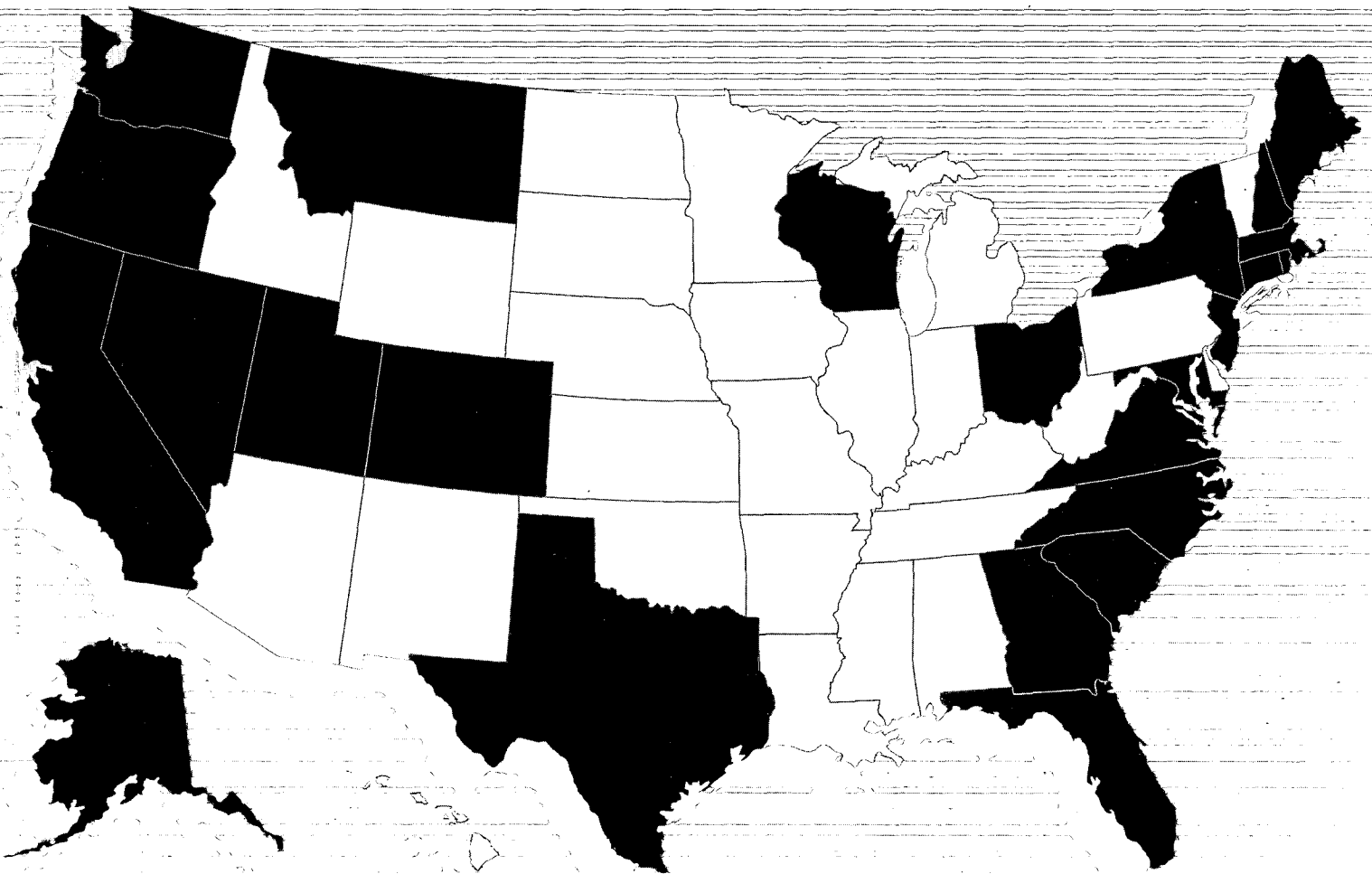


Determine Why There Are Fewer Young Alcohol-Impaired Drivers



*States with the Largest Declines in Young Drinking Driver
Fatal Crash Involvements, 1982 - 1998*

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Technical Report Documentation Page

1. Report No. DOT HS 809 348		2. Government Accession No.		3. Recipient's Catalog No.	
4. Title and Subtitle Determine Why There Are Fewer Young Alcohol Impaired Drivers			5. Report Date September 2001		
			6. Performing Organization Code		
7. Author(s) J.H. Hedlund, R.G. Ulmer and D.F. Preusser			8. Performing Organization Report No.		
9. Performing Organization Name and Address Preusser Research Group, Inc. 7100 Main Street Trumbull, CT 06611			10. Work Unit No. (TRAI5)		
			11. Contract or Grant No. DTNH22-97-D-05018		
12. Sponsoring Agency Name and Address U.S. Department of Transportation National Highway Traffic Safety Administration 400 Seventh Street, S.W. Washington, D.C. 20590			13. Type of Report and Period Covered Final Report July 1997-March 2000		
			14. Sponsoring Agency Code		
15. Supplementary Notes Dr. Linda Cosgrove served as the NHTSA Contracting Officer's Technical Representative for the study. We appreciate the guidance and support she provided. Dr. James Hedlund was an independent consultant to the project.					
16. Abstract The number of drinking drivers under the age of 21 involved in fatal crashes decreased by 61 percent over the past 17 years, from 4,393 in 1982 to 1,714 in 1998. This report investigates the causes of this substantial decline, which far exceeds the decline over the same period for older drivers. The report documents the changes in youth drinking and driving, and in youth drinking, and compares the changes across states and regions. There is solid evidence that four factors contributed to the decline: a shift in the age distribution of the U.S. population (the number of persons aged 15 to 20 decreased by 4 percent from 1982 to 1998 while the number of persons aged 25 to 54 increased by 31 percent), laws that increased the minimum drinking age to 21, laws that established .02 or less alcohol concentration for drivers under the age of 21, and general anti-drinking and driving efforts that affected drivers of all ages. However, these measures only partly account for the decline in crashes and the decline in self-reported youth drinking and driving. While lacking comprehensive evaluation evidence, the many education and information programs implemented during this period also appear to have been a significant factor.					
17. Key Words Youth Drinking and Driving Traffic Fatalities Laws Youth Programs			18. Distribution Statement Document is available through the National Technical Information Service Springfield, VA 22161		
19. Security Classif. (of this report) Unclassified		20. Security Classif. (of this page) Unclassified		21. No. of Pages 93	22. Price

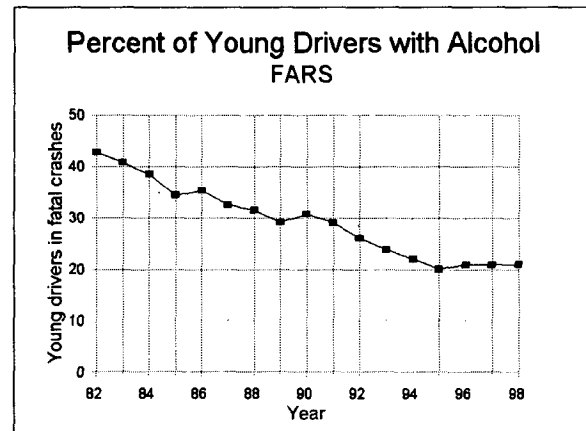
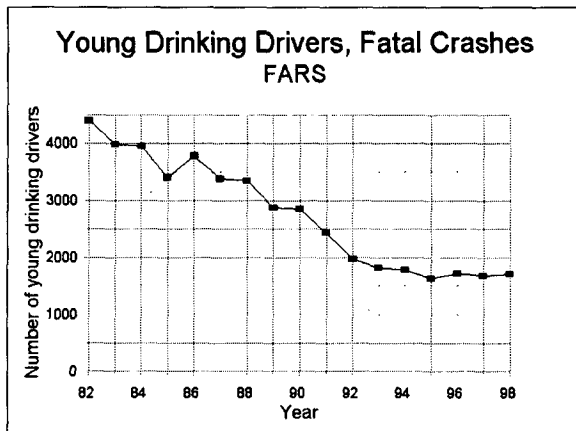
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DEPARTMENT OF TRANSPORTATION
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION

TECHNICAL SUMMARY

CONTRACTOR Preusser Research Group, Inc.	CONTRACT NUMBER DTNH22-97-D-05018
REPORT TITLE Determine Why There Are Fewer Young Alcohol-Impaired Drivers	REPORT DATE September 2001
REPORT AUTHOR(S) J.H. Hedlund, R.G. Ulmer and D.F. Preusser	

Youth drinking and driving in the United States decreased spectacularly in the past two decades. The best measure comes from fatal crash involvements: the number of drinking drivers under the age of 21 in fatal crashes dropped 61 percent, from 4,393 in 1982 to 1,714 in 1998. While 43 percent of young drivers in fatal crashes had a positive BAC in 1982, only 21 percent did in 1998. In comparison, the number of drinking drivers aged 21 and above dropped only 33 percent during this time.



This report investigates the causes of this substantial decrease. It documents the changes in youth drinking and driving, and in youth drinking, and compares the changes across states and regions. It analyzes the effects of the National Minimum Drinking Age and state zero tolerance laws. It examines the influence of programs directed at youth drinking and driving, such as SADD (originally Students Against Driving Drunk, now Students Against Destructive Decisions) and the large variety of programs promoting healthy choices and lifestyles for youth. It considers the effects of factors not directed specifically at youth, such as adult drinking and driving measures and broad socioeconomic trends. It compares influences and trends in the United States with those in Canada. It concludes with recommendations on how to reduce youth drinking and driving even further.

(Continue on additional pages)

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Youth Drinking and Driving -- National Trends

Nationally, youth drinking and driving as measured by fatal crash involvements and by self-reported drinking and driving behavior decreased substantially from 1982 to 1998. Most of the decrease took place between 1982 and 1992. Young drivers of all ages up to 21 reduced their drinking and driving by similar amounts. A small portion of the decrease in youth fatal crash involvements is due to a decrease in the number of young persons in the population.

Youth Drinking and Driving -- Regional and State Trends

Youth drinking driver fatal crash involvements decreased substantially in all regions of the country and in most states. Drinking driver involvements per population decreased by more than 50 percent in 45 states. Many states followed the national pattern of a substantial drop from 1982 through the early 1990s, with little subsequent change. In 1998, youth drinking driver fatal crash involvements were about 5 per 100,000 population (or even lower) in the 10 best states and about 15 in the five worst states.

Youth Drinking

Youth drinking also decreased from 1982 to 1998, but not as much as youth drinking and driving. Evidence from Monitoring the Future and other surveys shows a consistent drop in self-reported drinking by both high school and college students under 21. This decrease occurred fairly uniformly across all regions of the country. However, most youth still drink; a majority drink at least monthly; a substantial minority binge drink regularly. Since about 1993 the number of youth in the U.S. has increased slightly and the number who admit to drinking has increased slightly, but youth drinking driver involvements in fatal crashes has remained approximately constant.

The decline in drinking accounts for some, but by no means all, of the decline in drinking and driving. Youth have separated their drinking from their driving more in 1998 than they did in 1982, and more than have drivers over 21. Drinking and driving has become less socially acceptable among youth, as measured by youth student attitudes and by the use and acceptance of designated drivers.

Minimum Legal Drinking Age Laws

Thirty-six states raised their minimum legal drinking age (MLDA) to 21 between 1983 and 1987 (the other 14 states had age 21 laws in effect before 1983) so that by 1988 MLDA was in effect in all states. MLDA 21 laws clearly reduced youth drinking and driving. The laws reduced youth drinking by reducing alcohol availability and by establishing the threat of punishment for alcohol use. But MLDA 21 laws do not work particularly well in practice, as youth still can obtain alcohol relatively easily and underage drinkers are highly unlikely to be detected and punished. MLDA 21 laws also may have encouraged youth to separate their drinking from their

driving. The observations that youth drinking and driving decreased substantially more than youth drinking, and that youth drinking and driving after drinking both decreased in states that had MLDA 21 laws throughout the 1980s, suggest that MLDA 21 laws were not the only influence on youth drinking and driving during this period.

Zero Tolerance Laws

A zero tolerance law sets a maximum BAC of 0.02 or less for youth and suspends or revokes an offender's driver's license. All states and the District of Columbia adopted zero tolerance laws covering all drivers under 21 between 1990 and 1998. Zero tolerance laws also have reduced youth drinking and driving. They likely did so for two reasons: by deterring youth through the fear of losing their driver's license if they drive after drinking, and also by reinforcing the broad community disapproval of youth driving after drinking.

Youth Programs

States and communities conducted extensive youth drinking and driving programs in the past two decades. These programs seek to motivate youth not to drink and drive through positive means: by education on crash and injury risks posed by drinking and driving and the effects of alcohol use and abuse, by providing positive role models that discourage alcohol use, by establishing youth norms that do not include alcohol, and by encouraging youth activities that do not involve or lead to alcohol use. Other organizations concerned with traffic safety -- insurance companies, automobile manufacturers, MADD, and many others -- did the same through public education and specific program activities.

There is little direct evidence of the effects produced by these activities. Very few have been evaluated to determine their effects on youth knowledge, attitudes, behavior, traffic violations, or crashes. A few well-organized and well-funded community programs have reduced youth drinking and driving after drinking. Some school programs have affected students' knowledge and attitudes and may have affected their behavior. But there is no direct proof that most of the many youth traffic safety program activities not involving laws and enforcement had any direct effect on youth drinking and driving. There also is no proof that they did not. The accumulation of information, education, skills, role models, and the like provided by these programs may have been a crucial influence in the youth attitude, behavior, and crash changes that have occurred.

Drinking and Driving Measures Not Directed at Youth

In general, states that reduced overall drinking and driving the most from 1982 to 1998 also reduced youth drinking and driving the most. This suggests that states that took effective measures to reduce overall drinking and driving also saw the effect of these measures on youth drinking and driving. In addition, the travel, employment, and unemployment trends that influenced overall drinking and driving likely also affected youth drinking and driving.

The Canadian Experience

Canadian reductions in youth drinking and driving, measured both by fatal crash data and by surveys, followed virtually the same pattern as in the United States. But the Canadian reduction was not due to laws directed at youth: the drinking age did not change during this time and zero tolerance laws were implemented after the reduction had occurred. This means that the changes must have resulted from some combination of the difficult-to-assess educational and motivational programs and from other factors outside of traffic safety. This suggests that a substantial portion of the reduction in the United States also resulted from these same causes.

Conclusions

Three influences on youth drinking and driving are well-documented and well-understood: population changes, legal drinking age increases, and zero tolerance laws. However, these three by themselves account for only a portion of the observed decrease in youth drinking and driving. Influences from other factors -- youth programs, other drunk driving measures, and factors completely apart from driving or drinking -- can only be inferred. Something has worked spectacularly well in reducing youth drinking and driving. Some causes are known; some are not. The most prudent strategy would be to improve MLDA 21 and zero tolerance law enforcement, continue the programs directed at youth, and strengthen measures against all drinking and driving.

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I. INTRODUCTION

Drinking and driving in the United States, as measured by alcohol involvement in fatal crashes in NHTSA's Fatality Analysis Reporting System, decreased substantially from 1982 to 1998. The number of traffic fatalities involving alcohol dropped 36 percent, from 25,165 in 1982 to 16,020 in 1998. Traffic fatalities involving at least one driver or pedestrian with a blood alcohol content (BAC) of 0.10 or above dropped 39%, from 20,356 to 12,494 (NHTSA, 1999).

This decrease was led by young drivers under the age of 21. The number of young drivers in fatal crashes with a positive BAC dropped 61 percent, from 4,393 in 1982 to 1,714 in 1998. While 43 percent of young drivers in fatal crashes had a positive BAC in 1982, only 21 percent did in 1998. In contrast, the number of drivers in fatal crashes with a positive BAC age 21 and above dropped 33 percent, from 16,814 in 1982 to 11,228 in 1998 -- a substantial decrease, but far less than the decrease for drivers under 21.

Why did youth drinking and driving decrease so substantially, and so much more than drinking and driving by older drivers? Was this a national effect or did some states or regions do better than others? How much is due to laws directed at youth, especially the National Minimum Drinking Age and state zero tolerance laws, both of which were implemented in all states during this period? How much is due to youth programs directed at drinking and driving, such as SADD (originally Students Against Driving Drunk, now Students Against Destructive Decisions) and the large variety of programs promoting healthy choices and lifestyles for youth? Are there other factors not specifically directed at youth drinking and driving that have contributed? Most importantly, what can be learned from this success that can be used to reduce youth drinking and driving even further, that can be applied to reduce drinking and driving by other drivers, or that can guide safety and health activities in other areas?

This report addresses these issues. Specifically, it reviews the data on youth drinking and driving, analyzes differences across the states, and examines evidence on the effectiveness of various laws and programs that may have affected youth drinking and driving.

The report is organized as follows:

- Chapter I, Introduction.
- Chapter II, Data and Terminology, describes the data and other information that were assembled and used.
- Chapter III, What Happened?, presents and analyzes data and research studies that measure or describe changes in drinking, driving after drinking, and other drinking-related behavior for youth and older persons.
- Chapter IV, What Caused the Decrease?, presents and analyzes the available evidence on the factors that may have caused or influenced this decrease.

- Chapter V, Conclusions, summarizes the results, gives the authors' best judgment of the extent to which the various factors caused the decrease, and presents recommendations.

II. DATA AND TERMINOLOGY

A. Data on Fatal Crashes

A state-by-state database was created for the study that includes motor vehicle fatality information, demographic and economic data, and impaired driving laws and enforcement. This section describes the specific items in the database and their sources.

Drivers in fatal crashes. Data on fatal crashes came from NHTSA's Fatality Analysis Reporting System (FARS) and its supplemental Alcohol Imputation files. FARS is an enumeration of virtually all fatal motor vehicle crashes that occur in the U.S. The Alcohol Imputation files are based on available BAC data or use statistical methods to estimate (or impute) whether or not a crash involved alcohol if there is no direct evidence of alcohol presence or absence.

The Alcohol Imputation files are made up of two parts. The part used in this study contains probability values that each driver and nonoccupant in a fatal crash had a BAC of 0.00, a BAC of 0.01-0.09, and a BAC of 0.10 or more. The second part contains probability values at the crash level. That is, based on the driver and nonoccupant probabilities, a probability value is estimated that the crash involved drivers and nonoccupants with only 0.00 BAC, that the crash involved at least one driver or nonoccupant with a BAC in the 0.01-0.09 range but none higher, and that the crash involved at least one driver or nonoccupant with a BAC of 0.10 or higher. For both parts, when a driver or nonoccupant has a known BAC (zero or positive), that BAC value is used. When the BAC is unknown, a discriminant function model estimates the probabilities that the person's BAC was in the three categories. The variables entered into the discriminant function are those from the FARS database (vehicle type, police reported alcohol, time, day of week, driver age and sex, etc.). The imputation methodology is described by Klein (1986a) and a guide for using the imputation files can be found in Klein (1986b).

FARS has used the Alcohol Imputation process since 1982. For this study, drivers in fatal crashes have been examined over the 17-year period 1982-1998. The data used in the analyses for 1998 are from the preliminary file, as the final 1998 version had not been released when these analyses were completed. The preliminary data for 1998 indicated that there were 8,116 drivers under the age of 21 involved in fatal crashes, with 1,704 of these determined to have been drinking. The final FARS version for 1998 shows that there were 8,128 drivers under the age of 21 involved in fatal crashes, with 1,714 of these determined to have been drinking.

Some states do not use these estimated data to report alcohol-related traffic fatalities. Instead, they count as alcohol-related only those crashes and drivers for which there is positive evidence from a BAC test, a police report, or another official source. These states will report a lower number of alcohol-related traffic fatalities and alcohol-related drivers in fatal crashes than the FARS estimates. In addition, some states use a different definition of alcohol-related, such as by including only crashes in which a driver had a BAC of 0.10 or greater. The FARS data were used in this study to assure that all states were compared on a common basis. While some states

report different alcohol-related traffic fatality totals than FARS, in general the trends in FARS and state data are very similar. Trends also are similar regardless of what definition is used (total fatalities or drivers above 0.10 BAC, for example).

Data on Canadian fatal crashes were graciously provided by the Traffic Injury Research Foundation (TIRF), Ottawa (Beirness, 2000). The TIRF Fatality Database is supported financially by the Canadian Council of Motor Transport Administrators and Transport Canada.

B. Economic and Demographic Factors, and Laws

Population Data. The Bureau of the Census produces various annual estimates of the U.S. population. For this study, the most useful was the annual Estimates of the Population of the U.S. and States by Single Year of Age and Sex. Data on population by age in each state for the period 1982-1998 were compiled.

Economic Data. Annual state-by-state data were obtained from the Bureau of Labor Statistics on the number of persons employed, the number not employed, and the number not in the labor force for 1982-1997.

State laws. NHTSA provided the dates when different traffic and alcohol laws became effective in each of the states.

Alcohol Consumption. Published data were obtained from the National Institute of Alcohol Abuse and Alcoholism (NIAAA) and the Beer Institute of America.

DWI and Liquor Law Violations. Data were obtained from the Federal Bureau of Investigation (FBI) Uniform Crime Reporting System.

C. Data on Drinking and Drinking-related Behavior

Monitoring the Future. The best data on youth drinking and drinking-related behavior come from the ongoing Monitoring the Future study. Approximately 17,000 high school seniors, from a nationally representative sample of about 135 schools, have provided confidential self-reported information on alcohol and drug use and related behavior each year since 1975. Results are reported annually (most recently in Johnston, O'Malley, and Bachman, 1999). Questions on drinking and driving have been included since 1984 for one-sixth of the sample. O'Malley and Johnston (1999) summarize and discuss these data and trends. Data for this study were obtained from Johnston, O'Malley, and Bachman (1999) and O'Malley (2000).

College age youth surveys. While there are no ongoing surveys of college students comparable to Monitoring the Future, two studies provide information on college students' drinking and drinking-related problems, including driving after drinking, at several points in the past 20 years. Hanson and Engs (1992) surveyed approximately 4,000 students at 65 representative 4-year colleges in 1982, 1985, 1988, and 1991. Wechsler, Davenport, Dowdall et al. surveyed 17,552 students at 140 nationally-representative 4-year colleges in 1993.

General public surveys. Three other surveys provide useful information on drinking or drinking and driving for both young and other persons since 1980. Balmforth (1998) reports results from nationally representative surveys of approximately 4,000 persons age 16 and older in each of the years 1991, 1993, 1995, and 1997. Balmforth aggregates results into the age groups 16-20 and 21-29. Caetano and Clark (1997) surveyed nationally-representative samples of 1,947 black, 1,453 Hispanic, and 1,777 white adults (age 18 and older) in 1984 and 1,582 blacks, 1,585 Hispanics, and 1,636 whites in 1995. Midanik and Clark (1994) surveyed 2,058 adults in a national household probability sample in 1990 and compared their results with data from 5,221 respondents in a 1984 national alcohol survey. The latter two studies aggregate results for the age group 18-29.

D. Terminology

The following terms and abbreviations are used throughout the report.

BAC -- alcohol content in the body, originally measured using alcohol in blood (BAC stood for Blood Alcohol Content, expressed in milligrams of alcohol per 100 milliliters of blood), now typically measured using alcohol in breath.

Drinking driver -- a driver involved in a traffic fatality who is estimated to have a positive BAC (as reported by FARS).

DWI -- the offense of driving while impaired by alcohol. The formal offense differs from state to state (Driving While Impaired, Driving While Intoxicated, and Driving Under the Influence are common). Here, DWI will be used to describe each state's standard impaired driving offense.

Youth (or young driver) -- a person (or driver) under 21 years of age.

III. WHAT HAPPENED?

In the United States in 1982, there were 10,270 drivers under the age of 21 involved in fatal crashes. Forty-three percent (4,393) of these drivers were deemed to have been drinking prior to their crashes. In 1998, the number of under 21 year old drivers in fatal crashes was 8,128 with 21 percent (1,714) of these determined to have been drinking. Comparing 1998 with 1982, the number of youthful drivers involved in fatal crashes declined by 21 percent and the number who had been drinking declined by 61 percent.

These basic trends for young drivers in fatal crashes have been evident for some time. In particular, annual NHTSA reports (Wright, 2000) document the substantial drop in youth alcohol-related traffic fatalities and rates and compare these to alcohol-related traffic fatalities and rates for older persons. This chapter begins by presenting these national trends and disaggregating them by region and state. Next, national and regional youth drinking data and trends are analyzed and drinking trends are compared to drinking and driving trends. Finally, evidence is presented on youth drinking and driving behavior and how it has changed since 1982.

A. Young Drinking Drivers in Fatal Crashes -- National Trends

Young drivers in fatal crashes

Figure 1 shows the trend in the numbers of young drinking drivers involved in fatal crashes over the 1982-1998 period. The figure shows that there was a general downward trend until about 1993 with little change since then.

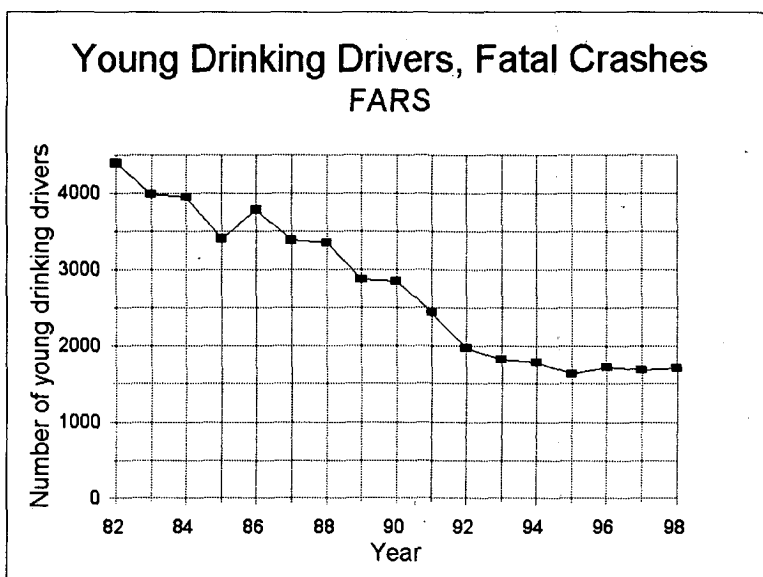


Figure 1. Young Drinking Drivers in Fatal Crashes

The trend for not-drinking young drivers in fatal crashes, shown in Figure 2, is quite different: increasing from 1982 to 1988, decreasing until 1992, then increasing again.

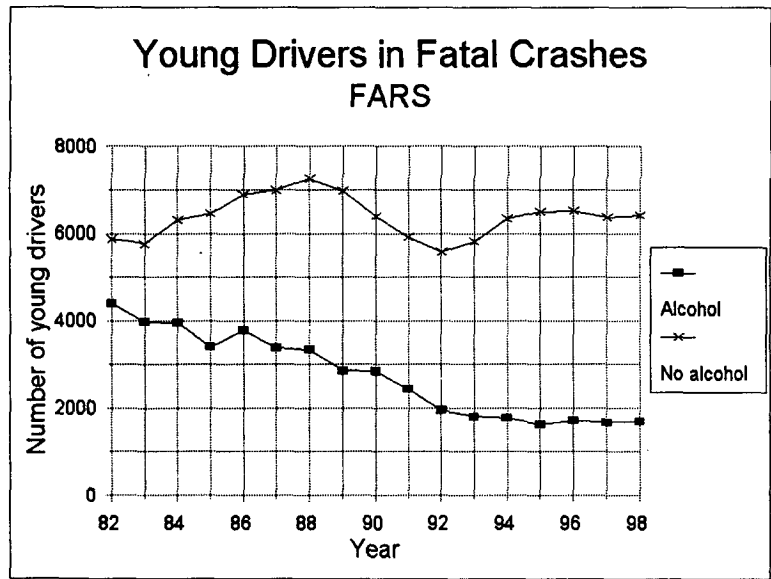


Figure 2. Young Drinking and Not-Drinking Drivers in Fatal Crashes

Figure 3 summarizes the two trends as the percentage of young drivers in fatal crashes with a positive BAC. This has decreased steadily from 43 percent in 1982 to 21 percent in 1998.

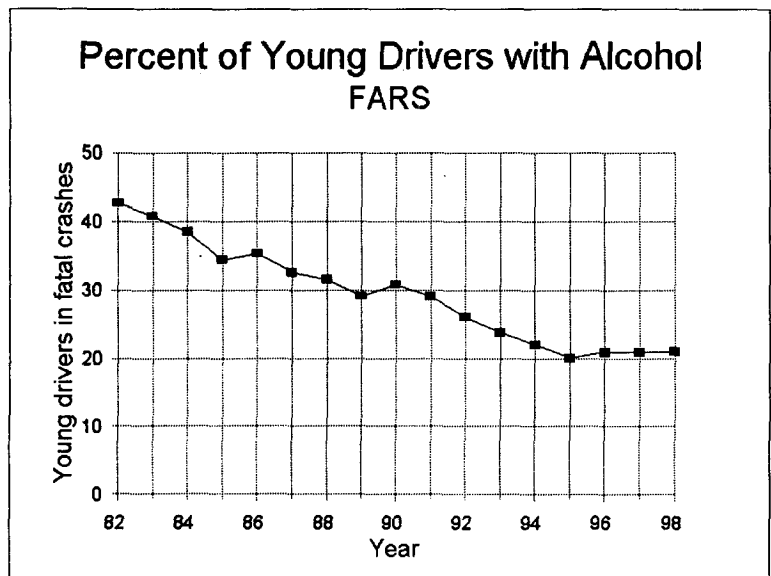


Figure 3. Percent of Young Drivers in Fatal Crashes with Positive BAC

It is very clear from these figures that the number of young drinking drivers in fatal crashes has dropped spectacularly since 1982. It's also clear that this is not just due to a general

reduction in young driver crash involvement, since the number of non-drinking drivers actually increased. This evidence suggests that overall drinking and driving by youth has decreased substantially since 1982.

Comparisons by age

Figure 4 shows the number of young drinking drivers in fatal crashes for each individual year of age. The figure shows that in virtually every calendar year the number of drinking driver involvements increases with each year of age: there are more drinking drivers age 16 than age under 16, more age 17 than 16, etc. The figure also shows that drinking driver involvement decreases followed the same pattern for each age. Overall, drinking drivers in fatal crashes decreased between 59 percent and 65 percent for each age, 16 through 20 from 1982 to 1998.

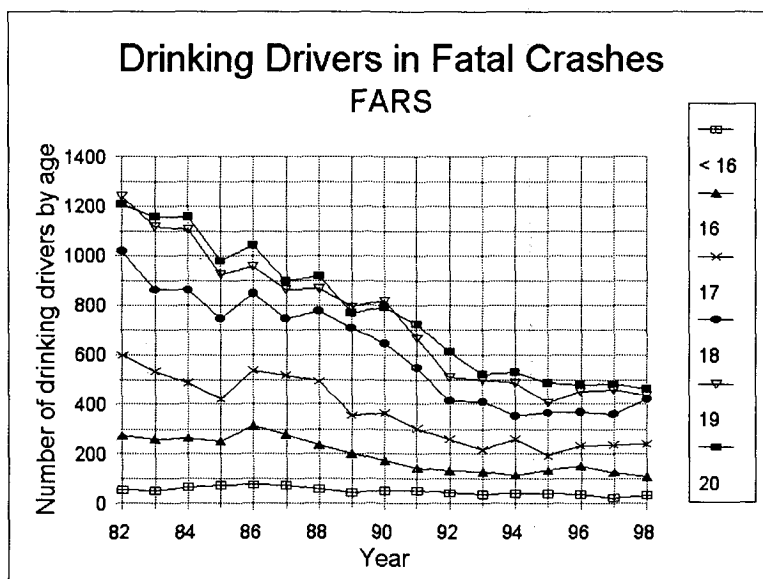


Figure 4. Young Drinking Drivers in Fatal Crashes by Age

The virtually identical trends by age illustrated in Figure 4 suggest an important conclusion. Drivers under 21 differ substantially by age in where they live, what they do, how much and why they drive. Most youth aged 16 attend high school and live at home with at least one parent. By the age of 20, most youth are considerably more independent, attend college or have a full-time job, and many do not live with their parents for much of the year. Yet the drinking driver decrease pattern was the same for 16- and for 20-year-olds. The causes of this decrease appear to have influenced youth of all ages.

Figure 5 compares the trends in drinking drivers in fatal crashes for three age groups: under 21, 21-24, and 25 and above. Driver involvements in the two younger age groups decreased steadily throughout the period, while the older age group's decrease was concentrated between 1990 and 1994.

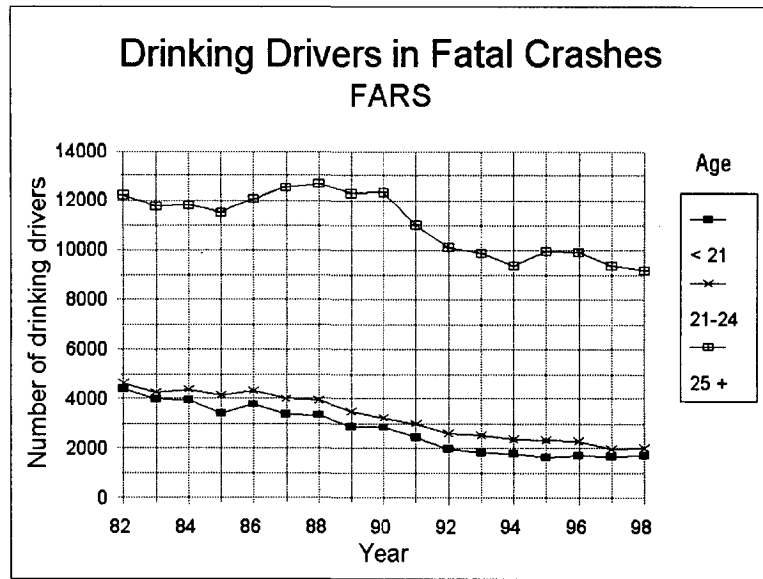


Figure 5. Drinking Drivers in Fatal Crashes by Age Group

Figure 6 plots the three trends from a base of 1982 = 100 percent. Thus, in 1998 the number of drinking drivers under age 21 was 39 percent of the 1982 level, a decrease of 61 percent. Similarly, in 1998 drinking drivers aged 21-24 were 44 percent of their 1982 level, and drinking drivers age 25 and above were 75 percent. Put another way, drinking drivers in fatal crashes aged 16-20 decreased 61 percent from 1982 to 1998; drivers aged 21-24 decreased 56 percent; and drivers aged 25 and above decreased 25 percent.

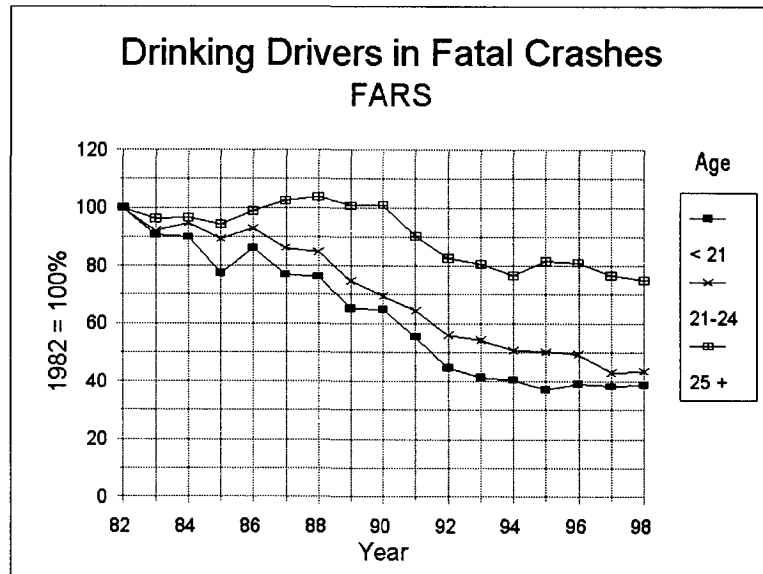


Figure 6. Drinking Drivers in Fatal Crashes by Age Group - Percentage Change, 1982-1998

Two conclusions are clear: the number of young drinking drivers in fatal crashes dropped faster than the number of older drinking drivers, but the number of drinking drivers aged 21-24 decreased almost as much.

Involvement rates by age

Changes in the US population age distribution clearly affect driver involvements in fatal crashes. In the past 20 years the number of young persons of driving age has decreased while the number of older persons has increased substantially. More precisely, between 1982 and 1998 the US population age 15 to 20 decreased by 4 percent, the population aged 21 to 24 decreased by 20 percent, and the population aged 25 to 54 increased 31 percent.

Figure 7 accounts for these population changes by plotting the number of drinking drivers in fatal crashes per 100,000 population.

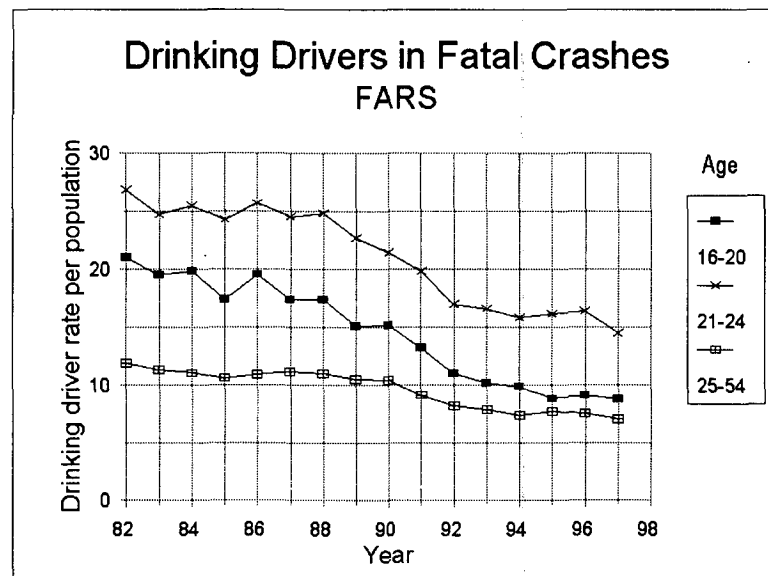


Figure 7. Drinking Drivers in Fatal Crashes per 100,000 Population.

The difference from the absolute numbers of Figure 5 is striking. Drivers aged 21-24 have the highest involvement rates, followed by drivers under 21, then by drivers aged 25 and above. Involvement rates for all three age groups have decreased quite steadily since 1982.

Figure 8 plots the three trends of Figure 7 from a base of 1982 = 100 percent. The involvement rate for drivers age 16-20 has decreased the most -- 59 percent; drinking driver involvements for age 21-24 decreased 46 percent; and involvements for age 25-54 decreased 43 percent.

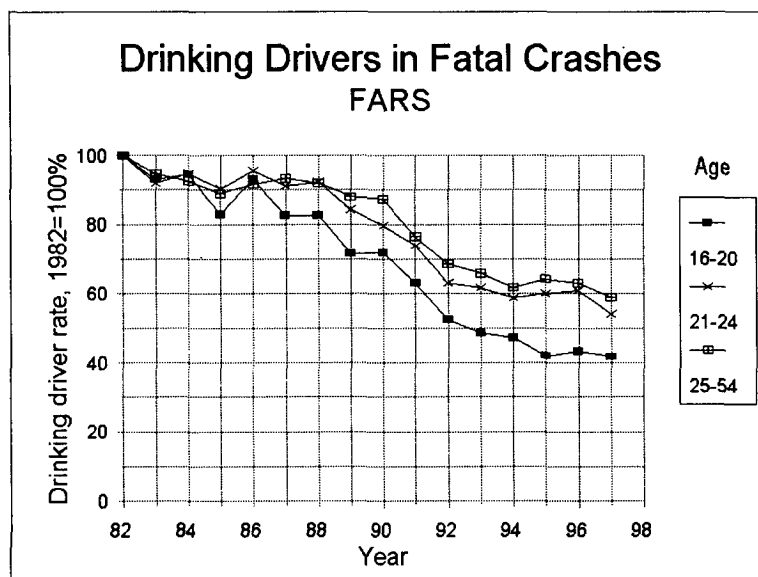


Figure 8. Drinking Drivers in Fatal Crashes per 100,000 Population- Percentage Change, 1982-1998

Table 1 summarizes the reductions illustrated in Figures 6 and 8. For drivers under 21, decreases in the number of drinking driver involvements and the involvement rate per population were very similar, at about 60 percent. For drivers aged 21-24, the 56 percent decrease in the number of driver involvements translates to a 46 percent decrease in involvement rate. Thus, some of their decrease in driver involvements was due to a decrease in the number of drivers on the road, not to a change in driver behavior. In contrast, due to the substantial increase in the population aged 25-54, the 24 percent decrease in their driver involvements grew to a 43 percent decrease in the involvement rate.

Table 1. Change in Drinking Drivers in Fatal Crashes

Age	Number of Drivers Change, 1982 to 1998 (Figure 6)	Drivers per Population Change, 1982 to 1998 (Figure 8)
Under 21	- 61 %	- 59 %
21-24	- 56 %	- 46 %
25-54	- 24 %	- 43 %

The driver involvement rates of Figure 8 and Table 1 provide the best measure of behavior change that can be deduced from FARS data. They show that drivers of all ages reduced their drinking and driving; young drivers reduced their drinking and driving about 37 percent more than older drivers (59 percent compared to 43 percent), with drivers aged 21-24 falling in between.

Thus, population changes account for some of the difference between young and older drivers suggested by a simple comparison of the number of drinking driver involvements in fatal crashes.

Conclusions

The national data examined so far suggest several conclusions.

- Youth drinking and driving, as measured by fatal crash involvement, decreased substantially from 1982 to 1998 -- by 61 percent.
- The decrease was greater than for older drivers, although drivers aged 21-24 decreased almost as much: fatal crash involvements for drivers aged 25-54 decreased only 25 percent.
- A small portion of the decrease is due to a decrease in the number of youth: the involvement rate per population decreased by 59 percent. More importantly, when involvements per population are considered, the gap between young driver and older driver decreases narrows.

B. Regional and State Experience

The experience of various regions of the country, and the individual states within these regions, regarding young drinking driver involvements in fatal crashes is examined in the following material. The measure used is the rate of drinking drivers age 16 to 20 involved in fatal crashes per 100,000 population in that age range.

Table 2 shows the percentage declines from 1982 to 1998 in each state in the youth drinking driver rate. The percentage change for each state was determined by fitting a linear regression to annual data for 1982-1998 and then estimating the "predicted" number of driver involvements in 1982 and 1998. These numbers were then used to calculate the 1982-1998 percentage change. This approach "smooths" the data series by giving weight to the intervening years, and thereby provides a better summary measure than the unadjusted change from 1982 to 1998 alone. Table 3 shows these same data with the states listed in rank order from largest to smallest decline.

Note that the reported results for Mississippi should be viewed with great caution. Mississippi's alcohol testing rates were very low in the early 1980s (for example, only nine percent of fatally-injured drivers in 1982 had a known BAC). Consequently, the FARS imputation model results used in Tables 2 and 3 may be misleading. See the full Mississippi data in Figure 15 and the accompanying discussion surrounding Table 9 for further detail.

Tables 2 and 3 reveal that virtually all states had substantial declines in the rate of youthful drinking driver involvements in fatal crashes. The median percentage decline was more than 65 percent and there were eight states that had declines of 80 percent or more.

Figure 9 highlights the top 25 states listed in Table 3. The figure shows that most of the top 25 states are located along the east and west coasts while most of the lower ranking states are located in interior sections of the country.

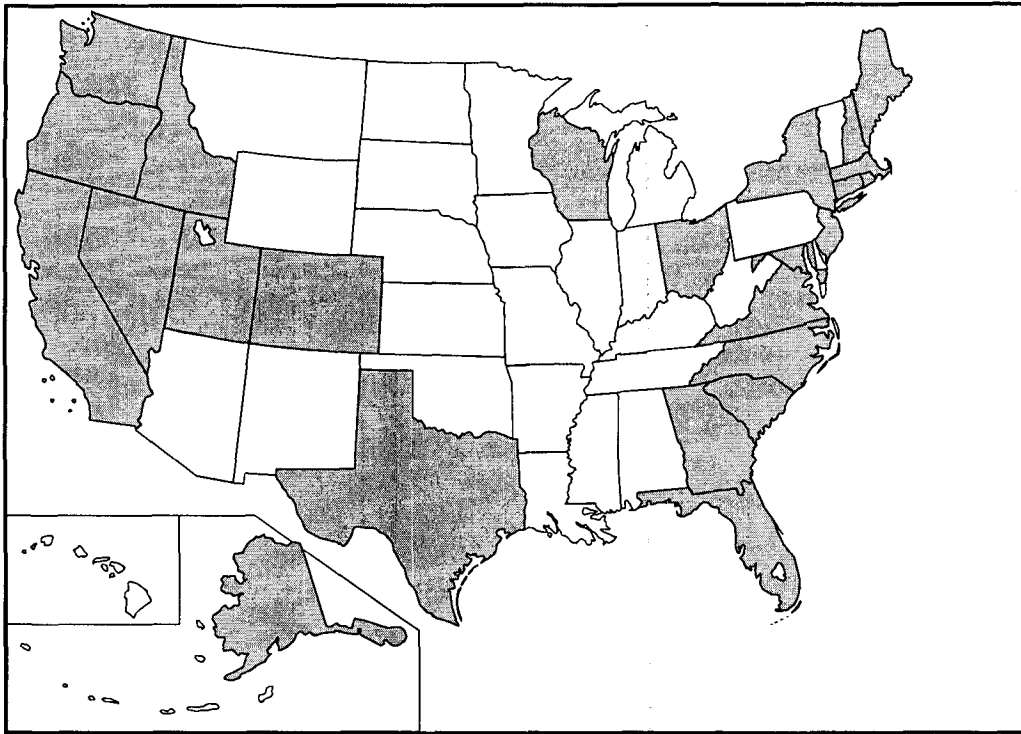


Figure 9. States with the Largest Declines in Young Drinking Driver Fatal Crash Involvements, 1982 - 1998.

Table 2. State Declines in Rate of Drinking Drivers Age 16-20 Involved in Fatal Crashes, 1982 to 1998

State	Percent Decline	Rank	State	Percent Decline	Rank
Alabama	-44.4	47	Montana	-63.9	31
Alaska	-92.0	2	Nebraska	-52.0	44
Arizona	-63.8	32	Nevada	-66.2	25
Arkansas	-64.3	29	New Hampshire	-95.4	1
California	-76.0	14	New Jersey	-83.0	6
Colorado	-69.4	21	New Mexico	-53.7	42
Connecticut	-88.1	4	New York	-79.8	9
Delaware	-72.8	19	North Carolina	-68.6	23
Florida	-74.2	15	North Dakota	-28.6	48
Georgia	-76.8	12	Ohio	-80.3	8
Hawaii	-65.3	26	Oklahoma	-57.7	39
Idaho	-59.9	13	Oregon	-73.4	16
Illinois	-54.6	41	Pennsylvania	-61.7	35
Indiana	-59.9	37	Rhode Island	-87.1	5
Iowa	-62.0	34	South Carolina	-68.6	24
Kansas	-52.9	43	South Dakota	-51.2	45
Kentucky	-58.5	38	Tennessee	-65.0	27
Louisiana	-47.0	46	Texas	-71.0	20
Maine	-81.7	7	Utah	-89.2	3
Maryland	-72.9	18	Vermont	-62.8	33
Massachusetts	-78.9	10	Virginia	-73.3	17
Michigan	-64.7	28	Washington	-69.0	22
Minnesota	-63.9	30	West Virginia	-56.3	40
Mississippi	47.7	50	Wisconsin	-77.2	11
Missouri	-18.7	49	Wyoming	-60.9	36

Involvement rate per 100,000 population age 16-20.

Table 3. State Rankings on Declines in Rate of Drinking Drivers Age 16-20 Involved in Fatal Crashes, 1982 to 1998

State	Percent Decline	Rank	State	Percent Decline	Rank
New Hampshire	-95.4	1	Hawaii	-65.3	26
Alaska	-92.0	2	Tennessee	-65.0	27
Utah	-89.2	3	Michigan	-64.7	28
Connecticut	-88.1	4	Arkansas	-64.3	29
Rhode Island	-87.1	5	Minnesota	-63.9	30
New Jersey	-83.0	6	Montana	-63.9	31
Maine	-81.7	7	Arizona	-63.8	32
Ohio	-80.3	8	Vermont	-62.8	33
New York	-79.8	9	Iowa	-62.0	34
Massachusetts	-78.9	10	Pennsylvania	-61.7	35
Wisconsin	-77.2	11	Wyoming	-60.9	36
Georgia	-76.8	12	Indiana	-59.9	37
Idaho	-76.6	13	Kentucky	-58.5	38
California	-76.0	14	Oklahoma	-57.7	39
Florida	-74.2	15	West Virginia	-56.3	40
Oregon	-73.4	16	Illinois	-54.6	41
Virginia	-73.3	17	New Mexico	-53.7	42
Maryland	-72.9	18	Kansas	-52.9	43
Delaware	-72.8	19	Nebraska	-52.0	44
Texas	-71.0	20	South Dakota	-51.2	45
Colorado	-69.4	21	Louisiana	-47.0	46
Washington	-69.0	22	Alabama	-44.4	47
North Carolina	-68.6	23	North Dakota	-28.6	48
South Carolina	-68.6	24	Missouri	-18.7	49
Nevada	-66.2	25	Mississippi	47.7	50

Involvement rate per 100,000 population age 16-20.

New England States

Table 4 shows the percentage change from 1982 to 1998 in 16-20 year old drinking drivers per 100,000 population for each of the New England states (hereafter the "youth drinking driver rate") and their national ranking on this measure. The table also shows the year in which each state implemented a minimum legal drinking age (MLDA) law at 21 years old, and the year in which each state adopted a zero tolerance law at .02 BAC or lower for persons under the age of 21. Figure 10 plots the trend in each state in the youth drinking driver rate over the 1982-1998 period.

Table 4 indicates that five of the six New England states were in the top 10 regarding the change in the youth drinking driver rate. In 1984, Rhode Island adopted an age 21 minimum drinking age law, Vermont did so in 1986 while the other four states in the region implemented MLDA 21 laws in 1985. The minimum drinking age did not necessarily change from 18 to 21 years in a single step. For example, Connecticut changed from age 18 to 19 in 1982, from 19 to 20 in 1983 and then to age 21 in 1985. Maine changed from age 18 to 20 in 1977, and then to age 21 in 1985. Massachusetts changed from age 18 to 20 in 1979, and then to age 21 in 1985. New Hampshire changed from age 18 to 20 in 1979, and then to age 21 in 1985. Rhode Island changed from age 18 to 19 in 1980, to age 20 in 1981 and then to age 21 in 1984. Vermont was the only state in the region to change from age 18 to age 21 in a single step. The "legal drinking age," therefore was an active topic in the region in the early 1980s. At the close of 1982, age 18 was the legal drinking age only in Vermont. Similar incremental steps occurred in many states in other regions.

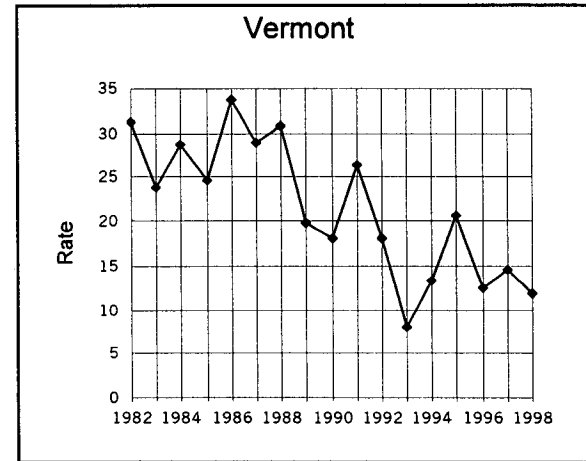
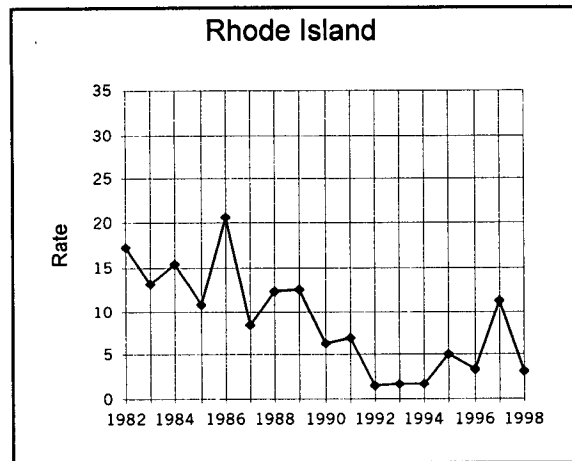
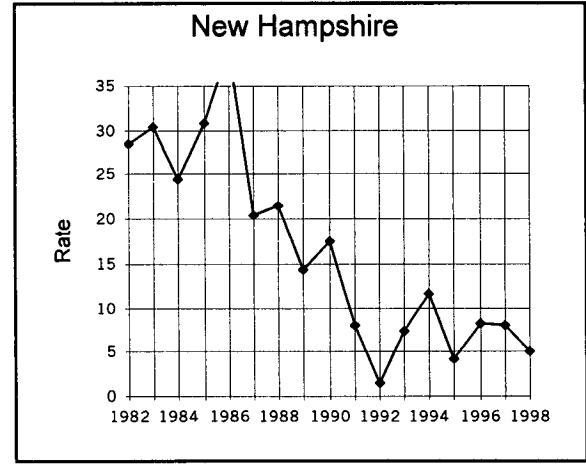
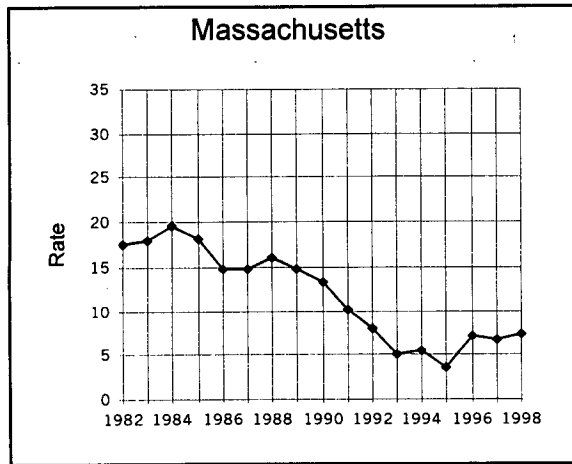
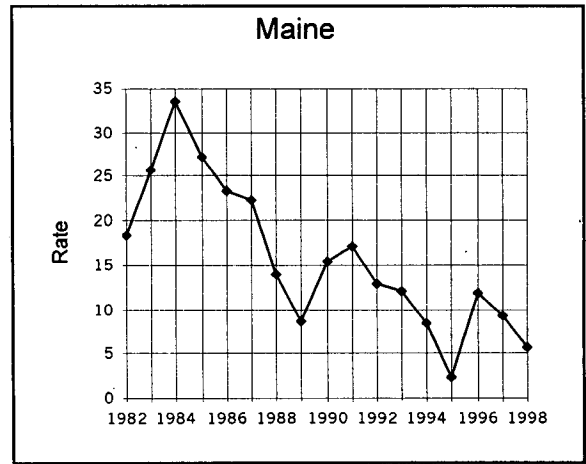
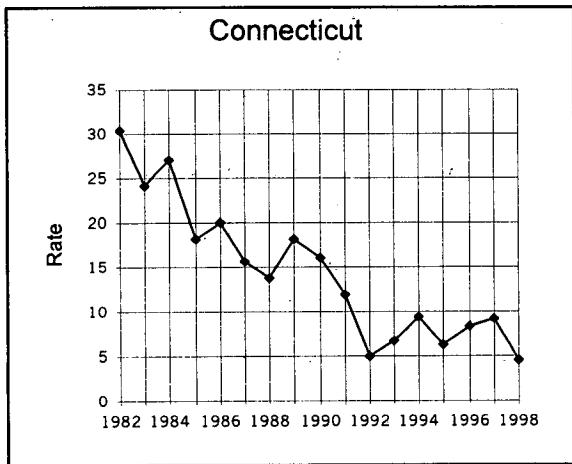
Zero tolerance was first adopted nationally by Maine in 1983. Vermont, in 1997, was the last of the New England States to do so. A few states have approached zero tolerance incrementally. For example, before adopting MLDA 21 in 1995, Rhode Island had a 0.04 limit for persons under the age of 18. Data for all states on the adoption of MLDA and zero tolerance laws are contained in the Appendix.

Figure 10 shows that the drinking driver rate for youth generally declined in each state from the early 1980s through the early 1990s and have become roughly constant since then. These states have relatively small populations so small changes in driver involvements can produce considerable fluctuations. Nevertheless, since the early 1990s, Connecticut, Maine, Massachusetts and New Hampshire generally have had rates in the 5 to 10 range (drinking drivers involved per 100,000 population). Rhode Island generally has had lower rates while Vermont has been higher.

Table 4. New England States

State	16-20 Year Old Drinking Driver Rate	National Rank	MLDA 21 Law	Zero Tolerance
	Percent Change 1982-1998			
Connecticut	-88.1	4	1985	1995
Maine	-81.7	7	1985	1983
Massachusetts	-78.9	10	1985	1994
New Hampshire	-95.4	1	1985	1993
Rhode Island	-87.1	5	1984	1995
Vermont	-62.8	33	1986	1997

Figure 10. New England States-Drinking Drivers Age 16-20 Involved in Fatal Crashes
(Rate per 100,000 Population)



Mid-Atlantic States

Of the three states in this region, New Jersey and New York ranked in the top 10 nationally in the change in the youth drinking driver rate while Pennsylvania ranked 35th. Pennsylvania is one of 11 states whose minimum drinking age has been 21 since the 1930s. New Jersey changed from age 18 to 19 in 1980 and then to age 21 in 1983. New York changed from age 18 to 19 in 1982 and to age 21 in 1985. New Jersey adopted zero tolerance in 1992 while New York and Pennsylvania did so in 1996 (see Table 5).

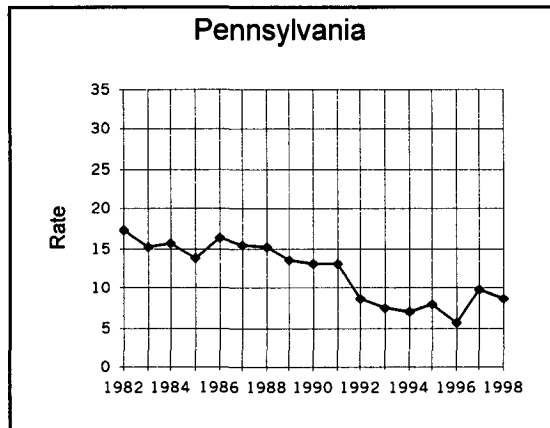
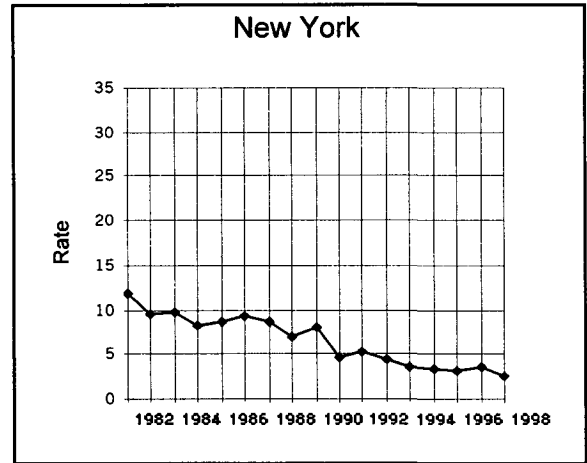
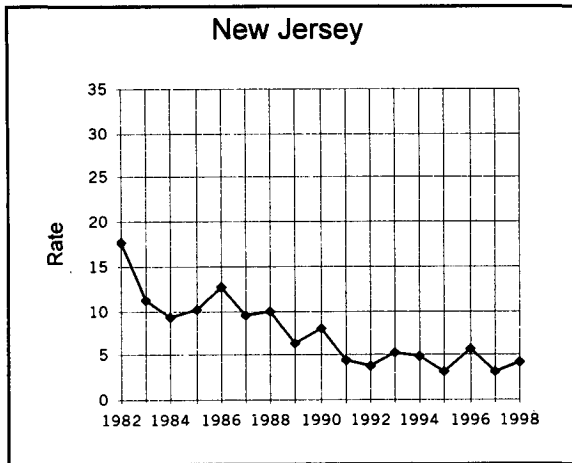
Table 5. Mid-Atlantic States

State	16-20 Year Old Drinking Driver Rate	National Rank	MLDA 21 Law	Zero Tolerance
	Percent Change 1982-1998			
New Jersey	-83.0	6	1983	1992
New York	-79.8	9	1985	1996
Pennsylvania	-61.7	35	1935	1996

Figure 11 shows the trend in the youth drinking driver rate in the three Mid Atlantic states over the 1882-1998 period. In New Jersey, the rate declined through 1991 and has remained at or below 5 (per 100,000 population) since then. The New York rate also reached 5 in 1991 but has continued downward since then. The Pennsylvania rate fell below 10 (per 100,000) in 1992 and has fluctuated between 5 and 10 since then. The New Jersey rate is influenced by the fact that the state's minimum licensing age has been 17. Similarly, New York's residents cannot be fully licensed until age 17 with driver education or age 18 without driver education. New York issues Junior Licenses at age 16. However, these licenses have night driving curfews and cannot be used at any time in New York City, and only in a very limited way on Long Island,

Figure 11. Mid Atlantic States-Drinking Drivers Age 16-20 Involved in Fatal Crashes

(Rate per 100,000 Population)



South Atlantic States

Table 6 shows the percentage change in the youth drinking driver rate for each of the eight states in the South Atlantic region, the states' national ranking and when each state adopted MLDA 21 and zero tolerance. Seven of the eight states in the region ranked in the top half of all states in the percentage change in the youth drinking driver rate. Each state adopted MLDA 21 between 1982 and 1986. Delaware raised its minimum drinking age to 21 in 1984. Prior to that the MLDA had been age 20. Florida raised its drinking age from 18 to 19 in 1980 and then to 21 in 1985. Georgia raised its MLDA from 18 to 19 in 1980, to 20 in 1985 and then to 21 in 1986. Maryland changed from 18 to 21 in 1982. North Carolina went from 18 to 19 in 1983 and then to age 21 in 1986. South Carolina went from age 18 to 19 (1984), 19 to 20 (1985) and 20 to 21 (1986). Virginia changed its MLDA from 18 to 19 in 1981, and to 21 in 1985. West Virginia changed from 18 to 19 in 1983 then to age 21 in 1986. Maryland, in 1990, was the first state in the region to enact a zero tolerance law while the other states in this region enacted zero tolerance between 1994 and 1998.

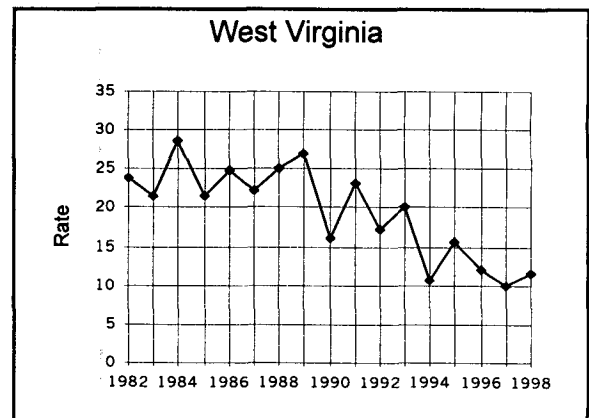
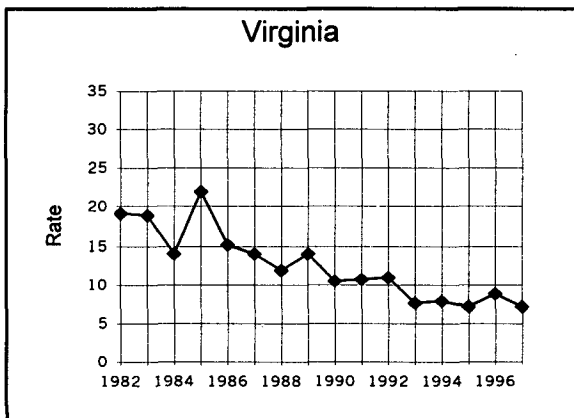
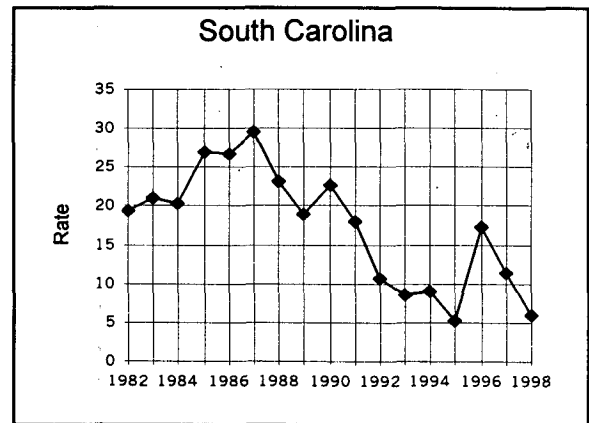
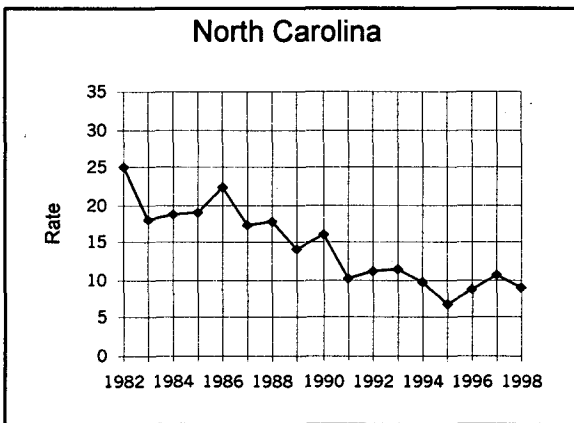
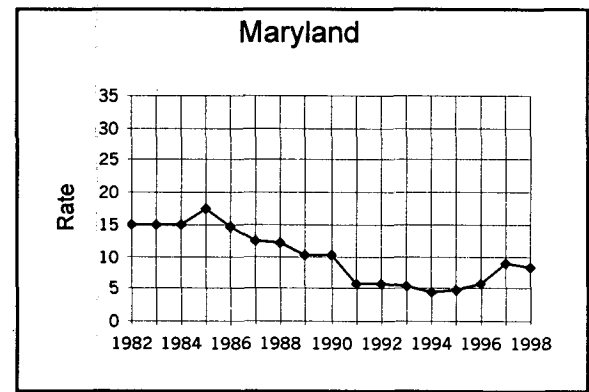
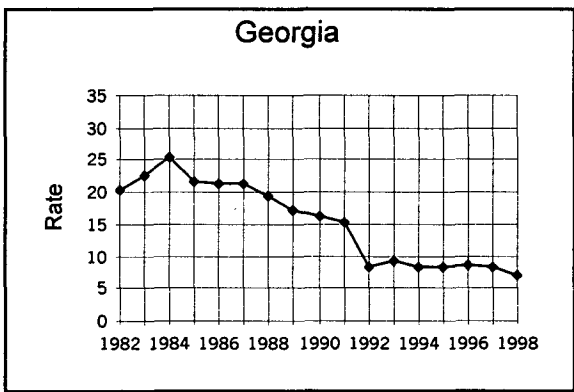
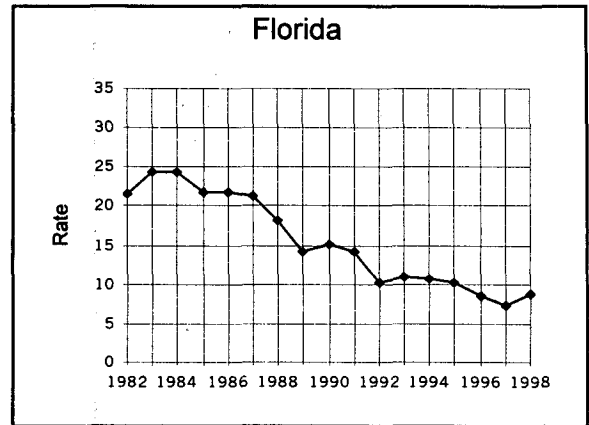
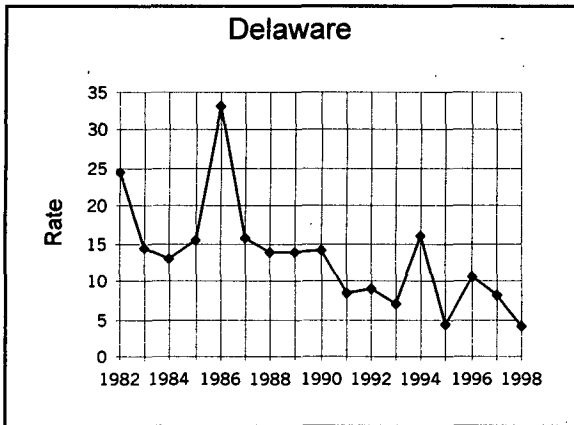
Table 6. South Atlantic States

State	16-20 Year Old Drinking Driver Rate	National Rank	MLDA 21 Law	Zero Tolerance
	Percent Change 1982-1998			
Delaware	-72.8	19	1984	1995
Florida	-74.2	15	1985	1997
Georgia	-76.8	12	1986	1997
Maryland	-72.9	18	1982	1990
North Carolina	-68.6	23	1986	1995
South Carolina	-68.6	24	1986	1998
Virginia	-73.3	17	1985	1994
West Virginia	-56.3	40	1986	1994

Figure 12 shows the trends in the youth drinking driver rate for the South Atlantic states over the 1982-1998 period. The rates in Georgia and Virginia declined into the early 1990s and have then remained relatively constant between 5 and 10 (per 100,000 population). Maryland attained the lowest rate in the region by the early 1990s but increased somewhat in recent years. Florida's youth drinking driver rate stabilized near 10 for several years after 1991 and has declined again more recently. North Carolina has been more or less stable around the 10 since 1991. The trends for Delaware, South Carolina and West Virginia show somewhat greater

variability. Recently, Delaware has been in the 5 to 10 range, South Carolina has fluctuated considerably, and West Virginia has been in the 10-15 rate range.

Figure 12. South Atlantic States-Drinking Drivers Age 16-20 Involved in Fatal Crashes
(Rate per 100,000 Population)



East North Central States

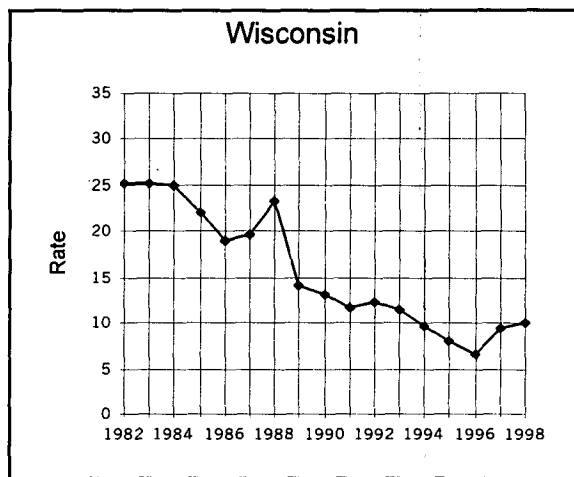
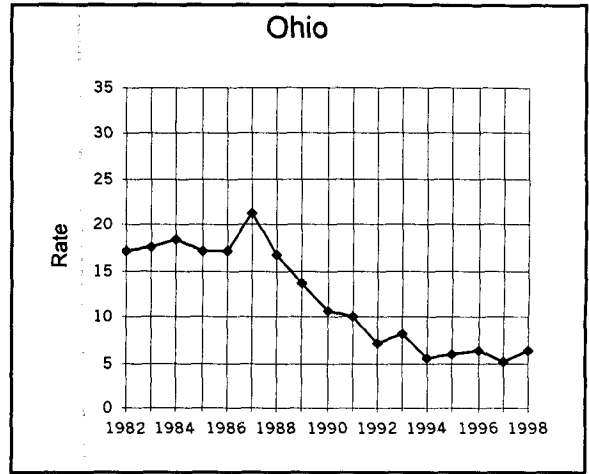
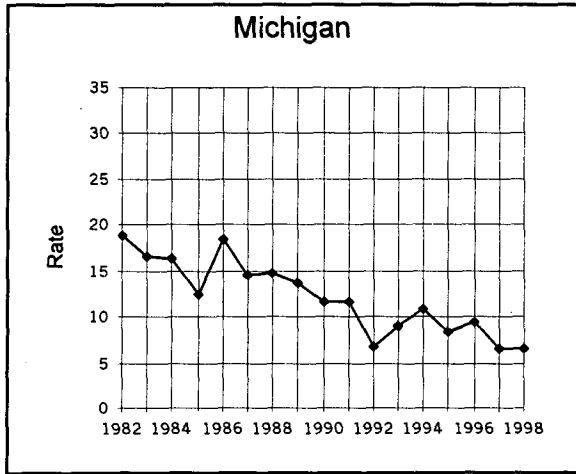
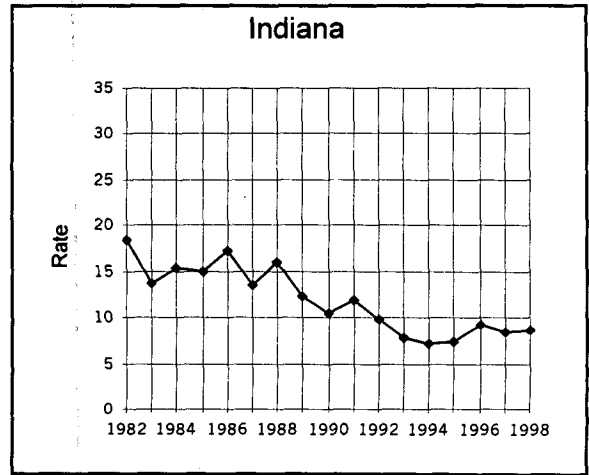
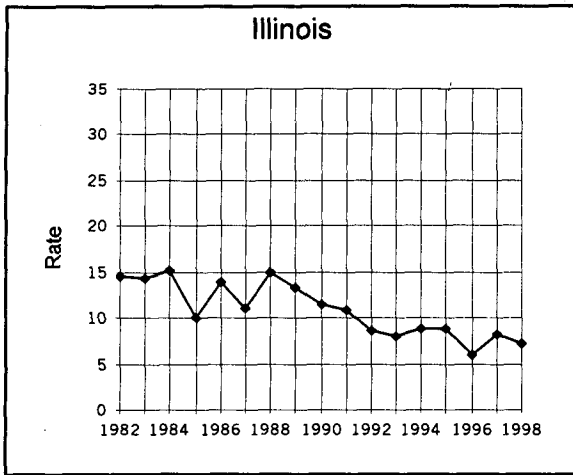
Of the states in the East North Central region, Ohio and Wisconsin had the largest declines in the youth drinking driver rate while Illinois, Indiana and Michigan have been below the mid-point of the 50 states (Table 7). Illinois adopted an MLDA 21 law in 1980, raised from age 19. Indiana had a 21 year old minimum drinking age law since the 1930s. Michigan was the earliest state to change its MLDA from 18 to 21 in a single step, having done so in 1978. Ohio changed its MLDA from 18 to 19 in 1982 then to age 21 in 1987. Wisconsin went from age 18 to 19 in 1984 then to age 21 in 1986. Michigan and Ohio adopted zero tolerance laws in 1994, Illinois did so in 1995 and Wisconsin did so in 1997.

Table 7. East North Central States

State	16-20 Year Old Drinking Driver Rate	National Rank	MLDA 21 Law	Zero Tolerance
	Percent Change 1982-1998			
Illinois	-54.6	41	1980	1995
Indiana	-59.9	37	1934	1997
Michigan	-64.7	28	1978	1994
Ohio	-80.3	8	1987	1994
Wisconsin	-77.2	11	1986	1997

Figure 13 shows the trends in the youth drinking driver rates for the East North Central states. Illinois, Indiana, Michigan and Ohio were below the national average rate of 21 per 100,000 population in 1982, declined somewhat into the 1990s, and have been more or less stable in the 5-10 range since. Ohio has achieved the lowest rate of the region having been relative constant near the 5 per 100,000 rate for a number of years. Wisconsin began the period above the national average, declined reasonably steadily until 1996, and rose again in 1997 and 1998.

Figure 13. East North Central States-Drinking Drivers Age 16-20 Involved in Fatal Crashes
(Rate per 100,000 Population)



West North Central States

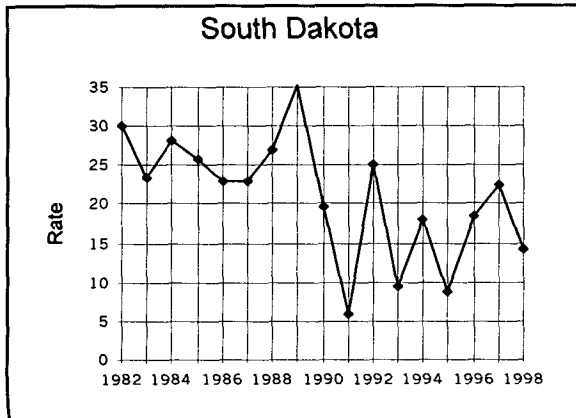
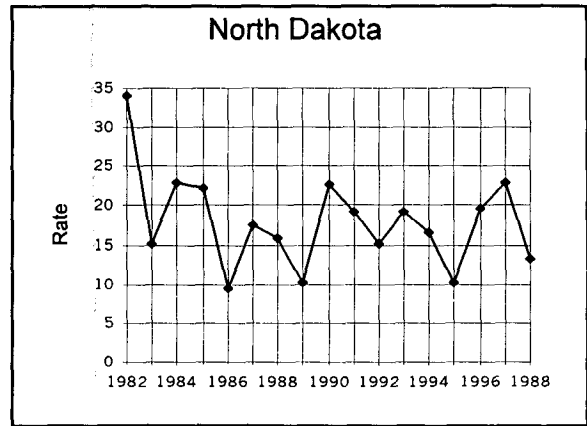
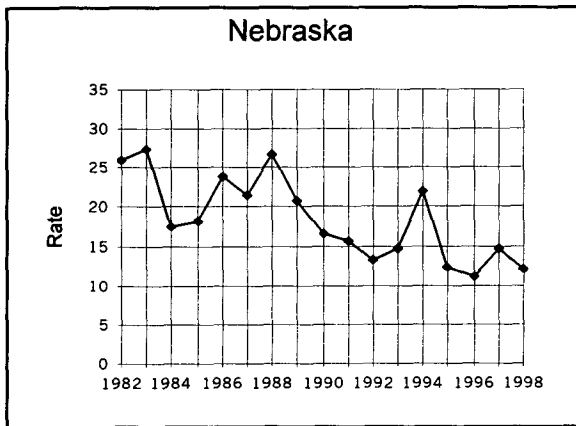
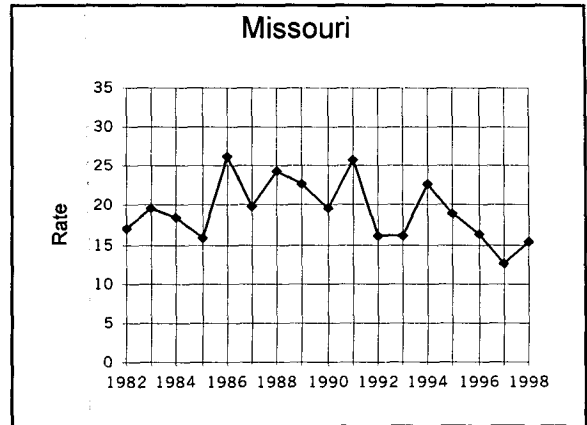
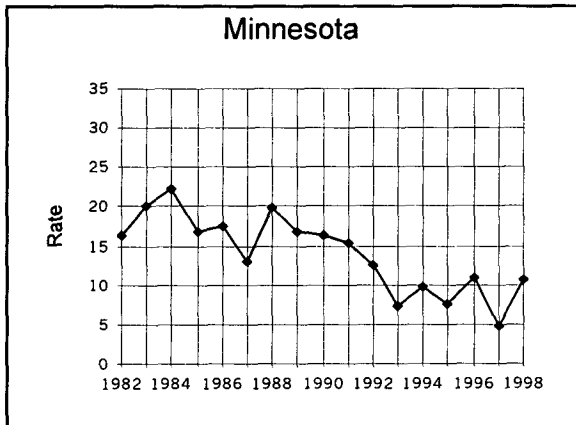
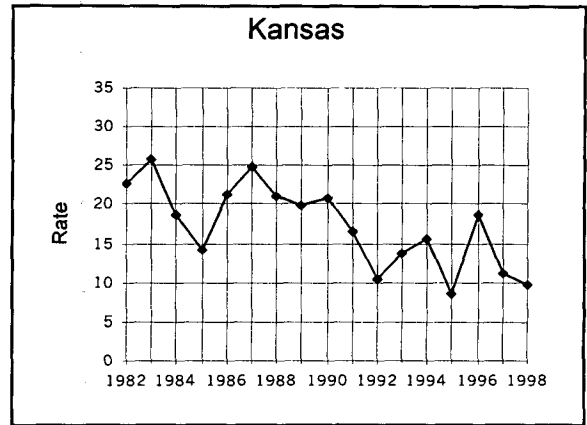
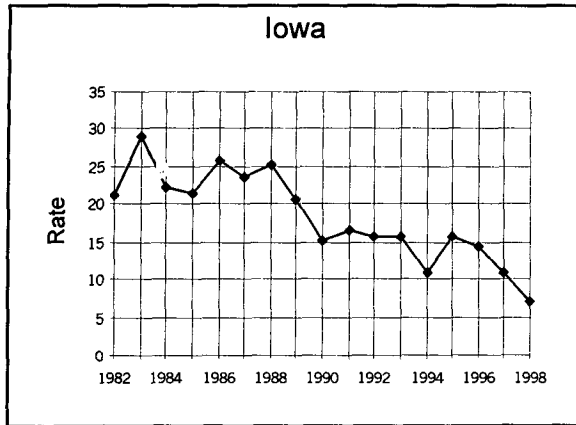
The states in this region were all in the lower half of the states in terms of percentage declines in youth drinking drive rates and several were among those with the smallest declines (Table 8). Iowa changed its MLDA from 18 to 19 in 1978 and to age 21 in 1986. Kansas changed from 18 to 21 in a single step in 1985. Minnesota increased its MLDA from 18 to 19 in 1976 and to 21 in 1986. North Dakota had a 21 year-old minimum drinking age dating back to the 1930s and Missouri had an age 21 law since 1945. Nebraska changed its MLDA from 18 to 19 in 1980 and then to 21 in 1985. South Dakota changed from 18 to 19 in 1984 and to age 21 in 1988, one of the last states to do so. Minnesota, in 1993, was the first state in the region to adopt a zero tolerance law while South Dakota, in 1998, was the last.

Table 8. West North Central States

State	16-20 Year Old Drinking Driver Rate	National Rank	MLDA 21 Law	Zero Tolerance
	Percent Change 1982-1998			
Iowa	-62.0	34	1986	1995
Kansas	-52.9	43	1985	1997
Minnesota	-63.9	30	1986	1993
Missouri	-18.7	49	1945	1996
Nebraska	-52.0	44	1985	1994
North Dakota	-28.6	48	1936	1997
South Dakota	-51.2	45	1988	1998

The trends in the youth drinking driver rates for each of the West North Central states are shown in Figure 14. Most of the states in this region began the period examined above the national rate (21 per 100,000) and at the end of the period shown only Iowa was below a rate of 10 per 100,000 population.

Figure 14. West North Central States-Drinking Drivers Age 16-20 Involved in Fatal Crashes (Rate per 100,000 Population)



East South Central States

All four of the states in this region were in the lower one-half of the states in terms of declines in the youth drinking driver rate (Table 9) though as noted previously the reported 47.7 percent increase for Mississippi is undoubtedly spurious. Figure 15 shows a pattern for Mississippi unlike that of any other state and shows apparent drinking-driver involvement rates in the early 1980s for Mississippi far below those of any other state. By about 1989, the Mississippi rates of about 20 per 100,000 population are similar to those of the other states in this region and similar to rates in the adjoining states of Louisiana and Arkansas (Figure 16). It is reasonable to conclude that the Mississippi data do not describe Mississippi fatal crash involvement rates accurately until about 1989. From that point, they probably are reasonably accurate in showing a gradual decrease from a rate of about 20 in 1989 to a rate of about 15 in 1998

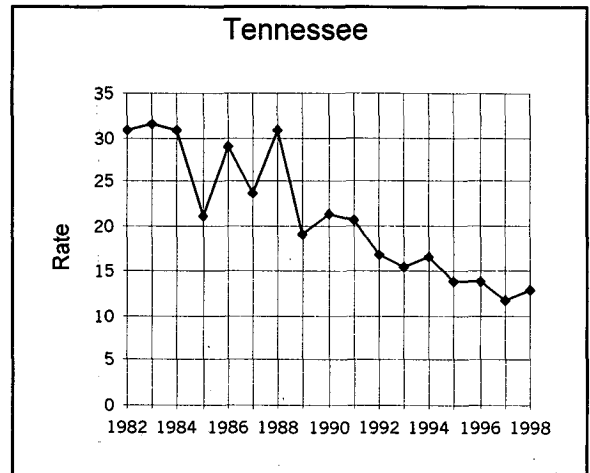
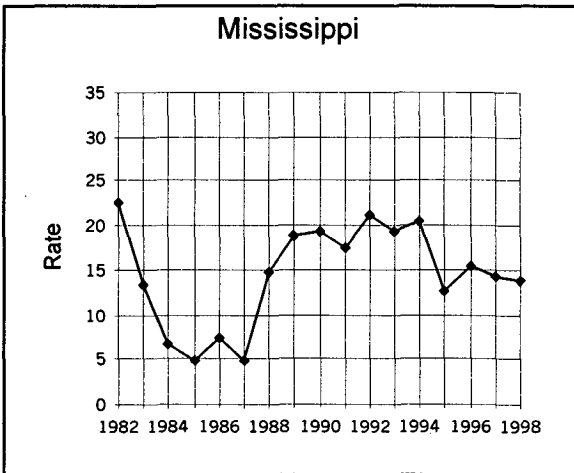
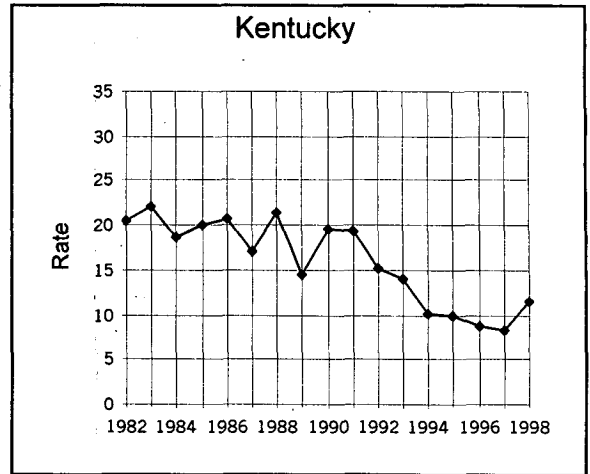
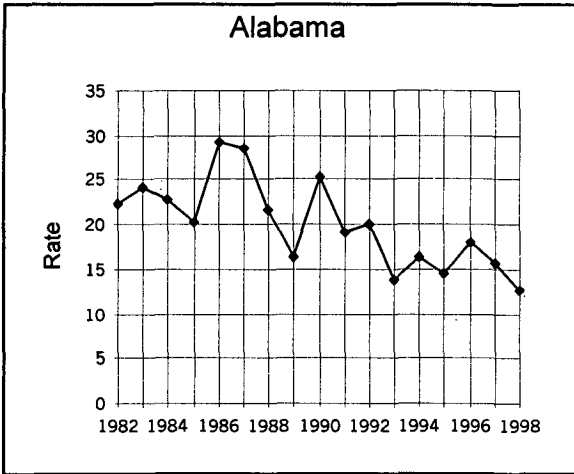
Kentucky was one of the states with an MLDA 21 law that dates back to the 1930s. Alabama adopted age 21 in a single step in 1985 as did Mississippi in 1986. Tennessee went from age 18 to 19 in 1979, then to age 21 in 1984. Tennessee was the first state in the region to adopt zero tolerance (1993) while Mississippi was the last (1998).

Table 9. East South Central States

State	16-20 Year Old Drinking Driver Rate	National Rank	MLDA 21 Law	Zero Tolerance
	Percent Change 1982-1998			
Alabama	-44.4	47	1985	1996
Kentucky	-58.5	38	1938	1996
Mississippi	47.7	50	1986	1998
Tennessee	-65.0	27	1984	1993

Figure 15 shows the trends in the rate of 16-20 year old drinking driver involvements in fatal crashes over the 1982-1998 period for these four states. Alabama, Kentucky and Tennessee had declines over the period shown but were still above a rate of 10 per 100,000 population in 1998, as was Mississippi.

Figure 15. East South Central States-Drinking Drivers Age 16-20 Involved in Fatal Crashes
(Rate per 100,000 Population)



West South Central States

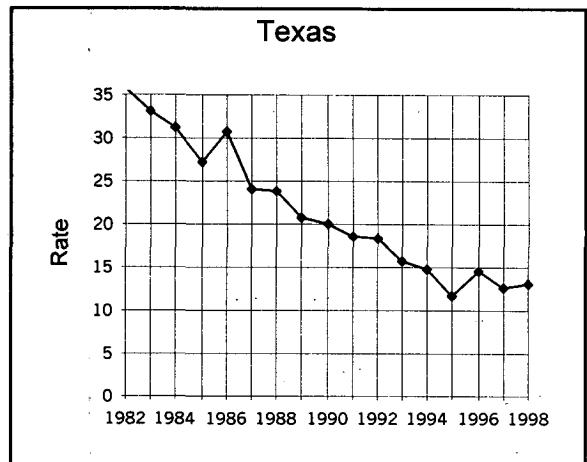
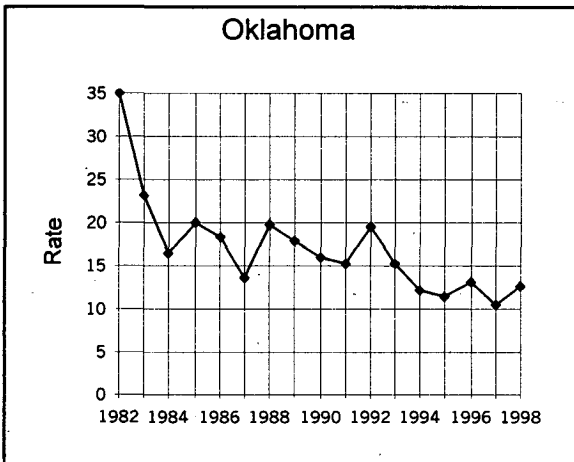
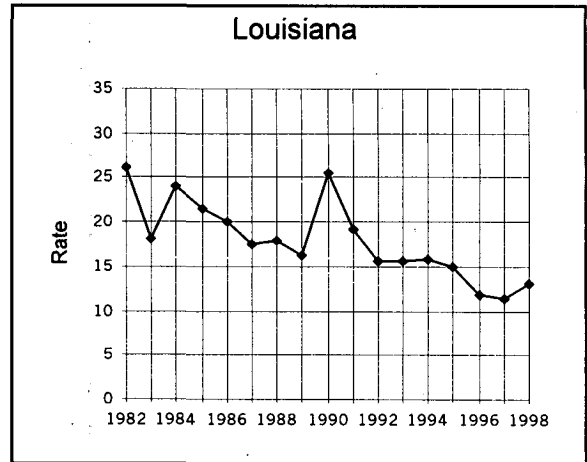
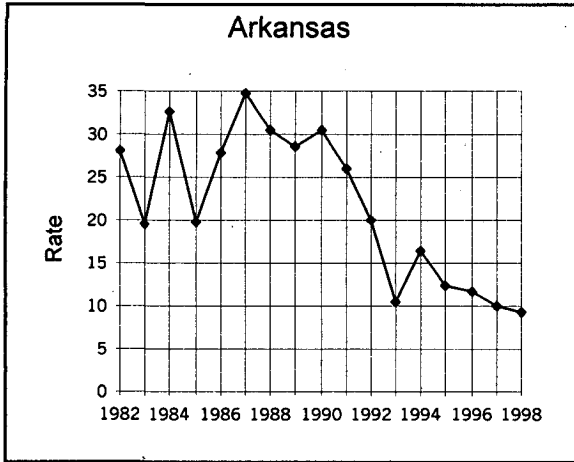
Table 10 shows that among the four states in this region, Texas was in the top half of all states in the percentage decline in the youth drinking driver rates while Arkansas, Louisiana and Oklahoma were in the second half. Arkansas has had MLDA 21 since 1935. Louisiana adopted an MLDA 21 law in 1987 and Oklahoma did so in 1985. Texas changed its law from age 18 to 19 in 1981 and to age 21 in 1986 (O'Malley and Wagenaar, 1991). Arkansas, in 1993, was the first state in the region to adopt a zero tolerance law, Oklahoma did so in 1996 and Louisiana and Texas followed in 1997.

Table 10. West South Central States

State	16-20 Year Old Drinking Driver Rate	National Rank	MLDA 21 Law	Zero Tolerance
	Percent Change 1982-1998			
Arkansas	-64.3	29	1935	1993
Louisiana	-47.0	46	1987	1997
Oklahoma	-57.7	39	1985	1996
Texas	-71.0	20	1986	1997

Figure 16 shows the 1982-1998 trends in the youth drinking driver rates for the West South Central states. Each of the four states began the period with rates well above the national average. Each state generally showed declines that continued into the 1990s. Louisiana, Oklahoma and Texas appear to have leveled out in the 10-15 per 100,000 population range while Arkansas may still be declining.

Figure 16. West South Central States-Drinking Drivers Age 16-20 Involved in Fatal Crashes (Rate per 100,000 Population)



Mountain States

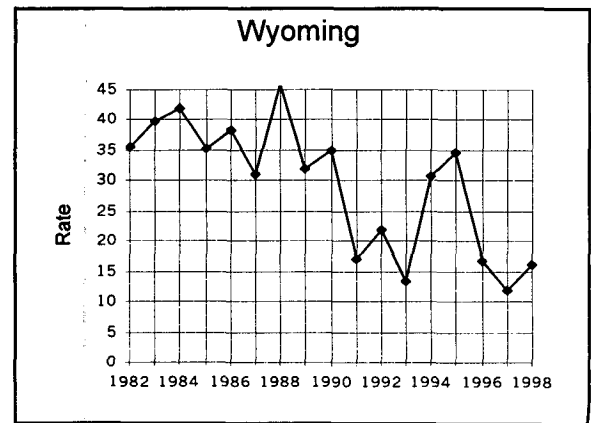
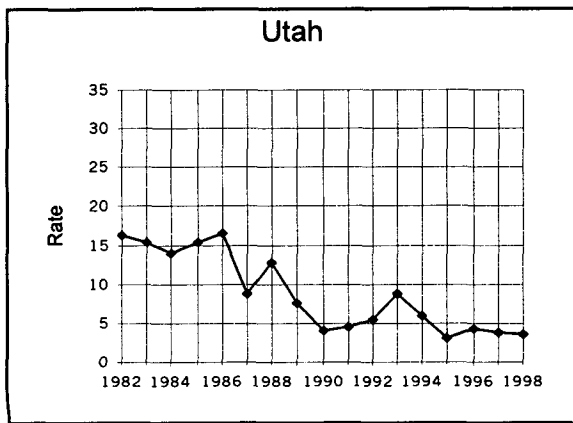
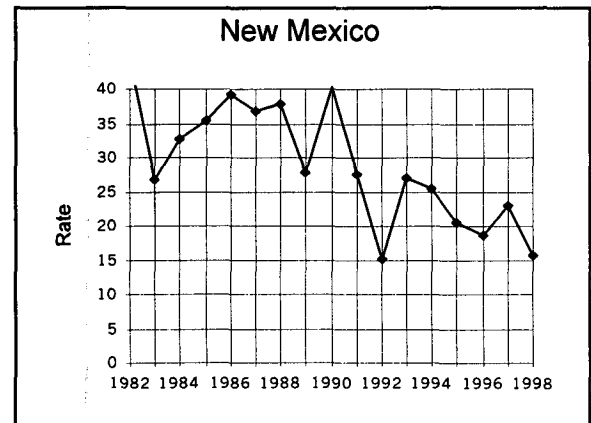
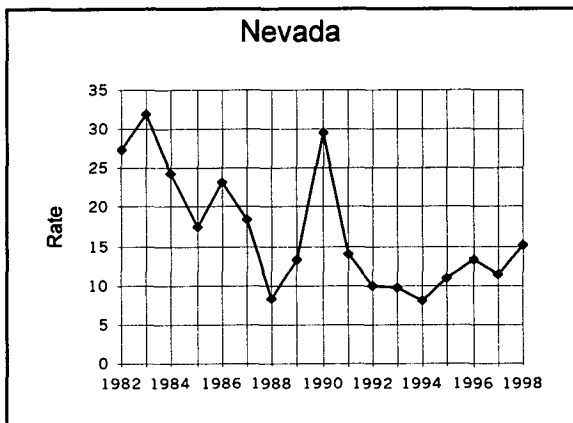
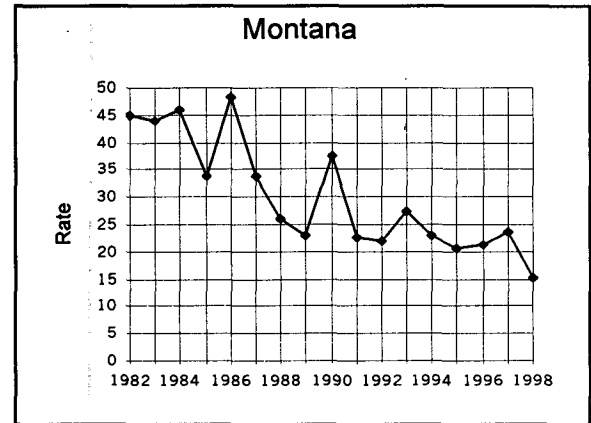
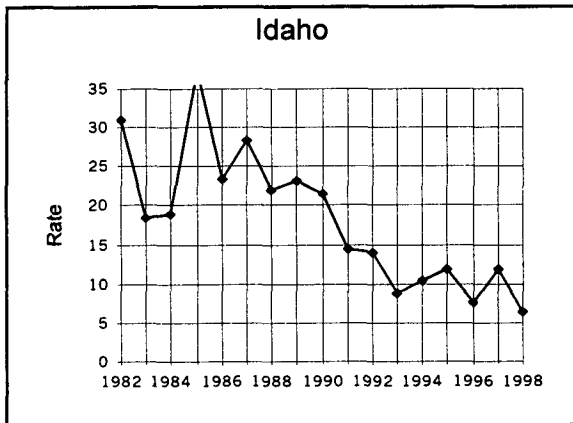
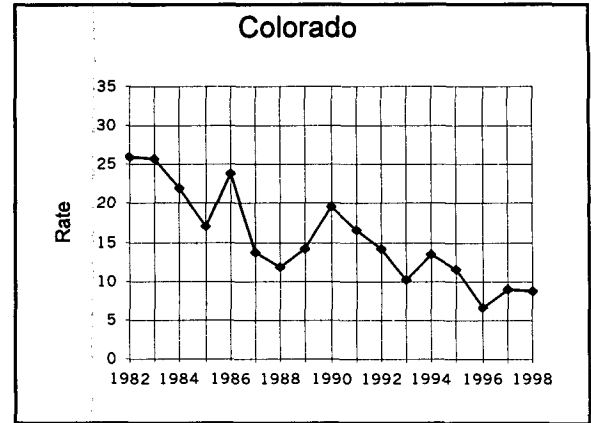
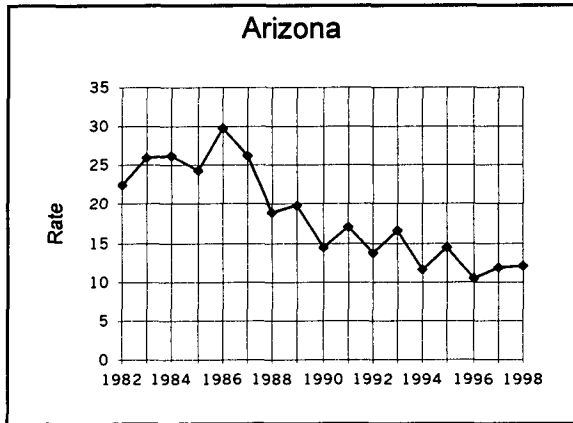
As shown in Table 11, four states in this region, Colorado, Idaho, Nevada and Utah, were in the top half of the states in the percentage decline in youth drinking driver rates while the other four states were among the second half. Three states, Nevada, New Mexico and Utah, have had MLDA 21 laws since the 1930s. Arizona changed its law from age 19 to age 21 in 1985. Colorado also has had a long standing minimum drinking age of 21 except that lower strength beer could be purchased at age 18. The latter provision was ended in 1987. Idaho raised its drinking age to 21 in 1987 and Montana raised its minimum drinking age from 18 to 19 in 1979 and then to age 21 in 1987. Wyoming, in 1988, was the last state to adopt an age 21 law. Arizona was the second state in the nation to adopt a zero tolerance law. Wyoming (1998) was the last state of this region to enact such a law.

Table 11. Mountain States

State	16-20 Year Old Drinking Driver Rate	National Rank	MLDA 21 Law	Zero Tolerance
	Percent Change 1982-1998			
Arizona	-63.8	32	1985	1990
Colorado	-69.4	21	1987	1997
Idaho	76.6	13	1987	1994
Montana	-63.9	31	1987	1995
Nevada	-66.2	25	1935	1997
New Mexico	-53.7	42	1934	1994
Utah	-89.2	3	1935	1992
Wyoming	-60.9	36	1988	1998

Figure 17 shows that each of the Mountain States except Utah had youth drinking driver rates in 1982 that were above the national average (21 per 100,000 population). Rates in most of these states remained high, or even increased, until later in the 1980s, then declined. Colorado had a general downward trend over the entire 1982-1998 period. In 1982, Utah had among the lowest rates of all states (16), remained near that rate until 1986, and then declined. In 1998, Montana, Nevada, New Mexico and Wyoming had youth drinking driver rates at or above 15; Arizona's rate was in the 10-15 range; Colorado and Idaho were in the 5-10 range; and Utah had a rate under 5.

Figure 17. Mountain States-Drinking Drivers Age 16-20 Involved in Fatal Crashes
(Rate per 100,000 Population)



Western States

Table 12 shows that five of the six Western states were in the top one-half of the states in the percentage decline in the youth drinking driver involvement rate. California, Oregon and Washington have had 21 year old minimum drinking ages since the 1930s. Alaska adopted an age 21 law in 1984 and Hawaii did so in 1986. Oregon was the third state in the nation, after Maryland and Arizona, to adopt a zero tolerance law. Hawaii was the last state in the nation to have such a law in effect.

Table 12. Western States

State	16-20 Year Old Drinking Driver Rate	National Rank	MLDA 21 Law	Zero Tolerance
	Percent Change 1982-1998			
Alaska	-92.0	2	1984	1996
California	-76.0	14	1933	1994
Hawaii	-65.3	26	1986	1997
Oregon	-73.4	16	1933	1991
Washington	-69.0	22	1934	1994

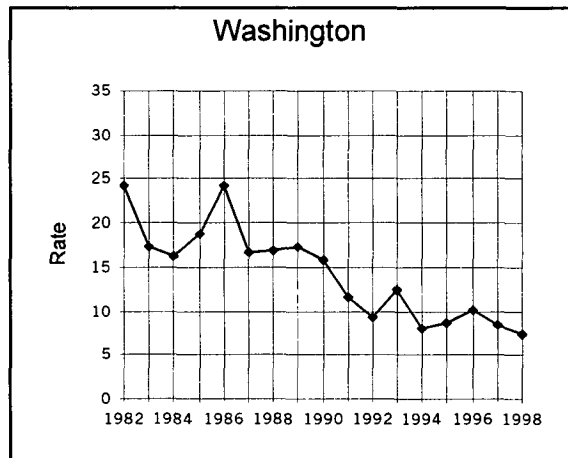
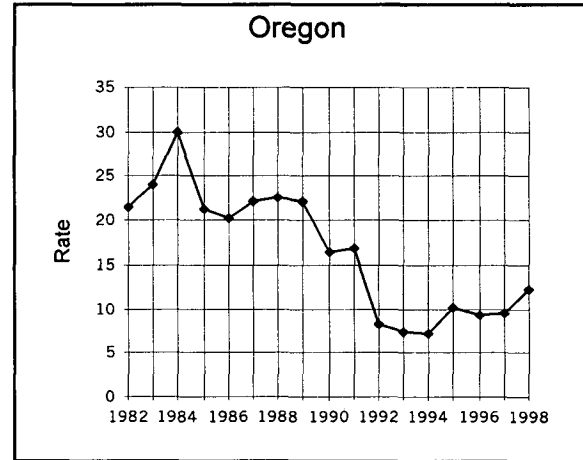
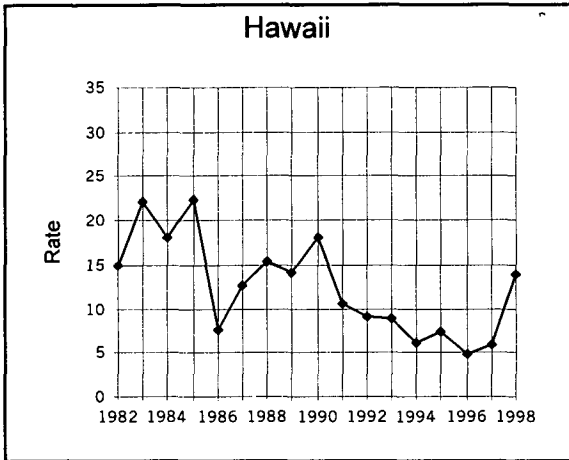
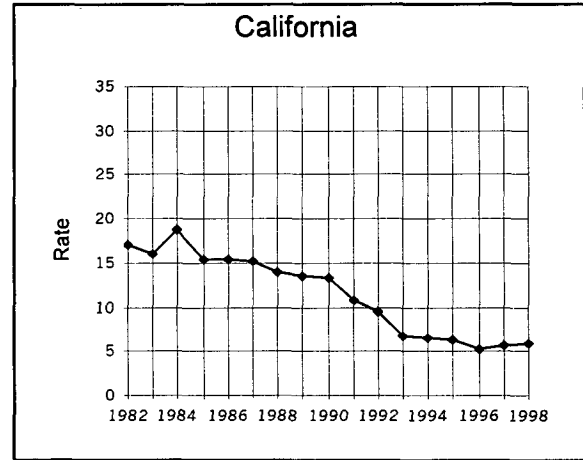
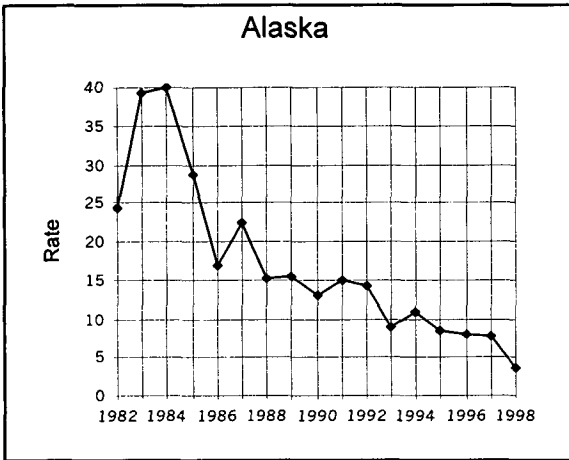
Figure 18 shows the trends for the Western states in youth drinking driver rates over the 1982-1998 period. Alaska began the period with among the highest rates in the country; by the end of the period it was among only a few states with a rate below 5 per 100,000 population. The trends in California and Washington were generally downward through the mid-1990s and have been relatively constant in more recent years. Oregon's rate dropped sharply between 1989 and 1992 and has risen somewhat since that time. Hawaii has had a variable but generally downward trend over the 1982-1998 period.

Conclusions

- Youth drinking driver fatal crash involvements decreased substantially from 1982 to 1998 in all regions of the country and in most states. Nationally, involvements per 100,000 population decreased 59 percent, from 21.0 in 1982 to 8.6 in 1998. Involvements per population dropped by more than 50 percent in 45 states.
- The decrease in many states was similar to the national pattern of Figure 8: a substantial drop from 1982 through the early 1990s, with little subsequent change. Involvements continued to decrease throughout the 1990s in some states, while involvements rose in the late 1990s in a few other states.

- Thirty-six states raised their minimum drinking age to 21 between 1983 and 1987 (the other 14 states had established MLDA 21 before 1983). All states adopted zero tolerance laws covering all drivers under 21 between 1991 and 1998.
- In 1998, youth drinking driver fatal crash involvements were about 5 per 100,000 population (or even lower) in the 10 best states and about 15 in the five worst states.

Figure 18. Western States-Drinking Drivers Age 16-20 Involved in Fatal Crashes
(Rate per 100,000 Population)



C. Youth Drinking -- National Trends

High school seniors -- Monitoring the Future

Drinking behavior by youth also has changed substantially since 1982. The most thorough and consistent data come from the Monitoring the Future surveys of high school seniors, conducted annually since 1975 (Johnston, O'Malley, and Bachman (1999)). As part of an extensive investigation of drug use, these surveys ask several questions about alcohol ranging from lifetime use (81.4 percent in 1998) to "been drunk daily" (1.5 percent in 1998).

The measures that appear most relevant to drinking and driving are "use within the past 30 days" and "5 or more drinks in a row within the past two weeks." These will be called "30-day drinking" and "binge drinking," respectively. In 1998, about half of all high school seniors reported 30-day drinking (52.0 percent) and about one-third reported binge drinking (31.5 percent).

Figure 19 shows the trends since 1982 in these two drinking measures. The question used to measure 30-day drinking changed in 1994. The 1994 survey included both old and new questions, and the response to the new question was 2.4 percentage points lower than to the old. To account for this change, the 30-day drinking data for each year after 1994 have been adjusted by adding 2.4 percentage points.

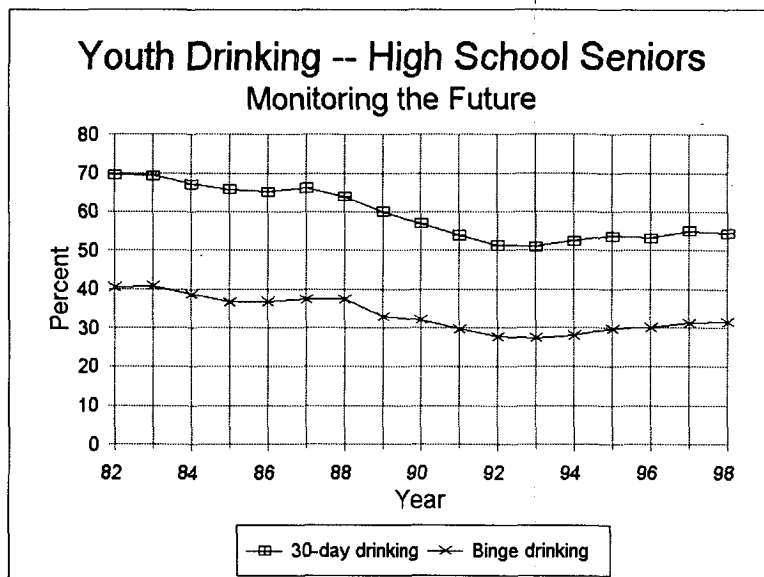


Figure 19. 30-Day and Binge Drinking by High School Seniors

The 30-day drinking and binge drinking trends are similar: a steady decrease from 1982 until about 1993, then a slight increase. The trends appear generally similar to the trend in drinking driver fatal crash involvements shown in Figures 1 and 7. To compare these trends more accurately, Figures 20 and 21 plot the changes in each from a base of 1982 = 100 percent.

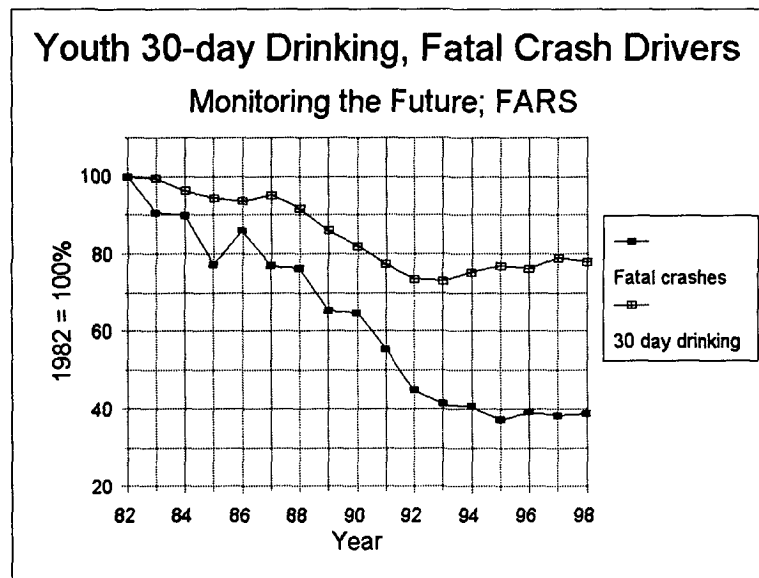


Figure 20. High School Seniors' 30-day Drinking and Youth Drinking Drivers in Fatal Crashes; Change from 1982

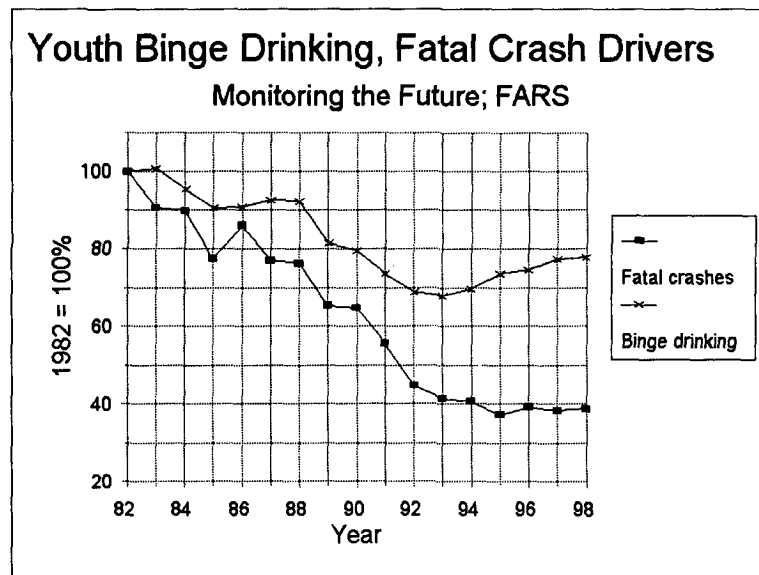


Figure 21. High School Seniors' Binge Drinking and Youth Drinking Drivers in Fatal Crashes, Change from 1982

From these Figures, the similarities and differences are apparent. Both 30-day and binge drinking decreased 22 percent from 1982 to 1998, while drinking driver fatal crash involvements decreased 61 percent. Both 30-day and binge drinking increased gradually since 1993, while drinking driver fatal crash involvements have not.

While Monitoring the Future data are not available for each state, they are published for four regional groupings of the 48 contiguous states: North East (7 states: New York, New Jersey, Pennsylvania, and New England), North Central (12 states from Ohio west to the Dakotas, Nebraska, and Kansas), West (11 states: Montana, Wyoming, Colorado, New Mexico west to the Pacific) and South (the remaining 16 states and the District of Columbia, from the Atlantic west to Oklahoma and Texas).

Figures 22 and 23 show regional trends in 30-day and binge drinking, respectively. Trends for individual regions are difficult to distinguish in these figures. In general, drinking decreased similarly in all regions; slightly more in the North East and North Central, but these two regions had higher drinking levels in 1982 than did the South and West. By 1998, drinking levels in all four regions were very similar. Thus the Monitoring the Future data suggest that regional differences in drinking by high school seniors were relatively small in 1982 and have become smaller -- drinking behavior by high school seniors is now very similar all across the country.

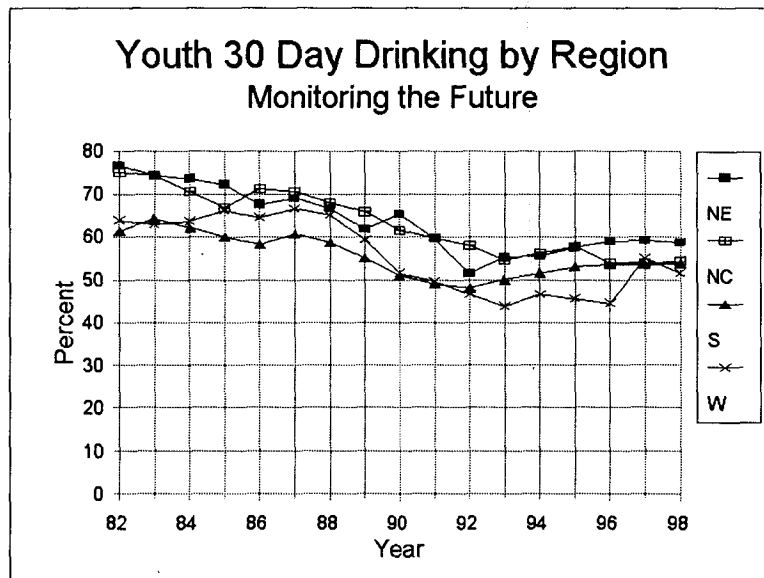


Figure 22. Youth

Region

Drinking by

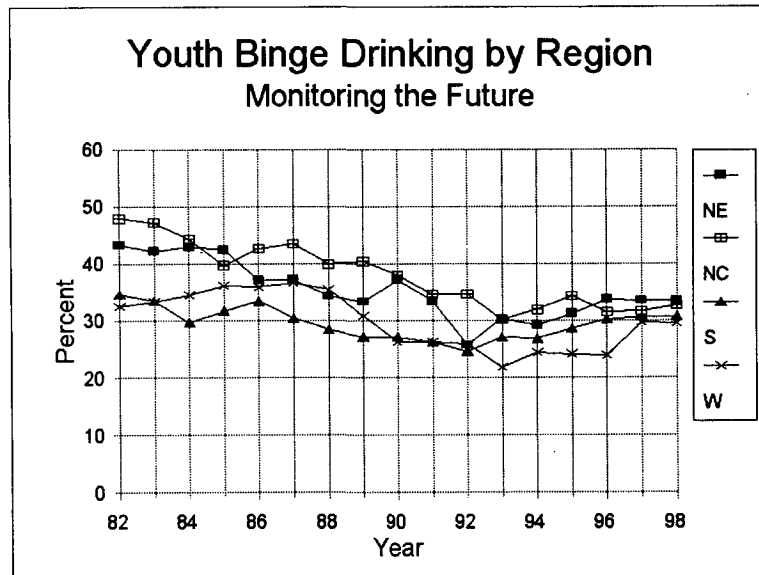


Figure 23. Youth Binge Drinking by Region

Youth aged 18 and above

Three studies provide more fragmentary evidence on drinking changes for youth aged 18 and above since 1982.

Hanson and Engs (1992) surveyed approximately 4,000 students at 65 four-year colleges in 1982, 1985, 1988, and 1991. Between 1982 and 1991 they found that annual drinking had decreased slightly but significantly, from 82 percent to 78 percent, while binge drinking (more than five drinks at one sitting at least one a week) had increased slightly but non-significantly, from 24 percent to 27 percent.

Caetano and Clark (1997) surveyed about 4,500 persons aged 18 and older in 1984 and 1995. They report drinking behavior in five classes: abstain, infrequent (less than once a month), less frequent (one to three times a month), frequent (weekly), and frequent heavy (five or more drinks weekly). Caetano and Clark group all persons aged 18-29, so youth under 21 cannot be examined separately. However, they note that:

“We examined trends in frequent heavy drinking for 18-20 year olds and 21-29 year olds, separately. Our data showed that the patterns of frequent heavy drinking within ethnic and gender categories did not differ for the two age groups and were accurately reflected in the trends for the 18-29 year old age category.”

Caetano and Clark found that drinking at least weekly had decreased by about one-quarter for white and black men and by almost one-half for Hispanic men; by almost one-third for white and black women but had risen very slightly for Hispanic women (from a low level).

Midanik and Clark (1994) reported drinking changes from 1984 to 1990, again for persons aged 18-29. The number of persons reporting drinking at least weekly dropped from

40.1 percent to 32.2 percent, a decrease of about 20 percent; the number reporting weekly binge drinking (five or more drinks weekly) decreased from 10.3 percent to 7.0 percent, a decrease of about one-third.

The evidence from these three studies is not completely consistent. However, taken together, they suggest drinking decreases among persons aged 18-29 that are generally consistent with the 22 percent drop in both 30-day and binge drinking recorded for high school seniors by the Monitoring the Future surveys and are considerably smaller than the 58 percent decrease in fatal crash involvements of young drinking drivers.

Beer is generally regarded as the “beverage of choice” among young adults. Figure 24 shows the trend in U.S. per capita beer consumption over the years 1982-1997. The figure indicates there has been a generally downward trend over this period with per capita consumption in 1997 approximately 10 percent lower than in 1982. Total per capita data, of course, do not isolate the trend for persons under the age of 21. Nevertheless, they support the perspective that alcohol consumption has decreased in the entire population including youth.

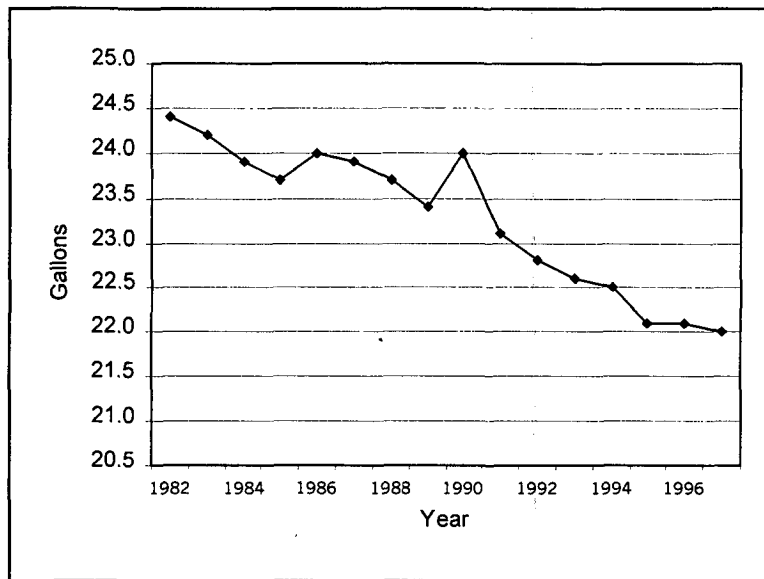


Figure 24. U.S.

Per Capita Beer Consumption

Current drinking levels

While youth drinking has decreased, it certainly hasn't disappeared. Table 13 presents results from five sources on recent drinking levels. Drinking level definitions are approximately similar across the five studies.

Table 13. Recent Youth Drinking Levels

Study	Year	Population	Annual	30-day	Binge
Monitoring the Future	1998	High school seniors	74 %	52%	32 %
Wechsler et al	1993	College	84 %		44 %
Hanson and Engs	1991	College	78 %		27 %
Caetano and Clark	1995	18-29		55-68%*	16-18%*
Midanik and Clark	1990	18-29	73 %		7 %

* varies by ethnicity

These studies suggest that the majority of youth drink at least monthly and 20-40% regularly drink at least five drinks in one sitting.

Conclusions

The data presented in this section suggest several conclusions.

- Youth drinking decreased between 1982 and 1998.
- The drinking decrease occurred fairly uniformly across all regions of the country.
- The decrease was considerably less than the decrease in youth drinking driver involvements in fatal crashes. Thus, the decrease in drinking may account for some, but by no means all, of the decrease in drinking and driving.
- Since about 1993 youth drinking has increased gradually, but youth drinking driver involvements in fatal crashes have remained approximately constant.
- Most youth drink; a majority drink at least monthly; a substantial minority binge drink regularly.

D. Youth Drinking and Driving Behavior

High school seniors -- Monitoring the Future

Beginning in 1984, the Monitoring the Future surveys included questions on drinking and driving behavior. The drinking and driving questions were "during the last two weeks, how many times (if any) have you driven a car, truck, or motorcycle after drinking alcohol?" and " ... after having five or more drinks in a row?" The survey also asked about riding with a driver who had been drinking and about friends' attitudes regarding driving after drinking (O'Malley and Johnston, 1999).

Figure 25 presents these self-reported drinking and driving trends and compares them with the drinking trends from Figure 19. Both driving after drinking measures have decreased substantially since 1984: driving after drinking dropped 48 percent, from 31.2 percent in 1984 to 16.3 percent in 1998; driving after binge drinking dropped 45 percent, from 18.3 percent to 10.0 percent. Each measure decreased steadily until about 1995 and rose slightly since then. The 30-day drinking and binge drinking trends reached their lowest level slightly earlier, in about 1993.

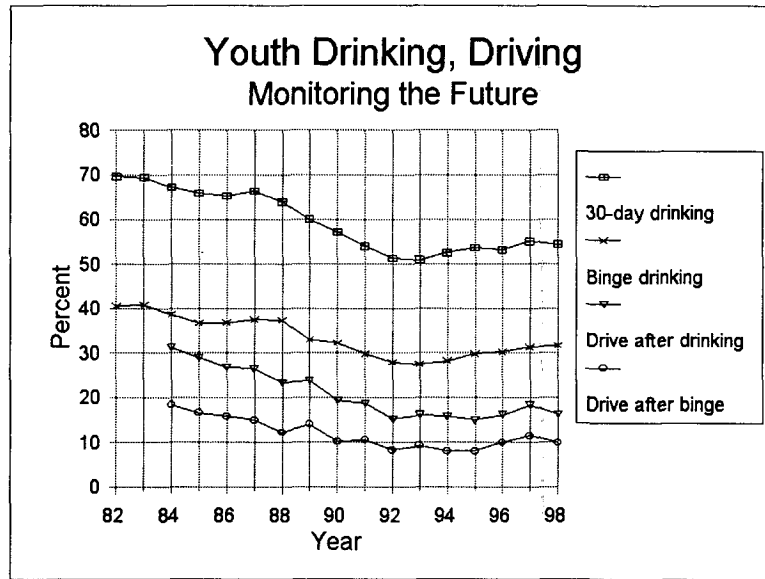


Figure 25.

Youth Drinking and Driving after Drinking

O'Malley and Johnston (1999) note that, for high school seniors, friends' disapproval of driving after drinking has risen at the same time. In 1984, 30 percent of high school seniors reported that their friends would strongly disapprove of their driving after having 1 or 2 drinks. By 1998, 48% reported this level of disapproval. As O'Malley and Johnston suggest, the substantial decrease in drinking and driving may have occurred because of a substantial decrease in the social acceptability of drinking and driving among young people.

Figure 26 compares the relative changes in 30-day drinking, driving after drinking in the past two weeks, and drinking driver fatal crash involvements, from a base of 1984 = 100 percent. Figure 27 does the same for binge drinking and driving after binge drinking. The two drinking and driving trends follow the fatal crash involvement trend very closely through about 1995. Since 1995, self-reported drinking and driving has increased while fatal crash involvements have not. The two drinking trends, on the other hand, decreased considerably less.

Table 14 summarizes these Figures by comparing overall percentage decreases from 1984 to 1998. In the Table, drinking drivers in fatal crashes include all drivers under 21 years of age as recorded in FARS. The driving after drinking and the drinking data apply to high school seniors as reported in Monitoring the Future. All four drinking and driving measures have decreased more than twice as much as either of the drinking measures.

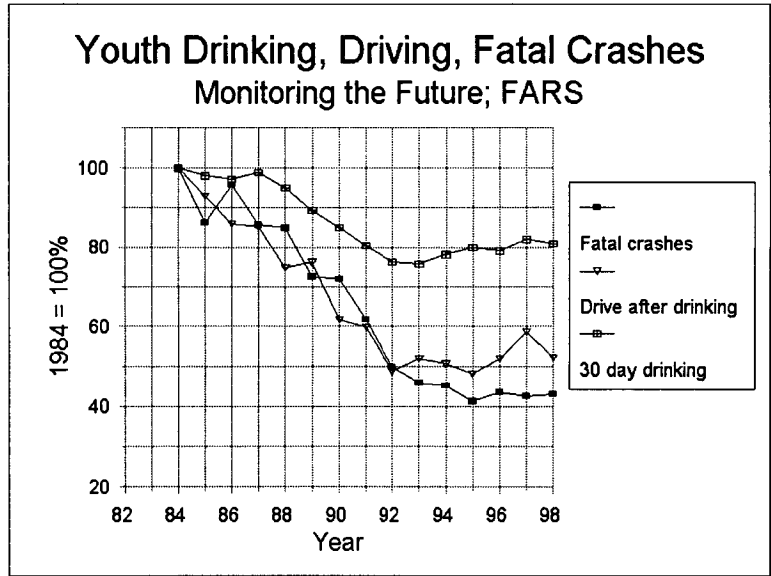


Figure 26. Youth 30-Day Drinking, Driving after Drinking, and Drinking Drivers in Fatal Crashes

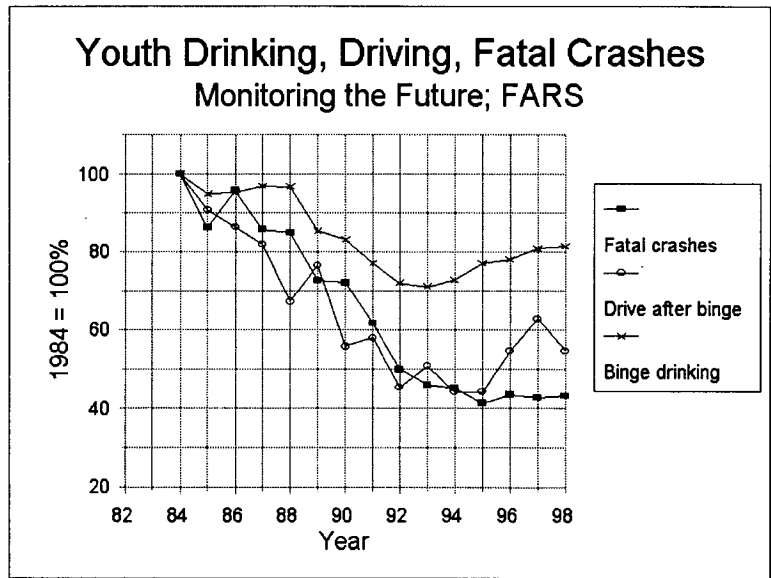


Figure 27. Youth Binge Drinking, Driving after Binge Drinking, and Drinking Drivers in Fatal Crashes

Table 14. Youth Drinking, Driving, and Fatal Crash Involvement Changes

	Change, 1984 to 1998
Drinking drivers in fatal crashes	- 61 %
Drinking drivers in fatal crashes per population	- 58 %
Driving after drinking	- 48 %
Driving after binge drinking	- 45 %
30-day drinking	- 22 %
Binge drinking	- 22 %

College students

Hanson and Engs (1992) report evidence that drinking and driving has decreased more than drinking among college students. As noted previously, they found a slight decrease in annual drinking but no significant change in binge drinking between 1982 and 1991. They also report on 17 problems during the past year related to drinking, such as having a hangover, fighting after drinking, and missing a class. Four of the measures involved driving and 13 did not. Among students who drank at least once a year, there were statistically significant increases in 10 of the 13 non-driving measures and a significant decrease in only one. In contrast, there were significant and substantial decreases in three of the four driving measures. Table 15 summarizes these changes.

Table 15. Changes in College Student Drinking and Driving

Driving-related behavior	1982	1991	change
Driven after several drinks	59 %	43 %	- 27 %
Driven after too much to drink	41 %	32 %	- 21 %
Driven while drinking	48 %	32 %	- 32 %
Arrested for driving while intoxicated	1%	1 %	

Additional evidence

Three other sources of evidence suggest that youth are separating their drinking from their driving. The first comes from a study comparing driver BAC levels and drinking histories. Roeper and Voas (1999) measured BAC levels at the roadside on Friday and Saturday nights in three communities from July 1992 to June 1996. They also recorded the drivers' drinking history over the previous 28 days. They found that drivers under 21 years of age were more frequent

binge drinkers, but less frequent drinking drivers, than older drivers. More precisely, drivers under 21 were more likely to have consumed six or more drinks at a sitting during the previous month than older drivers. But the proportion of drivers under 21 with a positive BAC was less than half that of older drivers: 6.8 percent for drivers under 21 compared to 18.7 percent for age 21-34 and 14.7 percent for drivers 35 and older. When drivers were disaggregated by drinking level, measured as the maximum number of drinks on any one day in the previous month, the result was the same: at each drinking level, fewer drivers under 21 had a positive BAC than older drivers. Drivers under 21 drank more, but drove after drinking less, than older drivers.

Balmforth (1998) reports on a national telephone survey of drinking and driving issues conducted every two years since 1991 by NHTSA. Each year, about 3,300 adults are contacted in a nationally-representative telephone survey. Results are reported for the age groups 16-20, 21-29, 30-45, 46-64, and 65 and above.

From 1991 to 1997, Balmforth found that the number of youth who reported driving within two hours of drinking in the past year had remained about the same (10 percent in 1991, 13 percent in 1993, 9 percent in 1995, and 12 percent in 1997). However, the average number of times these drivers drove after drinking within the past month decreased from 1.6 in 1993 to 1.2 in 1997. The study's sample size for drivers age 16-20 was relatively small, so these changes may not be statistically significant. Consistent with Roeper and Voas, Balmforth found that youth aged 16-20 drink more per sitting but drink and drive less frequently than older persons. For example, in 1997 youth averaged 4.6 drinks on their most recent drinking-driving occasion, compared to 3.1 for drivers aged 21-29, but only 7 percent of youth drove after drinking in the past month, compared to 18 percent of drivers aged 21-29.

One method that can be used to separate drinking from driving is the use of a designated driver: a person who will drive those who have been drinking and who agrees (in principle) not to drink. DeJong and Winsten (1999) report on designated driver use by college students in 1993 from the same national survey used by Wechsler et al (1993). They found that, in the past 30 days, 33 percent of all college students reported having served as a designated driver and 37 percent of students who drink had ridden with a designated driver. Of drinkers, over half did not drink when they were the designated driver and only 2 percent had five or more drinks. Of students who usually binge drink, only 5 percent binged when they were the designated driver. Barr and MacKinnon (1998) report even higher designated driver use at a single college: 86 percent of students had ridden with a designated driver, 84 percent had been a designated driver, 37 percent "always" use a designated driver when they are drinking and another 28 percent do "most of the time." It's clear that the designated driver is a socially accepted practice on college campuses. While the designated driver may not abstain from drinking, it's also clear that he or she only rarely drinks to excess.

Conclusions

The evidence in this section on drinking and driving practices supports and provides a link between the fatal crash data and the information on drinking behavior.

- Youth self-reported drinking and driving has dropped substantially since 1982, by amounts very consistent with the observed decrease in drinking driver fatal crash involvements.
- Youth drinking has decreased at the same time, but not by as much as drinking and driving.
- Youth separated their drinking from their driving more in 1998 than they did in 1982. One method may have been the use of designated drivers.
- Drinking and driving has become less socially acceptable among youth, as measured by high school senior student attitudes reported by Monitoring the Future and by the use and acceptance of designated drivers by college students.

IV. WHAT CAUSED THE DECREASE?

This chapter examines several factors that may have contributed to the youth drinking and driving decrease. These factors include very specific legislation directed at youth drinking or driving after drinking, programs to provide youth with the knowledge, skills, and attitudes to make healthy choices in many areas including drinking and driving, and broad factors that may have influenced youth attitudes and behavior. Some of these factors have been evaluated extensively with high-quality studies using accurate data; others have not. As a result, the effects of some factors are known quite accurately while the influences of others are highly speculative.

A. Minimum Legal Drinking Age 21 Laws

History of the laws

In 1933, the 21st amendment to the United States Constitution repealed the prohibition of the manufacture and sale of alcoholic beverages, thereby allowing each state to regulate how and by whom alcohol could be consumed. At that time, most states set the minimum legal drinking age at 21, the standard legal age of adulthood. New York opted for an MLDA of 18 and a few states had a 21 year-old legal age but permitted certain beverages (low strength beer) to be purchased at age 18. Additionally, some states continued for some years to prohibit alcohol or allowed the prohibition of its sale as a local option.

The Vietnam era brought about a national change in the age of majority to 18 years and many states followed by reducing the legal drinking age. By 1982, only 14 states retained a MLDA of 21; the MLDA in the other 36 states was 18, 19, or 20.

In the 1970s and early 1980s MLDA laws became a traffic safety issue. Several studies in the 1970s showed that youth traffic crashes increased as states lowered their MLDA. In addition, the "blood borders" between states with different MLDAs caught public attention after highly-publicized crashes in which youth below the legal drinking age would drive to an adjoining state with a lower MLDA, drink legally, and crash on their way home.

Advocacy groups urged states to raise their MLDA to 21. Several did so in the late 1970s and early 1980s, but others did not. To encourage a national drinking age, Congress enacted the Uniform Drinking Age Act in 1984, which provided that states that failed to raise their MLDA to 21 would lose a portion of their federal-aid highway construction funding. In response, all remaining states increased their MLDA to 21 by 1988. In terms of population coverage, most of the drinking age increase took place in a short time period. In 1985, about 30 percent of the U.S. population age 16-20 was covered by a MLDA 21 law. By 1987, over 90 percent were covered, and all were covered by 1988 (see Figure 28). Toomey, Rosenfeld, and Wagenaar (1996) summarize this history as well as many of the evaluation results that follow.

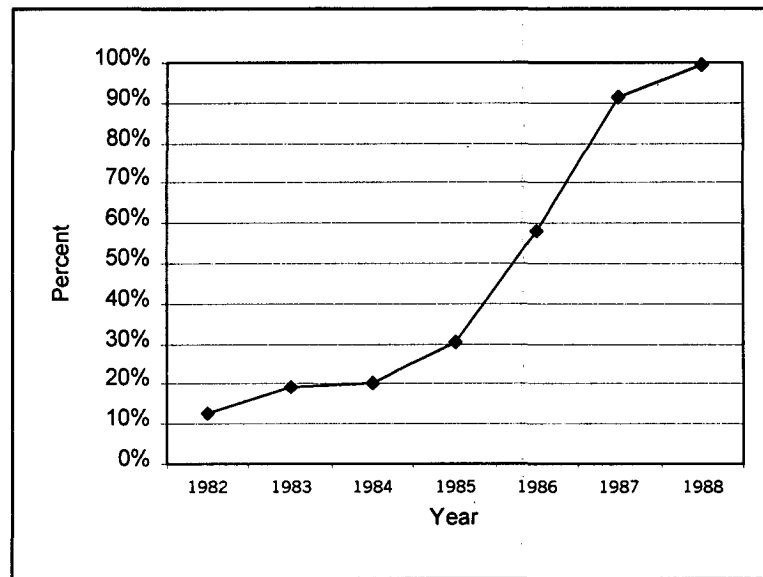


Figure 28. Percent of the U.S. Population Age 16-20 Covered by MLDA 21 Law

Effects of the laws

The effects of drinking age law changes on traffic crashes, injuries, and fatalities have been studied extensively. These effects are relatively easy to evaluate for several reasons. Each law applied to all drivers in an entire state as of a specific date, so crash results can be compared within the state, before and after the law, and with other states that did not change their law at the same time. Each reduction or increase in a state's drinking age provided a new opportunity to evaluate effects. Finally, evaluations can use large traffic crash data files. In particular, FARS has provided uniform national data on fatal crashes since 1975.

The United States General Accounting Office (1987) reviewed and synthesized results from all 49 studies that had adopted MLDA 21 by 1986. They concluded that "raising the drinking age has a direct effect on reducing alcohol-related traffic accidents among youths affected by the laws, on average, across the states" and that "raising the drinking age also results in a decline in alcohol consumption and in driving after drinking for the age group affected by the law." They note that the traffic accident studies they reviewed were high-quality. While the studies used different evaluation methods, they produced "remarkably consistent" results. Additional studies since 1986 have reached the same basic conclusions (Toomey, Rosenfeld, and Wagenaar, 1996).

Two recent studies deserve special note. O'Malley and Wagenaar (1991) used FARS and Monitoring the Future data to investigate how the MLDA affects youth drinking and youth drinking and driving. They compared states with a MLDA of 21 to states with a lower MLDA (during the years before all states raised their MLDA to 21). They also compared behavior in states that changed their MLDA and states that did not. Among their conclusions:

- High school seniors drank more in MLDA 18 states than in MLDA 21 states.
- High school senior drinking decreases throughout the 1980s were not due solely to increasing the MLDA – drinking also decreased in states with MLDA 21 throughout the 1980s.
- After controlling for sex, race, parent education, urbanicity, and region of the country, the MLDA remained a significant predictor of alcohol use: high school seniors drank less if the MLDA was 21 than if it was lower.
- Even after they reached the age of 21, persons in MLDA 21 states drank slightly less than persons in MLDA 18 states.
- MLDA 21 reduced traffic crashes, and this is directly the result of lower alcohol consumption.

In short, O'Malley and Wagenaar conclude that MLDA 21 laws reduce alcohol consumption, which in turn reduces crashes, and there is a carryover effect even after persons reach the age of 21.

Voas, Tippetts, and Fell (1999) use FARS data for all states from 1982 to 1997 to estimate and compare the effects of MLDA 21, zero tolerance, and other traffic safety laws (*per se*, administrative license revocation, and safety belt use). They find substantial effects for both MLDA 21 and zero tolerance laws.

Reasons for the effects

The evidence reviewed briefly above shows unequivocally that MLDA 21 laws reduce youth drinking and driving, as measured by traffic crash involvements. But the way in which MLDA 21 laws have produced these results may not be completely straightforward. The laws make it illegal for youth to purchase, possess, or consume alcohol (individual state laws differ in precisely what they prohibit). But, much as national prohibition did not stop drinking, MLDA laws have not eliminated alcohol use by youth: the data in Section IIIC show that most youth drink, and a majority drink at least monthly.

The basic method for implementing MLDA 21 laws is for anyone selling, serving, or otherwise providing alcohol to a young person to verify the person's age. Retail establishments (liquor, grocery, and convenience stores; restaurants, bars, taverns, sports arenas, etc.) can require that identification be checked. Still, many do not: for example, a 1991 study found that 97 out of 100 liquor outlets in Washington, DC sold alcohol to 17- and 18-year olds (Preusser and Williams, 1991). In areas where identification is checked regularly, many youth have responded by acquiring false identification cards. Verifying a young person's age at parties and other informal gatherings is considerably more problematic. In all settings, identification checking is done most effectively when some organization (retail establishment, college, private club) is

responsible for selling or providing alcohol and when that organization faces a substantial legal liability if they serve underage youth. But even then, false identification can subvert the MLDA.

Wolfson, Wagenaar, and Hornseth (1995) investigated MLDA enforcement in 1992. They interviewed law enforcement officers in four states (Kentucky, Michigan, Montana, and Oregon) regarding underage drinking, MLDA enforcement, and community attitudes regarding underage drinking. The officers reported that MLDA enforcement is not a community priority; indeed, they found a general acceptance of youth drinking in their communities. They reported that most underage drinkers obtained their alcohol from legal-age purchasers. When youth were arrested for MLDA violations, the officers felt that the penalties were light and were applied unevenly, so had little deterrent value. Impaired driving violations, on the other hand, were procedurally simpler to enforce and the penalty of a driver's license suspension or revocation was an effective deterrent. Overall, the officers felt that drinking and driving by youth had decreased in their communities over the past decade but that drinking by youth had not.

Conclusions

MLDA 21 laws clearly reduced youth drinking and driving. They appear to have done so both by reducing youth drinking directly and by encouraging youth to separate their drinking from their driving.

MLDA 21 laws reduced youth drinking both by reducing alcohol availability and by establishing the threat of punishment for alcohol use. Neither works particularly well in practice, as youth still can obtain alcohol relatively easily and underage drinkers are highly unlikely to be detected and punished. But both have had some effect.

But MLDA 21 laws probably had other effects beyond the straightforward prohibition and attempted punishment of alcohol use by youth. As listed in Chapter IIIB, 11 states have had MLDA 21 laws since the repeal of prohibition. These states also saw substantial reductions in youth drinking and driving after drinking in the 1980s. Furthermore, youth driving after drinking decreased more than youth drinking.

This suggests that MLDA laws may have helped influence youth attitudes about drinking and driving. The principal reason for raising the drinking age to 21 was to reduce traffic crashes. Some youth and some parents may have consciously or unconsciously absorbed some of these beliefs: that youth drinking is not a problem unless it results in dangerous actions, of which by far the most dangerous is drinking and driving. Underage drinking is generally accepted, but underage drinking and driving is not. The widespread debate over the legal drinking age also may have had some "spillover" effect in states where MLDA 21 was already in place.

However, the observations that youth drinking and driving decreased substantially more than youth drinking, and that youth drinking and driving after drinking both decreased in states which had MLDA 21 laws throughout the 1980s, suggest that MLDA 21 laws were not the only influence on youth drinking and driving during this period.

B. Zero Tolerance Laws

History of the laws

Zero tolerance laws are a logical combination of Minimum Legal Drinking Age laws that prohibit drinking by youth and *per se* laws that make it illegal to drive with a BAC exceeding a specified level. If it is illegal for youth to drink, then it should be illegal for youth to drive with **any** positive BAC. A zero tolerance law sets a maximum BAC of 0.02 or less for youth and suspends or revokes an offender's driver's license. Most zero tolerance laws use an 0.02 BAC limit rather than an absolute 0.00 limit to allow for small measurement errors in BAC test instruments and to avoid challenges from youth who claim they have taken medication with small amounts of alcohol.

During the 1980s several states enacted zero tolerance laws applying to drivers under their MLDA of 18 or 19. Other states set a BAC limit for young drivers below the legal limit for older drivers but above the now standard 0.02 zero tolerance limit: for example, New Mexico's BAC limit was 0.05 for drivers under 18. In the National Highway Systems Designation Act of 1995, Congress used the same strategy as for MLDA 21 to encourage zero tolerance laws: states failing to enact a zero tolerance law by 1999, at a BAC limit of 0.02 or lower, covering all persons under 21, would lose a portion of their federal-aid highway construction funds. Most zero tolerance laws took effect between 1994 and 1998, and by 1998, all states had zero tolerance laws in place (see Figure 29).

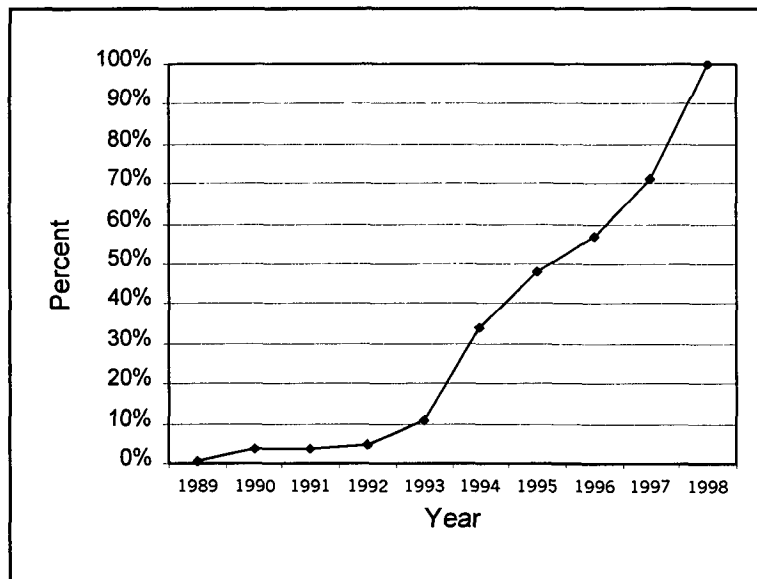


Figure 29. Percent of U.S. Population Age 16-20 Covered by Zero Tolerance Law

Effects of the laws

Several evaluations have shown that zero tolerance laws reduce youth drinking and driving crashes. Hingson, Heeren and Winter (1995) studied 12 states that lowered their BAC limit for some young drivers before 1991. They found a 22 percent reduction in single vehicle nighttime fatal crashes (a standard surrogate for crashes involving alcohol) in states with a 0.00 BAC limit, compared to a 2 percent reduction in comparison states; a 17 percent reduction in states with a 0.02 BAC limit compared to a 4 percent increase in comparison states; and no effect in states with a 0.04 to 0.06 BAC limit. Blomberg (1992) found an 11 percent reduction in crash-involved drinking drivers in Maryland. In six counties that publicized the zero tolerance law heavily, youth alcohol-related crashes decreased by 50 percent. Voas, Tippetts, and Fell (1999) found that zero tolerance laws reduced the proportion of underage drinking drivers in crashes by 24 percent.

Reasons for the effects

As with MLDA 21 laws, the reasons for these clear zero tolerance law effects may not be completely straightforward. Zero tolerance laws begin with several advantages. They prohibit something that's clearly defined (driving after drinking any alcohol) and that is commonly understood to be dangerous. The public generally supports zero tolerance laws: for example, Balmforth (1999) reports 45 percent of all adults agreeing that BAC limits should be lower for drivers under 21. Driver license suspension or revocation often provides an administrative penalty (not involving the courts) that clearly motivates youth: loss of your driver's license is a severe punishment indeed.

However, actually enforcing zero tolerance laws is difficult. As with any impaired driving violation, police first must observe something in a person's driving that provides grounds to make a traffic stop. Young drivers at low BACs may not exhibit driving behavior that police can link with probable impairment. Ferguson, Fields, and Voas (2000) studied zero tolerance laws in five states and concluded that these laws have not changed impaired driving enforcement practices. This means that young drivers at relatively low BAC levels who are in violation of zero tolerance laws are unlikely to be stopped by police unless they commit some other traffic violation. Some zero tolerance law provisions do make it easier for police to issue a citation to a young driver. For example, in California a zero tolerance law citation can be issued at the roadside, using evidence from a preliminary breath test equipment; a citation for the standard driving under the influence of alcohol offense requires an evidential breath test.

Despite these difficulties, youth are quite aware that they risk being stopped and sanctioned if they drink and drive. Balmforth (1999) reports that males age 16-20 believe that about one-third of impaired drivers will be stopped by police; females believe about one-half will be stopped. And about 12 percent of males and 8 percent of females aged 16-20 reported that they were stopped by police for a suspected drinking and driving violation in the past year. It is not clear, though, that youth know about their state's zero tolerance law or understand that it prohibits driving after drinking any alcohol. Balmforth reports that only 19 percent of the driving

population knew that the BAC limit was lower for youth, and only about 4 percent knew the correct BAC level for youth.

Three further studies shed some light on youth attitudes and behavior toward zero tolerance laws. First, Grosvenor, Toomey, and Wagenaar (1999) surveyed high school seniors in 15 upper Midwest communities on their drinking and driving attitudes and behavior. They found that 40 percent of the students reported a fairly high likelihood of being caught by police if they drove after drinking; 65 percent expected the penalty to be arrest or driver license suspension. Among binge drinkers, those who believed the probability of being caught after drinking and driving was high were less likely to drink and drive.

Grube and Voas (1996), on the other hand, find that driving after drinking by youth is influenced more by friends' approval or disapproval and by expectations regarding physical risks than by fear of arrest and sanction. They suggest that law enforcement's lack of influence may be due to the low likelihood that a drinking driver will be stopped by police.

Most recently, McCartt, Leaf, Preusser, and Farmer (2000) surveyed Florida high school juniors and seniors in 1996 and 1998, before and after the state's zero tolerance law. They found that self-reported driving when drinking and riding with friends who were drinking both decreased significantly after the law took effect, but not by substantial amounts: for example, the proportion reporting they had ever driven after drinking dropped from 23.7 percent to 20.0 percent.

Conclusions

Zero tolerance laws definitely have reduced youth drinking and driving. They likely did so for two reasons: by deterring youth through the fear of losing their driver's license if they drive after drinking, and also by reinforcing the broad community disapproval of driving after drinking. Zero tolerance laws likely strengthened the attitudes raised by MLDA 21 laws: underage drinking is normal and generally accepted, but drinking and driving is not. Zero tolerance laws directly address the ultimate goal of reducing drinking and driving, completely bypassing the intermediate issue of underage drinking.

C. Law Enforcement

The relationship between law enforcement, for MLDA and drinking and driving laws, and youth drinking and driving was examined further using data provided by the FBI. The data set contained the number of DWI arrests and the number of liquor law violation arrests of persons under 21 years of age in each state annually for 1989 through 1995. A general linear model was constructed using DWI arrests, liquor law arrests, year and state as independent variables and the number of youth drinking drivers involved in fatal crashes as the dependent variable. The model showed no significant relationship between these enforcement measures and youth drinking drivers involved in fatal crashes.

This result is not especially surprising as previous studies have not found a strong relationship between DWI arrest totals and alcohol-related crashes. It is generally agreed that

laws are most effective in deterring the behavior they prohibit if the public believes that violators are highly likely to be arrested and punished. Good enforcement programs seek to increase the public's perception of enforcement levels, not just raise arrest levels. Some enforcement efforts such as checkpoints produce few DWI arrests but create substantial publicity; other strategies can raise arrests but have little or no effect on public perceptions. In short, arrest levels generally are not a good measure of public perceptions of enforcement.

D. School and Community Youth Programs

Minimum drinking age and zero tolerance laws attempt to reduce youth drinking and driving through deterrence: passing laws prohibiting the behavior, publicizing the laws to advertise the consequences of violating them, enforcing the laws and applying penalties to the violators -- in short, by attempting to motivate youth through fear of legal consequences. The other major strategy used over the past 20 years is to motivate youth not to drink and drive through positive means: by education on crash and injury risks posed by drinking and driving and the effects of alcohol use and abuse, by providing positive role models that discourage alcohol use, by establishing youth norms that do not include alcohol, and by encouraging youth activities that do not involve or lead to alcohol use. This strategy typically is implemented through school or community programs.

History of youth traffic safety and alcohol programs

SADD. The single best known youth program is SADD, originally Students Against Driving Drunk. SADD was founded in 1981 as a high school-based program to reduce youth drinking and driving. Its original model included school assemblies, a student club (called a SADD chapter), alcohol-free activities, a 15-session curriculum for use in the sophomore year, and a Contract for Life between youth and parents in which youth who have been drinking and need a ride home agree to call parents and parents agree to provide the ride. SADD maintained national and state offices and provided program materials to school SADD chapters but did not control state or chapter activities. Consequently, state SADD organizations and local chapters operated in rather different ways with goals and activities adapted to local needs and opportunities. SADD's national goals have expanded beyond drinking and driving to other health and safety issues, as shown by its name change to Students Against Destructive Decisions.

SADD grew rapidly. By 1994 there were SADD chapters at an estimated 16,000 of the nation's high schools. Some state SADD organizations were well-organized with an effective state coordinator; others were not. In some states, SADD activities evolved under another name, sometimes with a continuing association with SADD, sometimes not: STAND in Colorado and SAFTYE in Washington are two examples.

State youth programs. At the same time that SADD was expanding rapidly, state traffic safety activities directed at youth drinking and driving also grew, with assistance from federal funds. Each state receives federal funds each year for highway safety activities under Section 402 of the Highway Safety Act of 1966. States usually allocate some of these funds to youth programs. In addition, some states qualified for additional funds for several years in the 1980s

and 1990s under the Section 408 and 410 alcohol incentive grant programs and used portions of these funds for youth programs.

A good view of how state impaired driving programs directed at youth grew, and what they included, can be found in a series of NHTSA assessments of how these federal funds were used (LaHeist, 1998). For these assessments, NHTSA selected one state from each of the 10 NHTSA regions. In each state, NHTSA traced how federal highway safety funds were used from 1980 to 1993. The information following, taken from these assessments, summarizes youth alcohol program activity across the 10 states and provides selected examples from each state.

Each of the 10 states developed and implemented a large number of youth impaired driving programs. Practically all were supported by federal funds. Programs usually began in a few areas and, if successful, spread statewide. One of the most popular was Project Graduation, which organizes alcohol-free prom and graduation celebrations at high schools and which was conducted extensively in each of the 10 states. SADD chapters were formed in most states. Several states developed media or other education programs for elementary and intermediate schools. All states conducted public education activities directed at youth drinking and driving. Many states integrated youth program activities into community traffic safety programs.

Colorado developed a "refusal skills" drug and alcohol education program which was part of the regular school curriculum by 1992. The first SADD chapter was formed in 1984. Colorado's SADD chapters reorganized in 1998 as STAND (Students Taking A New Direction) and have spread throughout the state. BACCHUS (Boost Alcohol Consciousness Concerning the Health of University Students) and GAMMA (Greeks Advocating Mature Management of Alcohol) chapters were active on every major college campus by 1994, promoting designated driver and Safe Spring Break programs and the National Collegiate Alcohol Awareness Week.

Connecticut began Project Graduation activities in 1986. Using the design and materials of Nationwide Insurance's "Prom Promise," 50 schools participated in 1994. A group of Middletown police officers, calling themselves the "Blue Crew," produced an award-winning rap video and poster on drinking and driving that was distributed to all Connecticut high schools and libraries. The NHTSA "Team Spirit" leadership program was introduced in 1994.

Kansas implemented a pilot drug and alcohol prevention program in Wichita schools in 1982 that reduced school suspensions for alcohol by more than 30 percent by 1985. Training conferences spread the program to other areas. Kansas established a Governor's Center for Teen Leadership in 1989 to promote drug- and alcohol-free lifestyles through education and training. SADD chapters grew from 3 in 1985 to over 200 by the early 1990s. Radio and television PSAs directed at youth drinking and driving were developed and aired.

Nevada conducted a Governor's Student Safety Program in 1980 for high school students and advisors. SADD in Nevada began in 1984. Friday Night Live programs provide youth with alcohol-free activities on weekends.

New Jersey youth activities began in 1979 as S.O.B.E.R. (Stay Off the Bottle, Enjoy the Road), a community-level public information campaign involving MADD, RID, SADD, PTAs,

the Federation of Women's Clubs, and other civic organizations. The Teen Institute of the Garden State (TIGS) was begun in 1987 to train students in alcohol and drug prevention strategies and leadership skills. The Governor's Youth Advisory Task Force on Alcohol and Drug Prevention was established in 1993 to oversee youth activities.

New Mexico's youth drinking and driving activities began in 1984, when the first SADD chapters were started. An Albuquerque school-based drinking and driving education program was begun in 1985 and spread to six other school districts by 1987. The Traffic Safety Education and Enforcement Fund, legislated in 1990, funded youth public information campaigns. Teen courts and Friday Night Live programs were active in several communities.

North Carolina formed the Governor's Youth Advocacy and Involvement Office in 1983 to organize youth groups and educate them about drinking and driving. SADD grew rapidly, to 325 chapters by 1990. Youth Safety Councils were formed in all state high schools to address drinking and driving and other issues. Many communities conducted Project Graduation activities annually. The college community of Chapel Hill instituted a Drive-A-Teen program to provide rides as an alternative to driving after drinking.

Ohio conducted over 1,300 high school programs on drinking and driving from 1986 through 1991. There were 670 SADD chapters by 1994 with a full-time state SADD coordinator. Project Graduation was conducted in 500 high schools by 1991; BACCHUS was active in 37 colleges by 1990. A "None for Under 21" campaign in 1994 promoted Ohio's zero tolerance law. Cops in Shops programs help enforce MLDA 21.

Pennsylvania held Youth Traffic Safety Council conferences in 1980 featuring drinking and driving. Forty school districts participated in an alcohol and drug education project in 1982-83. Ten regional youth traffic safety conferences were held in 1987. SADD had 400 chapters by 1989. An active network of community traffic safety programs conducts local public education and other program activities directed at youth.

Washington conducts youth drinking and driving activities through SAFTYE (Stopping Automobile Fatalities Through Youth Efforts), which began in 1974 and expanded substantially when a youth program coordinator was hired in 1985. By 1986, SAFTYE was active in over 120 high schools statewide. It conducted public education campaigns and held annual student conferences.

NHTSA's Report to Congress on Youth Alcohol Traffic Safety (1995) provides a similar brief summary of each state's federally-funded youth traffic safety activities during fiscal year 1994. The report tabulates activities in several broad categories and notes which states conducted activities in each. The categories and the number of states active within each are:

- Public information and education: 41 states
- Leadership training, conferences, and task forces: 33
- MLDA 21 enforcement, court programs, server training, problem identification: 32
- School, college, and workplace programs: 31

- Community activities: 8
- Family programs: 5
- Graduated driver licensing and zero tolerance legislation and implementation: 4

MADD's Rating the States. The Rating the States assessments compiled by Mothers Against Drunk Driving (MADD) provide an interesting, although subjective, measure of the strength of state youth programs (Mothers Against Drunk Driving, 1991, 1993, 1996, and 1999). In these assessments, a panel of MADD members and national drinking and driving experts collected information on each state's drunk driving laws and activities. The panel assigned each state and the nation as a whole a "report card" grade from A to F in each of about 10 categories. The categories differed slightly from year to year, but always included Youth Legislation, Prevention, and Education (in 1991 the category included only prevention and education, with youth legislation included elsewhere).

For the nation as a whole, Youth received the highest grade of all categories in each of the last three assessments: B- in 1993, tied with three others; B+ in 1996 along with one other; B+ in 1999 by itself. In 1991, Youth received the second highest grade of B, trailing one category and tied with none.

The MADD assessments are not evaluations in any sense. They subjectively compare the relative strengths of various drunk driving program components -- law enforcement, legislation, public information, youth programs, etc. -- against MADD's goals in each. The youth component contains legislation (zero tolerance) and enforcement (of MLDA 21 laws) as well as prevention and education programs. Nevertheless, when youth programs consistently receive top grades, it's clear that MADD's panel considers youth drinking and driving activities to be extensive and effective.

Community programs. Community traffic safety programs, or CTSPs, also developed and spread in the 1980s. These were organized and operated locally, sometimes with state assistance. Most conducted some youth impaired driving activities, as noted in some of the previous state program summaries. Two CTSP groups have been described and evaluated in some detail and are discussed in the following section.

Section 410. Section 410 of the 1991 Intermodal Surface Transportation Efficiency Act (ISTEA) provided grants for impaired driving countermeasures to qualifying states. To qualify, a state must meet a specified number of criteria: for example, in 1992, states qualified by meeting four out of five criteria. Over the years, the number of available criteria and the number required to be met for qualification changed somewhat. But one criterion directed at youth remained the same. To meet it, a state must issue distinctive driver licenses to persons under 21 and must conduct programs directed at youth drinking and driving, including a program for alcohol retailers and servers, a strategy to enforce the MLDA 21, and an underage drinking prevention program that involved youth participation.

In 1992, 19 states qualified for grants by meeting four out of five criteria. In 1997, 38 states qualified by meeting five out of seven criteria. In each year, 1992 through 1997, every

qualifying state met the youth criterion. No other single criterion was met this frequently. For example, in 1997 all 38 qualifying states met the youth criterion, while the next most frequently used criterion was met by 31 states (Leaf and Preusser, 1998). This observation provides additional evidence that each state took substantial actions directed at youth drinking and driving.

State expenditures on youth programs. States have spent a substantial amount of both federal and state funds on youth drinking and driving prevention activities over the past 20 years. Information on these expenditures for the fiscal years 1993-1995 are provided in NHTSA's Report to Congress (1995). Congress appropriated \$8 million for each fiscal year 1994 and 1995, and \$9.2 million for fiscal year 1996, to be used by the states for youth drinking and driving prevention. NHTSA reports that in fiscal year 1993, before this additional appropriation, states spent \$10.0 million of federal funds on youth drinking and driving (using a combination of Section 402, 408, and 410 funds). With the additional appropriation, the total rose to \$21.1 million in fiscal year 1994 and to \$21.7 million in fiscal year 1995.

Section 410 spending. Leaf and Preusser (1998) track Section 410 spending on youth drinking and driving for the six fiscal years 1992-1997. During these years, a total of \$93.3 million in Section 410 funds was awarded to states. Approximately 15 percent, or \$14.7 million, was used for youth activities: \$3.4 million for enforcing laws, \$3.2 million for school and workplace programs, \$1.3 million for youth leadership development, \$1.1 million for family-based programs, \$0.8 million for public education directed to youth, \$0.6 million for community youth program activities, and \$4.3 million for other activities.

Effects of youth programs

The volume and variety of youth drinking and driving program activity is barely suggested by the preceding information. Unfortunately, most of these activities have not been evaluated, so the evidence of their effects is meager. This section reviews what's available.

SADD. Two studies attempted to evaluate SADD's activities and effects. Klitzner et al (1994) examined SADD programs in two schools (one each in California and New Mexico). They concluded that neither school implemented the model SADD program well, student participation in SADD was low, and comparisons with similar schools without SADD chapters showed no evidence for SADD effects on any drinking and driving measure.

Leaf and Preusser (1995) examined six schools with strong SADD programs (in Arizona, Ohio, and Wisconsin), matched with similar schools with no similar program. They found that students in the SADD schools were exposed to more information about drinking, drugs, and driving while impaired and were more likely to hold attitudes opposed to drinking and driving. Self-reported drinking and driving behavior was slightly, though not consistently, lower in SADD schools.

Community programs. Two studies show that well-organized community traffic safety programs can reduce youth drinking and driving. The first is the Massachusetts Saving Lives program discussed and evaluated by Hingson et al. (1996). The program operated in six

Massachusetts communities beginning in 1989 and conducted many activities addressing all aspects of traffic safety. An evaluation compared results in these communities with five similar communities and with the rest of the state. The evaluation found that the proportion of 16-19 year olds reporting driving after drinking in the previous month dropped from 19 percent in 1988 to 9 percent in 1993 in program cities, a 40 percent decline relative to the rest of the state.

Communities Mobilizing for Change on Alcohol (CMCA) was directed very specifically at reducing youth access to alcohol and youth drinking (Wagenaar et al., 2000). It was conducted in seven Minnesota and Wisconsin communities with eight others serving as controls. Local CMCA organizations implemented many changes in community policies, procedures, and practices regarding alcohol service, backed up with extensive media and community support. The evaluation found that merchants in CMCA communities increased age identification checking and reduced sales to minors. The proportion of 18-20 year olds who drank in the past 30 days decreased 7 percent compared to the control communities.

Other evaluation evidence. As part of a guide to reducing youth alcohol use, Stewart (1999) reviews the evidence supporting the effectiveness of 36 different strategies. The three strategies directed specifically at driving all involve legislation and enforcement, and all “can be very effective”: zero tolerance laws, sobriety checkpoints, and vigorous overall impaired driving law enforcement. The remaining strategies are directed at alcohol use in one way or another. The only strategies that have been proven effective also involve laws and enforcement: enforcement against retailers selling alcohol to youth, better laws prohibiting alcohol possession by youth, increased alcohol taxes, media campaigns supporting enforcement, and school policies regarding alcohol use. All other strategies, including the youth program activities discussed above, either have not been evaluated or evaluations have not found consistent effects. For example:

Prevention curricula (in schools or youth clubs): evaluations have found weak and inconsistent effects on alcohol use.

Alcohol-free activities for youth: have not been specifically evaluated.

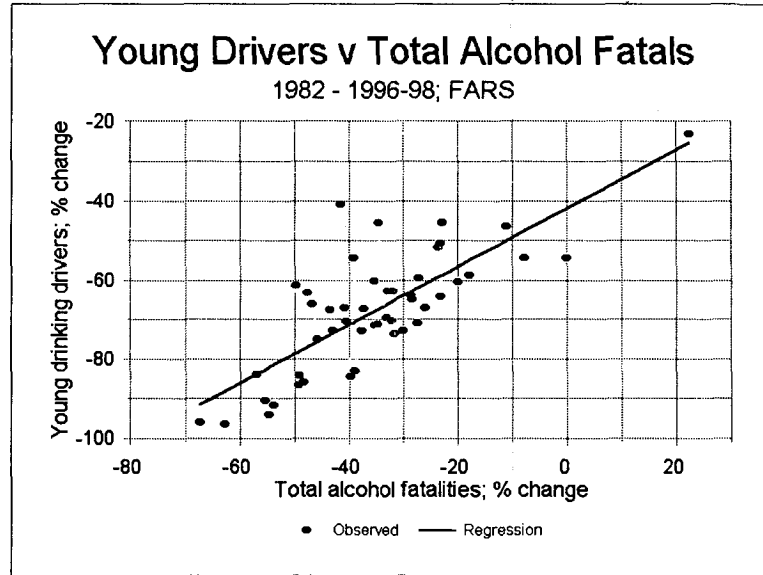
Keg registration laws (so that beer keg purchasers may be identified): have not been specifically evaluated.

Conclusions

Clearly, states and communities conducted extensive youth drinking and driving programs in the past two decades. Other organizations concerned with traffic safety -- insurance companies, automobile manufacturers, MADD, AAA, and many others -- did the same through public education and specific program activities.

But there is little evidence of the effects produced by these activities. The CMCA and Massachusetts Saving Lives results show that community programs can be successful. But these two examples were well-organized and well-funded and certainly may not be representative of many other community programs. The SADD evaluations show that effective SADD chapters

certainly affect knowledge and affect behavior. clear how many operate at this states evaluate their overall driving programs examine the measures of fatalities without disaggregate the program



students' attitudes and may Again, it is not SADD chapters level. When the effects of youth impaired they typically bottom-line youth crashes or attempting to effects of specific components.

The the exception of Saving Lives, there is no direct proof that any of the myriad youth traffic safety program activities not involving laws and enforcement had any direct effect on youth drinking and driving. But there also is no proof that they did not. The accumulation of information, education, skills, role models, and the like provided by these programs may have been the crucial force in the youth attitude, behavior, and crash changes documented in Chapter III. We simply do not know.

conclusion: with Massachusetts

E. Measures to Control Adult Drinking and Driving

Comparison of youth and total drinking and driving changes

Drinking and driving by youth does not occur in isolation: it is strongly related to drinking and driving by older persons. Measures to reduce drinking and driving overall should also affect youth. One way to investigate this assertion is to compare each state's success in reducing drinking and driving overall with its success in reducing drinking and driving by youth.

In a previous study, Ulmer, Hedlund, and Preusser (2000) calculated each state's change in total alcohol-related traffic fatalities from 1982 to 1996. To reduce the effects of random variations in individual years, they fit a simple linear regression to the annual data and then calculated the percentage change in the predicted values from 1982 to 1996, in the same manner as was used for Table 2 of Chapter III. Across the states, the change ranged from a reduction of 67 percent to an increase of 22 percent. Mississippi had an apparent increase of 88 percent, but the Mississippi FARS data are suspect for some of this time period.

To compare with the results for youth, this change in total alcohol-related traffic fatalities for each state except Mississippi was matched with the state's change in youth drinking driver fatal crash involvements. The results are plotted in Figure 30. In addition, a simple linear regression was fit to these data and also is plotted in the Figure.

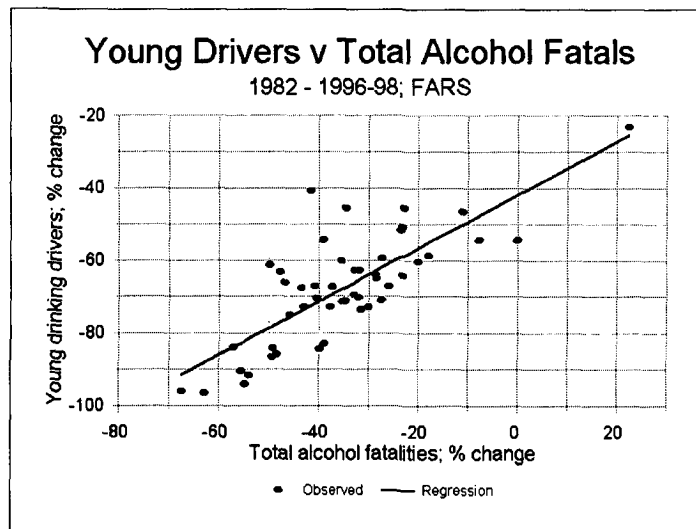


Figure 30. State Changes in Youth and Total Alcohol Related Fatalities

The Figure has 49 points, one for each state except Mississippi. The horizontal axis measures the state's percentage reduction in total alcohol-related traffic fatalities from 1982 to 1996, from Ulmer, Hedlund and Preusser (2000), Table 3. The vertical axis measures the state's percentage reduction in youth drinking driver fatal crash involvements from 1982 to 1998, from Table 2, Chapter III. The regression line is:

$$\text{youth \% reduction in drivers involved} = -41.9 + 0.739 (\text{total \% reduction in fatalities})$$

Thus the regression model predicts that a state that reduced total alcohol-related traffic fatalities by 30 percent from 1982 to 1996 (a typical amount) would reduce youth drinking drivers in fatal crashes by

$$-41.9 + 0.739 (-30) = 64.1 \text{ percent}$$

again a typical amount. The regression's r-square is 0.60, indicating a reasonable fit to the data.

The figure itself shows that most states lie close to the regression line. The few outliers are above the line: they did not reduce youth fatal crash involvements as much as the regression line would predict from their overall alcohol-related fatal crash reduction. Both the Figure and the regression show that, in general, the more a state reduced overall alcohol-related traffic fatalities, the more it reduced youth drinking driver fatal crash involvements.

Discussion and conclusions

The likely reason for this relationship is that measures to reduce overall drinking and driving affect both youth and older drivers. The basic impaired driving laws apply to everyone; the special laws applying to youth merely add to these laws or make them stronger (as zero tolerance laws strengthen existing *per se* laws by lowering the BAC limit). Thus, these laws should deter youth as well as older drivers. Impaired driving law enforcement may affect youth to

the extent that enforcement is present at the times and in the places where youth drive after drinking. Enforcement publicity sends a message that police are looking for all drunk drivers, not just those age 21 and above. General public education programs may reach youth if the messages and methods are appropriate to young as well as older drivers. Thus, states that took effective measures to reduce overall drinking and driving likely also saw the effect of these measures on youth drinking and driving.

Another factor also may be at work. States that took effective measures to address overall drinking and driving also may have taken special efforts to reduce drinking and driving by youth. Note, though, that all states adopted MLDA 21 and zero tolerance laws, the two measures proven to reduce youth drinking and driving. (Since 1980, 36 states raised their drinking age to 21 and all states enacted zero tolerance laws.) On balance, it is likely that some of the credit for reducing youth drinking and driving can be attributed to measures to reduce drinking and driving by everyone.

F. External Factors

Traffic safety in general, and drinking and driving in particular, may be affected by many broad economic, demographic, and social factors. This section discusses factors that may influence youth drinking and driving.

Changes in the Number of Youth

As documented in the section on national trends in Chapter III, the number of youth age 16-20 has decreased in the past 20 years while the number of older persons has increased substantially. When these changes are taken into account by comparing rates per population, the differences in drinking driver fatal crash involvements across age groups narrow. However, as was shown in Table 1, the decline in involvement rate for youth was considerably greater than among older drivers.

Economic and Travel Changes

Ulmer, Hedlund, and Preusser (2000) show the effects of travel, population, and employment changes on overall alcohol-related traffic fatalities. They report that state-by-state annual vehicle miles of travel (VMT), the numbers of persons employed, and the numbers of persons unemployed are associated with the overall level of alcohol-related traffic fatalities. That is, generally, favorable economic conditions yielded more alcohol-related fatalities than when the economy was less favorable.

Comprehensive state-by-state data on similar variables are not available for youth alone. To gain some insight into possible relationships between youth drinking and driving, and travel/economic conditions, a general linear model was constructed using state (as a categorical variable), year, VMT, persons employed and persons unemployed. Per capita beer consumption for the total population was also included. The dependent measure was 16-20 year old drinking drivers involved in fatal crashes. Thus, the dependent measure was specifically for youth while

the independent measures covered the full population. Logarithmic transformations were used for the dependent measure and for VMT, persons employed and persons unemployed. An analysis of variance of the independent variables is shown in Table 16.

Table 16. Analysis of Variance for Model Variables

Source	df	MS	F
State	49	0.92	11.06**
Year	1	12.43	149.27**
VMT	1	0.13	1.60
Persons Employed	1	1.78	21.41**
Persons Unemployed	1	1.11	13.37**
Per Capita Beer	1	5.88	70.56**

** p<.001

All of the model variables except VMT were statistically significant. Employment and per capita beer consumption had a positive relationship to the numbers of 16-20 year old drinking drivers involved in fatal crashes, while year and unemployment had negative relationships.

These results suggest that as overall employment and income rise, youth employment and income also rises; more youth have access to cars, have discretionary funds to spend on gasoline and vehicle upkeep -- and on alcohol. So it's highly likely that overall employment and income, and in particular youth employment and income, affect youth drinking and driving.

Youth Attitudes and Behavior

Chapter III shows clearly that youth attitudes regarding drinking and driving have changed substantially since 1980. It's also clear that youth knowledge, attitudes, and behavior have changed in many other ways during the same time. "Generation X" has given way to the "Millennials," raised on media and the Internet, cell phones and computers. The generation gap yawns as wide or wider than it ever has. Persons born before 1965 -- the Baby Boomers of the postwar years, the Silent Generation born before them -- have difficulty understanding today's teenagers (Howe and Strauss, 1993 label those born from 1961 to 1981 as the 13th Generation and describe some of their characteristics).

What changes in beliefs and practices in other areas affected youth drinking and drinking-driving attitudes and practices? Are youth today more politically conservative than in the 1960s? Are they more self-centered, interested in making money rather than saving the world? Do these changes reduce their risk-taking in general and their drinking and driving in particular? No studies or data addressing these issues were found. It's likely that there are substantial changes that have affected drinking and driving; it's possible that the observed changes in drinking and driving are

merely one relatively minor manifestation of major attitude and belief shifts. On the other hand, it's entirely possible that drinking and driving changes brought about by measures such as MLDA 21 and zero tolerance laws helped change youth attitudes and behavior in other areas. No evidence one way or the other was found.

Community

Changes over the past 20 years in where youth live and what they do undoubtedly affect youth drinking and driving. About 90 percent of young people now graduate from high school and about 62 percent of these graduates go on to college. By comparison in the early 1970s, about 85 percent of high school students graduated and 49 percent of these graduates went to college. Thus in recent years, more students are completing high school and more of these graduates are entering college. The underlying domicile, social and recreational patterns that go along with such changes may contribute to shifts in youth drinking and driving after drinking. For instance, it is likely that drinking on and around college campuses often can occur without requiring the use of an automobile. While plausible, such relationships cannot be quantified, however.

Conclusions

Economic, demographic, and social factors all undoubtedly influenced youth drinking and driving. The only influence that can be fully quantified is the change in the youth population relative to the total driving population. The other unquantified or even unidentified factors may have played a substantial role in reducing youth drinking and driving.

G. The Canadian Experience

To provide some perspective on youth drinking and driving changes in the United States since 1982, it's useful to examine Canada's experience over the same time.

Trends in Canada and the United States

Fatal crash data. Data from 1982 to date from the seven provinces for which these data are available (Alberta, British Columbia, Manitoba, New Brunswick, Ontario, Prince Edward Island, and Saskatchewan) were provided by the Transport Injury Research Foundation (TIRF). The data differ slightly from the United States FARS data in three ways. First, they record driver fatalities rather than driver involvements in fatal crashes. Second, they aggregate drivers age 16-19 rather than drivers under 21 as has been used for the United States. Finally, the TIRF file does not estimate alcohol presence for a driver without a BAC test. The proportion of fatally injured drivers with a positive BAC is calculated only for the drivers with a BAC test. Most drivers are tested: 76 percent of the age 16-19 driver fatalities in 1982 and 93 percent in 1997.

These differences may affect comparisons between the Canadian and United States data somewhat. For example, if BAC tests are available less frequently for sober drivers than for drinking drivers, then the proportion of fatally-injured drivers with a positive BAC calculated only

from the tested drivers may overstate the proportion for all fatally-injured drivers. But these differences should not affect the trends over time or trend comparisons between the two countries.

Figure 31 shows the trend in Canadian fatally-injured drinking drivers aged 16-19. It looks rather similar to the United States trend of Figure 1, with a rapid decrease through about 1993 and no substantial change since then. (The Canadian trend fluctuates more from year to year than the United States trend since the absolute number of Canadian traffic fatalities is much smaller.) Figure 32 shows how very similar the two trends are by plotting both using a base of 1982 = 100 percent.

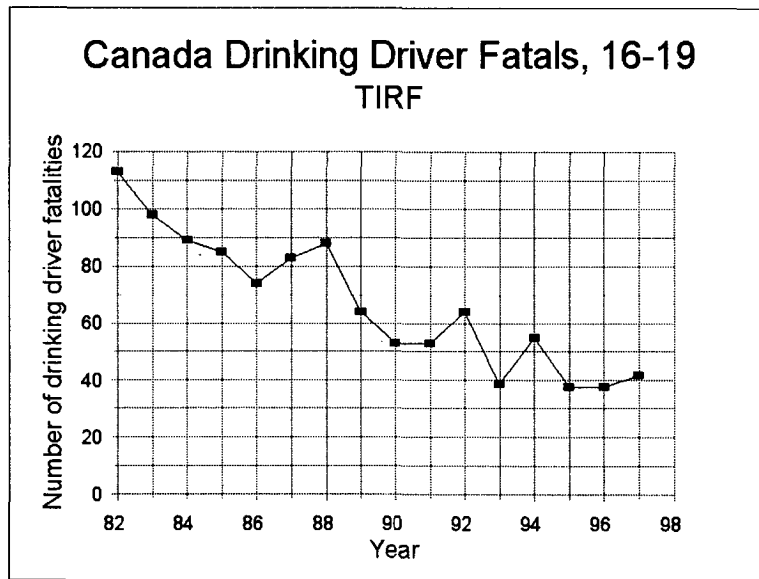


Figure 31.
Fatalities, Age
Positive BAC

Canadian Driver
16-19, with

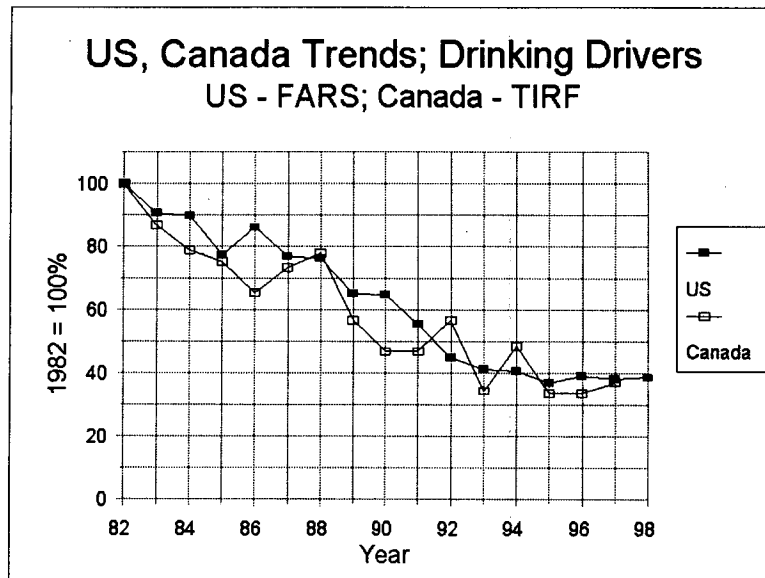


Figure 32. US and Canadian Trends, Percentage Change from 1982
 US: drivers under age 21 in fatal crashes with positive BAC (FARS)
 Canada: driver fatalities age 16-19 with positive BAC (TIRF)

Figure 33 shows the trend in the proportion of fatally-injured Canadian drivers with a positive BAC. The trend is similar to the corresponding United States trend of Figure 3. The absolute percentages are higher in Canada: 67 percent in 1982 (compared to 43 percent in the United States) and 39 percent in 1997 (compared to 21 percent). Some of this difference may be a result of the different methods used to estimate alcohol involvement in the two data files. Some may in fact reflect higher drinking and driving rates in Canada. But the trends in the two countries again appear very similar. Figure 34 compares the trends directly.

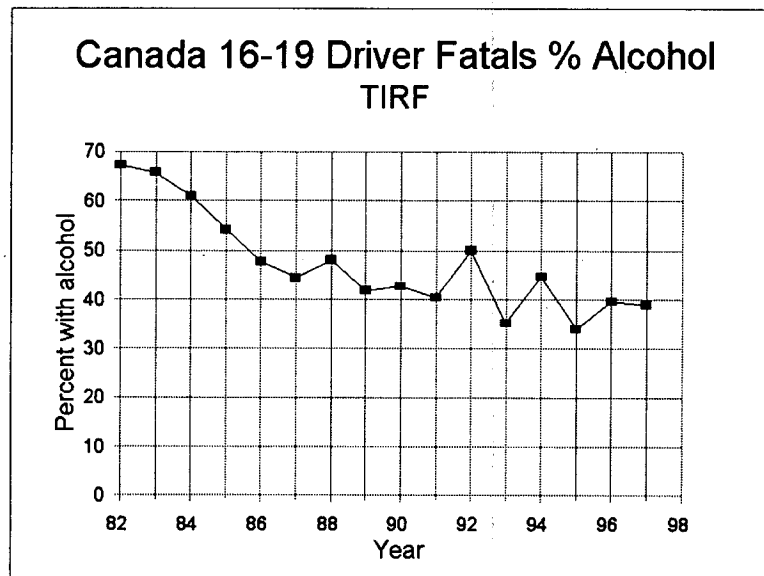


Figure 33. Percent of Canadian Driver Fatalities, Age 16-19, with Positive BAC

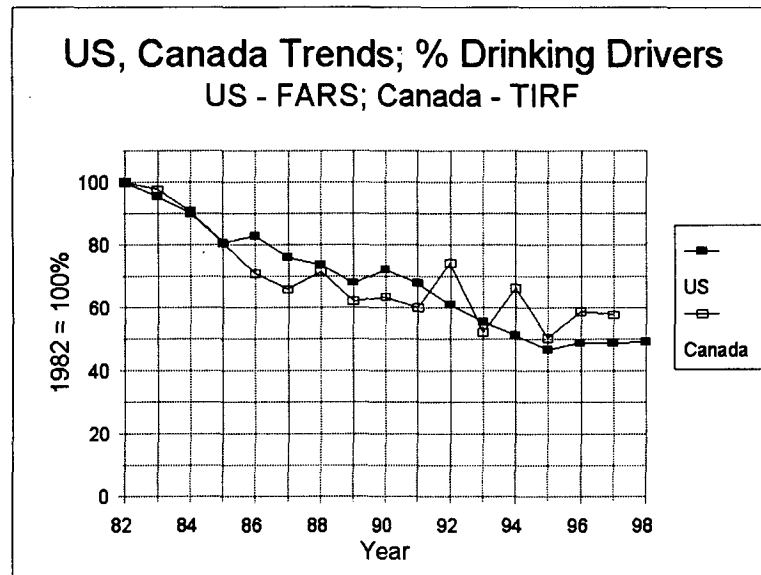


Figure 34 US and Canadian Trends, Percentage Change from 1982
 US: percentage of drivers under age 21 in fatal crashes with positive BAC (FARS)
 Canada: percentage of driver fatalities age 16-19 with positive BAC (TIRF)

Figures 32 and 34 show the same thing: as measured by fatal crash data, youth drinking and driving decreases in the United States and Canada from 1982 to 1997 were virtually identical. Other data strengthen this conclusion. In both countries, the number of young drinking drivers in fatal crashes decreased more rapidly than the number of older drinking drivers. A roadside survey in British Columbia produced results similar to Roeper and Voas (1999): a much smaller proportion of drivers age 16-19 than older drivers had a positive BAC, or a BAC exceeding the legal limit of 0.08 (Mayhew and Simpson, 1999).

Survey data. Smart, Adlaf, and Walsh (1994) report on biennial surveys of about 4,000 Ontario high school students similar to the Monitoring the Future surveys in the United States. Table 17 summarizes self-reported drinking changes from 1979 to 1991 from the two surveys.

Since the Ontario data come from a sample of students in grades 7-13, while the United States data come from high school seniors, it's no surprise that overall self-reported drinking levels are lower in Ontario. The reductions, though, are generally similar: a modest reduction in annual drinking, substantial reductions in binge drinking, and reductions close to 50 percent in both daily drinking (at low levels in both countries) and driving after drinking.

Table 17. Change in Self-reported Drinking and Driving after Drinking, High School Students

	1979	1991	change
Annual drinking: US	88.1 %	77.7 %	- 12 %
ON	76.9 %	58.7 %	- 24 %
Daily drinking: US	6.9 %	3.6 %	- 48 %
ON	0.9 %	0.4 %	- 56 %
5 or more drinks: US (2 weeks)	41.2 %	27.9 %	- 32 %
ON (4 weeks)	27.0 %	21.9 %	- 19 %
drive after drinking: US (2 weeks)	31.2 % (a)	18.7 %	- 40 %
ON (annual)	43.2 % (b)	20.1 %	- 53 %

US: high school seniors, Monitoring the Future, Johnston, O'Malley, and Bachman (1999)

ON: grades 7-13, Smart, Adlaf, and Walsh (1991), drive after drinking for licensed drivers only

(a) data from 1984

(b) data from 1983

Laws and programs in Canada and the United States

The major difference between Canadian and United States laws affecting youth drinking is the drinking age itself. In Canada, the drinking age is 18 in three provinces (Alberta, Manitoba, and Quebec) and 19 in the other seven. These legal ages have not changed in the past 20 years. The Canadian reduction in youth drinking and driving must have been caused entirely by other factors.

Eight of the ten Canadian provinces have zero tolerance laws, frequently as part of a graduated licensing system; Alberta and Manitoba do not. Aside from Prince Edward Island's law, which became effective in 1990, the laws were introduced from 1994 to 1999. Figures 31 and 33 show that virtually all the reduction in youth drinking and driving, as measured by traffic fatality data, had occurred by 1994 when these laws began to be introduced. So other factors must have caused the reduction.

In Canada, as in the United States, many educational and motivational programs in the past 20 years addressed youth drinking and driving after drinking. There was a strong student movement through organizations such as SADD, Teens Against Drunk Driving (TADD), and Ontario Students Against Impaired Driving (OSAID). Health Canada's primary program target during this period was youth. However, as in the United States, there is virtually no evaluation evidence on the effectiveness of these efforts. Mayhew and Simpson (1999) briefly review the programs and the limited evidence.

Discussion and conclusions.

Canadian reductions in youth drinking and driving, measured both by fatal crash data and by surveys, followed virtually the same pattern as in the United States. But the Canadian reduction was not due to laws directed at youth: the drinking age did not change during this time, and zero tolerance laws were implemented after the reduction had occurred. This means that the changes must have resulted from some combination of the difficult-to-assess educational and motivational programs and from other factors outside of traffic safety. This conclusion suggests that a substantial portion of the reduction in the United States also resulted from these same causes.

V. CONCLUSIONS AND RECOMMENDATIONS

What happened?

The data reported in Chapter III clearly demonstrate the changes in youth drinking, drinking and driving, and other related behaviors since 1982.

Youth drinking and driving dropped substantially

- Youth drinking and driving dropped substantially, as measured by drinking drivers in fatal crashes and by self-reported drinking and driving behavior. At the same time, young sober driver fatal crash involvement increased.
- Most of the decrease took place between 1982 and 1992.
- The decrease was nationwide: most states had very substantial decreases. However, states with the largest declines tended to lie on the East and West coasts. This outcome generally parallels the pattern for overall reductions in alcohol-related fatalities.
- Young drivers of all ages up to 21 reduced their drinking and driving by similar amounts. Drinking and driving decreases by high school and college age youth were similar.
- Drinking and driving decreased substantially more among youth than among older drivers.

Youth drinking also dropped, but not as much

- Youth drinking also decreased during this period, but by less than half as much as youth drinking and driving. Youth drinking has increased gradually since about 1993, while drinking and driving has remained approximately constant.
- The decrease in youth drinking also occurred fairly uniformly across the country. By 1998, youth drinking habits were similar in all regions.
- Most youth still drink; a majority drink at least monthly; a substantial minority binge drink regularly.

Youth have separated drinking and driving more than older drivers

- Youth have separated their drinking and their driving more than have drivers over 21.
- Drinking and driving has become less socially acceptable among youth than it was in 1982. Youth have accepted the designated driver concept and often use designated drivers.

What caused these changes?

As Chapter IV shows, the causes of this decrease are not nearly as well documented or understood.

Demographic changes -- the youth population decreased

- Changes in the population distribution account for a portion of the effect. The number of youth aged 16-20 decreased during this time, while the number of older persons increased substantially. If fatal crash involvements per population are compared instead of total fatal crash involvements, the gap between young and older driver decreases since 1982 narrows.

Laws and enforcement -- MLDA 21 and zero tolerance

- Minimum Legal Drinking Age increases caused some of the decrease. Thirty-six states raised their Minimum Legal Drinking Age to 21 since 1982. This reduced both youth drinking and youth drinking and driving.
- Zero tolerance laws caused a portion of the decrease. All states enacted zero tolerance laws since 1990.

Programs in states and communities

- States and communities have conducted many, many activities directed at youth drinking and driving not involving laws and enforcement. But there is almost no direct evidence that these activities have affected youth drinking and driving.

Drinking and driving measures directed at all drivers

- In general, states that reduced overall drinking and driving the most (as measured by the reduction in alcohol-related traffic fatalities) also reduced youth drinking driver involvements in fatal crashes the most.

Other factors

- Economic and social changes may well have influenced youth drinking and driving substantially, but no direct evidence was found.

What does this all mean?

Three influences are well-documented and well-understood: population changes, drinking age increases, and zero tolerance laws. Influences from the remaining factors -- youth programs, other drunk driving measures, and factors completely apart from driving or drinking -- can only be inferred. While MLDA 21 and zero tolerance laws clearly had some effect, they equally clearly did not cause the entire decrease. Canada's decrease was identical, with no drinking age changes,

and states whose drinking age was 21 before 1982 also shared in the decrease. Zero tolerance laws were implemented only in the 1990s, after most of the youth drinking and driving decrease had occurred.

The influence of drinking and driving measures directed at all drivers, not just youth, seems clear, both from the data of Chapter IVD and from common sense. However, youth drinking and driving decreased substantially more. Some of the difference may be due to the youth-directed measures of drinking age increases and zero tolerance laws. Another possibility is that some general measures may have a stronger effect on youth than on older drivers. For example, drinking and driving enforcement publicity may prompt parents to exert more control over their young drivers. Or the threat of a driver's license suspension may affect youth more than older drivers.

The effects of programs directed at youth are the most uncertain. These programs touched virtually all youth to some degree, through the schools, the media, and activities in their community. There is abundant anecdotal evidence that specific programs had some impact: students said they were affected by assembly programs featuring drunk driving victims or by "mock crash" events; no youth alcohol-related crashes occurred on Project Graduation weekends; virtually every student knows the dangers of drinking and driving. But there is little or no proof of any direct effect on youth drinking and driving. On the other hand, their cumulative effect may have been crucial in producing the youth attitude, behavior, and crash changes over the past 20 years. We simply do not know.

Recommendations

Lacking firm data and firm conclusions, it's difficult to make definitive recommendations. Those that follow come from the authors' experience and best judgment as well as the information presented in this report.

If it ain't broke, don't fix it

Something worked spectacularly well in reducing youth drinking and driving. Some causes are known; some are not. But none of the broad activities directed at youth drinking and driving over the past 20 years has been proven to be useless. So, carry on: continue enforcing the laws, continue the programs directed at youth, continue measures against all drinking and driving.

Improve drinking age and zero tolerance law enforcement

Both MLDA 21 and zero tolerance laws are poorly enforced, for several reasons: their enforcement may not be a priority; police may lack the necessary resources; enforcement procedures may pose obstacles; the laws themselves may have loopholes or unfortunate provisions. If enforcement improves, youth drinking and driving is likely to drop further.

Don't be complacent

Youth cultures change quickly. Programs and methods that affected last year's youth may be irrelevant to next year's. Continue the research, the experimentation, and the programs; inform, motivate, involve, and affect youth; reduce drinking and drinking and driving even further.

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APPENDIX STATE MLDA AND ZERO TOLERANCE LAW HISTORY

<u>State</u>	<u>MLDA21 Law Effective Data</u>	<u>Zero Tolerance Law (≤ 0.02 BAC, Age Under 21)</u>
Alabama	10/1/85	5/28/96
Alaska	11/1/84	8/10/96
Arizona	1/1/85	6/28/90
Arkansas	1935	8/12/93
California	1933	1/1/94 (Previously 0.05 Age < 18)
Colorado	7/1/87	7/1/97
Connecticut	Age 21 9/1/85 Age 19 to 20 10/1/83 Age 18 to 19 7/1/82	10/1/95
Delaware	1/1/84	7/1/95
Florida	Age 21 7/1/85 Age 18 to 19 10/1/80	1/1/97
Georgia	Age 21 9/30/86 Age 19 to 20 9/30/85 Age 18 to 19 9/1/80	7/21/97 (Previously 0.06 Age < 18)
Hawaii	10/1/86	12/1/97
Idaho	4/10/87	7/1/94
Illinois	1/1/80	1/1/95
Indiana	1934	1/1/97
Iowa	Age 21 9/1/86 Age 18 to 19 7/1/78	7/1/95
Kansas	7/1/85	1/1/97
Kentucky	1938	10/1/96
Louisiana	3/15/87	7/15/97
Maine	Age 21 7/1/85 Age 18 to 20 10/24/77	9/29/95

<u>State</u>	<u>MLDA21 Law Effective Data</u>	<u>Zero Tolerance Law (≤0.02 BAC, Age Under 21)</u>
Maryland	7/1/82	5/29/90
Massachusetts	6/1/85	6/27/94
Michigan	12/21/78	11/1/94
Minnesota	Age 21 9/1/86 Age 18 to 19 9/1/76	6/1/93
Mississippi	10/1/86	1998
Missouri	1945	8/28/96
Montana	Age 21 4/1/87 Age 18 to 19 1/1/79	10/1/95
Nebraska	Age 21 1/1/85 Age 19 to 20 7/19/80	1/1/94
Nevada	1935	7/16/97
New Hampshire	Age 21 6/1/85 Age 18 to 20 5/24/79	1/1/93
New Jersey	Age 21 1/1/83 Age 18 to 19 ½/80	12/17/92 (Previously 0.04 Age < 21)
New Mexico	1934	1/1/94 (Previously 0.05 Age < 18)
New York	Age 21 12/1/85 Age 18 to 19 12/4/82	11/1/96
North Carolina	Age 21 9/1/86 Age 18 to 19 10/1/83	9/15/95 (Previously 0.00 Age < 18)
North Dakota	1936	7/1/97
Ohio	Age 21 7/31/87 Age 18 to 19 8/19/82	5/4/94 (Previously 0.02 Age < 18)
Oklahoma	11/1/85	11/1/96
Oregon	1933	7/1/91
Pennsylvania	1935	8/2/96

<u>State</u>	<u>MLDA21 Law Effective Data</u>	<u>Zero Tolerance Law (≤0.02 BAC, Age Under 21)</u>
Rhode Island	Age 21 7/1/84 Age 19 to 20 7/1/81 Age 18 to 19 7/1/80	6/30/95 (Previously 0.04 Age < 18)
South Carolina	Age 21 9/14/86 Age 19 to 20 1/1/85 Age 18 to 19 1/1/84	7/1/93
South Dakota	Age 21 4/1/88 Age 18 to 19 7/1/84	1998
Tennessee	Age 21 8/1/84 Age 18 to 19 6/1/79	7/1/93
Texas	Age 21 9/1/86 Age 18 to 19 9/1/81	9/1/97
Utah	1935	7/1/92
Vermont	7/1/86	9/1/97 (Previously 0.02 Age < 18)
Virginia	Age 21 7/1/85 Age 18 to 19 7/1/81	7/1/94
Washington	1934	7/1/94
West Virginia	Age 21 7/1/86 Age 18 to 19 7/1/83	6/12/94
Wisconsin	Age 21 9/1/86 Age 18 to 19 7/1/84	10/14/97 (Previously 0.00 Age < 19)
Wyoming	7/1/88	1998

Sources: NHTSA; Insurance Institute for Highway Safety; O'Malley and Wagenaar (1991).

DOT HS 809 348
September 2001



U.S. Department
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**National Highway
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