**Introduction**

Excessive alcohol use accounted for an average of one in 10 deaths among working-age adults (aged 20–64 years) in the United States each year during 2006–2010 (1), and cost the United States $223.5 billion in 2006 (2). Binge drinking, defined as consuming four or more drinks for women or five or more drinks for men on an occasion, was responsible for more than half of these deaths (1) and three fourths of the economic costs (2). Binge drinking also is responsible for many health and social problems, including alcohol poisoning (3). Yet, approximately 38 million U.S. adults report binge drinking an average of four times per month, and consume an average of eight drinks per binge episode (4). Most binge drinkers (90%) are not alcohol dependent (5).

Alcohol poisoning is typically caused by binge drinking at high intensity. Such drinking can exceed the body's physiologic capacity to process alcohol, causing the blood alcohol concentration to rise. The clinical signs and symptoms of alcohol intoxication are progressive, and range from minimal impairment, decreased judgment and control, slurred speech, reduced muscle coordination, vomiting, and stupor (reduced level of consciousness and cognitive function) to coma and death. However, an individual's response to alcohol is variable depending on many factors, including the amount and rate of alcohol consumption, health status, consumption of other drugs, and metabolic and functional tolerance of the drinker (6,7).

Reducing the proportion of adults engaging in binge drinking (objective SA-14.3) and reducing the number of deaths attributable to alcohol (objective SA-20), including deaths from alcohol poisoning, are among the objectives in Healthy People 2020 (8). Reducing drug abuse and excessive alcohol use are also key components of the National Prevention Strategy (9).

**Methods**

CDC analyzed multiple cause-of-death mortality files for 2010–2012 from the National Vital Statistics System (10) to...
assess average annual alcohol poisoning deaths among persons aged ≥15 years in the United States. Alcohol poisoning deaths were defined as those with International Classification of Diseases, 10th Revision (ICD-10) underlying (i.e., principal) cause of death codes X45 (accidental poisoning by and exposure to alcohol) and Y15 (poisoning by and exposure to alcohol, undetermined intent). Alcohol poisoning death rates per 1 million were calculated by sex, age group, and race/ethnicity for persons aged ≥15 years using the U.S. Census bridged-race population for 2010–2012 as the denominator, and were age-adjusted to the 2000 U.S. Census standard population. State death rates also were calculated and age-adjusted to the 2000 U.S. Census standard population.

Selected conditions that might have directly contributed to alcohol poisoning deaths, including alcohol dependence (F10.2), hypothermia (X31, T68, T69.9), drug poisoning (T36–T50), and drug use mental disorders (F11–F16, F18, F19), also were assessed among persons who died of alcohol poisoning.

Key Points

- An annual average of 2,221 alcohol poisoning deaths, or six deaths per day, occurred in the United States during 2010–2012.
- Alcohol poisoning is typically caused by binge drinking at high intensity (i.e., consuming a very large amount of alcohol during an episode of binge drinking).
- Three in four of those who died were adults aged 35–64 years, and three in four decedents were men.
- Almost 70% of the deaths were among non-Hispanic whites; however, the highest age-adjusted alcohol poisoning death rate was among American Indians/Alaska Natives (49.1 deaths per 1 million).
- The age-adjusted alcohol poisoning death rate in states ranged from 5.3 deaths per 1 million in Alabama to 46.5 deaths per 1 million in Alaska.
- Several evidence-based strategies effective in reducing excessive alcohol use and related harms have been identified and recommended.
- Additional information is available at http://www.cdc.gov/vitalsigns.

Results

During 2010–2012, there was an annual average of 2,221 alcohol poisoning deaths, an age-adjusted rate of 8.8 deaths per 1 million population, among persons aged ≥15 years in the United States (Table 1). Of these deaths, 1,681 (75.7%) were among adults aged 35–64 years, and 1,696 (76.4%) were among men. The highest death rate from alcohol poisoning was among men aged 45–54 years (25.6 deaths per 1 million). Although non-Hispanic whites accounted for the majority of alcohol poisoning deaths (67.5%; 1,500 deaths), the highest age-adjusted alcohol poisoning death rate was among American Indians/Alaska Natives (49.1 deaths per 1 million). A total annual average of 44 deaths (2.0%) involved persons aged 15–20 years, who were under the legal drinking age of 21.

The age-adjusted alcohol poisoning death rate in states ranged from 5.3 per 1 million in Alabama to 46.5 per 1 million in Alaska (Table 2). Twenty states had alcohol poisoning death rates greater than the overall national rate of 8.8 per 1 million, and two states (Alaska and New Mexico) had alcohol poisoning death rates >30 per 1 million. States with the highest death rates were located mostly in the Great Plains and western United States, but also included two New England states (Rhode Island and Massachusetts) (Figure).

Alcohol dependence was listed as a contributing cause of death in an annual average of 677 (30.4%) of the deaths from alcohol poisoning, and hypothermia was listed as a contributing cause of death in an annual average of 134 (6.0%) deaths. Drug poisoning and drug use mental disorders were listed as contributing causes of death in an annual average of 62 (2.8%) and 86 (3.9%) deaths from alcohol poisoning, respectively.

Conclusions and Comment

The results in this report indicate that during 2010–2012 there was an average of six deaths from alcohol poisoning each day among persons aged ≥15 years in the United States. Three in four of these deaths involved adults aged 35–64 years, and three in four of these deaths involved males. Nearly 70% of the deaths were among non-Hispanic whites; however, the highest alcohol poisoning death rate was among American Indians/Alaska Natives (49.1 deaths per 1 million).

The large proportion of alcohol poisoning deaths (75.7%) among adults aged 35–64 years is consistent with recent findings that two thirds (69%) of all average annual alcohol-attributable deaths in the United States involve adults aged 20–64 years (1). Alcohol-attributable deaths also result in substantial losses in workplace productivity and were responsible for >70% of the $223.5 billion in economic costs attributed to excessive drinking in the United States in 2006 (2). This finding also is consistent with the distribution of binge drinking episodes in the United States, most of which are reported by adults aged ≥26 years (11).

The large proportion of alcohol poisoning deaths among non-Hispanic whites is consistent with the high prevalence of binge drinking in this population (4). The high alcohol poisoning death rate among American Indians/Alaska Natives also is consistent with the high binge drinking intensity that has been
Male

49.1 114 6.7 75.0 39 7.5 24.3

Female

consistent with the results of a recent study that found that nine

was not listed as a contributing cause of death. This result is

these deaths involved persons for whom alcohol dependence

death in 30% of alcohol poisoning deaths, the majority of

will not be available.

likelihood that a person with alcohol poisoning will not be

living in geographically isolated rural areas might increase the

in binge drinking rates, also might be important contributors

times more likely to die from alcohol poisoning than whites,

reflecting both the higher intensity of binge drinking among

 binge drinkers in this population and other factors, such as

geographic isolation and reduced access to medical care (12).

Differences in alcohol poisoning death rates in states reflect

known differences in state binge drinking patterns, which

are strongly influenced by state and local laws governing

the price and availability of alcohol (13), as well as other cultural

and religious factors (14). A recent study that examined

the relationship between various subgroups of state alcohol

policies and binge drinking among adults found that a small

number of policies that raised alcohol prices and reduced

its availability had the greatest impact on binge drinking in

states (15). However, other factors, in addition to differences

in binge drinking rates, also might be important contributors

to differences in alcohol poisoning death rates. For example,

living in geographically isolated rural areas might increase the

likelihood that a person with alcohol poisoning will not be

found before death or that timely emergency medical services

will not be available.

Although alcohol dependence was a contributing cause of

death in 30% of alcohol poisoning deaths, the majority of

these deaths involved persons for whom alcohol dependence

was not listed as a contributing cause of death. This result is

consistent with the results of a recent study that found that nine

in 10 adults who drink excessively were not alcohol dependent,

including more than two thirds of those who reported binge
drinking ≥10 times per month (5).

The findings in this analysis are subject to at least three

limitations. First, alcohol-attributable deaths, including

alcohol poisoning, are underreported (16–18). Second, this

study was restricted to deaths in which alcohol poisoning was

the underlying cause of death, and did not include deaths in

which alcohol poisoning was a contributing cause of death.

A previous study found that there were three times as many

deaths in which alcohol poisoning was a contributing, rather

than underlying cause of death (19). Finally, mortality data

might underestimate the actual number of deaths for American

Indians/Alaska Natives (12) and certain other racial/ethnic

populations (e.g., Hispanics) because of misclassification of

race/ethnicity of the decedents on death certificates (20).

There are several recommended evidence-based, population-

level strategies to reduce excessive drinking and related harms,

such as regulating alcohol outlet density (i.e., the concentration

of retail alcohol establishments, including bars and restaurants

and liquor or package stores, in a given geographic area) and

preventing illegal alcohol sales in retail settings (e.g., commercial

host [dram shop] liability) (21,22). The status of each state’s

policies related to some of these recommendations are avail-

able from CDC online (at http://www.cdc.gov/psr/alcohol).

Screening and brief intervention for excessive alcohol use, includ-
ing binge drinking, among adults has also been recommended

| Characteristic       | Total |          |          |          | Male |          |          |          | Female |          |          |
|----------------------|-------|----------|----------|----------|------|----------|----------|----------|--------|----------|----------|----------|
|                     |       | annual no. | % of total | Age-adjusted |       | annual no. | % of male | Age-adjusted |       | annual no. | % of female | Age-adjusted |
| Overall              | 2,221 | 100.0    | 8.8      |          | 1,696 | 100.0    | 13.7     |          | 525    | 100.0    | 4.1      |          |
| Age group§ (yrs)     |       |          |          |          |       |          |          |          |        |          |          |          |
| 15–24                | 113   | 5.1      | 2.6      |          | 85    | 5.0      | 3.8      |          | 28     | 5.4      | 1.3      |          |
| 25–34                | 288   | 13.0     | 6.9      |          | 228   | 13.4     | 10.9     |          | 60     | 11.4     | 2.9      |          |
| 35–44                | 476   | 21.4     | 11.7     |          | 370   | 21.8     | 18.2     |          | 106    | 20.2     | 5.2      |          |
| 45–54                | 747   | 33.6     | 16.7     |          | 564   | 33.3     | 25.6     |          | 183    | 34.8     | 8.1      |          |
| 55–64                | 458   | 20.6     | 12.2     |          | 352   | 20.7     | 19.3     |          | 107    | 20.3     | 5.5      |          |
| ≥65                  | 139   | 6.3      | 3.3      |          | 98    | 5.8      | 5.4      |          | 41     | 7.9      | 1.8      |          |
| Race/Ethnicity       |       |          |          |          |       |          |          |          |        |          |          |          |
| White, non-Hispanic  | 1,500 | 67.5     | 8.8      |          | 1,103 | 65.0     | 13.1     |          | 397    | 75.6     | 4.6      |          |
| Black, non-Hispanic  | 191   | 8.6      | 6.2      |          | 149   | 8.8      | 10.6     |          | 42     | 8.1      | 2.6      |          |
| Hispanic             | 338   | 15.2     | 9.0      |          | 296   | 17.5     | 15.6     |          | 41     | 7.9      | 2.4      |          |
| American Indian/     | 154   | 6.9      | 49.1     |          | 114   | 6.7      | 75.0     |          | 39     | 7.5      | 24.3     |          |
| Alaska Native        |       |          |          |          |       |          |          |          |        |          |          |          |
| Asian/Pacific Islander| 32    | 1.5      | 2.2      |          | 28    | 1.7      | 4.1      |          | 4      | 0.8      | —        |          |

*Alcohol poisoning deaths included those occurring among persons aged ≥15 years in which alcohol poisoning was classified as the underlying (i.e., principal) cause of death based on International Classification of Diseases, 10th Revision (ICD-10) codes X45 (accidental poisoning by and exposure to alcohol) and Y15 (poisoning by and exposure to alcohol, undetermined intent).

†Rates per 1 million population for persons aged ≥15 years were calculated using U.S. Census bridged-race population for 2010–2012, and were age-adjusted to the 2000 U.S. Census standard population.

§Age-specific rate.

¶Number of deaths was too small to meet standards of reliability and precision to calculate age-adjusted death rate.
TABLE 2. Average annual number of alcohol poisoning deaths,* by state — National Vital Statistics System, United States, 2010–2012

| State† | Average annual no. of deaths | Age-adjusted rate§ |
|--------|-----------------------------|-------------------|
| Quartile 1 (5.3–6.7 death rate) |
| Alabama | 20 | 5.3 |
| Texas | 109 | 5.4 |
| Illinois | 57 | 5.6 |
| Virginia | 40 | 5.9 |
| Wisconsin | 28 | 6.0 |
| Idaho | 8 | 6.1 |
| Louisiana | 22 | 6.2 |
| Pennsylvania | 68 | 6.5 |
| Connecticut | 19 | 6.6 |
| Florida | 103 | 6.7 |
| Mississippi | 15 | 6.7 |
| New Hampshire | 8 | 6.7 |
| Quartile 2 (6.8–8.5 death rate) |
| Ohio | 64 | 6.9 |
| South Carolina | 28 | 7.4 |
| Missouri | 38 | 7.7 |
| Tennessee | 41 | 7.8 |
| Georgia | 62 | 7.8 |
| Arkansas | 17 | 7.8 |
| Maryland | 37 | 7.8 |
| Washington | 46 | 8.1 |
| Maine | 9 | 8.1 |
| Nebraska | 11 | 8.1 |
| Montana | 7 | 8.5 |
| Quartile 3 (8.6–11.8 death rate) |
| Indiana | 43 | 8.6 |
| North Carolina | 68 | 8.6 |
| New York | 143 | 8.8 |
| Kentucky | 32 | 9.1 |
| Kansas | 22 | 9.6 |
| Iowa | 23 | 9.7 |
| Michigan | 77 | 9.7 |
| Nevada | 21 | 9.8 |
| New Jersey | 74 | 9.9 |
| California | 299 | 9.9 |
| West Virginia | 17 | 11.2 |
| Quartile 4 (11.9–46.5 death rate) |
| Massachusetts | 67 | 11.9 |
| Oklahoma | 37 | 12.6 |
| Oregon | 42 | 12.7 |
| Colorado | 60 | 14.4 |
| Minnesota | 73 | 16.4 |
| Utah | 33 | 16.7 |
| South Dakota | 11 | 17.0 |
| Wyoming | 8 | 17.7 |
| Arizona | 93 | 18.7 |
| Rhode Island | 21 | 22.8 |
| New Mexico | 52 | 32.7 |
| Alaska | 27 | 46.5 |

* Alcohol poisoning deaths included those occurring among those aged ≥15 years in which alcohol poisoning was classified as the underlying (i.e., principal) cause of death based on International Classification of Diseases, 10th Revision (ICD-10) codes X45 (accidental poisoning by and exposure to alcohol) and Y15 (poisoning by and exposure to alcohol, undetermined intent).

† The average annual number of alcohol poisoning deaths in Delaware, District of Columbia, Hawaii, North Dakota, and Vermont was less than seven and therefore, did not meet standards of reliability and precision to calculate age-adjusted death rates.

§ Rates per 1 million population for persons aged ≥15 years were calculated using U.S. Census bridged-race population for 2010–2012, and were age-adjusted to the 2000 U.S. Census standard population.

Acknowledgments

Arialdi M. Miniño, MPH, Melonie Heron, PhD, Elizabeth Arias, PhD, Robert N. Anderson, PhD, Jennifer Madans, PhD, National Center for Health Statistics, CDC.

FIGURE. Age-adjusted alcohol poisoning* death rates,† by state§ — National Vital Statistics System, United States, 2010–2012

However, a recent study found that only one in six U.S. adults overall, one in five current drinkers, and one in four binge drinkers in 44 states and the District of Columbia reported ever discussing alcohol use with a doctor or other health professional. Furthermore, 65.1% of those who reported binge drinking ≥10 times in the past month had never had this dialogue (24).

Death from alcohol poisoning is a serious and preventable public health problem in the United States. A comprehensive approach to the prevention of excessive drinking that includes evidence-based community and clinical prevention strategies is needed to decrease alcohol poisoning deaths and other harms attributable to excessive alcohol use.

* Alcohol poisoning deaths included those occurring among those aged ≥15 years in which alcohol poisoning was classified as the underlying (i.e., principal) cause of death based on International Classification of Diseases, 10th Revision (ICD-10) codes X45 (accidental poisoning by and exposure to alcohol), and Y15 (poisoning by and exposure to alcohol, undetermined intent).

† Rates per 1 million population for persons aged ≥15 years were calculated using U.S. Census bridged-race population for 2010–2012, and were age-adjusted to the 2000 U.S. Census standard population.

§ The average annual number of alcohol poisoning deaths in Delaware, District of Columbia, Hawaii, North Dakota, and Vermont was less than seven and therefore, did not meet standards of reliability and precision to calculate age-adjusted death rates.
References

1. Stahre M, Roebert J, Kanny D, Brewer RD, Zhang X. Contribution of excessive alcohol consumption to deaths and years of potential life lost in the United States. Prev Chronic Dis 2014;11:130293.

2. Bouchery EE, Harwood HJ, Sacks JJ, Simon CJ, Brewer RD. Economic costs of excessive alcohol consumption in the United States, 2006. Am J Prev Med 2011;41:516–24.

3. World Health Organization. Global status report on alcohol and health—2014. Geneva, Switzerland: World Health Organization; 2014.

4. Kanny D, Liu Y, Brewer RD, Lu H. Binge drinking—United States, 2011. MMWR Surveill Summ 2013;62(Suppl no. 3):77–80.

5. Esser MB, Hedden SL, Kanny D, Brewer RD, Gfroerer JC, Naimi TS. Prevalence of alcohol dependence among U.S. adult drinkers. Prev Chronic Dis 2014;11:140329.

6. Caplan YH, Goldberger BA, eds. Garriott's medicolegal aspects of alcohol, sixth edition. Tucson, AZ: Lawyers and Judges Publication Company; 2015.

7. National Institute of Alcohol Abuse and Alcoholism. Alcohol overdose: the dangers of drinking too much. Bethesda, MD: National Institute of Alcohol Abuse and Alcoholism; 2013. Available at http://pubs.niaaa.nih.gov/publications/AlcoholOverdoseFactsheet/Overdosefact.htm.

8. US Department of Health and Human Services. Substance abuse objectives. Healthy people 2020. Washington, DC: US Department of Health and Human Services; 2011. Available at http://www.healthypeople.gov/2020/topics-objectives/topic/substance-abuse/objectives.

9. National Prevention Council. National Prevention Strategy, Washington, DC: US Department of Health and Human Services, Office of the Surgeon General; 2011.

10. CDC. Mortality multiple cause files. 2010–2012. US Department of Health and Human Services, CDC; 2014. Available at http://www.cdc.gov/nchs/nvss/mortality_public_use_data.htm.

11. Naimi TS, Brewer RD, Mokdad A, Denny C, Serdula MK, Marks JS. Binge drinking among US adults. JAMA 2003;289:70–5.

12. Landen M, Roebert J, Naimi T, Nielsen L, Sewell M. Alcohol-attributable mortality among American Indians and Alaska Natives in the United States, 1999–2009. Am J Public Health 2014;104:S343–9.

13. Naimi TS, Blanchette J, Nelson TF, et al. A new scale of the US alcohol policy environment and its relationship to binge drinking. Am J Prev Med 2014;46:10–6.

14. Holt JB, Miller JW, Naimi TS, Sui DZ. Religious affiliation and alcohol consumption in the United States. Geogr Rev 2006;96:523–42.

15. Xuan Z, Blanchette J, Nelson TF, Heeren T, Oussayef N, Naimi TS. The alcohol policy environment and policy subgroups as predictors of binge drinking measures among US adults. Am J Public Health 2014. [Epub ahead of print].

16. Dufour MC. Death certificates as a database for health research? Only with your help. Bulletin of Pathology Education 1984;9:57–9.

17. Hanzlick R. Death certificates, natural death, and alcohol: the problem of underreporting. Am J Forensic Med Pathol 1988;9:149–50.

18. Hudson P. The medical examiner looks at drinking. In Ewing JA, and Rouse BA, eds. Drinking: alcohol in American society. Chicago, IL: Nelson Hall; 1978:71–92.

19. Yoon YH, Stinson FS, Yi HY, Dufour MC. Accidental alcohol poisoning mortality in the United States, 1996–1998. Alcohol Res Health 2003;27:110–8.

20. Arias E, Schauman WS, Eschbach K, Sorlie PD, Backlund E. The validity of race and Hispanic origin reporting on death certificates in the United States. Vital Health Stat 2 2008;148:1–23.

21. Task Force on Community Prevention Services. Preventing excessive alcohol consumption. In: The guide to community preventive services. New York, NY: Oxford University Press; 2005. Available at http://www.thecommunityguide.org/alcohol/index.html.

22. Babor T, Caetano R, Casswell S, et al. Alcohol: no ordinary commodity—research and public policy. Oxford, UK: Oxford University Press; 2010.

23. Moyer VA; US Preventive Services Task Force. Screening and behavioral counseling interventions in primary care to reduce alcohol misuse: US Preventive Services Task Force recommendation statement. Ann Intern Med 2013;159:210–8.

24. McKnight-Eily LR, Liu Y, Brewer RD, et al. Vital Signs: Communication between health professionals and their patients about alcohol use—44 states and the District of Columbia, 2011. MMWR Morb Mortal Wkly Rep 2014;63:16–22.