and over. Age-adjusted death rates were computed by the direct method, using the age distribution of the population of California in 1980 as the standard population.

A linear regression procedure was used to determine the statistical significance of trends in alcohol-defined mortality rates for the 10-year period.[17] If the 95% confidence interval of the slope of a linear equation fitted to the data by the method of least squares did not include the value zero, the null hypothesis that the slope equals zero was rejected at the .05 level of significance ($P < .05$) and the trend was considered statistically significant.

Results

Alcohol-Related Mortality, California 1989

An estimated 13 276 California residents died during 1989 from causes related to alcohol (Table 1), representing 6.2% of all deaths in the state. California, with 12% of the US population, contributes about 13% of the total alcohol-related mortality for the nation.[18]

Individual diagnoses that accounted for large proportions of the total estimated alcohol-related mortality were motor vehicle accidents (17.8%), alcoholic cirrhosis of the liver (11.4%), homicide (10.8%), suicide (8.0%), and cerebrovascular diseases (7.6%). These five individual causes of death accounted for more than half of the estimated alcohol-related mortality in California during 1989. Five diagnostic categories accounted for 90% of the total estimated alcohol-related mortality in California during 1989: unintentional injuries, digestive diseases, intentional injuries, malignant neoplasms, and cardiovascular diseases.

Overall, 45.7 deaths per 100 000 population were attributed to alcohol use and misuse in California during 1989. The estimated alcohol-related mortality rate for men was significantly greater than that for women ($P < .05$). Men had significantly higher death rates for 21 of the 36 alcohol-related diagnoses; women had a significantly higher rate in only one diagnostic category: cerebrovascular diseases.

Men accounted for 9058 (68.2%) of the alcohol-related deaths in California during 1989; women, for 4218 (31.8%). Among California residents, such deaths accounted for 8.0% of all deaths for men and 4.1% for women. For men, major causes of these deaths were motor vehicle accidents (1698 deaths, 18.7%), homicide (1166 deaths, 12.9%), and alcoholic cirrhosis of the liver (1090 deaths, 12.0%). For women, the largest contributors to alcohol-related mortality were motor vehicle accidents (663 deaths, 15.7%), cerebrovascular diseases (616 deaths, 14.6%), and alcoholic cirrhosis of the liver (425 deaths, 10.1%).

Examined by diagnostic category, the gender disparity was most pronounced for mental disorders and intentional injuries (Table 2). Men were three times more likely than women to die from alcohol-defined causes such as alcohol dependence syndrome and alcohol abuse, and nearly four times more likely to die from alcohol-related homicide and suicide.

Examined by race/ethnicity, the leading cause of alcohol-related mortality for the White, Hispanic, and Asian/Other groups was motor vehicle accidents (Table 1); the leading cause for Blacks was homicide. Statistical tests indicate that Blacks had a significantly higher death rate (66.6 per 100 000 population) than each of the other race/ethnicity groups ($P < .05$). Regarding specific causes of death, Blacks had significantly higher estimated alcohol-related mortality rates for homicide, alcohol dependence, alcoholic liver damage (unspecified), cancer of the esophagus, diabetes mellitus, and accidents caused by fires than each of the other race/ethnicity groups; Whites, for suicide and accidental falls; and Hispanics, for motor vehicle accidents.

TABLE 1—Estimated Alcohol-Related Mortality (ARM) and Mortality Rates[a] by Diagnosis, California, 1989

Diagnosis	ICD-9[b] Code	AAF[b]	Age	Male		Female		Black		White		Hispanic		Asian/Other		Total[c]	
				ARM	Rate	ARM	Rate	ARM	Rate	ARM	Rate	ARM	Rate	ARM	Rate	ARM	Rate
Malignant neoplasms																	
Cancer of the lip/oral cavity/pharynx	140–149	...[d]	35 & over	265	4.24*	130	1.87	36	4.58	310	3.38	20	0.95	28	2.46	395	2.99
Cancer of the esophagus	150	0.75	35 & over	467	7.47*	202	2.91	69	8.78*	522	5.69	44	2.09	34	2.98	669	5.07
Cancer of the stomach	151	0.20	35 & over	186	2.98*	115	1.65	27	3.44	197	2.15	41	1.95	36	3.16	300	2.27
Cancer of the liver/intrahepatic bile ducts	155	0.15	35 & over	79	1.26*	47	0.68	11	1.40	72	0.78	18	0.86	25	2.19	126	0.95
Cancer of the larynx	161	...[d]	35 & over	128	2.05*	31	0.45	15	1.91	128	1.40	18	0.86	5	0.44	159	1.20
Mental disorders																	
Alcoholic psychoses	291	1.00	15 & over	30	0.27*	10	0.09	5	0.31	27	0.19	6	0.13	2	0.10	40	0.18
Alcohol dependence syndrome	303	1.00	15 & over	357	3.27*	125	1.09	63	3.95*	304	2.16	101	2.15	14	0.68	482	2.15
Alcohol abuse	305.0	1.00	15 & over	96	0.88*	17	0.15	12	0.75	55	0.39	39	0.83	7	0.34	113	0.50
Cardiovascular diseases																	
Essential hypertension	401	0.076	35 & over	12	0.19	20	0.29	3	0.38	25	0.27	2	0.10	2	0.18	32	0.24
Alcoholic cardiomyopathy	425.5	1.00	15 & over	130	1.19*	21	0.18	37	2.32	90	0.64	22	0.47	2	0.10	151	0.67
Cerebrovascular disease	430–438	0.065	35 & over	396	6.33	616	8.86*	74	9.42	810	8.83	72	3.43	56	4.91	1013	7.67
Respiratory diseases																	
Respiratory tuberculosis	011–012	0.25	35 & over	29	0.46*	12	0.17	5	0.64	20	0.22	9	0.43	7	0.61	41	0.31
Pneumonia and influenza	480–487	0.05	35 & over	228	3.65	281	4.04	28	3.56	426	4.64	35	1.67	19	1.67	508	3.85
Digestive diseases																	
Diseases of the esophagus/stomach/duodenum	530–537	0.10	35 & over	58	0.93	57	0.82	8	1.02	94	1.02	7	0.33	7	0.61	115	0.87
Alcoholic gastritis	535.3	1.00	15 & over	8	0.07	2	0.02	1	0.06	7	0.05	2	0.04	0	0.00	10	0.04
Alcoholic fatty liver	571.0	1.00	15 & over	75	0.69*	35	0.31	9	0.56	86	0.61	11	0.23	4	0.20	110	0.49
Acute alcoholic hepatitis	571.1	1.00	15 & over	78	0.71*	32	0.28	9	0.56	77	0.55	21	0.45	3	0.15	110	0.49
Alcoholic cirrhosis of liver	571.2	1.00	15 & over	1090	9.97*	425	3.71	126	7.91	983	6.99	361	7.68	45	2.20	1515	6.76
Alcoholic liver damage, unspecified	571.3	1.00	15 & over	528	4.83*	157	1.37	83	5.21*	404	2.87	182	3.87	16	0.78	685	3.06
Other cirrhosis of the liver	571.5, 571.6	0.50	35 & over	353	5.65*	261	3.75	32	4.07	447	4.87	102	4.86	33	2.89	613	4.64
Acute pancreatitis	577.0	0.42	35 & over	39	0.62	35	0.50	7	0.89	58	0.63	6	0.29	2	0.18	74	0.56
Chronic pancreatitis	577.1	0.60	35 & over	10	0.16	7	0.10	2	0.25	13	0.14	1	0.05	1	0.09	17	0.13

Continued

TABLE 1—Continued

Diagnosis	ICD-9[b] Code	AAF[b]	Age	Male ARM	Male Rate	Female ARM	Female Rate	Black ARM	Black Rate	White ARM	White Rate	Hispanic ARM	Hispanic Rate	Asian/Other ARM	Asian/Other Rate	Total[c] ARM	Total[c] Rate
Unintentional injuries																	
Motor vehicle accidents	E810–E825	0.42	All ages	1698	11.85*	663	4.50	175	8.02	1393	8.15	644	9.16*	149	5.39	2360	8.12
Other road vehicle accidents	E826, E829	0.20	All ages	5	0.03	1	0.01	0	0.00	3	0.02	1	0.01	1	0.04	5	0.02
Water transport accidents	E830–E838	0.20	All ages	9	0.06	2	0.01	1	0.05	8	0.05	0	0.00	2	0.07	11	0.04
Air/space transport accidents	E840–E845	0.16	All ages	19	0.13	4	0.03	0	0.00	22	0.13	0	0.00	1	0.04	23	0.08
Alcohol poisonings	E860.0, E860.1	1.00	15 & over	25	0.23	4	0.03	1	0.06	22	0.16	5	0.11	1	0.05	29	0.13
Accidental falls	E880–E888	0.35	15 & over	214	1.96*	142	1.24	19	1.19	279	1.99*	44	0.94	15	0.73	356	1.59
Accidents caused by fires	E890–E899	0.45	All ages	72	0.50	54	0.37	19	0.87*	77	0.45	24	0.34	5	0.18	126	0.43
Accidental drownings	E910	0.38	All ages	134	0.94*	44	0.30	11	0.50	105	0.61	42	0.60	20	0.72	178	0.61
Other injuries	. . .[e]	0.25	15 & over	187	1.71*	64	0.56	22	1.38	164	1.17	52	1.11	13	0.63	251	1.12
Intentional injuries																	
Suicide	E950–E959	0.28	15 & over	814	7.45*	252	2.20	50	3.14	848	6.03*	119	2.53	49	2.39	1066	4.76
Homicide	E960–E969	0.46	15 & over	1166	10.67*	261	2.28	475	29.81*	408	2.90	477	10.15	67	3.27	1427	6.37
Metabolic disorders																	
Diabetes mellitus	250	0.05	35 & over	73	1.17	91	1.31	21	2.67*	105	1.14	28	1.33	10	0.88	164	1.24
Other diagnoses																	
Alcoholic polyneuropathy	357.5	1.00	15 & over	0	0.00	1	0.01	0	0.00	1	0.01	0	0.00	0	0.00	1	0.00
Excess blood alcohol level	790.3	1.00	15 & over	3	0.03	0	0.00	0	0.00	1	0.01	2	0.04	0	0.00	3	0.01
Total[c]				9058	63.21*	4218	28.63	1454	66.63*	8591	50.28	2551	36.28	680	24.62	13276	45.68

Source. California Department of Finance.[7]
[a]Numbers of deaths are by place of residence; rates are per 100 000 population.
[b]ICD-9 = *International Classification of Diseases*, 9th version[6]; AAF = alcohol-attributable factor.
[c]Subtotals are rounded independently and may not add to totals.
[d]AAF for females is 0.40; AAF for males is 0.50.
[e]ICD-9 codes include E800–E807, E900–E909, E911, E916–E928, E980–E989.
*Statistically significant difference ($P < .05$).

TABLE 2—Estimated Alcohol-Related Mortality and Male-to-Female Ratios, by Diagnostic Category and Sex, California, 1989

Diagnostic Category	Male		Female		Total[a]		Male : Female
	n	%	n	%	n	%	Ratio
Malignant neoplasms	1125	12.4	524	12.4	1649	12.4	2.1:1
Mental disorders	483	5.3	152	3.6	635	4.8	3.2:1
Cardiovascular diseases	538	5.9	657	15.6	1195	9.0	0.8:1
Respiratory diseases	257	2.8	293	6.9	549	4.1	0.9:1
Digestive diseases	2239	24.7	1010	23.9	3248	24.5	2.2:1
Unintentional injuries	2363	26.1	977	23.2	3339	25.2	2.4:1
Intentional injuries	1980	21.9	513	12.2	2493	18.8	3.9:1
Other alcohol-related diagnoses[b]	76	0.8	92	2.2	168	1.3	0.8:1
Total	9058	100.0	4218	100.0	13276	100.0	2.1:1

Source. California Department of Finance.[7]
[a]Subtotals are rounded independently and may not add to totals.
[b]Includes diabetes mellitus, alcoholic polyneuropathy, and excess blood alcohol level.

Alcohol-Related Years of Potential Life Lost, California 1989

During 1989, approximately 207 000 YPLL to age 65 and 372 000 YPLL to life expectancy were attributable to alcohol-related causes (Table 3). Each death represented a mean of 15.6 YPLL to age 65 and 28.0 YPLL to life expectancy. The major contributors to these alcohol-related years lost were the diagnostic categories of unintentional injuries, intentional injuries, and digestive diseases.

Men accounted for 77% of the total YPLL to age 65 and 71% of the total YPLL to life expectancy. On average, each male death was associated with 17.6 and 29.2 years lost, respectively, whereas each female death represented 11.1 and 25.3 years lost, respectively. For both sexes, alcohol-related injury deaths accounted for nearly 40 YPLL to life expectancy per death. Male-female YPLL differentials were greatest for intentional injury and mental disorder deaths (Table 2).

TABLE 3—Alcohol-Related Years of Potential Life Lost (YPLL) and Mean YPLL Per Death, by Diagnostic Category and Sex, California, 1989

Diagnostic Category	Male		Female		Total	
	YPLL	Mean	YPLL	Mean	YPLL	Mean
YPLL to age 65	159 819	17.6	46 761	11.1	206 580	15.6
Malignant neoplasms	3 686	3.3	1 203	2.3	4 889	3.0
Mental disorders	7 003	14.5	1 769	11.6	8 772	13.8
Cardiovascular diseases	1 997	3.7	828	1.3	2 825	2.4
Respiratory diseases	425	1.7	187	0.6	612	1.1
Digestive Diseases	24 119	10.8	7 930	7.9	32 049	9.9
Unintentional injuries	66 213	28.0	22 524	23.1	88 737	26.6
Intentional injuries	56 091	28.3	12 129	23.6	68 220	27.4
Other alcohol-related diagnoses[a]	285	3.8	191	2.1	476	2.8
YPLL to life expectancy	264 894	29.2	106 778	25.3	371 672	28.0
Malignant neoplasms	17 370	15.4	8 526	16.3	25 896	15.7
Mental disorders	13 064	27.0	4 382	28.8	17 446	27.5
Cardiovascular diseases	7 544	14.0	7 650	11.6	15 194	12.7
Respiratory diseases	2 734	10.7	2 965	10.4	5 699	10.4
Digestive Diseases	52 950	23.7	24 180	23.9	77 130	23.7
Unintentional injuries	92 037	39.0	37 207	38.1	129 257	38.7
Intentional injuries	78 044	39.4	20 461	39.9	98 505	39.5
Other alcohol-related diagnoses[a]	1 151	15.1	1 394	15.2	2 545	15.1

Source. California Department of Finance.[7]
[a]Includes diabetes mellitus, alcoholic polyneuropathy, and excess blood alcohol level.

Trends in Alcohol-Defined Mortality, California 1980 to 1989

Data on deaths from the subset of 12 alcohol-defined diagnoses for California residents aged 15 years and older were examined for 1980 to 1989 (Table 4). During this 10-year period, a total of 30 493 deaths from alcohol-defined causes were reported. The 3249 alcohol-defined deaths in 1989 represent 24.5% of the 13 276 alcohol-related deaths estimated for that year. Three of the 12 diagnoses comprised more than 80% of the total number of alcohol-defined deaths: alcoholic cirrhosis of the liver; alcoholic liver damage, unspecified; and alcohol dependence syndrome. If the category of alcohol-defined deaths had been included in the leading causes of death tabulations published for California, it would have ranked 10th in 1980 as well as in 1989.

The age-adjusted alcohol-defined death rate significantly declined from 17.2 deaths per 100 000 population aged 15 and over in 1980 to 13.7 deaths in 1989 (Table 5). The age-adjusted alcohol-defined death rate for men was significantly higher than that for women, and the rate for Blacks was significantly higher than that for non-Blacks ($P < .05$).

Although regression analysis indicated that trends in age-adjusted alcohol-defined mortality rates for the four major race-sex groups significantly declined ($P < .05$), these rates have not declined uniformly for each group: rates for Black men declined by 11.2 per 100 000 compared with 3.7 per 100 000 for non-Black men, 3.9 per 100 000 for Black women, and 2.8 per 100 000 for non-Black women.

TABLE 4—Alcohol-Defined Mortality and Mortality Rates[a] for Persons Aged 15 and Over, California, 1980 through 1989

Diagnosis	ICD-9[b] Code	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
Alcoholic cirrhosis of the liver	571.2	1714	1571	1591	1513	1518	1247	1399	1490	1501	1515
Alcoholic liver damage, unspecified	571.3	534	530	525	552	605	563	623	604	696	685
Alcohol dependence syndrome	303	388	404	410	424	428	454	413	440	485	482
Alcoholic fatty liver	571.0	182	152	140	132	140	118	119	96	138	110
Alcoholic cardiomyopathy	425.5	101	108	123	126	114	108	118	122	136	151
Alcute alcoholic hepatitis	571.1	106	110	96	98	102	88	77	112	106	110
Nondependent use of alcohol	305.0	81	81	85	90	76	76	85	79	95	113
Alcoholic psychoses	291	46	46	31	29	27	33	36	40	31	40
Accidental poisonings	E860.0, E860.1	28	36	21	29	27	31	30	34	34	29
Alcoholic gastritis	535.3	11	18	24	9	6	9	7	13	10	10
Excess blood alcohol level	790.3	0	0	0	0	0	0	2	0	2	3
Alcoholic polyneuropathy	357.5	1	0	1	0	1	0	0	2	1	1
Total number		3192	3056	3047	3002	3044	2727	2909	3032	3235	3249
Total rate		17.16	16.10	15.73	15.21	15.16	13.30	13.86	14.14	14.77	14.51

Source. California Department of Finance.[7]
[a]Numbers of deaths are by place of residence; rates are per 100 000 population aged 15 years and over.

TABLE 5—Age-Adjusted Alcohol-Defined Mortality Rates[a] for Persons Aged 15 and Over, by Race and Sex, California, 1980 through 1989

	Black			Non-Black[b]			All Races		
Year	Male	Female	Total	Male	Female	Total	Male	Female	Total
1980	50.41	15.54	31.84	24.07	9.09	16.15	25.73	9.51	17.17
1981	44.33	15.64	28.82	22.70	8.55	15.18	24.05	9.04	16.08
1982	45.53	14.63	28.81	22.05	8.21	14.71	23.47	8.67	15.61
1983	38.19	15.32	25.85	21.76	7.63	14.27	22.77	8.14	15.01
1984	40.90	14.77	26.69	21.56	7.48	14.10	22.69	7.95	14.88
1985	42.22	12.31	26.12	18.57	6.30	12.10	20.01	6.70	12.99
1986	42.04	13.32	26.56	19.06	6.72	12.58	20.52	7.18	13.51
1987	41.91	12.30	25.72	20.59	5.85	12.84	22.07	6.35	13.78
1988	37.83	12.47	24.07	21.12	6.63	13.48	22.49	7.11	14.37
1989	39.25	11.60	23.87	20.42	6.30	13.00	21.48	6.66	13.67

Source. California Department of Finance.[7]
[a]Rates are per 100 000 population aged 15 and over, adjusted by the direct method using the 1980 California population as the standard population.
[b]Includes White, Asian/Pacific Islander, Hispanic, American Indian, Filipino, Other, and Unknown.

Discussion

Alcohol is the most commonly used and abused substance in California, and this study examined its impact on mortality during the 1980s. Findings from analyses of vital statistics data indicate that more than 30 000 deaths among California residents from 1980 to 1989 can be attributed to 12 alcohol-defined causes, and that an estimated 13 000 deaths during 1989 alone can be attributed to all alcohol-related causes.

Alcohol-related deaths among California residents, particularly those deaths due to intentional and unintentional injuries, represent a premature mortality equivalent of more than 370 000 years based on current estimates of life expectancy. The economic costs of those lost years have been estimated to be between $11.7 billion and $14.4 billion annually.[2,19]

This study demonstrates that the risk of mortality from alcohol-related causes is disproportionate among different segments of the population. We found that men are twice as likely to die as a result of alcohol use and misuse, that alcohol-related mortality rates are significantly higher for Blacks, and that intentional and unintentional injuries are major contributors to premature mortality due to alcohol use and abuse in California for all race/ethnicity groups. However, some racial/ethnic disparities were apparent in the 1989 data: Whites had a significantly higher death rate for alcohol-related suicide; Blacks, for alcohol-related homicide; and Hispanics, for alcohol-related motor vehicle accidents. Age-adjusted death rates for Black men who died as a result of alcohol-defined causes from 1980 to 1989 were found to be consistently and significantly higher than those for all other race-sex groups examined.

It is useful to explore new techniques of analyzing vital statistics data in response to ongoing public health problems. However, several considerations must be kept in mind when interpreting the results. Major methodological limitations in computing alcohol-attributable fraction values and unresolved research issues in determining the effects of alcohol use and misuse are addressed elsewhere.[5,9] The authors acknowledge that applying a single alcohol-attributable fraction value to compute the number of deaths across all age, race/ethnicity, and sex categories for a specific cause of death is problematic. For most alcohol-related diagnoses, age-, race-, and sex-specific relative risks are not currently available for California. This leads to the assumption that the relative risk estimates developed for various underlying causes of death using national data can be applied to state-specific mortality data and generalized across age, race, and sex categories. Although the ARDI software has undergone intensive review by the CDC, the need for more precise alcohol-attributable fractions is clear; the software was intentionally designed to accommodate user-specified changes in these fractions produced from either an expert consensus-building process or definitive research studies.

Another problem is that alcohol-related conditions often are not reported as the underlying cause of death on the death certificate, the primary data source for this analysis.[20,21] The degree to which tabulations based on the listed underlying cause of

death underreport or exclude other intermediate and contributory alcohol-related causes is currently unknown. Because the data used in this study are based solely on the underlying cause of death, they may understate the overall impact of alcohol on mortality. Further studies using data on both underlying and multiple causes of death are needed to allow direct computation of alcohol-attributable fraction values based on California's own population composition, prevalence-of-use estimates, and morbidity and mortality experience.

One problem area has been in determining the extent of alcohol involvement in injuries. Motor vehicle accidents are the leading cause of alcohol-related mortality in California, accounting for nearly 20% of the total estimated alcohol-related deaths for 1989. Death rates for alcohol-involved traffic fatalities have declined since 1987, and California is expected to meet the national health status objective for the year 2000 of 8.5 per 100 000 population.[22,3] Statistics released by the California Highway Patrol for 1990 show a 5.1% decrease in the number of people killed in alcohol-involved accidents from 1989.[23] Using highway patrol data to adjust the default ARDI alcohol-attributable fraction value for alcohol-related motor vehicle accident deaths (0.42) to correspond more closely with California's experience (0.46) represents one enhancement to the disease impact estimation methodology the California Department of Health Services is considering.

Caution in interpreting trend data by race/ethnicity is also warranted. Changes in the criteria for reporting race/ethnicity on the California death certificate, as well as in the enumeration of persons of Hispanic origin during the 1980 census, may contribute to lower numbers of deaths and lower death rates for Hispanics compared with Whites.[18] Multidisciplinary research efforts to address measurement problems associated with comorbidity, the reporting of alcohol-related diagnoses on death certificates, and racial/ethnic misclassification of decedents are essential for improving research methodologies based on vital statistics data.

Despite current limitations, the ARDI software provides a rapid data development and analysis tool that health professionals can use to promote data sharing at the national, state, and local levels. Its structured database approach has the potential for providing comprehensive descriptions of the health and economic consequences of alcohol use and misuse and for promoting standardization of data collected across study populations. Collaborative research and analysis efforts will be essential to aid in quantifying the impact of alcohol use and misuse on mortality, and to serve as a basis for formulating policies and implementing effective prevention strategies for reducing alcohol-related deaths in California. Continuing evaluation of mortality data would do much to raise public awareness of alcohol as a major component of the substance abuse problem and of the costly and deadly outcomes associated with its use and misuse. □

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