Alcohol as a Risk Factor for Injuries or Death Due to Fires and Burns: Review of the Literature

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Synopsis

The findings in 32 studies on alcohol and injuries and deaths attributed to fires and burns were analyzed in detail. The studies, all in English, were published between 1947 and 1986. Most of them were descriptive and reported on the percent of the victims who were exposed to alcohol. Eight of the nine best descriptive studies indicated that alcohol exposure was more likely among those who died in fires ignited by cigarettes than those attributable to other causes. It can be concluded that there is substantial, although not definitive, evidence that alcohol plays a role in the etiology of fire and burn injuries and deaths.

FIRES AND BURNS RANK FOURTH as a cause of unintentional deaths from injuries in the United States, surpassed only by vehicular accidents, falls, and drownings. About 6,000 deaths annually are attributed to fires and burns, excluding around 500 deaths associated with post-crash vehicular and airplane fires (*1*). In 1983, the rate of years of potential life lost per 100,000 population (YPLL rate) for fire and flames was 73.9 for men and 47.8 for women. These rates were surpassed only by those for motor vehicle crashes and drownings (*2*).

About three-fourths of the fatalities from fires and burns result from conflagrations. Most deaths from conflagrations—about 85 percent—are the result of house fires (*3*). Birky and Clarke found that 47 percent of Maryland residential fires, and 45 percent of the fatalities, were associated with cigarettes (*4*). Death from house fires can occur in several ways. About 66 percent are attributable to toxic gases, 28 percent to burns, 4 percent to falls or building collapse, and another 2 percent unspecified (*1*). Fire and burn fatalities also result from ignition of clothing, hot liquid or steam, explosions, chemicals, and electric current. Estimates of the distribution of fire fatalities by site and by cause of fire are presented in figure 1.

Each year, more than a million burn injuries require medical attention. Approximately 300,000 are treated in emergency rooms. Ninety thousand persons are admitted to hospitals, accounting for more than a million hospital days, with an average length of stay of 12 days per admission (*1*).

It is reasonable to suspect that alcohol plays a role in the etiology of injuries and death due to fires and burns. The evidence of an association between drinking and vehicular accidents is well established. Although it is less conclusive, there is also evidence suggesting that alcohol contributes to unintentional injuries resulting from falls and drownings (*5,6*). Moreover, there are several mechanisms by which alcohol might increase the risk for fire and burn injuries. Intoxication may contribute directly to the cause of a fire, as for example, when a victim becomes unconscious while smoking. Or intoxication may prevent a victim from hearing, or correctly interpreting, alarms of fires caused by others. Similarly, excessive alcohol consumption may inhibit appropriate response, thereby preventing escape. By affecting judgment, alcohol consumption may decrease avoidance of inherently dangerous situations involving burn-causing agents or, by affecting balance, exposure to alcohol may cause burns resulting from falls into, or against, sources of thermal energy. There is some evidence that blood alcohol acts synergistically with toxic gases, such as carbon monoxide, in accelerating behavioral incapacitation (*7*). Several studies suggest that a history of alcohol abuse decreases the probability of surviving serious burns once they have occurred (*8,9*).

This literature review examines whether alcohol consumption may contribute to injuries and death due to fires.

Figure 1. Estimates of annual U.S. fire fatalities by agent, site, and cause of death

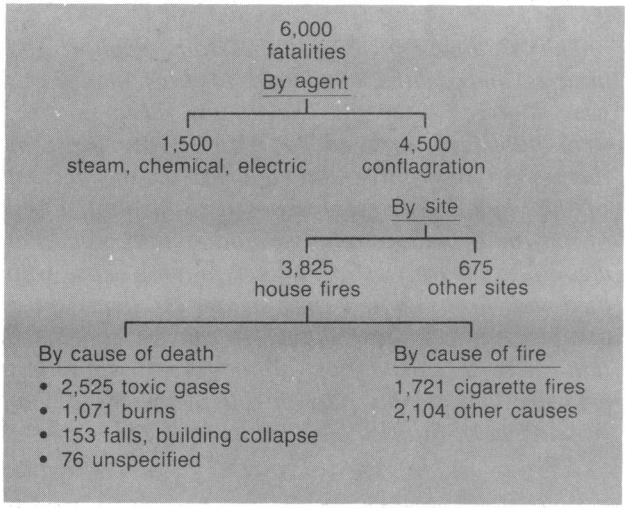
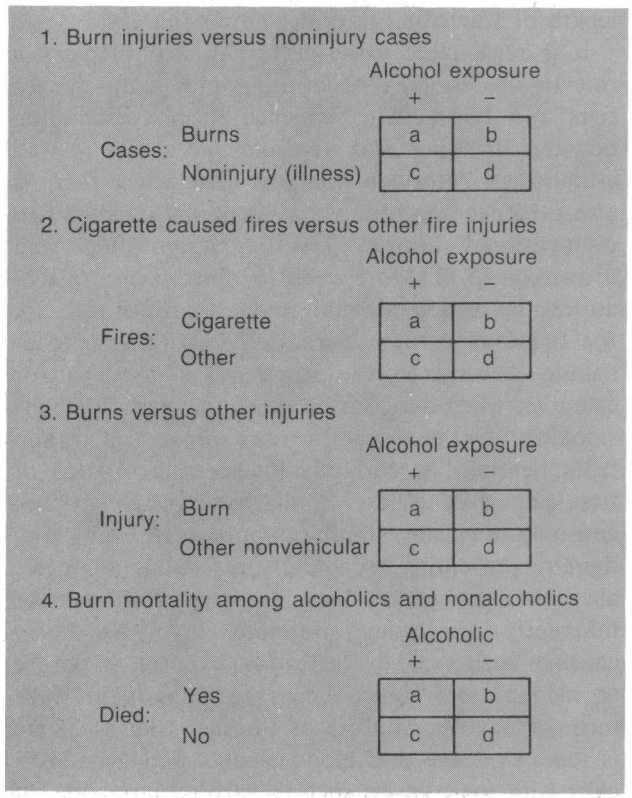


Figure 2. Estimates of risk for alcohol exposure and fire-burn injuries and fatalities



Methods

To accomplish this, we attempted to review the literature, published in English over the last 35 years, on the association between alcohol and injuries due to fires and burns.

Literature review. Bibliographic searches were performed, using Index Medicus (1966 through January 1986) and Psychological Abstracts (1967 through January 1986) data bases. Index Medicus was accessed (English and English language abstracts, humans only) with the following key words: (*a*) alcohol drinking, alcoholic beverages, alcoholism, and (*b*) morbidity, mortality, accidents, accident prevention, accident proneness, accidents home, accidents occupational, burns, and fires. Psychological Abstracts was accessed (English only) with the key words: (*a*) alcohol intoxication, chronic alcohol intoxication, alcoholism, problem drinking and (*b*) accident proneness, hazards, home accidents, injuries, accidents, and industrial accidents. An additional computer literature search was performed by the National Clearinghouse for Alcohol Information.

Index Medicus was searched manually for the period 1950 through 1985. We reviewed the tables of contents and subject indices, or both, for the period 1974 through 1985 for the Journal of Studies on Alcohol, American Journal of Public Health, Public Health Reports, and the MMWR. Manual searches of the tables of contents and indices were also made for the Journal of Safety Research (1969 through 1985), and Accident Analysis and Prevention (1969 through 1985).

The reference lists of papers found through these searches provided additional reports. For the period between 1950 and 1967 the bibliographies of previous literature reviews on alcohol and casualties (*10,11*) were particularly helpful.

Analysis. Most of the papers located reported on studies conducted in North America. The majority were descriptive, limiting analysis to reports of the proportion of fire and burn victims exposed to alcohol. Few investigators reported on alcohol exposure among control populations. Without information on alcohol exposure among nonburn controls, inferences about the causal role of alcohol cannot be drawn. Many of the reports reviewed, however, contained information on alcohol exposure among different kinds of burn cases (for example, job-related burns and cigarette and noncigarette fire fatalities), among different kinds of injury cases, and among burn cases and illness cases. When such data were provided, it was possible to generate comparison groups and thus develop crude estimates of risk (odds ratios) for alcohol exposure and fire and burn injuries or deaths. Examples of these calculations are presented in figure 2. Methods for calculating odds

Table 1. Alcohol exposure among persons who died and those injured in fires

Senior author	Year report published	Locale	Ascertainment	Site	Alcohol measure	Age group (years)	Number	Positive for alcohol		Risk OB:EX or OR [1]
								Number	Percent	
Fire fatalities										
Joss	1947	Minneapolis	Complete	All	BAC	≥15	5	4	80	...
Bowden	1958	Victoria, Australia	Part	House	BAC	≥15	22	19	86	...
Berfenstam	1969	Sweden	Complete	House	Unspecified	≥15	117	30	26	...
Waller	1972	Sacramento	Complete	All	BAC	≥15	22	14	64	7.9
Schmidt	1972	Toronto	Complete	All	History	Adults	13	...	...	9.7
Hollis	1973	Memphis	Complete	All	BAC	≥16	29	24	83	...
Berl	1976	Maryland	Part	All	BAC	≥20	64	37	58	...
Levine	1977	Baltimore	Part	All	BAC	All	34	11	32	...
Haberman	1978	New York City	Complete	All	BAC	≥18	28	15	54	...
Gerson	1979	Ontario	Complete	All	Unspecified	≥18	183	57	31	...
Berl	1979	Maryland	Part	All	BAC	≥20	299	176	59	...
Poyner	1980	England	Sample	House	Unspecified	≥15–≤64	28	11	39	...
Mierley	1983	Baltimore	Complete	House	BAC	≥15	33	13	39	...
Trier	1983	Denmark	Complete	All	History	≥20	69	16	23	...
Trier	1983	Denmark	Complete	All	BAC	≥20	33	14	42	...
Combs-Orme	1983	St. Louis	Complete	All	History	Adults	7	...	...	9.2 M 98.0 F
Sikes	1983	Fulton County, GA	Complete	All	BAC	All	10	6	60	
Gormsen	1984	Copenhagen	Complete	All	BAC	All	169	85	50	...
Metro	1967	United States	Complete	Home	Unspecified	15–64	233	20	9	...
Conway	1986	New Mexico	Complete	All	BAC	≥10	128	55	43	...
Birky	1981	Maryland	Complete	Home	BAC	All	530	211	40	...
Burn injuries (emergency room visits or hospital admissions)										
Ritenbury	1965	Virginia	Part	All	Unspecified	All	1358	268	20	...
Kirkpatrick	1967	Boston	Complete	Home	BAC	≥20	2	1	50	...
Maisels	1968	Prescott, UK	Complete	All	Unspecified	≥15	732	9	1	...
Wechsler	1969	Boston	Complete	Home	Breathalizer	≥16	31	5	16	...
MacLeod	1970	Melbourne, Australia	Complete	All	Unspecified	Unspecified	723	65	9	...
Lang	1976	Milwaukee	Part	All	BAC	Adult	83	29	35	...
McArthur	1976	Boston	Complete	All	Self report	Adult	155	26	17	...
Noyes	1979	Iowa City	Complete	All	Self report	Adult	67	11	16	...
White	1983	Birmingham, UK	Complete	All	Self report	≥16	142	18	13	...
Vogtsberger	1984	San Antonio	Complete	All	Unspecified	≥15	70	25	46	...
Stephens	1985	San Francisco	Complete	All	Breathalizer	>18	11	2	18	[2]2.8

[1] OB:EX = observed to expected deaths; OR = odds ratio.

[2] 95 percent confidence interval = .62, 12.17.

ratios and confidence intervals are presented in figure 3.

Results

The 32 studies identified (table 1) may be distinguished in several important respects. First, 21 reported on fire fatalities and 11 on burns requiring medical attention (emergency room (ER) visits, hospital admissions, or both). Second, studies differ by ascertainment. Twenty-six reports presented data for a complete (or nearly complete) series of events; six involved partial series resulting, for example, when blood alcohol determinations are made for some, but not all, persons. Third, 17 studies quantified alcohol exposure in terms of blood alcohol concentration (BAC); the remaining 15 studies determined exposure by self-reports, history of abuse, or other unspecified measures. Fourth, eight studies reported only on accidents occurring in the home; the remaining studies included accidents at all sites. Finally, most studies were descriptive, reporting the percent of victims who were exposed to alcohol. A few studies that presented exposure among control groups permit crude estimates of the association between alcohol and fire and burn injuries.

Fire fatalities. Nineteen studies (*4,12–28*) provided data on the percent of persons exposed to alcohol among those who died in fires. These reports are summarized in table 1. Among these studies, percentages range from 9 to 86 percent. The median value is 46.5 percent.

Figure 3. Methods of calculating odds ratios and confidence intervals

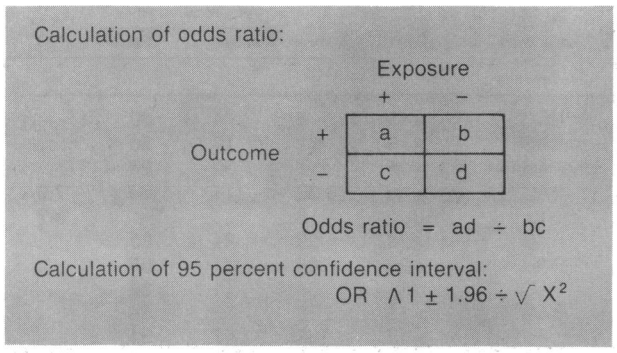


Table 2. Alcohol exposure among persons who died in fires with complete ascertainment and blood alcohol concentrations (BAC) of 0.10 percent or greater, data from 10 studies

Senior author and year report published	Age group (years)	Number	BAC ≥ 0.10 percent	
			Number	Percent
Waller (1972)	≥15	22	14	64
Joss (1947)	≥15	5	3	60
Sikes (1983)	All	10	6	60
Hollis (1973)	≥16	29	16	55
Gormsen (1984)	All	169	85	50
Haberman (1972)	≥18	28	13	46
Conway (1986)	≥10	128	55	43
Trier (1983)	≥20	33	14	42
Mierley (1983)	≥15	33	13	39
Birky (1981)	All	530	196	37

Among the subset of 10 studies reporting on a complete series and specifying exposure as BACs of 0.10 percent or greater (*4,12,16,17,20,24–28*) the percentages of those exposed to alcohol narrows, with a range from 37 to 64 percent (table 2). The median value is 48 percent.

Two studies of fatalities (*29,30*) provided estimates of risks for fire deaths among alcoholics relative to the general population (table 3). Schmidt and deLint followed the 1- to 14-year mortality experience of 6,478 alcoholics treated in Toronto between 1951 and 1963 (*29*). Of these, 13 died in fires. The expected deaths for a population comparable in age and sex (based on Ontario mortality statistics) was 1.34, yielding a ratio of observed to expected deaths of 9.7. In a similar study, Combs-Orme and coworkers followed the 6- to 9-year mortality experience of 1,289 treated alcoholics in St. Louis (*30*). Two men and five women died in fires. The expected deaths for men and women, based on St. Louis mortality data, were .217 and .051, respectively. Thus, the ratio of observed to expected fire deaths was 9.2 for men, and 98 for women, with an overall ratio of 26. Neither study indicated whether the alcoholic was drinking prior to the fatal fires.

In another general population study (table 3), Waller investigated a series of nonvehicular deaths occurring in Sacramento, CA, between 1965 and 1967 (*16*). Twenty-two deaths were attributed to fires, of which 14 (64 percent) had BACs in excess of 0.10 percent. Waller matched fire fatalities with deaths occurring from natural causes. Of the matched deaths, 67 persons (18 percent) out of 371 had BACs ≥ 0.10 percent, yielding a crude odds ratio for alcohol exposure and fire fatality of 7.9 (95 percent confidence limits: 3.6, 17.33).

Burn injuries (ER visits and hospital admissions). Investigators in 11 studies (*8,31–40*) reported on burn injuries requiring medical treatment (table 1). Percents of persons positive for alcohol ranged from 1 to 50 percent, with a median value of 17 percent.

Burn injury versus noninjury (illness) cases (ER visits). Because Stephens reported on alcohol exposure among all ER visits, it is possible to estimate the crude risk for fire and burn injuries, relative to persons who were ill (*40*). Of 11 burn victims, 2 (18 percent) had BACs ≥ 0.10 percent; of 1,284 noninjury ER patients, 96 (7 percent) had BACs ≥ 0.10 percent (crude odds ratio: 2.75; 95 percent confidence limits: .62, 12.17).

Risk for cigarette fire versus other fire injuries. Eight studies provided data on the frequency of alcohol exposure among those who died by cause of fire (*14,15,17,18,21,24,25*). Accordingly, it is possible to estimate the risk of alcohol exposure for those who died in fires attributed to cigarettes relative to fires with other causes. These studies are presented in table 4. Six investigators reported that alcohol exposure was more frequent among victims in cigarette-caused fires than among victims in fires not attributed to cigarettes (*14,15,17,18,24,25*). Crude odds ratios ranged from 18.5 (95 percent confidence limits: 6.9, 49.9) to 1.96 (confidence limits: .60, 6.4) (*14,25*). Gerson (*21*), in contrast, reported alcohol exposure was less frequent among cigarette fire fatalities than among other fire deaths (crude odds ratio: .69; 95 percent confidence limits: 30, 1.6). Only three studies yielded odds ratios significant at $P = .05$ (*14,15,18*).

Table 3. Risk estimates for alcoholics of fire deaths relative to the general population, data from 3 studies

Senior author and year report published	Exposure measure	Fire deaths observed	Comparison group	Risk OB:EX or OR
Schmidt (1972)	Alcoholism	13	Ontario	13 ÷ 1.34 = 9.7
Combs-Orme (1983)	Alcoholism	7	St. Louis	7 ÷ .269 = 26
Males	Alcoholism	2	St. Louis	2 ÷ .217 = 9
Females	Alcoholism	5	St. Louis	5 ÷ .051 = 98.0
Waller (1972)	BAC 0.10	22	Disease fatalities	7.9 (3.6, 1733)

NOTE: BAC = blood alcohol concentration. OB:EX = observed to expected deaths; OR = odds ratio.

Table 4. Risk estimates for alcohol-exposed persons who died in smoking related fires and for those who died in other fires, data from 8 studies

Senior author and year report published	Age group (years)	Total deaths	Smoking fire deaths			Other fire deaths			Odds ratio	95 percent confidence interval
			Number of persons	Alcohol exposure	No exposure	Number of persons	Alcohol exposure	No exposure		
Metro Life (1967)	≥15	233	67	17	50	166	3	163	18.5	[1] (6.9, 49.9)
Berfenstam (1969)	≥15	117	52	19	33	65	11	54	5.83	[1] (1.2, 6.5)
Hollis (1973)	16–60	29	16	14	2	13	10	3	2.1	(.29, 15.0)
Berl (1976)	All	99	50	31	19	49	12	37	5.0	[1](1.0, 11.7)
Gerson (1979)	≥19	116	41	11	30	75	26	49	.69	(.30, 1.6)
Mierley (1983)	≥15	33	22	11	11	11	2	9	4.5	(.80, 25.4)
Trier (1983)	≥20	69	39	11	28	30	5	25	1.96	(.60, 6.4)
Trier (1983)	≥20	33	18	9	9	15	5	10	2.0	(.47, 8.6)

[1] Significant at the $P = .05$ level.

Alcohol exposure for burns versus other injuries. Six studies allow risk estimation of fire and burn injuries relative to other nonvehicular accidents (*14,16,23,26,33,40*). Findings are not consistent. The results of these studies are summarized in table 5. Of 22 fire deaths reported by Waller, 14 persons (64 percent) had been exposed to alcohol (BACs ≥ 0.10 percent); of 80 nonvehicular unintentional fatalities, 24 persons (30 percent) had been exposed to alcohol (*16*). Thus, fire victims were four times as likely to have consumed alcohol as those who died in other nonvehicular accidents (crude odds ratio: 4.1; 95 percent confidence limits: 1.6, 10.7). Sikes (*26*) found that in 10 fire deaths in Fulton County, GA, 6 persons (60 percent) had BACs ≥ 0.10 percent; in 61 other nonvehicular injury deaths, 21 persons (34 percent) were exposed to alcohol (crude odds ratio: 2.9; 95 percent confidence limits: .73, 11.2). Poyner (*23*), reporting on home accidents only, found that among 28 deaths from fires, alcohol was a factor in 11 (39 percent); in 252 other home accident cases, alcohol was a factor in 61 (24 percent). These data suggest that fire victims were twice as likely to have been exposed to alcohol as were the victims of other home accidents (crude odds ratio: 2; 95 percent confidence limits: .91, 4.4).

The results of the Metropolitan Life fatality study conflict with those of the other studies in this category (*14*). Of 223 deaths caused by home fires and burns, 20 (9 percent) were associated with alcohol exposure; whereas, of 614 deaths in other home accidents, 117 (20 percent) were associated with alcohol (crude odds ratio: .4; 95 percent confidence limits: .25, .65).

Wechsler and coworkers and Stephens provided data for comparing alcohol exposure among emergency room patients (*33,40*). Wechsler reported on home accidents only. Of 31 persons with burn injuries, 5 (14 percent) were positive for alcohol compared to 126 of 582 persons (22 percent) in other home accidents (crude odds ratio: .70; 95 percent confidence limits: .27, 1.57). Thus, Wechsler's findings for home injuries are compatible with Metropolitan Life's findings for home fatalities: alcohol exposure is less among fire and burn victims than among other accident cases. In contrast, Stephens reported on a series of all accident victims presenting at a San Francisco, CA, emergency room (*40*). Of 11 with fire and

Table 5. Risk estimates for alcohol exposure in 6 studies comparing injuries and deaths in fires relative to other types of accidents

Senior author and year report published	Age group (years)	Outcome	Comparison group	Total persons	Fire-burn group alcohol exposure		Comparison group alcohol exposure		Odds ratio	95 percent confidence interval
					Yes	No	Yes	No		
Waller (1972)	≥15	Fatal	Nonvehicular accidents	102	14	8	24	56	4.1	(1.6, 10.7)
Sikes (1983)	All	Fatal	Nonvehicular accidents	71	6	4	21	40	2.9	(.73, 11.2)
Poyner (1980)	15–64	Fatal	Home accidents	280	11	17	61	191	2.0	(.9, 4.4)
Metro Life (1967)	15–64	Fatal	Home accidents	847	20	213	117	497	.40	(.25, .65)
Wechsler (1969)	≥16	Injury	Home accidents	613	5	26	126	456	.70	(.27, 1.57)
Stephens (1985)	All	Injury	All	523	2	9	80	432	1.2	(.25, 5.67)

Table 6. Survival of serious burn patients according to alcoholism status, 2 studies

Outcome	Ritenbury 1965	Crikelair 1968
Total burn patients	1,358	103
Alcoholics:		
Died	157	9
Survived	11	19
Not alcoholics:		
Died	113	8
Survived	1,077	67
Odds ratio	12.2	3.9
Confidence interval	9.3, 16.1	1.4, 11.2

burn injuries, 2 (18 percent) had BACs ≥ 0.10 percent compared to 80 of 512 (16 percent) of other accident victims, including those with traffic injuries (crude odds ratio: 1.2; 95 percent confidence limits: .25, 5.67). Only the Waller study and the Metropolitan Life study yielded odds ratios significant at $P = .05$ (*14,16*).

Risk of mortality from burns among alcoholics versus nonalcoholics. Two studies, summarized in table 6, suggest that, among patients hospitalized with serious burns, the case fatality rate for the alcoholics is higher than for the nonalcoholics (*8,9*). Ritenbury and coworkers reviewed 1,358 burn patients admitted to the Medical College of Virginia hospitals between 1949 and 1962 (*8*). There was a history of alcoholism, liver disease, or both, for 157 (58 percent) of the 270 who died and for 111 (10 percent) of the 1,088 survivors. Accordingly, patients with a history of alcoholic liver disease were 12 times more likely to succumb to burn injuries than other burn patients (crude odds ratio: 12.2; 95 percent confidence limits; 9.3, 16.06). Pre-existing alcoholism, however, was not a significant variable in a least squares regression analysis involving 15 independent variables. The interaction term for alcoholism by age was significant, suggesting that the association between alcoholism and mortality is due to the age of victims. Crikelair and coworkers studied 103 adult burn patients admitted to Harlem Hospital between 1966 and 1967 (*9*). Of the 17 burn victims who died, 9 (53 percent) were alcoholics. Of the 86 victims who survived, 19 (22 percent) were alcoholics (crude odds ratio: 3.97; 95 percent confidence limits: 1.4, 11.2).

Discussion

Nearly half of those who die in fires are legally drunk at the time of death. This observation is based on the relatively consistent results among the 10 reports with complete ascertainment and blood alcohol tests above 0.10 percent (table 2). Further, other studies of fire fatalities had a comparable median value. Nevertheless, inference regarding the causal role of alcohol in fire fatalities requires information about alcohol exposure among the population not experiencing fatal fires or burns. While this information is not directly available, clearly less than 50 percent of the general population are intoxicated at any given time, suggesting that alcohol exposure is a risk factor for fire deaths.

This conclusion is supported by studies with comparison groups, but not without qualification (*16,19,30*). Waller reported that persons who died as a result of fire and burn injuries were more likely to have been exposed to alcohol at the time

of death than were matched disease fatalities (*16*). It could be argued that this finding is confounded by the possibility that persons about to die from illness are less likely to be drinking than the general population. Schmidt and deLint and Combs-Orme and colleagues reported that alcoholics were more likely than comparable members of the general population to die from fires and burns (*29*, 30). Again, these findings are open to question; the evidence that the alcoholics were exposed to alcohol at time of death is circumstantial (based upon a history of alcohol abuse). Moreover, the association between alcoholism and mortality from fires may be confounded by social and economic variables; alcoholics may be disproportionately exposed to environments subject to fires; for example, poor housing (*11*).

Support for the hypothesis that alcohol is a risk factor for fire and burn fatalities also comes from the studies that compare alcohol exposure among victims of different kinds of accidents (*14,16,23, 26*). Three yield odds ratios indicating that victims of fires and burns were more likely to have been exposed to alcohol than those in other nonvehicular accidents (*16,23,26*). This evidence is persuasive, because presumably the persons who have other kinds of fatal, nonvehicular accidents are more likely to be exposed to alcohol than is the general population. It is not clear why the results of the Metropolitan Life study are discordant (*14*). But, in this study the subjects were life insurance policy holders, and therefore they may represent a more affluent population than the coroner cases reviewed by Waller, Sikes, and Poyner (*16,23,26*). Also, ascertainment of alcohol exposure was based upon history and reports of the victims' activities at the time of death, as opposed to BACs.

A second conclusion, derived from the studies of nonfatal treated burns cases, is that alcohol plays a less important role in less serious fire and burn injuries. The median value of 16 percent for the percentage exposed to alcohol among these studies is considerably lower than the 50 percent for the fatality studies. This inference, however, may be confounded by the fact that the measure of alcohol exposure among those who died is likely to be BAC, whereas the measure among nonfatal burns is likely to be self-report.

A third conclusion is that alcohol is probably an important risk factor for fire and burn injuries associated with cigarette smoking. Nine studies provide data for comparing fatalities from fires attributed to cigarettes to fatalities from fires attributed to other causes. Of these, the results of seven studies indicated that alcohol exposure was more frequent among victims in cigarette fires (*14,15,17,18,24,25*). This evidence is convincing, because the comparison groups are also victims of fires and are therefore more apt to be similar to cigarette fire victims than to the other "control" populations. In only one study were conflicting results reported (*21*).

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A fourth conclusion is that among the population with serious burns, patients with a history of alcohol abuse may be more likely to succumb to their injuries. This observation is suggested by the studies by Ritenbury and coworkers and Crikelair and coworkers (*8,9*). This association has a clinical basis. Alcoholism can impair liver function (cirrhosis), and the liver plays a role in recovery from burns. In addition, alcoholics have an increased susceptibility to bacterial infections due to alcoholic damage to the immune system. Since infection is one of the most common immediate causes of death among burn patients, alcoholics are at increased risk for succumbing to burns. However, the association between alcoholism and burn mortality may be confounded by age, as suggested by the results of Ritenbury's multivariate analysis.

None of the studies reviewed provided conclusive evidence of a causal association between alcohol exposure and fire and burn injuries. Of the 32 studies reviewed, only 2 present estimates of risk (*29,30*). Other estimates of risk have been generated by the authors from data provided by studies; however, it must be emphasized that these estimates are crude, unadjusted for possible confounders such as age, sex, and socioeconomic status. There is, however, overall consistency among the studies reviewed and, unless they share some systematic bias, in aggregate they provide substantial, if not definitive, evidence for the conclusions summarized previously.

Of particular importance is the conclusion that alcohol, in combination with cigarette smoking,

presents a serious risk for fire and burn injuries. Because house fires involving cigarettes account for approximately one-third of fire fatalities, further research on this association is warranted. The rarity and complexity of events leading to casualties make well-designed case-control studies of injuries and injury deaths difficult to perform. As Roizen has suggested, "the research may end up looking for matched controls in a particular neighborhood who are on a rickety ladder in a high wind" (*41*). Nevertheless, the pedestrian traffic accident study of Haddon and coworkers and the falls study of Honkanen and colleagues demonstrate that well-conceived investigations of the role of alcohol in unintentional injuries and deaths are possible (*42,43*). These investigators compared alcohol exposure among injured persons (cases) and uninjured persons (controls). Controls were identified by selecting persons at the location of each injury who appeared comparable to the case patient in terms of demographic characteristics (for example, age, sex) and activity at the time of the injury (for example, direction of movement).

Studies of comparable rigor should be conducted on alcohol involvement in fire and burn injuries. These studies should be performed prospectively to insure accurate ascertainment of the level of alcohol exposure among persons who serve as both cases and controls. Moreover, details on the sequence of events leading to injuries and deaths in house fires are necessary because persons other than those responsible for the fires are often the victims. As well, careful analysis of the circumstances surrounding these fires could help elucidate the independent, and possibly synergistic, contributions of alcohol and cigarette smoking to fire and burn injuries.

A study of the value of smoke detectors in reducing alcohol-related fire and burn injuries would be particularly useful. Public policy interventions, such as smokeless cigarettes and regulations concerning installation of smoke detectors and the flammability of materials used for bedding, chairs, and sofas, have been proposed (*44*). The case for these interventions would be strengthened by more definitive evidence on the relationships among alcohol, smoking, and fire and burn injuries.

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Persistence of Personal Health Practices over a 1-Year Period

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Synopsis

A large amount of research has been devoted to identifying the psychosocial and demographic correlates of personal preventive health practices. An additional factor to consider, however, is the stability of personal health practices over time. At least over short periods, the prediction of current behavior may be substantially improved by having information about an individual's previous performance of the practice being studied. To address this question, data from Wave 1 (1979) and Wave 2 (1980) of the National Survey of Personal Health Practices were examined. Using nine health practices as indices, performance reported at Wave 1 was used to predict performance of that same practice as reported at Wave 2, 1 year later. A two-step analysis strategy was followed to estimate how much more variance could be explained when the behavioral reports were added to a list of psychosocial and demographic predictors.

Results showed that over the 1-year interval, the Wave 1 behavioral reports were by far the strongest predictors of their corresponding measures obtained at Wave 2. The explained variance was increased substantially for most of the nine health practices, suggesting a strong tendency for persistence of the practices. Psychosocial and demographic variables tended to account for much smaller amounts of variance and often dropped out of the prediction equation when the Wave 1 behavior report was entered in the second step of analysis. Health practices other than the corre-