

Vital Signs: Drinking and Driving Among High School Students Aged ≥ 16 Years — United States, 1991–2011

Abstract

Background: Although every state prohibits persons aged <21 years from driving with any measurable amount of blood alcohol, many young persons still drink and drive. Additionally, fatal crash data indicate that most teen drivers with positive ($>0.00\%$) blood alcohol concentrations (BACs) who are involved in fatal crashes have BACs $\geq 0.08\%$, the level designated as illegal for adult drivers.

Methods: CDC analyzed data from the 1991–2011 national Youth Risk Behavior Surveys (YRBS) to describe the trend in prevalence of drinking and driving (defined as driving one or more times when they had been drinking alcohol during the 30 days before the survey) among U.S. high school students aged ≥ 16 years. The 2011 national YRBS data were used to describe selected subgroup differences in drinking and driving, and 2011 state YRBSs data were used to describe drinking and driving prevalence in 41 states.

Results: During 1991–2011, the national prevalence of self-reported drinking and driving among high school students aged ≥ 16 years declined by 54%, from 22.3% to 10.3%. In 2011, 84.6% of students who drove after drinking also binge drank. Drinking and driving prevalence varied threefold across 41 states, from 4.6% in Utah to 14.5% in North Dakota; higher prevalences were clustered among states in the upper Midwest and along the Gulf Coast.

Conclusions: Although substantial progress has been made during the past 2 decades to reduce drinking and driving among teens, in 2011, one in 10 students aged ≥ 16 years reported driving after drinking during the past 30 days. Most students who drove after drinking alcohol also binge drank.

Implications for Public Health Practice: Effective interventions to reduce drinking and driving among teens include enforcement of minimum legal drinking age laws, zero tolerance laws (i.e., no alcohol consumption allowed before driving for persons aged <21 years), and graduated driver licensing systems.

Introduction

Motor vehicle crashes are the leading cause of death among teens aged 16–19 years in the United States (1). In 2010, a total of 2,211 passenger vehicle occupants aged 16–19 years died in crashes on public roadways; 1,280 (58%) were drivers (2). Although every state prohibits persons aged <21 years from driving with any measurable amount of blood alcohol, in 2010, one in five drivers aged 16–19 years involved in fatal crashes had a positive ($>0.00\%$) blood alcohol concentration (BAC) (2). For this report, CDC used data from the 1991–2011 national Youth Risk Behavior Surveys (YRBS) to describe

the trend in drinking and driving among students aged ≥ 16 years, data from the 2011 national YRBS to describe selected subgroup differences, and data from 41 state YRBSs to examine drinking and driving by state.

Methods

The national YRBS, a component of CDC's Youth Risk Behavior Surveillance System (YRBSS), used independent, three-stage cluster samples for the 1991–2011 surveys to obtain cross-sectional data representative of public and private school students in grades 9–12 in all 50 states and the District



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of Columbia (3). Sample sizes ranged from 10,904 to 16,410 students per year. School response rates ranged from 70% to 81%, student response rates ranged from 83% to 90%, and overall response rates* ranged from 60% to 71%. The state YRBSSs, another component of the YRBSS conducted by state education and health agencies, used two-stage cluster samples for the 2011 surveys to obtain cross-sectional data representative of public school students in grades 9–12 in 39 states and of public and private school students in grades 9–12 in two states (Ohio and South Dakota). Sample sizes across states ranged from 1,147 to 13,201 students. School response rates ranged from 73% to 100%, student response rates ranged from 64% to 88%, and overall response rates ranged from 60% to 84%.

For each national survey and the 41 state surveys, students completed a voluntary and anonymous, self-administered questionnaire that included identically worded questions about drinking and driving, current alcohol use, and binge drinking. Drinking and driving was defined as having driven a car or other vehicle one or more times during the 30 days before the survey when they had been drinking alcohol. Current alcohol use was defined as having had at least one drink of alcohol on at least 1 day during the 30 days before the survey. Binge drinking was defined as having had five or more drinks of alcohol in a row (i.e., within a couple of hours) on at least 1 day during the 30 days before the survey. Race/ethnicity data are presented for non-Hispanic black, non-Hispanic white, and Hispanic students (who might be of any race); the numbers of students from other racial/ethnic groups were too small for meaningful analyses.

Data were weighted to provide national or state-level estimates, and the statistical software used accounted for the complex sample designs. All analyses were conducted only among students aged ≥ 16 years, the age at which teens in every jurisdiction except New Jersey and New York City could be licensed (4). Temporal changes during 1991–2011 were analyzed using logistic regression analyses, which controlled for sex, race/ethnicity, and grade and simultaneously assessed significant ($p < 0.05$) linear and quadratic time effects.[†] T-tests were used to test for significant ($p < 0.05$) differences between subgroups.

* Overall response rate = (number of participating schools/number of eligible sampled schools) \times (number of usable questionnaires/number of eligible students sampled).

[†] A quadratic trend indicates a significant but nonlinear trend in the data over time; whereas a linear trend is depicted with a straight line, a quadratic trend is depicted with a curve with one bend. Trends that include significant quadratic and linear components demonstrate nonlinear variation in addition to an overall increase or decrease over time.

National YRBSS Results

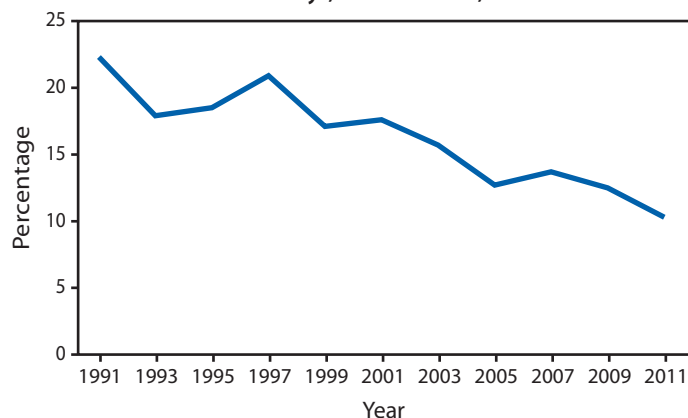
During 1991–2011, a significant linear decrease occurred in the prevalence of drinking and driving among U.S. high school students aged ≥ 16 years (22.3% to 10.3%) (Figure 1). A significant quadratic trend also was detected, indicating the prevalence of drinking and driving was stable until 1997 and then declined during 1997–2011.

In 2011, the overall prevalence of drinking and driving was 10.3%, representing approximately 950,000 high school students aged 16–19 years in the United States and approximately 2.4 million episodes of drinking and driving during the past 30 days. Male students (11.7%) were significantly more likely than female students (8.8%) to drink and drive. Drinking and driving was significantly more prevalent among white (10.6%) and Hispanic (11.5%) students than black (6.6%) students. Drinking and driving increased significantly by age, from 7.2% among students aged 16 years to 11.5% among students aged 17 years and 14.5% among students aged ≥ 18 years (Table 1). Overall, 26.4% of students reported binge drinking. However, among students who reported drinking and driving, 84.6% reported binge drinking. Prevalence of drinking and driving was more than three times higher among those who binge drank compared with those who reported current alcohol use but did not binge drink (32.1% versus 9.7%).

State YRBSS Results

Among the 41 states with available YRBSS results in 2011, prevalence of drinking and driving varied threefold, from 4.6% in Utah to 14.5% in North Dakota (median: 10.1%) (Table 2). States in the highest tertile included much of the upper Midwest; the western states of Montana, Wyoming, and New Mexico; South Carolina; and states along the Gulf Coast, except for Florida

FIGURE 1. Percentage of high school students aged ≥ 16 years who drove a car or other vehicle when they had been drinking alcohol,* — Youth Risk Behavior Surveys, United States, 1991–2011



* One or more times during the 30 days before the survey.

TABLE 1. Percentage of high school students aged ≥16 years who drove a car or other vehicle when they had been drinking alcohol,* by sex, race/ethnicity, and age — Youth Risk Behavior Survey, United States, 2011

Category	Female		Male		Total	
	%	(95% CI)	%	(95% CI)	%	(95% CI)
Total	8.8	(7.4–10.4)	11.7	(10.7–12.7)	10.3	(9.4–11.3)
Race/Ethnicity						
White, non-Hispanic	9.7	(7.9–11.8)	11.4	(10.2–12.7)	10.6	(9.3–12.0)
Black, non-Hispanic	4.6	(3.1–6.9)	8.6	(6.1–12.0)	6.6	(5.0–8.8)
Hispanic	9.3	(7.4–11.5)	13.6	(11.3–16.3)	11.5	(9.9–13.3)
Age (yrs)						
16	6.4	(5.1–8.1)	7.8	(6.4–9.4)	7.2	(6.1–8.5)
17	10.4	(8.4–12.9)	12.4	(10.7–14.3)	11.5	(10.0–13.1)
≥18	10.6	(7.9–14.1)	17.5	(15.1–20.1)	14.5	(12.8–16.4)

Abbreviation: CI = confidence interval.

* One or more times during the 30 days before the survey.

(Figure 2). Prevalence of drinking and driving was significantly higher than the national prevalence in six states (Iowa, Louisiana, Montana, North Dakota, Texas, and Wyoming), lower in nine states (Alaska, Indiana, Kentucky, Michigan, New York, North Carolina, Rhode Island, Utah, and Virginia), and not statistically different in the remaining 26 states.

Conclusions and Comment

The findings in this report indicate that substantial progress has been made during the past 2 decades to reduce drinking and driving among teens. However, the findings point to the need to further reduce teen access to alcohol and reduce opportunities to drink and drive. In 2011, one in 10 U.S. high school students aged ≥16 years reported drinking and driving during the past 30 days, and 85% of those students also engaged in binge drinking during the past 30 days.

Declines in both alcohol consumption and driving likely have contributed to the reduction in drinking and driving among high school students. YRBS trend data indicate that alcohol use and binge drinking have declined since the late 1990s (5). Similar declines in alcohol use and binge drinking have been reported by another national survey of students, Monitoring the Future.[§] Additionally, driving among teens, as reported by that survey, declined substantially during 2000–2010; the proportion of high school seniors who did not drive during an average week increased by nearly one-third during that period, from 15% to 22%.[¶] Reasons for the decline in driving among teens are not understood fully, but two factors are widely thought to contribute. First, widespread implementation of graduated driver licensing systems has delayed full licensure for teen drivers by extending the learner driver period and initially

TABLE 2. Percentage of high school students aged ≥16 years who drove a car or other vehicle when they had been drinking alcohol,* — Youth Risk Behavior Surveys, 41 states,† 2011

State	%	(95% CI)
Alabama	11.7	(9.0–15.1)
Alaska	6.7 [¶]	(5.1–8.8)
Arizona	10.7	(8.6–13.1)
Arkansas	11.0	(8.1–14.8)
Colorado	8.5	(6.4–11.3)
Connecticut	9.4	(7.9–11.1)
Delaware	9.7	(8.1–11.5)
Florida	11.0	(9.8–12.4)
Georgia	8.4	(6.4–10.9)
Idaho	10.1	(7.6–13.3)
Illinois	10.4	(8.2–12.9)
Indiana	6.5 [¶]	(5.0–8.4)
Iowa	13.6 [§]	(10.7–17.0)
Kansas	10.9	(8.9–13.3)
Kentucky	7.9 [¶]	(6.4–9.7)
Louisiana	13.9 [§]	(11.1–17.4)
Maryland	10.4	(8.1–13.2)
Massachusetts	8.9	(7.4–10.7)
Michigan	7.5 [¶]	(6.0–9.3)
Mississippi	12.6	(9.3–16.7)
Montana	13.4 [§]	(12.0–14.8)
Nebraska	11.0	(8.8–13.7)
New Hampshire	10.5	(8.4–12.9)
New Jersey	9.2	(6.7–12.4)
New Mexico	11.3	(9.4–13.5)
New York	6.7 [¶]	(5.5–8.1)
North Carolina	7.7 [¶]	(6.2–9.6)
North Dakota	14.5 [§]	(12.1–17.3)
Ohio	9.3	(7.3–11.6)
Oklahoma	9.2	(6.5–12.8)
Rhode Island	8.3 [¶]	(6.9–9.9)
South Carolina	11.7	(8.1–16.7)
South Dakota	12.7	(9.6–16.6)
Tennessee	9.7	(7.7–12.0)
Texas	12.6 [§]	(10.7–14.8)
Utah	4.6 [¶]	(3.4–6.3)
Vermont	9.2	(7.5–11.2)
Virginia	6.8 [¶]	(5.1–9.1)
West Virginia	8.6	(6.8–10.8)
Wisconsin	12.0	(10.0–14.3)
Wyoming	14.3 [§]	(12.3–16.6)
Median	10.1	
Range	(4.6–14.5)	

Abbreviation: CI = confidence interval.

* One or more times during the 30 days before the survey.

† Data not available for California, Hawaii, Maine, Minnesota, Missouri, Nevada, Oregon, Pennsylvania, and Washington.

§ Significantly higher than the national prevalence ($p < 0.05$).

¶ Significantly lower than the national prevalence ($p < 0.05$).

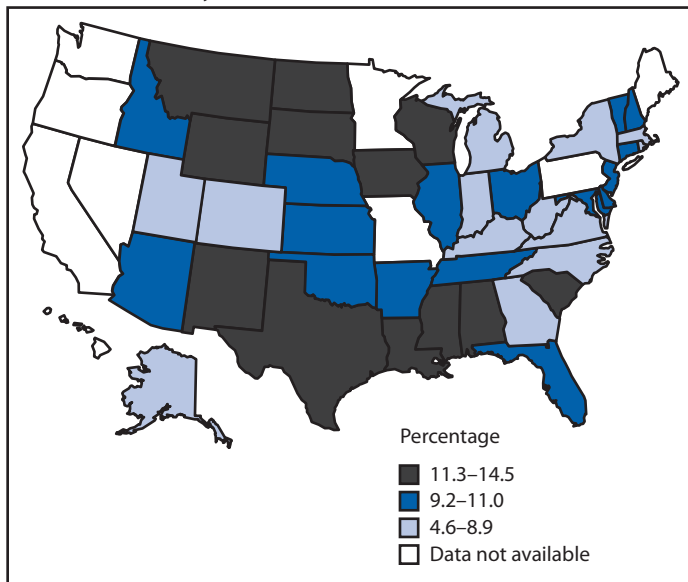
restricting independent driving under high-risk conditions such as nighttime driving and transporting young passengers (6). Second, teens are especially sensitive to increases in gasoline prices and declines in economic conditions, which might have decreased their miles driven since 2007 (7).

Young persons who drive after consuming any amount of alcohol pose an inordinate risk to themselves, their passengers, and other road users. For each 0.02% increase in BAC, the relative risk of a driver aged 16–20 years dying in a crash is

[§] Data available at <http://monitoringthefuture.org/data/11data.html#2011data-drugs>.

[¶] Data available at <http://monitoringthefuture.org/pubs.html#refvols>.

FIGURE 2. Percentage of high school students aged ≥ 16 years who drove a car or other vehicle when they had been drinking alcohol,* — Youth Risk Behavior Surveys, 41 states,[†] 2011



* One or more times during the 30 days before the survey.

[†] Data not available for California, Hawaii, Maine, Minnesota, Missouri, Nevada, Oregon, Pennsylvania, and Washington.

Key Points

- Every state prohibits persons aged <21 years from driving with any measurable amount of blood alcohol.
- During 1991–2011, the prevalence of drinking and driving among high school students aged ≥ 16 years declined by 54%, from 22.3% to 10.3%.
- In 2011, one in 10 high school students aged ≥ 16 years reported drinking and driving during the past 30 days.
- 85% of students who drove after drinking also binge drank during the past 30 days.
- 81% of teen drivers with positive ($>0.00\%$) blood alcohol concentrations (BACs) who are involved in fatal crashes have BACs of $\geq 0.08\%$, the level designated as illegal for adult drivers.
- Although drinking and driving among teens has declined by $>50\%$ in the past 2 decades, it still contributes to >800 deaths each year. Effective interventions to reduce drinking and driving among teens include enforcing minimum legal drinking age laws, zero tolerance laws, and graduated driver licensing systems.

estimated to more than double (8). Compared with a sober driver of the same age, a driver aged 16–20 years with a BAC of 0.08%–0.099% is estimated to be 32 times as likely to die in a single-vehicle crash and 13 times as likely to be in a crash in which the young driver lives but someone else dies (8). These estimates are especially alarming because, unlike most adults, most high school students who drink alcohol usually do so to the point of intoxication (9). Crash fatality data confirm that some teens are drinking heavily before driving. In 2010, according to the National Highway Traffic Safety Administration's Fatality Analysis Reporting System, 697 (20%) of the 3,405 drivers aged 16–19 years involved in fatal crashes (defined as a crash in which at least one person involved in the crash died within 30 days) had positive BACs. Among those 697 teen drivers, 568 (81%) had BACs $\geq 0.08\%$, the level designated as illegal for adult drivers (National Highway Traffic Safety Administration, unpublished data, 2012).

Policy developments since the 1980s are credited with reducing alcohol-involved fatal crashes among teens (6,10,11). By 1988, every state had enacted laws establishing the minimum legal drinking age of 21 years, leading to an estimated median reduction of 17% in alcohol-involved fatal crashes among teen drivers (11). Minimum legal drinking age laws are estimated to produce \$3.60 in total benefits (i.e., reductions in medical costs, work loss, and lost quality of life) for each \$1.00 spent (i.e., a 3.6 benefit:cost ratio) (12). During 1983–1998, every state enacted laws establishing a lower BAC

($\leq 0.02\%$) for drivers aged <21 years. These laws, referred to as “zero tolerance” laws, are estimated to have reduced alcohol-involved fatal crashes among inexperienced drivers by 9%–24% (11), resulting in an estimated 25.0 benefit:cost ratio (12). More recently, states have introduced graduated driver licensing (GDL) systems. First enacted by Florida in 1996, GDL systems have since been adopted in all 50 states and the District of Columbia (4). Although GDL does not directly address drinking and driving, it reduces the behavior by restricting nighttime driving and transporting of young passengers during the first months of licensure (6,13). A recent national study found that GDL nighttime driving restrictions were associated with a 13% reduction in fatal drinking driver crashes among drivers aged 16 or 17 years relative to drivers aged 19 or 20 years, who are not subject to the restriction (6). Although every state except Vermont has a nighttime driving restriction, start times vary from 6 p.m. to 1 a.m. (4). GDL, with a midnight nighttime driving restriction, is estimated to result in an 8.1 benefit:cost ratio (12).

The findings in this report are subject to at least six limitations. First, YRBS does not measure whether a student has driven during the 30 days before the survey, so it is not possible to assess prevalence of drinking and driving only among students who drive. According to results from the

Monitoring the Future survey, 22% of 12th grade students in 2010 did not drive at all “during an average week.” Second, YRBS defines binge drinking for boys and girls as five or more drinks within a couple hours, which differs from the nationally recommended definition.** The prevalence of binge drinking among girls likely would have been higher if it were defined using a four-drink threshold, consistent with national recommendations. Third, although binge drinking and drinking and driving were strongly associated, data were not available to determine whether binge drinking occurred before driving. Fourth, the extent of underreporting or overreporting of behaviors in YRBS cannot be determined, although the survey questions demonstrate good test-retest reliability (14). Fifth, these data apply only to youths who attend school and, therefore, are not representative of all persons in this age group. Nationwide, in 2009, of persons aged 16–17 years, approximately 4% were not enrolled in a high school program and had not completed high school (15). Finally, state-level prevalence estimates of drinking and driving were not available for nine states, including four contiguous western states (Washington, Oregon, California, and Nevada).

Effective interventions that reduce drinking and driving among teens include minimum legal drinking age laws, zero tolerance laws, and GDL. Enhanced enforcement of minimum legal drinking age laws using retailer compliance checks has proven effective in reducing retail sales of alcohol to minors (16). Families could consider using a parent–teen driver agreement (17) to establish and enforce the “rules of the road” for their newly licensed teen, including complying with all state GDL provisions, never drinking and driving, and always wearing a seat belt. Additionally, teen alcohol consumption (9,18) and drinking and driving patterns (18) are correlated with those of adults living in the same state. Effective strategies to reduce alcohol consumption and drinking and driving aimed at the general population, such as those recommended by the Community Preventive Services Task Force, also can reduce both behaviors among teens (10,11,16,19). Multifaceted community-based programs that address the local social, economic, and legal context in which teens access alcohol and drink and drive (20) are more likely to succeed than any single approach. Lastly, effective strategies to increase seat belt use, such as primary seat belt laws and enhanced enforcement of seat belt laws, reduce injury severity when crashes occur (21).

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References

1. CDC. Web-based injury statistics query and reporting system (WISQARS). US Department of Health and Human Services, CDC; 2011. Available at www.cdc.gov/ncipc/wisqars. Accessed July 9, 2012.
2. Insurance Institute for Highway Safety. Fatality facts 2010: teenagers. Arlington, VA: Insurance Institute for Highway Safety, Highway Loss Data Institute; 2012. Available at <http://www.iihs.org/research/fatality.aspx?topicname=teenagers&year=2010>. Accessed June 12, 2012.
3. CDC. Youth risk behavior surveillance—United States, 2011. *MMWR* 2012;61(No. SS-4).
4. Insurance Institute for Highway Safety. Summary table: young driver licensing systems in the U.S. Arlington, VA: Insurance Institute for Highway Safety, Highway Loss Data Institute; 2012. Available at <http://www.iihs.org/laws/graduatedlicensecompare.aspx>. Accessed August 10, 2012.
5. CDC. Trends in the prevalence of alcohol use national YRBS: 1991–2011. US Department of Health and Human Services, CDC; 2012. Available at http://www.cdc.gov/healthyyouth/yrbs/pdf/us_alcohol_trend_yrbs.pdf. Accessed June 15, 2012.
6. Fell JC, Todd M, Voas RB. A national evaluation of the nighttime and passenger restriction components of graduated driver licensing. *J Safe Res* 2011;42:283–90.
7. Sivak M. Is the U.S. on the path to the lowest motor vehicle fatalities in a decade? Ann Arbor, MI: University of Michigan Transportation Research Institute; 2008. Available at <http://deepblue.lib.umich.edu/bitstream/2027.42/60424/1/100969.pdf>. Accessed July 5, 2012.
8. Voas RB, Torres P, Romano E, Lacey JH. Alcohol-related risk of driver fatalities: an update using 2007 data. *J Stud Alcohol Drugs* 2012; 73:341–50.
9. CDC. Vital signs: binge drinking among high school students and adults—United States, 2009. *MMWR* 2010;59:1274–9.
10. Hingson RW, Assaillly J-P, Williams AF. Underage drinking: frequencies consequences, and interventions. *Traffic Inj Prev* 2004;5:228–36.
11. Shults RA, Elder RW, Sleet DA, et al. Reviews of evidence regarding interventions to reduce alcohol-impaired driving. *Am J Prev Med* 2001;21(4Suppl):66–88.
12. Children's Safety Network. Injury prevention: what works? A summary of cost-outcome analysis for impaired driving (2010 update). Calverton, MD: Children's Safety Network; 2010. Available at <http://www.childrenssafetynetwork.org/sites/childrenssafetynetwork.org/files/InjuryPreventionWhatWorks.pdf>. Accessed July 2, 2012.
13. Cavazos-Rehg PA, Krauss MJ, Spitznagel EL, et al. Associations between selected state laws and teenagers' drinking and driving behaviors. *Alcohol Clin Exp Res* 2012;36:1647–52.
14. Brener ND, Kann L, McManus T, Kinchen SA, Sundberg EC, Ross JG. Reliability of the 1999 Youth Risk Behavior Survey questionnaire. *J Adolesc Health* 2002;31:336–42.
15. Chapman C, Laird J, Ifill N, KewalRamani A. Trends in high school dropout and completion rates in the United States: 1972–2009 (NCES 2012-006). Washington, DC: US Department of Education, National Center for Education Statistics; 2011. Available at <http://nces.ed.gov/pubs2012/2012006.pdf>. Accessed May 30, 2012.

** Definition available at <http://www.niaaa.nih.gov/alcohol-health/overview-alcohol-consumption/moderate-binge-drinking>.

16. The Community Preventive Services Task Force. Preventing excessive alcohol consumption. Atlanta, GA: Task Force on Community Preventive Services; 2012. Available at <http://www.thecommunityguide.org/alcohol/index.html>. Accessed June 15, 2012.
17. CDC. Parents are the key campaign. US Department of Health and Human Services, CDC; 2012. Available at <http://www.cdc.gov/parentsarethekey/about/index.html>. Accessed July 2, 2012.
18. Nelson DE, Naimi TS, Brewer RD, Nelson HA. State alcohol-use estimates among youth and adults, 1993–2005. *Am J Prev Med* 2009;36:218–24.
19. Nelson TF, Naimi TS, Brewer RD, Wechsler H. The state sets the rate: the relationship among state-specific college binge drinking, state binge drinking rates, and selected state alcohol control policies. *Am J Public Health* 2005;95:441–6.
20. Poulin C, Boudreau B, Asbridge M. Adolescent passengers of drunk drivers: a multi-level exploration into the inequities of risk and safety. *Addiction* 2006;102:51–61.
21. The Community Preventive Services Task Force. Motor vehicle-related injury prevention. Atlanta, GA: Task Force on Community Preventive Services; 2011. Available at <http://www.thecommunityguide.org/mvoi/safetybelts/index.html>. Accessed June 15, 2012.