HB

12

Alaska State Legislature

House of Representatives

COMMITTEES
JUDICIARY COMMITTEE, CHAIR
RULES
MILITARY & VETERANS AFFAIRS
UTILITY RESTRUCTURING
ETHICS

INTERIM:
10928 EAGLE RIVER RD., SUITE 141
EAGLE RIVER, AK 99577

SESSION:
ALASKA STATE CAPITOL
JUNEAU, AK 99801

Sponsor Statement

HB 12

Operating motorized vehicles under the influence of alcohol has been a major problem in Alaska for a long time. This legislation reduces the amount of alcohol a person can have in their blood while operating motorized vehicles.

The number of accidents and deaths that occur due to the operation of motor vehicles, while under the influence of alcohol, is an ongoing problem. Alaska ranks No. 5 in the nation for alcohol related incidences. It is imperative that the state takes action that reduces this serious problem.

Strengthening the current statutes, by lowering the amount of alcohol in a person's blood to .08, would serve as a deterrent for operating any type of motorized vehicle. Any cost associated with the implementation of this legislation will be beneficial in the long run, as it will save lives. This bill also affords local law enforcement agencies a better instrument in the prosecution of offenders. The Alaska Peace Officers Association, Mothers Against Drunk Driving, and other similar organizations support it.

This legislation is imperative for the State of Alaska to follow the lead of the federal government in lowering the amount of alcohol a person can have in that person's blood while operating motorized vehicles. If this legislation fails the State of Alaska stands to lose federal highway funds at a rate of 2% after 2004, 4% after 2005, 6% after 2006, 8% after 2007 and so on.

I urge your support of this legislation.

Representative Pete Kott

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Sectional Summary

HB 12

This sectional summary should not be considered an authoritative interpretation of the bill, with the bill itself the best statement of its contents.

This bill lowers the limit of blood alcohol levels of a person who has committed the crime of driving or operating motorized vehicles.

Section 1: Lowers the limit of alcohol a person can have in his or her blood while driving or operating a motorized vehicle.

Section 2: Lowers the limit of alcohol a person can have in his or her blood when determining that the person is not under the influence of intoxicating liquor. Lowers the limit of alcohol a person can have in his or her blood not giving rise to any presumption that the person was or was not under the influence of intoxicating liquor, but that fact may be considered with other competent evidence in determining whether the person was under the influence of intoxicating liquor. Lastly, lowers the limit of alcohol a person can have in his or her blood when presuming the person was under the influence of intoxicating liquor.

Section 3: Effective date: September 1, 2001

FISCAL NOTE

STATE OF ALASKA
2001 LEGISLATIVE SESSION

Fiscal Note Number:
Bill Version: HB 12
() Publish Date:

Revision Date/Time(Note if Correction):
Dept. Affected: Corrections
Title: An Act relating to the offense of operating a motor vehicle, aircraft, or watercraft, while intoxicated;....
BRU: Administration and Operations
Component: All
Sponsor: Representative Kott
Requester: House Transportation Committee
Component Number: 694

Expenditures/Revenues (Thousands of Dollars)

Note: Amounts do not include inflation unless otherwise noted below.

OPERATING EXPENDITURES	FY 2002	FY 2003	FY 2004	FY 2005	FY 2006	FY 2007
Personal Services						
Travel						
Contractual						
Supplies						
Equipment						
Land & Structures						
Grants & Claims						
Miscellaneous	1,211.1	1,183.8	1,217.7	1,254.7	1,254.7	1,254.7
TOTAL OPERATING	**1,211.1**	**1,183.8**	**1,217.7**	**1,254.7**	**1,254.7**	**1,254.7**
CAPITAL EXPENDITURES						
CHANGE IN REVENUES ( )	**164.8**	**164.8**	**164.8**	**164.8**	**164.8**	**164.8**

FUND SOURCE (Thousands of Dollars)

1002 Federal Receipts						
1003 GF Match						
1004 GF	1,046.3	1,019.0	1,052.9	1,089.9	1,089.9	1,089.9
1005 GF/Program Receipts						
1037 GF/Mental Health						
Other - 1156 Receipt supported serv.	164.8	164.8	164.8	164.8	164.8	164.8
TOTAL	**1,211.1**	**1,183.8**	**1,217.7**	**1,254.7**	**1,254.7**	**1,254.7**

Estimate of any current year (FY2001) cost: 0.0

Check this box (X) if funding for this bill is included in the Governor's FY 2002 budget proposal:

POSITIONS

Full-time						
Part-time						
Temporary						

ANALYSIS: *(Attach a separate page if necessary)*

This legislation would reduce the threshold for presumption of DWI from .10 to .08. It is estimated by the Department of Law that although this may not increase arrests by a large amount, it will increase convictions by 10%. In FY00 there were 4118 statewide misdemeanor convictions for DWI and 200 felony convictions.

If we multiply 413 misdemeanants (10% of the total) by the percentages reflected in DMV's 2000 statistics for 1st, 2nd, 3rd, 4th and 5th time offenders, we come up with an estimate of how many of those offenders might be newly convicted under a .08 law. All 1st and 2nd time offenders go to the CRC (if there is one in their community) so the CRC cost of care is utilized for our calculations. Utilizing a snapshot done on 10/25/00 of our DWI population, we averaged the sentenced being served for 3rd, 4th and 5th time offenders and estimated proportions of time served in CRCs and hard beds to come up with a total cost.

Assuming 20 new felons convicted under this threshold, and utilizing the average sentence for DWI felons, we estimated

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Division Commissioner's Office
Date/Time 03/30/01/10:30 am
Approved by: Margaret Pugh
Date 3/30/01
Agency Department of Corrections

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(Rev 2/7/2001 OMB)

20 X 352 days X $88/day = $619,520. The total for misdemeanants and felons then is $1,211,134.

Felony DWI offenders are usually given an average of 3 years probation. Probation costs will not be incurred until after completion of sentence so the impact will not be felt until the 2nd and subsequent years. The daily cost for probationers is $517/day. If 18 of the 20 felons were on probation the second year, the cost would be $33,967. It would be necessary to add $67,934 the third year and $101,901 the fourth year. After that it would level off as the first probationers drop off.

The Department of Corrections expects a 15% decrease in the incarceration rate for manslaughter/negligent homicides as a result of this legislation, beginning the second year. It will take time for the public to become aware of lowered BAC and to change behaviors. That would result in an annual savings, beginning in FY03, of $61,320 (or 1.5 persons incarcerated @ $112/day per year).

Misdemeanant DWI offenders are required to pay the cost of their incarceration up to $1,000. The Department of Corrections receives approximately 80% of that amount which is collected by the Department of Law. This would net approximately $164,768 in revenues against the total costs.

FY02	FY03	FY04	FY05	FY06	FY07	
1,211,134	1,211,134	1,211,134	1,211,134	1,211,134	1,211,134	Cost of Incarceration
0	33,967	67,934	101,901	101,901	101,901	Probation Costs
1,211,134	1,245,101	1,279,068	1,313,035	1,313,035	1,313,035	Subtotal
0	-61,320	-61,320	-61,320	-61,320	-61,320	Less savings for ho
-164,768	-164,768	-164,768	-164,678	-164,678	-164,678	Costs paid by inmates
1,046,366	1,019,013	1,052,980	1,087,037	1,087,037	1,087,037	

FISCAL NOTE

STATE OF ALASKA
2001 LEGISLATIVE SESSION

Fiscal Note Number:
Bill Version: HB 12
() Publish Date:

Revision Date/Time (Note if correction):
Dept. Affected: Law
Title "... offense of operating a motor vehicle, ... while intoxicated; ...presumptions arising from the amount of alcohol ..
BRU Criminal Division
Component Third Judicial District: Anchorage
Sponsor Representative Kott
Requester House Transportation Committee
Component No. 2261

Expenditures/Revenues (Thousands of Dollars)

Note: Amounts do not include inflation unless otherwise noted below.

OPERATING EXPENDITURES	FY 2002	FY 2003	FY 2004	FY 2005	FY 2006	FY 2007
Personal Services	121.1	121.1	121.1	121.1	121.1	121.1
Travel	0.4	0.4	0.4	0.4	0.4	0.4
Contractual	18.7	18.7	18.7	18.7	18.7	18.7
Supplies	1.6	1.6	1.6	1.6	1.6	1.6
Equipment	6.5					
Land & Structures						
Grants & Claims						
Miscellaneous						
TOTAL OPERATING	148.3	141.8	141.8	141.8	141.8	141.8
CAPITAL EXPENDITURES						
CHANGE IN REVENUES ( )						

FUND SOURCE (Thousands of Dollars)						
1002 Federal Receipts						
1003 GF Match						
1004 GF	148.3	141.8	141.8	141.8	141.8	141.8
1005 GF/Program Receipts						
1037 GF/Mental Health						
Other (Specify Type)						
TOTAL	148.3	141.8	141.8	141.8	141.8	141.8

Estimate of any current year (FY2001) cost: 0.0

POSITIONS

Full-time	1	1	1	1	1	1
Part-time						
Temporary						

ANALYSIS: *(Attach a separate page if necessary)*

HB 12 amends AS 28.35.030(a) by lowering the blood alcohol limit from 0.10 to 0.08 percent by weight of alcohol in a person's blood (and a corresponding change in the limit for alcohol in a person's breath) for the offense of driving while intoxicated (DWI), a class A misdemeanor. The bill also changes the presumptions in AS 28.35.033(a) in a civil or criminal action from 0.05 - 0.10 to 0.04 - 0.08 percent by weight of alcohol in the person's blood (and a similar change for breath alcohol), as the area where there is no presumption about the person being under the influence of alcohol. Under this bill, a person who measures 0.04 and below is presumed not under the influence, and a person who measures 0.08 and above is presumed to be under the influence of intoxicating liquor. The bill will result in an increased number of DWI cases being prosecuted by the Department of Law.

In FY00, the Criminal Division accepted for prosecution 3,218 misdemeanor and 213 felony DWI referrals by law enforcement throughout the state. Recently received statistics from the Anchorage Police Department indicate there would be about a 6 percent

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Division Attorney General's Office
Date/Time 3/30/01 4:33 PM
Approved by: Kathryn Daughhetee for Bruce M. Botelho, Attorney General
Date 3/30/01
Agency Department of Law

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ANALYSIS CONTINUATION

increase in DWI referrals due to the lowering of the blood alcohol threshold to 0.08. Experience has varied in other states that have reduced from 0.10 to 0.08 the limit for driving while intoxicated (California, Maine, Oregon, and Utah). While some states have experienced a 20 to 40 percent increase in DWI cases, a conservative estimate for the increase is about 10 percent. This would result in 322 additional misdemeanor and 21 felony DWI cases, which are much more time-consuming to prosecute than misdemeanors. The Department of Law assumes that municipalities which presently prosecute misdemeanor DWI will amend their ordinances to mirror the change in state law. If this does not occur, the ostimated number of misdemeanor prosecutions is understated.

Much of the anticipated increase in prosecutions will occur in southcentral Alaska. Because Anchorage is the hub from which prosecutors are sent to assist other offices in times of overload, it will be necessary to add one new attorney position to the Anchorage District Attorney's Office.

Using the department's FY02 standard attorney cost schedule, the fiscal impact from this legislation would be $141,776. This cost includes clerical support, communications, space, supplies, data processing, and other normal overhead expenses. The standard cost does not include one-time new equipment purchases, and $6,500 is added in FY02 for this purpose. Please note that although no clerical support position is being added, proportionate support position funding is included in the standard attorney cost schedule to reduce clerical support vacancy so that the new attorney's clerical burden can be handled.

FISCAL NOTE

STATE OF ALASKA
2001 LEGISLATIVE SESSION

Fiscal Note Number:
Bill Version: HB 12
( ) Publish Date:

Revision Date/Time (Note if correction):
Dept. Affected: Health & Social Services
Title: Reducing blood alcohol to .08
BRU: Alcohol & Drug Abuse Svcs
Component: Alcohol Safety Action Program
Sponsor: Rep. Kott
Requester: House (TRA)
Component Number: 305

Expenditures/Revenues (Thousands of Dollars)

Note: Amounts do not include inflation unless otherwise noted below.

OPERATING EXPENDITURES	FY 2002	FY 2003	FY 2004	FY 2005	FY 2006	FY 2007
Personal Services	60.0	60.0	60.0	60.0	60.0	60.0
Travel						
Contractual						
Supplies						
Equipment						
Land & Structures						
Grants & Claims	52.4	52.4	52.4	52.4	52.4	52.4
Miscellaneous						
TOTAL OPERATING	112.4	112.4	112.4	112.4	112.4	112.4
CAPITAL EXPENDITURES						
CHANGE IN REVENUES ( )						

FUND SOURCE (Thousands of Dollars)

1002 Federal Receipts						
1003 GF Match						
1004 GF	112.4	112.4	112.4	112.4	112.4	112.4
1005 GF/Program Receipts						
1037 GF/Mental Health						
Other (Specify Type)						
TOTAL	112.4	112.4	112.4	112.4	112.4	112.4

Estimate of any current year (FY2001) cost: 0.0

Check this box (X) if funding for this bill is included in the Governor's FY 2002 budget proposal:

POSITIONS

Full-time	1	1	1	1	1	1
Part-time						
Temporary						

ANALYSIS: *(Attach a separate page if necessary)*

HB 12 lowers the blood alcohol content from .10 to .08. It is estimated that this will result in a 10% increase in number of DUI cases resulting in convictions and mandatory referral to Alcohol Safety Action Programs (ASAP) and subsequently for treatment. Of these additional cases DHSS estimates that 100% would be referred to an ASAP. The costs to handle these additional cases is $112.4. We estimate that 65-70% of theses cases will be handled by the ASAP office in Anchorage, which is operated by employees of the Division of Alcoholism and Drug Abuse.

Prepared by: Ernie Turner
Phone 465-2071
Division Alcoholism & Drug Abuse
Date/Time
Approved by: Elmer A. Lindstrom, Special Assistant
Date 4/2/01 12:45 PM
Agency Department of Health & Social Services

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(Rev 2/7/2001 OMB)

FISCAL NOTE

STATE OF ALASKA
2001 LEGISLATIVE SESSION

Fiscal Note Number:
Bill Version: HB 12
() Publish Date:

Revision Date/Time (Note if correction):
Dept. Affected: Administration
Title: "An Act relating to operating a vehicle while intoxicated and relating to presumptions..."
BRU: Legal & Advocacy Services
Component: Public Defender Agency
Sponsor: Representative Kott
Requester: (H) Transportation
Component Number: 1631

Expenditures/Revenues (Thousands of Dollars)

Note: Amounts do not include inflation unless otherwise noted below.

OPERATING EXPENDITURES	FY 2002	FY 2003	FY 2004	FY 2005	FY 2006	FY 2007
Personal Services	98.9	98.9	98.9	98.9	98.9	98.9
Travel	3.7	3.7	3.7	3.7	3.7	3.7
Contractual	27.3	27.3	27.3	27.3	27.3	27.3
Supplies	2.2	2.2	2.2	2.2	2.2	2.2
Equipment	8.5	0.8	0.8	0.8	0.8	0.8
Land & Structures						
Grants & Claims						
Miscellaneous						
TOTAL OPERATING	140.6	132.9	132.9	132.9	132.9	132.9
CAPITAL EXPENDITURES						
CHANGE IN REVENUES ( )						

FUND SOURCE (Thousands of Dollars)						
1002 Federal Receipts						
1003 GF Match						
1004 GF	140.6	132.9	132.9	132.9	132.9	132.9
1005 GF/Program Receipts						
1037 GF/Mental Health						
Other (Specify Type)						
TOTAL						

Estimate of any current year (FY2001) cost: 0.0

Check this box (X) if funding for this bill is included in the Governor's FY 2002 budget proposal:

POSITIONS

Full-time	1	1	1	1	1	1
Part-time						
Temporary						

ANALYSIS: *(Attach a separate page if necessary)*

See Page 2 for Analysis.

Prepared by: Barbara Brink, Director
Phone 334-4400
Division Public Defender Agency
Date/Time 04/02/01

Approved by: Jim Duncan, Commissioner
Date 4/2/01
Agency Department of Administration

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(Rev 2/7/2001 OMB)

Bill Analysis, HB 12 continued.

This bill would lower the threshold blood alcohol level for Driving While Intoxicated (DWI) from .10 to .08. The bill also lowers the threshold presumptive level for impaired driving from .05 to .04. This bill would result in an increase in the number of new criminal cases the Public Defender Agency is appointed to handle.

The Department of Law, in its fiscal note, estimated the number of new prosecutions at 322 additional misdemeanor and 21 additional felony cases. The Public Defender Agency accepts the Department of Law's estimates. The Department of Law based its estimate on a 10 percent increase in prosecutions. This is a conservative estimate. As the Department of Law points out, experience in other states varies. But in Maine, a state similar to Alaska in many respects (smaller population, Northern climate), there was about a 20 percent increase in prosecutions. The Public Defender Agency will be appointed in about 75% of the cases. Using Department of Law's estimate, the Agency will be appointed to 242 additional misdemeanor cases and 16 additional felony cases.

We will need one additional full-time attorney to handle this increased caseload. Because our Palmer office handles a significant number of DWI cases and has the largest caseload growth in recent years, we will place the attorney at that office. The attorney costs include clerical support and one-time equipment costs in the first year.

FISCAL NOTE

STATE OF ALASKA
2001 LEGISLATIVE SESSION

Fiscal Note Number:
Bill Version: HB 12
( ) Publish Date:

Revision Date/Time (Note if correction):
Dept. Affected: Health & Social Services
Title: Reducing blood alcohol to .08
BRU: Alcohol & Drug Abuse Svcs
Component: Alcohol/Drug Abuse Grants
Sponsor: Rep. Kott
Requester: House (TRA)
Component Number: 1239

Expenditures/Revenues (Thousands of Dollars)

Note: Amounts do not include inflation unless otherwise noted below.

OPERATING EXPENDITURES	FY 2002	FY 2003	FY 2004	FY 2005	FY 2006	FY 2007
Personal Services						
Travel						
Contractual						
Supplies						
Equipment						
Land & Structures						
Grants & Claims	582.2	582.2	582.2	582.2	582.2	582.2
Miscellaneous						
TOTAL OPERATING	582.2	582.2	582.2	582.2	582.2	582.2
CAPITAL EXPENDITURES						
CHANGE IN REVENUES ( )						

FUND SOURCE (Thousands of Dollars)

1002 Federal Receipts						
1003 GF Match						
1004 GF	582.2	582.2	582.2	582.2	582.2	582.2
1005 GF/Program Receipts						
1037 GF/Mental Health						
Other (Specify Type)						
TOTAL	582.2	582.2	582.2	582.2	582.2	582.2

Estimate of any current year (FY2001) cost: 0.0

Check this box (X) if funding for this bill is included in the Governor's FY 2002 budget proposal:

POSITIONS

Full-time						
Part-time						
Temporary						

ANALYSIS: *(Attach a separate page if necessary)*

HB 12 lowers the blood alcohol content from .10 to .08. It is estimated that this will result in a 10% increase in number of DUI cases resulting in convictions and mandatory referral to Alcohol Safety Action Programs and subsequently for treatment. Of these additional cases DHSS estimates that 75% would be treated in a public program. Due to existing wait capacity and waitlist an additional $582.2 is required to fund the capacity required to provide the mandated treatment required.

Prepared by: Ernie Turner
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Division Alcoholism & Drug Abuse
Date/Time
Approved by: Elmer A. Lindstrom, Special Assistant
Date 4/2/01 12:49 PM
Agency Department of Health & Social Services

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(Rev 2/7/2001 OMB)

FISCAL NOTE

STATE OF ALASKA
2001 LEGISLATIVE SESSION

BILL NO. HB 12

Revision Date/Time (Note if correction) _____
Title: BAC level for DWI
Sponsor: Rep. Pete Kott
Requester: House Transportation Committee

Dept. Affected
BRU: Alaska Court System
Component: Trial Courts
Component No. 768

Expenditures/Revenues (Thousands of Dollars)

Note: Amounts do not include inflation unless otherwise noted below.

OPERATING EXPENDITURES	FY 2002	FY 2003	FY 2004	FY 2005	FY 2006	FY 2007
Personal Services	67.9	67.9	67.9	67.9	67.9	67.9
Travel						
Contractual	6.2	6.2	6.2	6.2	6.2	6.2
Supplies						
Equipment						
Land & Structures						
Grants & Claims						
Miscellaneous						
TOTAL OPERATING	74.1	74.1	74.1	74.1	74.1	74.1
CAPITAL EXPENDITURES						
CHANGE IN REVENUES ( )						

FUND SOURCE (Thousands of Dollars)

1002 Federal Receipts						
1003 GF Match						
1004 GF	74.1	74.1	74.1	74.1	74.1	74.1
1005 GF/Program Receipts						
1037 GF/Mental Health						
Other (Specify Type)						
TOTAL	74.1	74.1	74.1	74.1	74.1	74.1

Estimate of any current year (FY2001) cost: 0.0

POSITIONS

Full-time						
Part-time	2	2	2	2	2	2
Temporary						

ANALYSIS: *(Attach a separate page if necessary)*

House Bill 12 lowers the BAC necessary for a DWI violation under 28.35.030 from .1 to .08. National studies show that this change typically results in a 10% increase in DWI fillings. Based on that assumption, the court system would see an additional 500 misdemeanor filings a year and an additional 28 felony filings a year. This note reflects the additional judicial and jury costs associated with those increases.

Prepared by: Douglas Wooliver
Division: Alaska Court System
Phone 463-4750 264-8265
Date/Time 4/03/01 9:30 a.m.

Approved by: Stephanie Cole by
Agency: Alaska Court System
Date _____

For distribution information, call the Governor's Legislative Office

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Alaska Court System
Fiscal Note Calculations for HB12
4/3/01

	FY02	FY03	FY04	FY05	FY06
Superior Court:					
50 Jurors 1.0 Days for Selection	1,250	1,250	1,250	1,250	1,250
14 Jurors for 1.5 Days of Court	525	525	525	525	525
12 Jurors for .5 Days of Deliberation	150	150	150	150	150
Deliberation Meal $11/12 jurors + bailiff	143	143	143	143	143
Total per Superior Court Trial	2,068	2,068	2,068	2,068	2,068
Proposed # Superior Court Trials	3	3	3	3	3
Estimated Cost of Superior Court Trials	6,204	6,204	6,204	6,204	6,204
District Court:					
District Court Judge (5 Months) PPT	50,419	50,419	50,419	50,419	50,419
In-Court Clerk (5 Months) PPT	17,499	17,499	17,499	17,499	17,499
	67,918	67,918	67,918	67,918	67,918
Fiscal Note for 500 Misdemeanors + 3 Felony Trials	74,122	74,122	74,122	74,122	74,122

DOT APPORTIONMENTS

State	IM/STP/NHS Total	Eligible for .08 Grants	Oct. 1, 2003 2% Penalty	Oct. 1, 2004 4% Penalty	Oct. 1, 2005 6% Penalty	Oct. 1, 2006 8% Penalty
Alabama	$342,638,533	X	-0-	-0-	-0-	-0-
Alaska	179,048,339		$3,580,967	$7,161,934	$10,742,900	$14,323,867
Arizona	346,186,696		6,923,734	13,847,468	20,771,202	27,694,936
Arkansas	243,992,590		4,879,852	9,759,704	14,639,555	19,519,407
California	1,529,215,765	X	-0-	-0-	-0-	-0-
Colorado	247,386,936		4,947,739	9,895,477	14,843,216	19,790,955
Connecticut	184,287,424		3,685,748	7,371,497	11,057,245	14,742,994
Delaware	82,934,413		1,658,688	3,317,377	4,976,065	6,634,753
D.C.	72,529,086	X	-0-	-0-	-0-	-0-
Florida	908,997,513	X	-0-	-0-	-0-	-0-
Georgia	649,914,759		12,998,295	25,996,590	38,994,886	51,993,181
Hawaii	87,533,317	X	-0-	-0-	-0-	-0-
Idaho	140,668,319	X	-0-	-0-	-0-	-0-
Illinois	578,788,117	X	-0-	-0-	-0-	-0-
Indiana	477,023,185		9,540,464	19,080,927	28,621,391	38,161,855
Iowa	233,761,151		4,675,223	9,350,446	14,025,669	18,700,892
Kansas	228,816,583	X	-0-	-0-	-0-	-0-
Kentucky	311,045,588	X	-0-	-0-	-0-	-0-
Louisiana	258,290,690		5,165,814	10,331,628	15,497,441	20,663,255
Maine	90,738,751	X	-0-	-0-	-0-	-0-
Maryland	260,265,880		5,205,318	10,410,635	15,615,953	20,821,270
Massachusetts	269,627,680		5,392,554	10,785,107	16,177,661	21,570,214
Michigan	578,169,423		11,563,388	23,126,777	34,690,165	46,253,554
Minnesota	304,583,674		6,091,673	12,183,347	18,275,020	24,366,694
Mississippi	235,276,784		4,705,536	9,411,071	14,116,607	18,822,143
Missouri	405,527,772		8,110,555	16,221,111	24,331,666	32,442,222
Montana	191,791,565		3,835,831	7,671,663	11,507,494	15,343,325
Nebraska	166,733,536		3,334,671	6,669,341	10,004,012	13,338,683
Nevada	141,949,392		2,838,988	5,677,976	8,516,964	11,355,951
New Hampshire	85,380,575	X	-0-	-0-	-0-	-0-
New Jersey	358,791,296		7,175,826	14,351,652	21,527,478	28,703,304
New Mexico	202,633,907	X	-0-	-0-	-0-	-0-
New York	615,866,843		12,317,337	24,634,674	36,952,011	49,269,347
North Carolina	489,204,742	X	-0-	-0-	-0-	-0-
North Dakota	143,729,580		2,874,592	5,749,183	8,623,775	11,498,366
Ohio	597,212,812		11,944,256	23,888,512	35,832,769	47,777,025
Oklahoma	290,063,196		5,801,264	11,602,528	17,403,792	23,205,056
Oregon	221,819,579	X	-0-	-0-	-0-	-0-
Pennsylvania	593,111,563		11,862,231	23,724,463	35,586,694	47,448,925
Rhode Island	86,676,803		1,733,536	3,467,072	5,200,608	6,934,144
South Carolina	316,689,556		6,333,791	12,667,582	19,001,373	25,335,164

What if this were the 19th State to have .08 in 2000?

19th State	2000 Oblig. Auth.(87.1%)
Alaska	847,468
Arkansas	2,084,629
Arizona	2,319,676
Colorado	2,425,076
Connecticut	1,790,867
Delaware	847,468
Georgia	4,119,339
Indiana	3,519,787
Iowa	2,453,537
Kentucky	2,492,121
Louisiana	2,612,752
Maryland	2,575,320
Massachusetts	3,183,945
Michigan	5,397,959
Minnesota	3,353,651
Mississippi	1,974,459
Missouri	3,606,033
Montana	1,103,086
Nebraska	1,700,499
New Jersey	3,951,785
New York	8,783,620
Nevada	1,053,060
North Dakota	1,194,576
Ohio	5,997,730
Oklahoma	2,619,944
Pennsylvania	6,447,658
Puerto Rico	1,841,228
Rhode Island	847,468
South Carolina	2,316,067
South Dakota	1,189,839
Tennessee	3,157,815
West Virginia	1,235,442
Wisconsin	3,403,571
Wyoming	847,468

Talking Points
On New .08 BAC Studies
Released In April, 1999

Background

- In February 1991, NHTSA issued a Report to Congress on the "Effects of Alcohol and Expected Institutional Responses to New Limits." Based upon impairment data and epidemiological research showing the increased risk of crashing as driver BAC increases, NHTSA recommended that a .08 per se limit be adopted by the States and jurisdictions.

- In October 1992, in a subsequent "Report to Congress on Alcohol Limits", NHTSA recommended that all states enact a .08 BAC level, at and above which it is a per se criminal offense to drive. Again, this recommendation is based on the fact that everyone is impaired at .08 BAC; epidemiological research shows an increase in crash risk of 9-11 times at .08 BAC; there is strong public acceptance of this limit; and a new study of the effectiveness of .08 BAC and administrative license revocation laws in California suggests that these laws are effective in reducing alcohol related crashes.

- On March 3, 1998, more than 150 representatives of national organizations and highway safety partners joined President Clinton as he addressed the Nation on setting new standards to prevent impaired driving. The President called for a national standard under which it would be illegal, per se, to operate a motor vehicle with a blood alcohol content (BAC) of .08 or higher. President Clinton called on Congress to enact legislation that would apply the .08 BAC standard across the country. (The Safe and Sober Streets Act of 1997 passed the Senate on March 4, 1998, by a 67 to 32 margin).

- On June 9, 1998, President Clinton signed the Transportation Efficiency Act (TEA 21) into law. In his signing statement, he expressed his deep disappointment "that H.R. 2400 failed to include language that would help establish 0.08 percent (BAC) as the standard for drunk driving in each of the 50 states." He further stated that his Administration would continue to fight for it.

Key Points

- In 1997, 16,189 people lost their lives on U.S. highways in alcohol-related crashes. This represented 39 percent of all traffic fatalities in 1997.

- While alcohol-related traffic fatalities have been decreasing (and the 39 percent in 1997 represented an all-time low in the U.S.), we have a long way to go to meet the national goal of no more than 11,000 alcohol-related fatalities by the year 2005.

- We know what works. In order to reduce impaired driving in this Nation, we need tough laws set by the states, highly visible enforcement of these laws, and a change in the public's attitude regarding this problem.

- One step in that direction will be to adopt .08 BAC as the illegal limit for adult drivers in all 50 states. Currently, only 16 states and the District of Columbia have such laws.

- Research shows that virtually all drivers, even experienced drinkers, are substantially impaired at .08 BAC with regard to critical driving tasks (such as braking steering, lane changing, judgement, and divided attention)

- The risk of being involved in a crash increases gradually at each blood alcohol level, but rises very rapidly after a driver reaches or exceeds .08 BAC.

- . 08 BAC is a reasonable limit to set. A 170-lb. male would have to consume 5 or more 12-ounce beers in a 2-hour period on an empty stomach to reach .08 BAC. An average (137 lb.) female would need to consume 4 beers in 2 hours to reach .08.

- Surveys show that most people would not drive after consuming 2 or 3 drinks and that 2 out of 3 Americans favor lowering the limit to .08, when they are made aware of how much alcohol that means.

- Most other industrialized nations have set BAC limits at .08 or lower. For example, Canada and Great Britain have had .08 for many years; Australia, France and Germany are at .05; and Sweden has an illegal limit set at .02 BAC.

- Past research has shown that .08 laws have been effective in reducing impaired driving in several states that have adopted them. However, some have suggested that because these studies have found different results in various states that they provide only "equivocal" evidence of the effectiveness of these laws.

- In fact, the quality and consistency of the results of the past studies is quite similar to that of studies conducted from 1980 -1990 to evaluate the effectiveness of minimum drinking age laws. Any inconsistency found in the studies (in both areas) has generally been in magnitude, not direction of effect, and it has involved primarily smaller states where fatal crashes vary significantly from year-to-year.

- However, because concerns have been raised, the Department of Transportation commissioned these three new studies to further investigate the effectiveness of .08 BAC laws.

- These three independently conducted studies add additional support for the effectiveness of .08 BAC laws.

- Even though these three studies provide additional evidence for the effectiveness of .08 laws, it should be pointed out that longstanding support for .08 BAC laws was based on the behavioral research that indicates that virtually everyone is impaired at this level; on epidemiological research that shows that the likelihood of being involved in a fatal or serious injury crash increases dramatically at this level; on the fact that the public overwhelmingly supports such a level; and on the fact that nearly all industrialized nations have a limit which is lower than .08.

- The most comprehensive of the three new studies conducted by the Pacific Institute for Research and Evaluation analyzed data from all 50 states. It examined the effectiveness of three major alcohol safety laws: administrative license revocation (ALR) laws; .10 illegal per se BAC laws, and .08 illegal per se BAC laws. It found that all three laws are effective in reducing alcohol-related crashes.

- This study found that .08 BAC laws reduce the involvement of drinking drivers in fatal crashes by about 8 percent. It estimated that these laws saved 275 lives in 1997 alone and that an additional 590 lives could have been saved if every state would have had a .08 BAC limit in place in that year. Reductions among drivers with high BACs were just as great as those with low BACs (i.e., about 8 percent).

- Another multi-state study (Rainbow Technologies and NHTSA) examined 11 states with .08 BAC laws and found significant reductions in alcohol-related fatalities in 7 states; in 5 of the 7 states (VT, KS, NC, FL, NM) the reduction was associated with the .08 BAC law itself; in 2 of the 7 states (CA, VA), the reductions were associated with the combined effect of .08 BAC laws and administration license revocation (ALR) laws enacted within six months of each other. In 4 states, no significant effects of .08 laws were observed.

- A third study looked at North Carolina alone (University of North Carolina - Highway Safety Research Center). It found no clear effect of a .08 BAC law implemented in North Carolina in 1993, during an already sharp decline in alcohol-related fatal crashes. Several study outcomes suggested modest additional reductions associated with the .08 law, but the magnitude of these results was not sufficient to be scientifically conclusive.

- The enactment of the .08 BAC law in North Carolina was but one of a number of comprehensive and aggressive efforts which the State has implemented over the past two decades to deter alcohol-impaired driving. As a result, the state has experienced a sharp decline in alcohol-related crashes and fatalities that began in 1987 and continued after the .08 BAC law was enacted.

- In aggregate, the three studies provide additional support for a comprehensive legislative approach to drunk driving, which includes .08 BAC laws. These laws are particularly

effective when coupled with other efforts, including ALR laws, sobriety checkpoints, enforcement blitzes, and public information campaigns.

- Even with these studies, there will undoubtedly be those who will still claim the evidence for the impact of .08 laws is still "equivocal." All research is (equivocal). However, with the addition of these studies, the quantity and quality of studies is reinforced. In fact, it can be argued that both the quality of the studies and the consistency of their results parallels that of the minimum drinking age (MDA 21) studies, which have been widely viewed (including GAO reviewers) as constituting one of the most unequivocal areas of highway safety evaluation]

Questions and Answers Regarding the .08 Issue and the Recent Studies Supporting Its Impact

Questions Directly Related to the .08 Studies

Q. How do you resolve the fact that in one study of the effects of .08 BAC legislation in North Carolina, the researchers found "no clear effect," while in the other study a significant effect of the law was found?

There is more consistency than inconsistency in the findings of these two recent studies of the North Carolina .08 law implemented in 1993. Both studies found that the .08 BAC law was *implemented in the midst of a sharp decline* in alcohol-related crashes that had begun in 1987. Thus, both studies attempted to find evidence of an *additional* effect, above and beyond the downward trend that was already occurring.

In fact, both studies did find evidence of an *additional* effect associated with the .08 BAC law. In the 11-state study (Apsler, Char, Harding, and Klein), the outcome (for North Carolina) was a statistically significant reduction in alcohol related fatalities. In the case of the North Carolina study (Foss, Stewart, and Reinfurt), several analyses were conducted, the majority of which found evidence of an *additional* reduction in alcohol related crashes associated with the .08 BAC law (in comparison with all states without .08 laws and in comparison with 11 other states with high BAC testing). In this study, however, the magnitude of these results was not great enough for the researchers to conclude that there was a clear effect. Some of the differences in the size of the effect observed appear to be related to differences in pre/post time periods. In any case, the majority of the outcomes of both studies suggested an *additional* effect associated with the law.

In summary,

> Both studies found **long term declines in alcohol-related fatal crashes** in North Carolina, due to a variety of activities and programs implemented within the State.

With regard to the **specific impact of the .08 BAC legislation**, the majority of the analyses (in both studies) indicated fewer alcohol-related crashes or fatalities associated with the .08 BAC legislation. Thus, the *direction* of the results was consistent between the two studies.

Because there already was a sharp decline occurring in alcohol related crashes, the residual reductions found to be attributable to the .08 BAC legislation in North Carolina were deemed by the researchers to be modest and not statistically significant in the single state (NC) study. While a 4% decline in alcohol-related fatalities attributable to the .08 BAC law may not have been "statistically significant", it is significant when viewed in terms of the lives saved.

The slight differences in the outcomes (i.e., statistical significance versus non-significance) in the two studies are likely due, at least in part, to differences in the time periods studied.

Q. How did these studies separate out the effects of many different programs and laws working at the same time, such as administrative license revocation, sobriety checkpoints, enforcement blitzes, and designated driver programs?

The current studies employed several methods to single out the impact of .08 legislation.

Each study included in its analysis, *data and trends regarding extraneous factors* which might affect crashes, both alcohol-related and non-alcohol related.

Each study also used at least one *dependent variable* (i.e., the ratio of alcohol-related to non-alcohol-related drivers) to control for factors which equally affect alcohol-related and non-alcohol related crashes.

Two of the current studies used sophisticated *time-series analysis* techniques to control for the implementation of other countermeasures as well as changes in extraneous factors such as alcohol consumption, seasonal effects, trend effects, etc. These techniques depend upon differences in the timing of the implementation of various actions or programs to determine individual impact.

Finally, several studies have *compared states* with .08 BAC legislation with those that do not have such legislation on various measures.

Additional Information

Nearly all of the progress we have made in reducing drunk driving has been the result of a combination of a large number of actions that have been taken over the past two decades. Success at any one point builds upon the successes of previous efforts, especially with regard to legislative efforts. It is not reasonable to expect that any single action will have a major impact

on this very difficult problem. Thus, many countermeasures are in operation at any one time and it is very difficult try to separate out the impact of specific actions.

In addition, there are many extraneous factors that can affect drunk driving (e.g. alcohol consumption levels and patterns, unemployment, etc.). These factors (at least those which are known to affect alcohol-related crashes) must also be accounted for in any credible study.

Efforts to control for the impact of extraneous variables and to estimate the impact of individual measures are never perfect.

However, primarily because of differences in the timing of various efforts, it is often possible to determine (using time series analysis) with some confidence if a particular countermeasure (such as .08 BAC legislation) is having an impact.

It is also possible to use different measures and comparisons with other states to show differences.

The replication of such impact by an accumulation of studies, conducted over different time periods and using different measures and techniques adds to the confidence of these findings.

Q. How did you account for public attitude changes to drunk driving mainly due to the work of grass roots groups such as MADD and SADD?

All of the studies took into account the potential impact of such factors by including a "year trend" factor in their analyses Even taking this trend into account, the two national level studies still found that .08 laws had a significant effect on reducing alcohol related fatal crashes.

Q. Intuitively a .08 law with lots of publicity and enforcement should work better than a law with little of either. Does that account for some of the variability in your results? Can you be assured that the presence or absence of publicity and/or enforcement in conjunction with these laws has been taken into account?

Unfortunately, there is not good data available regarding the level of enforcement or publicity that accompanied the implementation of .08 BAC laws in all of the states that enacted them. It is certainly possible that differences in the levels of these complementary activities resulted in differences in measured impact in various states with .08 BAC legislation.

Q. Everybody knows that the baby boomers are getting older and more health conscious and that alcohol consumption is going down in the U.S. The young population was also decreasing over the years of your study. Those factors cause a long-term decline in drinking and driving along with many other social problems. How did your analyses account for that?

All of the studies used "time factors" in their analyses to attempt to control for such factors that are highly correlated with time. Again, even after accounting for these time trends, the two

national studies released today found that .08 BAC laws were effective in reducing alcohol related fatal crashes in several states.

Q. In the past, supporters of .08 BAC laws claimed that there is no evidence to believe that people will drink less or that bars and restaurant businesses will be hurt by .08 BAC laws. Both of the new studies seem to indicate that .08 laws do affect alcohol consumption. How do you resolve this conflict?

In the past, there was little or no evidence that .08 laws affected alcohol consumption. In the four .08 states where consumption figures were available, there were no changes in per capita alcohol consumption trends when .08 was adopted. However, NHTSA decided to examine this issue in the new national studies using time series analyses to determine any deviations from the already decreasing alcohol consumption trends.

QUESTIONS NOT DIRECTLY RELATED TO THE .08 IMPACT STUDIES

Q. Why did the New Jersey Governor's DWI Task Force conclude that the results were mixed on the effects of .08 and consequently did not recommend to the Governor that the limit be lowered to .08?

The Task Force reviewed only the four previously published studies of the effects of .08 BAC and concluded, in their review, that the "results were mixed." We believe that, while the direction of the findings of all the previous studies is remarkably consistent, the studies released today contribute considerably to the evidence that .08 BAC laws reduce alcohol-related fatalities.

Q. If .08 BAC legislation is so effective, and the rationale behind it is so solid, why have only 16 states adopted .08 this far?

This year, there was legislative activity in a substantial number of states regarding .08 BAC laws. However, such legislation is never easy to enact and some in the alcohol and hospitality industries have strongly opposed such legislation. Their lobbyists have been very effective in confusing the facts regarding number of drinks required to reach .08, impairment and increased crash risk at various BAC levels, and the effectiveness of .08 BAC laws. As a result, they have often been effective in getting .08 legislation killed in legislative committees. It is our perception that more and more .08 legislation is now getting out of committee and is being voted on by the full house or Senate in the states. This suggests that such legislation is gaining more momentum and support in the states and we expect an increasing number of states to enact .08 BAC laws in the near future.

Q. Do your latest studies show that .08 legislation affects the real drinking driving problem in this country, drivers who reach BACs of .15 or greater?

Yes, nearly all of the studies of .08 BAC legislation that have been conducted have shown that such laws reduce the involvement of both high and low BAC drivers in fatal crashes.

This legislation sends a message to all potential drinking drivers that the standard is being lowered and that their risk of arrest, conviction and sanction is becoming greater.

Q. Doesn't a .08 BAC law mean that a 120-lb woman who has two glasses of wine in two hours will be subject to arrest, fines and jail?

This scenario is extremely unlikely. Obviously, if the woman drinks large glasses of high alcohol-content wine on an empty stomach, her BAC could rise to that level. However, numerous demonstrations have been conducted around the country which have included small-statured women. In those demonstrations, even on an empty stomach, two glasses of wine have not resulted in BACs of .08 -- even though the women often showed obvious signs of impairment.

That is the important point -- all persons, small-statured women or large, heavy men, show significant impairment before reaching a BAC of .08. That is why research shows that the risk of being involved in a fatal or serious injury crash increases significantly by the time one is at a .08 BAC.

Q. If lowering the illegal BAC limit from .10 to .08 saves lives, why not lower it to .06 or .05 and save even more lives?

The research on impairment, risk of crash involvement, and effectiveness of legislation, along with the level of public acceptance of current and proposed BAC legislation all points to .08 as the most appropriate illegal level. If future research suggests that lower levels should be adopted and the public agrees, perhaps lower limits will be considered. Right now, .08 is the level recommended for adults. Keep in mind, all states now have adopted per se levels of .04 BAC for commercial drivers (large trucks, buses, etc) and .02 BAC (or zero tolerance) for drivers under the age of 21.

Q. Some countries with .08 BAC limits (e.g. Mexico, Canada, Austria) have higher alcohol involvement rates in fatal crashes than in the U.S. How do you explain that?

Some countries do have higher alcohol involved fatal crash rates than the U.S., even though they have .08 BAC limits. Such laws are only one among many factors influencing alcohol-related fatality rates. There are many other factors that affect these statistics, such as enforcement levels, sanctions, public attitudes toward drinking and driving, alcohol consumption levels and patterns, availability of alternative transportation, etc.

In the U.S., 39% of the traffic fatality are alcohol-related. In many countries with lower BAC limits, like Sweden, the percent alcohol-related is far lower, usually below 30%.

Q. Even in countries like Sweden, the average BAC of a person involved in an alcohol-related fatal crash is .15. How do you explain that?

An average BAC of .15 among drinking drivers involved in fatal crashes is quite common across nations. It is only a measure of average BAC among the population of fatally injured drivers who were drinking, regardless of the size of that population.

The percent of fatal crashes involving a drinking driver is much more relevant as a measure of success and, where .08 has been introduced, there is strong and growing evidence that this measure of alcohol-involvement is reduced.

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ORIGINAL ARTICLES

Effects of recent 0.08% legal blood alcohol limits on fatal crash involvement

Ralph Hingson, Timothy Heeren, Michael Winter

This article is dedicated to Ross H and Geri J Goughler who in 1992, while traveling to a Thanksgiving visit with their daughter, were struck and fatally injured by a driver in New Mexico. Police reports indicated the driver had been drinking but his blood alcohol level was below 0.10%, the legal limit at the time. He was not charged with a drunk driving violation.

Abstract

***Objectives*—This study assessed whether states that lowered legal blood alcohol limits from 0.10% to 0.08% in 1993 and 1994 experienced post-law reductions in alcohol related fatal crashes.**

***Methods*—Six states that adopted 0.08% as the legal blood alcohol limit in 1993 and 1994 were paired with six nearby states that retained a 0.10% legal standard. Within each pair, comparisons were made for the maximum equal available number of pre-law and post-law years.**

***Results*—States adopting 0.08% laws experienced a 6% greater post-law decline in the proportion of drivers in fatal crashes with blood alcohol levels at 0.10% or higher and a 5% greater decline in the proportion of fatal crashes that were alcohol related at 0.10% or higher.**

***Conclusions*—If all states adopted the 0.08% legal blood alcohol level, 400–500 fewer traffic fatalities would occur annually.**

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Keywords: fatal crash; legal blood alcohol limit; drunk driving

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Traffic crashes are the leading cause of death for persons between the ages of 1 and 24 in the United States[1] and alcohol is involved in nearly 40% of fatal traffic crashes.[2] In 1998, 15 935 persons died in alcohol related traffic crashes[2] and approximately one million are injured each year.[3] Those deaths and injuries cost the nation over $45 billion in lost economic productivity, hospital and rehabilitation costs.[4]

To reduce alcohol related traffic deaths, 17 states have lowered their criminal per se legal blood alcohol limit from 0.10% to 0.08%. To reach 0.08% blood alcohol content (BAC), a 170 pound (77.1 kg) male would have to consume four drinks in one hour on an empty stomach, and a 135 pound (61.2 kg) female would need to consume three drinks in one hour.[4]

Experimental laboratory studies have shown that at 0.08% BAC, driving performance is impaired. At 0.08%, there is reduced peripheral vision, poor recovery from glare, poorer performance on complex visual tracking, and reduced divided attention performance.[4] Driver simulation and road course studies have revealed poor parking performance, impaired driving performance at slow speed, and steering inaccuracies.[5] Roadside observational studies have identified speeding and breaking performance deterioration.[6] A national comparison of drivers in single vehicle fatal crashes with drivers not involved in crashes stopped at roadside indicated that each 0.02% increase in BAC nearly doubles the risk of fatal crash involvement.[7] In all age and sex groupings at a BAC of 0.05%–0.09%, the fatal crash risk was at least nine times greater than at zero BAC.

Many countries have established blood alcohol limits at 0.08% or lower.[3] Austria, Canada, the United Kingdom, and Switzerland have 0.08% blood alcohol limits. Legal limits range from 0.05%–0.8% in Australia, and are at 0.05% in Finland, France, Germany, the Netherlands, Norway, and Japan. Sweden has a legal blood alcohol limit of 0.02%, a level similar to the zero tolerance laws for drivers under age 21 now found in all states in the United States.

In California, the largest state to adopt a 0.08% law, researchers found a 12% decline in alcohol related fatal crashes after the law was adopted (National Highway Traffic Safety Administration, 1991). Because California also adopted an administrative license revocation (ALR) law six months after the 0.08% per se law, the separate effects of each law were difficult to determine. According to one study, most of the effects occurred after the ALR provisions were added (Rogers, 1995[8]).

Johnson and Fell monitored six measures of driver alcohol involvement in the first five states to adopt 0.08% laws (Utah, Oregon, Maine, California, and Vermont) and identified several statistically significant pre-law to post-law decreases.[9] Because the study did not compare states with the 0.08% law to states that did not have the law, researchers could not determine whether the changes were independent of general regional trends. The researchers did conclude the effects of the law were independent of national trends.

Another study, conducted by the authors of this report, examined the first five states to lower legal blood alcohol limits to 0.08% relative to nearby states which retained 0.10% as the legal limit. These 0.08% law states experienced a 16% greater post-law decline in the proportion of fatal crashes that involved a fatally injured driver with a BAC of 0.08% or

ner.[10] Comparison states were selected which had parallel pre-law trends in the proportion of fatally injured drivers with BACs of 0.08% or higher, similar population sizes and geographic proximity. The results of this study resembled those initially found in both the United Kingdom and France when those countries first combined 0.08% laws with automatic license revocation.[11 12] In the United Kingdom the proportion of drivers killed with an illegal BAC declined from 25% the year before the law to 15% the following year. During the first year after France's 0.08% law, traffic deaths declined 13.9%.

Because all of the 0.08% law states also had ALR laws and some adopted them in close time proximity to the 0.08% laws, our earlier study was not able to fully disaggregate 0.08% law effects from ALR law effects. National studies indicate ALR laws are associated with 6%–9% reductions in alcohol related fatal crashes.[13 14] Some investigators have noted that the paper did not detail comparison state selection criteria and questioned whether selection of different comparison states would have altered the study's findings.[15 16] They argued that the use of multiple comparison states or a national comparison would be a preferable approach.

Foss *et al* conducted a time series analysis of alcohol related fatal crashes from 1991 through 1996 before and after North Carolina adopted a 0.08% law in 1993.[17] They did not find a statistically significant reduction in alcohol related fatalities after the law. They also compared the proportion of drivers in North Carolina in fatal crashes with a BAC of 0.01% or higher during the 33 months before and the 39 months after North Carolina's 0.08% law to the proportion in the 37 states without a 0.08% law. Using an analytic approach similar to that used in our earlier paper, North Carolina experienced a 6% greater decline during the post-law period. A similar decline was found among drivers with a BAC of 0.10% or higher. Neither decline was statistically significant when compared to non-0.08% law states. Given the number of crashes in these states, an 8% greater post-law decline in North Carolina would have been needed for statistical significance. That analysis had less than 80% power to detect a 10% post-law reduction in study outcomes and less than 60% power to detect an 8% decline. In this context, statistical power describes the likelihood of detecting a true 0.08% law effect. Most researchers would argue that a study should have power of 80% or higher. No power calculations were presented for the time series analyses, making these null findings difficult to interpret. In studies of single states changing a traffic law, potentially meaningful post-law reductions in alcohol related traffic deaths may not reach statistical significance. The same magnitude of decline however, if observed in multiple states adopting the law, can be statistically significant.

Two multistate studies of 0.08% laws were recently published.[15 16] Apsler *et al* studied the first 11 states to adopt 0.08% laws.[15] They examined each state separately using intervention model time series analysis of trends in the ratio of fatal crashes involving drivers with BAC of 0.10% or higher relative to fatal crashes with no driver alcohol involvement. Examining data from the Fatality Analysis Reporting System from 1982–97 they found 0.08% laws either alone or in conjunction with ALR laws were associated with significant declines in seven states. In five of those states, declines were specifically associated with 0.08% laws alone. No comparison areas were included in the analysis to rule out regional or national secular trends. Voas and Tippetts conducted a national study from 1982–97 and identified an 8% decline in the proportion of drivers with positive BACs involved in fatal crashes relative to other fatal crashes.[16] Using regression models they determined this reduction was independent of other drinking while under the influence laws such as 0.10% per se laws and ALR laws as well as safety belt laws and demographic, economic, and seasonal factors and per capita alcohol consumption. They projected that there would be 500–600 fewer deaths nationwide if all states adopted 0.08% laws.

In a review of all the 0.08% law studies cited above the United States General Accounting Office concluded "there are strong indications that 0.08% BAC laws in combination with other drunk driving legislation (particularly license revocation laws), sustained public education and consistent enforcement efforts can save lives".[16] However, the report also indicated "the evidence does not conclusively establish that 0.08% BAC laws by themselves result in reduction in the number and severity of alcohol related crashes".

There is a need to further explore whether lowering the legal blood alcohol limit from 0.10% to 0.08% produces reductions in alcohol related fatal crashes beyond that achieved by administrative license revocation laws.

STATES RECENTLY ADOPTING 0.08% LAWS

In 1993 and 1994, six states not included in our first study[10] lowered their criminal per se legal blood alcohol limits from 0.10% to 0.08% (Kansas, North Carolina, Florida, New Mexico, New Hampshire, and Virginia) (table 1). This study explores whether these newer 0.08% laws reduced alcohol involvement in fatal crashes and whether the declines were independent of implementation of ALR laws. The analysis period extends beyond previously published studies into 1998.

Table 1 Analysis periods: recent 0.08% law states and comparison states

New 0.08% law state	Date of law	Comparison state	Analysis period
Kansas	July 93	Oklahoma	July 88–June 98
North Carolina	October 93	Tennessee	Oct 88–Sept 98
Florida	January 94	Georgia	Jan 89–Dec 98
New Mexico	January 94	Colorado	Jan 89–Dec 98
New Hampshire	January 94	Connecticut	Jan 89–Dec 98
Virginia	July 94	Maryland	July 90–June 98

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This s[illegible] compared fatal crash trends in the six states that adopted 0.08% laws between 1993 and 1994 with nearby states that retained 0.10% as their legal blood alcohol limit. We sought to address criticisms of our earlier analysis of the first five states to adopt 0.08% legislation by (1) explicitly describing comparison state selection criteria, (2) comparing states with new 0.08% laws to matched individual comparison states as well as comparing them to all other states without 0.08% laws, and (3) conducting separate analyses of states adopting 0.08% laws and ALR in close time proximity and those that adopted 0.08% laws several years after they adopted ALR laws. This latter analysis was done to assess whether 0.08% laws have effects independent of ALR laws.

We searched for comparison states which (1) were contiguous, (2) had similar population size, (3) had 75% or more of fatally injured drivers tested for BAC, and (4) had similar pre-0.08% law trends in the proportion of fatal crashes that were alcohol related. Five of the six comparison states met all our criteria. New Hampshire did not share a common border with a New England 0.10% law state. Vermont and Maine have 0.08% per se laws and Massachusetts adopted a 0.08% ALR law in 1994. Consequently, New Hampshire was compared with Connecticut, the most populous state in New England that retained a legal BAC of 0.10%. We selected comparison states that were contiguous or from the same geographic region because they would be more likely to experience similar economic trends and weather patterns that could affect trends in fatal crashes.

In each pair of states, we examined the maximum equal number of pre-law and post-law years for which fatal crash data were available. Table 1 lists the 0.08% law states, their comparison states and the analysis periods.

We examined (1) the proportion of drivers in fatal crashes who had BACs at 0.10% or higher and (2) the proportion of fatal crashes that were alcohol related, where alcohol was present in a driver or pedestrian at BACs of 0.10% or higher. We also examined fatal crash data from the United States Department of Transportation Fatality Analysis Reporting System. Alcohol results were derived based on imputational methods used by the National Highway Traffic Safety Administration to calculate annual state and national data on alcohol involvement in fatal crashes.[19] This method uses actual blood alcohol test results when available and estimates the proportion of untested drivers and crashes where alcohol was present at levels of 0.01% to 0.09% and at 0.10% and higher based on characteristics identified in states with high levels of alcohol testing to significantly predict alcohol involvement in fatal crashes with a high degree of accuracy. We used data calculated by the imputational method. This method controls for any pre-law to post-law variability between 0.08% law and comp[illegible]on states in the percentage of drivers teste[illegible]alcohol.

The proportion of drivers in fatal crashes who had raised BACs of 0.10% or higher was examined instead of the absolute number of drivers in fatal crashes with raised BACs to control for the long term downward trend in fatal crashes over the last decade and changes in exogenous variables that might influence driver involvement in fatal crashes such as the economy, safety characteristics of vehicles and highways, and the price of fuel. For similar reasons, we examined the proportion of fatal crashes that were alcohol related rather than the absolute number of alcohol related fatal crashes.

Within each state, the change in the level of alcohol involvement in fatal crashes from the pre-law to post-0.08% law period is described through the ratio (relative risk) of the post-law to pre-law proportion of crashes involving alcohol according to the measures described above. A relative risk of less than 1.0 indicated a reduction in the level of alcohol involvement. This relative risk (RR) is related to the percentage change in crashes with drivers with higher BACs:

$$100\% \times (p_{post} - p_{pre})/p_{pre} = 100\% \times (RR-1)$$

and changes are described through this percentage change.

Within each state pair, the relative change (and the 95% confidence interval) in the proportion of alcohol involved crashes in the law state relative to the control state was calculated as the ratio of the two relative risks. Subtracting 1 from this ratio gives the percentage change in the proportion of alcohol involved fatal crashes in the 0.08% law state relative to the comparison state.

Meta-analytic methods were used to calculate an overall relative change due to 0.08% laws across the set of six state pairs.[20] This overall effect is a weighted average of the individual state effects, where states with more crashes are weighted more heavily. A test of heterogeneity of effects across the six state pairs was conducted to test the significance of state to state variation in effects. Regardless of the observed variation in effect, the relative change in the proportion of fatal crashes involving alcohol was treated as a random effect in the meta-analysis. A pooled estimated and standard error for the natural log of the ratio of relative risks from each state pair were calculated. This estimate and its 95% confidence interval were transformed back to the scale of the ratio of relative risks for presentation, and subtracting one from this ratio gives an estimate for the overall percentage of change in the proportion of alcohol involved fatal crashes in the 0.08% law states relative to control states.

In a commentary on meta-analytic approaches DerSimonian and Laird indicate that meta-analysis "is becoming increasingly popular in medical research where information on the efficacy of a treatment is available from a number of clinical studies with similar treatment protocols. If considered separately any one study may be either too small or too limited

Table 2 Proportion of drivers in fatal crashes with a BAC of 0.10% or higher before and after the passage of 0.08% legal blood alcohol limit in six states

0.08% Law states and comparison states	*Proportion before 0.08% law (n)*	*Proportion after 0.08% law (n)*	*% Change in proportion (RR)*	*Ratio of the RRs (95% CI)*
Kansas (0.08%)	0.24 (649/2723)	0.19 (574/3068)	−22% (0.78)	0.96 (0.85 to 1.10)
Oklahoma	0.23 (928/4114)	0.18 (885/4821)	−19% (0.81)	
North Carolina (0.08%)	0.20 (1847/9381)	0.15 (1507/9997)	−23% (0.77)	0.95 (0.88 to 1.04)
Tennessee	0.25 (1929/7594)	0.20 (1704/8361)	−20% (0.80)	
Florida (0.08%)	0.21 (3925/18499)	0.15 (2875/19739)	−31% (0.69)	0.93 (0.86 to 1.00)
Georgia	0.21 (2012/9755)	0.15 (1610/10585)	−26% (0.74)	
New Mexico (0.08%)	0.31 (875/2841)	0.23 (651/2782)	−24% (0.76)	0.94 (0.83 to 1.06)
Colorado	0.25 (876/3509)	0.20 (825/4086)	−19% (0.81)	
New Hampshire (0.08%)	0.23 (220/944)	0.18 (155/851)	−22% (0.78)	0.93 (0.75 to 1.14)
Connecticut	0.28 (648/2329)	0.23 (502/2137)	−16% (0.84)	
Virginia (0.08%)	0.22 (1028/4669)	0.19 (931/4971)	−15% (0.85)	0.93 (0.81 to 1.07)
Maryland	0.14 (501/3551)	0.13 (469/3644)	−9% (0.91)	
Overall law effect				0.94 (0.90 to 0.98)

BAC = blood alcohol content; CI = confidence interval; RR = relative risk.

in scope to come to unequivocal or generalizable conclusions about the effect of a treatment. Combining the findings across such studies represents an attractive alternative to strengthen the evidence about the treatment efficacy".[20]

They caution against integrating results from studies that are diverse in terms of design and methods used. This is clearly not a problem in the analysis we conducted because in this study all six states adopted 0.08% criminal per se laws within a one year time period and exactly the same outcome measures and comparison state selection criteria were used in each analysis.

Of note, four of the 0.08% law states (Kansas, North Carolina, Florida, and New Mexico) had ALR laws in effect for three or more years before the legal limit was lowered to 0.08%, most if not all of the pre-0.08% law analysis periods in those states. Hence, simultaneous enactment of ALR laws could not account for any differential post-0.08% law reductions in alcohol related fatal crashes in those states. Analyses were repeated for those states as a group.

Results

DRIVERS IN FATAL CRASHES WITH RAISED BACS

Based on the meta-analysis, the six 0.08% states experienced a 6% greater relative post-0.08% law decline in the proportion of drivers in fatal crashes with raised BACs at 0.10% or higher ($p<0.01$, table 2). The proportion of drivers in fatal crashes with raised BACs declined 26.1% from 0.218 (8545/39 057) to 0.161 (6693/41 408) in 0.08% law states. In the comparison states, the decline was 20.2% from 0.223 (6894/30 852) to 0.178 (6002/33 634). Each 0.08% law state experienced a greater decline than its respective comparison state. There was no significant variation in 0.08% law effect across the six state pairs.

In the four 0.08% law states with ALR laws in place long before the 0.08% limit was adopted, the meta-analysis indicated the relative post-0.08% law decline in the proportion of drivers with raised BACs was also 6% greater than their comparison states experienced ($p<0.02$). Those four 0.08% law states experienced a 27.5% post-0.08% law decline from 0.218 (7297/33 444) to 0.158 (5607/35 586). Their comparison states experienced a 21.3% decline from 0.230 (5745/24 972) to 0.181 (5030/27 853). Results were similar when we examined the proportion of drivers in fatal crashes with BACs at 0.01% or higher (data available on request).

ALCOHOL RELATED FATAL CRASHES

Based on our meta-analysis, the 0.08% law states experienced a relative 5% greater post-law decline in the proportion of fatal crashes that involved alcohol at BACs of 0.10% or

Table 3 Proportion of fatal crashes involving a driver or pedestrian with a BAC of 0.10% or higher before and after the passage of 0.08% legal blood alcohol limit in six states

0.08% Law states and comparison states	*Proportion before 0.08% law (n)*	*Proportion after 0.08% law (n)*	*% Change in proportion (RR)*	*Ratio of the RRs (95% CI)*
Kansas (0.08%)	0.30 (664/1834)	0.29 (589/2049)	−21% (0.79)	0.95 (0.85 to 1.07)
Oklahoma	0.36 (994/2778)	0.30 (960/3217)	−17% (0.83)	
North Carolina (0.08%)	0.36 (2217/6209)	0.28 (1847/6512)	−21% (0.79)	0.95 (0.89 to 1.02)
Tennessee	0.40 (2021/5104)	0.33 (1834/5546)	−16% (0.84)	
Florida (0.08%)	0.36 (4568/12035)	0.29 (3611/12537)	−24% (0.76)	0.97 (0.92 to 1.04)
Georgia	0.35 (2292/6489)	0.28 (1882/6830)	−22% (0.78)	
New Mexico (0.08%)	0.50 (1060/2115)	0.41 (814/2003)	−19% (0.81)	0.93 (0.84 to 1.02)
Colorado	0.38 (928/2441)	0.33 (910/2735)	−12% (0.88)	
New Hampshire (0.08%)	0.35 (232/657)	0.29 (167/572)	−17% (0.83)	0.95 (0.79 to 1.15)
Connecticut	0.42 (678/1608)	0.37 (544/1486)	−13% (0.87)	
Virginia (0.08%)	0.35 (1133/3230)	0.31 (1037/3381)	−13% (0.87)	0.90 (0.80 to 1.01)
Maryland	0.26 (632/2415)	0.25 (591/2326)	−3% (0.97)	
Overall law effect				0.95 (0.92 to 0.99)

highly significant ($p<0.01$ (table 3). As a group, the 0.08% law states experienced a 21.4% post-law reduction from 0.379 (9874/26 080) to 0.298 (8065/27 054). The comparison states experienced a smaller decline, 16.0% from 0.362 (7545/20 835) to 0.304 (6722/22 148). Again, each 0.08% law state experienced a greater decline than its respective comparison state. There was no significant heterogeneity in trend between 0.08% law states.

In the four 0.08% states with longstanding ALR laws, the meta-analysis indicated the relative post-law decline was also 5% greater in the 0.08% law states than their comparison states ($p<0.03$). As a group, 0.08% law states with long standing ALR laws experienced a 22.5% reduction in the proportion of fatal crashes involving alcohol at 0.10%+ from 0.383 (8509/22 193) to 0.297 (6862/23 101) while their comparison states experienced a 17.8% decline from 0.371 (6235/16 812) to 0.305 (5586/18 334). Results were similar when we examined trends in the proportion of fatal crashes involving alcohol at 0.01% or higher (data available upon request).

Discussion

On both measures of alcohol involvement in fatal crashes examined in this study, recent 0.08% law states experienced significantly greater post-law declines than their comparison states. These declines were significant not in each individual 0.08% state relative to its paired comparison state, but in the 0.08% law states as a group relative to the comparison states as a group. These are not contradictory findings. Given the number of crashes in each state, the statistical power of showing a significant decline in any individual state was low. The power to detect an 8% post-law decline, as reported by Voas and Tippetts,[16] in individual 0.08% law states in this study was between 12% and 60%. By pooling the results across states, using meta-analysis, the statistical power was stronger. The meta-analysis had 97% power of significantly detecting such a decline. Further, all six 0.08% law states had greater post-law declines than their respective comparison states and there was no significant heterogeneity in effect between 0.08% law states.

The relative post-0.08% law declines were significantly greater, even in 0.08% law states with longstanding ALR laws, suggesting the post-0.08% law declines were independent of ALR laws. One comparison state, Tennessee, did not have an ALR law. Even if we deleted the North Carolina-Tennessee pair from our analysis of states with longstanding ALR laws, the post-law declines in 0.08% states with longstanding ALR laws were significantly greater than their comparison states again showing effects of 0.08% laws independent of ALR. Georgia, Florida's comparison state, adopted an ALR law during the study period after Florida adopted its 0.08% law. That made it more difficult for us to detect the greater post-0.08% law reductions we found on study outcomes in Florida.

Only the 0.08% states had criminal per se laws before the study period as did four comparison states Oklahoma, Georgia, Colorado, and Connecticut. In addition, all states in the study except New Hampshire had safety belt laws throughout the study. Also, all states had a minimum legal drinking age of 21 before the study period. Thus, passage of those laws during the study period did not confound results.

Of note, the comparison states in this study experienced very similar trends on study outcomes during the study period as all remaining states in the United States without 0.08% laws. There were no significant differences on study outcomes from the pre-law to post-law periods between comparison states and other non-0.08% law states. Also, the decline in study outcomes were significant in the 0.08% law states relative to these other 0.10% law states. Thus, it is unlikely that there were any biases in the selection of comparison states.

A limitation of this study was that the level of alcohol testing of fatally injured drivers was not as high and consistent as in an earlier analysis of the first five states with 0.08% laws. Consequently, we were not able to examine the effects of the law on drivers with BACs of 0.08% and 0.15% and higher. None the less, this study replicates the earlier analysis of the first five 0.08% law states, which indicated 0.08% laws significantly reduce the proportion of fatal crashes that involve alcohol. Further, this study identified effects of 0.08% laws that were independent of ALR legislation. While the 0.08% reductions in alcohol related fatal crashes in this study were 5%–6% and smaller than the 16% reduction observed earlier in states passing 0.08% laws and ALR laws in close time proximity, the decline in the more recent 0.08% law states is close to what might have been anticipated given that ALR laws have been found in national studies to produce 6%–9% reductions in alcohol related fatal crashes.[13 14]

In 1998 there were 8503 fatalities in crashes involving alcohol at levels of 0.10% or higher in states that had not yet lowered the legal per se limit to 0.08%. If all those states were to adopt a 0.08% per se limit and were to experience the 5% reduction in alcohol related traffic crashes experienced by these recent 0.08% law states, 400–500 fewer fatalities would occur annually. Currently, 33 states do not have 0.08% criminal per se legal blood alcohol limits and 10 states have still not adopted ALR laws. All states should adopt both ALR and 0.08% laws.

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Brazil bans computer games for violent content

Brazil's Justice Ministry recently banned six computer games for their violent content, including one that they said encouraged a medical student to go on a deadly shooting rampage last month in a movie theatre, Reuters reported in December. The games the Justice Ministry banned stores from selling are *Doom*, *Mortal Kombat*, *Requiem*, *Blood*, *Postal*, and *Duke Nukem*. The ministry also said it would rule on other games with violent content in 120 days. "The games are considered violent and affecting people who play them, particularly children", the Justice Ministry spokeswoman said. "As for *Duke Nukem*, the ministry regulation says its virtual world may have motivated Mateus da Costa Meira to stage the cinema shooting on November 3 in Sao Paulo". Stores that violate the ban will be fined $11 000 per day.

Accident man gets £3526 bill

A pub landlord knocked down by a bus has received a £3526 bill for damaging the vehicle. Norman Green, 51, of Thornbury, near Bristol, was crossing a city centre street when he was sent sprawling and suffered four broken ribs, which laid him off work for 14 weeks. He was stunned when the bus company asked him to pay for repairs to a light and windscreen broken in the collision and threatened to take him to court if he refused to pay. The company said the accident happened because "Mr Green was not looking where he was going" and it had suspended the summons until his finances improved.

Screening teens for suicide

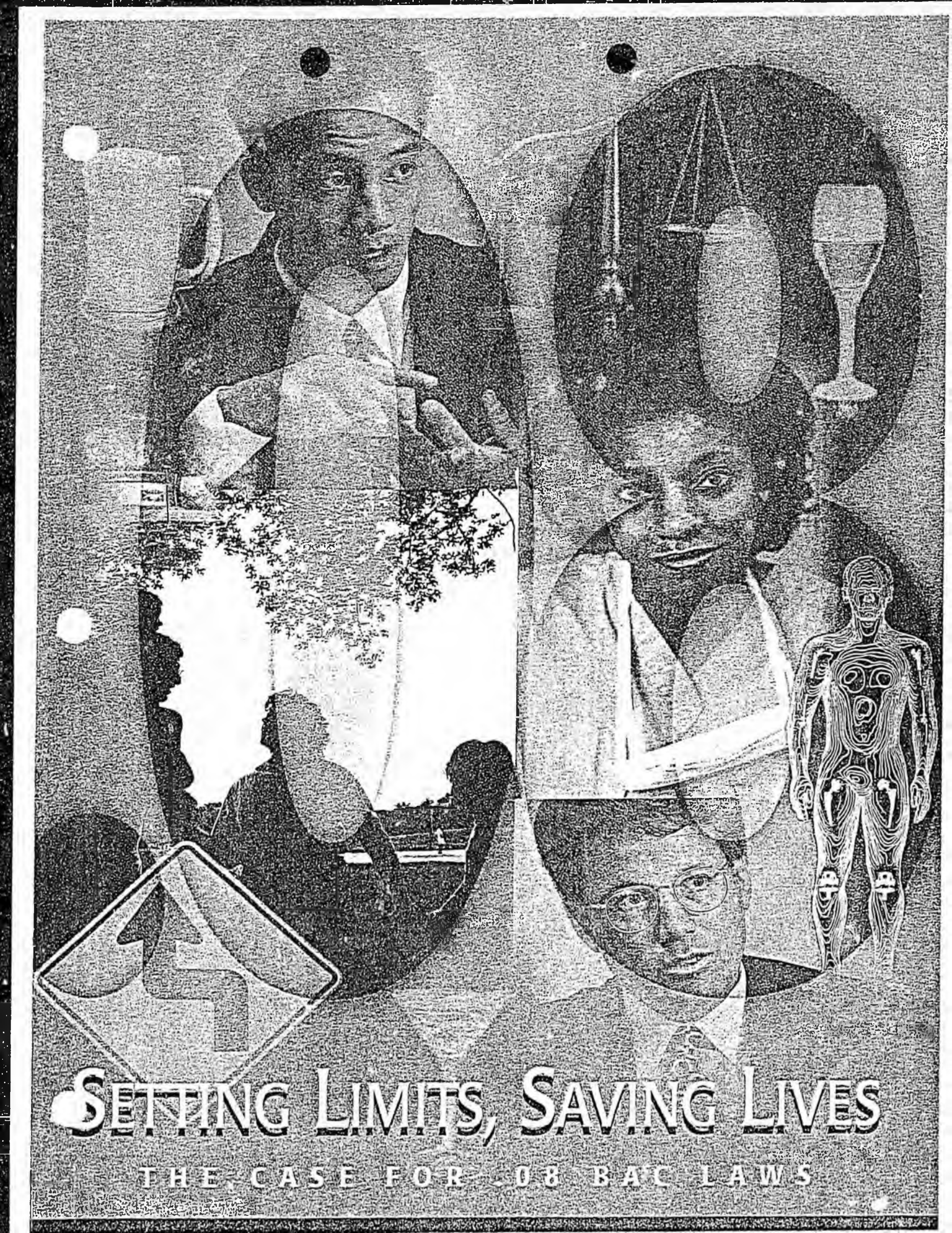
In spite of the fact that suicide is the third leading cause of death among adolescents, less than one quarter of US pediatricians and family physicians screen these patients for risk factors associated with suicide. A recent study reported nearly one half of the 600 physicians surveyed reported that at least one of their patients had attempted suicide in the past year. Routine screening was associated with more frequent counselling about safe storage of firearms and car occupant safety. Apparently, one barrier (or excuse) for not screening more often is concerns about confidentiality. Another may be the lack of evidence that the counselling provided is effective (*Arch Pediatr Adoles Med* 2000;154:162–8).

Surviving massive burns

A surprising report in *JAMA* suggests that most children who survive a massive burn have a satisfying quality of life. The study by Sheridan and colleagues from the highly respected Shriners Burn Hospital in Boston was based on an evaluation of 68 children who had burns involving more than 70% of their body surface. The assessment took place an average of 15 years after the injury. The burned children were compared with age matched general population norms using a standardized measure. The unexpectedly good results are either a tribute to the excellent aftercare program or may reflect weaknesses in the measure itself (*JAMA* 2000;283:69–73).

Aggressive children? Is it hormones after all?

A study shows an association between low levels of salivary cortisol and early and persistent aggression in boys 7–12. The key finding is aggression that starts early and persists among this subgroup of children. The study is based on a four year follow up of 38 school aged boys. Aggression was measured by peer evaluations. Those with low cortisol levels on two occasions displayed three times as many aggressive symptoms and were three times more likely to be chosen as most aggressive by their peers. Interestingly, the investigator noted that "stress delivered to a pregnant female mammal can permanently reset the cortisol system in the infant" (*Arch Gen Psychiatry* 2000;57:38–43).


SETTING LIMITS, SAVING LIVES
THE CASE FOR .08 BAC LAWS

SECTION 1

Introduction

Overview of the Problem

Impaired driving is the most frequently committed violent crime in America. Every 33 minutes, someone in this country dies in an alcohol-related crash. In the time it takes you to read this booklet, someone else will die needlessly.

For many years, we were making good progress. Due to the tireless efforts of many organizations and citizens around the country, alcohol-related traffic deaths decreased significantly. In the last decade, alcohol-related fatalities dropped from 23,630 in 1988 to 15,935 in 1998, according to the National Highway Traffic Safety Administration (NHTSA).

This 33% drop in alcohol-related deaths is generally attributed to:

- STRONGER LAWS,
- TOUGHER ENFORCEMENT, AND
- GOOD CONSUMER EDUCATION.

Americans better understand the impaired driving problem, fewer are driving after drinking, and more are getting caught when they do.

While alcohol-related fatalities have decreased the past three years (after an increase in 1995), alcohol involvement is still the single greatest factor in motor vehicle deaths and injuries. Only about 5% of all crashes involve the use of alcohol, but 38% of fatal crashes do.

15,935 deaths in one year is 15,935 grieving families too many. But the carnage doesn't end there. In addition to these tragic deaths, another one million people are injured in alcohol-related traffic crashes annually. And these crashes cost society over $45 billion every year for things like:

- EMERGENCY AND ACUTE HEALTH CARE COSTS,
- LONG-TERM CARE AND REHABILITATION,
- POLICE AND JUDICIAL SERVICES,
- INSURANCE,
- DISABILITY AND WORKERS' COMPENSATION,
- LOST PRODUCTIVITY, AND
- SOCIAL SERVICES FOR THOSE WHO CANNOT RETURN TO WORK AND SUPPORT THEIR FAMILIES.

Just one alcohol-related fatality is estimated to cost society $950,000. Each alcohol-related injury averages $20,000. Eventually, we all bear the costs of these deadly actions, through taxpayer supported services and programs, higher insurance costs and even higher prices on goods and services, since employers pick up about half the costs associated with motor vehicle crashes.

EVERY 33 MINUTES SOMEONE IN THIS COUNTRY DIES IN AN ALCOHOL-RELATED CRASH. IN THE TIME IT TAKES YOU TO READ THIS BOOKLET, SOMEONE ELSE WILL DIE NEEDLESSLY.

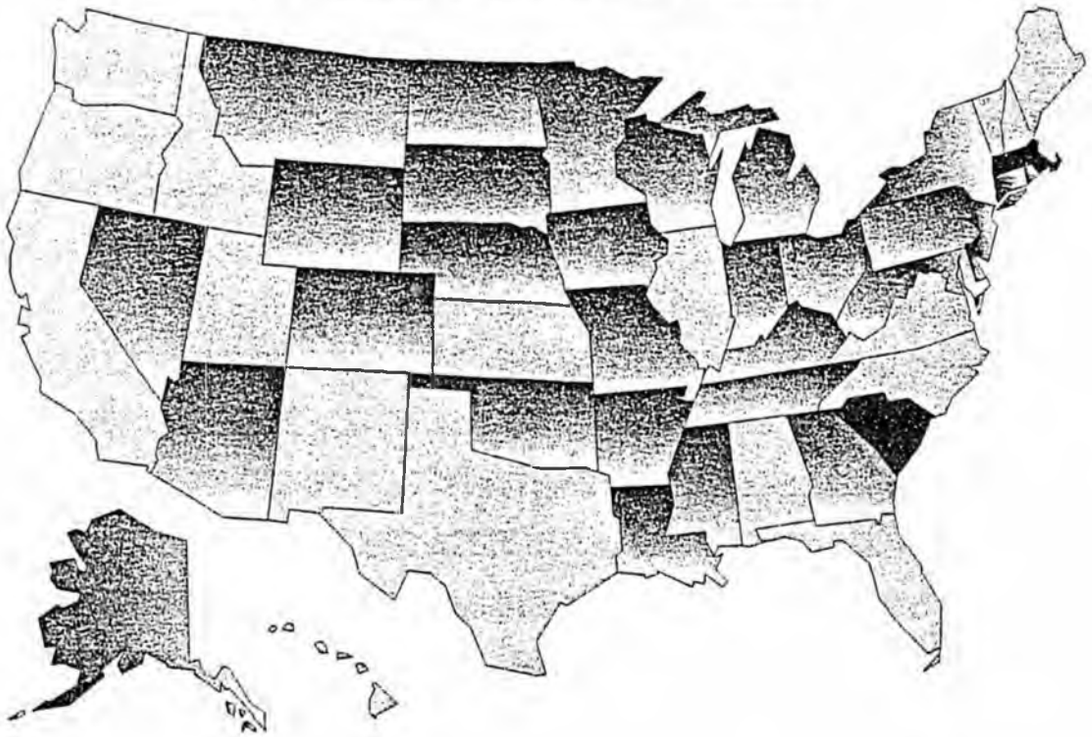
conducted properly or that other challenges about the accuracy of alcohol detection equipment are valid). As of late 1999, all 50 states plus DC had zero tolerance laws for youth. States that did not have zero tolerance laws for youth by 1998 faced a federal sanction of the withholding of highway construction funds.

.08 BAC – .08 establishes a lower limit to define intoxication for all drivers. Lowering the BAC limit to .08 sets the illegal limit at a point at which driving skills are proven to be compromised. At .08 BAC, all drivers, even experienced ones, show impairment in driving ability. For the great majority, there is serious deterioration in driving performance at .08. Although virtually all highway safety groups and transportation safety agencies support .08, only 17 states, plus DC have adopted such laws as of late 1999. Some organizations in the alcohol and hospitality industries vigorously oppose .08 legislation whenever it is proposed.

In addition to these four key laws, the National Safety Council and the National Highway Traffic Safety Administration (along with many other organizations and agencies) encourage other anti-impaired driving steps such as:

- THE USE OF SOBRIETY CHECKPOINTS AND SATURATION PATROLS BY LAW ENFORCEMENT AGENCIES COUPLED WITH HIGH LEVELS OF PUBLICITY;
- INCREASED ENFORCEMENT FOR UNDERAGED DRINKING AND DRIVING;
- GRADUATED DRIVER LICENSING PROGRAMS FOR NEW, YOUNG DRIVERS;
- THE USE OF DESIGNATED DRIVER AND SAFE RIDE PROGRAMS;
- RESPONSIBLE SERVER PROGRAMS;
- CONSUMER EDUCATION; AND
- CONTINUED RESEARCH TO FIND NEW AND BETTER WAYS TO COMBAT IMPAIRED DRIVING.

States With BAC *per se* Laws



.08 BAC

.10 BAC

No *Per Se* Laws

SECTION 2

What is .08?

Measuring Impairment

The amount of alcohol in a person's body is measured by the weight of the alcohol in a certain volume of blood. This is called the blood alcohol concentration, or "BAC." Because the volume of blood varies with the size of a person, BAC establishes an objective measure to determine levels of impairment.

The measurement is based on grams per deciliter (g/dl), and in most states a person is considered legally intoxicated if his or her BAC is .10 g/dl or greater; that is, alcohol makes up one-tenth of one percent of the person's blood.

A driver's BAC can be measured by testing the blood, breath, urine or saliva. Breath testing is the primary method used by law enforcement agencies. Preliminary breath testing can be performed easily during a roadside stop using a hand-held device carried by police officers. It is non-invasive and can even be performed while the person is still in his or her vehicle.

Evidentiary breath testing equipment is evaluated for precision and accuracy by NHTSA. Test instruments approved by NHTSA as conforming to specifications are accurate within plus or minus .005 of the true BAC value.

State BAC Levels

All states but two (Massachusetts and South Carolina) have established BAC *per se* levels. Seventeen of those states plus the District of Columbia have set that level at .08 (Alabama, California, Florida, Hawaii, Idaho, Illinois, Kansas, Maine, New Hampshire, New Mexico, North Carolina, Oregon, Texas, Utah, Virginia, Vermont and Washington). For more state-specific data, see the chart "The State of the States," on next page.

"A DRINK IS A DRINK IS A DRINK"

1 DRINK EQUALS .54 OUNCES OF ALCOHOL. THIS IS THE APPROXIMATE AMOUNT FOUND IN: ONE SHOT OF DISTILLED SPIRITS, OR ONE CAN OF BEER, OR ONE GLASS OF WINE.

SECTION 3

Effect of BAC on Traffic Crashes

The Effect of Alcohol on Ability

With each drink consumed, a person's blood alcohol concentration increases. Although the outward appearances vary, virtually all drivers are substantially impaired at .08 BAC. Laboratory and on-road research shows that the vast majority of drivers, even experienced drivers, are significantly impaired at .08 with regard to critical driving tasks such as braking, steering, lane changing, judgment and divided attention. In a recent study of 168 drivers, every one was significantly impaired with regard to at least one measure of driving performance at .08 BAC. The majority of drivers (60-94%) were impaired at .08 BAC in any one given measure. This is regardless of age, gender, or driving experience (see chart, "BAC and Impairment," at right).

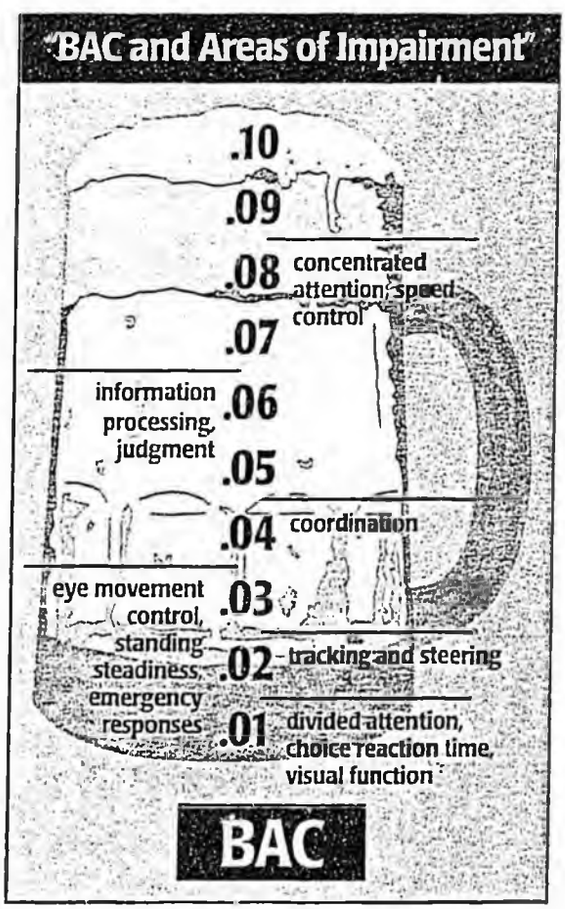
The risk of being in a motor vehicle crash also increases as the BAC level rises. The risk of being in a crash rises gradually with each BAC level, but then rises very rapidly after a driver reaches or exceeds .08 BAC compared to drivers with no alcohol in their system.

A recent study found that the risk of being killed in a single vehicle crash at .08 to .099 BAC ranged from 11 times the risk at .00 BAC for older drivers to 52 times the risk at .00 BAC for young male drivers.

.08 Sets a Reasonable Limit

Setting the BAC limit at .08 is a reasonable response to the problem of impaired driving. This is not a couple of beers after work or a glass or two of wine with dinner. At .08, everyone is impaired to the point that driving skills are degraded. Most states that have lowered their BAC to .08 have found a measurable drop in impaired driving crashes and fatalities, as have many countries that have adopted .08 (see chart, "BAC Levels in Other Countries," on page 10). .08 also serves to deter driving after drinking. Crash statistics show that even heavy drinkers, who account for a high percentage of DWI arrests, are less likely to drink and drive because of the general deterrent effect of .08. At the same time, lowering the BAC limit to .08 makes it possible to convict seriously impaired drivers whose BAC levels are now considered marginal because they are at or just over .10.

SETTING THE BAC LIMIT AT .08 IS A REASONABLE RESPONSE TO THE PROBLEM OF IMPAIRED DRIVING.



SECTION 4

The Case for .08 BAC Laws

.08 Laws Work

The effect of California's .08 law was analyzed by NHTSA, which found that 81% of the driving population knew that the BAC limit was stricter (from a tremendously successful public education effort). The state experienced a 12% reduction in alcohol-related fatalities, although some of this can be credited to the new administrative license revocation law. The state also experienced an increase in DUI arrests.

The second multi-state analysis of the effect of lowering BAC levels to .08 was conducted recently by Ralph Hingson, Sc.D., a professor at Boston University's School of Public Health and Chairman of the school's Social and Behavioral Sciences Department, along with two other researchers. The results of their study were reported in the September 1996 issue of the American Journal of Public Health, a peer-reviewed journal.

Hingson compared the first five states to lower their BAC limit to .08 (California, Maine, Oregon, Utah and Vermont) with five nearby states that retained the .10 limit. Overall, the .08 states experienced a 16% reduction in the proportion of fatal crashes with a fatally injured driver whose BAC was .08 or higher, as well as an 18% reduction in such crashes with a fatally injured driver whose BAC was .15 or higher.

The immediate significance of these findings is that, not only did the .08 BAC laws reduce the overall incidence of alcohol fatalities, but also reduced fatalities at the higher BAC levels. The effect on extremely impaired drivers (the "problem drinking drivers") was even greater than the overall affect.

The study concluded that if all states lowered their BAC limits to .08, alcohol-related highway deaths would decrease by 500-600 per year.

In a NHTSA analysis of these five states (Johnson and Fell, 1995), significant reductions in alcohol-related fatal crashes were found in 4 out of the 5 states ranging from 4% to 40% when compared to the rest of the states with .10 BAC laws.

Impaired Driving Affects Us All

About two out of every five Americans will be involved in an alcohol-related crash at some time in their lives, and many of them will be innocent victims. There is no such thing as a drunk driving accident. Virtually all crashes involving alcohol could have been avoided if the impaired person were sober.

As BAC levels rise, so does the risk of being involved in a fatal crash. Recent research has shown that, in single vehicle crashes, the relative fatality risk for drivers with BACs between .08 and .099 is at least eleven times greater than for drivers with a BAC of zero and is 52 times greater for young males.

A RECENT COMPARISENCE STUDY (COVERING ALL 50 STATES) ANALYZED THE EFFECTS OF .08 BAC AND OTHER LAWS OVER A 16 YEAR PERIOD. THE STUDY ESTIMATED THAT .08 BAC LAWS HAD AN 8% EFFECT IN REDUCING FATAL CRASHES INVOLVING DRIVERS AT BOTH HIGH BACS AND LOWER BACS. IT ESTIMATES THAT IF ALL 50 STATES HAD .08 BAC LAWS IN EFFECT IN 1997 AN ADDITIONAL 590 LIVES WOULD HAVE BEEN SAVED.

above. (NHTSA supports zero tolerance for drivers under the legal drinking age – see Section 1 for more information.) Numerous other federal agencies with an interest in public health and safety issues, as well as dozens of private sector organizations, support NHTSA's call for universal .08 state laws (see box, "Who Supports .08 BAC Laws?," page 13).

Why Some States Don't Have .08

As a public policy to deter impaired driving, .08 has lagged behind other countermeasures such as *per se*, administrative license revocation and zero tolerance for those under 21. Nearly all states have *per se*, the vast majority have ALR and all have zero tolerance.

But the passage of new .08 laws have been few and far between, despite consistent evidence that they work, because some organizations in the alcohol and hospitality industries oppose any and all such proposals at the state level. This is both sad and ironic, since these industries have not only been strong supporters of many other anti-impaired driving laws, but have also been crucial partners in getting safety messages out to hard-to-reach audiences.

Promotions such as designated driver programs and sober ride/call-a-cab efforts showcase their concern, generate enormous goodwill from the general public and raise awareness. It is tragic that some of the same companies and trade associations that have launched excellent server training programs, public information campaigns and other efforts to reduce impaired driving so vigorously oppose legislation when it comes to .08 (see box, "What the Hospitality Industry Can Do," on page 18).

A recently released report by the General Accounting Office (GAO), which reviewed the currently available .08 BAC studies stated that, while the evidence of impact of .08 BAC laws is not conclusive, "there are...strong indications that

"Who Supports .08 BAC Laws?"

The following organizations support a BAC limit of .08 or lower:

- Advocates for Highway and Auto Safety
- Allstate Insurance
- American Alliance for Rights and Responsibilities
- American Association of Motor Vehicle Administrators
- American Association of Neurological Surgeons
- American Automobile Association
- American Automobile Manufacturers Association
- American Coalition for Traffic Safety
- American Insurance Association
- American Medical Association
- American Spinal Cord Injury Association
- American Spinal Injury Association
- American Trucking Associations
- Association for the Advancement of Automotive Medicine
- Center for Substance Abuse Prevention, U.S. Department of Health and Human Services
- Daimler-Chrysler Corporation
- Federal Highway Administration, U.S. Department of Transportation
- Ford Motor Company
- Insurance Information Institute
- Insurance Institute for Highway Safety
- International Association of Chiefs of Police
- Kemper Insurance Group
- Mothers Against Drunk Driving (MADD)
- National Association of Governors' Highway Safety Representatives
- National Commission Against Drunk Driving
- National Committee on Uniform Traffic Laws and Ordinances
- National District Attorneys Association
- National Highway Traffic Safety Administration, U.S. Department of Transportation
- National Institute for Alcohol Abuse and Alcoholism
- National Safety Council
- National Sheriffs' Association
- Nationwide Insurance
- Operation Lifesaver
- Remove Intoxicated Drivers
- Students Against Destructive Decisions (SADD)
- USAA Insurance
- U.S. Department of Justice
- U.S. Surgeon General

SECTION 5

Myths about .08 BAC

Myths about .08 abound, many proliferated by those who actively oppose .08 laws. Here are a few of the commonly heard myths, countered by research-based facts from the National Highway Traffic Safety Administration, academic and scientific institutions, and credible private sector organizations such as Mothers Against Drunk Driving.

MYTH:

"If you lower the BAC limit to .08, it means I can't even have a couple of drinks with my dinner."

FACT: While there is no "safe" amount of alcohol for drivers, most people can drink moderately and drive legally when the illegal *per se* limit is set at .08. A 170-pound male typically would have to consume more than four drinks in one hour on an empty stomach to reach a BAC of .08. A 135-pound female typically would have to consume three drinks in the same time frame.

MYTH:

"I know when I'm 'too drunk to drive' – I don't need to be concerned about my blood alcohol concentration."

FACT: Your driving skills can be seriously compromised even when your behavior is not observably "drunk." Alcohol causes impairment in reaction time, attention, tracking, comprehension and other skills essential for safe driving. Even when attempting to drive carefully, an impaired driver cannot compensate for those reduced abilities. In addition, alcohol affects your ability to judge whether or not you are impaired.

MYTH:

"The American public does not support .08 because most people have no idea how much alcohol it would take to put them over the legal limit."

FACT: According to several national surveys, most Americans would not drive after having two or three drinks in one hour, an amount that would put them below .08. Most people know how much alcohol it takes to impair their driving ability and they accept lower limits such as .08 for adults.

MYTH:

".08 BAC legislation will not affect problem drinker drivers who have high BAC levels."

FACT: The latest research shows that .08 laws not only reduce the incidence of impaired driving at lower BACs, they also reduce the incidence of impaired driving at high BACs over .10 (Voas and Tippetts, 1999). A .08 law serves as a general deterrent to drinking and driving, sends a message that the state is getting tougher on impaired driving, and makes people think twice about getting behind the wheel after they've had too much to drink. .08 is a key part of a complete package to reduce impaired driving. While problem drinker drivers do account for a significant part of the DWI problem, most fatally injured drinking drivers (70-80%) had no prior alcohol-related offenses. A comprehensive anti-impaired driving program must use all available laws and programs to reduce DWI.

A .08 LAW SERVES AS A GENERAL DETERRENT TO DRINKING AND DRIVING, SENDS A MESSAGE THAT THE STATE IS GETTING TOUGHER ON IMPAIRED DRIVING, AND MAKES PEOPLE THINK TWICE ABOUT GETTING BEHIND THE WHEEL AFTER THEY'VE HAD TOO MUCH TO DRINK.

SECTION 6

Consumer Education and Public Support

Polls Support Anti-DWI Efforts

The American public overwhelmingly supports legislation and programs to curb impaired driving. In a poll conducted for Mothers Against Drunk Driving (MADD), the Gallup Organization found that the vast majority of the American public considers drunk driving the number one major highway safety problem and most support tough laws and sanctions to reduce impaired driving.

All of the approaches to deal with impaired driving do well in public opinion polls, but the programs that have received more attention in the media and other public forums – ALR, zero tolerance, sobriety checkpoints and vehicle confiscation for repeat offenders – poll higher than .08. The likely reason is that people do not understand the technical aspects of how BACs are determined and what .08 means in real terms. When it comes to their own tolerance for alcohol and their own abilities, however, the American public is certain: most say they would not drive after consuming two or three drinks in one hour.

.08 is a Public Health Policy

The challenge for .08 supporters is to help people make a connection between their own common sense and the public policy that would define impaired driving as .08. Clearly, the more people know about the problem and the potential solutions, the more they support changes to bring about those solutions. .08 is a key part of any public health initiative that aims to reduce society's burden from impaired driving.

Supporters of .08 have many allies and resources to call upon, both at the national level and in the states. A list of resource organizations is included in the appendix.

Help is Available

Federal and State Governments and several private sector organizations hold workshops, publish idea samplers and planners, and offer other helpful organizing tools that may help .08 supporters achieve their public policy goals.

"What You Can Do"

Around the country, voluntary efforts are underway by concerned citizens who support adoption of .08 BAC laws. To become part of the activities in your state:

- FIND OUT YOUR STATE'S BAC LIMIT, AND WHETHER THERE IS AN ILLEGAL PER SE LAW, BY CALLING YOUR GOVERNOR'S HIGHWAY SAFETY REPRESENTATIVE, YOUR LOCAL SAFETY COUNCIL OR YOUR LOCAL MADD CHAPTER (SEE RESOURCE SECTION);
- IF YOUR STATE DOESN'T HAVE AN ILLEGAL PER SE LAW OF .08, CONTACT EXISTING GRASSROOTS AND GOVERNMENT ORGANIZATIONS INVOLVED IN PREVENTION EFFORTS TO FIND OUT HOW YOU CAN HELP;
- JOIN OR HELP FORM A COALITION TO SUPPORT LEGISLATIVE EFFORTS IN YOUR STATE TO LOWER THE BAC LIMIT;
- SPREAD THE WORD ABOUT THE IMPORTANCE OF .08 LAWS, THROUGH NEWSLETTER ARTICLES, PRESS RELEASES, CONFERENCES, SPEECHES TO LOCAL ORGANIZATIONS, ETC.; COOPERATE WITH STATE HIGHWAY AND PUBLIC HEALTH AGENCIES TO DRAW ATTENTION TO YOUR EFFORT;
- LET YOUR GOVERNOR AND STATE LEGISLATORS KNOW ABOUT THE EFFECTIVENESS OF .08 LAWS IN SAVING LIVES AND TAXPAYER DOLLARS.

SECTION 7

Law Enforcement

Enforcing .08

One of the arguments used against .08 is the impact on the law enforcement and judicial system. However, when the largest state, California, lowered the BAC limit to .08, there was little impact on court administrators or judges.

The main impact in California has been on prosecutors' decisions concerning whether or not cases should be filed. Previously, those arrested for DWI with BACs below .12 typically were allowed to plea to reduced charges. Since the limit was changed, this plea-bargain "cut off" has dropped to about .10 BAC. No increases were reported in the proportion of DWI defendants pleading guilty, requesting jury trials, or appealing convictions.

Quick and Easy Testing

Modern breath analysis equipment is easy to use during a roadside stop, whether the legal limit is .08 or any other limit. The devices are small enough and inexpensive enough that every patrol car on traffic duty can be equipped with one. Law enforcement officers can administer the test quickly and easily, without the driver even leaving the car. If the preliminary breath test shows the person is not impaired, motorists can be on their way and police can continue their duties. .08 does not change the fact that law enforcement officers can conduct these roadside tests quickly and easily.

Law Enforcement Supports .08

.08 is supported by law enforcement organizations, including two of the largest: the International Association of Chiefs of Police and the National Sheriffs' Association. These organizations and others like them would not support a law that is unenforceable, ineffective or burdensome on police officers.

.08 IS SUPPORTED BY LAW ENFORCEMENT ORGANIZATIONS . . . [GROUPS THAT] WOULD NOT SUPPORT A LAW THAT IS UNENFORCEABLE, INEFFECTIVE OR BURDENSOME ON POLICE OFFICERS.

Treatment Can Help

Medical treatment programs for repeat offenders – and sometimes even first time offenders – have become an increasingly popular part of the sentencing process. Some states require certain treatments while others recommend but do not require them.

This leads to concern that programs will be overcrowded with long waiting lists. Most safety organizations recommend that impaired driving programs be self-supporting. Fines and fees paid by offenders should cover the cost of all sentencing, including treatment for alcoholism or alcohol abuse. This reduces the burden on taxpayers while helping to ensure that offenders get the help they need.

Medical treatment for impaired drivers, whether required by law or ordered at the discretion of a judge, correctly positions impaired driving as a public health problem. .08 laws do not contribute to burdens on society but help to identify those with a problem and get them into programs to reduce the chance they will eventually kill or injure themselves or someone else.

SECTION 8

Summary

.08 is Reasonable

.08 is a reasonable BAC level. A .08 BAC is not reached with a couple of beers after work or a glass or two of wine with dinner. The public supports .08, and surveys show that most people would not drive after consuming two or three drinks.

.08 Works

As a public health initiative and a traffic safety policy, .08 works and works well, especially in combination with other laws and programs. A .08 BAC *per se* law will:

- INCREASE THE ARREST AND CONVICTION RATES FOR IMPAIRED DRIVERS AT .10 AND ABOVE;
- RAISE THE PERCEIVED RISK OF ARREST FOR DRIVING AFTER DRINKING;
- IMPROVE PUBLIC AWARENESS ABOUT HOW MUCH ALCOHOL IT TAKES TO BE DANGEROUSLY IMPAIRED; AND
- BRING THE U.S. CLOSER TO *PER SE* LIMITS OF MOST INDUSTRIALIZED NATIONS.

.08 Could Save Your Life

If every state adopted a .08 *per se* law, hundreds of lives could be saved every year, with thousands of injuries prevented and millions of dollars saved. But even more important would be all the extra birthday candles that would get blown out, the graduation ceremonies that would be attended, the weddings that would be celebrated and the millions of everyday smiles that would be exchanged.

No one will ever know if they or one of their loved ones will be the next victim of impaired driving, just as no one will ever know if they are the one who was spared thanks to good public policy. .08 is sensible, reasonable and effective. It's time to adopt .08 in every state.

IF EVERY STATE ADOPTED A .08 PER SE LAW, HUNDREDS OF LIVES COULD BE SAVED EVERY YEAR, WITH THOUSANDS OF INJURIES PREVENTED AND MILLIONS OF DOLLARS SAVED.

APPENDIX A

Facts on The Impaired Driving Problem

According to the US Department of Transportation's Fatality Analysis Reporting System and the National Highway Traffic Safety Administration's National Center for Statistical Analysis:

- In 1998, 41,471 people were killed in highway crashes. Another 3 million were injured. These crashes cost society $150 billion every year.
- Of those killed on our highways in 1998, 15,935 died in alcohol-related crashes (38%).
- Approximately one million people are injured in alcohol-related traffic crashes annually.
- Alcohol involvement is the single greatest factor in motor vehicle deaths and injuries. While about 5% of all crashes involve the use of alcohol, 38% of fatal crashes do.
- Anti-impaired driving efforts work. From 1988 to 1998, alcohol-related fatalities dropped 33%. This drop is generally attributed to stronger laws, tougher enforcement, and good consumer education.
- Among all drivers involved in fatal crashes in 1998, 23% had been drinking.
- Many states now are lowering the BAC defining impaired driving from .10 to .08. A BAC as low as .02 has been shown to affect driving ability and crash likelihood.
- The probability of a crash increases significantly at .05 and even more rapidly at .08.
- Among drivers with BACs above .15 on weekend nights, the likelihood of death in a single-vehicle crash is more than 380 times higher than it is for nondrinking drivers.
- The highest proportion of driver deaths involving BACs at or above .08 in 1998 occurred in passenger vehicles. The group of drivers with the lowest proportion was tractor-trailer drivers.
- In 1998, 29 percent of all fatal crashes during the week were were alcohol-related, compared to 52 percent on weekends. For all crashes, the alcohol involvement rate was 5 percent during the week and 12 percent during the weekend.
- The highest rates of drivers involved in fatal crashes in 1998 with BACs at or above .10 were recorded for drivers 21-24 years old (28 percent), followed by ages 25-34 (24 percent) and 35-44 (21 percent).

The Facts About .08

- A law making .08 BAC the legal limit is a reasonable, sensible approach to the problem of impaired driving.

- .08 laws increase the arrest and conviction rates for impaired drivers at .10 and above while raising the perceived risk of arrest for driving after drinking.

- .08 laws raise public awareness about how much alcohol it takes to be dangerously impaired.

  Most other industrial nations already set their legal limit at .08 or lower.

- Supporters of .08 BAC laws include federal and state agencies, consumer and victim's organizations, highway safety groups, law enforcement organizations, medical and public health groups, insurance companies and other business interests, and many others.

- According to a recent poll by the Gallup Organization for Mothers Against Drunk Driving, 97% of Americans believe drunk driving is a major highway safety problem.

- If every state had adopted a .08 *per se* law in 1997, instead of the 15 states that had .08 laws, an additional 590 lives could have been saved, according to a recent study conducted by researchers at the Pacific Institute for Research and Evaluation.

- It takes about 3-4 drinks in one hour on an empty stomach to reach a .08 BAC. This does not affect the casual, social drinker who may have a couple of beers after work or a glass or two of wine with dinner once in a while.

- On average, alcohol metabolizes in the body and dissipates from the blood at a rate of about .015 BAC per hour.

- At .08, virtually all drivers are impaired to the point that critical driving skills such as reaction time, attention, tracking ,and comprehension are degraded.

APPENDIX B

Resources

The Federal Government

The National Highway Traffic Safety Administration (NHTSA), an agency of the US Department of Transportation, is responsible for anti-impaired driving and other highway safety programs. NHTSA maintains statistics and fact sheets, and provides information to the media, grassroots organizations, other government agencies, and the general public. Check out their homepage on the World Wide Web (http://www.nhtsa.dot.gov) for more information about the agency's services and publications, as well as highway safety facts.

NHTSA also has ten regional offices to serve the safety community and the general public. The NHTSA regional administrator that serves your state is a great resource for those working to fight impaired driving.

NHTSA Region I
(Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island and Vermont)
Volpe National Transportation Systems Center
Kendall Square, Code 903
Cambridge, MA 02142
Phone 617/494-3427
Fax 617/494-3646

NHTSA Region II
(New Jersey, New York, Puerto Rico, Virgin Islands)
222 Mamaroneck Avenue, Suite 204
White Plains, NY 10605
Phone 914/682-6162
Fax 914/682-6239

NHTSA Region III
(Delaware, District of Columbia, Maryland, Pennsylvania, Virginia, West Virginia)
10 South Howard Street, Suite 4000
Baltimore, MD 21201
Phone 410/962-0077
Fax 410/962-2770

NHTSA Region IV
(Alabama, Florida, Georgia, Kentucky, Mississippi, North Carolina, South Carolina, Tennessee)
Atlanta Federal Center
61 Forsyth Street, Suite 17T30
Atlanta, GA 30303
Phone 404/562-3739
Fax 404/562-3763

NHTSA Region V
(Illinois, Indiana, Michigan, Minnesota, Ohio, Wisconsin)
19900 Governor Drive, Suite 201
Olympia Fields, IL 60461
Phone 708/503-8822
Fax 708/503-8991

NHTSA Region VI
(Arkansas, Louisiana, New Mexico, Oklahoma, Texas, Indian Nations)
819 Taylor Street, Room 8A38
Fort Worth, TX 76102
Phone 817/334-3653
Fax 817/334-8339

NHTSA Region VII
(Iowa, Kansas, Missouri, Nebraska)
901 Locust Street
Kansas City, MO 64106
Phone 816/329-3900
Fax 816/329-3910

NHTSA Region VIII
(Colorado, Montana, North Dakota, South Dakota, Utah, Wyoming)
555 Zang Street, 4th Floor
Lakewood, CO 80228
Phone 303/969-6917
Fax 303/969-6294

NHTSA Region IX
(Arizona, California, Hawaii, Nevada, American Samoa, Guam, Northern Mariana Islands)
201 Mission Street, Suite 2230
San Francisco, CA 94105
Phone 415/744-3089
Fax 415/744-2532

Safety Office Florida Department of Transportation
605 Suwannee Street, MS 53
Tallahassee, FL 32399-0450
Phone: 904/488-3546
Fax: 904/922-2935

Georgia Governor's Office of Highway Safety
1 Park Tower
34 Peach Tree Street, Suite 1600
Atlanta, GA 30303
Phone: 404/656-6996
Fax: 404/651-9107

Highway Safety Coordinator
Guam Department of Public Works
PO Box 2950
Agana, GU 96910
Phone: 011-671-646-3211
Fax: 011-671-649-3733

Operator Assisted Calls: 01-671-646-3211
Motor Vehicle Safety Office
Hawaii Department of Transportation
601 Kamokila Boulevard, Suite 511
Kapolei, HI 96707
Phone: 808/692-7650
Fax: 808/692-7665

Office of Highway Safety
Idaho Transportation Department
PO Box 7129, 3311 West State Street
Boise, ID 83707-1129
Phone: 208/334-8101
Fax: 208/334-3858

Division of Traffic Safety
Illinois Department of Transportation
PO Box 19245
3215 Executive Park Drive
Springfield, IL 62794-9245
Phone: 217/782-4972
Fax: 217/782-9159

Indiana Governor's Council on Impaired and Dangerous Driving
150 West Market Street, Suite 330
Indianapolis, IN 46204
Phone: 317/232-1299
Fax: 317/232-5150

Indian Highway Safety Program
Bureau of Indian Affairs
Department of the Interior
PO Box 2006
Albuquerque, NM 87103
Phone: 505/248-5053
Fax: 505/248-5064

Governor's Traffic Safety Bureau
Iowa Department of Public Safety
307 East 7th Street
Des Moines, IA 50319-0248
Phone: 515/281-3907
Fax: 515/281-6190

Kansas Bureau of Traffic Safety
Thacher Building, 2nd Floor
217 S.E. 4th
Topeka, KS 66603-3504
Phone: 913/296-3756
Fax: 913/291-3010

Highway Safety Standards Branch
Kentucky State Police Headquarters
919 Versailles Road
Frankfort, KY 40601
Phone: 502/695-6356
Fax: 502/573-1634

Highway Safety Commission
Louisiana Department of Public Safety
PO Box 66336
Baton Rouge, LA 70896
Phone: 504/925-6991
Fax: 504/922-0083

Bureau of Highway Safety
Maine Department of Public Safety
164 State House Station
Augusta, ME 04333
Phone: 207/624-8756
Fax: 207/624-8768

Northern Mariana Islands
Department of Public Safety
PO Box 791
Saipan, M.P. 96950
Phone: 011-670-034-6505
Fax: 011-670-234-8531

Office of Traffic & Safety
Maryland State Highway Administration
7491 Connelley Drive
Hanover, MD 21076
Phone: 410/787-5822
Fax: 410/787-5823

Massachusetts Governor's Highway Safety Bureau
100 Cambridge Street, Room 2104
Boston, MA 02202
Phone: 617/727-5073
Fax: 617/727-5077

Michigan Office of Highway Safety Planning
4000 Collins Road, PO Box 30633
Lansing, MI 48909-8133
Phone: 517/333-5291
Fax: 517/333-5756

Office of Traffic Safety
Minnesota Department of Public Safety
Town Square, Suite 100-B
444 Cedar Street
St. Paul, MN 55101-2128
Phone: 612/296-3804
Fax: 612/297-4844

Highway Safety Office
Mississippi Department of Public Safety
PO Box 23039
401 North West Street, 8th Floor
Jackson, MS 39225-3039
Phone: 601/359-7842
Fax: 601/359-7832

Missouri Division of Highway Safety
PO Box 104808
Jefferson City, MO 65110-4808
Phone: 573/751-7643
Fax: 573/634-5977

Virginia Department of Motor Vehicles
Transportation Safety Office
PO Box 27412
2300 West Broad Street
Richmond, VA 23269
Phone: 804/367-8140
Fax: 804/367-6631

Governor's Representative
Virgin Islands Office of Highway Safety
Lagoon Street Complex, Fredricksted
St. Croix, VI 00840
Phone: 809/776-5820
Fax: 809/772-2626

Washington Traffic Safety Commission
PO Box 40944
1000 South Cherry Street
Olympia, WA 98504-0944
Phone: 360/753-6197
Fax: 360/586-6489

Governor's Highway Safety Program West Virginia
Criminal Justice & Highway Safety Division
Capito Complex, Building 3, Room 118
Charleston, WV 25301
Phone: 304/558-6080
Fax: 304/558-0391

Bureau of Transportation Safety
Wisconsin Department of Transportation
PO Box 7936
4802 Sheboygan Avenue, Room 809
Madison, WI 53707
Phone: 608/266-0402
Fax: 608/267-0441

Highway Safety Program
Wyoming Transportation Department
PO Box 1708
Cheyenne, WY 82003-1708
Phone: 307/777-4450
Fax: 307/777-4250

The Private Sector

The National Safety Council, with chapters all over the country, can provide information on a wide range of occupational, home and traffic safety issues. The Council produces dozens of publications and provides services and educational opportunities in these areas.

National Safety Council
1121 Spring Lake Drive
Itasca, IL 60143
Phone: 630/285-1121
Fax: 630/285-1315
Web site: http://www.nsc.org

Mothers Against Drunk Driving is a non-profit, grass roots organization with more than 400 chapters nationwide. It "is not a crusade against alcohol consumption;" its focus is "to look for effective solutions to the drunk driving and underage drinking problems, while supporting those who have already experienced the pain of these senseless crimes." To join, find a chapter in your area or for more information, contact the National Office at:

Mothers Against Drunk Driving
511 E. John Carpenter Freeway., #700
Irving, Texas 75062
Phone: 214/744-MADD (6233)
Fax: 972/869-2206/2207
Web site: http://www.madd.org

Other private sector groups may be helpful. Here is a list of some of the national organizations that support .08 BAC laws.

Advocates for Highway and Auto Safety
750 First Street, NE, Suite 901
Washington, DC 20002
Phone: 202/408-1711
Web site: http://www.saferoads.org

American Automobile Association
1000 AAA Drive
Heathrow, FL 32746
Phone: 407/444-7000
Web site: http://www.aaa.com

American Automobile Manufacturers Association
1401 H Street, NW, Suite 900
Washington, DC 20005
Phone: 202/326-5500
Web site: http://aama.com

American Coalition for Traffic Safety
1110 N. Glebe Road, Suite 1020
Arlington, VA 22201
Phone: 703/243-7501

American Insurance Association
1130 Connecticut Avenue, Suite 1000
Washington, DC 20036
Phone: 202/828-7100
Web site: http://www.aiadc.org

American Medical Association
515 North State Street
Chicago, IL 60610-4379
312/464-5000
Web site: http://www.ama-assn.org

Insurance Institute for Highway Safety
1005 North Glebe Road
Arlington, VA 22201
Phone: 703/247-1500
Web site: http://www.hwysafety.org

International Association of Chiefs of Police
515 North Washington Street
Alexandria, VA 22314
Phone: 703/836-6767
Web site: http://www.theiacp.org

National Commission Against Drunk Driving
1900 L Street NW, Suite 705
Washington, DC 20036
Phone: 202/452-6004
Web site: http://www.ncadd.com

Remove Intoxicated Drivers (RID)
PO Box 520
Schenectady, NY 12301
Phone: 518/393-4357
Web site: TBA

Students Against Destructive Decisions (SADD)
PO Box 800
Marlboro, MA 01752
Phone: 508/481-3568
Web site: www.sadd.org

APPENDIX C

Model Law

The Uniform Vehicle Code, published by the National Committee on Uniform Traffic Laws and Ordinances, is a document developed by transportation and highway safety professionals to serve as a guideline for those developing state motor vehicle legislation. Inclusion of this model law here should not be interpreted as a formal endorsement by the National Safety Council or the National Highway Traffic Safety Administration. The entire Uniform Vehicle Code is available on the World Wide Web at http://www.ncutlo.org.

CHAPTER 11 - Rules of the Road

ARTICLE IX – SERIOUS TRAFFIC OFFENSES

11-902 – Driving while under the influence of alcohol or drugs

(a) A person shall not drive or be in actual physical control of any vehicle while:

1. The alcohol concentration in such person's blood or breath is 0.08 or more based on the definition of blood and breath units in [Section 11-903(a)(5)].

Optional 1. The alcohol concentration in such person's blood or breath as measured within three hours of the time of driving or being in the actual physical control is 0.08 or more based on the definition of blood and breath units in [Section 11-903]. If proven by a preponderance of evidence, it shall be an affirmative defense to violation of this subsection that the defendant consumed a sufficient quantity of alcohol after the time of driving or actual physical control of a vehicle and before the administration of the evidentiary test to cause the defendant's alcohol concentration to be 0.08 or more. The foregoing provision shall not limit the introduction of any other competent evidence bearing upon the question whether or not the person violated this section, including tests obtained more than three hours after such alleged violation.

2. Under the influence of alcohol;

3. Under the influence of any other drug or combination of other drugs to a degree which renders such person incapable of safely driving; or

4. Under the combined influence of alcohol and any other drug or drugs to a degree which renders such person incapable of safely driving.

(b) The fact that any person charged with violating this section is or has been legally entitled to use alcohol or other drug shall not constitute a defense against any charge of violating this section.

(c) In addition to the provisions of [Section 11-904], every person convicted of violating this section shall be punished by imprisonment for not less than 10 days or more than one year, or by fine of not less than $100 nor more than $1,000, or by both such fine and imprisonment and on a second or subsequent conviction, such person shall be punished by imprisonment for not less than 90 days nor more than one year, and, in the discretion of the court, a fine of not more than $1,000.

ACKNOWLEDGMENTS

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Evaluation of the Effects of North Carolina's 0.08% BAC Law

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BACKGROUND

Motor vehicle crashes account for approximately half of all fatalities resulting from unintentional injury (Baker et al., 1992). In the U.S., alcohol is involved in about 7% of all traffic crashes, but is much more commonly involved in fatal crashes. During 1997, an estimated 35 6% of traffic fatalities in North Carolina were *alcohol-related* (i.e., involved a driver, pedestrian, or bicyclist with BAC > 0.01%; NHTSA, 1998). This is somewhat less than the 38.6% of fatalities with alcohol-involvement nationally during 1997. Although there has been clear improvement in the proportion of alcohol-related crashes during the past decade, motor vehicle crashes in which alcohol was centrally involved continue to be a major part of the injury problem nationally, as well as in North Carolina.

Following national movement toward establishment of *per se* limits (a blood alcohol concentration [BAC] that is considered to be illegal, regardless of evidence of impaired behavior) and the move to raise the legal drinking age to 21 in all states, traffic safety efforts in many states are now focusing on lowering the *per se* BAC limit from 0.10% to 0.08%. Continuing a trend for North Carolina to be among the leaders in state efforts to combat impaired driving., the illegal *per se* BAC limit was reduced to 0.08% effective October 1, 1993.

Both experimental and epidemiologic evidence suggests that a BAC limit of 0.10% is too high. A variety of behaviors and cognitive functions begin to show evidence of impairment at BACs as low as 0.04% (Moscowitz & Burns, 1990). In addition to this experimental evidence, the best epidemiologic information currently available on BAC and the risk of a driver crashing shows a clear increase in the slope of the risk curve at BACs of about 0.08%. Hence there is a clear and substantial scientific basis for setting the *per se* BAC limit at 0.08% (or lower).

Data on BACs of persons involved in fatal crashes suggests, however, that reducing the legal BAC limit may have little effect. Fatality Analysis Reporting System (FARS; NHTSA, 1991) data indicate that among fatally injured drivers who have been drinking, BACs are well in excess of the current legal limit of 0.10% (in most states). Thus it is argued that drivers killed in alcohol-related crashes are already in substantial violation of the BAC limit and that, therefore, reducing the legal limit will likely have no effect.

A counter argument can be made that, although individuals drive with BACs in excess of the legal limit, reducing that limit can send the message to heavier drinkers that they need to reduce their consumption when they are going to drive. Thus, if drinking drivers believe (though incorrectly) that they are 'okay,' to drive after drinking a certain amount, a lowered BAC limit will send the message that their personal "drinking limit" must be lowered as well. Accordingly the predicted effect of a lowered legal BAC limit would be to reduce the general BAC level among drinking drivers, even though it might not bring persons in line specifically with the new, lower limit. This is the classic public health approach, wherein benefits for a population are achieved through policies that alter, even fractionally, the risk of entire groups rather than concentrating on individuals.

Since a number of states have already enacted 0.08% BAC limits, evidence has begun to accumulate on the effect of this lower limit. These results are briefly reviewed below.

Previous Evaluations of 0.08% BAC Laws

There have been four attempts to empirically determine the effects of 0.08% *per se* laws.

- California's 0.08% law was initially examined under the sponsorship of the National Highway Traffic Safety Administration (NHTSA, 1991); more recently the California Department of Motor Vehicles conducted its own assessment (Rogers, 1995).
- In 1994 the NHTSA released the results of a preliminary assessment of the effects of the lowered BAC limit in the first five states to reduce their *per se* limit to 0.08%.
- Most recently Hingson et al. (1996) reported results of another study of the effects seen in the first five states to reduce their BAC limit to 0.08%.

California

Among the 16 states that have reduced the *per se* illegal BAC limit to 0.08%,[1] only the California law has been subjected to a thorough evaluation. Because California has a very large number of crashes, it was possible to conduct a scientifically valid examination of the effects of the lower BAC limit shortly after the new law took effect. A study conducted by Research and Evaluation Associates (NHTSA, 1991) shortly after the lower BAC limit took effect found a 12% decrease in alcohol-related fatalities, but no corresponding decline in non-alcohol crashes. Unfortunately, another law – providing for administrative license revocation (ALR) for persons found driving with illegal BACs – took effect six months after the 0.08% law was implemented. Moreover, a good deal of public discussion about the ALR law occurred prior to its enactment, overlapping the period immediately following enactment of the 0.08% law. As a result, it was not possible to determine whether the decrease in alcohol-related fatalities that occurred was due to the 0.08% law, the ALR law, or some combination of the two.

In 1995 another study examined effects of the California 0.08% law (Rogers, 1995). A large number of crash types[2] were studied using time series analysis techniques to control for a variety of factors such as amount of driving and general economic conditions (indicators of crash exposure). Trends were examined for a five year period prior to implementation of the lower BAC limit and four years following implementation. No decrease in alcohol-involved crashes or alcohol-involved fatal crashes was found to be associated with the 0.08% law. Some decline was found in surrogate measures for alcohol crashes: nighttime serious injury or fatal crashes and fatal or injury crashes occurring between 2 and 3 am.

First Five States to Enact 0.08% BAC Limit

In a preliminary evaluation of the first five states to reduce BAC limits to 0.08%, six measures or indicators of drinking-driving available from FARS were examined for comparable time periods before and after the lower BAC limit was enacted in five states where the lower limit had been in effect for two

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[1] Alabama, California, Florida, Hawaii, Idaho, Illinois, Kansas, Maine, New Hampshire, New Mexico, North Carolina, Oregon, Utah, Vermont, Virginia and Washington.

[2] Alcohol-involved crashes, nighttime crashes, 2-3 am crashes, and single vehicle crashes were all examined. Moreover, each of these types was considered for three different degrees of severity: fatal crashes only, fatal + severe injury, and fatal + injury.

years or more (NHTSA, 1994)[3]. The findings were inconsistent across the five states, with anywhere from zero to four of the six indicators examined showing a statistically significant decline. In three of the five states, the proportion of drivers in fatal crashes found to have a BAC above 0.10% did decline significantly. Despite a somewhat inconsistent pattern of changes on the other measures, it is noteworthy that no significant declines on any of the six measures were found in the rest of the nation. Although this comparison does not control for other possible explanations for this change besides the lower BAC limit, it does help to rule out the possibility that the observed changes merely reflect a general and widespread decline in drinking-driving that has been documented (Transportation Research Board, 1994).

Hingson et al. (1996) reported findings that appear to corroborate the preliminary results reported by NHTSA, using a more controlled research design. Each of the first five states to reduce their per se limit to 0.08% was matched with a similar state from the same general region that did not reduce the limit. Among the 0.08% states, compared with 'matching' states, there was a significant reduction in the proportion of fatal crashes in which a fatally injured driver had a BAC above 0.08%. Similar results were obtained for the proportion of fatally injured drivers with BACs above 0.08%. Unfortunately, as was the case in California, it is difficult to disentangle the effects of the 0.08% laws from administrative license revocation laws that took effect at about the same time as the 0.08% laws in three of the states. Moreover, nearly half (4/9) of the statistically significant effects the NHTSA study found occurred in Vermont and Utah, yet Hingson et al. found no decline in Vermont, and an increase in alcohol-involved crashes subsequent to the 0.08% law in Utah.

Overall then, the available empirical evidence on the effect of 0.08% legislation to date is not strong, but does suggest that there may be a desired effect. The greatest drawback in previous studies has been the inability to attribute apparent effects clearly to 0.08% laws rather than to co-existing ALR laws, which have been demonstrated to reduce drinking-driving (Wagenaar et al., 1995). Another problem is the inherent difficulty in finding appropriate 'matches' to 0.08% states. For example, although Vermont and New Hampshire are both small, largely rural New England states, they are dramatically different politically and in other ways specific to drinking-driving (e.g., sobriety checkpoints are constitutionally prohibited in New Hampshire). Similarly, Utah and Idaho are sparsely populated states in the intermountain west, but there are numerous differences, not the least of which is the presence of a large Mormon population in Utah – potentially a critical confounding factor in studies of alcohol use.

Distinctiveness of the North Carolina Study

To shed additional light on the effects of reducing the *per se* BAC limit to 0.08%, we examined data from North Carolina. There is a sufficiently large number of crashes in North Carolina to conduct time series analyses using monthly crash rates, thus allowing use of North Carolina as its own 'control.' An additional benefit of this study is that effects of North Carolina's ALR law, which was enacted in 1983, are not confounded with the 0.08% law. No other major drinking-driving legislation was enacted in close temporal proximity to the October 1, 1993 date on which the 0.08% BAC limit took effect. Thus, the methodological problems that have confounded interpretation of results from others states, rendering conclusions about the effects of 0.08% laws tentative, can be avoided by using North Carolina data.

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[3] Indicators examined were: (1) driver BAC $\geq$0.01%, (2) driver BAC $\geq$0.10%, (3) police-reported alcohol involvement, (4) 'estimated' alcohol involvement (e.g., police reported drinking, positive BAC measurement, or alcohol violations/citations), and two surrogate measures, (5) single-vehicle nighttime crashes, and (6) single-vehicle nighttime male driver crashes.

In the present study, the primary focus of analysis was on crashes prior to and following implementation of the 0.08% law. Time series analyses were employed to examine various possible indicators of the effects of this new law. We considered a variety of outcome or criterion variables: alcohol-related crashes as identified by the investigating officer, alcohol-related fatal crashes, and alcohol-related injury crashes. In addition, because reports of alcohol involvement in all but fatal crashes are somewhat problematic, proxy measures for alcohol-related crashes (nighttime crashes, fatal/serious injury nighttime crashes) were also examined. Although not the primary focus of this research, we were able to obtain information about the general public's knowledge about and perceived effects of the 0.08% law. This information will help to place the effects on crash rates in context. We turn first to the question of public awareness of the new law.

❑ PUBLIC KNOWLEDGE AND PERCEPTIONS OF THE LOWER BAC LIMIT

A critical element in the success of any social policy approach that involves individuals making a choice to alter their behavior is that the public whose behavior is targeted must be aware of the policy. It is often assumed by policy makers that enacting a policy or law is sufficient to achieve its goal. It is axiomatic, however, that without awareness, no effect can be expected. There appear to be essentially three ways in which the public might have learned about the new, lower BAC limit: through the media, through direct experience (being arrested), and subsequently, by word of mouth from individuals who initially learned about the law through one of the two primary channels.

As a proposed law is being deliberated in the legislature, media attention will likely alert some proportion of the public to the issue. Following passage, additional media attention should provide the first information that there is a new BAC limit (albeit not yet in effect). At about the time the new law becomes effective, additional media attention as well as public information/education campaigns should increase awareness. Upon implementation of the law, if it is enforced, awareness should begin to grow slowly. There was relatively little media attention to the 0.08% BAC law as it was being considered, or when it took effect. However, enforcement was vigorous, as is typical in North Carolina.

We were able to obtain one "point-in-time" indicator of awareness of the new 0.08% BAC limit 17 months after the law went into effect. During February, 1995, the Insurance Institute for Highway Safety sponsored a telephone survey in North Carolina to obtain a variety of traffic safety-related information. At our request, a few questions about the 0.08% law were included and the data were provided to HSRC for those items as well as the other questions in the survey. This survey consisted of interviews with 802 randomly selected individuals living in four areas in the state. Consequently, these data are not from a representative sample of the entire state. However, the four areas do provide broad geographic representation. Figure 1 shows the locations where interviews were conducted (Cumberland, Guilford,

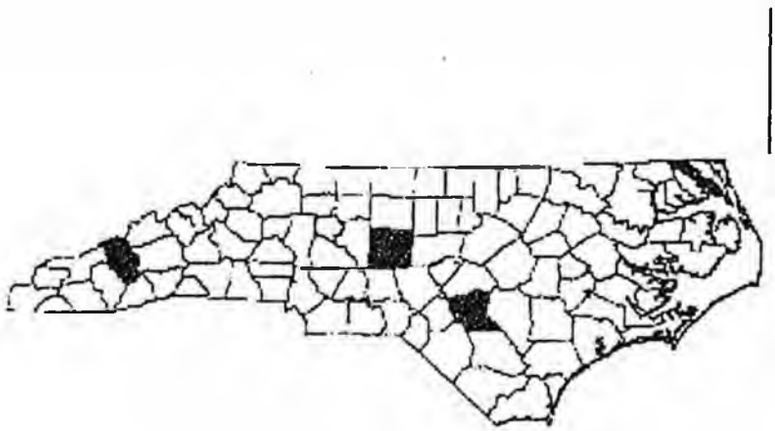

Figure 1 Counties where telephone interviews were conducted

Haywood, and Pasquotank counties)[4]. The demographic characteristics of the composite of these four counties are quite similar to the state as a whole. Table 1 presents 1990 census information on race, sex and age characteristics of the state as a whole, the four counties where interviews were conducted, and the sample of interviewed respondents. This allows for a direct comparison of how well the full interview sample represents the population of the counties interviewed. It is clear that the sample of persons interviewed somewhat over represents females, whites, and persons in the primary age group for drinking-driving.

Table 1. Demographic Characteristics of Survey Respondents and Sampled Geographic Regions

	Population	% Male	% Nonwhite	Age 21 - 35
North Carolina	6,628,637	48.5	24.4	25.6
4-County Population (Mean)		48.4	26.6	25.9
Cumberland County	274,566	51.7	38.1	33.0
Haywood County	46,942	47.7	2.0	19.9
Guilford (High Point)	347,420	47.3	28.2	26.5
Pasquotank (Elizabeth City)	31,298	46.7	38.0	24.1
4-County Survey Respondents (N)	802	40.8	18.4	31.2

Note. Population data are from 1990 census.

In addition to a series of questions pertaining to seat belts and drinking-driving enforcement, respondents were asked the following questions regarding the BAC limit:

- Do you know the legal blood alcohol limit (BAC) for drivers in North Carolina?
  - If respondents said yes, they were asked: "What is it? [The legal blood alcohol limit in North Carolina?]"
- Has the legal blood alcohol content limit for drivers in North Carolina been changed since 1992?
- Do you think that reducing the blood alcohol limit (BAC) has made it more likely that drinking drivers in North Carolina will be arrested for DWI?
- How much publicity have you seen or heard about the new blood alcohol limit (BAC) since it took effect? Would you say this new limit has been publicized. . . *Very well, Pretty well, Not very well, Not at all well.*
- What effect, if any, has the change in the blood alcohol limit had on your own behavior? Would you say you (*Are less likely to drive after drinking since the limit was lowered, Drive more carefully after drinking since the limit was lowered, Drink less since the limit was lowered, Have*

[4] These four counties had been selected as demonstration counties for the 'Booze It and Lose It' campaign which began in November, 1994. Interviews were conducted to learn of residents awareness of that program, and other highway safety issues.

made no change [drink and drive the same as before]. Unread options: *Don't drink, Don't drink & drive*).

Knowledge of the BAC Limit

Only half of the respondents (50%) claimed to know the BAC limit (see Figure 2). Of those, nearly three-quarters (74%) correctly reported the limit as 0.08%. Another 17% reported the old limit of 0.10%. Thus, among all respondents, only 37% knew the correct BAC limit.

When asked whether the BAC limit had changed since 1992, sixty-four percent of respondents thought it had; another 27% were not sure and 10% said it had not.

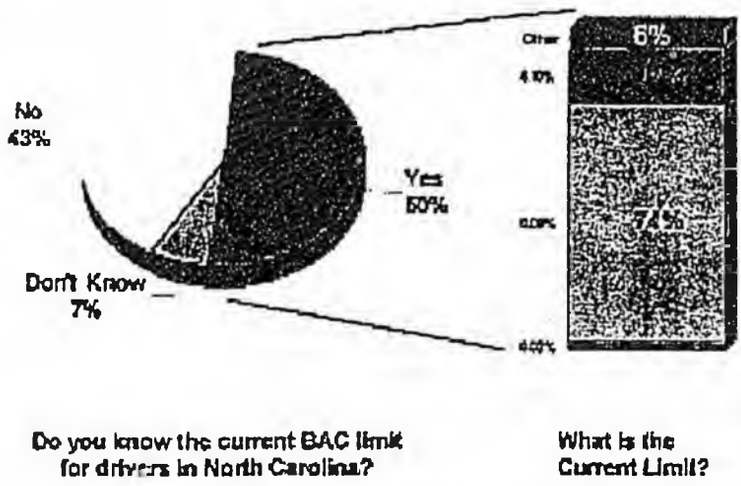

Figure 2 Reported knowledge of new BAC limit.

Knowledge both of the limit and that it had changed was related to education, sex, and race. As is shown in Figure 3, males, those with higher levels of formal education and whites were more likely to know the BAC limit had changed and what the new level was.

It would appear that general knowledge in the population of the new BAC limit was poor. However, this kind of information is not so relevant to non-drinkers as it is for drinkers, and a substantial proportion of North Carolina residents are non-drinkers. Survey data routinely collected on alcohol use indicate that from 45 - 50% of adults in North Carolina report being non-drinkers (Kroutil et al., 1997). In the present sample 70% reported being non-drinkers.

As is shown in Figure 4, those persons who reported that they do drink were far more likely to be aware of the BAC limit and that it had changed recently. Knowledge of the limit was even more closely related to reported frequency of drinking. Whereas 67% of those who drink more than once a week knew the new limit, barely a quarter of non-drinkers could report that 0.08% was the limit (not shown in figure).

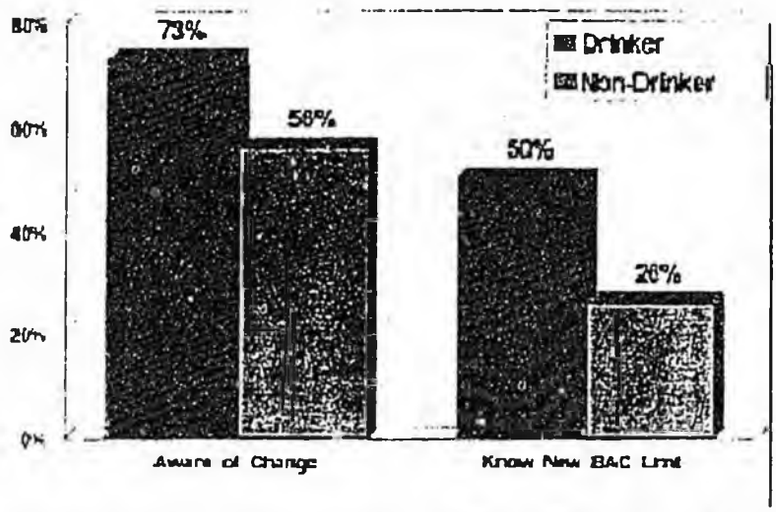

Figure 3 Drinker vs. non-drinker knowledge of 0.08% BAC limit

Drinking status also significantly modified the relationship between knowledge of the BAC limit and demographic characteristics. When drinking status is controlled, neither sex nor race is related to knowledge that the BAC limit had changed (although there is still a weak relationship between race and knowledge among non-drinkers). Among both drinkers and non-drinkers, males are more likely to know the correct BAC limit. Among drinkers, there were no racial differences in knowledge of the limit, but among non-drinkers blacks were less likely to know the current BAC limit.

Not surprisingly, level of formal education was strongly related to knowledge of the BAC limit and that it had changed. Among both drinkers and non-drinkers this relationship remains strong. Moreover, education largely explains the racial differences in knowledge of the limit and that it had changed. Controlling for education had no effect on the relationship between sex and knowledge. Consistently across levels of education, males were more knowledgeable about the new limit than females.

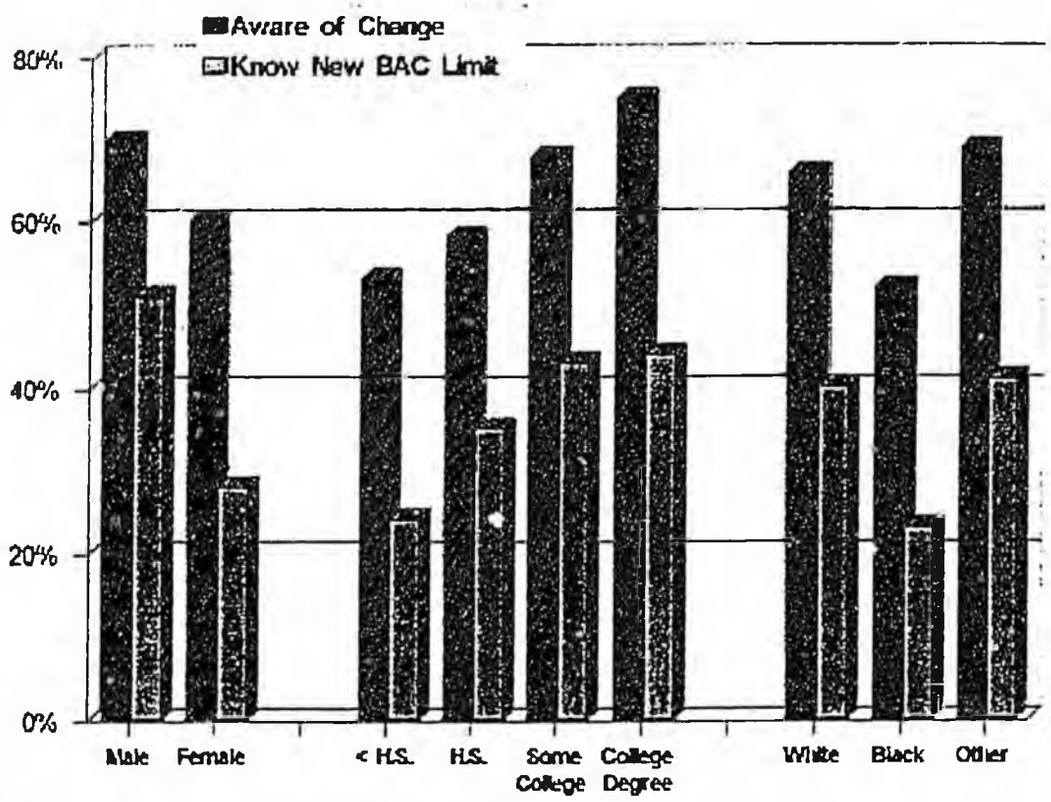

Figure 4 Knowledge of BAC limit by demographic subgroup

Perceived Publicity about the New Law

It is clear that some 17 months after the change formally took place a substantial number of North Carolinians did not know that the BAC limit had been lowered. It is probably not of great importance that non-drinkers were unaware of this change. Nearly three-quarters (73%) of drinkers thought the limit had changed, but only half (50%) could correctly identify the new BAC limit. Even among persons who reported that they drink once a week or more, fully a third could not correctly identify the new limit.

A question arises, then, as to how well the new limit was conveyed to the public. We have no objective way to measure that, but it is possible to address respondents' perceptions of how well the law was publicized. Figure 5 shows the distribution of responses to the question, "How much publicity have you seen or heard about the new blood alcohol limit (BAC) since it took effect? Would you say this new limit has been publicized..." (This question was asked only of those 512 respondents who thought the law had changed.) Despite a substantial lack of knowledge about the new limit, respondents in general appear to believe that the new law was well-publicized. Two-thirds (68%) thought the law was publicized either very well (26%) or pretty well (42%).

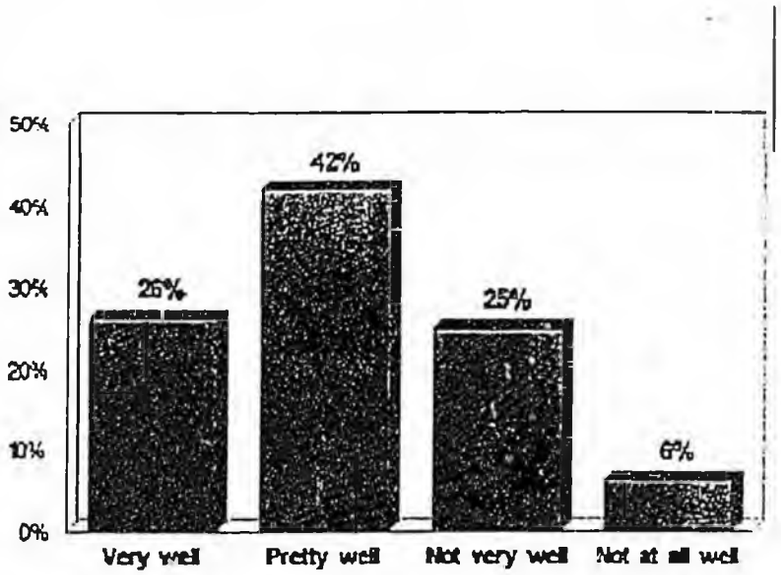

Figure 5 How well has the new BAC limit been publicized? (N = 512)

Perceived publicity of the lower limit was clearly related to age, with older respondents believing the publicity had been more extensive. Education was weakly related to perceived publicity. Less educated respondents were somewhat more likely to believe the change in the law had been well-publicized. Drinking status, race, and sex were unrelated to perceptions about publicity of the law.

Those respondents who correctly identified the new BAC limit were somewhat more likely to believe the law had been well-publicized. This association undoubtedly would have been stronger if the question had been asked of all respondents, including those who did not think there had been a change.

Perceived Effect of the Lower BAC Limit

Respondents overwhelmingly (85%) believed that lowering the BAC limit increased the likelihood that individuals would be arrested for drinking-driving. The vast majority denied that it had any relevance to them, however. Fifty-two percent of those who knew of the change reported either that they don't drink or don't drink and drive. Another 18% said the law had not affected their behavior. (In all likelihood some of these individuals also meant they were unaffected because it didn't apply to them.) Nine percent indicated that they are less likely to drive after drinking and 3% reported that they began drinking less. Of the entire sample, fewer than 6% reported that they had driven after having anything to drink during the past month. Only two admitted that they might have been above the legal limit.

Roadside survey studies of drivers' perceptions of risk of apprehension have demonstrated that those individuals to whom DWI laws are most likely to apply (e.g., persons coming from bars, and those with elevated or illegal BACs) are least likely to believe they will be detected or arrested (Foss & Perrine, 1990). A similar finding emerged in the present survey. In response to the question of whether the new limit would increase the likelihood of individuals being arrested for drinking-driving, persons who drink most frequently (more than once a week) were least likely to believe the likelihood of arrest was increased by the law (see Figure 6).

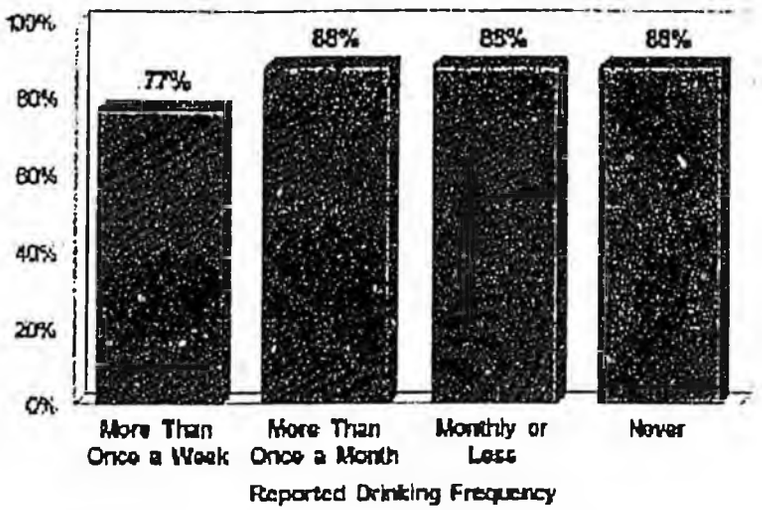

Figure 6 Perceived likelihood that DWI arrests will increase following new law by respondent drinking frequency.

❑ CHANGES IN ALCOHOL-RELATED CRASHES

For the following crash analyses, we used data reported to the North Carolina Division of Motor Vehicles, Collision Reports section (the North Carolina Traffic Crash File). Since January 1991 information obtained from the North Carolina Medical Examiner's Office concerning alcohol use by drivers killed in crashes has been used to update information recorded by investigating officers at the crash scene. As a result, data on alcohol involvement in fatal crashes prior to this date are not directly comparable to the more recent information.

Figure 7 shows the proportion of fatal crashes in North Carolina that involved alcohol from 1991 through 1995 as reported by the NC Division of Motor Vehicles in its annual Crash Facts report. There was a dramatic decline in alcohol-related fatal crashes, from 42% to 27% – a 36% relative decrease. The majority of this decline occurred from 1991 to 1993. Although the sharpest drop occurred during the year when the lower BAC limit took effect, the new limit was in effect only for the final three months of 1993.

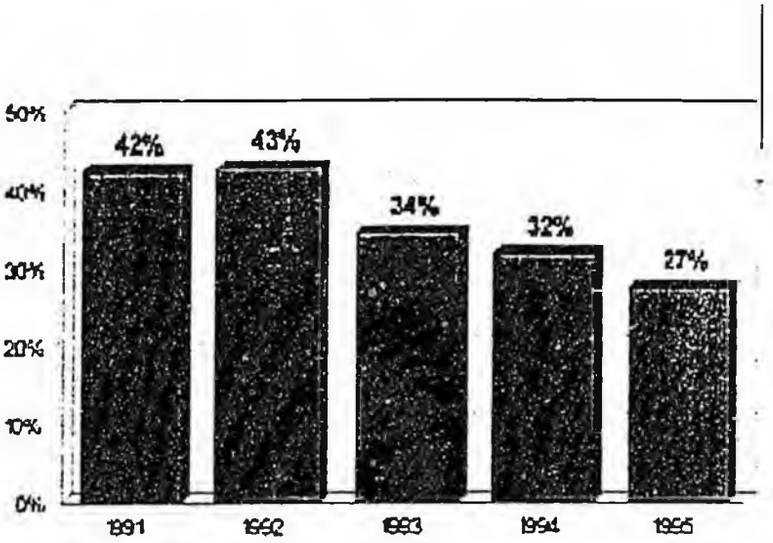

Figure 7 Percent of North Carolina fatal traffic crashes involving alcohol, 1991 - 1995 (source: NC Div. of Motor Vehicles).

Because the 0.08% law applies to operators of vehicles, we examined changes only for those crashes where drivers of motor vehicles had been drinking (either by objective measurement or officer judgment) as the criterion of interest. That is, those crashes that involved alcohol only by virtue of drinking by a pedestrian or bicyclist were not considered alcohol-involved crashes for purposes of this evaluation.

Figure 8 shows the percent of all crashes that involved a drinking driver by month from January 1991 through December, 1995. It is clear that the most dramatic part of the decline in alcohol involvement occurred well in advance of the reduction in the BAC limit. Although 'anticipatory' effects of traffic laws are sometimes seen, that does not appear to have occurred in the present case. Legislation to reduce the BAC limit was introduced in the North Carolina General Assembly in March of 1993 and was passed in July.[5]

Examination of the data series suggests that if there was a time-delineated shift (rather than simply a general continuing decline), it probably occurred somewhere in early- to mid-1992, fully a year before the 0.08% legislation was introduced. We are unable to find any events or policy changes that occurred around that time which might have resulted in such a decline.

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[5] We examined coverage of this issue in the Raleigh *News & Observer*, one of the two major newspapers in the state that give detailed coverage of legislative activity. Given the high level of interest in drinking-driving issues in North Carolina, the low amount of coverage accorded this issue is fairly striking. This may be due, in part, to the fact that the legislation was not the subject of extensive debate. The bill received little attention until the final days of the session, when it was passed.

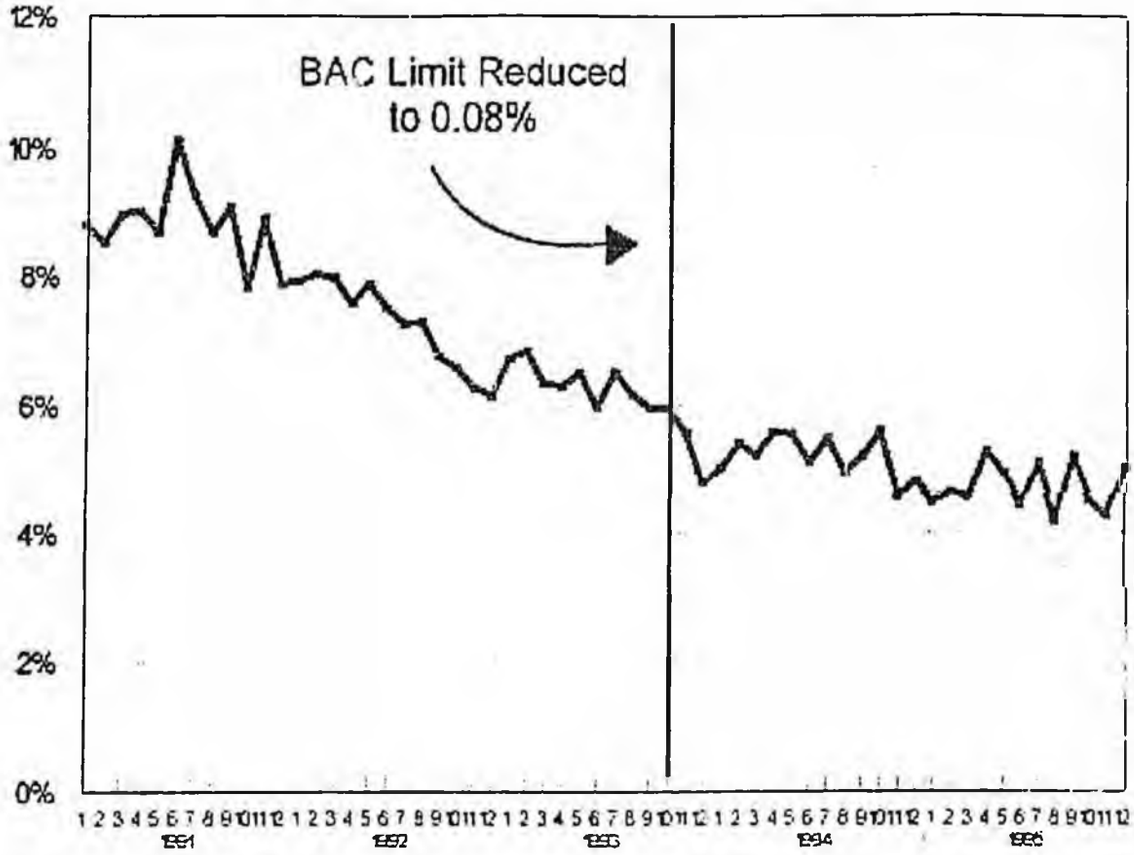

Figure 8 Percent of all North Carolina crashes involving alcohol, 1991 - 1995.

Because of the variety of factors that influence motor vehicle crashes in general, and those involving alcohol in particular, it is necessary to conduct more sophisticated, time-series analyses to determine whether an intervention has had an effect. Accordingly, a number of time series models were fit to the number of various types of motor vehicle crashes occurring in North Carolina by month from January 1991 through December 1995. These models were used to estimate any changes in the number of alcohol-related crashes that coincided with implementation of the lower BAC limit. Structural time series models were fit to the data using the software package STAMP (Structural Time Series Analyser, Modeler and Predictor) developed at the London School of Economics and ESRC Centre in Economic Computing (Harvey, 1989).

The components of structural time series models consist of a level, a trend, seasonal factors, effects due to various "regression variables" and intervention effects (see Harvey, 1989, for a thorough discussion of these models). The level, trend, and seasonal factors can either vary stochastically over time, to accommodate the possibility that they do not remain constant, or be constrained to take on fixed values. Regression variables can include autoregressive terms (lagged values of the response variable) as well as other explanatory factors associated with the response variable. In the models that follow, two basic types of intervention effects were considered. One includes a step shift in the level of the series at the point of intervention; the other hypothesizes a change in the trend or slope (rather than an abrupt shift) of the series beginning at the time of intervention. The objectives of model development are to construct a model that produces essentially uncorrelated residuals, has statistically significant parameters, and fits the data series as well as possible.

As an illustration of the modeling procedure, consider the following model fit to the data series of monthly alcohol-related crash frequencies. The model was fit using a log transformation, so the response variable was $\log_e$ (alcohol related crashes)[6]. The model contains a stochastic level, stochastic slope, and stochastic seasonal factors. Three regression variables were included: an autoregressive term at lag 7, the log of all crashes (to control for amount of travel), and a variable that represents the number of weekends in each month (since alcohol-related crashes are more common on weekends). The intervention variable was a unit step-function occurring in October 1993. Results from this model are shown in table 2.

Table 2. Parameters for model of North Carolina alcohol-related crashes ($\log_e$), 1991 - 1995

Parameter	Estimate	s.e.	t-ratio	p-value
Level*	-3.23	2.23	-1.450	.156
Trend*	-.007	.0014	-4.661	<.0001
$\log_e$ (A-R crashes, at lag 7)	.469	.121	3.850	.0001
$\log_e$ (all crashes)	.644	.181	3.556	.001
Weekends	.053	.010	5.55	<.0001
Intervention (Lower BAC limit)	-.008	.025	-.330	.744

* level and trend estimates represent final estimates at end of series.

Test for Seasonality $\chi^2_{(11)} = 33.79$, $p = .0004$

Residual Autocorrelations	*Goodness-of-Fit*
Q(5) = 4.30	$R^2 = .874$
Q(10) = 11.55	$R^2_D = .780$
Q(15) = 12.38	$R^2_S = .624$

For simplicity, estimates of the 11 seasonal parameters are not shown, but rather only an overall test for seasonality. There is a significant seasonal component in alcohol-related crashes during the time period from 1991 through 1995.

Information concerning residual autocorrelation is presented by the three values of the Ljung and Box Q-statistic. This statistic Q(k) is based on the sum of squares of the first k residual autocorrelations and is approximately distributed as χ^2 with $k - \tau$ degrees of freedom, where τ is the number of stochastic components in the model. Thus, values of Q(k) that remain at a value of k or smaller tend to indicate that the residuals are sufficiently uncorrelated. Thus, for Table 2 above,

$$Q(k) = Q(5) = 4.30 \simeq 5 = k$$

[6] Time-series analyses often use log-transformations because data transformed in this way exhibit more desirable mathematical properties.

and similarly for Q(10) = 11.55 $\simeq$ 10 and Q(15) = 12.38 $\simeq$ 15. These suggest that the residuals in the model for alcohol-related crashes are reasonably uncorrelated. Note that k = 5, 10 and 15 are selected to be representative of the possible range of residual autocorrelations.

Three goodness-of-fit measures are also shown for the model. R^2 is a measure of the overall fit of the model, part of which is due to the trend and seasonal factors. R^2_D is a measure of the goodness-of-fit of the detrended series (that is, with any general trend removed) and R^2_S the fit of the deseasonalized series (i.e., with seasonal fluctuations removed).

The estimated intervention effect shown in table 2 is quite small and is not statistically significant (p = .744). This estimate represents a decrease in the value of the logarithm of alcohol-related fatal crashes by .008 beginning in Oct. 1993 and persisting through the end of the series.

When the change in slope or trend (in October, 1993), rather than a step shift, was modeled, the estimated effect was .006. Thus, the effect is a slight increase in the (downward) slope of the series, but again, the estimate is not statistically significant (t = .951, p = .348).

The models described above represent the *number* of alcohol-related crashes per month as a function of the monthly frequencies of all crashes, seasonality, general trend and number of weekends per month. We also tried an alternative approach, modeling the *proportion* (or percent) of all crashes that were alcohol-related to see if changes could be detected that coincided with the 0.08% legislation. Specifically, we constructed a data series where P_t = percent of all crashes in month t that were alcohol-related, and time series models were fit to P_t, $\log_e(P_t)$, and logit $(P_t) = \log_e(P_t/(100-P_t))$ Models fit to each of these three data series were of the same structure and produced similar estimates of intervention effects. Hence, only results for the logit models are reported below.

Because the new BAC limit may have affected only more serious crashes, which are most likely to be alcohol-related, we conducted additional analyses to examine the percent of all fatal and serious injury crashes that were alcohol-related. Although reporting of alcohol involvement in North Carolina crashes is considered to be quite good, surrogate measures of alcohol-involved crashes are sometimes used to supplement analyses that are based on officers' judgments about alcohol involvement. Hence, additional analyses were conducted using each of the following as the 'response' variable:

- percent of all crashes that occurred during nighttime hours (between the hours of 8:00 p.m. and 4:00 a.m.), and
- percent of all fatal and serious injury crashes occurring during nighttime hours.

The results obtained when fitting models to logit transforms of each of the series described above are presented in table 3.[7] Two separate models were fit to each data series – one with a step shift at time of intervention (October 1, 1993) and one with a change in slope at time of intervention. None of these effects was statistically significant in any of the models.

[7] More extensive description of these models is given in Appendix A.

Table 3. Parameters for logit models of various indicators of alcohol-involved North Carolina crashes, 1991 - 1995.

Outcome Variable	Modeled intervention effect	Estimate	s.e.	p-value
Percent of crashes involving alcohol – *all levels of severity*	Shift in level	-.038	.038	.320
	Change in trend	.001	.009	.866
Percent of crashes involving alcohol – *severe and fatal crashes only*	Shift in level	.023	.058	.698
	Change in trend	-.0001	.003	.986
Percent of crashes occurring at night – *all levels of severity*	Shift in level	-.022	.022	.308
	Change in trend	.001	.003	.762
Percent of crashes occurring at night – *serious and fatal crashes only*	Shift in level	.050	.040	.222
	Change in trend	.003	.002	.288

Comparison of North Carolina Crash Trends to Other States

Although none of the analyses indicate that the lower BAC limit had an effect on alcohol-related crashes, it was thought that perhaps the effect of the new law might have been to prevent an upturn in alcohol-involved crashes that appeared to be afoot nationally. It is possible that the rate of decline in alcohol-related crashes was already so great in North Carolina when the new law came into effect that it could not produce an added benefit. We reasoned that perhaps having this law in place as the broader trend in alcohol-related crashes leveled might serve to mitigate that effect in North Carolina. Accordingly we compared the trend in alcohol-related fatal crashes in North Carolina with that in eleven other states that have had consistently high rates of testing for alcohol among fatally injured drivers (> 80% for each year 1991 - 1995).[8] The mean testing rate for these 11 states was 89.9% (vs. 85.3% for NC) for the five year period.

Data on BAC's of drivers killed in motor vehicle crashes in North Carolina and the 11 other states were obtained from the Fatality Analysis Reporting System (FARS). The data covered the time period from January 1990 through December 1995. Over this time period, 26.1% of drivers killed in motor vehicle crashes in North Carolina were reported to have BAC's of 0.10% or higher. In the other states this

[8] The states selected were Colorado, Connecticut, Hawaii, Illinois, Massachusetts, Montana, New Mexico, Oregon, Rhode Island, Washington, and Wisconsin. Among these states, Oregon, Hawaii, and New Mexico have 0.08% BAC limits. However, only the New Mexico law, which also changed in 1993, presents a problem for this analysis. The law in Oregon did not change during the analysis period and Hawaii's change only applied to the final few months of the period. Including New Mexico in this analysis has a slight tendency to work against finding an effect of the North Carolina law. However, because of its relatively small population, excluding New Mexico from the analysis would not materially change the results.

percentage ranged from 30.8% (Massachusetts) to 44.1% (Montana). The overall rate of alcohol involvement for the 11 states combined was 36.8%.

Three monthly data series were created:

- the percent of all fatally injured drivers in North Carolina having BAC's $\geq$ 0.10%
- the percent of all fatally injured drivers in the 11 comparison states with BAC's $\geq$ 0.10%
- the logit transform of the proportion of all killed drivers with BAC's $\geq$ 0.10% among the 12 states that were North Carolina drivers

Time series models were then fit to each of these data series. The data series for percent of fatally injured North Carolina drivers with BAC $\geq$ 0.10% was essentially a random series (i.e., there were no significant autocorrelations). In this case the basic time series model reduced to a regression line fit to the data points. The estimated model parameters are shown in table 4. When added to the model, neither a step shift (p = .728) in October 1993, nor a change in trend component (p = .765), was statistically significant.

Table 4. Regression statistics for percent of fatally injured North Carolina drivers with BAC $\geq$ 0.10% by month, 1990 - 1995.

Parameter	Estimate	s.e.	t-statistic	p-value
Intercept	31.90	1.16	27.57	<.0001
Trend	-.159	.028	-5.79	<.0001

Goodness-of-Fit
R^2 = .324
R^2_D = .500

The data series for the percent of fatally injured drivers with BAC's > 0.10% in the group of comparison states was also an essentially random series with a slight downward trend. The autocorrelation function, however, suggested that the data contained some seasonal variation. Thus a model that contained a fixed level, fixed slope and stochastic seasonal effects was fit to this series. Results are summarized in table 5.

Table 5. Regression statistics for percent of fatally injured drivers in 11 comparison states with BAC $\geq$ 0.10% by month, 1990 - 1995.

Parameter	Estimate	s.e.	t-statistic	p-value
Level	40.64	.713	56.96	< .0001
Trend	-.107	.017	-6.25	< .0001

Test for Seasonality $\chi^2_{(11)} = 17.27$, p = .100

Residual Autocorrelations
Q(5) = 5.00
Q(10) = 11.25
Q(15) = 17.38

Goodness-of-Fit
$R^2 = .383$
$R^2_D = .471$
$R^2_S = .199$

Thus both series show general decreases in alcohol involvement over time, though the rate of decrease is slightly greater for the North Carolina series (-.159 vs -.107).

A more direct way of examining alcohol-related fatalities in North Carolina relative to those in the comparison states is to consider the proportion of all fatally injured drivers with BAC > 0.10% who were North Carolina drivers. A model was fit to the logit transform of this proportion. Parameter estimates for the best fitting model to this series are shown in table 6.

Table 6. Parameter estimates for best fitting model for North Carolina alcohol-related (BAC $\geq$ 0.10%) fatalities relative to those in 12 States, 1990 - 1995.

Parameter	*Estimate*	*s.e.*	*t-statistic*	*p-value*
Intercept	-1.95	.276	-7.06	< .0001
Trend	-.004	.002	-2.10	.039
Autoregressive Lag 1	.147	.119	1.23	.236
Autoregressive Lag 5	-.325	.119	-2.74	.008

Residual Autocorrelations
Q(5) = 6.71
Q(10) = 10.58
Q(15) = 16.20

Goodness-of-Fit
$R^2 = .165$
$R^2_D = .495$

This series also displays a slight downward trend (.004) in the proportion of alcohol-related crashes involving North Carolina drivers during the period from 1990 through 1995. Intervention effects added to the model did not approach statistical significance for either a shift in level (p=.862) or a change in trend (p=.509).

These results confirm earlier analyses, again showing that alcohol-related crashes have been declining in North Carolina over the past several years but that no specific effects are found that can be attributed to the lowered *per se* illegal BAC limit.

Analyses of BAC Data for Fatally Injured Drivers in North Carolina

Evaluations of drinking-driving interventions often look only at fatal crashes. There are two reasons to do this. First, having a much greater involvement of alcohol, fatal crash rates are probably more sensitive indicators of drinking-driving. Second, measurement of alcohol involvement is generally better in fatal crashes.

Hence, in addition to the data extracted from FARS, information on BAC's of killed drivers was also obtained from the North Carolina Medical Examiner's (ME) office. These data covered the time period January 1991 - December 1995. From these data, two monthly time series were constructed and analyzed. The first was the monthly percent of all fatally injured drivers who had BAC's $\geq$ 0.10%. This is essentially the same as one of the data series extracted from FARS, although the beginning of the time interval is 1991 rather than 1990. Where the time intervals overlap, the agreement between the two series is close but not identical.

The behavior of the ME data series is quite similar to that from FARS. Namely, the data series is essentially a random series with no significant autocorrelation structure. A straight line fit to the data contains a significant negative (or decreasing) trend, $p < .0001$. Neither a shift in level nor a change in trend effect was statistically significant, $p = .113$ and $p = .325$, respectively.

The second data series was a month-by-month series of mean BACs for fatally injured drivers in North Carolina crashes whose BAC's were0.10% or higher. The mean of these monthly means was 0.21% and over the 60 month interval the values ranged from 0.16% to 0.26%. This series did contain some significant autocorrelations but did not exhibit any long term trends. A model fit to this series contained a fixed level and autoregressive terms at lags 5 and 6. Adding a linear trend term to the model yielded an estimated trend of .00011 with a standard error of .00016 ($p = .460$). Similarly, neither a shift in level nor a change in trend intervention was significant, with p-values of .254 and .598, respectively.

In summary, the proportion of fatally injured drivers having BAC's $\geq$ 0.10% has continued its decline through 1995, but with no abrupt changes that can be attributed to the 0.08% law. The mean BAC of fatally injured drivers with BAC's $\geq$ 0.10%, on the other hand, has remained relatively constant with an overall mean of 0.21%.

The failure to find an effect that might be attributed to the lower BAC limit in North Carolina, considering a variety of indicators of alcohol involvement, suggests that the law has not had the intended effect. There are a number of possible reasons for this. First, and perhaps most likely, is simply that reducing the legal limit does not affect drinking-driving behavior. There are other possible explanations. It may be that the proportion of the drinking-driving population that such a law would affect had already changed their behavior before the limit was lowered in North Carolina, where drinking-driving is less common than in other states. Or, similarly, given the dramatic decline in alcohol-related crashes that was occurring in North Carolina during the early 1990s, it may be that any possible effects of reducing the BAC limit were simply obscured by a broad change in drinking-driving behavior that was already occurring.

Yet another possible explanation for the failure of an effect to materialize for the lower BAC limit is that this new, lower level was not sufficiently well publicized. There was relatively little media attention to the 0.08% law, either when it was being considered, when it passed, or when it was enacted. On the other hand, beginning about 14 months after the BAC limit was lowered, there was a great deal of publicity about DWI enforcement in conjunction with the "Booze-it-and-Lose-it" campaign, which featured sobriety

checkpoints in every North Carolina county. Most publicity about DWI enforcement in North Carolina does mention the BAC limit of 0.08%, though there was no particular mention that the limit was lower than it had been previously.

One important consideration in the analysis of crashes where alcohol involvement is judged rather than measured is the possibility that the new law may have increased officers' sensitivity to alcohol involvement, either individually or, perhaps, via organizational policy (having signaled to law enforcement agencies that drinking-driving was of heightened concern to the legislature). In the present situation, increases in officers' sensitivity to alcohol involvement would work against our finding an effect of the law. If the proportion of alcohol-involved crashes actually decreased, while officers' diligence in reporting alcohol involvement increased, the latter would tend to mask the former. However, the failure to find any change in alcohol involvement in fatal crashes or surrogate measures of alcohol involvement suggests that real effects of the 0.08% law are probably not being masked by changes in alcohol detection where officer judgment is central.

Another possible explanation for the failure to detect an effect of the new law is that it was not being enforced. If persons with BACs of 0.08-0.09% were not being arrested, or if those arrested at that level were not being prosecuted or convicted, that information would begin to spread and would dilute, or eliminate, any possible effect of the new law. To address this possibility, changes in DWI arrests and convictions following implementation of the 0.08% law as well as possible effects on the court system were examined.

Changes in DWI Arrests and Convictions

It was expected that the number of arrests for DWI would increase following enactment of the 0.08% law. For example, roadside survey data from Ohio and Minnesota indicate that lowering the illegal BAC from 0.10% to 0.08% would have increased the number of nighttime drivers who are in violation of the DWI law by 44% to 52% in those states (Foss & Perrine, 1990; Foss, Beirness & Sprattler, 1994).

We had hoped to examine the trend in DWI arrests as part of this study. This would have been complicated by the variety of overlapping special enforcement efforts that have occurred in North Carolina during the 1990s, but these could likely have been dealt with satisfactorily. However, a serious disruption in the availability of driver history file data occurred as the North Carolina Division of Motor Vehicles revised their data system. As a result we were not able to track arrest and conviction data as we had hoped.

An HSRC study using data obtained before the disruption, however, does provide an indication of changes in DWI arrests that occurred following implementation of the new BAC limit (Foss, Martell & Stewart, 1995). The proportion of persons arrested with BACs below 0.10% increased 20-fold immediately after the lower BAC limit took effect, going from less than 1% to approximately 10% of DWI arrests. Arrests of persons with 'marginally' illegal BACs of 0.10-0.11% appear to have increased somewhat as well. However, the overall number of arrests did not increase. Whether this reflects a general downward shift in BACs among the driving population, or that fact that officers' time was more often spent arresting more prevalent types of drinking drivers – those with lower, but still illegal, BACs – is not known. In view of data reported above showing no apparent change in drinking-driving as a result of the new law, it appears that the latter explanation is more likely.

In sum, the 0.08% BAC law did not affect the size of the case load in the North Carolina Substance Abuse Treatment system. However, the make-up of the population of individuals screened for alcohol/substance abuse problems did change by virtue of an influx of persons arrested with lower BACs, who were less likely to be diagnosed as needing treatment for alcohol use problems. Hence, although

persons with BACs of 0.08-0.09% may not have been arrested in proportion to their prevalence, they were by no means being overlooked by law enforcement officers.

Changes in DWI Case Loads for Prosecutors and the Courts

It is of interest to know what effect the new law has had on the criminal justice system. Although the study of California's 0.08% BAC limit indicated little effect on case loads, there was still some concern that an overload might result in North Carolina. In addition, it is possible that persons with low BAC arrests were less likely to be charged or convicted, which might undermine the effect of the new law. To determine whether any of these effects may have occurred, we conducted key informant interviews with county prosecutors (or their representatives) from six counties selected to provide a rough representation of the state.

Figure 9 shows the counties where interviews were conducted. These represent both urban and rural counties as well as the three naturally occurring geographic regions of the state: the western/mountain region, the more heavily populated and industrialized Piedmont (central) region, and the eastern/coastal region.

Among the main issues pursued were (1) whether the new law produced a notable increase in the workload for prosecutors; (2) what, if any, effect the law had on the way cases were prosecuted; (3) whether prosecutors were less likely to charge persons arrested with low BACs; or (4) whether judges appeared to have viewed cases with marginal BACs at time of arrest (i.e., 0.08-0.09%) any differently from the way they viewed marginal BACs (0.10-0.11%) prior to the law.

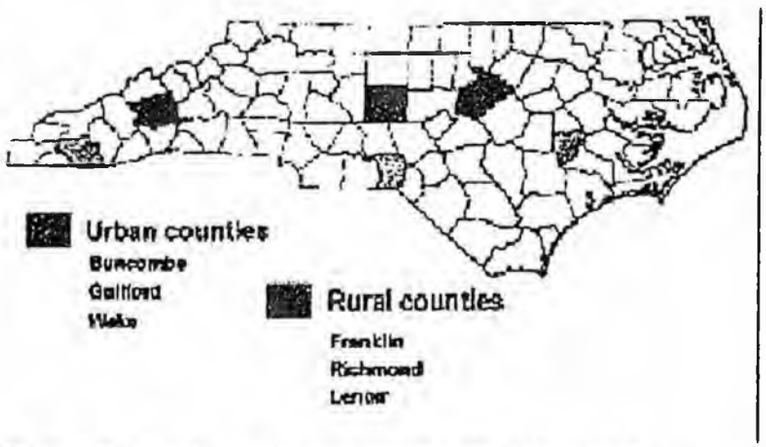

Figure 9 Counties where prosecutors were interviewed.

These interviews produced no evidence that the new law had increased the perceived number of arrests, or that persons with BACs of 0.08-0.09% were not being charged or convicted. Because there was no apparent effect of the 0.08% law on prosecutors' case loads, procedures, or conviction rates, we did not pursue discussions with representatives from a larger sample of counties.

❑ COMPARISON OF NORTH CAROLINA ALCOHOL-RELATED FATAL CRASHES WITH THOSE IN OTHER STATES

As a final set of analyses for this study, we examined several indicators of alcohol involvement in North Carolina fatal crashes compared to fatal crashes in the 37 U.S. states that did not have an 0.08% BAC limit at any time during the period 1991 - 1996. These analyses looked at the six criterion variables reported in the NHTSA preliminary study of the effects of 0.08% laws in the first five states to enact such laws (described below; NHTSA, 1994).

Alcohol use, and its involvement in crashes, has been on the decline for many years in the U.S. Therefore, it is necessary to include an appropriate comparison group (state or states) when examining changes in alcohol involvement in crashes across time to evaluate the effect of an intervention, such as the reduction of the BAC limit. Although there is some appeal to choosing a comparison group that is 'similar' to the state under consideration, it is difficult to know the relevant characteristics upon which states should be matched. Hingson et al. (1996) have been criticized for, among other things, their choice of comparison states (Scopatz, 1998). Although there is merit to the arguments advanced by both sides on this issue, it is probably impossible to convincingly argue that a particular state is the best (or even an appropriate) match to any other state. Consequently, rather than comparing alcohol involvement in North Carolina crashes with those of any particular state or subset of states, we elected to compare North Carolina with all states that had a BAC limit of 0.10% during the entire period we examined (January 1, 1991 – December 31, 1996).[9]

As mentioned above, there are shortcomings in every indicator of alcohol involvement in crashes. If we rely only on police reports of alcohol involvement, there is the likelihood that some alcohol-related crashes are misjudged as not involving alcohol. If we rely only on data where a driver's BAC was objectively measured, a large and unrepresentative proportion of crashes are excluded from analysis. To address this problem, several years ago the National Highway Traffic Safety Administration developed a technique to estimate alcohol involvement in fatal crashes where no objective measure of alcohol was obtained (Klein, 1986). Using discriminant function analyses it is possible to estimate, with a substantial degree of precision, the likelihood that a crash involves a drinking driver, given other characteristics of the crash, the driver and the vehicle he/she is driving. These estimates[10] of alcohol involvement are used by the NHTSA in their analyses of alcohol involvement in fatal crashes and are included in publicly distributed crash data files. The estimates provide an indication of whether a driver involved in a fatal crash had a non-zero BAC (i.e., > 0.0 %) and also the probability that the driver's BAC was in excess of 0.10%, the legal limit in most states. We examined two criterion variables, using Klein's estimation procedures, for all drivers involved in fatal crashes:

- Any alcohol involvement by a driver (BAC $\geq$ 0.01%) and
- Whether there was evidence of alcohol in excess of 0.10% for a driver.

For completeness, and to parallel various other studies of alcohol use by drivers in fatal crashes, we also looked at the following four variables, comparing North Carolina with the 37 other states:

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[9] The following states had an 0.08% BAC limit in effect for at least some portion of the period from 1991 to 1996 and were, therefore, excluded from the analyses: Alabama, California, Florida, Hawaii, Kansas, Maine, New Hampshire, New Mexico, Oregon, Utah, Virginia, Vermont.

[10] It is important to note that although we refer to these as estimated values, since they result from use of an estimation procedure, a large proportion of these data represent an actual measurement. When a measurement is present, the 'estimated BAC' is the measured value. Only in those instances where no BAC measurement is available do the data actually include estimated values.

- Police-reported alcohol involvement
- Single vehicle nighttime crashes (a traditional proxy or surrogate measure for drinking-driving)
- Single vehicle nighttime crashes by male drivers (another commonly used proxy measure for drinking-driving)
- Estimated alcohol involvement (based on police report, driver record of previous alcohol citation, and measured BAC)

As noted above, each of these measures taken alone has shortcomings. The most appropriate way to address this problem is to look at each of the measures to see whether a consistent picture emerges. If the 0.08% law has a clear and strong effect, that should be detectable using any one of the measures–and the effect should appear with all of them. Should there be inconsistencies in results among the measures, we believe that based on the strengths and weaknesses of each, more credence should be given to findings based on the two variables based on the statistical estimation procedures. The other four measures are less robust in that, in one way or another, they incorporate only some of the information that the estimates include.

The most appropriate, though statistically complex, way to examine the effect of a point-in-time intervention, such as enactment of a law, is through the use of statistical modeling procedures to examine a series of data points, as was done in the analyses reported above. However, prior to conducting detailed time-series analyses for each of the several indicators of alcohol-involvement in fatal crashes for North Carolina and the 37 comparison states, we decided to first do a simple before-after comparison. We planned to conduct time-series analyses using only those indicators that showed a clear effect in the simple before-after comparison.

The following analyses consider all drivers involved in fatal crashes between 1991 and 1996, as reported in the NHTSA Fatality Analysis Reporting System (FARS). This provides data for a 33 month period prior to implementation of the 0.08% law in North Carolina and 39 months following its enactment. For ease of comparison with other analyses in the literature, we used the same statistical measures as those employed by Hingson et al. (1996), that is, a ratio of relative risks of alcohol involvement comparing North Carolina to the other 37 states.[11]

Driver BAC of 0.01% or Greater

During the 33 months prior to enactment of the 0.08% law, 24.4% of drivers involved in a fatal crash in North Carolina had an estimated BAC of 0.01% or greater. That declined to 20.1% in the 39 months immediately following enactment of the lower BAC limit, which is a statistically significant decline of 17.4% ($p < .001$). The risk ratio for alcohol involvement at this level before vs. after enactment of the law is 1.21, with a 95% confidence interval of 1.14 to 1.29. Among the 37 states without an 0.08% BAC limit, there was a decrease in estimated alcohol involvement, from 28.1% to 24.5%, a decline of 12.8%, which is also statistically significant ($p < .001$). The before-after risk ratio for these 37 states is 1.15, with a 95% confidence interval of 1.13 to 1.16. The comparison of the change in these states vs. North Carolina, given by the ratio of these two risk ratios, is 1.06. Although this reflects a 6% greater decline in North Carolina, the 95% confidence interval for this ratio is .98 to 1.14, indicating that the difference in declines between North Carolina and the other sta es is not statistically significant.

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[11] We wish to gratefully acknowledge the assistance of Dr. Tim Heeren, Boston University, who provided detailed information on their calculations.

Hence, the conclusion is that the proportion of drivers involved in fatal crashes who had a BAC above 0.01% declined significantly, and to about the same degree in both North Carolina and the other 37 states.

Table 7. Drivers age 21 or older in fatal crashes with estimated BAC of 0.01%, 1991 - 1996, North Carolina vs. 37 states without 0.08% BAC limit before and after enactment of 0.08% limit in North Carolina.

	North Carolina		Other 37 States	
	≥ 0.01%	< 0.01%	≥ 0.01%	< 0.01%
Before (1/1/91 to 9/30/93)	24.4% (1,014)	75.6% (3,147)	28.1% (24,027)	71.9% (61,487)
After (10/1/93 to 12/21/96)	20.1% (1,093)	79.9% (4,337)	24.5% (26,272)	75.5% (81,005)
Decline	17.4%*		12.8%*	
Risk Ratio (before/after)	1.21		1.15	
95% Confidence Interval	[1.14, 1.29]		[1.13, 1.16]	
* $p < .001$	$RR_{NC}/RR_{37} = 1.06$, 95% CI = .98 to 1.14			

Driver BAC of 0.10% or Greater

We would not necessarily expect that lowering the BAC limit to 0.08% would reduce the proportion of drivers who had any alcohol in their system, which the previous analysis examined. Many drivers with a positive – but low – BAC are below both the former and new BAC limits. If the law is effective, however, it should reduce the proportion of drivers with higher BACs. In particular, we would expect a decrease in the proportion of drivers with BACs above 0.10% in North Carolina compared with states that retained a 0.10% BAC limit. We turn to that analysis now, the results of which are summarized in Table 8.

Table 8. Drivers age 21 or greater in fatal crashes with estimated BAC ≥ 0.10%, 1991 - 1996, North Carolina vs. 37 comparison states.

	North Carolina		Other 37 States	
	≥ 0.01%	**< 0.01%**	**≥ 0.01%**	**< 0.01%**
Before (1/1/91 to 9/30/93)	22.2% (924)	77.8% (3,237)	23.8% (20,383)	76.2% (65,131)
After (10/1/93 to 12/21/96)	18.3% (991)	81.7% (4,439)	20.7% (22,211)	79.3% (85,066)
Decline	17.8%*		13.1%*	
Risk Ratio (before/after)	1.22		1.15	
95% Confidence Interval	[1.14, 1.30]		[1.13, 1.17]	
* $p < .001$	$RR_{NC}/RR_{37} = 1.06$, 95%, CI = .97 to 1.15			

Prior to enactment of the 0.08% law, 22.2% of drivers involved in a fatal crash in North Carolina had an estimated BAC of 0.10% or greater. That declined to 18.3% in the 39 months immediately following enactment of the lower BAC limit, a decline of 17.8% ($p < .001$). The risk ratio for alcohol involvement at this level before vs. after enactment of the law is 1.22, with a 95% confidence interval of 1.14 to 1.30. There was a somewhat smaller decrease in alcohol involvement at this level in the other 37 states, from 23.8% to 20.7%. This 13.1% decrease is also statistically significant ($p < .001$). The before-after risk ratio for these 37 states is 1.15, with a 95% confidence interval of 1.13 to 1.17. The direct comparison of the change in these states vs. North Carolina, given by the ratio of these two risk ratios, is 1.06. The 95% confidence interval for this ratio is .97 to 1.15, indicating again that the difference in declines between North Carolina and the other states is not statistically significant.

The changes in the percent of persons with estimated BAC above 0.10% are nearly identical to the changes in persons having any alcohol (BAC above 0.01%). Both measures provide the consistent finding that the decline in drivers with a positive BAC, or a high BAC, in North Carolina was slightly greater than in the other states, but not significantly so.

Police-reported Alcohol Involvement

A fairly direct measure of alcohol involvement in crashes is the investigating officer's report of whether there is evidence of alcohol use by a driver. Although police officers appear to be quite good at determining whether a driver has been drinking, a variety of factors can interfere with their ability to accurately determine alcohol use. Perhaps the greatest problem is the difficulty in determining low levels of alcohol use, for which there are few obvious indicators. Another problem is that factors at the crash scene, for example, the need to deal quickly with seriously injured persons, may inhibit the officer's ability to fully assess whether a driver has been drinking. Nonetheless, this is an indicator that is commonly used to measure whether alcohol is involved in a crash. Table 9 presents results of the analysis of this variable for North Carolina and the 37 other states.

Table 9. Police-reported (PR) alcohol involvement 1991 - 1996, North Carolina vs. 37 comparison states.

	North Carolina		Other 37 States	
	PR-Alcohol	**No Alcohol**	**PR-Alcohol**	**No Alcohol**
Before (1/1/91 to 9/30/93)	17.6% (731)	82.4% (3,430)	19.8% (16,953)	80.2% (68,561)
After (10/1/93 to 12/21/96)	13.4% (725)	86.6% (4,705)	17.1% (18,325)	82.9% (89,125)
Decline	24.0%*		14.0%*	
Risk Ratio (before/after)	1.32		1.16	
95% Confidence Interval	[1.22, 1.41]		[1.14, 1.18]	
* $p < .001$	$RR_{NC}/RR_{37} = 1.13$, 95% CI = 1.03 to 1.25			

Prior to enactment of the 0.08% law, police officers reported that 17.6% of drivers in fatal crashes in North Carolina had been drinking. That declined to 13.4% in the 39 months immediately following enactment of the lower BAC limit, a rather dramatic decline of 24%. The risk ratio for police-reported alcohol involvement before vs. after enactment of the law is 1.32. There was a smaller decrease in police reports of alcohol involvement in the other 37 states (14.0%). The before-after risk ratio for these 37 states is 1.16. The ratio of these changes between North Carolina and the other states is 1.13, indicating a significantly greater decline in North Carolina than in states that did not have an 0.08% BAC limit.

It is instructive to look at the changes in police-reported alcohol involvement by quarter for the period 1991 through 1996 shown in Figure 10.a. It is apparent that although a simple before-after comparison of the proportions of drinking drivers in crashes reported by police suggests a decline following implementation of the 0.08% BAC limit in North Carolina, that is an inappropriate conclusion. The reduction in police-reported alcohol involvement in North Carolina relative to the other states began in the second quarter of 1992, 18 months prior to implementation of the lower BAC limit, and approximately a year before legislation to lower the limit was introduced in the North Carolina General Assembly. During 1991, police reports of alcohol involvement in North Carolina fatal crashes were nearly the same as in the 37 states that did not reduce their BAC limits. It is that high rate, rather than a decrease following enactment of the 0.08% BAC limit, that produces a significantly greater decline in North Carolina than in the other states from the 33 months prior to the 0.08% law to the 39 months following its implementation.

Figure 10a

Police-reported Alcohol Use by Drivers in Fatal Crashes
by Quarter, North Carolina vs. 37 Other States

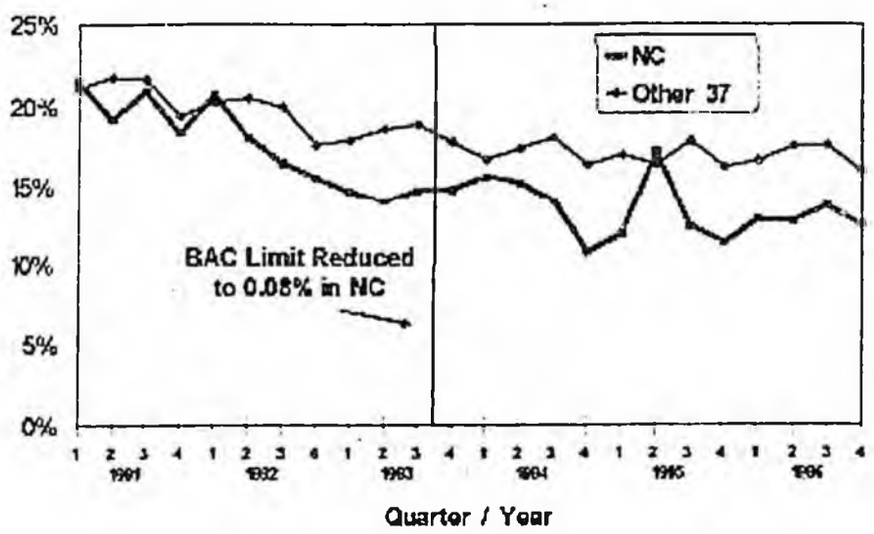
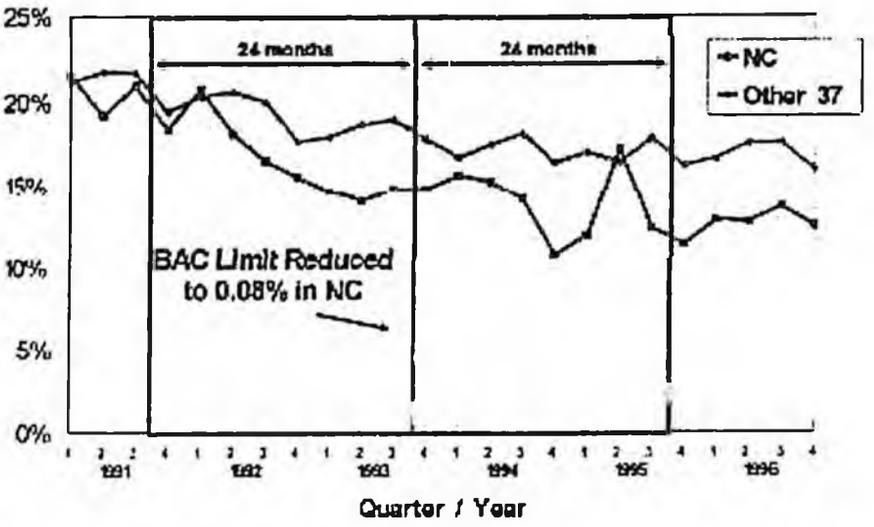


Figure 10b

Police-reported Alcohol Use by Drivers in Fatal Crashes
by Quarter, North Carolina vs. 37 Other States



Clearly there was a change in alcohol involvement, as reported by police officers. However, in view of its timing, it is not reasonable to believe that the change resulted from the lower BAC limit. The divergence between North Carolina and the other states occurred prior to the law. Selection of a different time period for analysis – for example, 24 months prior to and 24 months following enactment of the lower BAC limit – more accurately conveys what occurred prior to the new law (see Figure 10.b.). These before-after time periods are also matched for seasonal effects–covering identical months of the year. The ratio of relative risks comparing North Carolina to the other states for this four year period is 1.07 [.95, 1.20]. That is, there appeared to be a somewhat greater decline in police-reported alcohol use by drivers in fatal crashes, but the difference is not statistically significant.

Another pertinent consideration here is that the North Carolina "Booze-It-and-Lose-It" program was implemented in November, 1994. This effort included the conduct of 3,185 sobriety checkpoints throughout the state between November, 1994 and July, 1995, in conjunction with extensive media coverage of this enforcement activity. The dip in the percent of police-reported alcohol involvement in crashes shown in Figure 10 is coincident with the period during which the Booze-It-and-Lose-It program was at the peak of activity.[12] It is not possible to include the effects of this program in the simple before-after analyses reported here, as was done with earlier time-series analyses. However, it is clear from other time-series analyses (Foss & Stewart, 1998) that there was a reduction in alcohol-involved fatal and serious injury crashes for approximately eight months as a result of the Booze-It-and-Lose-It program. Hence, some of the post-1993 decline in alcohol-involvement in fatal crashes may be attributable to this program. That further undermines our confidence in the effect of the 0.08% BAC limit.

Single Vehicle Nighttime Crashes

Prior to development of the algorithm to estimate alcohol involvement for individual drivers involved in fatal crashes, it was common practice to use surrogate or proxy measures of alcohol involvement. That was a crude way of accomplishing what the estimation procedure does in a more statistically sophisticated fashion. Because crashes that occur at night are more likely to involve alcohol, and those that are single-vehicle crashes are even more likely to be alcohol-related, the incidence of such crashes has been used as an indicator of the extent of drinking-driving. Table 10 presents results of the analysis of single vehicle nighttime (8 p.m. to 4 a.m.) crashes among drivers over age 21 for North Carolina and the 37 other states.

Prior to enactment of the 0.08% law, 16.6% of fatal crashes in North Carolina were single vehicle nighttime crashes. That declined to 15.0% in the 39 months immediately following enactment of the lower BAC limit, a decline of 9.6%. The risk ratio for SVN to other type crashes before vs. after enactment of the law is 1.11. There was a nearly identical decrease in SVN crashes in the other 37 states, from 17.0% to 15.2%, a decline of 10.4% ($p < .001$). The before-after risk ratio for these 37 states is 1.12. The ratio of these changes between North Carolina and the other states is .99, indicating a virtually identical decline in SVN crashes.

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[12] However, there is no apparent explanation for the sharp increase during the 2nd quarter of 1995. That increase reflects only 15 cases out 456 crashes, and does not appear nearly so dramatic in other measures of alcohol involvement.

Table 10. Drivers in single vehicle nighttime (SVN) crashes 1991 - 1996, North Carolina vs. 37 comparison states.

	North Carolina		Other 37 States	
	SVN	**Other**	**SVN**	**Other**
Before (1/1/91 to 9/30/93)	16.6% (691)	83.4% (3,470)	17.0% (14,513)	83.0% (71,001)
After (10/1/93 to 12/21/96)	15.0% (815)	85.0% (4,615)	15.2% (16,320)	84.8% (90,957)
Decline	9.6%†		10.4%*	
Risk Ratio (before/after)	1.11		1.12	
95% Confidence Interval	[1.01, 1.99]		[1.10, 1.14]	
† $p < .05$	$RR_{NC}/RR_{37} = .99$, 95% CI = .90 to 1.09			
* $p < .001$				

Single Vehicle Nighttime Male Driver Crashes

Another, somewhat more refined, proxy measure of alcohol involvement is a single vehicle nighttime crash by a male driver. Table 11 presents results of the analysis of these crashes for North Carolina and the 37 other states.

Table 11. Drivers in single vehicle nighttime male (SVN-M) driver crashes 1991 - 1996, North Carolina vs. 37 comparison states.

	North Carolina		Other 37 States	
	SVN-M	**Other**	**SVN-M**	**Other**
Before (1/1/91 to 9/30/93)	12.7% (530)	87.3% (3,631)	13.7% (11,712)	86.3% (73,802)
After (10/1/93 to 12/21/96)	11.7% (633)	88.3% (4,797)	12.1% (12,988)	87.9% (94,289)
Decline	8.5%‡		11.6%*	
Risk Ratio (before/after)	1.09		1.13	
95% Confidence Interval	[.99, 1.20]		[1.11, 1.16]	
‡ $p < .01$	$RR_{NC}/RR_{37} = .97$, 95% CI = .87 to 1.08			
* $p < .001$				

Prior to enactment of the 0.08% law, 12.7% of fatal crashes in North Carolina were single vehicle nighttime male driver crashes. That declined to 11.7% in the 39 months immediately following enactment of the lower BAC limit, a decline of 8.5%. There was a somewhat greater decrease in SVN-M crashes in

the other 37 states (11.60%). The ratio of these changes between North Carolina and the other states is .97 [.87, 1.08], indicating a non-meaningful difference in these changes.

Estimated Alcohol Involvement

In its examination of the first five states that reduced their BAC limit to 0.08%, the NHTSA used a variable described as 'estimated alcohol,' which was based on three factors: Police-reported alcohol involvement, evidence of a previous alcohol violation on the driver's record, and a positive measured BAC value. The report of this analysis does not give a detailed explanation of how this variable was created. We attempted to conduct a similar analysis as follows: "Estimated driver alcohol use" was considered to be positive if the driver had one or more DWI convictions on his/her record, *or* if there was an alcohol-related charge, *or* if the results of an alcohol test registered a BAC of $\geq$0.01%. Table 12 presents results of the analysis of these crashes for North Carolina and the 37 other states.

Table 12. Drivers' estimated alcohol involvement in fatal crashes 1991 - 1996, North Carolina vs. 37 comparison states.

	North Carolina		Other 37 States	
	Yes	**No**	**Yes**	**No**
Before (1/1/91 to 9/30/93)	25.0% (1,041)	75.0% (3,120)	24.7% (21,155)	75.3% (64,359)
After (10/1/93 to 12/21/96)	20.4% (1,110)	79.6% (4,320)	21.9% (23,458)	78.1% (83,819)
Decline	18.3%*		11.6%*	
Risk Ratio (before/after)	1.22		1.13	
95% Confidence Interval	[1.15, 1.30]		[1.12, 1.15]	
* $p < .001$	$RR_{NC}/RR_{37} = 1.08$, 95% CI = 1.00 to 1.17			

Prior to enactment of the 0.08% law, 25.0% of drivers in fatal crashes in North Carolina were estimated to have been drinking. That declined to 20.4% in the 39 months immediately following enactment of the lower BAC limit. For the other 37 states, estimated drinking declined by 11.61%. The ratio of these changes between North Carolina and the other states is 1.08, indicating a greater relative decrease in estimated alcohol involvement for North Carolina. Again, however, inspecting this variable for 24 months prior to and following the lowered BAC limit suggests that the change seen above results not so much from the effects of the law as from the fact that drinking-driving in North Carolina was comparable to that in the other states in 1991 and early 1992, but then declined relative to other states during the 18 month period prior to enactment of the 0.08% limit. Comparing only the 48 months immediately surrounding the reduction of the BAC limit, the ratio of relative risks is 1.05 [.95, 1.15], a non-significant ($p > .20$) difference.

Summary of Before-After Analyses

Table 13 provides a summary of the findings of the various analyses reported above. For completeness it also includes analyses for the 48 month period October 1, 1991 - Sept. 30, 1995. The 48-month period

was examined to more closely parallel the periods reported in the initial analyses by NHTSA (1994) and to equalize seasonal effects in the before-after periods. The only two measures that show a significantly greater decrease in North Carolina than in the states that retained a BAC limit of 0.10% during 1991-1996 are police-reported alcohol involvement and estimated alcohol involvement.[13] Considering analyses of time periods more proximate to the change in the North Carolina BAC limit, and taking seasonality into account, these findings disappear.

Table 13. Summary of findings from FARS data, North Carolina vs. 37 other states, 72- and 48-month analysis periods

Criterion Measure	Analysis Period			
	1991-96 (33 months before, 39 months after)		48 Months (24 mos. before, 24 months after)	
	Ratio of RRs	95% CI	Ratio of RRs	95% CI
Alcohol > 0.01%	1.06	.98, 1.14	1.04	.94, 1.14
Alcohol > 0.10%	1.06	.97, 1.15	1.02	.92, 1.13
PR-Alcohol	**1.13**	**1.03, 1.25**	1.07	.95, 1.20
SVN	0.99	.90, 1.09	0.97	.92, 1.16
SVN-M	0.97	.87, 1.08	0.93	.81, 1.06
Est. Alcohol	**1.08**	**1.00, 1.17**	1.05	.96, 1.15

Comparison of North Carolina with other states

North Carolina has a reputation for being tough on drinking drivers as is reflected in the comprehensiveness of its DWI laws. It was one of only three states to receive an A- rating by MADD in its recent review of state DWI laws. In addition, beginning in late 1994, North Carolina implemented an extensive high visibility DWI enforcement program (Booze-It-and-Lose-It), which resulted in 3,185 DWI checkpoints being conducted throughout the state between November of 1994 and July, 1995. For these and perhaps other reasons, it may be that North Carolina is an atypical state in terms of drinking-driving.

It is difficult to know whether any characteristics on which a state may differ from others with respect to traffic safety laws or programs is a meaningful one – a factor that should be taken into account when deciding whether any findings from that state should be generalized to other states. We can, however, examine whether various indicators of drinking-driving are dramatically different in North Carolina when compared to the rest of the nation. To address this issue, Table 14 compares North Carolina with the 37 states on each of the six criterion measures examined above prior to enactment of the 0.08% law. It is clear that there are some statistically meaningful differences. For example, 1.7% fewer drivers involved in fatal crashes in North Carolina between 1991 and 1993 had a high BAC ($\geq$ 0.10%); 2.3% fewer were reported by the investigating officer to have been drinking. On the other hand, there were negligible and non-significant differences on several other measures.

[13] It is important to keep in mind that these are not independent findings, since police-reported alcohol involvement is one of the elements of the 'estimated alcohol' measure.

In sum, although there are some statistically significant differences between North Carolina and other states, the magnitude of these differences is relatively small. Hence, it would not appear that during the early 1990s North Carolina was so atypical with respect to drinking-driving, that we should hesitate to generalize findings from this or other studies of drinking drivers, to the U.S. in general.

Table 14. Comparison of North Carolina with 37 comparison states on six measures of drinking-driving in fatal crashes for 1991 - 1993.

Measure	NC	37 States	Difference	z
BAC Over .01%	24.1%	27.9%	-3.8%	5.54*
BAC Over .10%	22.0%	23.7%	-1.7%	2.65*
Police-Reported Alcohol	17.4%	19.7%	-2.3%	4.11*
SVN	16.3%	16.8%	-0.5%	0.88
SVN-M	17.1%	18.2%	-1.1%	1.57
Estimated Alcohol	24.8%	24.5%	0.2%	0.35

*Note. z-test for difference of proportions. $p < .01$

❑ CONCLUSION

There appears to have been little clear effect of the lower BAC limit in North Carolina. Survey data indicate that the general public believes the new law was well-publicized. Although awareness of the new lower limit was not particularly high nearly 18 months after the law took effect, frequent drinkers did evidence a substantial degree of awareness that the law had changed and about what the new BAC limit was. As is typical in North Carolina, enforcement of the lower limit was vigorous and strict. Hence, it appears that the most likely explanation for the lack of a demonstrable effect of the lower BAC limit is that the drinking-driving population in North Carolina at the time the lower limit took effect was simply unresponsive to this change. Whether that is because, following a substantial reduction in drinking-driving behavior, the remaining drinking-drivers in North Carolina represented a 'hard core' that cannot be affected by such broad policies, or that this particular policy simply does not have the potential to measurably affect drinking drivers in general, is unknown.

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Appendix A

Detailed presentation of stochastic time series models fit to various types of alcohol-related North Carolina crashes as summarized in Table 3 .

Note. The models for percent of alcohol-related fatal or serious injury crashes (table 3.b.) contain no stochastic components. Hence, these reduce to simple regression models. These models also contain no seasonal factors. As a result residual autocorrelations are only computed through lag 14, and, hence, Q(14) is presented for these models rather than Q(15) as is reported for other series. Similarly since no seasonal patterns were found, no value of R^2_S is computed for these models.

Table 3. Parameters for logit models of various indicators of alcohol-involved North Carolina crashes, 1991 - 1995.

3. a. PERCENT OF CRASHES INVOLVING ALCOHOL – all levels of severity

Components of Model:

- Stochastic level, trend, seasonal
- Autoregressive term at lag 7,
- Number of weekend days per month

Intervention (1)	*estimate*	*s.e.*	*t-ratio*	*p-value*
Shift in level	-.038	.038	-1.007	.320
		Residual Autocorrelations	*Goodness-of-Fit*	
		Q(5) = 2.26	R^2 = .941	
		Q(10) = 6.88	R^2_D = .679	
		Q(15) = 10.64	R^2_S = .549	

Intervention (2)	*estimate*	*s.e.*	*t- io*	*p-value*
Change in trend	.001	.009	.168	.866
		Residual Autocorrelations	*Goodness-of-Fit*	
		Q(5) = 1.98	R^2 = .940	
		Q(10) = 8.88	R^2_D = .673	
		Q(15) = 14.09	R^2_S = .541	

3. b. PERCENT OF CRASHES INVOLVING ALCOHOL – severe and fatal crashes only.

Components of Model:

- Fixed level, fixed trend

Intervention (1)	*estimate*	*s.e.*	*t-statistic*	*p-value*
Shift in level	.023	.058	.390	.698
		Residual Autocorrelations	*Goodness-of-Fit*	
		Q(5) = .442	R^2 = .759	
		Q(10) = 7.00	R^2_D = .470	
		Q(14) = 7.86		

Intervention (2)	*estimate*	*s.e.*	*t-statistic*	*p-value*
Change in trend	-.0001	.003	-.017	.986
		Residual Autocorrelations	*Goodness-of-Fit*	
		Q(5) = .426	R^2 = .758	
		Q(10) = 7.13	R^2_D = .468	
		Q(14) = 8.09		

Table 3. Results for Logit Models (Continued)

3. c. PERCENT OF CRASHES OCCURRING AT NIGHT – all levels of severity

Components of Model:

- Stochastic level, trend, seasonal
- Autoregressive term at lag 4
- Number of weekend days per month

Intervention (1)	*estimate*	*s.e.*	*t-statistic*	*p-value*
Shift in level	-.022	.022	-1.033	.308
		Residual Autocorrelations	*Goodness-of-Fit*	
		Q(5) = 3.25	R^2 = .760	
		Q(10) = 5.88	R^2_D = .694	
		Q(15) = 11.26	R^2_S = .432	

Intervention (2)	*estimate*	*s.e.*	*t-statistic*	*p-value*
Change in trend	.001	.003	.305	.762
		Residual Autocorrelations	*Goodness-of-Fit*	
		Q(5) = 3.63	R^2 = .733	
		Q(10) = 5.72	R^2_D = .659	
		Q(15) = 12.03	R^2_S = .368	

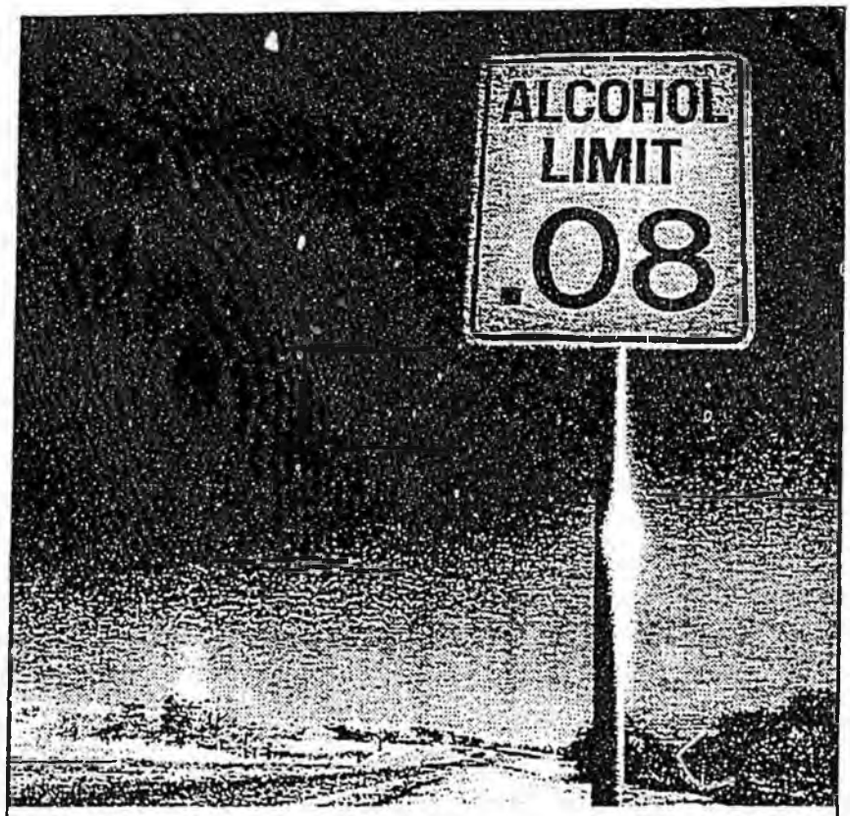
3. d. PERCENT NIGHTTIME CRASHES – serious and fatal crashes only

Components of Model:

- Fixed level, fixed trend, stochastic seasonal
- Number of weekend days per month

Intervention (1)	*estimate*	*s.e.*	*t-statistic*	*p-value*
Shift in level	.050	.040	1.240	.222
		Residual Autocorrelations	*Goodness-of-Fit*	
		Q(5) = 3.26	R^2 = .610	
		Q(10) = 7.68	R^2_D = .633	
		Q(14) = 11.15	R^2_S = .446	

Intervention (2)	*estimate*	*s.e.*	*t-statistic*	*p-value*
Change in trend	.003	.002	1.075	.288
		Residual Autocorrelations	*Goodness-of-Fit*	
		Q(5) = 2.30	R^2 = .611	
		Q(10) = 8.58	R^2_D = .633	
		Q(15) = 12.48	R^2_S = .447	



TO ALL THE SIGNS THAT MAKE DRIVING A LITTLE SAFER, WE'D LIKE TO ADD ONE MORE.

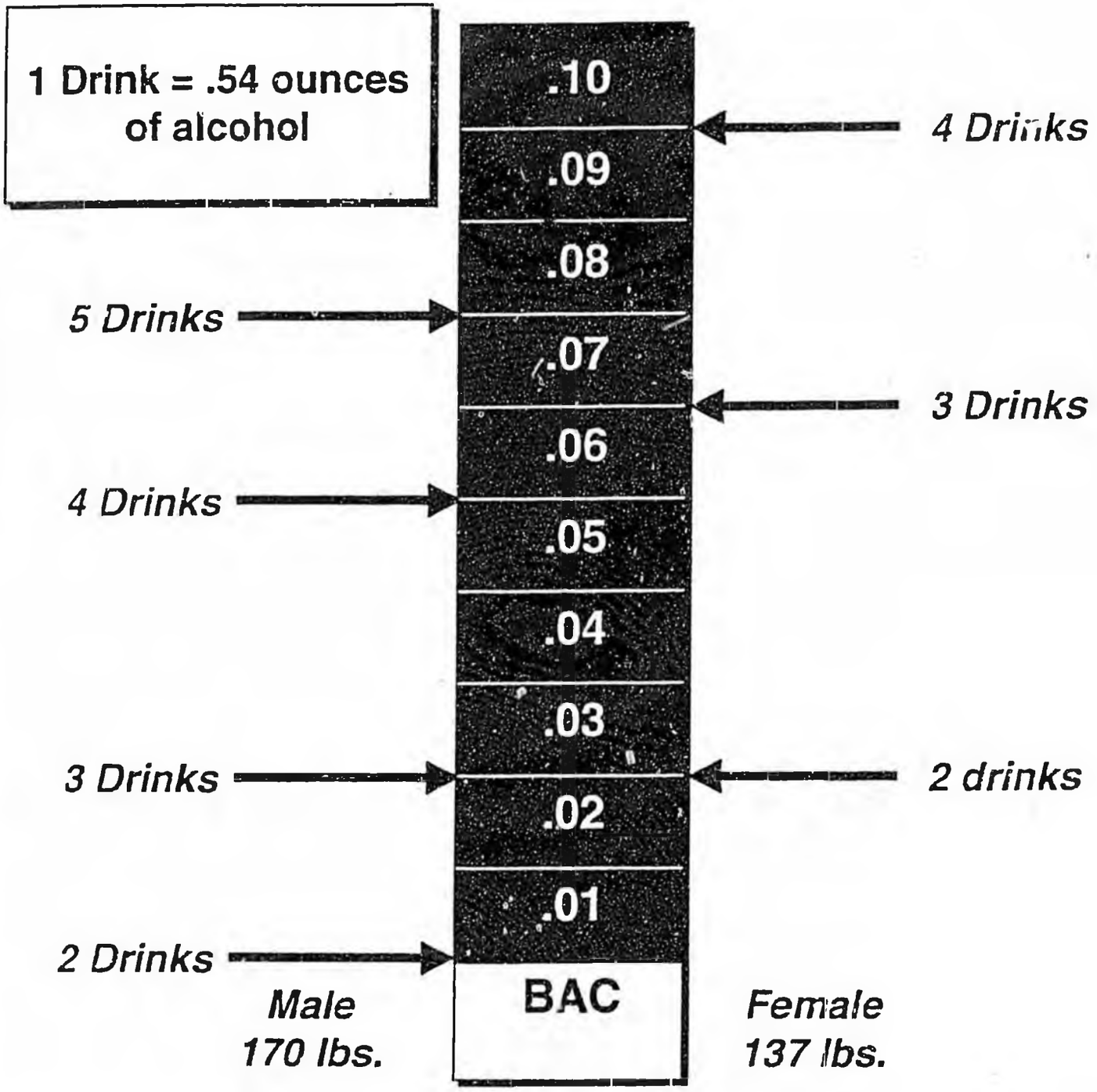
Even though your ability to drive a car is seriously impaired at a blood alcohol level of .08, most states only prosecute at .10 or higher. We'd like every state to make .08 the blood alcohol limit. If you want to help, please call or write your state legislators. Together we can make this a sign of life.

MADD

Mothers Against Drunk Driving

.08
Illegal Per Se

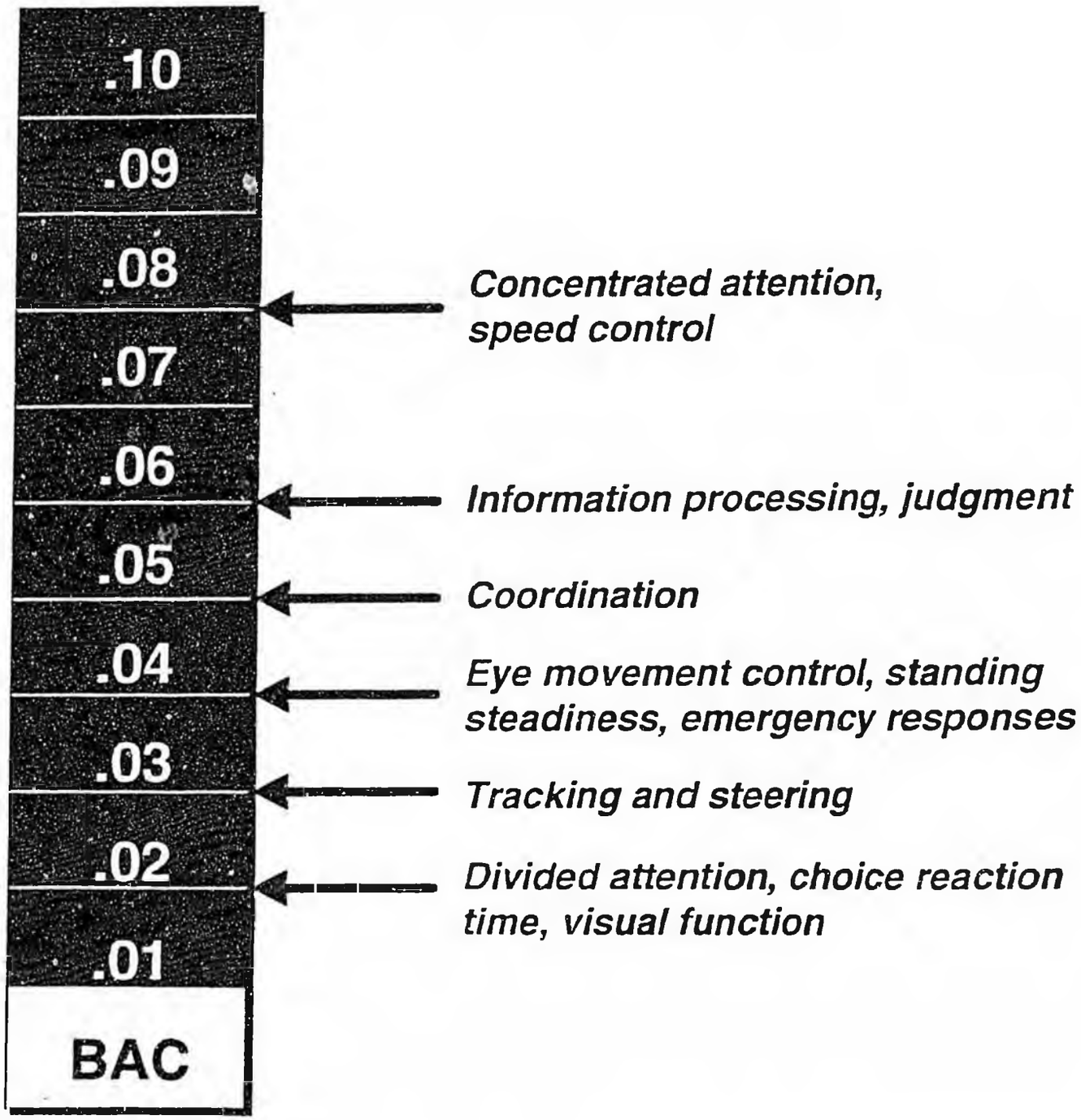
Number of Drinks and BAC in Two Hours of Drinking



.08 Illegal Per Se

- Driving at .08 BAC or above constitutes the violation in and of itself (no other factors are needed as evidence).
- *Articulable suspicion* for making the stop and "probable cause" for making the arrest must still be demonstrated.
- *Burden of proof* is less for the prosecutor.

BAC and Impairment



Alcohol Limits for Drivers
A Report to Congress
NHTSA-USDOT February 1991

- No "safe" BAC level
- All States should have "Per Se" laws
- .08 should be adopted
- Multilevel system of administrative, civil, and criminal penalties should be considered

Driving Under the Influence: A Report to Congress on Alcohol Limits

- **Enact .08 BAC as per se criminal offense**
- **Accompany lower limits with PI&E**
- **Repeal laws that create presumption drivers *not* under influence at any BAC above .00**
- **"Don't drink and drive"**
- **"Don't drive if you have been drinking"**

National Highway Traffic Safety Administration
United States Department of Transportation

July 1992

Effectiveness of .08 Laws

- **Impact of .08 in five states, NHTSA, 1995**
  - Significant reductions in A/R fatal crashes in 4 out of 5 states ranging from 4% (CA) to 40% (VT)
- **Effect of .08 in 5 states, Boston University, 1996**
  - 5 States with .08 matched to 5 states with .10 showed 16% reduction in driver fatalities at .08+ and an 18% reduction in driver fatalities at .15+ due to .08 laws.

Effectiveness of .08 Per Se

- **NHTSA evaluated effects of .08 in California**
- **Results:**
  - **81% knew BAC limit was stricter**
  - **Increase in DUI arrests**
  - **12% reduction in A/R fatalities**
  - **Some of effects due to ALR**

BAC Limits in Other Countries

Country	Illegal Per Se
Canada	.08
Great Britain	.08
Australia	.05
Austria	.08
Switzerland	.08
Netherlands	.05
Norway	.05
Finland	.05
Sweden	.02

Who Supports Lower BAC Levels?

- **AMA** — American Medical Association
- **NSC** — National Safety Council
- **NCUTLO** — National Committee on Uniform Traffic Laws and Ordinances
- **AAAM** — Association for the Advancement of Automotive Medicine
- **NIAAA** — National Institute for Alcohol Abuse and Alcoholism
- **NHTSA** — National Highway Traffic Safety Administration

.08 Per Se

- **Will .08 affect problem drinker drivers (BACs ≥ .15)?**
  - **Significant reductions in the proportion of fatally injured drivers with BACs ≥ .20 occurred in California after .08 went into effect**
  - **Significant reductions in the proportion of fatally injured drivers with BACs ≥ .15 occurred in Boston University 5 state study due to .08 law**
  - **.08 serves as a general deterrent, if accompanied with PI&E even for drinkers who reach high BACs**

The .08 Per Se Law Will:

- Increase the arrest and conviction rates for impaired drivers at .10 and above
- Raise the perceived risk of arrest for driving after drinking
- Improve public awareness about how much alcohol it takes to be dangerously impaired
- Bring the U.S. closer to per se limits of most industrialized nations

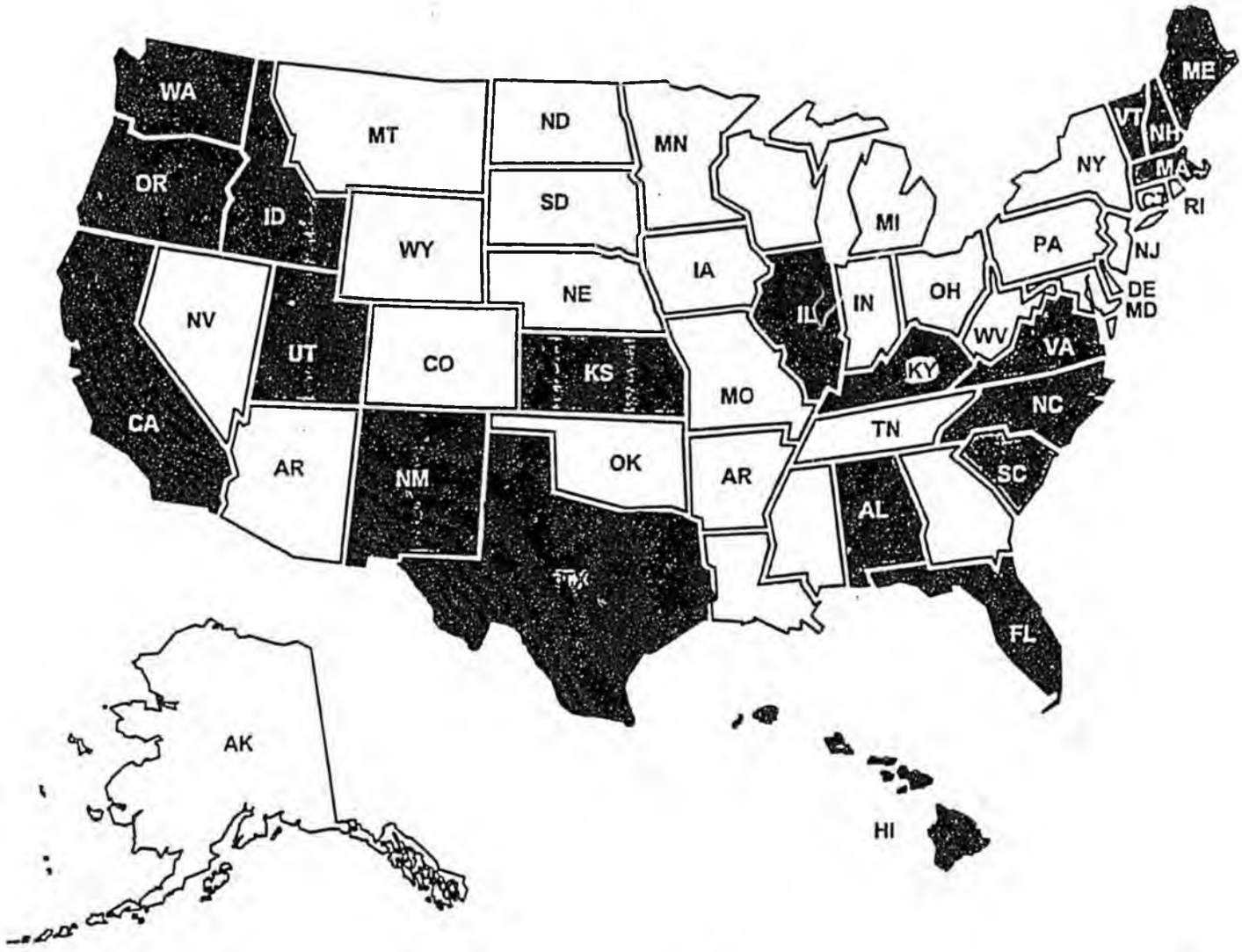
Cost/Benefit of .08 Laws

- Minimal costs to implement
- Small increase in arrests, but not enough to overburden the courts
- Same rules of enforcement apply (articulable suspicion; probable cause)
- Law sends a message to the public that the State is getting tougher on impaired driving
- Potential benefits far outweigh any costs

.08 In Summary ...

- Is not just a couple of drinks after work
- Is a level at which critical driving skills are impaired
- Is a level above which the risk of crash is increased substantially
- Is a level which most industrialized countries have adopted
- Is a proven effective measure which will reduce alcohol-related fatalities

States With BAC Per Se Laws



.08 BAC (AL, CA, FL, HI, ID, IL, KS, ME, NC, NH, NM, OR, UT, VA, VT, WA)

.10

No Per Se Law (MA, SC)

Alcohol-Related Relative Risk of Driver Fatalities and Driver Involvement in Fatal Crashes in Relation to Driver Age and Gender: An Update Using 1996 Data*

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ABSTRACT. *Objective:* To re-examine and refine estimates for alcohol-related relative risk of driver involvement in fatal crashes by age and gender as a function of blood alcohol concentration (BAC) using recent data. *Method:* Logistic regression was used to estimate age/gender specific relative risk of fatal crash involvement as a function of the BAC for drivers involved in a fatal crash and for drivers fatally injured in a crash, by combining crash data from the Fatality Analysis Reporting System with exposure data from the 1996 National Roadside Survey of Drivers. *Results:* In general, the relative risk of involvement in a fatal vehicle crash increased steadily with increasing driver BAC in every age/gender group among both fatally injured and surviving drivers. Among 16-20 year old male drivers, a BAC increase of 0.02% was estimated to more than double the relative risk of fatal single-vehicle crash injury. At the midpoint of the 0.08% - 0.10% BAC range, the relative risk of a fatal single-vehicle crash injury varied between 11.4 (drivers 35 and older) and 51.9 (male drivers, 16-20). With only very few exceptions, older drivers had lower risk of being fatally injured in a single-vehicle crash than younger drivers, as did women compared with men in the same age range. When comparable, results largely confirmed existing prior estimates. *Conclusions:* This is the first study that systematically estimated relative risk for drink-drivers with BACs between 0.08% and 0.10% (these relative risk estimates apply to BAC range midpoints at 0.09%.) The results clearly show that drivers with a BAC under 0.10% pose highly elevated risk both to themselves and to other road users. (*J. Stud. Alcohol* 61: 387-395, 2000)

BASED ON extensive research over several decades, we now have overwhelming evidence showing that even blood alcohol concentration (BAC) levels as low as 0.02% impair driving-related skills. One such line of evidence grows out of laboratory research with dosed subjects (Moskowitz and Robinson, 1987; see also National Institute on Alcohol Abuse and Alcoholism, 1997, chapter 7). Confirming evidence also comes from field research that compares the BACs of crash-involved with noncrash-involved drivers to determine the relative risk of crash involvement (for a review, see Perrine et al., 1989; Zador, 1991).

According to National Highway Traffic Safety Administration (NHTSA) information, as of September 1999, 31 states defined driving with a BAC above 0.10% as a crime per se, while another 17 states plus the District of Columbia set their per se limit at 0.08%. (Under a per se law it is a crime to drive with a BAC at or above the proscribed level; two states, Maryland and South Carolina, do not have a per se law but a presumptive limit.) Due to a combination of legal measures, enforcement actions and changes in voluntary behavior patterns, alcohol-related fatalities have been declining for nearly 2 decades, both in absolute numbers and as a proportion of all fatalities. Nonetheless, there were still 15,936 alcohol-related traffic fatalities in the United States that accounted for nearly 38% of total traffic fatalities in 1998 (NHTSA, 1999), indicating that much more needs to be done.

The objective of the present research is to re-examine and refine relative fatal crash risk estimates, in a systematic fashion using more recent data. It extends similar prior work by the first author, in three important ways. First, we estimate relative risk for the policy-relevant BAC range of 0.08% to 0.10%. Second, we estimate relative risk for six driver groups: (1) driver fatalities in single-vehicle crashes, (2) driver involvements in single-vehicle fatal crashes, (3) driver fatalities in two-vehicle crashes, (4) driver involvements in two-vehicle fatal crashes, (5) driver fatalities in all crashes and (6) driver involvement in all fatal crashes. Third, we employ statistical methods to estimate both the effect of sampling roadside exposure and the effect of multiple imputation of missing BACs on the uncertainty of relative risk estimates.

Method

Data sources

Driver exposure data: the 1996 Roadside Survey. The 1996 National Roadside Survey (96NRS) of weekend nighttime drivers in the 48 contiguous states followed the same principles as its two predecessors (in 1973 and 1986). A

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sample of noncommercial operators of four-wheel motor vehicles was interviewed and breath-tested during a roughly 1-month period in the fall of 1996. Counties with a population of less than 20,000 were not sampled, and in counties with larger populations, roadways with average daily traffic below 2,000 were excluded from the surveys (for details, see Lestina et al., 1999). Using a geographically stratified multistage cluster sample, drivers were selected for interviews and breath tests. This survey was designed based on the National Automotive Sampling System/Crashworthiness Data System (NASS/CDS) (NHTSA, 1995). The first stage of the design comprised 24 primary sampling units (PSUs) employed by NASS/CDS, six each in the Northeast, South, West and Midwest regions. The second stage comprised a total of 46 police jurisdictions: 11-12 per region. At the third stage, square grids with sides roughly equal to 1 mile were superimposed on the sampled jurisdictions and then randomly sampled to obtain the requisite number of squares (this procedure was modified for areas with low road density). Once a square was chosen, the survey was conducted at the first safe area found in it by the survey team leader. Driver selection represented the final stage: the first driver who approached the site after an interviewer became available was stopped for the next interview. Field operations were conducted on Friday and Saturday nights during two 2-hour periods at separate sites: at one site between 10 pm and midnight, and at the other between 1 am and 3 am. Data from the 96NRS is only representative of locations and periods when drinking and driving is most prevalent (i.e., not of all times or roadways in the 48 contiguous states).

We adjusted driver sampling weights from the 96NRS for nonrespondents, and used the adjusted weights to approximate the statistical distribution of drivers on weekend nights (exposure), by gender, age (16-20, 21-34 and ≥ 35) and % BAC (0.000, 0.001-0.019, 0.020-0.049, 0.050-0.079, 0.080-0.099, 0.100-0.149 and 0.150+). For details on nonresponse adjustments, see Lestina et al. (1999) and Zador et al. (in press).

Data on drivers in fatal crashes. The Fatality Analysis Reporting System (FARS) is a census of all fatal motor vehicle crashes that occur on public trafficways in the United States and result in a fatality within 30 days. Although FARS is maintained by NHTSA of the U.S. Department of Transportation, the data in FARS are obtained through cooperative agreements with agencies in each state's government and are managed by regional contracting officer's technical representatives located in the 10 NHTSA regional offices. For basic data elements associated with a fatal vehicle crash, reporting is usually of very high quality with relatively few missing values, however, there is one exception: even in recent years, BACs were not available for many drivers involved in fatal crashes. To deal with this problem, NHTSA has employed a statistical method since the early 1980s for imputing missing BACs (Klein, 1986). More recently, the method of multiple imputation (Rubin, 1987) was adopted to handle the problem of missing BACs on FARS (Rubin et al., 1999). Under multiple imputation, each missing value is replaced by a small number of imputed values (10, in the present case) that are generated by a statistical procedure designed to reflect the statistical properties of the missing driver BACs. We used the 10 complete-data versions of FARS in our statistical analyses. Note that, although the data files for the multiple imputation method are available, NHTSA is not yet using the multiple imputation method for its published alcohol estimates. The same method used in previous years is to be used for the 1998 FARS estimates.

We selected drivers of four-wheel passenger vehicles who were 16 years of age and over and were involved in fatal crashes during 1995 or 1996 in 1 of the 48 contiguous states (NHTSA, 1995-96). The crash had to have occurred on a weekend night in a county with a 1990 population of at least 20,000; outside of special jurisdictions; and on a paved road that was not classed as an interstate, other urban freeway or expressway. There were only two notable differences between the exposure and the crash screening criteria, and both were disregarded to increase the sample size for drivers retained for the analyses. First, we accepted crashes that occurred between midnight and 1 AM, since those crashes were excluded from the exposure sample only to permit the survey team to change location, and not because BAC distribution between midnight and 1 AM was thought to be different. Second, we did not restrict crashes to the weekend nights during which the surveys were conducted. Including weekend nights for the whole year increased sample sizes almost 12-fold and introduced no substantial difference in the distribution of driver BACs since driver BACs varied little between the survey period and the rest of the year. We classified the drivers meeting these selection criteria by the number of crash-involved vehicles (one, two, and any number of vehicles) and by whether the driver was just involved in the crash or was also fatally injured in the crash. We thus defined six driver groups for analysis: drivers fatally injured in single-vehicle crashes, drivers involved in fatal single-vehicle crashes, drivers fatally injured in two-vehicle crashes, drivers involved in fatal two-vehicle crashes, drivers fatally injured in a motor-vehicle crash and drivers involved in a fatal motor-vehicle crash. We classified the six groups of driver fatalities and involvements by gender, age group and BAC, in the same way we classified the exposure sample.

Statistical methods

Using odds ratios and logistic regression to estimate relative risk. Following Zador (1991), we base our methods on the intuitive notion that comparisons between the frequency distribution of fatal-crash involvement by gender, age and BAC, and the frequency distribution of roadside exposure by gender, age and BAC, can provide a good yardstick for measuring the effect of these factors on the relative likelihood of fatal-crash involvement per unit of driving exposure. Since the 96NRS did not provide a national estimate for total miles

TABLE 2. Logistic regression coefficients in models for risk of driver fatalities and driver involvement in single-vehicle crashes, in two-vehicle crashes and in all crashes as a function of variables for age, gender and interactions of age, gender and BAC. Data from the 96NRS and the 1995-96 FARS.

		Single-vehicle crashes		Two-vehicle crashes		All crashes	
Variable	Parameter	Fatalities	Involvements	Fatalities	Involvements	Fatalities	Involvements
Age 16-20	Coefficient[a]	−1.547	−0.572	−2.184	−0.873	−1.077	0.085
	SE	0.072	0.063	0.060	0.057	0.065	0.057
Age 21-34	Coefficient	−2.352	−1.205	−2.643	−1.187	−1.654	−0.331
	SE	0.042	0.028	0.051	0.034	0.036	0.025
Age 35+	Coefficient	−2.540	−1.656	−2.425	−1.291	−1.672	−0.591
	SE	0.043	0.039	0.037	0.036	0.036	0.039
Female	Coefficient	−0.580	−0.509	−0.065	−0.265	−0.351	−0.356
	SE	0.069	0.053	0.054	0.043	0.053	0.042
BAC < .019, age 21+	Coefficient	−2.861	−1.889	−1.593	−2.004	−2.031	−1.925
	SE	0.375	0.126	0.121	0.134	0.137	0.106
BAC[a], age 16-20	Coefficient	0.044	0.039	0.032	0.031	0.041	0.035
	SE	0.007	0.006	0.005	0.005	0.006	0.005
BAC, age 16-20, female	Coefficient	−0.014	−0.015	−0.006	−0.015	−0.016	−0.016
	SE	0.006	0.005	0.006	0.005	0.006	0.005
BAC, age 21-34	Coefficient	0.029	0.024	0.023	0.019	0.026	0.020
	SE	0.001	0.001	0.001	0.001	0.001	0.001
BAC, age 35+	Coefficient	0.027	0.024	0.020	0.018	0.023	0.020
	SE	0.001	0.001	0.001	0.001	0.001	0.001
Model diagnostic							
Heterogeneity factor		1.6979	1.7774	1.8783	3.3159	2.0918	3.7070
Max-rescaled R^2		0.6844	0.4935	0.6524	0.3142	0.5297	0.3171
H-L goodness-of-fit, p		0.1998	0.6806	0.0317	0.0001	0.4008	0.0002
Normality of residuals, p		0.2813	0.0606	0.5701	0.4175	0.2189	0.0165

[a]BAC represents driver BAC as a continuous variable.
[b]A positive (negative) parameter indicates that variable and risk change in the same (opposite) directions.

was adequately represented by the models in Table 2 for three of the driver groups: drivers involved in a fatal single-vehicle crash, drivers killed in a single-vehicle crash and drivers killed in any vehicle fatal crashes. While the Hosmer-Lemeshow test statistic ($p = .032$) rejected the hypothesis of model fit for fatally injured drivers in two-vehicle crashes, the regression model explained 65% of all explainable relative risk variation, and the standardized Pearson residuals were normally distributed. Overall, we deem model fit acceptable for driver fatalities in two-vehicle crashes. In contrast, the models performed poorly for the two remaining driver groups—drivers in fatal crashes involving two vehicles or drivers in fatal crashes involving any number of vehicles.

We explored, in considerable detail, the way our models broke down for fatal two-vehicle crashes. We examined model fit statistics for the models in Table 2 and for several other model specifications, including specifications obtained by stepwise regression (for a summary of results for a few of the dozens of models that were examined, see the Appendix). The results showed clearly that sober driver involvement in two-vehicle crashes is not closely related to driver involvement at positive BACs, and we discovered that only the inclusion of indicator variables representing overall sober driver risk, and sober driver risk by age and gender, would produce acceptable model fit. This result was, in fact, not too surprising—for two reasons. First—in crashes involving more than a single vehicle, some drivers may be innocent (and probably sober) victims whose vehicles were struck by a high BAC at-fault driver. Second, in multivehicle crashes, crash configuration and vehicle occupancy become important determinants of relative risk. However, we decided not to use regression models that included sober driver risk variables (e.g., main effect for zero BAC, zero BAC by age interaction, etc.; see Appendix) because it was not clear how these models can be used to estimate relative risk with BAC = 0 as the baseline. Therefore, relatively poor model fit notwithstanding, we believe that the relative risk estimates presented from the model parameter estimates in Table 2 provide reasonable, albeit conservative, approximations of the true relative risk, even for driver involvement in multivehicle fatal crashes. Additional research will be needed to improve model fit for these driver groups.

Table 3 shows model-based estimates for factor of proportionate increase in relative risk associated with an increase of 0.02% in BAC level for each driver group, by age and gender. Of noteworthy mention, it was estimated that each 0.02 percentage point increase in the BAC of a driver with a nonzero BAC more than doubled the risk of receiving a fatal injury in a single-vehicle crash among male drivers aged 16-20, and nearly doubled the comparable risk among the other driver groups. Proportionality factors were estimated from age-specific regression coefficients of BAC in Table 2, except that for female drivers aged 16-20 the estimates were adjusted for the effect of being female. For the relative risk estimates in subsequent tables, relative risk was

In general, the pattern of results for the other driver groups was quite similar to the pattern described above (see Zador et al., in press). There are two major differences among the other driver groups: (1) For fatally injured drivers, relative risk increased more slowly with increasing BAC in two-vehicle than in single-vehicle crashes. As indicated earlier, this was to be expected since in multivehicle fatal crashes some involved drivers were likely to be no more than marginally at-fault. (2) Since most fatally injured drivers were killed in a single-vehicle or in a two-vehicle crash, the overall rate of increase in relative risk was bracketed by the rates of increase for single-vehicle and two-vehicle crashes.

Discussion

Confirmatory findings

This study generally confirmed that the relative risks of fatal injury and fatal crash involvement increase steadily with increasing driver BAC within each of the six driver age and gender groups studied. The only exception was that among drivers 21 and over, relative risk was lower at near-zero positive BAC than at zero BAC. The classic Grand Rapids study by Borkenstein et al. (1974) found a similar "dip" in the risk curve. Hurst (1973) showed that controlling self-reported drinking frequency eliminates the Grand Rapids dip. The customary interpretation of these results is that the anomalous dip probably results from differing alcohol tolerance between crash-involved and noncrash-involved drivers. Since drinking frequency data were not available in our study, we were unable to estimate risk curves by drinking frequency. With few exceptions, relative risk was found to decrease with increasing driver age at every BAC level, for both men and women—a finding that extends similar age trends reported for more moderate BACs by Zador (1991).

The current study also confirms the substantially higher relative risk for involvement in a single-vehicle crash of young drivers at a zero BAC as previously reported by Mayhew et al. (1986). In addition, female drivers exhibited substantially lower relative risk than male drivers of the same age. To a somewhat lesser extent, both sets of findings were also true for most of the other five driver groups studied.

In this study, lower and upper 95% confidence bound estimates for relative risk as a function of driver BAC take into account both the sampling variation of the roadside driver exposure sample and the effect of multiple BAC imputations performed by Rubin and Schaffer (1998) for NHTSA. Not surprisingly, relative risk confidence intervals are wide (e.g., lower and upper confidence bounds were 16.5 and 164 for male drivers ages 16-20 killed in single-vehicle crashes with a BAC between 0.08% and 0.10%; these relative risk estimates apply to BAC range midpoints at 0.09%). We note that the width of 95% confidence intervals increases with increasing BACs for mathematical reasons (both relative risk and its confidence bounds depend exponentially on the corresponding logistic regression parameters). We also note that, allowing for comparable variation in prior estimates, the relative risk estimates presented here are largely in line with estimates published elsewhere. (Relative risk estimates presented in this article differ in several ways from similar estimates in Zador [1991]. In the earlier study, the baseline BAC group was defined to include drivers at or below a BAC of 0.01%, age groups and BAC groups were defined differently, driver fatalities were included from only 29 states with low rates of missing BACs, missing BACs were not imputed, and the numeric BAC values were not used in analyses except to classify drivers.)

New findings

This is the first study that estimated relative risk from compatible data sources using the same methods for six groups of drivers involved in fatal crashes that were defined by the number of crash-involved vehicles and by whether the driver was only involved or also fatally injured in the crash. Drivers killed in single-vehicle crashes are of particular interest for assessing the *pure* effect of drink-driving because in single-vehicle crashes: (1) driver fault is not shared, (2) crash configuration is less of a factor, (3) vehicle occupancy is not relevant and (4) the seating position of the fatally injured occupant is fixed. In two-vehicle crashes, the possibility that fault may be split between two drivers, one or both of whom may have a (possibly different) positive BAC, would seem to make it difficult to estimate the pure effect of BAC on crash risk. It was all the more gratifying to find that the relative risk of a fatal driver injury depends on driver BAC in almost the same way for single-vehicle crashes and two-vehicle crashes, provided that the relative risk model of two-vehicle crashes statistically accounted for the possible roles of not at-fault sober drivers (see Appendix). In this study, we focused on the general effect on relative risk of a positive driver BAC, rather than on its pure effect. Our main statistical model for estimating relative risk did not, therefore, adjust relative risk estimates for the overrepresentation of sober (probably not-at-fault) drivers. Consequently, the model we used in this study appears to have generally underestimated the pure effect of positive driver BAC on relative risk, except for drivers in single-vehicle crashes.

As noted earlier, this study confirmed that relative risk and driver age are inversely related at every BAC. However, somewhat surprisingly and in part contrary to Zador (1991), we also found that for the 16-20 age group, women had lower relative risk than men at every BAC. For BACs of 0.02% and over, this lower relative risk was roughly comparable to relative risk among adult drivers aged 21 to 34—an important finding because of the increasing nighttime presence of young female drinking drivers observed in the 96NRS. That most recent survey found more, although not significantly more, female than male drinking drivers in the 16-20 age group. Perhaps the lower relative risk could be attributed to

surprising that, in every age group, the regression coefficients of BAC for driver involvement in fatal two-vehicle crashes are substantially higher in the model that incorporates a zero-BAC term than in the corresponding model that does not (this finding is actually a mathematical consequence of the fact that zero-BAC coefficients are always positive). It is surprising, however, that in every age group the regression coefficients of BAC in the model for driver involvement in fatal two-vehicle crashes that incorporates a zero-BAC term are only slightly smaller than similar age-group regression coefficients for fatally injured drivers in single-vehicle crashes. This suggests that positive BAC affects single-vehicle fatalities and two-vehicle crash involvement to roughly the same extent, provided that not-at-fault sober drivers are suitably accounted for. However, until confirmed by additional research, this finding must be considered more as a hypothesis than a definitive conclusion. Note, however, that similar suggestions were also made in Zador (1991).

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American Journal of Public Health

Reprint

Public Health Briefs

Lowering State Legal Blood Alcohol Limits to 0.08%: The Effect on Fatal Motor Vehicle Crashes

Ralph Hingson, ScD, Timothy Heeren, PhD, and Michael Winter, MPH

ABSTRACT

Objectives. This study was undertaken to determine whether reductions in alcohol-related fatal crashes following adoption of 0.08% legal blood alcohol limits were independent of general regional trends.

Methods. The first five states that lowered legal blood alcohol limits to 0.08% were paired with five nearby states that retained a 0.10% legal standard. Within each pair, comparisons were made for the maximum equal available number of pre- and postlaw years.

Results. States adopting 0.08% laws experienced 16% and 18% relative postlaw declines in the proportions of fatal crashes involving fatally injured drivers whose blood alcohol levels were 0.08% or higher and 0.15% or higher.

Conclusions. If all states adopted 0.08% legal blood alcohol limits, at least 500 to 600 fewer fatal crashes would occur annually. (*Am J Public Health.* 1996;86:1297–1299)

Introduction

In 1994, 16 589 people died and nearly 297 000 persons were injured in alcohol-related traffic crashes.[1] Several different types of studies have reported that driver impairments begin at blood alcohol levels well below the 0.10% legal standard in most states. Experimental laboratory studies have shown that at 0.08%, a level reached by a 150-lb person consuming four drinks an hour on an empty stomach, there is reduced peripheral vision, poorer recovery from glare, poor performance on complex visual tracking, and reduced divided attention performance.[2] Driver simulation and road course studies have revealed poor parking performance, impaired driver performance at slow speeds, and steering inaccuracies[3]; roadside observational studies have identified speeding and breaking performance deterioration.[4] A national comparison of drivers in single-vehicle fatal crashes with drivers not in fatal crashes but stopped at roadside surveys indicated that each 0.02% increase in blood alcohol level nearly doubles the risk of fatal crash involvement. In all age and sex groupings, the fatal crash risk at a blood alcohol level of 0.05% to 0.09% was at least nine times greater than that at zero blood alcohol.[5]

To reduce alcohol-related fatal traffic crashes, 14 states have lowered the legal blood alcohol limit from 0.10% to 0.08%. Johnson and Walz[6] monitored six different measures of driver involvement in alcohol-related fatal crashes in the first five states to adopt 0.08% laws. Nine of the 30 pre- to postlaw comparisons identified statistically significant decreases. However, comparison areas were not included to assess whether the postlaw declines were independent of general regional trends. Thus, this study was undertaken to assess whether, relative to nearby states, states adopting a 0.08% legal limit experienced a reduction in the proportion of fatal crashes involving (1) fatally injured drivers with blood alcohol levels of 0.08% or higher and 0.15% or higher, and (2) any driver with a blood alcohol level at 0.08% or higher and 0.15% or higher.

Methods

Prior to 1992, five states had lowered the legal blood alcohol limit from 0.10% to 0.08%: Utah (August 1983), Oregon (November 1983), Maine (August 1988), California (January 1990), and Vermont (July 1991). Each of these states was paired with a nearby state that retained a 0.10% legal limit. Within each pair, comparisons were made for the maximum equal number of available pre- and postlaw years. Thus, Utah was compared with Idaho from August 1976 to July 1991, Oregon with Washington from November 1976 to October 1991, Maine with Massachusetts from August 1984 to July 1993, California with Texas from January 1986 to December 1993, and Vermont with New Hampshire from July 1990 to June 1993.

To minimize potential bias resulting from variation in testing policies, the analysis initially focused on fatally injured drivers with blood alcohol levels of 0.08% or greater. During the analysis period, blood alcohol test results were available from the US Fatal Accident Reporting System for 81% of fatally injured drivers

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This paper was accepted April 12, 1996.

TABLE 2—Proportion of Fatal Crashes with a Fatally Injured Driver Whose Blood Alcohol Was 0.15% or More, Before and After the Passage of 0.08% Legal Blood Alcohol Limits in 5 States

0.08% Law States and Comparison States	Proportion before 0.08% Law (n)	Proportion after 0.08% Law (n)	% Change in Proportion (RR − 1)	Ratio of RRs (95% CI)
Oregon (0.08%)	0.22 (992/4455)	0.18 (769/4186)	−17% (0.83)	0.79 (0.70, 0.88)
Washington	0.20 (1266/6184)	0.21 (1158/5390)	+5% (1.05)	
Utah (0.08%)	0.10 (220/2252)	0.12 (245/2085)	+20% (1.20)	0.91 (0.72, 1.15)
Idaho	0.11 (232/2057)	0.15 (265/1773)	+33% (1.33)	
Maine (0.08%)	0.19 (198/1024)	0.15 (143/942)	−21% (0.79)	0.77 (0.61, 0.97)
Massachusetts	0.15 (493/3241)	0.15 (418/2703)	+2% (1.02)	
California (0.08%)	0.16 (3009/19370)	0.14 (2291/16278)	−9% (0.91)	0.82 (0.76, 0.89)
Texas	0.15 (1780/11924)	0.16 (1804/10961)	+10% (1.10)	
Vermont (0.08%)	0.19 (36/186)	0.19 (34/181)	−3% (0.97)	1.23 (0.68, 2.23)
New Hampshire	0.17 (48/280)	0.14 (30/222)	−21% (0.79)	
Overall law effect				0.82 (0.77, 0.87)

Note. RR = relative risk; CI = confidence interval.

Second, unlike previous studies, this analysis included comparison states to control for regional fatal crash trends.

Third, 0.08% law states may have been more concerned about alcohol-impaired driving and more responsive to legislative initiatives to reduce the problem. They were more likely to have other stringent laws that have been shown to reduce alcohol-related fatal crashes. All 0.08% law states had criminal per se laws in effect prior to the study, compared with only two comparison states: Texas and Vermont. The comparison states of Idaho and Washington introduced criminal per se laws during the study. It is likely that the 0.08% law effects were independent of criminal per se laws. Before the 0.08% law, reductions in alcohol-involved fatal crashes were seen both in pairs of states where both 0.08% law states and comparison states had criminal per se legislation throughout the study and in pairs where comparison states adopted the law during the study period.

All five 0.08% law states also had administrative licence revocation laws during the study, three of which were implemented within 1 year of the state's 0.08% law. Administration licence revocation laws have been associated with 5% declines in fatal crashes.[9] Among the control states, only New Hampshire had this law during the study period. This restricted our ability to separate the effects of 0.08% legislation from administrative licence revocation laws. Maine was the only 0.08% law state to implement an administrative licence revocation law prior to the study period and hence the only state where post-0.08% law reductions in alcohol-involved fatal crashes could be clearly separated from the effects of administrative licence revocation laws passed during the study period.

Finally, this analysis focused only on fatal crashes. Studies of other traffic laws indicate that the magnitude of their impact can be influenced by accompanying educational and enforcement efforts.[10–12] Studies of 0.08% laws are needed that not only assess the laws' impact on fatal crashes but also measure how effectively the laws are implemented.

On balance, the results of this study suggest that 0.08% laws, particularly in combination with administrative licence revocation, reduce the proportion of fatal crashes involving drivers and fatally injured drivers with blood alcohol levels of 0.08% or higher and 0.15% or higher. This legislation warrants consideration in other states. □

Acknowledgments

This study was supported by grants from the National Institute on Alcohol Abuse and Alcoholism, the US Centers for Disease Control and Prevention, and the Massachusetts Governor's Highway Safety Bureau.

The study is dedicated to Lori Lynn Webb and Mitch Pewitt, both of whom died, and Kara Webb Hensel and Millie and Roy Webb, who were seriously injured, in a crash involving a driver with a 0.08% blood alcohol level.

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Lowering State Legal Blood Alcohol Limits to .08%: The Effect on Fatal Motor Vehicle Crashes

DISCUSSION

- High levels of blood alcohol testing of fatally injured drivers favors accuracy of the results:
  - 88% of fatally injured drivers in .08% states
  - 75% in comparison states
- Testing levels were the same in pre and post law years

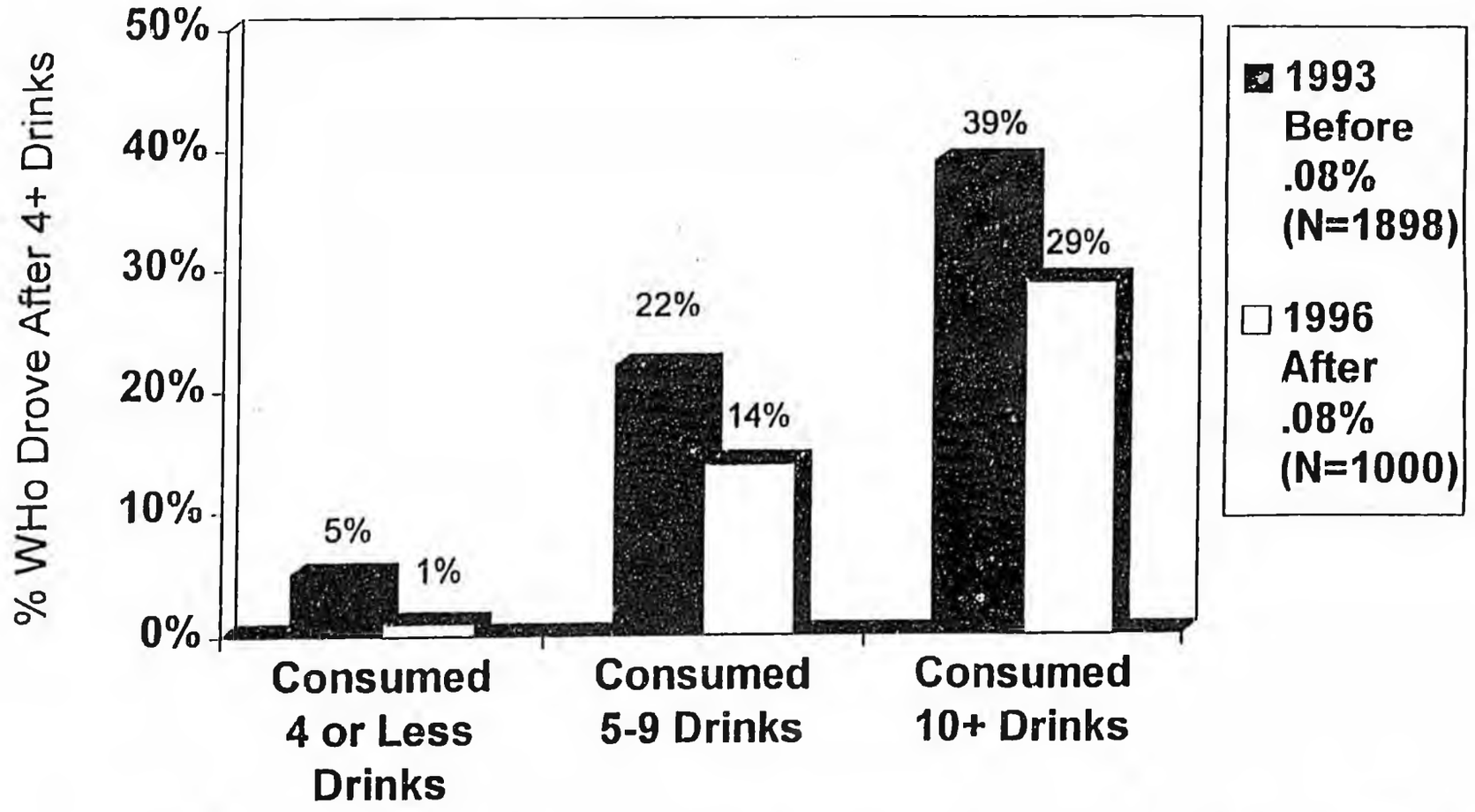
Lowering State Legal Blood Alcohol Limits to .08%: The Effect on Fatal Motor Vehicle Crashes

RESULTS

- Overall .08% Law states experienced a statistically significant 16% relative post-law reduction in the proportion of fatal crashes involving fatally injured drivers at .08% or higher and at .15% and higher
- Four out of five .08% Law states showed a reduction relative to control states in the proportion of fatal crashes with fatally injured drivers at BAC's .08% or higher and .15% or higher

Perceptions of Massachusetts Adults Age 21+

% Who Drove after 4 or More Drinks According to Single Days Highest Alcohol Consuption in the Past Month

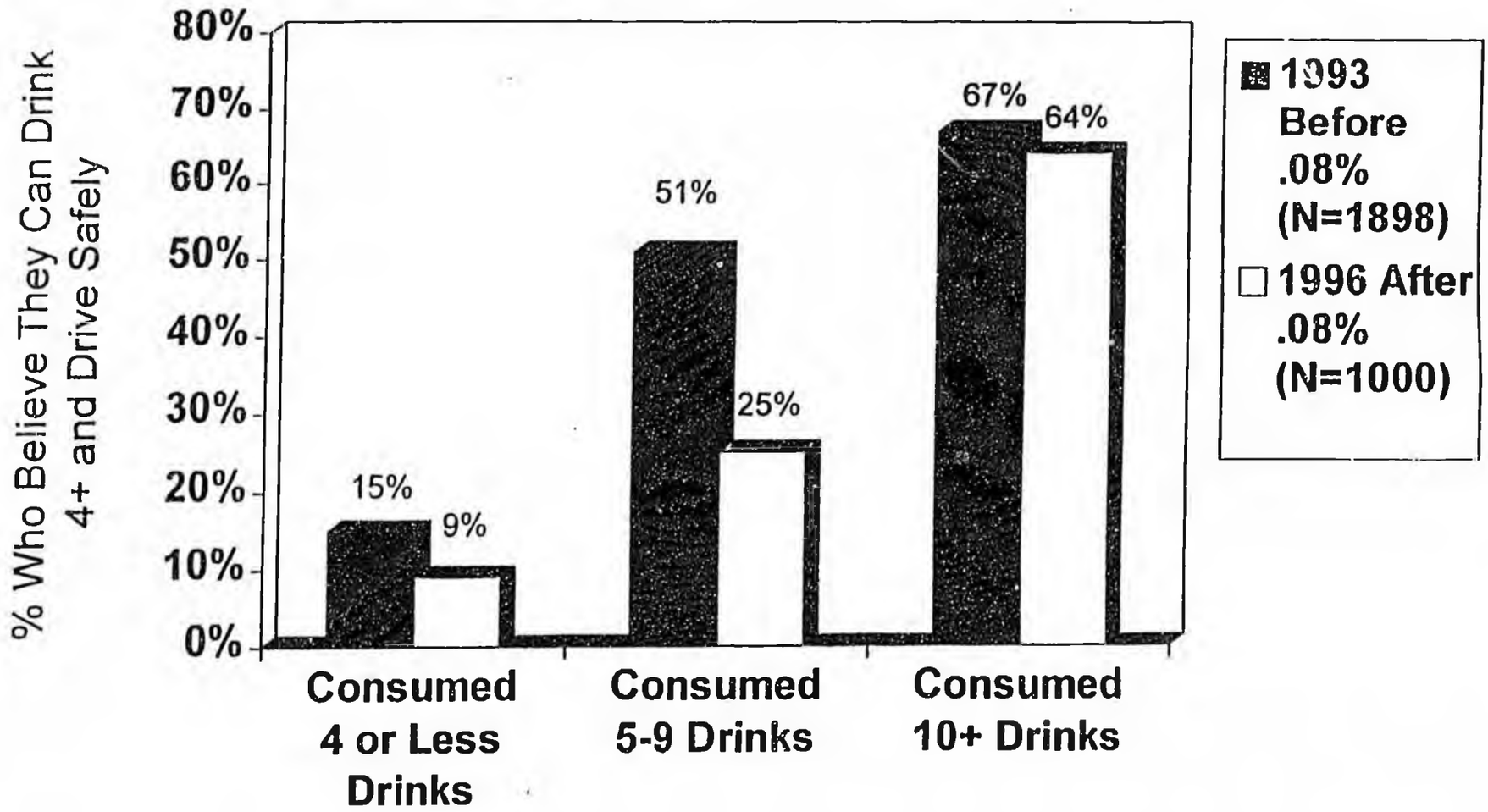


• After the .08% law there were declines in the proportions of persons who drove after 4+ drinks among light and heavy drinkers.

Source: Massachusetts Governor's Highway Safety Bureau 1993 and 1996 Statewide Telephone Survey

Perceptions of Massachusetts Adults Age 21+

One Can Drink 4 or More Drinks and Drive ***Safely*** According to Single Days Highest Alcohol Consuption in the Past Month

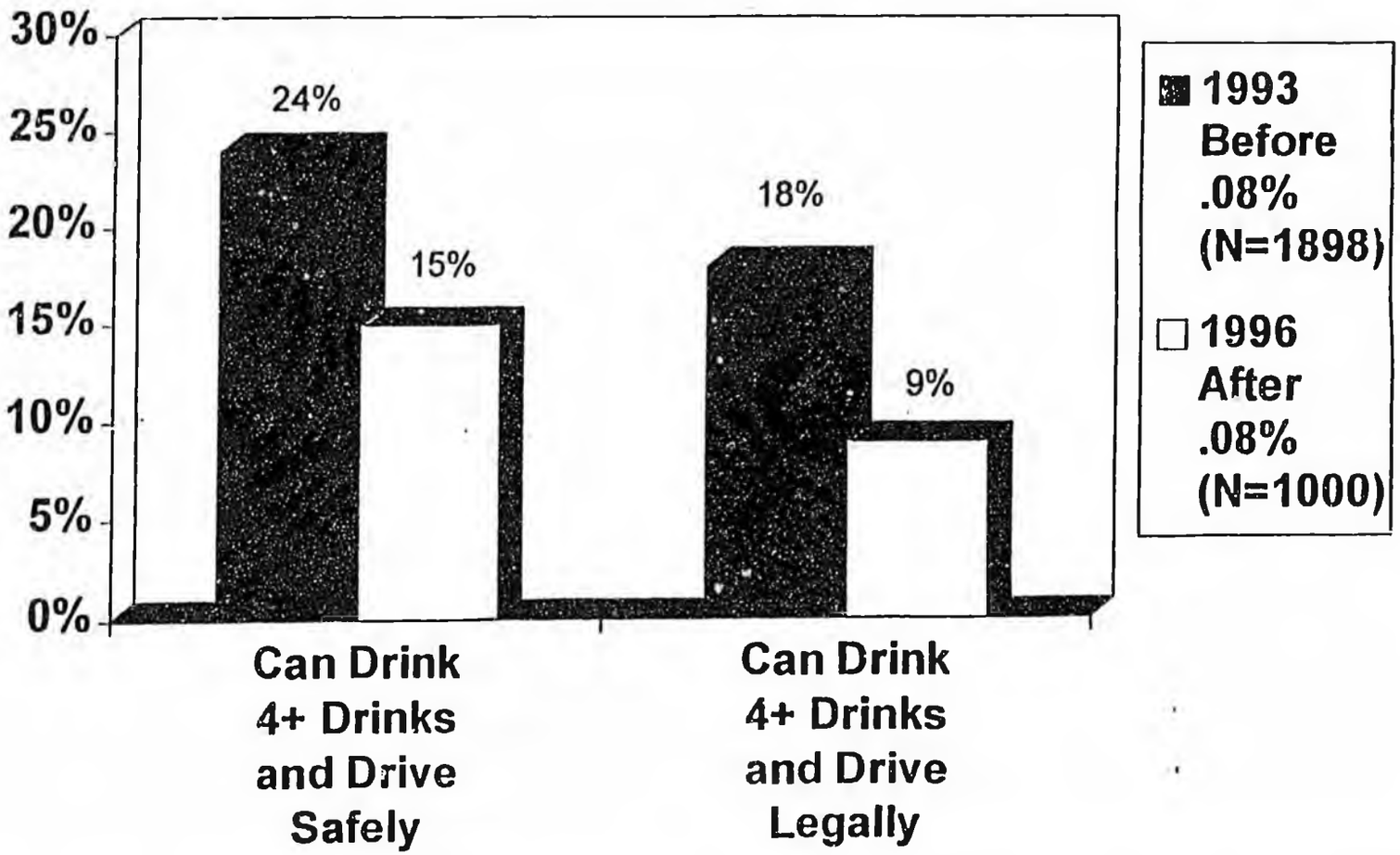


- The proportion of drivers who believed they could drink 4+ drinks and drive safely declined after the .08% law in all but the very heaviest drinkers

Source: Massachusetts Governor's Highway Safety Bureau 1993 and 1996 Statewide Telephone Surveys

Beliefs of Massachusetts Adults Age 21+

Before and After the legal BAL was Lowered from .10 to .08%



• After the .08% law, there were declines in the proportion of drivers who believed they could drive safely and legally after 4 or more drinks.

Source: Massachusetts Governor's Highway Safety Bureau 1993 and 1996 Statewide Telephone Surveys

Point: There could have been other reasons than the .08 law for the declines in fatally injured drivers with BACs $\geq$ .08 and .15 in these five .08 states. Were these other factors controlled for?

Counterpoint: All factors that could have accounted for the .08 effects were not controlled for. This is impossible to do in real world evaluations of this kind. For example, all .08 states had ALR laws in effect during the study while only one of the comparison states had ALR. Indeed, there may have been other factors that contributed to the decline in the .08 states other than the law itself.

On the other hand, some things were controlled: any regional effects (economy, etc) by using neighboring states; any urban/rural/population effects by using states with similar populations; any BAC testing rate effects by using states with high BAC testing rates.

Point: Two .08 states (UT and VT) actually had increases in the proportion of fatally injured drivers with BACs $\geq$ .08 in the before and after analyses. If .08 is so effective, why did this happen in two out of five states?

Counterpoint: It could be stated that if it weren't for the .08 law, those increases may have been greater. In most analyses of this nature, there will be states that do not show the desired effect (e.g. it happened in all of our MDA 21 studies) for one reason or another. The .08 law may not have been publicized or enforced as much. What is important is the cumulative effect of the five states, and that was a significant decrease. Similar findings occurred in NHTSA's analyses of ALR states and MDA 21 states in determining their effects. The overall effect in those studies, however, was also positive.

ABI Criticisms

ABI: "According to their research, in 1992 blood alcohol tests were available in 81% of all fatal accidents. We find that number to be unusually high because according to NHTSA, the BAC testing levels were nearly half of what MADD Incorporated claims they were."

Answer: The Hingson study states that "During the analysis period, blood alcohol test results were available from the US Fatal Accident Reporting System for 81% of fatally injured drivers in the study states."

Hingson's statement is correct. ABI is talking about BAC tests on all drivers in all states being less than 50%. Hingson is talking about BAC tests on fatally injured drivers from the 10 states during the study period.

WHY .08 BAC ?

"...afe alcohol levels should be set by health experts, not the lobby for Hooter's and Harrah's. The ...utenberg-[DeWine]-Lowey amendment isn't a drive toward prohibition, but an uphill push toward health consensus." – ***The Wall Street Journal***, September 9, 1997

"Legislation to lower the BAC definition of intoxication to 0.08 percent would be an important contribution toward reducing impaired driving on our highways." – James Hall, **National Transportation Safety Board**

"What this bill will do is send a strong signal that excessive drinking and driving do not mix. They are unacceptable and will not be tolerated by society. So I am delighted, on behalf of the Clinton Administration, to endorse this legislation. And I urge swift passage by the Congress. President Clinton is ready to sign it today." – **U.S. Secretary of Transportation Rodney E. Slater**, October 23, 1997

"We know that drinking, plus driving, spell death and disaster...The problem is bigger than the individual states...It's a grave national problem, and it touches all our lives. With the problem so clear-cut and the proven solution at hand, we have no misgivings about this judicious use of federal power." – **President Ronald Reagan**, July 18, 1984, upon signing the National Minimum Drinking Age bill

"Drunk drivers are deadly threats no matter where they speed or weave in this country. Yet a driver who is certifiably drunk in Virginia can roll to a "sobriety" of sorts merely by crossing into Maryland. That is a life-threatening inconsistency that exists around the country because there is no uniform standard of drunkenness on the roads. There ought to be a national standard [of drunk ...ving], and such a proposition is now before Congress, with support from across the political ...pectrum...Congress can bring still better sense to highways by approving a uniform, nationally understood definition of a dangerous driver." – ***The Washington Post*** editorial, November 8, 1997

"Lower Threshold for Drunken Driving – the force of law nudges people to drink more responsibly. That's a critical and little recognized benefit of a .08 law. Four drinks in one state makes you no less drunk than four drinks in another. The abundant evidence justifies a national response." – ***The Baltimore Sun*** editorial, October 25, 1997

"A .08 blood-alcohol concentration is more than enough to make you a hazard on the road, and making it the threshold for DWI would strengthen the hand of the police once they pull over erratic drivers. And that would make Maryland roads safer...The national trend is clear enough – sooner or later Maryland will have the tougher DWI standard. We might as well make it sooner, and make our roads that much safer." – ***Annapolis Capital*** editorial, November 7, 1997

"Drunk Driving remains a national shame. Despite progress over the years, 41% of all motor vehicle fatalities – more than 17,000 lives lost – involve alcohol. Yet the current legal BAC in most states is .10, the highest in the industrial world...[We] believe enactment of S.412...is a necessary and important step. Laws which set the legal BAC limit at .08 are a needed part of the combination of programs and policies which must be in place if we are to win the fight against drunk driving." – Gerald Scannell, President, **National Safety Council**

"...he drunk driving problem has not been solved and will not be solved until safety becomes a top priority, not only in Washington, but in every state." – Katherine P. Prescott, President, **Mothers Against Drunk Driving**

confident of our company's wholehearted support of your joint initiative." – Michael Dineen, Vice President, **Kemper Insurance**

"Too many innocent victims have fallen prey to the irresponsibility of drivers who have gotten behind the wheel when impaired...[S. 412] should be included in the ISTEA reauthorization bill." – Stephen Brobeck, Chairman, **The Coalition for Consumer Health and Safety**

"Yes to National Drunken Driving Law – Congress uses the threat of withheld funds too often, in our opinion, to focus its will upon states. In this case, however, the states would merely be required to set an intoxication standard that reflects research on how alcohol affects driving." – ***Omaha World-Herald*** editorial, October 29, 1997

"'The Safe and Sober Streets Act of 1997' would encourage American drinkers to be more careful about drinking when they drive. It would help reduce the number of intoxicated drivers on the highways and decrease the carnage from drunk driving." – George A. Hacker, Alcohol Policies Project, **Center for Science in the Public Interest**

"We already know that more than 17,000 lives were lost in 1997 on our nation's highways due to drunk driving. And we know that laws which allow less BAC will save lives." – Mary Jac Rauh, M.P.H., Assistant Director, **Rural Health Projects, Inc.**, Oklahoma

"Complaints from the beverage industry that the new limits would target social drinkers and not alcoholics are ridiculous and dangerous. All that matters is whether the person behind the wheel has had too much to drink. Whether he or she is a social drinker is irrelevant." – ***The Toledo [OH] Blade*** editorial, November 30, 1997

"NHTSA has, for many years recommended that states adopt a .08 BAC standard. The Alliance has strongly supported this recommendation. Medical evidence clearly indicates that at .08 BAC an individual is seriously impaired and should not operate a motor vehicle." – David Farmer, Senior Vice President, **Alliance of American Insurers**

"The NFPA supports your initiative to provide for a national standard to prohibit the operation of motor vehicles by intoxicated individuals. According to NFPA statistics, an estimated 550 civilian fire deaths occurred last year in highway vehicles. Many of these are caused by motor vehicle operators who are intoxicated. There must be a stop to the irresponsibility that kills thousands of Americans each year." – George Miller, President & CEO, **National Fire Protection Association**

"S. 412 represents a necessary step forward in the campaign to educate and successfully deter people from drinking and driving and to secure the safety of motorists, bicyclists, and pedestrians on our highways and streets. As a society, we must make very clear that there is 'no such thing as a drunk driving accident'" – Patrick Schultz, **Tri State Transportation Campaign**

"When confronted with a controversial issue, it's sometimes enlightening to consider the markup of the two sides in the controversy...On one side are the people who make and sell booze...On the other side are governmental, safety and business organizations whose interest lies in reducing the number of deaths and injuries on the highways...[they] favor cutting the legal BAC to .08...Their interest also happens to be the public interest, and the public policy they advocate is the right one." – ***The Times of Trenton*** (NJ) editorial, August 21, 1997

FACTS AND MYTHS SURROUNDING THE .08 BAC ISSUE

MYTH: "If you do have one or two beers with a slice of pizza prior to driving home, MADD wants you arrested. Social drinking at a tavern would be made nearly impossible for most customers, save those with chauffeurs." – ABI, *Chicago Tribune*, April 27, 1997

FACT: This claim is completely unfounded and untrue. According to the National Highway Traffic Safety Administration, a 170 pound male can drink at least four 12-ounce cans of beer, four five-ounce glasses of wine, or four mixed drinks within one hour on an empty stomach before reaching .08 BAC. A 137 pound female can drink three to four drinks of the same size on an empty stomach before reaching that same level, a level at which all driving skills are affected. This is hardly social drinking or just a few beers with pizza.

MYTH: "Want to know the difference between .07 and .08? Pardon my language, but if I spit in this glass, that would be the amount of liquid needed to go from legal to illegal." – Rick Berman, ABI General Counsel, *testimony given at New Jersey Senate Task Force*, August 19, 1997.

FACT: .08 is four to five drinks in an hour for a 170 pound man and three to four drinks in an hour for a 137 pound woman. That's not social drinking, nor is it a drop of spit in a wine glass. With these types of comments, Mr. Berman spits in the face of drunk driving victims. His continuing ludicrous comments and increasingly outrageous behavior on behalf of a narrow self serving special interest show not only his lack of knowledge about the drunk driving issue but a complete lack of sensitivity for victims.

The real issue is one of intoxication. No matter how many drinks it takes for a person to reach .08 BAC, when that person reaches .08, he or she is dangerously impaired and is 16 times more likely to be involved in a single-vehicle alcohol-related fatal crash than a person with a .00 BAC level. At .10, a person is 32 times more likely to be involved in such a crash. The real issue isn't how much alcohol it takes to reach .08. The real and more important issue is, at .08 BAC, people are too impaired to be driving safely.

MYTH: "MADD's proposal to lower the threshold for drunk driving arrests to .08 BAC attacks social drinkers and completely ignores the real problem – drunk drivers." – ABI, PR Newswire article, May 7, 1997

FACT: MADD is concerned about the hard-core or habitual drinking driver, but the truth is that approximately 85 percent of all alcohol-related traffic fatalities are caused by first-time offenders or people who have not re-offended in the past three years.

Our volunteers throughout the nation spend hours trying to pass laws, educate the public, support victims, and monitor DUI court cases. Money does not drive our mission, saving lives does.

MYTH: "MADD insists drunk driving is on the rise but fails to point out all highway traffic fatalities increased by 4 percent. Alcohol-related fatalities as a percentage of all fatalities stayed virtually the same." – ABI, *USA Today*, June 19, 1997

FACT: In the past, even as all traffic fatalities and miles travelled increased, alcohol-related traffic fatalities decreased. In 1995, there were 17,274 alcohol-related traffic deaths compared with 16,589 in 1994. This represented the first increase in a decade. In 1996, 17,126 people were killed in alcohol-related traffic crashes. There was no statistically significant change in the percentage of alcohol-related traffic fatalities. Alcohol-related traffic fatalities among people ages 15-20 increased for the first time since 1990. The nation has reached a plateau in the fight against drunk driving.

Nearly one quarter (3,732) of the 17,126 alcohol-related traffic deaths in 1996 involved drivers with BAC levels below .10. That's 3,732 lives. MADD thinks that's a problem worth solving. A .08 BAC law in every state would save an estimated 500 to 600 lives each year.

MYTH: "MADD foments fear by claiming *every* person killed in a drunk driving accident is a victim. Yet, according to the Transportation Department, drunken drivers themselves account for more than half the fatalities." – ABI, *USA Today*, June 19, 1997

FACT: First of all, drunk driving is not an accident – it is a violent crime. A person makes the conscious decision to drink alcohol and then drive. It is no accident. Second, this outrageous statement is infuriating. The family members and friends of people who died while drinking and driving are also victims of this preventable and tragic crime. Their lives are also shattered and forever altered by the death of a loved one. They too have lost a precious family member. The ABI's discount of these grieving victims of the drunk driving problem further demonstrates its total lack of compassion. But then, saving lives is not the ABI's goal – selling alcohol is.

MYTH: "A couple of drinks steadies a person, and might improve someone's driving ability." – Richard Bellshot, Camden County, New Jersey tavern owner, *New Jersey Senate Task Force Hearing*, August 19, 1997

FACT: Impairment begins at levels as low as .02. By the time a person reaches a BAC level of .08, critical driving skills such as steering, braking, lane changing, judgement, and emergency response are definitely impaired.

MYTH: ".08 BAC laws do not save lives. Lowering the legal BAC limit will have no effect on drivers who already ignore the current law." – *ABI web page*, August 1997

FACT: In Dr. Ralph Hingson's study published last year in the *American Journal of Public Health*, .08 BAC laws were proven to reduce the proportion of fatal crashes involving fatally injured drivers whose BAC levels were .15% and higher by 18 percent. Clearly, .08 BAC laws are a deterrent to all drinking drivers, regardless of BAC level.

MYTH: "By threatening to revoke highway funds, the proposed .08% federal legislation would force these states to implement policy changes already turned down by their own legislatures." – ABI web page, August 1997

FACT: The Safe and Sober Streets Act of 1997 aims to set an illegal BAC limit that is safe and sane. Science has proven that drivers at .08% are critically impaired.

In many states where .08 BAC legislation has been proposed and defeated, the bills have gained strong support from the public, the media and a majority of legislators. A small handful of legislators, under pressure from the alcohol and hospitality industries, have succeeded in defeating this lifesaving legislation.

MYTH: "To study the effect of .08% states, Hingson paired .08% states with what he termed "nearby" .10% states. Inexplicably, one of these "nearby" pairs consisted of California and Texas...In short, Hingson's method is flawed, the results do not replicate, and there is no evidence to suggest that .08% laws have had any effect." – *ABI web page*, August 1997

FACT: "Texas was compared with California because it is the closest state to California of comparable population and number of large urban centers. In addition, the demographics are comparable." – Dr. Ralph Hingson, 1997

"The comparison states were selected on the basis of geographic closeness, size and BAC testing rates. These were about the only five states (the five states studied in the survey) that could have been selected as comparisons based upon the study criteria for matching." – NHTSA, 1997

MYTH: "A driver who exceeds the legal limit by a one-hundredth of a percent of blood alcohol receives the same penalty as someone driving at two or three times the maximum BAC!...The ABI has consistently supported an escalated penalty system." – *ABI web page*, August 1997

FACT: Whether a drunk driver kills someone while driving impaired at .08% BAC or at .15% BAC the victim is still just as dead. Driving at BAC levels of .08% and higher is unsafe and threatens the lives of America's motorists. It should be illegal to drive at .08

United States General Accounting Office

GAO

Report to Congressional Committees

June 1999

HIGHWAY SAFETY

Effectiveness of State .08 Blood Alcohol Laws

GAO

Accountability • Integrity • Reliability

GAO/RCED-99-179

GAO

United States
General Accounting Office
Washington, D.C. 20548

Resources, Community, and
Economic Development Division

B-280883

June 23, 1999

The Honorable John McCain
Chairman
The Honorable Ernest F. Hollings
Ranking Minority Member
Committee on Commerce, Science,
and Transportation
United States Senate

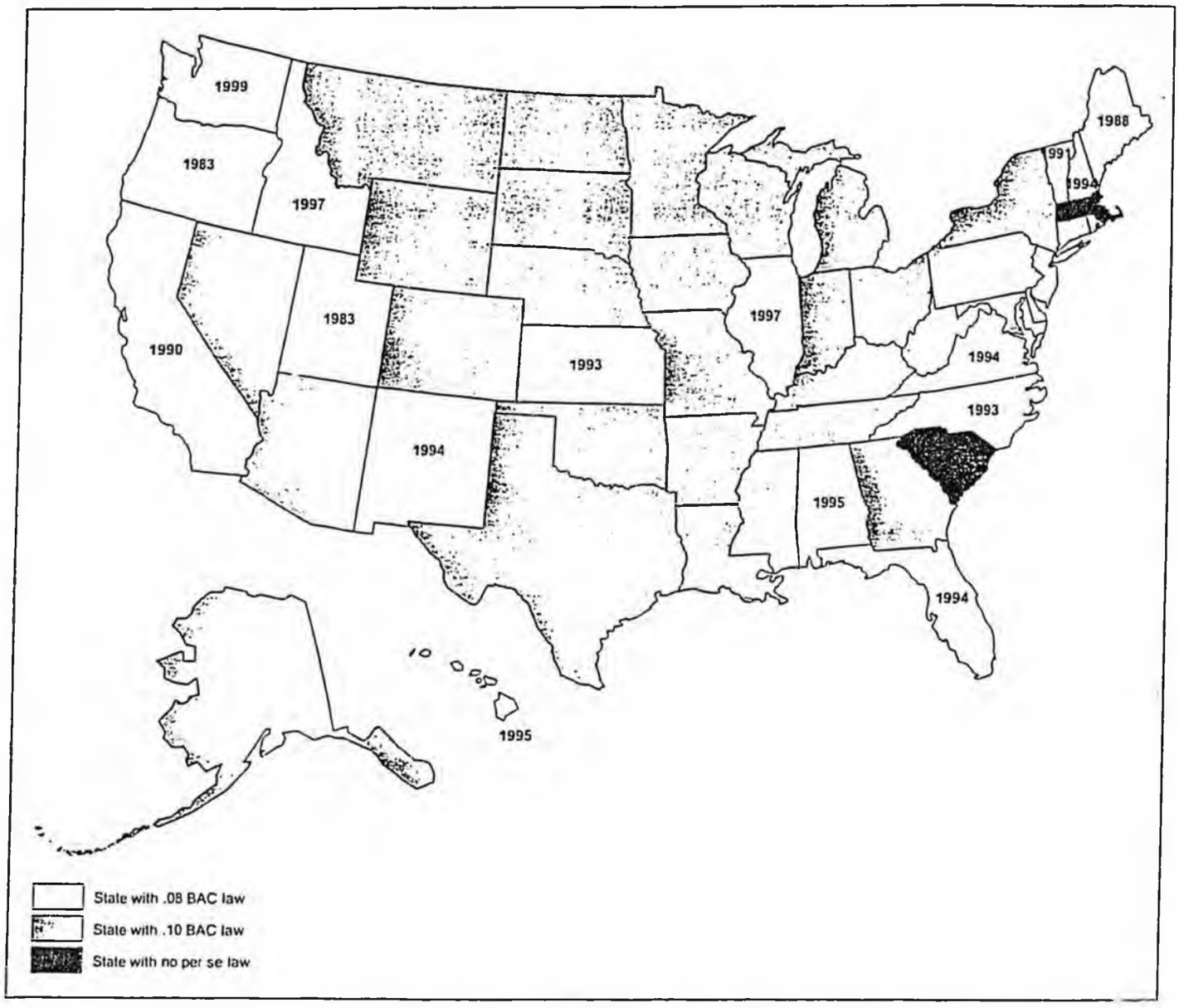
The Honorable Bud Shuster
Chairman
The Honorable James L. Oberstar
Ranking Democratic Member
Committee on Transportation and Infrastructure
House of Representatives

In 1997, someone in the United States died in an alcohol-related motor vehicle crash every 32 minutes. For years, the Congress and the states have grappled with and sought solutions to the problem of drunk driving. Most states have laws making it illegal for people to drive with a specified level of alcohol in their blood, usually set at .10 blood alcohol concentration (BAC)—the level at which a person's blood contains 1/10th of 1 percent alcohol. However, 16 states have more stringent laws setting the limit at .08 BAC. In 1998, the Clinton administration endorsed a bill that would have required all states to enact and enforce .08 BAC laws or face reductions in federal highway funds. The Senate approved this bill; the House took no action.

The Transportation Equity Act for the 21st Century directed GAO to evaluate the effectiveness of state .08 BAC laws in reducing the number and severity of crashes involving alcohol.[1] To accomplish this objective, we reviewed (1) the policies and positions of the Department of Transportation's (DOT) National Highway Traffic Safety Administration (NHTSA) on .08 BAC laws and other drunk driving countermeasures and (2) seven published studies on the effect of .08 BAC laws on the number and severity of crashes involving alcohol, including three studies released on April 28, 1999.

[1]The Transportation Equity Act for the 21st Century also directed us to study the effectiveness of .02 BAC laws for drivers under 21 in reducing the number and severity of crashes involving alcohol. The National Highway System Designation Act of 1995 required all states to enact and enforce such laws or face reductions in federal highway funds. However, as agreed to by your staff, we will not address the impact of .02 BAC laws, since all 50 states and the District of Columbia now have laws establishing BAC levels of .02 or less for drivers under 21.

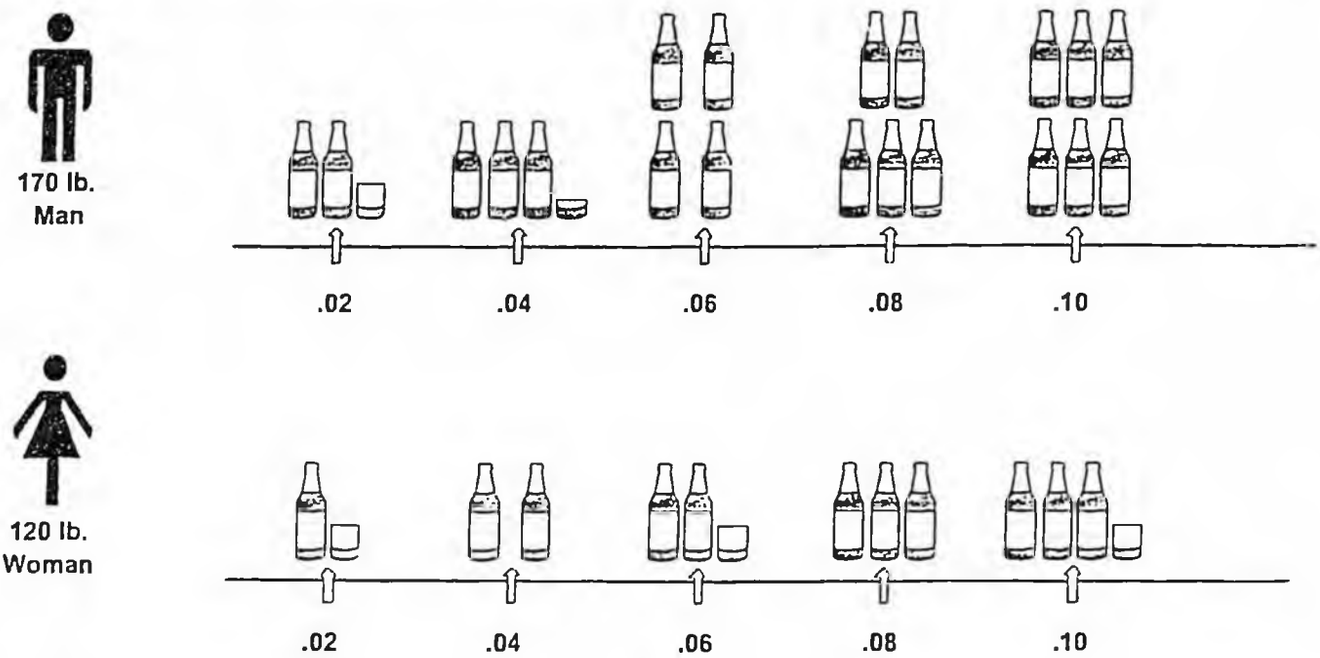
Figure 1: State Blood Alcohol "per Se" Laws



Note: States with .08 BAC laws are shown with the year the law became effective.

Source: GAO's illustration based on information from NHTSA.

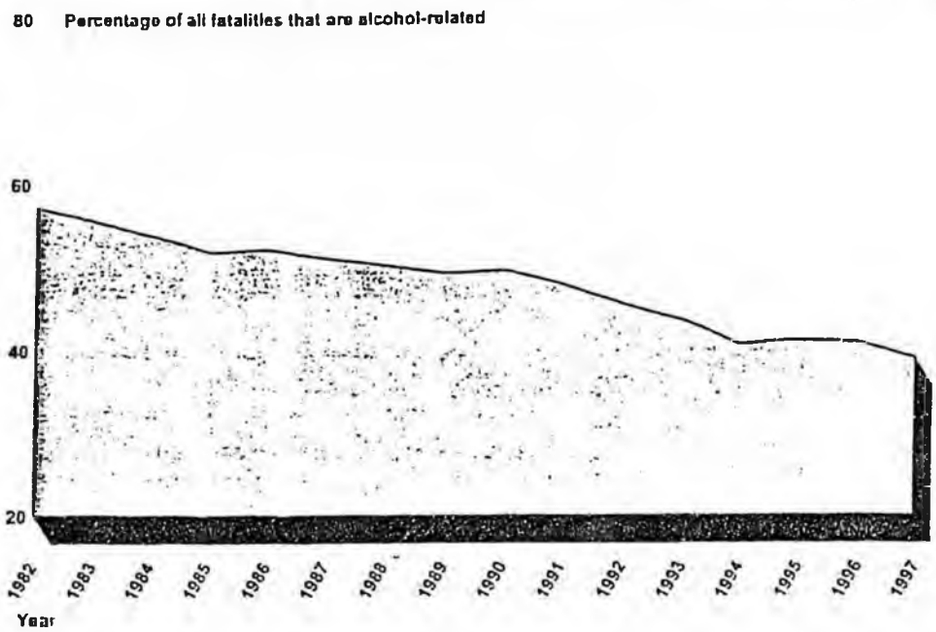
Figure 2: Alcohol Consumption and Blood Alcohol Levels



Source: GAO's illustration based on NHTSA's BAC estimator.

Alcohol use is a significant factor in fatal motor vehicle crashes. In 1997, the most recent year for which data are available, there were 16,189 alcohol-related fatalities, representing 38.6 percent of the nearly 42,000 people killed in fatal crashes that year. In the states with .08 BAC laws, alcohol was involved in 36 percent of all traffic fatalities, lower than the national average and the 39.5-percent rate of alcohol involvement in the

Figure 3: Alcohol-Related Fatalities, 1982-97



Source: GAO's illustration based on NHTSA's Traffic Safety Facts, 1997

Each state reports, and NHTSA collects and publishes, data on fatal crashes through the Fatal Accident Reporting System (FARS), a comprehensive national database of all crashes in which a person dies within 30 days of the crash. These data include (1) the number of fatalities that occur in all crashes and (2) the number of drivers involved in fatal crashes. FARS also includes whether crashes involved drivers who had been drinking. However, FARS has limitations regarding alcohol involvement in crashes—for example, fewer than half of the drivers at the scene of fatal accidents are tested for alcohol. To address the missing data, NHTSA developed a statistical model, first used in 1982, to estimate alcohol involvement in cases in which data are not available. The model provides estimates in three broad categories—sober (.00 BAC), "low BAC" (.01- .09 BAC), and "high BAC" (.10 BAC and above).[4] Therefore, certain questions—such as how many fatal crashes involve drivers with .08 BAC

[4]When cataloguing fatalities in crashes in which more than one driver had been drinking, FARS uses the driver with the higher BAC.

Since 1992, when it first recommended in a report to the Congress that all states have .08 BAC laws, NHTSA's position has changed from urging the states to pass .08 BAC laws to favoring that states be required to do so. The latter position was embodied in the President's endorsement of a Senate bill entitled the Safe and Sober Streets Act. This bill would have required all states to enact and enforce .08 BAC laws by October 1, 2001, or lose 5 percent of certain federal highway funds the first year and 10 percent each succeeding year. The Senate approved this bill on March 4, 1998, but the House took no action before the 105th Congress adjourned.[7]

As figure 4 shows, NHTSA has a number of reasons why it believes all states should adopt .08 BAC laws.

Figure 4: NHTSA's Reasons Why All States Should Adopt .08 BAC Laws

- Virtually all drivers are substantially impaired at .08 BAC with regard to critical driving tasks.
- The risk of being in a crash increases substantially when a driver reaches .08 BAC.
- .08 is a reasonable level to set the limit.
- The public supports lower BAC limits.
- Other industrialized nations have .08 or lower BAC laws.
- Lowering the limit to .08 is a proven effective countermeasure that will reduce crashes and save lives.

One of NHTSA's principal arguments for nationwide adoption of .08 BAC laws is that the medical evidence of drivers' impairment at that level is substantial and conclusive. According to NHTSA, and as shown in figure 5, reaction time, tracking and steering, and emergency responses are impaired at even low levels, and substantially impaired at .08 BAC. As a result, the risk of being in a motor vehicle crash increases when alcohol is involved, and increases dramatically at .08 BAC and higher levels. In contrast to NHTSA's position, industry associations critical of .08 BAC laws contend that .08 BAC is an acceptable level of impairment for driving a motor vehicle and that these laws penalize "responsible social drinking." These associations also believe that .08 BAC laws do not address the problem of drunk driving because many more drivers using alcohol are reported at the "high" BAC levels (above .10 BAC) than the lower BAC levels.

[7]The Senate approved this bill as an amendment to its surface transportation reauthorization bill. However, these provisions were not included in the House bill and were not included in the final version of the Transportation Equity Act for the 21st Century.

May 1998, the NHTSA Administrator stated, "The traffic safety administration is aware of four published studies, . . . [and] each study has shown that lowering the illegal blood alcohol limit to .08 is associated with significant reductions in alcohol-related fatal crashes." In a fact sheet distributed to state legislatures considering these laws, NHTSA stated that the agency's "analysis of five states that lowered the BAC limit to .08 showed that significant decreases in alcohol-related fatal crashes occurred in four out of the five states *as a result of the legislation*" (emphasis added). NHTSA used these study results to encourage states to enact .08 BAC laws, testifying in one instance before a state legislature, "We conservatively project a 10-percent reduction in alcohol-related crashes, deaths, and injuries" in the state.

Seven Studies Have Examined the Effectiveness of .08 BAC Laws

Seven studies have been published assessing the effect of .08 BAC laws on motor vehicle crashes and fatalities in the United States. Four studies published between 1991 and 1996 assessed the effectiveness of .08 BAC laws in the five states that enacted them between 1983 and 1991. On April 28, 1999, NHTSA released three additional studies. Table 1 summarizes the seven studies that examine .08 BAC laws.

results. Therefore, these studies did not provide conclusive evidence that .08 BAC laws by themselves have resulted in reductions in drunk driving crashes and fatalities. A task force of the New Jersey State Senate examined this evidence and, in a report issued in December 1998, reached a similar conclusion.[8]

The California Studies

NHTSA has cited California's experience as evidence of the effectiveness of .08 BAC laws. For example, in a publication promoting the need for .08 BAC laws, NHTSA stated that "alcohol-related fatalities significantly decreased after the state's BAC limit was lowered to .08 in 1990." In another publication, it said "California's .08 law was analyzed by NHTSA, [and] . . . the state experienced a 12% reduction in alcohol-related fatalities, although some of this can be credited to the new administrative license revocation law."

While NHTSA's 1991 study by Research and Evaluation Associates (see table 1) did find a 12-percent decline in alcohol-related fatalities after the .08 BAC law took effect, the study had important limitations. For example, the authors had available to them only 1 year of data for the period after the law went into effect, an unusually short period of time to analyze trends, and the authors acknowledged this limitation. California also had a license revocation law—under which a person deemed to be driving under the influence has his or her driving privileges suspended or revoked—take effect 6 months after the .08 BAC law. Although the authors concluded that this law had no effect, they stated that they were unable to accurately account for the separate effects of the two laws.

A more comprehensive, methodologically sound study of California was released by the state's Department of Motor Vehicles in 1995. In contrast to the 1991 review, this study was based on 4 years of data after the law became effective and found mixed results. The study concluded that the .08 BAC law was not associated with any statistically significant reductions in crashes resulting in fatalities or serious injuries in which drivers were reported to have been drinking, but that reductions did occur in accidents that took place during hours in which alcohol involvement is probable, such as nighttime crashes between 2 and 3 a.m. The study found

[8]State of New Jersey, Senate Task Force on Alcohol-Related Motor Vehicle Accidents and Fatalities, Dec. 11, 1998. Created by the leaders of the New Jersey State Senate, the task force was composed of elected officials and representatives from the state's judicial, medical, academic, and law enforcement communities. The task force was charged with, among other things, evaluating the available studies, and determining whether reducing the BAC limit to .08 would reduce the number of alcohol-related accidents and fatalities in New Jersey. The task force concluded that "the impact of laws that reduce the per se BAC level from .10 to .08, in isolation, is inconclusive" and that the effect of public education and awareness campaigns and license revocation laws "can be greater than changing the legal BAC."

to several or to the rest of the nation.

- Three of the five states had license revocation laws take effect within 10 months of their .08 BAC laws. This study made no effort to separately analyze the relative contribution of the two types of laws to any subsequent decline in fatal motor vehicle crashes in those three states. Thus, in at least three states, the authors' findings could as easily apply to the license revocation law as the .08 BAC law. The authors acknowledged this limitation, but it is rarely cited in NHTSA's literature and public statements endorsing this study and its findings.

- The study's conclusion that 500 to 600 fewer fatal crashes would occur annually if all states had .08 BAC laws is unfounded. The study does not explain how this estimate was derived or how the reduction could be credited to .08 BAC laws since the .08 BAC and license revocation laws went into effect within 10 months of each other in three of the five states. The authors told us that the estimate assumed that all states without .08 BAC laws would experience a reduction of up to 10 percent in alcohol-related crashes after enacting the laws. However, the study provides no basis for assuming that reductions of that magnitude would occur. Even this particular study found that while three of the five states experienced reductions greater than their comparison state, two of the five did not. NHTSA's April 1999 study of the effect of .08 BAC laws in 11 states (see table 1) characterized this conclusion as "unwarranted."

NHTSA Staff Study

In 1994, NHTSA staff conducted a study that examined FARS data in the first five states that enacted .08 BAC laws (see table 1). NHTSA has often cited this study as evidence of the effectiveness of .08 BAC laws. For example, a December 1997 publication with the National Safety Council said, "... significant reductions in alcohol-related fatal crashes were found in 4 out of the 5 states ranging from 4% to 40%...."

The staff study examined 6 measures of alcohol involvement, ranging from fatal crashes involving drivers with high BACs to single-vehicle crashes late at night, in each of the five states (for a total of 30 measures) and found statistically significant decreases in 9 of the 30 measures. The study also had several important limitations, which the authors acknowledged. For example, as with the Boston University study, the staff study made no effort to separately account for the relative contributions of .08 BAC laws and license revocation laws in the three states that enacted them within a short period. The staff study cautioned that the results were preliminary and that they pointed to the need for further research. NHTSA's public

study found statistically significant reductions after .08 BAC laws became effective.

Table 2: Results of the 11-State Study of .08 BAC Laws

		Statistically significant reduction occurred in		
State	Year .08 BAC law became effective	Alcohol-related fatalities	Fatalities involving "high BAC" drivers	Proportion of fatalities involving "high BAC" drivers to those involving sober drivers
Utah	1983	No	No	No
Oregon	1983	No	No	No
Maine	1988	No	No	No
California	1990	No	No	No
Vermont	1991	**Yes**	**Yes**	**Yes**
Kansas	1993	No	No	**Yes**
North Carolina	1993	No	No	**Yes**
Florida	1994	**Yes**	**Yes**	**Yes**
New Hampshire	1994	No	No	No
New Mexico	1994	No	No	**Yes**
Virginia	1994	No	No	No
Total		**2 of 11**	**2 of 11**	**5 of 11**

Note: "Yes" indicates a statistically significant reduction after the .08 BAC law became effective. "No" indicates no statistically significant reduction

Reductions in all three measures of fatalities involving alcohol occurred in Florida and Vermont. Although alcohol involvement in fatal crashes began to decline in Florida before the .08 BAC law was enacted, it continued to do so after the law went into effect on January 1, 1994. According to FARS, the number of alcohol-related traffic deaths in Florida declined in 1994 by nearly 10 percent, while the proportion of fatalities involving alcohol fell from 44 to 39 percent—in 1997 it stood at around 34 percent. While the study noted that Vermont has experienced fluctuations in its fatal crash rates, it found that after Vermont's .08 BAC law took effect, it also experienced statistically significant reductions in both the number of fatalities involving alcohol and the proportion of fatalities involving drivers with high BACs to those involving sober drivers. In this study, Vermont was the only state of the first five states to enact .08 BAC laws that showed any reductions in alcohol-related fatalities associated with .08 BAC laws.

it concluded that .08 BAC laws added to the impact that enforcement; public information; and legislative activities, particularly license revocation laws, were having. In addition to the two states where .08 BAC and license revocation laws were found to be effective in combination, the study noted that the five states with .08 BAC laws that showed reductions already had license revocation laws in place. One of the authors told us that this suggested that the .08 BAC laws had the effect of expanding the scope of the license revocation laws to a new portion of the driving public.

University of North Carolina Study

A NHTSA-sponsored study by the University of North Carolina concluded, in contrast to the 11-state study, that the .08 BAC law in North Carolina had little clear effect. The study examined alcohol-related crashes and crashes involving drivers with BACs greater than .10 from 1991 through 1995; compared fatalities among drivers with BACs greater than .10 in North Carolina with such fatalities in 11 other states; and compared six measures of alcohol involvement in North Carolina and 37 states that did not have .08 BAC laws at that time. The study controlled for and commented on external factors that could confound the results, such as the state's sobriety checkpoints, enforcement, and media coverage. The study found the following:

- No statistically significant decrease in alcohol-related crashes after passage of North Carolina's .08 BAC law in three direct and two "proxy" measures.[9]
- A continual decline in the proportion of fatally injured drivers with BACs equal to or greater than .10 but no abrupt change in fatalities that could be attributed to the .08 BAC law.
- Decreases in alcohol-related crashes in North Carolina and in the 11 other states studied. While North Carolina's decreases were greater, the study concluded that no specific effects could be attributed to the .08 BAC law.
- No statistically significant difference between North Carolina and 37 states without .08 BAC laws in four of the six measures. While reductions in police-reported and estimated instances of alcohol involvement were found to be statistically significant, these reductions happened 18 months before North Carolina lowered its BAC limit. The authors attributed these decreases, in part, to increased enforcement.

[9]Direct measures are actual observations, such as police reports of alcohol involvement in crashes, whereas proxy measures are not actual observations, but categories in which the involvement of alcohol is considered probable, such as nighttime crashes between 2 and 3 a.m.

fatalities or drivers as a percentage of all fatalities or drivers. The 50-state study's 8-percent estimate is the change in the ratio of alcohol-involved drivers to sober drivers who are in fatal crashes. While this is not an inappropriate way to measure differences in crashes and fatalities, this method can increase the size of the effect because, rather than comparing fatalities or drivers involving alcohol to all fatalities or drivers, it compares the number of alcohol-involved drivers to just the number of sober drivers. This method produced a larger effect in this study because, since 1982, of the drivers involved in fatal crashes, the number reported to have been using alcohol has dramatically declined (by around 39 percent), while the number reported to have been sober has substantially increased (by around 25 percent). While the 11-state study also measured this ratio, that study did not report a numerical effect.

Table 3 illustrates the difference between these methods of portraying traffic statistics using NHTSA's FARS data on drivers involved in fatal crashes between 1995 and 1997. As the table shows, while the number of alcohol-involved drivers declined by about 6 percent, the ratio of such drivers to sober drivers declined by 9 percent.

Table 3: Drivers Involved in Fatal Crashes, 1995-97

	1995	1997	Difference
Alcohol-involved drivers	14,269	13,393	(6.1%)
Sober drivers	41,895	43,209	3.1%
All drivers	56,164	56,602	0.8%
Ratio of alcohol-involved drivers to sober drivers	34%	31%	(9%)

Source: GAO's analysis of FARS data

Another reason why this study's results cannot be directly compared to other studies' is because it did not include data for drivers under 21. In 1997, drivers under 21 accounted for around 14 percent of the drivers in fatal crashes and about 12 percent of the drivers in fatal crashes involving alcohol. According to the authors, drivers under 21 were excluded from the analysis because other laws affect these drivers, such as minimum drinking age and "zero tolerance" BAC laws, and thus the primary effect of .08 BAC legislation would be expected to be on the population over 21 years old. While this argument may have merit, other arguments exist for including this population. First, NHTSA has stated that .08 BAC laws have a general deterrent effect on drinking and driving among all drivers. Also, young drivers violating .08 BAC laws have been prosecuted under those

conclusively establish that .08 BAC laws by themselves result in reductions in the number and severity of crashes involving alcohol. Until recently, limited published evidence existed on the effectiveness of .08 BAC laws, and NHTSA's position—that this evidence was conclusive—was overstated. In 1999, more comprehensive studies have been published that show many positive results, and NHTSA's characterization of the results has been more balanced. Nevertheless, these studies fall short of providing conclusive evidence that .08 BAC laws by themselves have been responsible for reductions in fatal crashes.

Because a state enacting a .08 BAC law may or may not see a decline in alcohol-related fatalities, it is difficult to accurately predict how many lives would be saved if all states passed .08 BAC laws. The effect of a .08 BAC law depends on a number of factors, including the degree to which the law is publicized; how well it is enforced; other drunk driving laws in effect; and the unique culture of each state, particularly public attitudes concerning alcohol.

As drunk driving continues to claim the lives of thousands of Americans each year, governments at all levels seek solutions. Many states are considering enacting .08 BAC laws, and the Congress is considering requiring all states to enact these laws. Although a strong causal link between .08 BAC laws by themselves and reductions in traffic fatalities is absent, other evidence, including medical evidence on impairment, should be considered when evaluating the effectiveness of .08 BAC laws. A .08 BAC law can be an important component of a state's overall highway safety program, but a .08 BAC law alone is not a "silver bullet." Highway safety research shows that the best countermeasure against drunk driving is a combination of laws, sustained public education, and vigorous enforcement.

Agency Comments and Our Evaluation

DOT provided comments on a draft of this report (see app. I). The Department generally agreed with the information presented in the report. DOT reiterated its long-standing commitment to a systems approach for combating drunk driving and stated that while no individual component, including .08 BAC laws, is effective in isolation, the overall evidence supports the effectiveness of .08 BAC laws. DOT stated that the four original studies provided positive, if not conclusive, results and formed a reasonable basis for supporting .08 BAC laws. The three recent studies added to this body of evidence, including the North Carolina study, which, while finding little clear effect of the state's .08 BAC law, did find

The scope of our study was limited to the effect of .08 BAC laws on the number and severity of alcohol-related crashes. We did not review several other arguments raised by both proponents and opponents of .08 BAC laws; for example, while we describe the medical evidence on impairment, we did not evaluate that evidence. In addition, our ability to review the severity of alcohol-related crashes was limited by the fact that the FARS database—used entirely by five of the seven studies and in part by a sixth—includes only fatal crashes. The .08 BAC laws reviewed may have had a greater or lesser effect on nonfatal crashes than it did on fatal crashes. Finally, section 2008 of the Transportation Equity Act for the 21st Century required us to review the effect of .02 BAC laws for drivers under 21 in reducing the number and severity of alcohol-related crashes. As agreed with your staff, we will not address those laws as all 50 states and the District of Columbia now have laws establishing BAC levels of .02 or less for drivers under 21 years of age.

We performed our work from August 1998 through April 1999 in accordance with generally accepted government auditing standards.

We will send copies of this report to cognizant congressional committees; the Secretary of Transportation; and the Administrator, National Highway Traffic Safety Administration. We will make copies available to others upon request. If you have any questions regarding this report, please contact me at (202) 512-3650 or Ronald Stouffer at (202) 512-4416. Key contributors are listed in appendix II.

Sincerely yours,

Phyllis F. Scheinberg

Phyllis F. Scheinberg
Associate Director,
Transportation Issues

Department of Transportation
Comments on the General Accounting Office (GAO) Draft Report
"Highway Safety: Effectiveness of State .08 Blood Alcohol Laws,"
RCED-99-179

The Department commends GAO for reaching the sound and accurate conclusion that a .08 blood alcohol concentration (.08 BAC) law can be an important component of a state's overall highway safety program. We agree that highway safety research shows that the best countermeasure against drunk driving is a combination of laws, including .08 BAC, sustained public education, and vigorous enforcement. The Department has consistently supported such a systems approach to reduce alcohol related driving fatalities. The .08 BAC laws are an important component of this system, as research has shown substantial evidence that performance in driving-related skills such as reaction time, tracking and steering, and emergency response is substantially impaired for all persons at .08 BAC. It is not the Department's position that .08 BAC laws, by themselves, are sufficient to address the issue of alcohol-impaired driving.

Systems Approach Most Effective for Reducing Alcohol Related Highway Deaths

GAO aptly recognizes in the draft report that the National Highway Traffic Safety Administration (NHTSA) has, since 1970, espoused a systems approach for reducing alcohol-impaired driving. This systems approach must include legislative, enforcement, judicial, licensing and public information components. In 1998, NHTSA further refined this concept with the publication of an action plan to further reduce alcohol related driving fatalities. This plan recommends that all states initiate a wide range of laws and programs including .08 BAC limits, administrative license revocation (ALR) laws, comprehensive screening and treatment programs for alcohol offenders, vehicle impoundment and zero tolerance BAC laws for youth.

While studies conducted for NHTSA have attempted to measure the effectiveness of individual components of such a systems approach to reducing alcohol related deaths, it is recognized that no component operates in a vacuum. All of the efforts to reduce alcohol-impaired driving over the past two decades have built upon and operated in the environment created by the totality of actions which have preceded it. Thus, new laws will be most effective when they complement other laws and activities. Consistent with this position, the Agency has often pointed out that .08 BAC laws are likely to be most effective when combined with ALR laws, and vice versa. The studies conducted to date convincingly support this position.

Three Recent Studies Strengthen Analytical Basis for Supporting .08 BAC Laws

NHTSA recently released the results of these three high quality studies of .08 BAC law effects, which provided additional evidence to support the effectiveness of these laws. When combined with the previously conducted studies, the three new studies provide additional confidence in the expectation that .08 BAC laws, when added to existing laws or programs, reduce alcohol-related traffic fatalities. A substantial body of directionally consistent evidence is now available to support the Department's position that .08 BAC laws are effective in reducing alcohol-related fatalities. The 50-state study, for example, controlled for more extraneous variables than any previous study and showed a significant reduction in the involvement of both low BAC and high BAC drivers in fatal crashes. The 11-state study found that .08 BAC laws were associated with reductions in alcohol-related fatalities in 7 of the 11 states studied, either alone or in conjunction with ALR laws. In the North Carolina study, which found no clear effect of its .08 BAC law, the majority of outcomes were directionally consistent with such an effect, over and above the sharp decline in alcohol-related fatalities that began before the law was enacted.

The methodologies used in these studies provide tools to make responsible estimates of how many lives would be saved if all states enacted .08 BAC laws. It is common and appropriate for such estimates to be made, based on average, pooled, or aggregated study results. Researchers that make such estimates are fully aware that there will be a range of results experienced by individual states. However, if such estimates are based on sound research and appropriate algorithms, it is reasonable to predict average effects which can be expected in states yet to adopt a particular program.

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In Depth Rebuttal of Points Made in GAO Report

"Results of Recent .08 Studies are Mixed."

By far the majority of the outcomes contained in the eight studies that have been conducted to date support the contention that .08 BAC laws are associated with reductions in alcohol-related fatalities. For example, in the recent NHTSA-sponsored 11-state study, a total of 39 outcomes were reported in the results section (33 relating to .08 BAC laws alone). Of these, 32 (26 relating to .08 BAC laws alone) were directionally in support of reduction in alcohol-related fatalities associated with .08 BAC laws, alone or in conjunction with Administrative License Revocation (ALR) laws. Eleven of these outcomes (involving 7 of the 11 states) were statistically significant. Of the remaining four states, one (UT) had non-significant outcomes which supported a decrease in alcohol related fatalities; one (ME) had mixed results; and two (OR and NH) had non-significant outcomes in the opposite direction.

In summary, significant reductions associated with .08 BAC laws were found in 5 of 11 states and significant reductions associated with the combination of .08 BAC and ALR laws were found in an additional two states.

It should be added that, in the previously published multi-state study conducted by Boston University (Hingson et. al., 1996), 8 of 10 outcomes were directionally in support of reductions in alcohol related fatal motor vehicle crashes. Six of these outcomes (covering 4 of the 5 states studied) were statistically significant. Two outcomes were neither directionally in support of an impact nor statistically significant.

"Some studies find different results for the same state"

One other aspect of variation in .08 study outcomes involves the fact that different studies have sometimes found different results in the same individual states. The most resent example of this involves the two recent studies which included North Carolina. This statement is somewhat misleading, however, since the majority of the outcomes reported in the NHTSA 11-state study and in the NHTSA North Carolina study are directionally consistent. Outcomes differ primarily in magnitude and statistical significance. Both studies reported evidence of an additional effect of the .08 BAC laws, above and beyond the sharp decline in alcohol-related fatalities that had begun prior to the implementation of the .08 BAC law.

Different studies have reported different results for other states as well, most notably for OR, UT, NH, and ME. However, these kinds of inconsistencies in outcomes have been found in other areas of traffic safety research where the body of research is considered to be consistent and convincing.
Among the studies of the age-21 minimum drinking age (MDA), for example, different results were reported by different studies for several states (most notably GA, IA, ME, and MT). As the 1987 GAO report that reviewed these studies points out, these

include the combined effect of .08 and ALR laws in CA and VA). Thirty two of 39 outcomes directionally support evidence of an impact of .08 laws alone.

The 50-state study controlled for multiple extraneous factors known to be related to fatal crashes (more than any other .08 study conducted to date) and, *in addition*, introduced a time-trend factor to account for variation which *might have been* attributable to unknown or unmeasurable factors. It still found an impact for both low and high BAC drivers.

The North Carolina study conducted approximately 17 analyses where the authors provided information regarding the directionality of the results. In 11 of these 17 analyses, the results suggested the presence of a reduction in alcohol related crashes or fatalities associated with the .08 BAC law, over and above the pre-existing trend.

We consider these results to be directionally unambiguous and consistent with the findings of previous studies.

"The North Carolina researchers found no clear evidence of effect of the .08 BAC law."

Again, most of the outcomes of the North Carolina study were directionally consistent with an impact over and above the sharp decline in alcohol-related fatalities already being experienced in the state. It was this pre-existing sharp decline that prevented the observed effect of the law from being even greater than it was. The North Carolina researchers recognized this possibility when the stated that ...

"... given the dramatic decline in alcohol-related crashes that was occurring in North Carolina during the early 1990s, it may be that any possible effects of reducing the BAC limit were simply obscured by a broad change in drinking-driving behavior that was already occurring."

"The NHTSA 50-state study was well controlled but its results must be interpreted differently from other studies because it used a different outcome measure."

The 50-state study represents one of the most sophisticated, well conceived, comprehensive and controlled studies conducted to date. It directly controlled for many factors which could have affected alcohol-related crashes over the 16 years of the study. It covered the experiences of fifteen .08 BAC law states; it was based on a clear theoretical model of potential variables which affect drinking and driving; data were gathered and entered into the analysis to control for vehicle miles traveled, urban/rural distribution, seasonality, unemployment rates, alcohol consumption; and safety belt usage laws.

In addition, a sophisticated outcome measure was used (just as in the 11-state study) which helped control for any extraneous factors which might affect both alcohol-related

A Comparison of Studies of the Effectiveness of Minimum Drinking Age Laws and .08 BAC Laws

Background to the MDA 21 Literature

A review of the literature on the effectiveness of Minimum Drinking Age (MDA) laws is informative with regard to the current discussion surrounding the studies of the effectiveness of .08 BAC laws. The research literature regarding MDA law effectiveness is considered by many researchers to be among the most consistent and robust of any area. This perception is conveyed in a March 1987 report by the General Accounting Office (GAO) which reviewed these studies.

On page 27, the GAO reviewers stated: *"We identified far more studies that met our minimum threshold criteria for the traffic-accident outcome than for other reported research areas. In addition, almost as many studies met our minimum criteria as did not."*

In its conclusion, the GAO report stated: *"In total, the evidence is persuasive that raising the minimum drinking age has had significant effects on reducing alcohol-related traffic accidents for the age group affected by the law. We conclude that states can generally expect reductions in their traffic accidents, but the magnitude will depend on the outcome measure evaluated and the characteristics of the state. This finding is supported through multiple observations of similar direction and, often, similar magnitude, obtained by alternative approaches to analyzing various measures of traffic accidents. Further support for our conclusion comes from the knowledge that such consistent findings rarely occur in reviews of this sort. "*

What the Current .08 Studies Have Found

Before looking at the MDA law literature, it would be useful to review the results of studies of .08 laws conducted to date. There have been eight studies of the effectiveness of .08 BAC laws in the U.S:

NHTSA **(1991)**; covered California; single outcome measure
- *found 12 percent effect of 08 and ALR together*

Johnson and Fell (1995); covered five states, 6 outcome measures
- 26 of 30 outcomes suggested reductions; 10 were statistically significant
- consistent reductions found in four states (CA, OR, UT, VT)
- mixed results found in one state (ME)
- estimated effect varied between *4 and 40 percent reductions* (no pooling)

Rogers (1995) California DMV study; used a variety of outcome measures
- mixed results, most non-significant
- *7.2% reduction in nighttime fatal* and severe injury crashes
- *10% reduction in fatal and total injury crashes between 2-3 a.m.*

Hingson et al (1996); covered five (early .08) states; single outcome measure

from 5 percent (Hoskin et al, 1986) to 28 percent reductions (Williams et al 1983).

Studies that pooled results from several states always reported overall decreases in (measures of) alcohol-related crashes, but **within these pools, the results for individual states varied considerably**, with the majority of them not reaching statistical significance.

The Characteristics of the MDA 21 Literature Relative to the .08 BAC Literature

With this summary information in mind, it is instructive to compare the characteristics of the highly regarded body of MDA 21 law studies with those of the .08 BAC law studies.

Clearly, the MDA 21 studies have involved a competent group of researchers, sound research methods, and results that have been directionally consistent.

On the other hand, these studies have also reported a *wide range of effect sizes*, used a variety of outcome measures, and *have sometimes reported inconsistent results* -- even among some studies conducted in exactly the same manner. With some states, there were actually findings of increased crash involvement for the age group(s) affected.

The level of consistency (or inconsistency) of outcomes in the .08 BAC law literature is similar to that of the MDA 21 area. Reported inconsistencies have nearly always involved significant versus non-significant findings, not directionally different findings. *In both areas, the level of consistency in the directionality of outcomes is very similar*

With regard to quality of studies, the overall quality and sophistication of studies of .08 BAC laws is just as high, if not higher, than the studies reported in the 1987 GAO report.

Several specific issues of concern have been raised with regard to .08 BAC law studies. They include: *inconsistent or equivocal results*, *use single comparison states*, and *suggested inappropriateness of pooling or aggregating results* across states.

Variation in Reported Outcomes

It has been suggested (by GAO reviewers and others) that there is a degree of inconsistency (and equivocality of results) among the studies of .08 BAC laws.

All research findings are equivocal!

Within both the MDA-21 and the .08 BAC literature, *between-state differences in effect have been common* and *different studies have often reported different results for a particular state.* Usually these differences involve outcomes that are directionally consistent but which vary in magnitude and/or statistical significance. With regard to the .08 BAC law literature, there is no greater inconsistency with regard to either magnitude or directionality of outcomes than in the

However, pooling is a common practice, particularly when dealing with small states. Nearly all of the MDA 21 multi-state studies included some form of pooling, averaging, or aggregating across states (e.g., Arnold (1985); DuMouchell (1985); Hoskin (1985); and Williams et al. (1983)).

Another form of (GAO) criticism that relates to pooling is the suggestion that it is inappropriate to include states in the pool if they have had results that were either not statistically significant or directionally inconsistent.

This is not uncommon and it is not inappropriate. In fact, the 1987 GAO report acknowledges the fact that between-state outcomes varied considerably within the "pools" of states included in the studies they cited as meeting their criteria and showing impact. The report stated that: *"most individual states making up the pool of states evaluated in each study observed statistically significant reductions in this category; however, there were some exceptions. For example, in the Arnold (1985) study, Georgia, Iowa, and Maine exhibited a net percentage increase in "driver fatal" crashes for the age groups affected by the law during the study period."*

Use and Selection of Single Comparison States

Perhaps the most frequently voiced criticism of the Hingson et al. (1996) study o. .08 BAC law effectiveness has been that these researchers (arbitrarily) selected single states to serve as a control or comparison for each .08 BAC law state.

Hingson and his associates selected their comparison states on the basis of geographical proximity and similar (high) levels of BAC testing as the .08 law states. Critics (including GAO) have focused on the fact that selection of different states would have produced different results.

Most researchers agree that multi-state comparison groups (such as those used by Foss et. al., and by Apsler et. al.) are more robust than single state comparison groups. As a result, it is preferable to use a combination of states (or even all remaining) states for comparison purposes.

However, it should also be pointed out that the use of single comparison states is common in public health research. *Nearly all of the MDA law studies included single states for comparison with individual law states.* In fact, one of the better multi-state MDA studies included in the GAO review (Williams et al., 1983) used an approach similar to that used by Hingson et al. (1986).

Summary

In summary, many of the current criticisms of the .08 BAC effectiveness literature are inconsistent with the views held regarding similar research conducted with regard to MDA laws. As with the MDA laws, the studies of .08 BAC law impact have been conducted by reputable researchers who have employed sound analytical methods.

RECENT STUDIES OF THE EFFECTS OF .08 BAC LEGISLATION

NHTSA recently completed three studies of the effects of lowering the illegal blood alcohol concentration (BAC) limit from .10% to .08%. Two of these studies indicate that .08 BAC laws have reduced alcohol-related crash involvement, particularly in conjunction with the presence of other impaired driving laws and programs such as administrative license revocation (ALR). The third study looked at the effect of a .08 BAC law in a single state (NC) and found no statistically significant change in a pre-existing downward trend in factors related to alcohol-related crashes.

The most comprehensive study (covering all 50 states) analyzed the effects of both .08 and .10 illegal per se laws, as well as administrative license revocation (ALR) laws over a 16-year time period. After extensive efforts to control for extraneous factors, this study found that all three laws were associated with reductions in drinking drivers involved in fatal crashes. It estimated that .08 BAC laws had an 8% effect in reducing fatal crashes involving drivers at both high BACs and lower BACs and resulted in 275 fewer fatalities in the 15 states where they were in effect in 1997. If all 50 states had such laws in effect, an additional 590 fatalities would have been prevented.

An 11-state study also examined the effects of .08 BAC (and ALR) laws. It found that 0.08 BAC legislation was associated with reductions in alcohol-related fatalities, alone or in conjunction with ALR laws, in seven of the eleven states studied. In five of these states (VT, KS, NC, FL, NM), implementation of the 0.08 BAC law itself was associated with significantly lower rates of alcohol related fatalities. These results take into account any pre-existing downward trends the states were already experiencing, due to other factors such as the presence of other laws, use of sobriety checkpoints, etc. In two states (CA and VA), significant reductions were associated with the combination of .08 BAC and ALR laws, implemented within 6 months of each other.

The third study analyzed the effects of a .08 BAC law implemented in 1993 in North Carolina, a state which had already been experiencing a sharp decline in alcohol-related fatalities since 1987. This study concluded that there was little clear effect of the lower BAC limit. Results from various analyses suggested that some portion of the reductions may have been associated with the law but the magnitude of these effects was not sufficient to make this conclusion.

In aggregate, these three studies provide additional support for the premise that .08 BAC laws help to reduce alcohol-related fatalities, particularly when they are implemented in conjunction with other impaired driving laws and programs. Nearly all of the findings of these and previous studies show changes that suggest that .08 BAC legislation (as well as .10 BAC laws and ALR laws) have contributed to the trend toward reduced alcohol-related crashes and fatalities that have been experienced across the nation.

- While alcohol-related traffic fatalities have been decreasing (and the 39 percent in 1997 represented an all-time low in the U.S.), we have a long way to go to meet the national goal of no more than 11,000 alcohol-related fatalities by the year 2005.

- We know what works. In order to reduce impaired driving in this Nation, we need tough laws set by the states, highly visible enforcement of these laws, and a change in the public's attitude regarding this problem.

- One step in that direction will be to adopt .08 BAC as the illegal limit for adult drivers in all 50 states. Currently, only 16 states and the District of Columbia have such laws.

- Research shows that virtually all drivers, even experienced drinkers, are substantially impaired at .08 BAC with regard to critical driving tasks (such as braking steering, lane changing, judgement, and divided attention)

- The risk of being involved in a crash increases gradually at each blood alcohol level, but rises very rapidly after a driver reaches or exceeds .08 BAC.

- . 08 BAC is a reasonable limit to set. A 170-lb. male would have to consume 5 or more 12-ounce beers in a 2-hour period on an empty stomach to reach .08 BAC. An average (137 lb.) female would need to consume 4 beers in 2 hours to reach .08.

- Surveys show that most people would not drive after consuming 2 or 3 drinks and that 2 out of 3 Americans favor lowering the limit to .08, when they are made aware of how much alcohol that means.

- Most other industrialized nations have set BAC limits at .08 or lower. For example, Canada and Great Britain have had .08 for many years; Australia, France and Germany are at .05; and Sweden has an illegal limit set at .02 BAC.

- Past research has shown that .08 laws have been effective in reducing impaired driving in several states that have adopted them. However, some have suggested that because these studies have found different results in various states that they provide only "equivocal" evidence of the effectiveness of these laws.

- In fact, the quality and consistency of the results of the past studies is quite similar to that of studies conducted from 1980 -1990 to evaluate the effectiveness of minimum drinking age laws. Any inconsistency found in the studies (in both areas) has generally been in magnitude, not direction of effect, and it has involved primarily smaller states where fatal crashes vary significantly from year-to-year.

- However, because concerns have been raised, the Department of Transportation commissioned these three new studies to further investigate the effectiveness of .08 BAC laws.

effective when coupled with other efforts, including ALR laws, sobriety checkpoints, enforcement blitzes, and public information campaigns.

- Even with these studies, there will undoubtedly be those who will still claim the evidence for the impact of .08 laws is still "equivocal." All research is (equivocal). However, with the addition of these studies, the quantity and quality of studies is reinforced. In fact, it can be argued that both the quality of the studies and the consistency of their results parallels that of the minimum drinking age (MDA 21) studies, which have been widely viewed (including GAO reviewers) as constituting one of the most unequivocal areas of highway safety evaluation]

Questions and Answers Regarding the .08 Issue and the Recent Studies Supporting Its Impact

Questions Directly Related to the .08 Studies

Q. How do you resolve the fact that in one study of the effects of .08 BAC legislation in North Carolina, the researchers found "no clear effect," while in the other study a significant effect of the law was found?

There is more consistency than inconsistency in the findings of these two recent studies of the North Carolina .08 law implemented in 1993. Both studies found that the .08 BAC law was *implemented in the midst of a sharp decline* in alcohol-related crashes that had begun in 1987. Thus, both studies attempted to find evidence of an *additional* effect, above and beyond the downward trend that was already occurring.

In fact, both studies did find evidence of an *additional* effect associated with the .08 BAC law. In the 11-state study (Apsler, Char, Harding, and Klein), the outcome (for North Carolina) was a statistically significant reduction in alcohol related fatalities. In the case of the North Carolina study (Foss, Stewart, and Reinfurt), several analyses were conducted, the majority of which found evidence of an *additional* reduction in alcohol related crashes associated with the .08 BAC law (in comparison with all states without .08 laws and in comparison with 11 other states with high BAC testing). In this study, however, the magnitude of these results was not great enough for the researchers to conclude that there was a clear effect. Some of the differences in the size of the effect observed appear to be related to differences in pre/post time periods. In any case, the majority of the outcomes of both studies suggested an *additional* effect associated with the law.

In summary,

> Both studies found **long term declines in alcohol-related fatal crashes** in North Carolina, due to a variety of activities and programs implemented within the State.

on this very difficult problem. Thus, many countermeasures are in operation at any one time and it is very difficult try to separate out the impact of specific actions.

In addition, there are many extraneous factors that can affect drunk driving (e.g. alcohol consumption levels and patterns, unemployment, etc.). These factors (at least those which are known to affect alcohol-related crashes) must also be accounted for in any credible study.

Efforts to control for the impact of extraneous variables and to estimate the impact of individual measures are never perfect.

However, primarily because of differences in the timing of various efforts, it is often possible to determine (using time series analysis) with some confidence if a particular countermeasure (such as .08 BAC legislation) is having an impact.

It is also possible to use different measures and comparisons with other states to show differences.

The replication of such impact by an accumulation of studies, conducted over different time periods and using different measures and techniques adds to the confidence of these findings.

Q. **How did you account for public attitude changes to drunk driving mainly due to the work of grass roots groups such as MADD and SADD?**

All of the studies took into account the potential impact of such factors by including a "year trend" factor in their analyses Even taking this trend into account, the two national level studies still found that .08 laws had a significant effect on reducing alcohol related fatal crashes.

Q. **Intuitively a .08 law with lots of publicity and enforcement should work better than a law with little of either. Does that account for some of the variability in your results? Can you be assured that the presence or absence of publicity and/or enforcement in conjunction with these laws has been taken into account?**

Unfortunately, there is not good data available regarding the level of enforcement or publicity that accompanied the implementation of .08 BAC laws in all of the states that enacted them. It is certainly possible that differences in the levels of these complementary activities resulted in differences in measured impact in various states with .08 BAC legislation.

Q. **Everybody knows that the baby boomers are getting older and more health conscious and that alcohol consumption is going down in the U.S. The young population was also decreasing over the years of your study. Those factors cause a long-term decline in drinking and driving along with many other social problems. How did your analyses account for that?**

All of the studies used "time factors" in their analyses to attempt to control for such factors that are highly correlated with time. Again, even after accounting for these time trends, the two

This legislation sends a message to all potential drinking drivers that the standard is being lowered and that their risk of arrest, conviction and sanction is becoming greater.

Q. Doesn't a .08 BAC law mean that a 120-lb woman who has two glasses of wine in two hours will be subject to arrest, fines and jail?

This scenario is extremely unlikely. Obviously, if the woman drinks large glasses of high alcohol-content wine on an empty stomach, her BAC could rise to that level. However, numerous demonstrations have been conducted around the country which have included small-statured women. In those demonstrations, even on an empty stomach, two glasses of wine have not resulted in BACs of .08 -- even though the women often showed obvious signs of impairment.

That is the important point -- all persons, small-statured women or large, heavy men, show significant impairment before reaching a BAC of .08. That is why research shows that the risk of being involved in a fatal or serious injury crash increases significantly by the time one is at a .08 BAC.

Q. If lowering the illegal BAC limit from .10 to .08 saves lives, why not lower it to .06 or .05 and save even more lives?

The research on impairment, risk of crash involvement, and effectiveness of legislation, along with the level of public acceptance of current and proposed BAC legislation all points to .08 as the most appropriate illegal level. If future research suggests that lower levels should be adopted and the public agrees, perhaps lower limits will be considered. Right now, .08 is the level recommended for adults. Keep in mind, all states now have adopted per se levels of .04 BAC for commercial drivers (large trucks, buses, etc) and .02 BAC (or zero tolerance) for drivers under the age of 21.

Q. Some countries with .08 BAC limits (e.g. Mexico, Canada, Austria) have higher alcohol involvemeut rates in fatal crashes than in the U.S. How do you explain that?

Some countries do have higher alcohol involved fatal crash rates than the U.S., even though they have .08 BAC limits. Such laws are only one among many factors influencing alcohol-related fatality rates. There are many other factors that affect these statistics, such as enforcement levels, sanctions, public attitudes toward drinking and driving, alcohol consumption levels and patterns, availability of alternative transportation, etc.

In the U.S., 39% of the traffic fatality are alcohol-related. In many countries with lower BAC limits, like Sweden, the percent alcohol-related is far lower, usually below 30%.

Q. Even in countries like Sweden, the average BAC of a person involved in an alcohol-related fatal crash is .15. How do you explain that?

The Relationship of Alcohol Safety Laws to Drinking Drivers in Fatal Crashes

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16. Abstract

This paper presents an analysis of the relationships between the passage of key alcohol safety laws and the number of drinking drivers in fatal crashes. The study evaluated three major alcohol safety laws (administrative license revocation laws, .10 illegal *per se* , and .08 illegal *per se* laws) on the proportion of drinking drivers in fatal crashes. Drivers age 21 and older in fatal crashes at two BAC levels--.01 to .09 and .10 or greater--were considered separately. Drivers under age 21 were not included because they are affected by the Minimum Legal Drinking Age law. This study used data on drinking drivers in fatal crashes from the Fatality Analysis Reporting System (FARS) covering 16 years from 1982 though 1997 for all 50 states and the District of Columbia. Also, included in the study were such variables as per-capita alcohol consumption and annual vehicle miles traveled, which could impact the number of alcohol-related crashes. The results indicate that each of the three laws had a significant relationship to the downward trend in alcohol-related fatal crashes in the United States over that period. The paper points out that this long-term trend is not the product of a single law, but the result of the growing impact of several laws over time plus the affect of some factors not included in the model tested, such as the increasing use of sobriety checkpoints and the

Alcohol Safety Laws	Adult drivers in fatal crashes	
	BAC .01–.09	BAC .10+
Illegal *per se* laws (.10)	–13.17%	–8.69%
Per se .08 law	–7.89%*	–8.00%
Admin. license revocation law	–18.96%	–12.81%

* Significant at p=.05; all other significant at p<.001

Because the passage of alcohol safety laws by the states took place over time and is highly correlated with time, it was felt that the introduction of the "time trend" factor absorbed some additional impact properly attributable to the three laws in question and, thus, this analysis produced conservative estimates of the potential impact of these three laws.

Finally, the attribution of savings to any single law should be made with caution since each new law builds to some extent on existing legislation and on other ongoing trends and activities. The synergistic interaction among laws is perhaps most evident in the relationship between illegal per se laws (.10 BAC and .08 BAC) and ALR laws.

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91	.5784	.0882	.9020	.7450	.1569	.4509
92	.5974	.0980	.9412	.7932	.1569	.4750
93	.6373	.1127	.9412	.8300	.1765	.5032
94	.6766	.2158	.9510	.8989	.1765	.5377
95	.7451	.2500	.9608	.9413	.1829	.5621
96	.7626	.2745	.9804	.9608	.2059	.5833
97	.7843	.2843	.9804	.9640	.2283	.5961

* For laws becoming effective part way through the year, state weight was adjusted proportionately to represent time during the year in which the law was in effect.

Fatal crashes result from a multiplicity of factors. Some of the factors that have been shown to affect the number of crashes include amount of travel, the status of the economy, and the quality of vehicles and roadways. Driver alcohol impairment is only one such factor. To properly study the effects of alcohol legislation, it was necessary to control for as many extraneous factors contributing to changes in alcohol-related and non-alcohol-related fatal crash frequency as possible. The most frequently used procedure for studying the legislative impact on crashes is to compare states with and without the stricter BAC laws (for example, see Hingson, Heeren, & Winter, 1994, 1996; and Johnson & Fell, 1995). This approach depends upon selecting *comparison* states similar in significant characteristics to *experimental* states that have enacted the laws in question. An alternative procedure is a panel study that uses all states over a long time. A state-by-year (or state-by-quarter) matrix can be created as a framework for regression analyses where drinking drivers in fatal crashes constitute the dependent variable and where alcohol safety laws and other factors thought to influence fatal crashes constitute the independent (or "predictor") variables.

To conduct such a study, it is necessary to:

1. identify the dependent variable most relevant to the purposes of the study;
2. identify the laws to be evaluated;
3. identify those additional independent variables that can significantly influence the dependent measure, and
4. provide a trend factor to capture those variables omitted from the analysis.

Figure 1 provides a model of the variables thought to be related to crash causation and included in the current analysis. It illustrates the plan for this study. The relationships shown by the arrows are those studied in the current research. Other potential relationships between those measures were controlled, at least partially, through the regression analyses.

Figure 1. Model for analysis of the impact of laws on the proportion of drivers in fatal crashes with BAC >0

involved in fatal crashes are available for all 50 states and the District of Columbia, dating back to 1982 (NHTSA, 1998), and each of the three dependent measures (i.e., number of crashes, drivers, and fatalities) can be related to level of alcohol involvement. Of the 912,954 driver records used in this analysis, 399,348 were fatally injured and 69.2% of those had known BACs. The remaining 513,606 were surviving drivers of which 23.1% had known BACs. The Klein procedure provided a probability estimate for the drivers with unknown BACs in three categories: .00, .01 to .09, $.10.

The laws that were studied were aimed at deterring potential drinking drivers. Therefore, it seemed appropriate to "standardize" the dependent measure by using the ratio created by dividing the number of drivers in fatal crashes with a positive BAC by the number of drivers in crashes who had a zero BAC. Using this ratio assists in controlling for those factors that impact all fatal crashes, not just those related to impaired driving. The total amount of driving, as measured by the vehicle miles traveled in a state, for example, is likely to affect both alcohol and non-alcohol-related crashes, presumably to a similar extent. Using this ratio helps to eliminate the effect of this factor, to the extent that miles of driving has a similar effect on alcohol and non-alcohol-related crashes.

3. Alcohol consumption

Alcohol consumption potentially has a complex relationship with drinking-and-driving laws. Beer has been shown to be the beverage of choice for individuals convicted of driving while intoxicated (DWI) (Berger & Snortum, 1985). For this study, separate state per-capita consumption levels were available for wine, beer and spirits (Williams, Stinson, Sanchez, & Dufour, 1997). However, only beer and total alcohol consumption correlated significantly with the number of drinking drivers in fatal crashes. Thus, beer consumption was used as the principal relevant measure of alcohol consumption.

The relationship between alcohol consumption, safety legislation, and fatal crashes is complex. It is hypothesized that increased alcohol consumption increases the probability of drivers being involved in an alcohol-related fatal crash. But, it is not clear if decreased consumption has resulted in more alcohol-related safety legislation (and a reduction in alcohol-related fatal crashes) or if such legislation has resulted in a decrease in per-capita consumption.

To determine the direction of this effect, two preliminary analyses were conducted. First, the 1982 annual beer-consumption levels for those states that later adopted .08 laws were compared with consumption levels in those states that, as of 1997, had not enacted such legislation. The average per-capita beer consumption for the .08 BAC law states was 1.42 (±.04 se); the average for the states without .08 BAC laws was 1.40 (±.07 se). This indicates that there was no significant difference (p=.826) in beer consumption between the two groups of states in 1982, prior to the enactment of any .08 BAC laws. Further, an examination of the consumption levels in .08 states, by date of adoption, indicated that the early adopters did not have different levels of per-capita beer consumption than late adopters (p=.311). A second study compared per-capita beer consumption before-versus-after the enactment of .10 BAC, .08 BAC, and ALR laws in states that adopted such legislation. *For all three laws*, there was a reduction in beer consumption following the enactment of the law. The reduction associated with .10 *per se* was 3.22%; the reduction associated with .08 *per se* was 3.49%; and the reduction associated with ALR was 2.16%. All of these differences were significant (p<.001). Thus, the evidence examined in this study favors the hypothesis that the relationship between the safety laws and beer consumption is that the laws affect consumption, rather than the other way around.

4. Drinking-and-driving laws

enacted within 6 months of each other. Rogers (1997) in a study of the .08 BAC law in California found a relatively modest 7% effect on nighttime crashes occurring between 12 AM and 2 AM. Johnson and Fell (1995) reported that four out of five states (California, Maine, Oregon, Utah, and Vermont) implementing .08 BAC laws showed significant reductions in one or more measures of alcohol-related fatal crashes. A study by Hingson and colleagues (1996), which was limited to five states with such legislation and a somewhat controversial selection of five comparison states, found that .08 BAC laws were associated with a significant reduction in the proportion of drivers in fatal crashes who had BACs greater than .08. That study also showed a significant reduction in the proportion of high BAC drivers involved in fatal crashes (i.e., at or above .15 BAC). However, these results were affected by the fact that these states had also recently enacted ALR legislation.

5. Safety belt laws

Occupant restraint programs include three types of laws: child safety seat laws, secondary *safety belt laws*, and primary *safety belt laws* . Secondary laws require the observation of some other traffic offense before a driver can be stopped and cited for nonuse of a safety belt. Primary laws allow an officer to stop and cite the driver based solely on a safety belt violation. Since this study focuses on alcohol use by drivers, child safety seat laws were not included. NHTSA estimates that safety belts have saved 100,000 lives since 1975 (NHTSA, 1997).

Use of safety belts has a complex relationship with alcohol-related crashes. Clearly, usage protects both drinking and nondrinking drivers. However, the usage rates among these two driver groups varies significantly and, depending upon the level of usage, a law requiring usage will affect drinking and nondrinking drivers differently. In the absence of safety belt use laws, safety belt usage is lower among drinking drivers than among nondrinking drivers, but the usage rates of both groups is low. In such a situation, the effect of enacting a safety belt use law generally produces proportionally greater usage among nondrinking drivers than among drinking drivers. At higher usage rates, however, where the use rates of nondrinking drivers are already much higher than those of drinking drivers, an upgrade in the law (which usually makes it more enforceable) is likely to affect drinking drivers to a greater degree than nondrinking drivers since their usage rate is so much lower (Voas & Tippetts, 1998)

Thus, initial safety belt laws (enacted when safety belt use rates are quite low) are likely to increase the ratio of alcohol-positive to alcohol-negative drivers involved in fatal crashes. When upgrades in safety belt laws occur (usually when usage rates are much higher), a larger proportion of alcohol-positive drivers than alcohol-negative drivers will begin to use safety belts (making them less likely to be involved in a fatal crash). Thus, at this level, it is hypothesized that such laws will reduce the alcohol-positive to alcohol-negative ratio of drivers involved in fatal crashes.

Because some states moved directly to primary laws while others first passed secondary laws, attempts in the present research to use two separate variables to represent these laws were complicated by the varying sequence in the enactment of these measures. Ultimately, it was decided to represent secondary and primary safety belt laws with a single three-level variable, with values of zero, 0.5, and one. Primary safety belt laws are weighted twice as effective (value = 1) as secondary laws (value = 0.5). This estimate is based on the fact that initial increases in safety belt usage rates were significantly greater in primary law states than in secondary law states. Furthermore, in recent years when several states have upgraded from secondary to primary laws, significant increases in usage have been observed. Prior to any safety belt use laws, the national usage rate stood at approximately 14%. By 1994, the average usage rate in no law, secondary law, and primary law states was 45%, 62%, and 75%, respectively (NHTSA, 1995).

caused by the sampling size of the state's pool of crashes and, therefore, taps into the size-of-state dimension well (Spearman's rho=.858). In addition, the weighting derived from within-state variability has the desirable qualities of a narrower range and a less extreme distribution. Larger states have lower re-sampling variability because they have more crash-involved drivers and random fluctuations tend to wash out, thereby providing more reliable ratios. Weighting cases by this measure naturally places more importance on the experience of larger states or at least on those states having a larger traffic problem in terms of numbers of fatal crashes. These case weights had a mean of 1.0 across all 51 states (including the District of Columbia) within each period, ranging from a low of approximately 0.25 (North Dakota, Alaska, and Rhode Island) to a high of slightly more than 2.5 (California).

Independent Variables and Covariates

The three alcohol-related laws being evaluated were modeled as dichotomous dummy variables: When a law became effective partway through a quarterly period, the variable represented that portion of the quarter the law was in effect. When a state lowered its *per se* limit from .10 to .08, the dummy variable for the *per se* .10 law was continued so as to ensure that the dummy variable for the .08 law represented only the marginal effect of the lowered limit. Safety restraint laws were modeled as a single three-step variable, with no law represented by a value of zero, a secondary law represented by a value of 0.5, and a primary law represented by 1.0.

Maryland and Massachusetts enacted ALR laws embodying a BAC limit without establishing a *per se* law. Since the ALR limit may have a greater impact in terms of certainty of sanctioning, these two states were modeled as having the corresponding *per se* law BAC limit when they enacted their ALR law. In all other states, the *per se* laws were passed first and then strengthened by the later passage of the ALR.

To avoid over-fitting a model with a dummy parameter for each state and to explain variation over time within states, other variables relating to state environment and conditions were used as covariates. The most important of these in terms of correlating with the prevalence of alcohol in drivers involved in fatal crashes was per-capita beer consumption. Consumption data were not yet available for 1996 and 1997, the two years when many of these laws were enacted. So, rather than eliminate one of the strongest predictors of alcohol-involved crashes, a per-state average beer consumption level, a between state measure that was constant over time within each state, was developed.

As reported earlier in this paper, per-capita alcohol consumption differences between states were unrelated to passage of DWI laws. However, these differences might still be related to the number of drinking drivers in crashes. Where small, but significant, effects of the safety laws on increasing subsequent consumption within states were found, state consumption levels were adjusted for the laws' effects on drinking for those states passing the laws. After averaging the adjusted beer consumption level for each state, this variable served as a between-state covariate only, remaining constant over time within each state.

Among other measures that vary between-states within the same period and within-states over time, three were found to be important predictors: per-capita vehicle miles traveled (VMTPC) changed yearly, urban/rural distribution of the state's population changed yearly, and unemployment rates changed quarterly. The two components of VMTPC—total state VMT and number of licensed

	B	Std. Error	Beta	t	Sig.	Correlations	
						Zero-order	Partial
(Constant)	-4.78598	.146		-32.737	.000		
BEER@ADJ	.58444	.053	.191	11.062	.000	.195	.190
UE@	.01025	.005	.036	2.062	.039	.138	.036
ALR@	-.21021	.027	-.169	-7.764	.000	-.227	-.135
PS@10	-.14125	.028	-.087	-5.031	.000	-.126	-.088
PS@08	-.08224	.041	-.041	-2.019	.044	-.154	-.035
YR2TREND	-.0000851765	.000	-.166	-8.095	.000	-.256	-.141
QTR2	.17652	.023	.124	7.597	.000	.082	.132
QTR3	.21376	.023	.150	9.200	.000	.099	.159
VMT@	.10899	.013	.156	8.153	.000	.183	.142
SB#	.11198	.022	.085	5.016	.000	.132	.088
URBAN	.49323	.082	.112	6.016	.000	.213	.105
ALR#	.15287	.031	.105	4.954	.000	.033	.087
PS#08	-.06672	.027	-.050	-2.485	.014	-.026	-.043

Multiple R's—Without trend component: .443; with trend component: .484

Table 3. Variables significantly related to the proportion of drinking drivers in fatal crashes with BACs at or above .10

	B	Std. Error	Beta	t	Sig.	Correlations	
						Zero-order	Partial
(Constant)	-2.39975	.072		-33.150	.000		
BEER@ADJ	.63269	.031	.303	20.687	.000	.258	.341
VMTPERLD	.04778	.004	.233	13.054	.000	-.111	.223
UE@	.01546	.003	.080	4.681	.000	.226	.082
ALR@	-.13708	.014	-.162	-9.489	.000	-.258	-.164
PS@10	-.09090	.018	-.081	-4.979	.000	-.219	-.087
PS@08	-.08340	.025	-.062	-3.334	.001	-.243	-.058
YR2TREND	-.0000889403	.000	-.254	-4.266	.000	-.442	-.075
YR_TREND	-.0050083072	.002	-.220	-3.295	.001	-.441	-.058
QTR2	.11763	.015	.121	8.080	.000	.090	.140
QTR3	.11648	.015	.120	8.003	.000	.069	.139
SEATBELT	.09460	.023	.078	4.201	.000	-.242	.073
PS#08	.04869	.015	.054	3.141	.002	-.023	.055

Multiple R's—Without trend component: .502; with trend component: .594

For both analyses, the adjusted beer consumption factor (BEER@ADJ) was correlated with an increased number of drinking drivers in fatal crashes. This factor represents the difference between states in beer consumption, not a change in sales over time within-state, since our preliminary study indicated that beer consumption fell following the passage of alcohol safety legislation. As previously

* Significant at p=.05; all other significant at p<.001

Interpreting effects sizes: The effect sizes shown in Table 4 are somewhat difficult to interpret because they are percentages of ratios. Further, they are not additive because they are expressed as percentages. Rather, they are multiplicative. This means that the total percentage reduction attributable to a combination of two or more laws is slightly less than it would be if the percentages were simply added together. Thus, two or more of the laws studied account for some involvement of the same drivers. To make these effect sizes more meaningful, the impact of a single law on fatalities can be estimated using the following assumptions and procedures.

The first assumption is that since this analysis included only adult drivers (21 years and older), the calculation assumes that zero lives were saved by a reduction in crashes involving drivers under age 21. Further, the analyses conducted were based on drivers involved in fatal crashes, not on the number of fatalities. The estimated reductions due to the .08 BAC law "effect" were 7.8% fewer drivers at .01-.09 BAC, and 8% fewer drivers at .10+ BAC. After calculating the number of drivers these percentage reductions represent, that figure is converted into the number of fatalities that would have been associated with those drivers. The conversion rates, calculated from the 1997 FARS data, were .9222 fatalities per driver at .10+ BAC, .8332 fatalities at .01-.09 BAC, and .6901 fatalities at .00 BAC.

To arrive at these conversion "rates," the drivers involved in each crash are divided into three BAC categories based upon the driver-level Klein imputations (.00 BAC, .01–.09, .10+). The total fatalities within each crash are then attributed proportionately to each of the three BAC categories of drivers involved in that crash. For example, if there were four fatalities in a crash involving three drivers, and two of the three drivers were in the .10+ category, with the other driver alcohol-negative, then 2/3 of the 4 fatalities (2.667 fatalities) would be attributed to drivers at the .10+ level, and 1/3 of the fatalities (1.333 fatalities) would be attributed to the driver at the .00 level. This proportional attribution of involvement to drivers implies equal responsibility for the crash to each driver, regardless of BAC level, and ignores the possibility of one or more drivers being more at fault than others. As such, this approach probably underestimates the number of fatalities that alcohol-positive drivers are responsible for, given that these drivers are more likely to be at fault. In the (mathematically) trivial case of single vehicle crashes, the proportional involvement and fault are, with very few exceptions, identical. This procedure yielded the estimate that if, rather than 16 states, all 50 states had .08 laws throughout 1997, 590 (95% confidence interval=200 to 958) additional lives would have been saved. The .08 and .10 illegal per se laws are shown in Table 5.

Table 5. Estimated savings in 1997 for the three alcohol safety laws analyzed in this study

	.08 per se	.10 per se	
States with law in 1997	16	49 & DC*	
Estimated to have been saved in states with laws in 1997	274 95% confidence interval 88 to 472	1115 95% confidence interval 663 to 1586	95% cor 10·

shown in Table 4 are probably conservative.

This study is not the first to produce evidence for the effectiveness of the three laws included in the analysis. However, this study covers the longest period (16 years) and more states (all 50 plus the District of Columbia) than most previous studies. It also specifically includes potentially confounding variables such as alcohol consumption and safety belt laws not directly considered in most previous studies. The credibility of the results is strengthened by their conformity to theoretical expectations. Beer consumption, for example, is associated with proportionally more positive BAC drivers in fatal crashes as would be expected. Furthermore, the relationships between alcohol safety laws and reductions in drinking-driver involvements, while significant, are generally consistent with the results of other studies.

Perhaps, more significant than the effect of any one law is the evidence that each of these major alcohol-safety laws has contributed to the downward trend over the last two decades of alcohol-related crashes. As should be expected, this long-term national trend is not the product of any single policy act, and it is undoubtedly influenced by factors not in the present analysis such as the increasing use of sobriety checkpoints in some states. Since factors such as alcohol policies, roadway and vehicle characteristics, and economic conditions all interact in their influence on crashes, it is important to interpret estimates of lives saved due to any single law with considerable caution.

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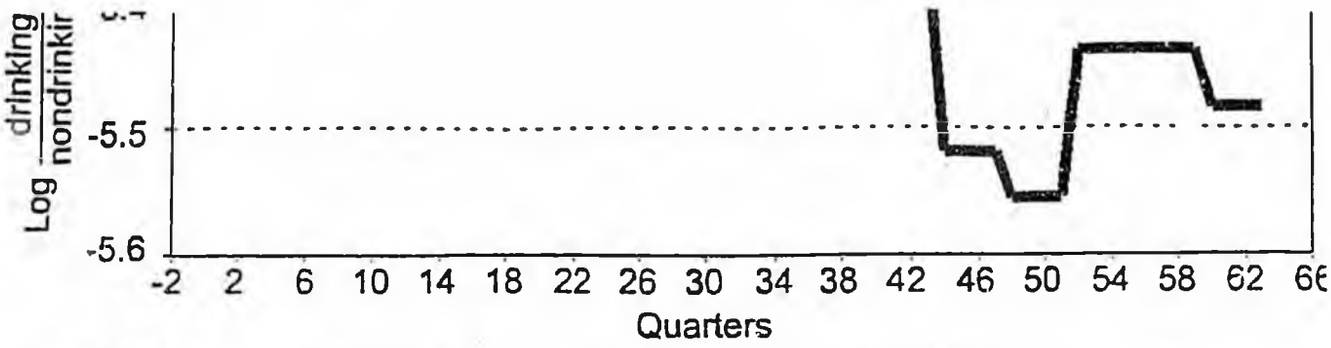
42 Pennsylvania	38.5		59.4	
44 Rhode Island	2.2		3.7	
45 South Carolina	15.3		24.6	
46 South Dakota	2.7		4.4	
47 Tennessee	26.6		43.0	
48 Texas	94.4		155.1	
49 Utah		3.7		6.5
50 Vermont		1.9		3.3
51 Virginia		22.7		39.3
53 Washington	15.3		25.0	
54 West Virginia	8.0		12.7	
55 Wisconsin	17.5		28.4	
56 Wyoming	2.1		3.3	
Total	590.3	274.5	965.0	476.9

Appendix B: Treatment Effects for Analysis Without Time Variable

To illustrate the effect of including the two time trend variables in the analysis, a separate analysis was conducted in which the time trends were not entered. The resulting effect sizes are shown in Table B-1. These should be compared with Table 4 in the text.

Table B-1. Effect sizes for alcohol safety and safety belt laws for two groups of drivers in fatal crashes

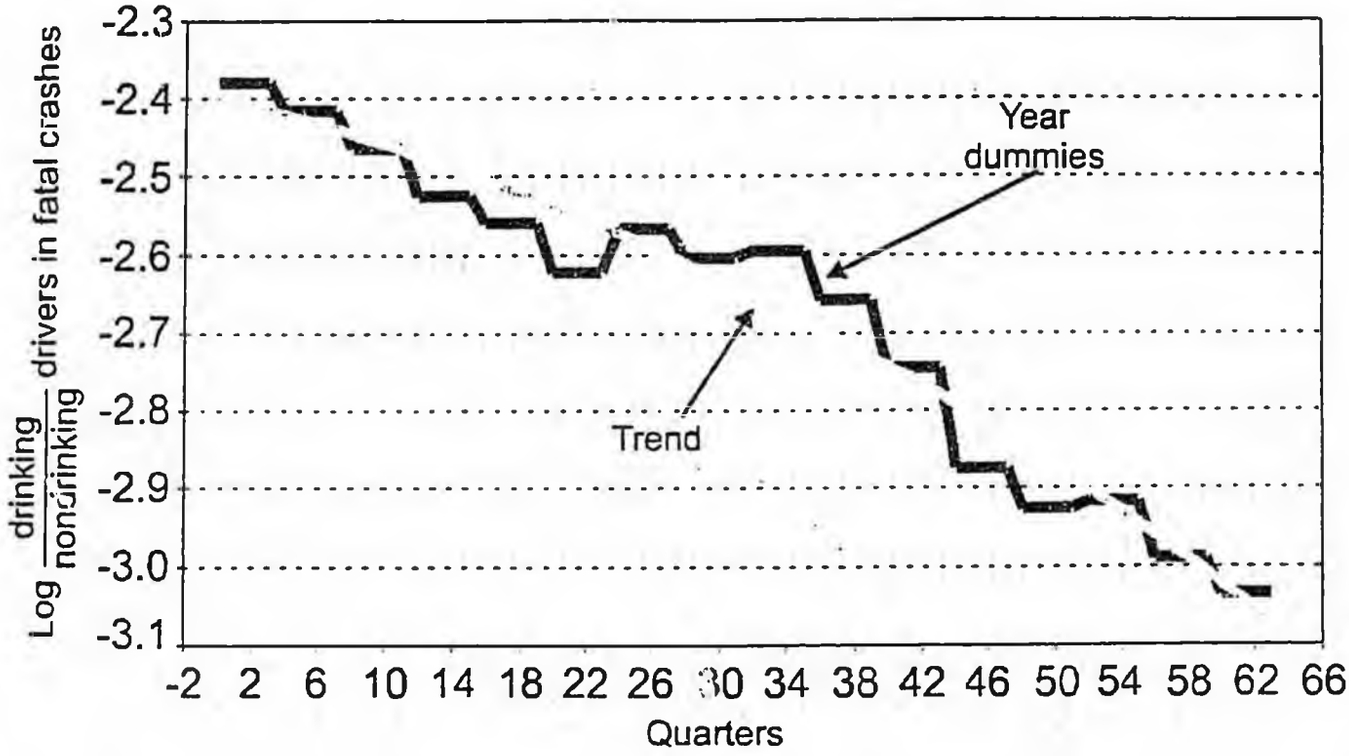
Alcohol safety laws	Drivers in fatal crashes age 21 and older—Estimates
Illegal *per se* laws (.10)	
.01 to .09	*–16.54%*
.10+	*–11.60%*
Per se .08 law	
.01 to .09	*–15.60%*
.10+	*–12.15%*
Admin. license revocation law	
.01 to .09	*–14.60%*
.10+	*–14.88%*



Trend: -.0000851765 x (quarter^2) (where quarter = 0 to 63) (from Jan-Mar 1982 through Oct-Dec 1997)

Year dummies: parameter estimates of the year effects for 50 states and the District of Columbia

Figure C-1. Comparison of trend estimates for impaired drivers with .01 to .09 BACs



Trend: –.0050083072 x (quarter) –.0000889403 x (quarter^2) (where quarter = 0 to 63) (from Jan-Mar 1982 through Oct-Dec 1997)

Year dummies: parameter estimates of the year effects for 50 states and the District of Columbia

Figure C-2. Comparison of trend estimate for intoxicated (.10+) rates

Evaluation of the Effects of North Carolina's 0.08% BAC Law

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March, 1999

Carolina since the early 1980s. To control for the effects of this general trend, as well as seasonal fluctuations, we carried out structural time series analyses examining monthly crash statistics. In each case we looked for evidence of either an immediate decrease in the rate or a change in the general trend of alcohol-related crashes following implementation of the lower BAC limit. There was no significant change in the rate, nor in the trend, coinciding with introduction of the lower BAC limit, for any of the measures examined.

To determine whether the trend in alcohol-related crashes in North Carolina may have benefitted in comparison with a broader general trend in the U.S. (which had leveled out and appeared to be on the verge of increasing again), we compared North Carolina fatal crash data with those from 11 other states that have high rates of alcohol testing for fatally injured drivers. The data series representing the North Carolina proportion of all fatally injured drivers in the 12 states who had BACs in excess of 0.10% was examined for either a step shift or a change in the trend. Again there was no evidence that the pattern in North Carolina changed following enactment of the lower BAC limit, or that it differed in comparison to the other 11 states.

To see whether the BAC levels of persons had been reduced by the 0.08% law, even if not brought below the 0.10% threshold of the previous limit, we examined the mean monthly BACs of fatally injured drivers whose BAC was above 0.10%. Again there was no evidence of an effect of the new BAC limit. The monthly average BACs remained essentially unchanged from 1990 through 1995, with an overall mean of 0.21%.

Finally, we conducted a series of simple before-after comparisons of various indicators of alcohol involvement in fatal crashes. These analyses examined each the six measures that the National Highway Traffic Safety Administration used in its initial examination of the effect of 0.08% laws: (1) driver BAC $\geq$ 0.01%, (2) driver BAC $\geq$ 0.10%, (3) police-reported alcohol involvement, (4) single vehicle nighttime crash, (5) single vehicle nighttime male driver crash, and (6) estimated alcohol involvement. To examine changes in these measures we used the same analytic approach employed by Hingson et al. (1996) in their widely-cited study of the first five states to enact 0.08% limits – comparing changes in North Carolina rates with those in comparison states. To avoid potential pitfalls of trying to select a single appropriate comparison state, we compared North Carolina data with all 37 states that had retained higher per se limits from 1991 through 1996.

Of the six measures considered, two showed a significantly greater decrease in North Carolina than in the comparison states: police-reported alcohol and estimated alcohol, which is based in part on police report as well. For both these measures, the apparent effect of the 0.08% law is an artifact of grouping several months data before the law took effect, rather than an effect of the law itself. During the pre-0.08% period, noteworthy changes occurred in North Carolina that are obscured when the data are grouped. When analyses to ameliorate this artifact were conducted, none of the six measures showed a significantly greater decrease in North Carolina than in the states that retained a higher BAC limit.

Although North Carolina has a reputation for being progressive and aggressive in its efforts to deal with drinking drivers, it does not appear that the state is so different as to render it

THE EFFECTS OF 0.08 BAC LAWS

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months of one another, were modeled as a single intervention.

These findings are consistent with the hypothesis that 0.08 laws work best in conjunction with other laws, especially ALR laws. All of the states which exhibited a significant association between a 0.08 BAC law and a reduction in alcohol involvement already had an administrative license revocation law in effect (Vermont, Kansas, North Carolina, Florida and New Mexico). In two states the reductions occurred when 0.08 BAC and ALR laws were enacted in close temporal proximity to each other (California and Virginia).

Again, it is clear that many factors have been at work since the early 1980's, which have resulted in long-term declines in alcohol-related fatalities in most states. Some of these factors were in operation prior to the implementation of the 0.08 BAC laws. While it is difficult to pinpoint all the factors that have been responsible for these long-term declines, it is likely that the declines resulted from a combination of legislative, enforcement, judicial, sanctioning, and public information activities implemented in the states. These analyses suggest that the 0.08 BAC laws added significantly to this impact in several of the states studied, usually in conjunction with the presence of administrative license revocation laws.

Reduction of the legal BAC limit from 0.10 to 0.08 also appears to be associated with a reduction in beer consumption in 4 of the 5 states for which consumption data were available. The association is strong in two of these five states (California and Vermont). The association in California is weaker and is clouded by increased volatility following implementation of the 0.08 law. The absence of an association in Oregon could be due to an artifact. A substantial reduction in annual beer consumption occurred two years before the 0.08 law was implemented. This sharp reduction may have made it difficult for an additional reduction to occur.

MADD NATIONAL OFFICE

PUBLIC POLICY DEPARTMENT

SAMPLE TESTIMONY

ON LEGISLATION TO LOWER THE ILLEGAL BAC LIMIT TO .08

TESTIMONY BY LYNNE GOUGHLER
BEFORE THE _____ JUDICIARY COMMITTEE
OF THE MINNESOTA STATE LEGISLATURE
ON THE MERITS OF A .08 BAC PER SE LAW FOR ADULT DRIVERS

FEBRUARY 5, 1997

Thank you for inviting me to testify today. My name is Lynne Goughler, and I am the Public Policy Liaison for the Mothers Against Drunk Driving Minnesota State Organization. I will be testifying specifically in favor of S.B./H.B. ___ which proposes to lower the illegal blood alcohol concentration (BAC) limit from .10 to .08 per se. We believe that lowering the illegal per se BAC limit to .08 will not only save lives and reduce injuries in Minnesota, but will also save substantial amounts of money in associated health care costs.

The National Highway Transportation Safety Administration (NHTSA) has produced two reports to the U.S. Congress on the subject of blood alcohol concentration (BAC) limits for drivers. In both of those reports, it is recommended that all states and Washington, D.C. should establish .08 BAC as the illegal limit for drivers aged 21 and older.

In addition, a study was published in the September 1996 *American Journal of Public Health* which supports that if every state passed an illegal .08 BAC limit, the proportion of fatal crashes caused by impaired drivers would decrease by approximately 16 percent – or approximately 600 fewer deaths each year.

There are a number of reasons why MADD supports the passage of .08 BAC levels in every state:

1. Virtually all drivers are substantially impaired at .08 BAC. Laboratory and test track research shows that the vast majority of drivers, even experienced drinking drivers, are impaired at .08 with regard to critical driving tasks. There are significant decrements in performance in braking, steering, lane changing, judgement and divided attention, among other measures at .08 BAC. Performance decrements in these tasks are as high as 60 to 70 percent at .08 BAC according to studies.

2. The risk of being involved in a crash increases substantially at .08 BAC. The risk of being in a crash gradually increases at each BAC level, but rises rapidly after a driver reaches or exceeds .08 BAC compared to drivers with no alcohol in their blood systems. Research by the Insurance Institute for Highway Safety indicates that the relative risk of being killed in a single vehicle crash at BACs between .05 and .09 is 11 times that of drivers at .00 BAC (no alcohol).

3. Lowering the BAC per se limit is a proven effective countermeasure which will reduce alcohol-related traffic fatalities. We have evidence in four states that significant reductions in alcohol-related fatalities occurred after .08 BAC laws went into

Remarks of State Senator Ida Ruben (D-20-Maryland)
Maryland Senate Sponsor, .08 BAC Legislation
News Conference on Federal .08 BAC Legislation
May 22, 1997

Thank you Senator Lautenberg, Senator DeWine, Congresswoman Lowey and my former Maryland General Assembly colleague Congresswoman Connie Morella. I am very pleased to be here today with you and my friends from Advocates for Highway and Auto Safety and MADD.

You might wonder what a state legislator is doing on Capitol Hill talking in support of federal legislation that sanctions the states to take a prescribed action. When my friends at MADD and Advocates for Highway and Auto Safety told me about this gathering, I very much wanted to be here. The fact is, the problems we face in Maryland are sometimes not just Maryland problems but also national problems.

I am a chief sponsor of the .08 legislation in the Maryland State Senate, and I can tell you that from my vantage point in Annapolis, the situation there with respect to the .08 issue is not a positive one.

The alcohol industry has a presence in the halls of the State House. They thwarted our efforts in this past legislative session. They relayed information to legislators that would criminalize so-called social drinking, and they misrepresented how many drinks it takes to get to .08.

We come together today to face the facts about impaired driving. It is fact that .08 is a lot of alcohol and it's a lot of impairment. We all realize that .08 is not the answer to the nation's impaired driving tragedy. Much needs to be done. But it must start with drawing a safer and saner line in the sand against impaired driving at .08.

08 is the right thing to do. But, it is very very tough competing with the power, influence and money of the alcohol industry as they trip up the safety groups in state capital after state capital. To wage and win this battle state by state will take us into the 21st century.

That is why I, as a state legislator, believe federal action is essential, and I hope the Congress will pass this lifesaving legislation this year. The issue is not a matter of states' rights. It's a matter of life or death. There are times when federal action is needed to solve problems in all the states. And this is one of them.

I thought it was called for in 1984 when Senator Lautenberg sponsored and President Reagan signed into law the national uniform 21 drinking age legislation. You saw how quickly those dangerous blood borders between states with different drinking ages were quickly erased after that federal action. And, I thought it was called for in 1995 when Congresswoman Lowey sponsored and President Clinton signed into law the national "zero tolerance" BAC law.

These national laws are saving so many lives every year. And I now realize that a federal law is essential to make .08 the law of the land.

I would like to see the alcohol industry change its position on this issue because they are wrong. I think they tarnish their image even more in the long-run by fighting MADD, Advocates and the other safety groups than by standing out of the way of progress in this war on impaired driving.

I wanted to be here today to lend my support to your efforts in the Congress. I hope the Congress will pass and the Administration will strongly support your legislation this year. It will make our jobs in the state capitals across this country that much easier. Thank you for allowing me to join you here today. (END)

ADVOCATES
FOR HIGHWAY
AND AUTO SAFETY

TESTIMONY OF BILL BRONROTT
ADVOCATES FOR HIGHWAY AND AUTO SAFETY
BEFORE THE HOUSE JUDICIARY COMMITTEE, MARYLAND HOUSE OF DELEGATES

HB 810: A BILL TO REDUCE "DRIVING WHILE INTOXICATED" TO .08 B-A-C

FEBRUARY 20, 1997

Thank you, Mr. Chairman, and members of the committee.

My name is Bill Bronrott and I am with Advocates for Highway and Auto Safety, which is an alliance of consumer, safety and insurance organizations. I am here to testify in favor of HB 810 which will lower the illegal blood-alcohol concentration (BAC) limit from .10 to .08 for "driving while intoxicated," and from .07 to .06 for the lesser offense of "driving under the influence of alcohol."

In 1995, 671 people were killed in highway crashes in Maryland. Among those killed were 234 people who died in alcohol-related crashes. These 234 alcohol-related traffic deaths represented 35 percent of total motor vehicle fatalities in 1995. On top of this enormous human suffering were the huge economic losses.

The cost per alcohol-related fatality is estimated at about $1.1 million, according to the U.S. Department of Transportation. It is estimated that the 234 alcohol-related traffic fatalities in 1995 resulted in $257 million in societal costs in Maryland.

In addition, among these 234 alcohol-related traffic deaths were 57 people who died in crashes where the driver had a BAC below the current .10 limit. In other words, 23 percent of all alcohol-related traffic fatalities resulted from crashes where the driver had a BAC below the current .10 limit.

Lowering the illegal BAC limit will save lives, reduce injuries and result in a substantial savings in related societal costs, including health and medical care.

The U.S. Department of Transportation has produced two reports to the U.S. Congress on the subject of BAC limits for drivers. In both reports, it is recommended that all states establish .08 BAC as the illegal limit for drivers aged 21 and older.

Also, a study published in the September 1996 *American Journal of Public Health* concludes that if every state passed an illegal .08 BAC limit, the proportion of fatal crashes caused by impaired drivers would decrease by approximately 16 percent, resulting in about 600 fewer deaths each year.

1. Drivers are substantially impaired at .08 BAC. Laboratory and test track research shows that the vast majority of drivers, even experienced drinking drivers, are impaired at .08 with regard to critical driving tasks. There are significant decrements in performance in braking, steering, lane changing, judgement and divided attention, among other measures at .08 BAC. All the skills a person needs to drive a car are affected at .08 and performance decrements in these tasks are as high as 60 to 70 percent at .08 BAC according to studies.

Nor did it change in Utah and Oregon the year after .08 went into effect. There is evidence from Maine that restaurant sales actually increased 11 percent in 1988, the year .08 went into effect. Recently, the National Restaurant Association Foodservice Industry's 1996 sales projections reported $312.9 billion in food and drink sales – an increase of $74.1 million from 1990.

In summary, 13 states (AL, CA, FL, HI, KS, ME, NC, NH, OR, UT, VA and VT) have already passed .08 BAC per se laws, and more than 25 states are considering .08 BAC limits in legislative sessions this year. Maryland has long been a leader in highway traffic safety countermeasures. Maryland needs to resume its leadership role in highway safety. We can do that by becoming the 14th state with .08. The time is now.

.08 BAC is a level at which critical driving skills are impaired. It is a level at which the risk of a crash increases substantially. It is a level which most industrialized nations have adopted. It is a proven effective measure which will save lives and reduce injuries. And, it is not just a couple of drinks after work. We are talking about a substantial amount of alcohol when we talk about .08 BAC.

While tremendous progress has been made in the war on drunk driving over the past 16 years in Maryland, the fact that 234 people lost their lives in alcohol-related crashes in 1995 clearly indicates that the war has not been won.

234 people killed due to the combination of alcohol and driving is the equivalent of two 737 jetliners crashing in our state. Whenever a jetliner tragically crashes, there is a blizzard of media attention and a huge public outcry . . . justifiably so . . . demanding answers and action.

The drunk driving problem deserves comparable treatment, attention and action. A sudden violent death in one mode of transportation is just as tragic as in another.

Impaired driving remains the most frequently committed violent crime in our country. The FBI reports that the crime resulting in the most arrests of adults in the United States in 1995 was "driving under the influence." Arrests for DUI totaled 1.4 million last year. The U.S. Department of Transportation estimates that only one of every 1,000 DUI incidents results in an arrest, so it is mind-boggling to think of the tens of millions of criminal acts of impaired driving that flood our nation's highways.

There seems to be a false perception in many states that the war on drunk driving has been won. Clearly, the great progress of the 1980s and early 1990s is in serious jeopardy. We, as a nation and a state, can and must do better because it is truly a matter of life or death.

That is why Advocates for Highway and Auto Safety, MADD and other highway safety groups recently joined together with the U.S. Department of Transportation to set a new goal to reduce alcohol-related traffic deaths by at least one-third — down to 11,000 or less per year by the year 2005.

The front lines in this battle are drawn in each state capital and on the streets and highways in every local community. No one believes that .08 is THE answer. But, virtually the entire highway safety community feels strongly that .08 BAC is one essential law that every state should adopt to draw a safer, saner and more sensible line in the pavement against intoxicated driving.

We urge the House Judiciary Committee to consider the merits of this legislation and to pass HB 810 to lower the illegal BAC to .08 this year. Thank you very much.

ATTACHMENTS

SENATE TESTIMONY

Distinguished Senators and others who have gathered to speak about this bill, my name is Dawn Richardson. I live in Providence. I am a homeowner, taxpayer and voter, and the mother of two school age boys. In spite of my looking like I just graduated from college, I am a 1988 graduate of the medical school at Brown University. I completed my residency at Rhode Island Hospital this past summer, specializing in Emergency Medicine. That's right, just like the television shows ER and Chicago Hope. I am an attending physician in the Emergency Care Center at Sturdy Memorial Hospital in Attleboro, Massachusetts, and part time at Rhode Island Hospital Emergency Department to keep my skills current. I have been recently appointed to the Medical Advisory Board of the Rhode Island Registry of Motor Vehicles, a position I sought because of my outrage about my daily experiences with the carnage of drunk driving.

The trauma rooms at Rhode Island Hospital are where the majority of serious drunk driving victims in Rhode Island end up. I have spent the last two years in those rooms, sometimes 115 hours a week. I have cared for hundreds of critically injured people in the trauma rooms and trauma intensive care. My time is spent fighting keeping them alive. What I am going to tell you is very graphic, but you must hear what the liquor and hospitality industry won't tell you. This is what happens in the trenches of the war against drunk driving.

If these critically injured people are at all conscious, I put them to sleep with powerful drugs. I then shove respirator tubes down their throats to put them on life support. If they have collapsed lungs, I put large tubes in their chests to empty the blood and air that has leaked from their lungs. If there is a sign of internal injury, I cut a 1 inch hole below their belly button to see if their abdomen is filled with blood from a burst spleen. If they are bleeding to death, I put large IV's in their arms or shoulders and pour blood or saline into their veins, sometimes a gallon or more before they go to the operating room. I put a tube in their penis to see if they are bleeding from a burst kidney, but not before putting my finger in their rectum to see if they have bled from torn intestines. I put a tube down their nose into their stomach to see if it is full of blood. Then my trauma surgery colleagues whisk them off to the operating room for emergency surgery. The photograph you see was taken just after the patient left the trauma room for surgery. If they have hit their head on the steering wheel or been thrown out of the car and damaged their brain, I call one of my brain surgery colleagues to drill a hole in their head to release the blood. If their bones are mangled, I call my orthopedic surgery colleagues to straighten or operate on them. If their faces are broken or cut beyond recognition, I call my plastic surgery colleagues to try to put their faces back together. The stitching that takes an hour or less I do myself. At 7 o'clock on Monday mornings we all meet to argue about how we managed the toughest cases the past week at Trauma Conference. The hardest part of my job is telling family members that their loved

This bill has died in committee six years in a row. I have come here today to put it on life support. It is the law in almost every other New England state and many foreign countries. We're not talking about the right to drink or the right of the hospitality and liquor industries to do business. Drunk people just have to find another way home. This is about public safety. I beg of you, please consider the public safety first, and put special interest pressure aside. You are the trauma surgeons of this law. I am turning the patient over to you, because I have done all I can do. Keep it alive. Send this bill to the floor for a general vote. Thank you.

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TO: Rep. Kohring, Chair of House Transportation
FROM: Kac'e McDowell, Executive Director Alaska CHARR
DATE: April 10, 2001
RE: HB 12

Memo

STOP DRUNK DRIVING WITHOUT THE FISCAL NOTE FOR .08

1. Century Council is a non-profit organization dedicated to reducing drunk driving and underage drinking, as is CHARR. We work closely with Century Council on all of these issues. DISCUS, distilled spirits council of the united states, is the council that has taken the pro .08 BAC stand. This council is made up of many of America's distillers. Upon speaking to our representative from DISCUS, he made clear they do not support stand alone .08 BAC legislation.

2. CHARR is Alaska's Hospitality Association and we teach the TAM, Techniques of Alcohol Management, Program throughout the State of Alaska. We feel this has been one of the main programs helping to deter drunk driving and underage driving. This is at no cost to the state. I have enclosed some information about this program

3. CHARR is also involved in a program with Anchorage Against Drunk Driving called "Off the Road Program". A taxi will drive customers home and their car. We are working on HB 68 to exempt the Taxi companies from liability so we can initiate this program state-wide. This program will be fully funded by the Hospitality Industry and other concerned entities.

4. CHARR, with Century Council, would certainly be interested in putting together a program that could be used in the school system to help solve the under drinking problem.

5. CHARR believes that there are many other ways to help solve these major Problems without the government always having to pay the bill.

6. The big decision is does the government want to meet the fiscal note of .08 or use these funds in better areas. Do we want to be blackmailed to do it? Is it the most beneficial way to spend our available revenue? Will it really make a difference with the real problem of the chronic abuser?

Techniques of Alcohol Management
Goals and Objectives

Alaska CHARR is proud to be a part of one of the largest industries in the state, hospitality. The Hospitality industry is one of the largest employers in the State of Alaska. One of the first jobs young people will experience will most likely be in the hospitality industry in some form. Here they will begin to acquire the ethics and skills necessary to lead them in any career they may choose to pursue. We encourage those just starting in the industry to look at this as a career choice, one they can grow with and be proud to be a part of.

CHARR recognizes the concerns we face today in the Licensed Beverage Industry and is proud to administer the Techniques of Alcohol Management (TAM) program. This comprehensive class teaches responsible hospitality to servers and sellers of beverage alcohol in the State of Alaska. CHARR was the first to bring a program of this type to Alaska, before it became a state mandate. We currently have 23 instructors throughout the state, providing this valuable education in the rural areas of Alaska as well as our larger cities.

The National Licensed Beverage Association in cooperation with law enforcement, highway safety, substance abuse professionals and liquor control commission, developed the new TAM program and it is administered in Alaska through CHARR.The class is taught in five segments. The clinical effects of alcohol, SIR (size, interview, rate) & MAMM (move ,assert, attitude, move on), False identification, customer disturbances and laws, rules and regulations.

Our main objectives through TAM are to reduce the number of alcohol related accidents on the highway through education and stop underage drinking. Our program places a great deal of emphasis on the moral, ethical and legal obligation we have in our industry towards this end.

Through our program participants learn how alcohol is absorbed into the blood stream, how to slow down the rate of intoxication, a method to estimate BAC, the effects of alcohol on the brain, how and when to discontinue service and effectively prevent and handle customer disturbances. Our segment on SIR and MAAM teaches participants how to effectively rate customers and make responsible decisions about serving or refusing service.

In our segment on BAC we teach students the difference between blood alcohol content and tolerance. Each individual's tolerance for alcohol is of course different and it is very important for students to know and recognize the signs of intoxication. I have included a chart on estimating BAC using the method we teach in our classes. The chart is broken down according to body type, as you will see, and is of course only used for estimation purposes.

We have a segment dedicated to false identification, and the problem of underage drinking. Participants learn what to look for in and I.D. and how to handle a situation when presented with a false I.D. card.

The last segment of our program is dedicated to State laws and regulations. Attached you will find the 16 points that we cover in the TAM program, as required by the ABC board, whom we work closely with to maintain the legal integrity of our program. In the last section of the participant's workbook, we have included a section specific to Alaska and the laws that pertain to serving alcohol in our state. As laws can and do often differ in each municipal location we require our instructors to become familiar with the laws that pertain specifically to the areas in which they are teaching and integrate this into the class program on laws and regulations.

Our program encourages considerable class participation and allows ample time for open discussion to further enhance and re-enforce the educational experience.

It is our hope that our students walk away with not only a much better understanding of the law, but of their moral and legal responsibilities as well.

Thanks for the information Mary. I appreciate it.

Vic

Mary Marshburn wrote:

> Representative Kohring:
>
> I am the director of DMV and was tied in to your committee hearing yesterday on HB 12, reducing the BAC from .10 to .08. You asked about its effect on fatality reduction. I am including a web site below which is a report done in 1996 that addresses your question. You can double-click on the link to access the report.
>
> Mary Marshburn
>
> http://www.ncadd.com/tsra/abstracts/066.html

NCADD
National Commission Against Drunk Driving

Go to Main Index Go

Lowering State Legal Blood Alcohol Limits to 0.08%: The Effect on Fatal Motor Vehicle Crashes

Research indicates that the impairing effects of alcohol begin at blood alcohol levels (BACs) well below .10 legal limit in most states. Laboratory studies have demonstrated that at .08 BAC, there is reduced peripheral vision, poorer recovery from glare, poor performance on complex visual tasks, and reduced performance on multiple tasks requiring a person's attention to be divided. Studies involving driving simulators and road courses have revealed impaired driver performance at slow speeds, steering inaccuracies, and poor parking performance. Roadside observational studies have identified speeding and deterioration of braking performance. As of 1996, 14 states had lowered their legal BAC limits from .10 to .08.

This study evaluated the effectiveness of .08 laws in the first five states which adopted them. Each state was compared pre- and post-law implementation with a neighboring state which still maintained a .10 BAC law. Comparisons were made with respect to the proportion of fatal crashes involving fatally injured alcohol-impaired drivers at BAC levels of .08 and greater and .15 and greater. The crash proportions for the higher BAC levels were examined to ascertain the effect of .08 laws on crashes involving severely intoxicated drivers.

Results indicated that four of the five states with .08 laws showed a reduction in the proportion of alcohol-impaired driver deaths to all driver deaths as compared to the control states. In one pairing, the comparison state also showed a decrease; however the matched .08 state showed twice as large a decrease. Overall, the states with .08 laws experienced a post-law reduction of 16% for drivers with BACs of .08 or greater. The .08 states also experienced a reduction of 18% for drivers with BACs of at least .15.

The authors note that they were able to obtain BAC results for 88% of fatally injured drivers from .08 states, and for 74% of such drivers in the comparison states, strengthening the validity of these results. However, they also note that .08 states were more likely to have other stringent drinking and driving laws (such as per se laws and administrative license revocation laws) which have been demonstrated to have an impact on the incidence of alcohol-related crashes and offenses. Few comparison states had similar laws in place, making it difficult to separate the effects of .08 laws from the effects of other legislation. They conclude, however, that .08 laws, especially when combined with other laws, can reduce the proportion of fatal crashes involving drivers and fatally injured drivers with BACs of .08 and greater and .15 and greater.

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FOR IMMEDIATE RELEASE

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✳ MADD AND U.S. TRANSPORTATION SECRETARY MINETA APPLAUD DISTILLED SPIRITS INDUSTRY'S SUPPORT OF .08 BAC AND OTHER COMPREHENSIVE DRUNK DRIVING LAWS ✳

Washington, D.C. (April 10, 2001) – Mothers Against Drunk Driving (MADD) along with U.S. Transportation Secretary Norman Y. Mineta, today applauded The Century Council and the distilled spirits industry's landmark announcement of support for lowering the drunk driving limit to .08 blood alcohol concentration (BAC) as part of a comprehensive approach to fight drunk driving. The industry unveiled a well-rounded package of legislation that they will promote in the states.

"MADD commends The Century Council and the distilled spirits industry's vowed commitment to fight for comprehensive drunk driving laws, in particular its support for legislation that includes lowering the drunk driving limit to .08 BAC," said MADD National President Millie I. Webb. "As preliminary Department of Transportation statistics show that alcohol-related traffic deaths increased in 2000 for the first time in five years, it is important that all Americans, including those in the alcohol beverage industry, do their part in the fight against drunk driving."

Although the percentage of alcohol-related traffic fatalities remained the same at 38 percent, the number of people who died in alcohol-related crashes increased from 15,786 in 1999 to 16,068 in 2000.

MADD recognized the distilled spirits industry and the Century Council, a not-for-profit organization founded by America's leading distillers to fight underage drinking and drunk driving
as taking an "important step to help fight drunk driving" by pushing individual states to promote effective, comprehensive legislation addressing several specific areas, including:

- A .08 BAC standard when accompanied by meaningful BAC education
- Administrative license revocation

- Enhanced penalties for high BAC drivers, repeat offenders and those who refuse tests
- Vehicle-based sanctions
- Mandatory treatment/aftercare

Currently, .08 BAC laws are pending in 19 states, and three other states have passed .08 BAC legislation that awaits Governors' signatures. Today, Governor Hull in Arizona is expected to sign the .08 bill into law. Many of these states have also introduced legislation to address higher-risk drivers.

MADD says the Century Council and distilled spirits industry's planned efforts will compliment MADD's comprehensive legislative agenda to reduce drunk driving, addressing both higher risk drivers and drivers with a blood alcohol content of .08 BAC. Research shows that a minimum of 500 lives would be saved if every state passed .08 BAC laws.

"While we do not see 'eye-to-eye' with the distilled industry on all issues, this legislative effort is one that we can all agree on as a measure to help save lives and prevent injuries," said MADD National President Millie I. Webb. "We believe in giving credit where credit is due, however in this recognition, MADD is holding true to its longstanding policy to not accept monetary contributions from any segment of the alcohol industry."

"The distilled spirits industry has had a long standing commitment in the fight against drunk driving and we are very enthusiastic about the opportunity to work with MADD to effectively help states implement comprehensive legislation to combat this devastating problem. We know that the battle against drunk driving requires a comprehensive approach; in addition to the implementation of the .08 BAC limit passed by Congress in the fall, it must aggressively address the hardcore drunk driver and include BAC education," said Acting Chair of The Century Council, the Honorable Susan Molinari. "We hope our efforts will help save lives across this country," Molinari continued.

The mission of Mothers Against Drunk Driving is to stop drunk driving, support the victims of this violent crime, and prevent underage drinking. Mothers Against Drunk Driving is a 501(c)(3) non-profit grass roots organization with more than 600 chapters and approximately 2 million members and supporters nationwide. For more information, visit www.madd.org.

###

Potential Q's & A's
Century Council .08 Event

MADD RESPONSES

Internal Document

1. **Why has MADD changed their mind and is suddenly standing beside the industry that they are normally so strongly opposed to?**

   For years MADD has called on all segments of the alcohol industry to "step up to the plate" in the war against driving. The Century Council, representing the distilled spirits industry, has done quite a bit of work in this area and we're willing to give credit where credit is due. The distilled spirits industry's decision to support and advocate for .08 BAC laws and education, in tandem with other comprehensive legislation, will save lives. We urge the rest of the alcohol and hospitality industries to step up to the plate and do the same.

   We may not see "eye-to-eye" on all issues, but the distilled spirits industry is deserving of credit for taking this tough stance against drunk driving.

2. **What's in it for MADD? Is MADD now accepting funding from the liquor industry?**

   No. MADD is and will continue to stand firm on its policy of not accepting funds from any segment of the alcohol industry. What we gain from this announcement is the opportunity to prevent death and injury.

   MADD is here to recognize the distilled spirits industry's support of .08 laws as part of a comprehensive plan to fight drunk driving. We know their lobbying strength will help pass this important legislation in the states more swiftly, and more lives will be saved as a result.

3. **What is MADD's stance on the Century Council's BAC estimator? Do you feel it is accurate?**

   MADD does not have a position on the BAC estimator. We believe it is important to pass .08 BAC laws in tandem with public information and education, but we believe each state must make their own decision on the best kind of public education efforts for their citizens. We want to make our message clear: We support a legal BAC limit of .08 percent. That's the level where it should be illegal to drink and drive. However, we encourage people to designate a non-drinking driver if they plan to drink alcohol. That's the safest way to get home after drinking.

4. **So, does MADD really want an even lower limit or "zero tolerance" for drinking and driving?**

No. MADD supports .08 BAC as the legal drunk driving limit. We support .08 BAC as the legal line because of sound, scientific research showing that this is the level at which virtually every driver is impaired -- affecting all of the critical driving skills including: braking, steering, judgment and response time. Again, we feel .08 should be the legal limit, however do remind Americans that the best way to keep you and others safe is to never get behind the wheel after drinking.

5. **Would MADD be willing to join forces with the beer industry if they came out in support of .08 laws?**

   Unfortunately, we haven't seen that happen however, we call on all segments of the alcohol industry to support .08 and other lifesaving legislation.

6. **How does MADD feel about distilled spirits ads on television? Didn't you oppose a Seagrams ad a few years ago?**

   MADD has a position on alcohol advertising that outlines what we feel is unacceptable. For instance, we are concerned about alcohol ads that use animals or animated characters or ads that are placed at a time likely to be viewed by young people. Any ads that appeal to people under 21 are ads we oppose regardless of what type of alcohol the ad promotes. We encourage all segments of the alcohol industry to be responsible, including the distilled spirits industry. We may not agree on everything, however, we are willing to applaud the distilled industry's support for .08 BAC as part of a comprehensive approach to fight drunk driving.

7. **What exactly will MADD and the Century Council do to pass this legislation in the states?**

   The Century Council will now use its lobbying power to help pass tough drunk driving laws in the states. Traditionally, MADD, a grassroots, non-profit organization, has had a tough time passing .08 due to the alcohol industry's opposition. We hope the Century Council's support will help pass this legislation, along with legislation to address the higher-risk driver.

8. **There are rumblings that the federal .08 law may be repealed. What will MADD do to prevent this from happening?**

   We do not feel a repeal effort will be successful. We feel confident that in the not too distant future .08 will be the law in every state. Since the federal .08 BAC law passed last year, there has been a tremendous amount of movement to pass .08 laws in the states. There was strong bi-partisan support in Congress to enact the federal standard and we know that lives will be saved as a result.

9. **Why don't you accept funding from the alcohol industry?**

   MADD is focused on saving lives, preventing injuries and helping victims, and we are dedicated to this mission. Although we sometimes agree with segments of the alcohol industry on issues, we often do not see "eye-to-eye." By remaining "independent" MADD will always represent the grassroots fight against drunk driving and underage drinking, and will continue to speak out about issues related to our cause.

.08 BAC: THE FACTS

.08 Means Dangerous Impairment

- An average 170-pound man must have four drinks in one hour on an empty stomach to reach a .08 percent blood alcohol concentration (BAC) level. A 137-pound woman would reach .08 BAC after about three drinks in an hour on an empty stomach (National Highway Traffic Safety Administration) – a level that exceeds what is commonly accepted as social drinking.

- Regardless of how much alcohol it takes to get to this level, at .08 BAC any driver is a dangerous threat on the road. .08 BAC is the level at which the fatal crash risk significantly increases and virtually everyone is seriously impaired, affecting all of the basic critical driving skills including: braking, steering, lane changing, judgment and response time (NHTSA).

- The risk of a driver being killed in a crash at .08 BAC is at least 11 times that of drivers without alcohol in their system. At .10 BAC the risk is at least 29 times higher (Zador).

- More than 20 percent of alcohol-related traffic deaths involve BAC levels below .10 percent (NHTSA).

.08 Saves Lives

- If every state passed a .08 BAC law, about 500 lives would be saved each year (Hingson, et al).

- .08 BAC is a proven effective measure to reduce alcohol-related traffic deaths. Studies have shown a 6 to 8 percent reduction in alcohol-related traffic deaths in states following the passage of .08 BAC (MADD).

.08 Needed in Every State

- 30 states still define intoxicated driving as .10 BAC – the most lenient definition of drunk driving in the industrialized world.

- 20 states and the District of Columbia comply with the federal law (AL, AR, CA, FL, HI, ID, IL, KS, KY, ME, NE, NH, NM, NC, OR, TX, UT, VT, VA and WA).

- 19 states have .08 BAC legislation pending (AK, CT, DE, IN, LA, MA, MI, MN, MO, NV, NJ, NY, OH, OK, PA, RI, TN, WV, WI). 3 States have bills that have passed the

legislature but await the Governor's signature (AZ, GA, MD). **Arizona Governor Hull is expected to sign the .08 BAC bill into law today, Tuesday April 10, 2001.**

- The BAC level is .08 in Canada, Austria, Great Britain and Switzerland.
- Seventy-two (72) percent of Americans support lowering the drunk driving limit to .08 blood alcohol concentration (BAC) as an initiative to reduce drunk driving. (Independent Gallup
- Survey sponsored by MADD and General Motors).

States with Complying

.08 BAC Per Se

Updated August 1, 2000

State	Enactment Date	Effective Date
Alabama	7/31/95	10/1/95
California	1989	1/1/90
District of Columbia	12/1/98	4/13/99
Florida	4/27/93	1/1/94
Hawaii	6/30/95	6/30/95
Idaho	3/17/97	7/1/97
Illinois	7/2/97	7/2/97
Kansas	4/22/93	7/1/93
Kentucky*	4/21/00	10/1/00
Maine	4/28/88	8/4/88
New Hampshire	4/15/93	1/1/94
New Mexico	3/19/93	1/1/94
North Carolina	7/5/93	10/1/93
Oregon	8/4/83	10/15/83
Puerto Rico*	1/10/00	1/10/01
Rhode Island*	7/13/00	7/13/00
Texas	5/28/99	9/1/99
Utah	3/19/83	8/1/83
Vermont	6/6/91	7/1/91

Virginia	4/6/94	7/1/94
Washington	03/30/98	1/1/99

Total : 19 States, DC and Puerto Rico

Note:

NHTSA and the FHWA administer an incentive grant program, which was authorized under the Transportation Equity Act for the 21st Century (TEA 21), 23 U.S.C. Section 163, under which States can qualify for grant funds if they enact and enforce a conforming .08 BAC per se law. To conform, a law must meet the requirements of the Section 163 statute and the agencies' implementing regulations. The States listed above have laws that comply with the Section 163 requirements and will receive funding in FY 2000, with the following exceptions: Kentucky and Puerto Rico have laws that will comply with the Section 163 requirements in FY 2001, and Rhode Island's ".08 BAC per se" law does not fully comply with the Section 163 requirements. Accordingly, Rhode Island does not qualify for grant funds, based on this law.

Source:

U.S. Department of Transportation, Washington, DC 20590
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION
Traffic Safety Programs (202) 366-4892

National Conference of State Legislatures
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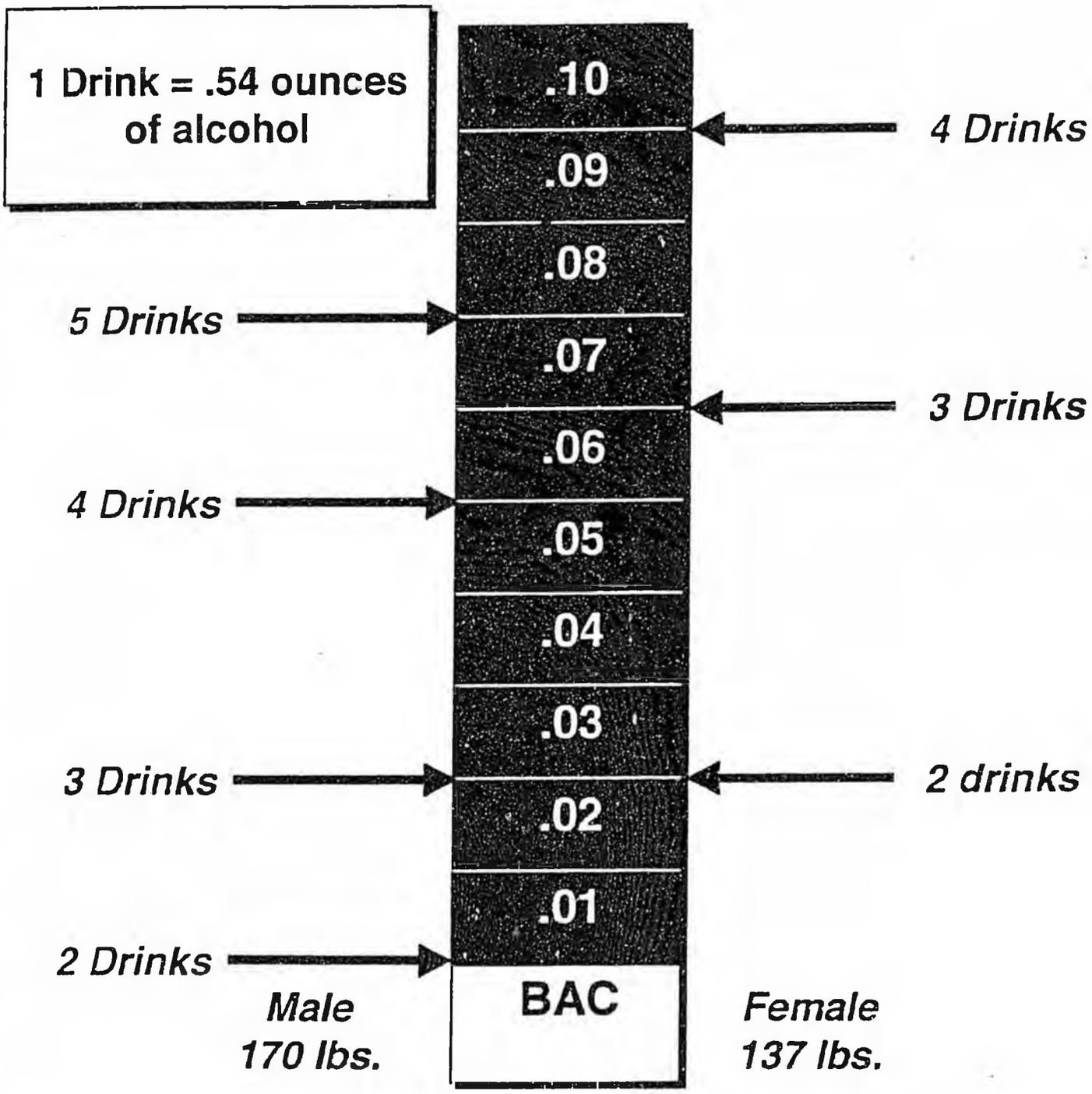
Fax: 202-737-1069

States Considering/Not Considering
.08 BAC
2000-2001 Session

AK	HB 12, HB 4
AR	HB1717, HB 1122
AZ	Passed
CO	Not Considering
CT	Not Considering
DE	Not Considering
GA	SB 73
IN	Indeterminate
IA	Indeterminate
LA	Not Considering
MD	Not Considering
MA	Not Considering
MI	Not Considering
MN	Not Considering
MS	Indeterminate
MO	SB 36, HB 38, HB 302
MT	Not Considering
NE	Passed
NV	AB 166
NJ	ACR 121, SCR 73 (Jun 29,2000) S 1896 (Nov13, 2000) A 1041 (Jan 11, 2000)
NY	Not Considering
ND	Not Considering
OH	Not Considering
OK	Not Considering
PA	Not Considering
SC	Not Considering
SD	Not Considering
TN	HB 138, HB 0223, HB 0261, HB 1924, SB 0189, SB 1131, SB 1392, SB 1471
WV	SB 120, HB 2197
WI	Not Considering
WY	Not Considering

Note: Information derived from individual States web-pages (30 March and 2 April 2001)

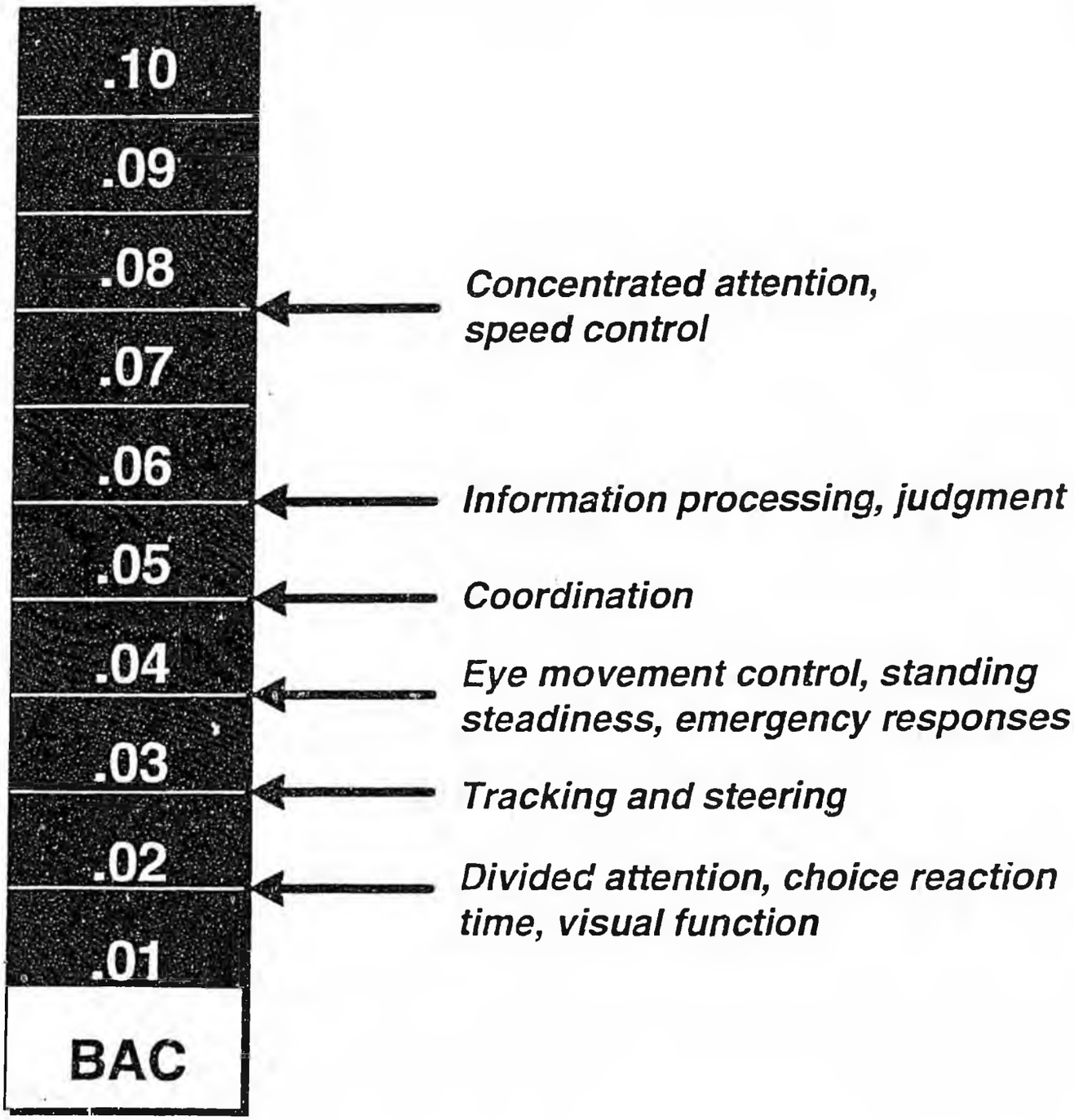
Number of Drinks and BAC in Two Hours of Drinking



.08 Illegal Per Se

- Driving at .08 BAC or above constitutes the violation in and of itself (no other factors are needed as evidence).
- *Articulable suspicion* for making the stop and "probable cause" for making the arrest must still be demonstrated.
- *Burden of proof* is less for the prosecutor.

BAC and Impairment



Alcohol Limits for Drivers
A Report to Congress
NHTSA-USDOT February 1991

- No "safe" BAC level
- All States should have "Per Se" laws
- .08 should be adopted
- Multilevel system of administrative, civil, and criminal penalties should be considered

Driving Under the Influence: A Report to Congress on Alcohol Limits

- **Enact .08 BAC as per se criminal offense**
- **Accompany lower limits with PI&E**
- **Repeal laws that create presumption drivers *not* under influence at any BAC above .00**
- **"Don't drink and drive"**
- **"Don't drive if you have been drinking"**

National Highway Traffic Safety Administration
United States Department of Transportation

July 1992

Effectiveness of .08 Laws

- **Impact of .08 in five states, NHTSA, 1995**
  - **Significant reductions in A/R fatal crashes in 4 out of 5 states ranging from 4% (CA) to 40% (VT)**
- **Effect of .08 in 5 states, Boston University, 1996**
  - **5 States with .08 matched to 5 states with .10 showed 16% reduction in driver fatalities at .08+ and an 18% reduction in driver fatalities at .15+ due to .08 laws.**

Effectiveness of .08 Per Se

- NHTSA evaluated effects of .08 in California
- Results:
  - 81% knew BAC limit was stricter
  - Increase in DUI arrests
  - 12% reduction in A/R fatalities
  - Some of effects due to ALR

BAC Limits in Other Countries

Country	Illegal Per Se
Canada	.08
Great Britain	.08
Australia	.05
Austria	.08
Switzerland	.08
Netherlands	.05
Norway	.05
Finland	.05
Sweden	.02

Who Supports Lower BAC Levels?

- **AMA** — American Medical Association
- **NSC** — National Safety Council
- **NCUTLO** — National Committee on Uniform Traffic Laws and Ordinances
- **AAAM** — Association for the Advancement of Automotive Medicine
- **NIAAA** — National Institute for Alcohol Abuse and Alcoholism
- **NHTSA** — National Highway Traffic Safety Administration

.08 Per Se

- **Will .08 affect problem drinker drivers (BACs ≥ .15)?**
  - **Significant reductions in the proportion of fatally injured drivers with BACs ≥ .20 occurred in California after .08 went into effect**
  - **Significant reductions in the proportion of fatally injured drivers with BACs ≥ .15 occurred in Boston University 5 state study due to .08 law**
  - **.08 serves as a general deterrent, if accompanied with PI&E even for drinkers who reach high BACs**

The .08 Per Se Law Will:

- Increase the arrest and conviction rates for impaired drivers at .10 and above
- Raise the perceived risk of arrest for driving after drinking
- Improve public awareness about how much alcohol it takes to be dangerously impaired
- Bring the U.S. closer to per se limits of most industrialized nations

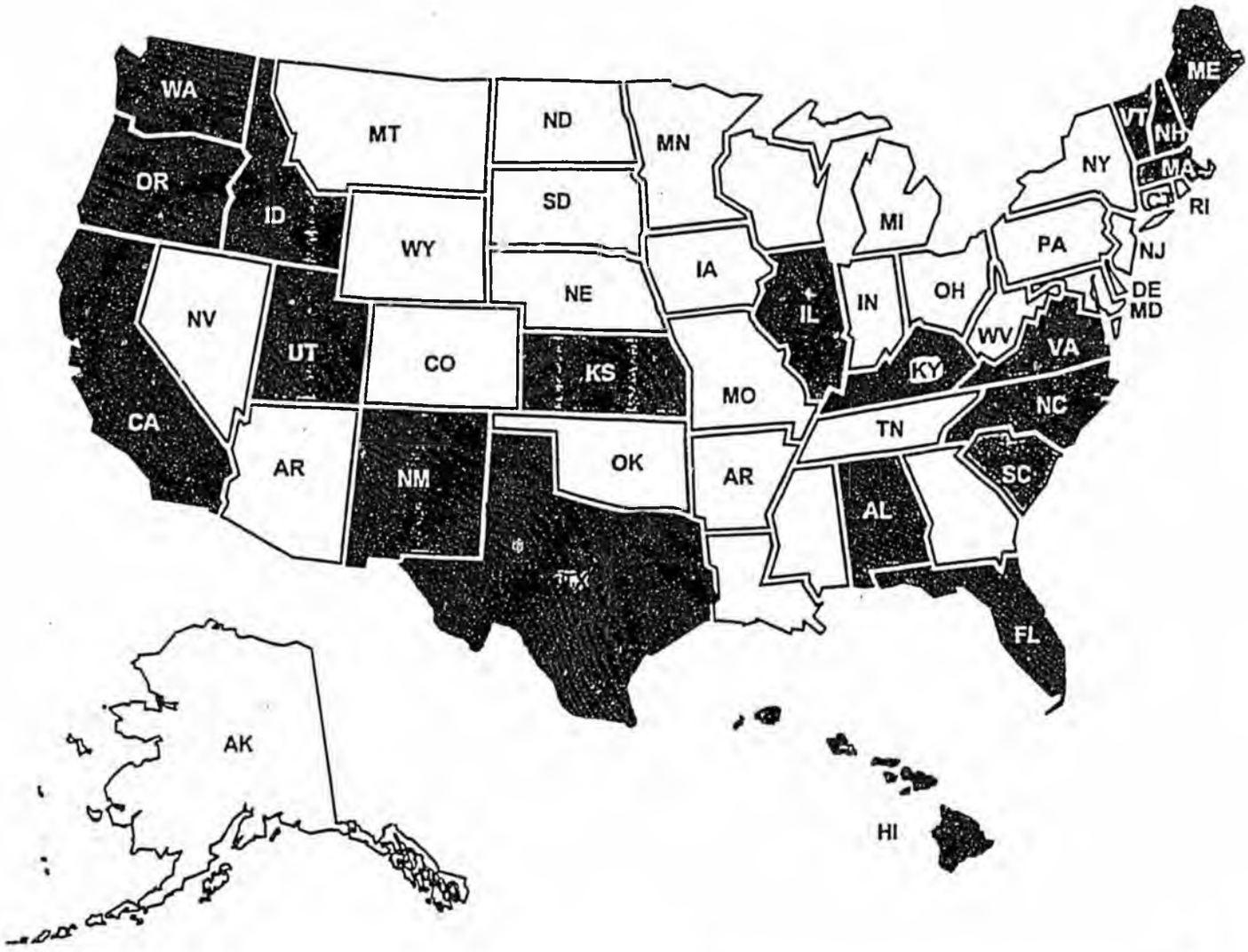
Cost/Benefit of .08 Laws

- Minimal costs to implement
- Small increase in arrests, but not enough to overburden the courts
- Same rules of enforcement apply (articulable suspicion; probable cause)
- Law sends a message to the public that the State is getting tougher on impaired driving
- Potential benefits far outweigh any costs

.08 In Summary ...

- Is not just a couple of drinks after work
- Is a level at which critical driving skills are impaired
- Is a level above which the risk of crash is increased substantially
- Is a level which most industrialized countries have adopted
- Is a proven effective measure which will reduce alcohol-related fatalities

States With BAC Per Se Laws



.08 BAC (AL, CA, FL, HI, ID, IL, KS, ME, NC, NH, NM, OR, UT, VA, VT, WA)

.10

No Per Se Law (MA, SC)

Alcohol-Related Relative Risk of Driver Fatalities and Driver Involvement in Fatal Crashes in Relation to Driver Age and Gender: An Update Using 1996 Data*

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ABSTRACT. *Objective:* To re-examine and refine estimates for alcohol-related relative risk of driver involvement in fatal crashes by age and gender as a function of blood alcohol concentration (BAC) using recent data. *Method:* Logistic regression was used to estimate age/gender specific relative risk of fatal crash involvement as a function of the BAC for drivers involved in a fatal crash and for drivers fatally injured in a crash, by combining crash data from the Fatality Analysis Reporting System with exposure data from the 1996 National Roadside Survey of Drivers. *Results:* In general, the relative risk of involvement in a fatal vehicle crash increased steadily with increasing driver BAC in every age/gender group among both fatally injured and surviving drivers. Among 16-20 year old male drivers, a BAC increase of 0.02% was estimated to more than double the relative risk of fatal single-vehicle crash injury. At the midpoint of the 0.08% - 0.10% BAC range, the relative risk of a fatal single-vehicle crash injury varied between 11.4 (drivers 35 and older) and 51.9 (male drivers, 16-20). With only very few exceptions, older drivers had lower risk of being fatally injured in a single-vehicle crash than younger drivers, as did women compared with men in the same age range. When comparable, results largely confirmed existing prior estimates. *Conclusions:* This is the first study that systematically estimated relative risk for drink-drivers with BACs between 0.08% and 0.10% (these relative risk estimates apply to BAC range midpoints at 0.09%.) The results clearly show that drivers with a BAC under 0.10% pose highly elevated risk both to themselves and to other road users. (*J. Stud. Alcohol* 61: 387-395, 2000)

BASED ON extensive research over several decades, we now have overwhelming evidence showing that even blood alcohol concentration (BAC) levels as low as 0.02% impair driving-related skills. One such line of evidence grows out of laboratory research with dosed subjects (Moskowitz and Robinson, 1987; see also National Institute on Alcohol Abuse and Alcoholism, 1997, chapter 7). Confirming evidence also comes from field research that compares the BACs of crash-involved with noncrash-involved drivers to determine the relative risk of crash involvement (for a review, see Perrine et al., 1989; Zador, 1991).

According to National Highway Traffic Safety Administration (NHTSA) information, as of September 1999, 31 states defined driving with a BAC above 0.10% as a crime per se, while another 17 states plus the District of Columbia set their per se limit at 0.08%. (Under a per se law it is a crime to drive with a BAC at or above the proscribed level; two states, Maryland and South Carolina, do not have a per se law but a presumptive limit.) Due to a combination of legal measures, enforcement actions and changes in voluntary behavior patterns, alcohol-related fatalities have been declining for nearly 2 decades, both in absolute numbers and as a proportion of all fatalities. Nonetheless, there were still 15,936 alcohol-related traffic fatalities in the United States that accounted for nearly 38% of total traffic fatalities in 1998 (NHTSA, 1999), indicating that much more needs to be done.

The objective of the present research is to re-examine and refine relative fatal crash risk estimates, in a systematic fashion using more recent data. It extends similar prior work by the first author, in three important ways. First, we estimate relative risk for the policy-relevant BAC range of 0.08% to 0.10%. Second, we estimate relative risk for six driver groups: (1) driver fatalities in single-vehicle crashes, (2) driver involvements in single-vehicle fatal crashes, (3) driver fatalities in two-vehicle crashes, (4) driver involvements in two-vehicle fatal crashes, (5) driver fatalities in all crashes and (6) driver involvement in all fatal crashes. Third, we employ statistical methods to estimate both the effect of sampling roadside exposure and the effect of multiple imputation of missing BACs on the uncertainty of relative risk estimates.

Method

Data sources

Driver exposure data: the 1996 Roadside Survey. The 1996 National Roadside Survey (96NRS) of weekend nighttime drivers in the 48 contiguous states followed the same principles as its two predecessors (in 1973 and 1986). A

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sample of noncommercial operators of four-wheel motor vehicles was interviewed and breath-tested during a roughly 1-month period in the fall of 1996. Counties with a population of less than 20,000 were not sampled, and in counties with larger populations, roadways with average daily traffic below 2,000 were excluded from the surveys (for details, see Lestina et al., 1999). Using a geographically stratified multistage cluster sample, drivers were selected for interviews and breath tests. This survey was designed based on the National Automotive Sampling System/Crashworthiness Data System (NASS/CDS) (NHTSA, 1995). The first stage of the design comprised 24 primary sampling units (PSUs) employed by NASS/CDS, six each in the Northeast, South, West and Midwest regions. The second stage comprised a total of 46 police jurisdictions: 11-12 per region. At the third stage, square grids with sides roughly equal to 1 mile were superimposed on the sampled jurisdictions and then randomly sampled to obtain the requisite number of squares (this procedure was modified for areas with low road density). Once a square was chosen, the survey was conducted at the first safe area found in it by the survey team leader. Driver selection represented the final stage: the first driver who approached the site after an interviewer became available was stopped for the next interview. Field operations were conducted on Friday and Saturday nights during two 2-hour periods at separate sites: at one site between 10 pm and midnight, and at the other between 1 am and 3 am. Data from the 96NRS is only representative of locations and periods when drinking and driving is most prevalent (i.e., not of all times or roadways in the 48 contiguous states).

We adjusted driver sampling weights from the 96NRS for nonrespondents, and used the adjusted weights to approximate the statistical distribution of drivers on weekend nights (exposure), by gender, age (16-20, 21-34 and ≥ 35) and % BAC (0.000, 0.001-0.019, 0.020-0.049, 0.050-0.079, 0.080-0.099, 0.100-0.149 and 0.150+). For details on nonresponse adjustments, see Lestina et al. (1999) and Zador et al. (in press).

Data on drivers in fatal crashes. The Fatality Analysis Reporting System (FARS) is a census of all fatal motor vehicle crashes that occur on public trafficways in the United States and result in a fatality within 30 days. Although FARS is maintained by NHTSA of the U.S. Department of Transportation, the data in FARS are obtained through cooperative agreements with agencies in each state's government and are managed by regional contracting officer's technical representatives located in the 10 NHTSA regional offices. For basic data elements associated with a fatal vehicle crash, reporting is usually of very high quality with relatively few missing values, however, there is one exception: even in recent years, BACs were not available for many drivers involved in fatal crashes. To deal with this problem, NHTSA has employed a statistical method since the early 1980s for imputing missing BACs (Klein, 1986). More recently, the method of multiple imputation (Rubin, 1987) was adopted to handle the problem of missing BACs on FARS (Rubin et al., 1999). Under multiple imputation, each missing value is replaced by a small number of imputed values (10, in the present case) that are generated by a statistical procedure designed to reflect the statistical properties of the missing driver BACs. We used the 10 complete-data versions of FARS in our statistical analyses. Note that, although the data files for the multiple imputation method are available, NHTSA is not yet using the multiple imputation method for its published alcohol estimates. The same method used in previous years is to be used for the 1998 FARS estimates.

We selected drivers of four-wheel passenger vehicles who were 16 years of age and over and were involved in fatal crashes during 1995 or 1996 in 1 of the 48 contiguous states (NHTSA, 1995-96). The crash had to have occurred on a weekend night in a county with a 1990 population of at least 20,000; outside of special jurisdictions; and on a paved road that was not classed as an interstate, other urban freeway or expressway. There were only two notable differences between the exposure and the crash screening criteria, and both were disregarded to increase the sample size for drivers retained for the analyses. First, we accepted crashes that occurred between midnight and 1 AM, since those crashes were excluded from the exposure sample only to permit the survey team to change location, and not because BAC distribution between midnight and 1 AM was thought to be different. Second, we did not restrict crashes to the weekend nights during which the surveys were conducted. Including weekend nights for the whole year increased sample sizes almost 12-fold and introduced no substantial difference in the distribution of driver BACs since driver BACs varied little between the survey period and the rest of the year. We classified the drivers meeting these selection criteria by the number of crash-involved vehicles (one, two, and any number of vehicles) and by whether the driver was just involved in the crash or was also fatally injured in the crash. We thus defined six driver groups for analysis: drivers fatally injured in single-vehicle crashes, drivers involved in fatal single-vehicle crashes, drivers fatally injured in two-vehicle crashes, drivers involved in fatal two-vehicle crashes, drivers fatally injured in a motor-vehicle crash and drivers involved in a fatal motor-vehicle crash. We classified the six groups of driver fatalities and involvements by gender, age group and BAC, in the same way we classified the exposure sample.

Statistical methods

Using odds ratios and logistic regression to estimate relative risk. Following Zador (1991), we base our methods on the intuitive notion that comparisons between the frequency distribution of fatal-crash involvement by gender, age and BAC, and the frequency distribution of roadside exposure by gender, age and BAC, can provide a good yardstick for measuring the effect of these factors on the relative likelihood of fatal-crash involvement per unit of driving exposure. Since the 96NRS did not provide a national estimate for total miles

TABLE 2. Logistic regression coefficients in models for risk of driver fatalities and driver involvement in single-vehicle crashes, in two-vehicle crashes and in all crashes as a function of variables for age, gender and interactions of age, gender and BAC. Data from the 96NRS and the 1995-96 FARS.

		Single-vehicle crashes		Two-vehicle crashes		All crashes	
Variable	Parameter	Fatalities	Involvements	Fatalities	Involvements	Fatalities	Involvements
Age 16-20	Coefficient[a]	−1.547	−0.572	−2.184	−0.873	−1.077	0.085
	SE	0.072	0.063	0.060	0.057	0.065	0.057
Age 21-34	Coefficient	−2.352	−1.205	−2.643	−1.187	−1.654	−0.331
	SE	0.042	0.028	0.051	0.034	0.036	0.025
Age 35+	Coefficient	−2.540	−1.656	−2.425	−1.291	−1.672	−0.591
	SE	0.043	0.039	0.037	0.036	0.036	0.039
Female	Coefficient	−0.580	−0.509	−0.065	−0.265	−0.351	−0.356
	SE	0.069	0.053	0.054	0.043	0.053	0.042
BAC < .019, age 21+	Coefficient	−2.861	−1.889	−1.593	−2.004	−2.031	−1.925
	SE	0.375	0.126	0.121	0.134	0.137	0.106
BAC[a], age 16-20	Coefficient	0.044	0.039	0.032	0.031	0.041	0.035
	SE	0.007	0.006	0.005	0.005	0.006	0.005
BAC, age 16-20, female	Coefficient	−0.014	−0.015	−0.006	−0.015	−0.016	−0.016
	SE	0.006	0.005	0.006	0.005	0.006	0.005
BAC, age 21-34	Coefficient	0.029	0.024	0.023	0.019	0.026	0.020
	SE	0.001	0.001	0.001	0.001	0.001	0.001
BAC, age 35+	Coefficient	0.027	0.024	0.020	0.018	0.023	0.020
	SE	0.001	0.001	0.001	0.001	0.001	0.001
Model diagnostic							
Heterogeneity factor		1.6979	1.7774	1.8783	3.3159	2.0918	3.7070
Max-rescaled R^2		0.6844	0.4935	0.6524	0.3142	0.5297	0.3171
H-L goodness-of-fit, p		0.1998	0.6806	0.0317	0.0001	0.4008	0.0002
Normality of residuals, p		0.2813	0.0606	0.5701	0.4175	0.2189	0.0165

[a]BAC represents driver BAC as a continuous variable.
[b]A positive (negative) parameter indicates that variable and risk change in the same (opposite) directions.

was adequately represented by the models in Table 2 for three of the driver groups: drivers involved in a fatal single-vehicle crash, drivers killed in a single-vehicle crash and drivers killed in any vehicle fatal crashes. While the Hosmer-Lemeshow test statistic ($p = .032$) rejected the hypothesis of model fit for fatally injured drivers in two-vehicle crashes, the regression model explained 65% of all explainable relative risk variation, and the standardized Pearson residuals were normally distributed. Overall, we deem model fit acceptable for driver fatalities in two-vehicle crashes. In contrast, the models performed poorly for the two remaining driver groups—drivers in fatal crashes involving two vehicles or drivers in fatal crashes involving any number of vehicles.

We explored, in considerable detail, the way our models broke down for fatal two-vehicle crashes. We examined model fit statistics for the models in Table 2 and for several other model specifications, including specifications obtained by stepwise regression (for a summary of results for a few of the dozens of models that were examined, see the Appendix). The results showed clearly that sober driver involvement in two-vehicle crashes is not closely related to driver involvement at positive BACs, and we discovered that only the inclusion of indicator variables representing overall sober driver risk, and sober driver risk by age and gender, would produce acceptable model fit. This result was, in fact, not too surprising—for two reasons. First, in crashes involving more than a single vehicle, some drivers may be innocent (and probably sober) victims whose vehicles were struck by a high BAC at-fault driver. Second, in multivehicle crashes, crash configuration and vehicle occupancy become important determinants of relative risk. However, we decided not to use regression models that included sober driver risk variables (e.g., main effect for zero BAC, zero BAC by age interaction, etc.; see Appendix) because it was not clear how these models can be used to estimate relative risk with BAC = 0 as the baseline. Therefore, relatively poor model fit notwithstanding, we believe that the relative risk estimates presented from the model parameter estimates in Table 2 provide reasonable, albeit conservative, approximations of the true relative risk, even for driver involvement in multivehicle fatal crashes. Additional research will be needed to improve model fit for these driver groups.

Table 3 shows model-based estimates for factor of proportionate increase in relative risk associated with an increase of 0.02% in BAC level for each driver group, by age and gender. Of noteworthy mention, it was estimated that each 0.02 percentage point increase in the BAC of a driver with a nonzero BAC more than doubled the risk of receiving a fatal injury in a single-vehicle crash among male drivers aged 16-20, and nearly doubled the comparable risk among the other driver groups. Proportionality factors were estimated from age-specific regression coefficients of BAC in Table 2, except that for female drivers aged 16-20 the estimates were adjusted for the effect of being female. For the relative risk estimates in subsequent tables, relative risk was

In general, the pattern of results for the other driver groups was quite similar to the pattern described above (see Zador et al., in press). There are two major differences among the other driver groups: (1) For fatally injured drivers, relative risk increased more slowly with increasing BAC in two-vehicle than in single-vehicle crashes. As indicated earlier, this was to be expected since in multivehicle fatal crashes some involved drivers were likely to be no more than marginally at-fault. (2) Since most fatally injured drivers were killed in a single-vehicle or in a two-vehicle crash, the overall rate of increase in relative risk was bracketed by the rates of increase for single-vehicle and two-vehicle crashes.

Discussion

Confirmatory findings

This study generally confirmed that the relative risks of fatal injury and fatal crash involvement increase steadily with increasing driver BAC within each of the six driver age and gender groups studied. The only exception was that among drivers 21 and over, relative risk was lower at near-zero positive BAC than at zero BAC. The classic Grand Rapids study by Borkenstein et al. (1974) found a similar "dip" in the risk curve. Hurst (1973) showed that controlling self-reported drinking frequency eliminates the Grand Rapids dip. The customary interpretation of these results is that the anomalous dip probably results from differing alcohol tolerance between crash-involved and noncrash-involved drivers. Since drinking frequency data were not available in our study, we were unable to estimate risk curves by drinking frequency. With few exceptions, relative risk was found to decrease with increasing driver age at every BAC level, for both men and women—a finding that extends similar age trends reported for more moderate BACs by Zador (1991).

The current study also confirms the substantially higher relative risk for involvement in a single-vehicle crash of young drivers at a zero BAC as previously reported by Mayhew et al. (1986). In addition, female drivers exhibited substantially lower relative risk than male drivers of the same age. To a somewhat lesser extent, both sets of findings were also true for most of the other five driver groups studied.

In this study, lower and upper 95% confidence bound estimates for relative risk as a function of driver BAC take into account both the sampling variation of the roadside driver exposure sample and the effect of multiple BAC imputations performed by Rubin and Schaffer (1998) for NHTSA. Not surprisingly, relative risk confidence intervals are wide (e.g., lower and upper confidence bounds were 16.5 and 164 for male drivers ages 16-20 killed in single-vehicle crashes with a BAC between 0.08% and 0.10%; these relative risk estimates apply to BAC range midpoints at 0.09%). We note that the width of 95% confidence intervals increases with increasing BACs for mathematical reasons (both relative risk and its confidence bounds depend exponentially on the corresponding logistic regression parameters). We also note that, allowing for comparable variation in prior estimates, the relative risk estimates presented here are largely in line with estimates published elsewhere. (Relative risk estimates presented in this article differ in several ways from similar estimates in Zador [1991]. In the earlier study, the baseline BAC group was defined to include drivers at or below a BAC of 0.01%, age groups and BAC groups were defined differently, driver fatalities were included from only 29 states with low rates of missing BACs, missing BACs were not imputed, and the numeric BAC values were not used in analyses except to classify drivers.)

New findings

This is the first study that estimated relative risk from compatible data sources using the same methods for six groups of drivers involved in fatal crashes that were defined by the number of crash-involved vehicles and by whether the driver was only involved or also fatally injured in the crash. Drivers killed in single-vehicle crashes are of particular interest for assessing the *pure* effect of drink-driving because in single-vehicle crashes: (1) driver fault is not shared, (2) crash configuration is less of a factor, (3) vehicle occupancy is not relevant and (4) the seating position of the fatally injured occupant is fixed. In two-vehicle crashes, the possibility that fault may be split between two drivers, one or both of whom may have a (possibly different) positive BAC, would seem to make it difficult to estimate the pure effect of BAC on crash risk. It was all the more gratifying to find that the relative risk of a fatal driver injury depends on driver BAC in almost the same way for single-vehicle crashes and two-vehicle crashes, provided that the relative risk model of two-vehicle crashes statistically accounted for the possible roles of not at-fault sober drivers (see Appendix). In this study, we focused on the general effect on relative risk of a positive driver BAC, rather than on its pure effect. Our main statistical model for estimating relative risk did not, therefore, adjust relative risk estimates for the overrepresentation of sober (probably not-at-fault) drivers. Consequently, the model we used in this study appears to have generally underestimated the pure effect of positive driver BAC on relative risk, except for drivers in single-vehicle crashes.

As noted earlier, this study confirmed that relative risk and driver age are inversely related at every BAC. However, somewhat surprisingly and in part contrary to Zador (1991), we also found that for the 16-20 age group, women had lower relative risk than men at every BAC. For BACs of 0.02% and over, this lower relative risk was roughly comparable to relative risk among adult drivers aged 21 to 34—an important finding because of the increasing nighttime presence of young female drinking drivers observed in the 96NRS. That most recent survey found more, although not significantly more, female than male drinking drivers in the 16-20 age group. Perhaps the lower relative risk could be attributed to

surprising that, in every age group, the regression coefficients of BAC for driver involvement in fatal two-vehicle crashes are substantially higher in the model that incorporates a zero-BAC term than in the corresponding model that does not (this finding is actually a mathematical consequence of the fact that zero-BAC coefficients are always positive). It is surprising, however, that in every age group the regression coefficients of BAC in the model for driver involvement in fatal two-vehicle crashes that incorporates a zero-BAC term are only slightly smaller than similar age-group regression coefficients for fatally injured drivers in single-vehicle crashes. This suggests that positive BAC affects single-vehicle fatalities and two-vehicle crash involvement to roughly the same extent, provided that not-at-fault sober drivers are suitably accounted for. However, until confirmed by additional research, this finding must be considered more as a hypothesis than a definitive conclusion. Note, however, that similar suggestions were also made in Zador (1991).

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Reprint

Public Health Briefs

Lowering State Legal Blood Alcohol Limits to 0.08%: The Effect on Fatal Motor Vehicle Crashes

Ralph Hingson, ScD. Timothy Heeren, PhD, and Michael Winter, MPH

ABSTRACT

Objectives. This study was undertaken to determine whether reductions in alcohol-related fatal crashes following adoption of 0.08% legal blood alcohol limits were independent of general regional trends.

Methods. The first five states that lowered legal blood alcohol limits to 0.08% were paired with five nearby states that retained a 0.10% legal standard. Within each pair, comparisons were made for the maximum equal available number of pre- and postlaw years.

Results. States adopting 0.08% laws experienced 16% and 18% relative postlaw declines in the proportions of fatal crashes involving fatally injured drivers whose blood alcohol levels were 0.08% or higher and 0.15% or higher.

Conclusions. If all states adopted 0.08% legal blood alcohol limits, at least 500 to 600 fewer fatal crashes would occur annually. (*Am J Public Health.* 1996;86:1297–1299)

Introduction

In 1994, 16 589 people died and nearly 297 000 persons were injured in alcohol-related traffic crashes.[1] Several different types of studies have reported that driver impairments begin at blood alcohol levels well below the 0.10% legal standard in most states. Experimental laboratory studies have shown that at 0.08%, a level reached by a 150-lb person consuming four drinks an hour on an empty stomach, there is reduced peripheral vision, poorer recovery from glare, poor performance on complex visual tracking, and reduced divided attention performance.[2] Driver simulation and road course studies have revealed poor parking performance, impaired driver performance at slow speeds, and steering inaccuracies[3]; roadside observational studies have identified speeding and breaking performance deterioration.[4] A national comparison of drivers in single-vehicle fatal crashes with drivers not in fatal crashes but stopped at roadside surveys indicated that each 0.02% increase in blood alcohol level nearly doubles the risk of fatal crash involvement. In all age and sex groupings, the fatal crash risk at a blood alcohol level of 0.05% to 0.09% was at least nine times greater than that at zero blood alcohol.[5]

To reduce alcohol-related fatal traffic crashes, 14 states have lowered the legal blood alcohol limit from 0.10% to 0.08%. Johnson and Walz[6] monitored six different measures of driver involvement in alcohol-related fatal crashes in the first five states to adopt 0.08% laws. Nine of the 30 pre- to postlaw comparisons identified statistically significant decreases. However, comparison areas were not included to assess whether the postlaw declines were independent of general regional trends. Thus, this study was undertaken to assess whether, relative to nearby states, states adopting a 0.08% legal limit experienced a reduction in the proportion of fatal crashes involving (1) fatally injured drivers with blood alcohol levels of 0.08% or higher and 0.15% or higher, and (2) any driver with a blood alcohol level at 0.08% or higher and 0.15% or higher.

Methods

Prior to 1992, five states had lowered the legal blood alcohol limit from 0.10% to 0.08%: Utah (August 1983), Oregon (November 1983), Maine (August 1988), California (January 1990), and Vermont (July 1991). Each of these states was paired with a nearby state that retained a 0.10% legal limit. Within each pair, comparisons were made for the maximum equal number of available pre- and postlaw years. Thus, Utah was compared with Idaho from August 1976 to July 1991, Oregon with Washington from November 1976 to October 1991, Maine with Massachusetts from August 1984 to July 1993, California with Texas from January 1986 to December 1993, and Vermont with New Hampshire from July 1990 to June 1993.

To minimize potential bias resulting from variation in testing policies, the analysis initially focused on fatally injured drivers with blood alcohol levels of 0.08% or greater. During the analysis period, blood alcohol test results were available from the US Fatal Accident Reporting System for 81% of fatally injured drivers

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This paper was accepted April 12, 1996.

TABLE 2—Proportion of Fatal Crashes with a Fatally Injured Driver Whose Blood Alcohol Was 0.15% or More, Before and After the Passage of 0.08% Legal Blood Alcohol Limits in 5 States

0.08% Law States and Comparison States	Proportion before 0.08% Law (n)	Proportion after 0.08% Law (n)	% Change in Proportion (RR − 1)	Ratio of RRs (95% CI)
Oregon (0.08%)	0.22 (992/4455)	0.18 (769/4186)	−17% (0.83)	0.79 (0.70, 0.88)
Washington	0.20 (1266/6184)	0.21 (1158/5390)	+5% (1.05)	
Utah (0.08%)	0.10 (220/2252)	0.12 (245/2085)	+20% (1.20)	0.91 (0.72, 1.15)
Idaho	0.11 (232/2057)	0.15 (265/1773)	+33% (1.33)	
Maine (0.08%)	0.19 (198/1024)	0.15 (143/942)	−21% (0.79)	0.77 (0.61, 0.97)
Massachusetts	0.15 (493/3241)	0.15 (418/2703)	+2% (1.02)	
California (0.08%)	0.16 (3009/19370)	0.14 (2291/16278)	−9% (0.91)	0.82 (0.76, 0.89)
Texas	0.15 (1780/11924)	0.16 (1804/10961)	+10% (1.10)	
Vermont (0.08%)	0.19 (36/186)	0.19 (34/181)	−3% (0.97)	1.23 (0.68, 2.23)
New Hampshire	0.17 (48/280)	0.14 (30/222)	−21% (0.79)	
Overall law effect				0.82 (0.77, 0.87)

Note. RR = relative risk; CI = confidence interval.

Second, unlike previous studies, this analysis included comparison states to control for regional fatal crash trends.

Third, 0.08% law states may have been more concerned about alcohol-impaired driving and more responsive to legislative initiatives to reduce the problem. They were more likely to have other stringent laws that have been shown to reduce alcohol-related fatal crashes. All 0.08% law states had criminal per se laws in effect prior to the study, compared with only two comparison states: Texas and Vermont. The comparison states of Idaho and Washington introduced criminal per se laws during the study. It is likely that the 0.08% law effects were independent of criminal per se laws. Before the 0.08% law, reductions in alcohol-involved fatal crashes were seen both in pairs of states where both 0.08% law states and comparison states had criminal per se legislation throughout the study and in pairs where comparison states adopted the law during the study period.

All five 0.08% law states also had administrative licence revocation laws during the study, three of which were implemented within 1 year of the state's 0.08% law. Administration licence revocation laws have been associated with 5% declines in fatal crashes.[9] Among the control states, only New Hampshire had this law during the study period. This restricted our ability to separate the effects of 0.08% legislation from administrative licence revocation laws. Maine was the only 0.08% law state to implement an administrative licence revocation law prior to the study period and hence the only state where post-0.08% law reductions in alcohol-involved fatal crashes could be clearly separated from the effects of administrative licence revocation laws passed during the study period.

Finally, this analysis focused only on fatal crashes. Studies of other traffic laws indicate that the magnitude of their impact can be influenced by accompanying educational and enforcement efforts.[10–12] Studies of 0.08% laws are needed that not only assess the laws' impact on fatal crashes but also measure how effectively the laws are implemented.

On balance, the results of this study suggest that 0.08% laws, particularly in combination with administrative licence revocation, reduce the proportion of fatal crashes involving drivers and fatally injured drivers with blood alcohol levels of 0.08% or higher and 0.15% or higher. This legislation warrants consideration in other states. □

Acknowledgments

This study was supported by grants from the National Institute on Alcohol Abuse and Alcoholism, the US Centers for Disease Control and Prevention, and the Massachusetts Governor's Highway Safety Bureau.

The study is dedicated to Lori Lynn Webb and Mitch Pewitt, both of whom died, and Kara Webb Hensel and Millie and Roy Webb, who were seriously injured, in a crash involving a driver with a 0.08% blood alcohol level.

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Lowering State Legal Blood Alcohol Limits to .08%: The Effect on Fatal Motor Vehicle Crashes

DISCUSSION

- High levels of blood alcohol testing of fatally injured drivers favors accuracy of the results:
  - 88% of fatally injured drivers in .08% states
  - 75% in comparison states
- Testing levels were the same in pre and post law years

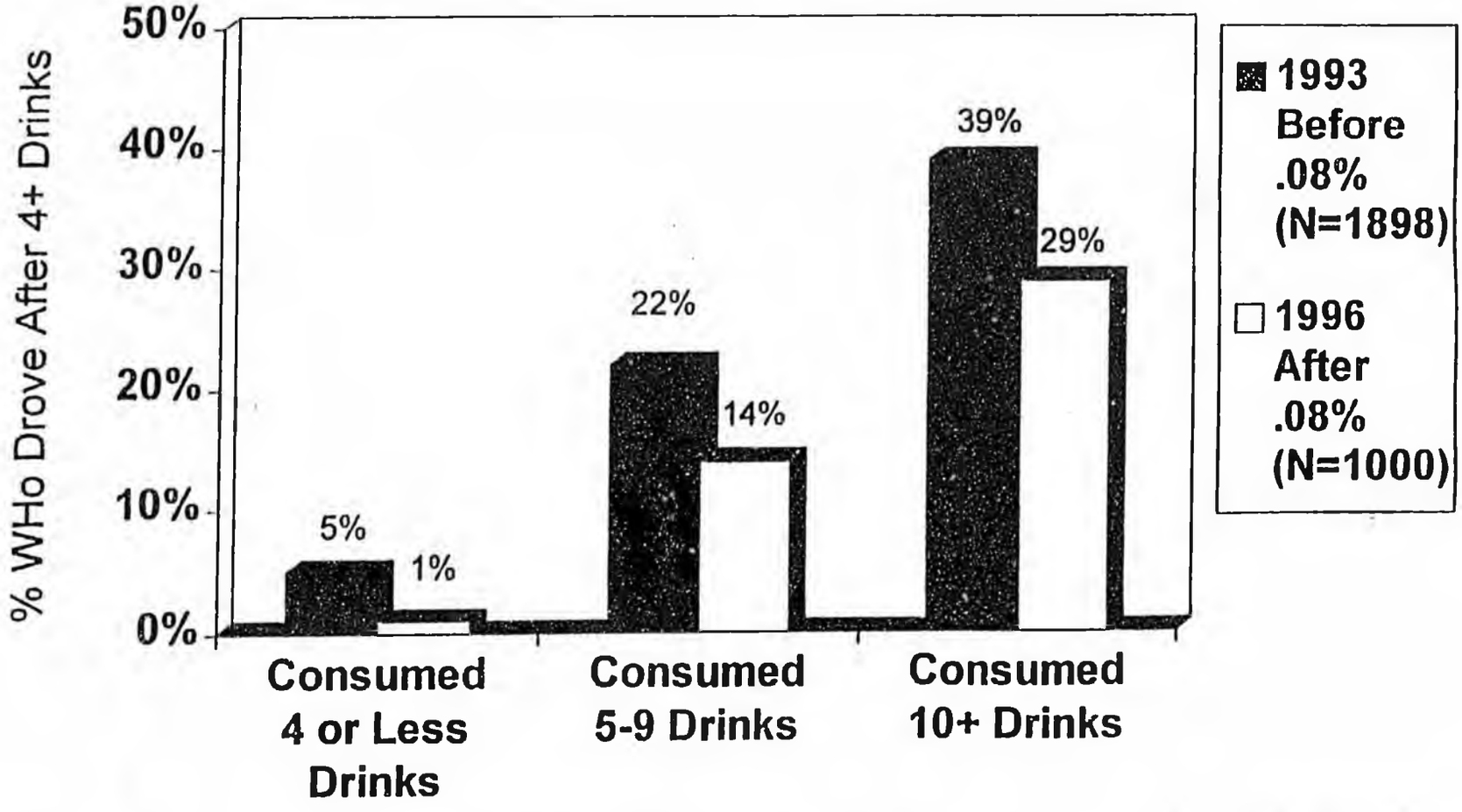
Lowering State Legal Blood Alcohol Limits to .08%: The Effect on Fatal Motor Vehicle Crashes

RESULTS

- Overall .08% Law states experienced a statistically significant 16% relative post-law reduction in the proportion of fatal crashes involving fatally injured drivers at .08% or higher and at .15% and higher
- Four out of five .08% Law states showed a reduction relative to control states in the proportion of fatal crashes with fatally injured drivers at BAC's .08% or higher and .15% or higher

Perceptions of Massachusetts Adults Age 21+

% Who Drove after 4 or More Drinks According to Single Days Highest Alcohol Consuption in the Past Month

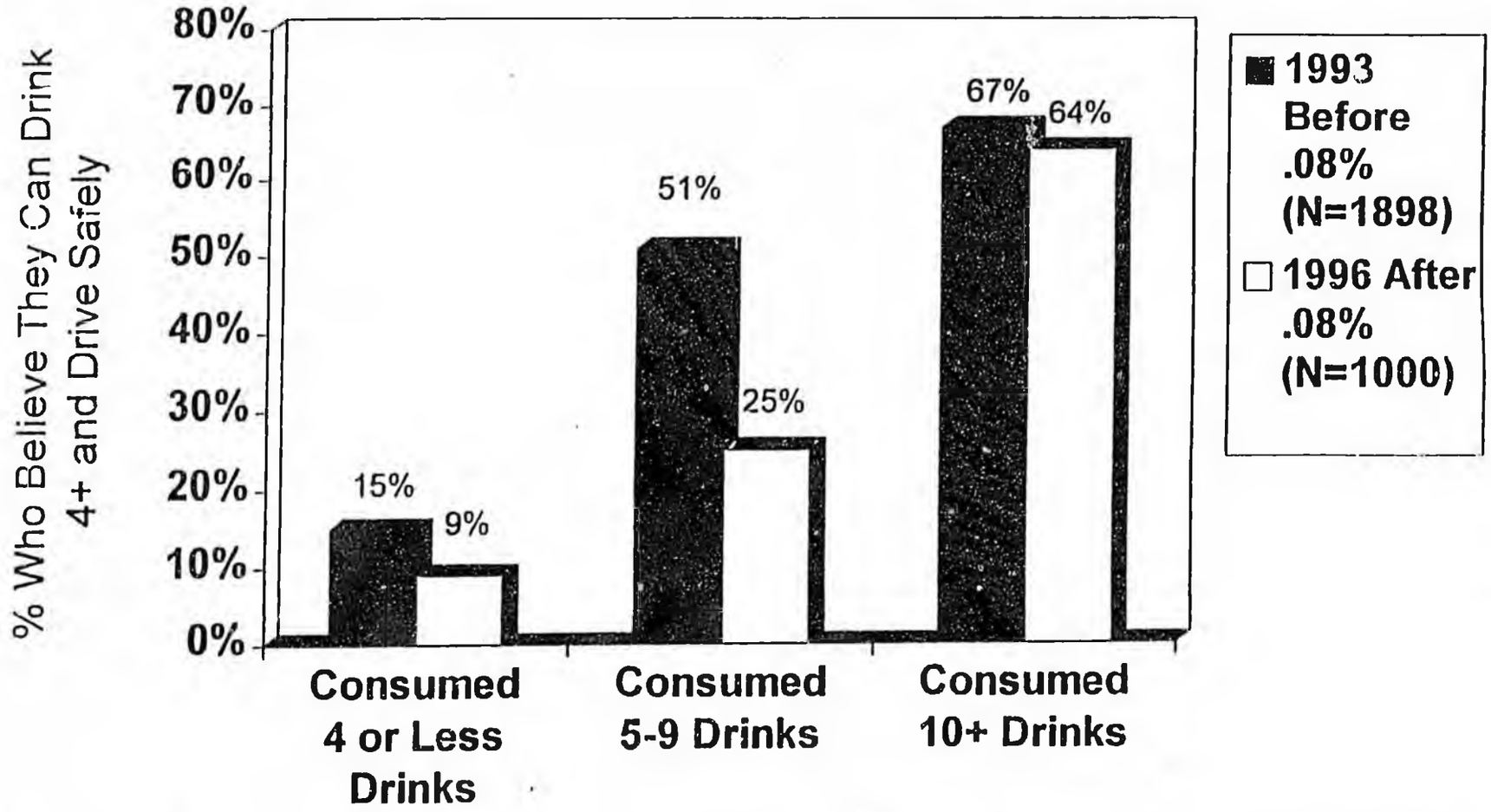


• After the .08% law there were declines in the proportions of persons who drove after 4+ drinks among light and heavy drinkers.

Source: Massachusetts Governor's Highway Safety Bureau 1993 and 1996 Statewide Telephone Survey

Perceptions of Massachusetts Adults Age 21+

One Can Drink 4 or More Drinks and Drive ***Safely*** According to Single Days Highest Alcohol Consuption in the Past Month

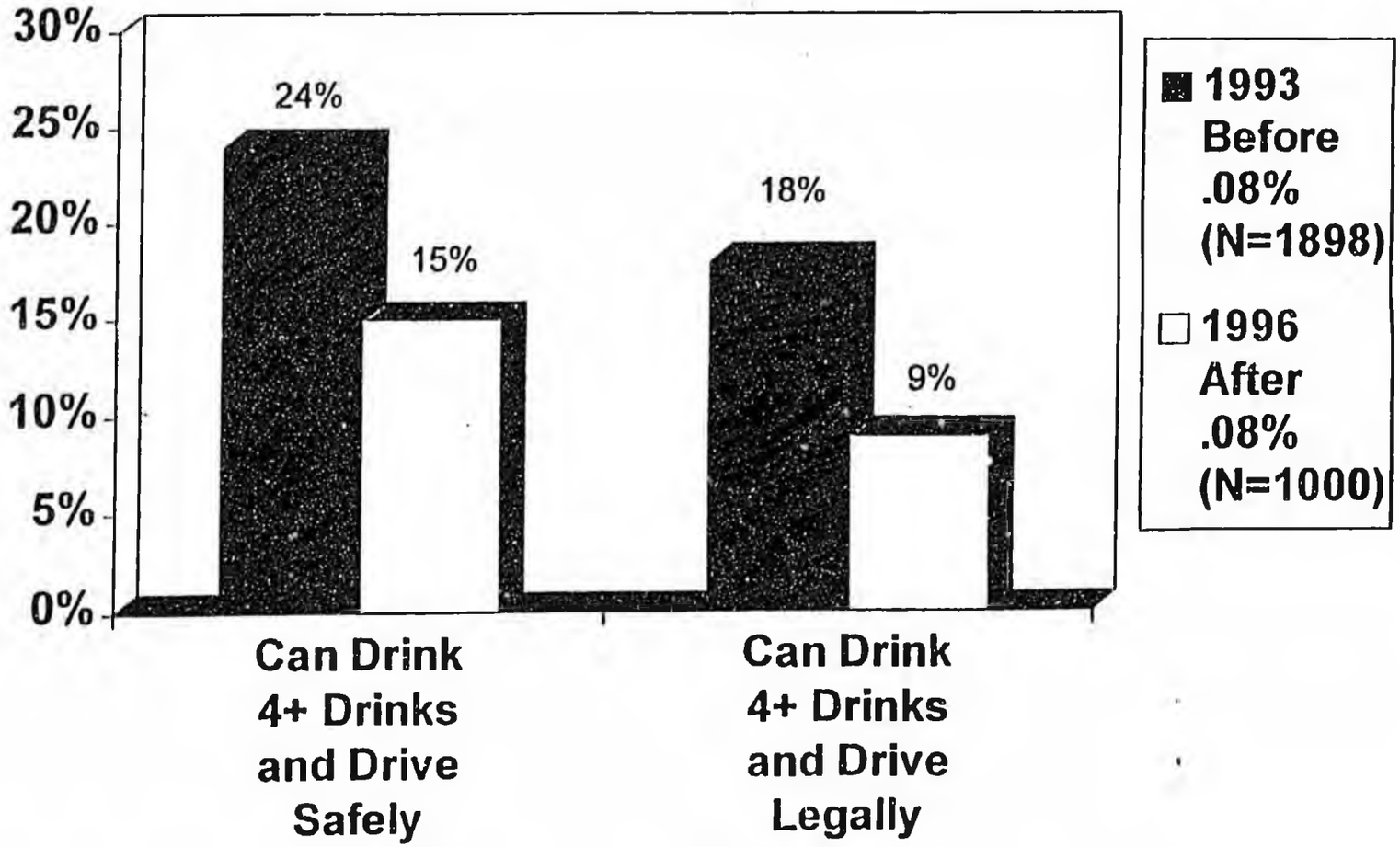


- The proportion of drivers who believed they could drink 4+ drinks and drive safely declined after the .08% law in all but the very heaviest drinkers

Source: Massachusetts Governor's Highway Safety Bureau 1993 and 1996 Statewide Telephone Surveys

Beliefs of Massachusetts Adults Age 21+

Before and After the legal BAL was Lowered from .10 to .08%



• After the .08% law, there were declines in the proportion of drivers who believed they could drive safely and legally after 4 or more drinks.

Source: Massachusetts Governor's Highway Safety Bureau 1993 and 1996 Statewide Telephone Surveys

Point: There could have been other reasons than the .08 law for the declines in fatally injured drivers with BACs $\geq$ .08 and .15 in these five .08 states. Were these other factors controlled for?

Counterpoint: All factors that could have accounted for the .08 effects were not controlled for. This is impossible to do in real world evaluations of this kind. For example, all .08 states had ALR laws in effect during the study while only one of the comparison states had ALR. Indeed, there may have been other factors that contributed to the decline in the .08 states other than the law itself.

On the other hand, some things were controlled: any regional effects (economy, etc) by using neighboring states; any urban/rural/population effects by using states with similar populations; any BAC testing rate effects by using states with high BAC testing rates.

Point: Two .08 states (UT and VT) actually had increases in the proportion of fatally injured drivers with BACs $\geq$ .08 in the before and after analyses. If .08 is so effective, why did this happen in two out of five states?

Counterpoint: It could be stated that if it weren't for the .08 law, those increases may have been greater. In most analyses of this nature, there will be states that do not show the desired effect (e.g. it happened in all of our MDA 21 studies) for one reason or another. The .08 law may not have been publicized or enforced as much. What is important is the cumulative effect of the five states, and that was a significant decrease. Similar findings occurred in NHTSA's analyses of ALR states and MDA 21 states in determining their effects. The overall effect in those studies, however, was also positive.

ABI Criticisms

ABI: "According to their research, in 1992 blood alcohol tests were available in 81% of all fatal accidents. We find that number to be unusually high because according to NHTSA, the BAC testing levels were nearly half of what MADD Incorporated claims they were."

Answer: The Hingson study states that "During the analysis period, blood alcohol test results were available from the US Fatal Accident Reporting System for 81% of fatally injured drivers in the study states."

Hingson's statement is correct. ABI is talking about BAC tests on all drivers in all states being less than 50%. Hingson is talking about BAC tests on fatally injured drivers from the 10 states during the study period.

WHY .08 BAC ?

"...afe alcohol levels should be set by health experts, not the lobby for Hooter's and Harrah's. The ...utenberg-[DeWine]-Lowey amendment isn't a drive toward prohibition, but an uphill push toward health consensus." – ***The Wall Street Journal***, September 9, 1997

"Legislation to lower the BAC definition of intoxication to 0.08 percent would be an important contribution toward reducing impaired driving on our highways." – James Hall, **National Transportation Safety Board**

"What this bill will do is send a strong signal that excessive drinking and driving do not mix. They are unacceptable and will not be tolerated by society. So I am delighted, on behalf of the Clinton Administration, to endorse this legislation. And I urge swift passage by the Congress. President Clinton is ready to sign it today." – **U.S. Secretary of Transportation Rodney E. Slater**, October 23, 1997

"We know that drinking, plus driving, spell death and disaster...The problem is bigger than the individual states...It's a grave national problem, and it touches all our lives. With the problem so clear-cut and the proven solution at hand, we have no misgivings about this judicious use of federal power." – **President Ronald Reagan**, July 18, 1984, upon signing the National Minimum Drinking Age bill

"Drunk drivers are deadly threats no matter where they speed or weave in this country. Yet a driver who is certifiably drunk in Virginia can roll to a "sobriety" of sorts merely by crossing into Maryland. That is a life-threatening inconsistency that exists around the country because there is no uniform standard of drunkenness on the roads. There ought to be a national standard [of drunk ...ving], and such a proposition is now before Congress, with support from across the political spectrum...Congress can bring still better sense to highways by approving a uniform, nationally understood definition of a dangerous driver." – ***The Washington Post*** editorial, November 8, 1997

"Lower Threshold for Drunken Driving – the force of law nudges people to drink more responsibly. That's a critical and little recognized benefit of a .08 law. Four drinks in one state makes you no less drunk than four drinks in another. The abundant evidence justifies a national response." – ***The Baltimore Sun*** editorial, October 25, 1997

"A .08 blood-alcohol concentration is more than enough to make you a hazard on the road, and making it the threshold for DWI would strengthen the hand of the police once they pull over erratic drivers. And that would make Maryland roads safer...The national trend is clear enough – sooner or later Maryland will have the tougher DWI standard. We might as well make it sooner, and make our roads that much safer." – ***Annapolis Capital*** editorial, November 7, 1997

"Drunk Driving remains a national shame. Despite progress over the years, 41% of all motor vehicle fatalities – more than 17,000 lives lost – involve alcohol. Yet the current legal BAC in most states is .10, the highest in the industrial world...[We] believe enactment of S.412...is a necessary and important step. Laws which set the legal BAC limit at .08 are a needed part of the combination of programs and policies which must be in place if we are to win the fight against drunk driving." – Gerald Scannell, President, **National Safety Council**

"...he drunk driving problem has not been solved and will not be solved until safety becomes a top priority, not only in Washington, but in every state." – Katherine P. Prescott, President, **Mothers Against Drunk Driving**

confident of our company's wholehearted support of your joint initiative." – Michael Dineen, Vice President, **Kemper Insurance**

"Too many innocent victims have fallen prey to the irresponsibility of drivers who have gotten behind the wheel when impaired...[S. 412] should be included in the ISTEA reauthorization bill." – Stephen Brobeck, Chairman, **The Coalition for Consumer Health and Safety**

"Yes to National Drunken Driving Law – Congress uses the threat of withheld funds too often, in our opinion, to focus its will upon states. In this case, however, the states would merely be required to set an intoxication standard that reflects research on how alcohol affects driving." – ***Omaha World-Herald*** editorial, October 29, 1997

"'The Safe and Sober Streets Act of 1997' would encourage American drinkers to be more careful about drinking when they drive. It would help reduce the number of intoxicated drivers on the highways and decrease the carnage from drunk driving." – George A. Hacker, Alcohol Policies Project, **Center for Science in the Public Interest**

"We already know that more than 17,000 lives were lost in 1997 on our nation's highways due to drunk driving. And we know that laws which allow less BAC will save lives." – Mary Jac Rauh, M.P.H., Assistant Director, **Rural Health Projects, Inc.**, Oklahoma

"Complaints from the beverage industry that the new limits would target social drinkers and not alcoholics are ridiculous and dangerous. All that matters is whether the person behind the wheel has had too much to drink. Whether he or she is a social drinker is irrelevant." – ***The Toledo [OH] Blade*** editorial, November 30, 1997

"NHTSA has, for many years recommended that states adopt a .08 BAC standard. The Alliance has strongly supported this recommendation. Medical evidence clearly indicates that at .08 BAC an individual is seriously impaired and should not operate a motor vehicle." – David Farmer, Senior Vice President, **Alliance of American Insurers**

"The NFPA supports your initiative to provide for a national standard to prohibit the operation of motor vehicles by intoxicated individuals. According to NFPA statistics, an estimated 550 civilian fire deaths occurred last year in highway vehicles. Many of these are caused by motor vehicle operators who are intoxicated. There must be a stop to the irresponsibility that kills thousands of Americans each year." – George Miller, President & CEO, **National Fire Protection Association**

"S. 412 represents a necessary step forward in the campaign to educate and successfully deter people from drinking and driving and to secure the safety of motorists, bicyclists, and pedestrians on our highways and streets. As a society, we must make very clear that there is 'no such thing as a drunk driving accident'" – Patrick Schultz, **Tri State Transportation Campaign**

"When confronted with a controversial issue, it's sometimes enlightening to consider the markup of the two sides in the controversy...On one side are the people who make and sell booze...On the other side are governmental, safety and business organizations whose interest lies in reducing the number of deaths and injuries on the highways...[they] favor cutting the legal BAC to .08...Their interest also happens to be the public interest, and the public policy they advocate is the right one." – ***The Times of Trenton*** (NJ) editorial, August 21, 1997

FACTS AND MYTHS SURROUNDING THE .08 BAC ISSUE

MYTH: "If you do have one or two beers with a slice of pizza prior to driving home, MADD wants you arrested. Social drinking at a tavern would be made nearly impossible for most customers, save those with chauffeurs." – ABI, *Chicago Tribune*, April 27, 1997

FACT: This claim is completely unfounded and untrue. According to the National Highway Traffic Safety Administration, a 170 pound male can drink at least four 12-ounce cans of beer, four five-ounce glasses of wine, or four mixed drinks within one hour on an empty stomach before reaching .08 BAC. A 137 pound female can drink three to four drinks of the same size on an empty stomach before reaching that same level, a level at which all driving skills are affected. This is hardly social drinking or just a few beers with pizza.

MYTH: "Want to know the difference between .07 and .08? Pardon my language, but if I spit in this glass, that would be the amount of liquid needed to go from legal to illegal." – Rick Berman, ABI General Counsel, *testimony given at New Jersey Senate Task Force*, August 19, 1997.

FACT: .08 is four to five drinks in an hour for a 170 pound man and three to four drinks in an hour for a 137 pound woman. That's not social drinking, nor is it a drop of spit in a wine glass. With these types of comments, Mr. Berman spits in the face of drunk driving victims. His continuing ludicrous comments and increasingly outrageous behavior on behalf of a narrow self serving special interest show not only his lack of knowledge about the drunk driving issue but a complete lack of sensitivity for victims.

The real issue is one of intoxication. No matter how many drinks it takes for a person to reach .08 BAC, when that person reaches .08, he or she is dangerously impaired and is 16 times more likely to be involved in a single-vehicle alcohol-related fatal crash than a person with a .00 BAC level. At .10, a person is 32 times more likely to be involved in such a crash. The real issue isn't how much alcohol it takes to reach .08. The real and more important issue is, at .08 BAC, people are too impaired to be driving safely.

MYTH: "MADD's proposal to lower the threshold for drunk driving arrests to .08 BAC attacks social drinkers and completely ignores the real problem – drunk drivers." – ABI, PR Newswire article, May 7, 1997

FACT: MADD is concerned about the hard-core or habitual drinking driver, but the truth is that approximately 85 percent of all alcohol-related traffic fatalities are caused by first-time offenders or people who have not re-offended in the past three years.

Our volunteers throughout the nation spend hours trying to pass laws, educate the public, support victims, and monitor DUI court cases. Money does not drive our mission, saving lives does.

MYTH: "MADD insists drunk driving is on the rise but fails to point out all highway traffic fatalities increased by 4 percent. Alcohol-related fatalities as a percentage of all fatalities stayed virtually the same." – ABI, *USA Today*, June 19, 1997

FACT: In the past, even as all traffic fatalities and miles travelled increased, alcohol-related traffic fatalities decreased. In 1995, there were 17,274 alcohol-related traffic deaths compared with 16,589 in 1994. This represented the first increase in a decade. In 1996, 17,126 people were killed in alcohol-related traffic crashes. There was no statistically significant change in the percentage of alcohol-related traffic fatalities. Alcohol-related traffic fatalities among people ages 15-20 increased for the first time since 1990. The nation has reached a plateau in the fight against drunk driving.

Nearly one quarter (3,732) of the 17,126 alcohol-related traffic deaths in 1996 involved drivers with BAC levels below .10. That's 3,732 lives. MADD thinks that's a problem worth solving. A .08 BAC law in every state would save an estimated 500 to 600 lives each year.

MYTH: "MADD foments fear by claiming *every* person killed in a drunk driving accident is a victim. Yet, according to the Transportation Department, drunken drivers themselves account for more than half the fatalities." – ABI, *USA Today*, June 19, 1997

FACT: First of all, drunk driving is not an accident – it is a violent crime. A person makes the conscious decision to drink alcohol and then drive. It is no accident. Second, this outrageous statement is infuriating. The family members and friends of people who died while drinking and driving are also victims of this preventable and tragic crime. Their lives are also shattered and forever altered by the death of a loved one. They too have lost a precious family member. The ABI's discount of these grieving victims of the drunk driving problem further demonstrates its total lack of compassion. But then, saving lives is not the ABI's goal -- selling alcohol is.

MYTH: "A couple of drinks steadies a person, and might improve someone's driving ability." – Richard Bellshot, Camden County, New Jersey tavern owner, *New Jersey Senate Task Force Hearing*, August 19, 1997

FACT: Impairment begins at levels as low as .02. By the time a person reaches a BAC level of .08, critical driving skills such as steering, braking, lane changing, judgement, and emergency response are definitely impaired.

MYTH: ".08 BAC laws do not save lives. Lowering the legal BAC limit will have no effect on drivers who already ignore the current law." – *ABI web page*, August 1997

FACT: In Dr. Ralph Hingson's study published last year in the *American Journal of Public Health*, .08 BAC laws were proven to reduce the proportion of fatal crashes involving fatally injured drivers whose BAC levels were .15% and higher by 18 percent. Clearly, .08 BAC laws are a deterrent to all drinking drivers, regardless of BAC level.

MYTH: "By threatening to revoke highway funds, the proposed .08% federal legislation would force these states to implement policy changes already turned down by their own legislatures." – ABI web page, August 1997

FACT: The Safe and Sober Streets Act of 1997 aims to set an illegal BAC limit that is safe and sane. Science has proven that drivers at .08% are critically impaired.

In many states where .08 BAC legislation has been proposed and defeated, the bills have gained strong support from the public, the media and a majority of legislators. A small handful of legislators, under pressure from the alcohol and hospitality industries, have succeeded in defeating this lifesaving legislation.

MYTH: "To study the effect of .08% states, Hingson paired .08% states with what he termed "nearby" .10% states. Inexplicably, one of these "nearby" pairs consisted of California and Texas...In short, Hingson's method is flawed, the results do not replicate, and there is no evidence to suggest that .08% laws have had any effect." – *ABI web page*, August 1997

FACT: "Texas was compared with California because it is the closest state to California of comparable population and number of large urban centers. In addition, the demographics are comparable." – Dr. Ralph Hingson, 1997

"The comparison states were selected on the basis of geographic closeness, size and BAC testing rates. These were about the only five states (the five states studied in the survey) that could have been selected as comparisons based upon the study criteria for matching." – NHTSA, 1997

MYTH: "A driver who exceeds the legal limit by a one-hundredth of a percent of blood alcohol receives the same penalty as someone driving at two or three times the maximum BAC!...The ABI has consistently supported an escalated penalty system." – *ABI web page*, August 1997

FACT: Whether a drunk driver kills someone while driving impaired at .08% BAC or at .15% BAC the victim is still just as dead. Driving at BAC levels of .08% and higher is unsafe and threatens the lives of America's motorists. It should be illegal to drive at .08

United States General Accounting Office

GAO

Report to Congressional Committees

June 1999

HIGHWAY SAFETY

Effectiveness of State .08 Blood Alcohol Laws

GAO

Accountability • Integrity • Reliability

GAO/RCED-99-179

GAO

United States
General Accounting Office
Washington, D.C. 20548

Resources, Community, and
Economic Development Division

B-280883

June 23, 1999

The Honorable John McCain
Chairman
The Honorable Ernest F. Hollings
Ranking Minority Member
Committee on Commerce, Science,
and Transportation
United States Senate

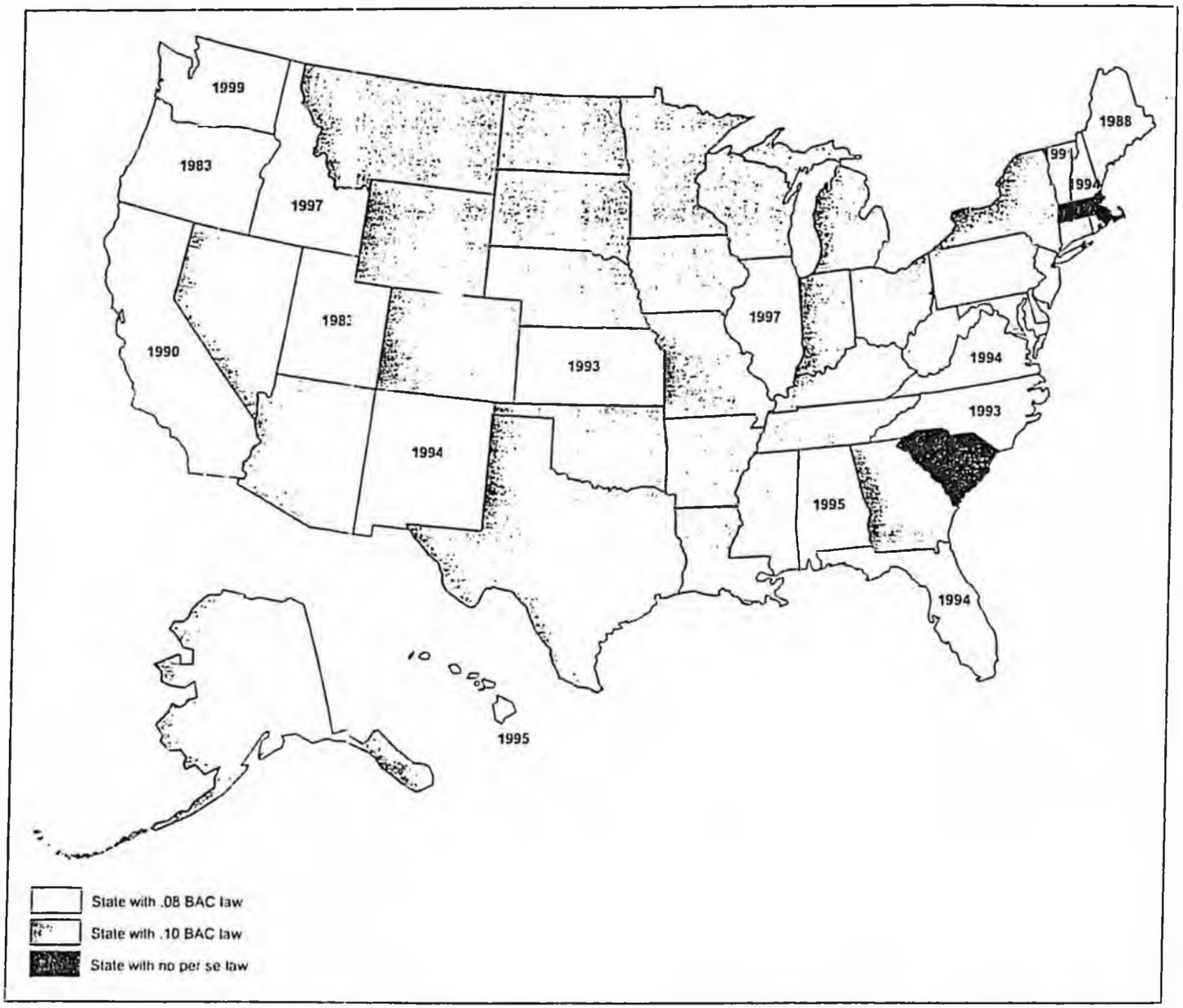
The Honorable Bud Shuster
Chairman
The Honorable James L. Oberstar
Ranking Democratic Member
Committee on Transportation and Infrastructure
House of Representatives

In 1997, someone in the United States died in an alcohol-related motor vehicle crash every 32 minutes. For years, the Congress and the states have grappled with and sought solutions to the problem of drunk driving. Most states have laws making it illegal for people to drive with a specified level of alcohol in their blood, usually set at .10 blood alcohol concentration (BAC)—the level at which a person's blood contains 1/10th of 1 percent alcohol. However, 16 states have more stringent laws setting the limit at .08 BAC. In 1998, the Clinton administration endorsed a bill that would have required all states to enact and enforce .08 BAC laws or face reductions in federal highway funds. The Senate approved this bill; the House took no action.

The Transportation Equity Act for the 21st Century directed GAO to evaluate the effectiveness of state .08 BAC laws in reducing the number and severity of crashes involving alcohol.[1] To accomplish this objective, we reviewed (1) the policies and positions of the Department of Transportation's (DOT) National Highway Traffic Safety Administration (NHTSA) on .08 BAC laws and other drunk driving countermeasures and (2) seven published studies on the effect of .08 BAC laws on the number and severity of crashes involving alcohol, including three studies released on April 28, 1999.

[1]The Transportation Equity Act for the 21st Century also directed us to study the effectiveness of .02 BAC laws for drivers under 21 in reducing the number and severity of crashes involving alcohol. The National Highway System Designation Act of 1995 required all states to enact and enforce such laws or face reductions in federal highway funds. However, as agreed to by your staff, we will not address the impact of .02 BAC laws, since all 50 states and the District of Columbia now have laws establishing BAC levels of .02 or less for drivers under 21.

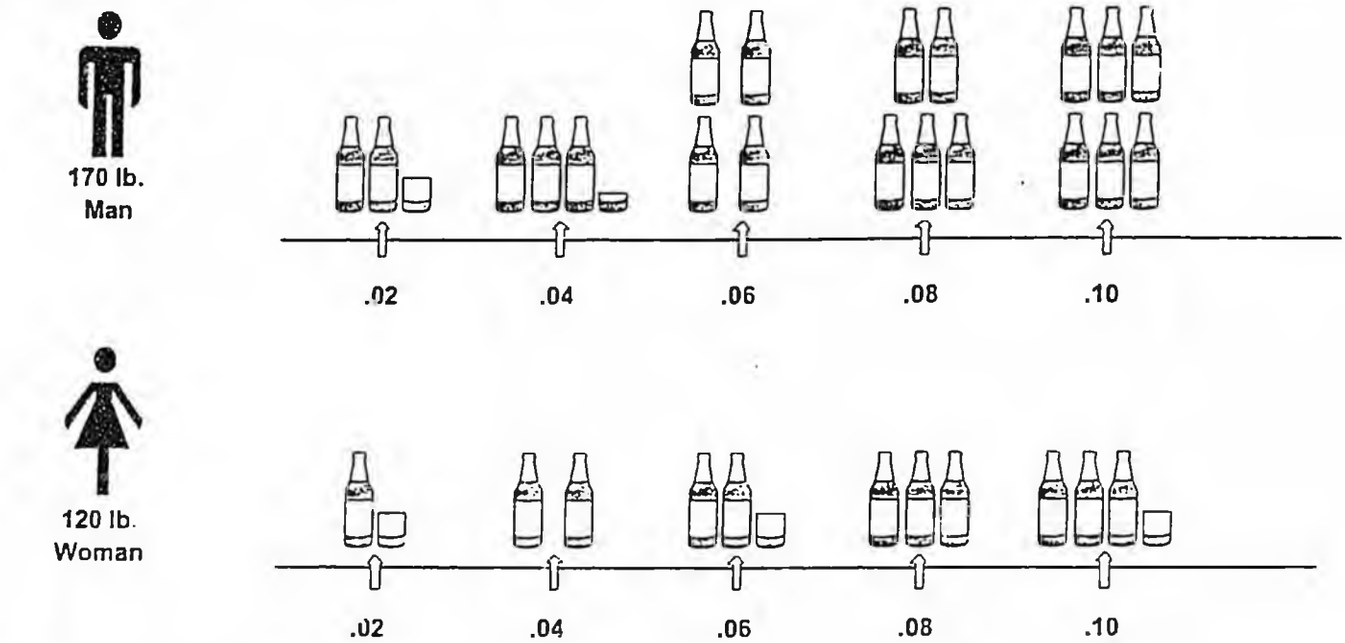
Figure 1: State Blood Alcohol "per Se" Laws



Note: States with .08 BAC laws are shown with the year the law became effective.

Source: GAO's illustration based on information from NHTSA.

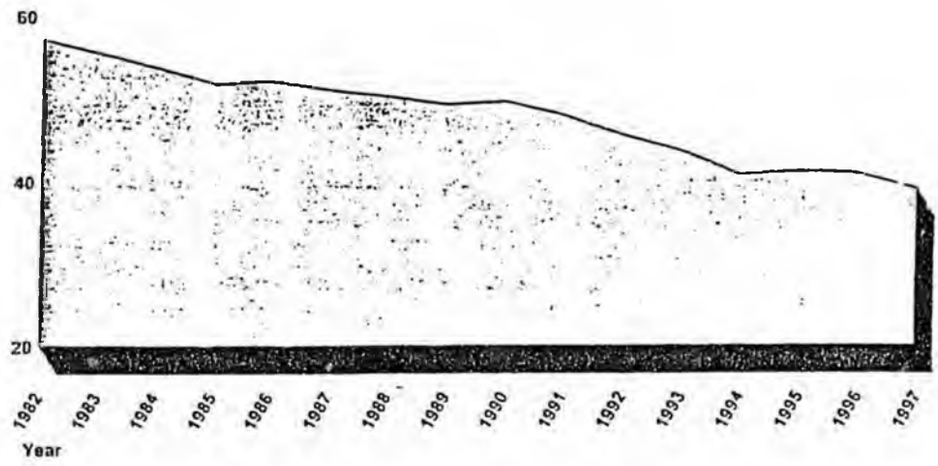
Figure 2: Alcohol Consumption and Blood Alcohol Levels



Source: GAO's illustration based on NHTSA's BAC estimator.

Alcohol use is a significant factor in fatal motor vehicle crashes. In 1997, the most recent year for which data are available, there were 16,189 alcohol-related fatalities, representing 38.6 percent of the nearly 42,000 people killed in fatal crashes that year. In the states with .08 BAC laws, alcohol was involved in 36 percent of all traffic fatalities, lower than the national average and the 39.5-percent rate of alcohol involvement in the

Figure 3: Alcohol-Related Fatalities, 1982-97



Source: GAO's illustration based on NHTSA's Traffic Safety Facts, 1997

Each state reports, and NHTSA collects and publishes, data on fatal crashes through the Fatal Accident Reporting System (FARS), a comprehensive national database of all crashes in which a person dies within 30 days of the crash. These data include (1) the number of fatalities that occur in all crashes and (2) the number of drivers involved in fatal crashes. FARS also includes whether crashes involved drivers who had been drinking. However, FARS has limitations regarding alcohol involvement in crashes—for example, fewer than half of the drivers at the scene of fatal accidents are tested for alcohol. To address the missing data, NHTSA developed a statistical model, first used in 1982, to estimate alcohol involvement in cases in which data are not available. The model provides estimates in three broad categories—sober (.00 BAC), "low BAC" (.01- .09 BAC), and "high BAC" (.10 BAC and above).[4] Therefore, certain questions—such as how many fatal crashes involve drivers with .08 BAC

[4]When cataloguing fatalities in crashes in which more than one driver had been drinking, FARS uses the driver with the higher BAC.

Since 1992, when it first recommended in a report to the Congress that all states have .08 BAC laws, NHTSA's position has changed from urging the states to pass .08 BAC laws to favoring that states be required to do so. The latter position was embodied in the President's endorsement of a Senate bill entitled the Safe and Sober Streets Act. This bill would have required all states to enact and enforce .08 BAC laws by October 1, 2001, or lose 5 percent of certain federal highway funds the first year and 10 percent each succeeding year. The Senate approved this bill on March 4, 1998, but the House took no action before the 105th Congress adjourned.[7]

As figure 4 shows, NHTSA has a number of reasons why it believes all states should adopt .08 BAC laws.

Figure 4: NHTSA's Reasons Why All States Should Adopt .08 BAC Laws

- Virtually all drivers are substantially impaired at .08 BAC with regard to critical driving tasks.
- The risk of being in a crash increases substantially when a driver reaches .08 BAC.
- .08 is a reasonable level to set the limit.
- The public supports lower BAC limits.
- Other industrialized nations have .08 or lower BAC laws.
- Lowering the limit to .08 is a proven effective countermeasure that will reduce crashes and save lives.

One of NHTSA's principal arguments for nationwide adoption of .08 BAC laws is that the medical evidence of drivers' impairment at that level is substantial and conclusive. According to NHTSA, and as shown in figure 5, reaction time, tracking and steering, and emergency responses are impaired at even low levels, and substantially impaired at .08 BAC. As a result, the risk of being in a motor vehicle crash increases when alcohol is involved, and increases dramatically at .08 BAC and higher levels. In contrast to NHTSA's position, industry associations critical of .08 BAC laws contend that .08 BAC is an acceptable level of impairment for driving a motor vehicle and that these laws penalize "responsible social drinking." These associations also believe that .08 BAC laws do not address the problem of drunk driving because many more drivers using alcohol are reported at the "high" BAC levels (above .10 BAC) than the lower BAC levels.

[7]The Senate approved this bill as an amendment to its surface transportation reauthorization bill. However, these provisions were not included in the House bill and were not included in the final version of the Transportation Equity Act for the 21st Century.

May 1998, the NHTSA Administrator stated, "The traffic safety administration is aware of four published studies, . . . [and] each study has shown that lowering the illegal blood alcohol limit to .08 is associated with significant reductions in alcohol-related fatal crashes." In a fact sheet distributed to state legislatures considering these laws, NHTSA stated that the agency's "analysis of five states that lowered the BAC limit to .08 showed that significant decreases in alcohol-related fatal crashes occurred in four out of the five states *as a result of the legislation*" (emphasis added). NHTSA used these study results to encourage states to enact .08 BAC laws, testifying in one instance before a state legislature, "We conservatively project a 10-percent reduction in alcohol-related crashes, deaths, and injuries" in the state.

Seven Studies Have Examined the Effectiveness of .08 BAC Laws

Seven studies have been published assessing the effect of .08 BAC laws on motor vehicle crashes and fatalities in the United States. Four studies published between 1991 and 1996 assessed the effectiveness of .08 BAC laws in the five states that enacted them between 1983 and 1991. On April 28, 1999, NHTSA released three additional studies. Table 1 summarizes the seven studies that examine .08 BAC laws.

results. Therefore, these studies did not provide conclusive evidence that .08 BAC laws by themselves have resulted in reductions in drunk driving crashes and fatalities. A task force of the New Jersey State Senate examined this evidence and, in a report issued in December 1998, reached a similar conclusion.[8]

The California Studies

NHTSA has cited California's experience as evidence of the effectiveness of .08 BAC laws. For example, in a publication promoting the need for .08 BAC laws, NHTSA stated that "alcohol-related fatalities significantly decreased after the state's BAC limit was lowered to .08 in 1990." In another publication, it said "California's .08 law was analyzed by . . ., [and] . . . the state experienced a 12% reduction in alcohol-related fatalities, although some of this can be credited to the new administrative license revocation law."

While NHTSA's 1991 study by Research and Evaluation Associates (see table 1) did find a 12-percent decline in alcohol-related fatalities after the .08 BAC law took effect, the study had important limitations. For example, the authors had available to them only 1 year of data for the period after the law went into effect, an unusually short period of time to analyze trends, and the authors acknowledged this limitation. California also had a license revocation law—under which a person deemed to be driving under the influence has his or her driving privileges suspended or revoked—take effect 6 months after the .08 BAC law. Although the authors concluded that this law had no effect, they stated that they were unable to accurately account for the separate effects of the two laws.

A more comprehensive, methodologically sound study of California was released by the state's Department of Motor Vehicles in 1995. In contrast to the 1991 review, this study was based on 4 years of data after the law became effective and found mixed results. The study concluded that the .08 BAC law was not associated with any statistically significant reductions in crashes resulting in fatalities or serious injuries in which drivers were reported to have been drinking, but that reductions did occur in accidents that took place during hours in which alcohol involvement is probable, such as nighttime crashes between 2 and 3 a.m. The study found

[8]State of New Jersey, Senate Task Force on Alcohol-Related Motor Vehicle Accidents and Fatalities, Dec. 11, 1998. Created by the leaders of the New Jersey State Senate, the task force was composed of elected officials and representatives from the state's judicial, medical, academic, and law enforcement communities. The task force was charged with, among other things, evaluating the available studies, and determining whether reducing the BAC limit to .08 would reduce the number of alcohol-related accidents and fatalities in New Jersey. The task force concluded that "the impact of laws that reduce the per se BAC level from .10 to .08, in isolation, is inconclusive" and that the effect of public education and awareness campaigns and license revocation laws "can be greater than changing the legal BAC."

to several or to the rest of the nation.

- Three of the five states had license revocation laws take effect within 10 months of their .08 BAC laws. This study made no effort to separately analyze the relative contribution of the two types of laws to any subsequent decline in fatal motor vehicle crashes in those three states. Thus, in at least three states, the authors' findings could as easily apply to the license revocation law as the .08 BAC law. The authors acknowledged this limitation, but it is rarely cited in NHTSA's literature and public statements endorsing this study and its findings.

- The study's conclusion that 500 to 600 fewer fatal crashes would occur annually if all states had .08 BAC laws is unfounded. The study does not explain how this estimate was derived or how the reduction could be credited to .08 BAC laws since the .08 BAC and license revocation laws went into effect within 10 months of each other in three of the five states. The authors told us that the estimate assumed that all states without .08 BAC laws would experience a reduction of up to 10 percent in alcohol-related crashes after enacting the laws. However, the study provides no basis for assuming that reductions of that magnitude would occur. Even this particular study found that while three of the five states experienced reductions greater than their comparison state, two of the five did not. NHTSA's April 1999 study of the effect of .08 BAC laws in 11 states (see table 1) characterized this conclusion as "unwarranted."

NHTSA Staff Study

In 1994, NHTSA staff conducted a study that examined FARS data in the first five states that enacted .08 BAC laws (see table 1). NHTSA has often cited this study as evidence of the effectiveness of .08 BAC laws. For example, a December 1997 publication with the National Safety Council said, "... significant reductions in alcohol-related fatal crashes were found in 4 out of the 5 states ranging from 4% to 40%. . . ."

The staff study examined 6 measures of alcohol involvement, ranging from fatal crashes involving drivers with high BACs to single-vehicle crashes late at night, in each of the five states (for a total of 30 measures) and found statistically significant decreases in 9 of the 30 measures. The study also had several important limitations, which the authors acknowledged. For example, as with the Boston University study, the staff study made no effort to separately account for the relative contributions of .08 BAC laws and license revocation laws in the three states that enacted them within a short period. The staff study cautioned that the results were preliminary and that they pointed to the need for further research. NHTSA's public

study found statistically significant reductions after .08 BAC laws became effective.

Table 2: Results of the 11-State Study of .08 BAC Laws

State	Year .08 BAC law became effective	Statistically significant reduction occurred in: Alcohol-related fatalities	Fatalities involving "high BAC" drivers	Proportion of fatalities involving "high BAC" drivers to those involving sober drivers
Utah	1983	No	No	No
Oregon	1983	No	No	No
Maine	1988	No	No	No
California	1990	No	No	No
Vermont	1991	**Yes**	**Yes**	**Yes**
Kansas	1993	No	No	**Yes**
North Carolina	1993	No	No	**Yes**
Florida	1994	**Yes**	**Yes**	**Yes**
New Hampshire	1994	No	No	No
New Mexico	1994	No	No	**Yes**
Virginia	1994	No	No	No
Total		**2 of 11**	**2 of 11**	**5 of 11**

Note: "Yes" indicates a statistically significant reduction after the .08 BAC law became effective. "No" indicates no statistically significant reduction.

Reductions in all three measures of fatalities involving alcohol occurred in Florida and Vermont. Although alcohol involvement in fatal crashes began to decline in Florida before the .08 BAC law was enacted, it continued to do so after the law went into effect on January 1, 1994. According to FARS, the number of alcohol-related traffic deaths in Florida declined in 1994 by nearly 10 percent, while the proportion of fatalities involving alcohol fell from 44 to 39 percent—in 1997 it stood at around 34 percent. While the study noted that Vermont has experienced fluctuations in its fatal crash rates, it found that after Vermont's .08 BAC law took effect, it also experienced statistically significant reductions in both the number of fatalities involving alcohol and the proportion of fatalities involving drivers with high BACs to those involving sober drivers. In this study, Vermont was the only state of the first five states to enact .08 BAC laws that showed any reductions in alcohol-related fatalities associated with .08 BAC laws.

it concluded that .08 BAC laws added to the impact that enforcement; public information; and legislative activities, particularly license revocation laws, were having. In addition to the two states where .08 BAC and license revocation laws were found to be effective in combination, the study noted that the five states with .08 BAC laws that showed reductions already had license revocation laws in place. One of the authors told us that this suggested that the .08 BAC laws had the effect of expanding the scope of the license revocation laws to a new portion of the driving public.

University of North Carolina Study

A NHTSA-sponsored study by the University of North Carolina concluded, in contrast to the 11-state study, that the .08 BAC law in North Carolina had little clear effect. The study examined alcohol-related crashes and crashes involving drivers with BACs greater than .10 from 1991 through 1995; compared fatalities among drivers with BACs greater than .10 in North Carolina with such fatalities in 11 other states; and compared six measures of alcohol involvement in North Carolina and 37 states that did not have .08 BAC laws at that time. The study controlled for and commented on external factors that could confound the results, such as the state's sobriety checkpoints, enforcement, and media coverage. The study found the following:

- No statistically significant decrease in alcohol-related crashes after passage of North Carolina's .08 BAC law in three direct and two "proxy" measures.[9]
- A continual decline in the proportion of fatally injured drivers with BACs equal to or greater than .10 but no abrupt change in fatalities that could be attributed to the .08 BAC law.
- Decreases in alcohol-related crashes in North Carolina and in the 11 other states studied. While North Carolina's decreases were greater, the study concluded that no specific effects could be attributed to the .08 BAC law.
- No statistically significant difference between North Carolina and 37 states without .08 BAC laws in four of the six measures. While reductions in police-reported and estimated instances of alcohol involvement were found to be statistically significant, these reductions happened 18 months before North Carolina lowered its BAC limit. The authors attributed these decreases, in part, to increased enforcement.

[9]Direct measures are actual observations, such as police reports of alcohol involvement in crashes, whereas proxy measures are not actual observations, but categories in which the involvement of alcohol is considered probable, such as nighttime crashes between 2 and 3 a.m.

fatalities or drivers as a percentage of all fatalities or drivers. The 50-state study's 8-percent estimate is the change in the ratio of alcohol-involved drivers to sober drivers who are in fatal crashes. While this is not an inappropriate way to measure differences in crashes and fatalities, this method can increase the size of the effect because, rather than comparing fatalities or drivers involving alcohol to all fatalities or drivers, it compares the number of alcohol-involved drivers to just the number of sober drivers. This method produced a larger effect in this study because, since 1982, of the drivers involved in fatal crashes, the number reported to have been using alcohol has dramatically declined (by around 39 percent), while the number reported to have been sober has substantially increased (by around 25 percent). While the 11-state study also measured this ratio, that study did not report a numerical effect.

Table 3 illustrates the difference between these methods of portraying traffic statistics using NHTSA's FARS data on drivers involved in fatal crashes between 1995 and 1997. As the table shows, while the number of alcohol-involved drivers declined by about 6 percent, the ratio of such drivers to sober drivers declined by 9 percent.

Table 3: Drivers Involved in Fatal Crashes, 1995-97

	1995	1997	Difference
Alcohol-involved drivers	14,269	13,393	(6.1%)
Sober drivers	41,895	43,209	3.1%
All drivers	56,164	56,602	0.8%
Ratio of alcohol-involved drivers to sober drivers	34%	31%	(9%)

Source: GAO's analysis of FARS data

Another reason why this study's results cannot be directly compared to other studies' is because it did not include data for drivers under 21. In 1997, drivers under 21 accounted for around 14 percent of the drivers in fatal crashes and about 12 percent of the drivers in fatal crashes involving alcohol. According to the authors, drivers under 21 were excluded from the analysis because other laws affect these drivers, such as minimum drinking age and "zero tolerance" BAC laws, and thus the primary effect of .08 BAC legislation would be expected to be on the population over 21 years old. While this argument may have merit, other arguments exist for including this population. First, NHTSA has stated that .08 BAC laws have a general deterrent effect on drinking and driving among all drivers. Also, young drivers violating .08 BAC laws have been prosecuted under those

conclusively establish that .08 BAC laws by themselves result in reductions in the number and severity of crashes involving alcohol. Until recently, limited published evidence existed on the effectiveness of .08 BAC laws, and NHTSA's position—that this evidence was conclusive—was overstated. In 1999, more comprehensive studies have been published that show many positive results, and NHTSA's characterization of the results has been more balanced. Nevertheless, these studies fall short of providing conclusive evidence that .08 BAC laws by themselves have been responsible for reductions in fatal crashes.

Because a state enacting a .08 BAC law may or may not see a decline in alcohol-related fatalities, it is difficult to accurately predict how many lives would be saved if all states passed .08 BAC laws. The effect of a .08 BAC law depends on a number of factors, including the degree to which the law is publicized; how well it is enforced; other drunk driving laws in effect; and the unique culture of each state, particularly public attitudes concerning alcohol.

As drunk driving continues to claim the lives of thousands of Americans each year, governments at all levels seek solutions. Many states are considering enacting .08 BAC laws, and the Congress is considering requiring all states to enact these laws. Although a strong causal link between .08 BAC laws by themselves and reductions in traffic fatalities is absent, other evidence, including medical evidence on impairment, should be considered when evaluating the effectiveness of .08 BAC laws. A .08 BAC law can be an important component of a state's overall highway safety program, but a .08 BAC law alone is not a "silver bullet." Highway safety research shows that the best countermeasure against drunk driving is a combination of laws, sustained public education, and vigorous enforcement.

Agency Comments and Our Evaluation

DOT provided comments on a draft of this report (see app. I). The Department generally agreed with the information presented in the report. DOT reiterated its long-standing commitment to a systems approach for combating drunk driving and stated that while no individual component, including .08 BAC laws, is effective in isolation, the overall evidence supports the effectiveness of .08 BAC laws. DOT stated that the four original studies provided positive, if not conclusive, results and formed a reasonable basis for supporting .08 BAC laws. The three recent studies added to this body of evidence, including the North Carolina study, which, while finding little clear effect of the state's .08 BAC law, did find

The scope of our study was limited to the effect of .08 BAC laws on the number and severity of alcohol-related crashes. We did not review several other arguments raised by both proponents and opponents of .08 BAC laws; for example, while we describe the medical evidence on impairment, we did not evaluate that evidence. In addition, our ability to review the severity of alcohol-related crashes was limited by the fact that the FARS database—used entirely by five of the seven studies and in part by a sixth—includes only fatal crashes. The .08 BAC laws reviewed may have had a greater or lesser effect on nonfatal crashes than it did on fatal crashes. Finally, section 2008 of the Transportation Equity Act for the 21st Century required us to review the effect of .02 BAC laws for drivers under 21 in reducing the number and severity of alcohol-related crashes. As agreed with your staff, we will not address those laws as all 50 states and the District of Columbia now have laws establishing BAC levels of .02 or less for drivers under 21 years of age.

We performed our work from August 1998 through April 1999 in accordance with generally accepted government auditing standards.

We will send copies of this report to cognizant congressional committees; the Secretary of Transportation; and the Administrator, National Highway Traffic Safety Administration. We will make copies available to others upon request. If you have any questions regarding this report, please contact me at (202) 512-3650 or Ronald Stouffer at (202) 512-4416. Key contributors are listed in appendix II.

Sincerely yours,

Phyllis F. Scheinberg

Phyllis F. Scheinberg
Associate Director,
Transportation Issues

Department of Transportation
Comments on the General Accounting Office (GAO) Draft Report
"Highway Safety: Effectiveness of State .08 Blood Alcohol Laws,"
RCED-99-179

The Department commends GAO for reaching the sound and accurate conclusion that a .08 blood alcohol concentration (.08 BAC) law can be an important component of a state's overall highway safety program. We agree that highway safety research shows that the best countermeasure against drunk driving is a combination of laws, including .08 BAC, sustained public education, and vigorous enforcement. The Department has consistently supported such a systems approach to reduce alcohol related driving fatalities. The .08 BAC laws are an important component of this system, as research has shown substantial evidence that performance in driving-related skills such as reaction time, tracking and steering, and emergency response is substantially impaired for all persons at .08 BAC. It is not the Department's position that .08 BAC laws, by themselves, are sufficient to address the issue of alcohol-impaired driving.

Systems Approach Most Effective for Reducing Alcohol Related Highway Deaths

GAO aptly recognizes in the draft report that the National Highway Traffic Safety Administration (NHTSA) has, since 1970, espoused a systems approach for reducing alcohol-impaired driving. This systems approach must include legislative, enforcement, judicial, licensing and public information components. In 1998, NHTSA further refined this concept with the publication of an action plan to further reduce alcohol related driving fatalities. This plan recommends that all states initiate a wide range of laws and programs including .08 BAC limits, administrative license revocation (ALR) laws, comprehensive screening and treatment programs for alcohol offenders, vehicle impoundment and zero tolerance BAC laws for youth.

While studies conducted for NHTSA have attempted to measure the effectiveness of individual components of such a systems approach to reducing alcohol related deaths, it is recognized that no component operates in a vacuum. All of the efforts to reduce alcohol-impaired driving over the past two decades have built upon and operated in the environment created by the totality of actions which have preceded it. Thus, new laws will be most effective when they complement other laws and activities. Consistent with this position, the Agency has often pointed out that .08 BAC laws are likely to be most effective when combined with ALR laws, and vice versa. The studies conducted to date convincingly support this position.

Three Recent Studies Strengthen Analytical Basis for Supporting .08 BAC Laws

NHTSA recently released the results of these three high quality studies of .08 BAC law effects, which provided additional evidence to support the effectiveness of these laws. When combined with the previously conducted studies, the three new studies provide additional confidence in the expectation that .08 BAC laws, when added to existing laws or programs, reduce alcohol-related traffic fatalities. A substantial body of directionally consistent evidence is now available to support the Department's position that .08 BAC laws are effective in reducing alcohol-related fatalities. The 50-state study, for example, controlled for more extraneous variables than any previous study and showed a significant reduction in the involvement of both low BAC and high BAC drivers in fatal crashes. The 11-state study found that .08 BAC laws were associated with reductions in alcohol-related fatalities in 7 of the 11 states studied, either alone or in conjunction with ALR laws. In the North Carolina study, which found no clear effect of its .08 BAC law, the majority of outcomes were directionally consistent with such an effect, over and above the sharp decline in alcohol-related fatalities that began before the law was enacted.

The methodologies used in these studies provide tools to make responsible estimates of how many lives would be saved if all states enacted .08 BAC laws. It is common and appropriate for such estimates to be made, based on average, pooled, or aggregated study results. Researchers that make such estimates are fully aware that there will be a range of results experienced by individual states. However, if such estimates are based on sound research and appropriate algorithms, it is reasonable to predict average effects which can be expected in states yet to adopt a particular program.

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In Depth Rebuttal of Points Made in GAO Report

"Results of Recent .08 Studies are Mixed."

By far the majority of the outcomes contained in the eight studies that have been conducted to date support the contention that .08 BAC laws are associated with reductions in alcohol-related fatalities. For example, in the recent NHTSA-sponsored 11-state study, a total of 39 outcomes were reported in the results section (33 relating to .08 BAC laws alone). Of these, 32 (26 relating to .08 BAC laws alone) were directionally in support of reduction in alcohol-related fatalities associated with .08 BAC laws, alone or in conjunction with Administrative License Revocation (ALR) laws. Eleven of these outcomes (involving 7 of the 11 states) were statistically significant. Of the remaining four states, one (UT) had non-significant outcomes which supported a decrease in alcohol related fatalities; one (ME) had mixed results; and two (OR and NH) had non-significant outcomes in the opposite direction.

In summary, significant reductions associated with .08 BAC laws were found in 5 of 11 states and significant reductions associated with the combination of .08 BAC and ALR laws were found in an additional two states.

It should be added that, in the previously published multi-state study conducted by Boston University (Hingson et. al., 1996), 8 of 10 outcomes were directionally in support of reductions in alcohol related fatal motor vehicle crashes. Six of these outcomes (covering 4 of the 5 states studied) were statistically significant. Two outcomes were neither directionally in support of an impact nor statistically significant.

"Some studies find different results for the same state"

One other aspect of variation in .08 study outcomes involves the fact that different studies have sometimes found different results in the same individual states. The most resent example of this involves the two recent studies which included North Carolina. This statement is somewhat misleading, however, since the majority of the outcomes reported in the NHTSA 11-state study and in the NHTSA North Carolina study are directionally consistent. Outcomes differ primarily in magnitude and statistical significance. Both studies reported evidence of an additional effect of the .08 BAC laws, above and beyond the sharp decline in alcohol-related fatalities that had begun prior to the implementation of the .08 BAC law.

Different studies have reported different results for other states as well, most notably for OR, UT, NH, and ME. However, these kinds of inconsistencies in outcomes have been found in other areas of traffic safety research where the body of research is considered to be consistent and convincing.
Among the studies of the age-21 minimum drinking age (MDA), for example, different results were reported by different studies for several states (most notably GA, IA, ME, and MT). As the 1987 GAO report that reviewed these studies points out, these

include the combined effect of .08 and ALR laws in CA and VA). Thirty two of 39 outcomes directionally support evidence of an impact of .08 laws alone.

The 50-state study controlled for multiple extraneous factors known to be related to fatal crashes (more than any other .08 study conducted to date) and, *in addition*, introduced a time-trend factor to account for variation which *might have been* attributable to unknown or unmeasurable factors. It still found an impact for both low and high BAC drivers.

The North Carolina study conducted approximately 17 analyses where the authors provided information regarding the directionality of the results. In 11 of these 17 analyses, the results suggested the presence of a reduction in alcohol related crashes or fatalities associated with the .08 BAC law, over and above the pre-existing trend.

We consider these results to be directionally unambiguous and consistent with the findings of previous studies.

"The North Carolina researchers found no clear evidence of effect of the .08 BAC law."

Again, most of the outcomes of the North Carolina study were directionally consistent with an impact over and above the sharp decline in alcohol-related fatalities already being experienced in the state. It was this pre-existing sharp decline that prevented the observed effect of the law from being even greater than it was. The North Carolina researchers recognized this possibility when the stated that ...

"... given the dramatic decline in alcohol-related crashes that was occurring in North Carolina during the early 1990s, it may be that any possible effects of reducing the BAC limit were simply obscured by a broad change in drinking-driving behavior that was already occurring."

"The NHTSA 50-state study was well controlled but its results must be interpreted differently from other studies because it used a different outcome measure."

The 50-state study represents one of the most sophisticated, well conceived, comprehensive and controlled studies conducted to date. It directly controlled for many factors which could have affected alcohol-related crashes over the 16 years of the study. It covered the experiences of fifteen .08 BAC law states; it was based on a clear theoretical model of potential variables which affect drinking and driving; data were gathered and entered into the analysis to control for vehicle miles traveled, urban/rural distribution, seasonality, unemployment rates, alcohol consumption; and safety belt usage laws.

In addition, a sophisticated outcome measure was used (just as in the 11-state study) which helped control for any extraneous factors which might affect both alcohol-related

A Comparison of Studies of the Effectiveness of Minimum Drinking Age Laws and .08 BAC Laws

Background to the MDA 21 Literature

A review of the literature on the effectiveness of Minimum Drinking Age (MDA) laws is informative with regard to the current discussion surrounding the studies of the effectiveness of .08 BAC laws. The research literature regarding MDA law effectiveness is considered by many researchers to be among the most consistent and robust of any area. This perception is conveyed in a March 1987 report by the General Accounting Office (GAO) which reviewed these studies.

On page 27, the GAO reviewers stated: *"We identified far more studies that met our minimum threshold criteria for the traffic-accident outcome than for other reported research areas. In addition, almost as many studies met our minimum criteria as did not."*

In its conclusion, the GAO report stated: *"In total, the evidence is persuasive that raising the minimum drinking age has had significant effects on reducing alcohol-related traffic accidents for the age group affected by the law. We conclude that states can generally expect reductions in their traffic accidents, but the magnitude will depend on the outcome measure evaluated and the characteristics of the state. This finding is supported through multiple observations of similar direction and, often, similar magnitude, obtained by alternative approaches to analyzing various measures of traffic accidents. Further support for our conclusion comes from the knowledge that such consistent findings rarely occur in reviews of this sort. "*

What the Current .08 Studies Have Found

Before looking at the MDA law literature, it would be useful to review the results of studies of .08 laws conducted to date. There have been eight studies of the effectiveness of .08 BAC laws in the U.S:

NHTSA (1991); covered California, single outcome measure
- *found 12 percent effect of .08 and ALR together*

Johnson and Fell (1995); covered five states, 6 outcome measures
- 26 of 30 outcomes suggested reductions; 10 were statistically significant
- consistent reductions found in four states (CA, OR, UT, VT)
- mixed results found in one state (ME)
- estimated effect varied between *4 and 40 percent reductions* (no pooling)

Rogers (1995) California DMV study; used a variety of outcome measures
- mixed results, most non-significant
- *7.2% reduction in nighttime fatal* and severe injury crashes
- *10% reduction in fatal and total injury crashes between 2-3 a.m.*

Hingson et al (1996); covered five (early .08) states; single outcome measure

from 5 percent (Hoskin et al, 1986) to 28 percent reductions (Williams et al 1983).

Studies that pooled results from several states always reported overall decreases in (measures of) alcohol-related crashes, but **within these pools, the results for individual states varied considerably**, with the majority of them not reaching statistical significance.

The Characteristics of the MDA 21 Literature Relative to the .08 BAC Literature

With this summary information in mind, it is instructive to compare the characteristics of the highly regarded body of MDA 21 law studies with those of the .08 BAC law studies.

Clearly, the MDA 21 studies have involved a competent group of researchers, sound research methods, and results that have been directionally consistent.

On the other hand, these studies have also reported a *wide range of effect sizes*, used a variety of outcome measures, and *have sometimes reported inconsistent results* -- even among some studies conducted in exactly the same manner. With some states, there were actually findings of increased crash involvement for the age group(s) affected.

The level of consistency (or inconsistency) of outcomes in the .08 BAC law literature is similar to that of the MDA 21 area. Reported inconsistencies have nearly always involved significant versus non-significant findings, not directionally different findings. *In both areas, the level of consistency in the directionality of outcomes is very similar*

With regard to quality of studies, the overall quality and sophistication of studies of .08 BAC laws is just as high, if not higher, than the studies reported in the 1987 GAO report.

Several specific issues of concern have been raised with regard to .08 BAC law studies. They include: *inconsistent or equivocal results*, *use single comparison states*, and *suggested inappropriateness of pooling or aggregating results* across states.

Variation in Reported Outcomes

It has been suggested (by GAO reviewers and others) that there is a degree of inconsistency (and equivocality of results) among the studies of .08 BAC laws.

All research findings are equivocal!

Within both the MDA-21 and the .08 BAC literature, *between-state differences in effect have been common* and *different studies have often reported different results for a particular state.* Usually these differences involve outcomes that are directionally consistent but which vary in magnitude and/or statistical significance. With regard to the .08 BAC law literature, there is no greater inconsistency with regard to either magnitude or directionality of outcomes than in the

However, pooling is a common practice, particularly when dealing with small states. Nearly all of the MDA 21 multi-state studies included some form of pooling, averaging, or aggregating across states (e.g., Arnold (1985); DuMouchell (1985); Hoskin (1985); and Williams et al. (1983)).

Another form of (GAO) criticism that relates to pooling is the suggestion that it is inappropriate to include states in the pool if they have had results that were either not statistically significant or directionally inconsistent.

This is not uncommon and it is not inappropriate. In fact, the 1987 GAO report acknowledges the fact that between-state outcomes varied considerably within the "pools" of states included in the studies they cited as meeting their criteria and showing impact. The report stated that: *"most individual states making up the pool of states evaluated in each study observed statistically significant reductions in this category; however, there were some exceptions. For example, in the Arnold (1985) study, Georgia, Iowa, and Maine exhibited a net percentage increase in "driver fatal" crashes for the age groups affected by the law during the study period."*

Use and Selection of Single Comparison States

Perhaps the most frequently voiced criticism of the Hingson et al. (1996) study of .08 BAC law effectiveness has been that these researchers (arbitrarily) selected single states to serve as a control or comparison for each .08 BAC law state.

Hingson and his associates selected their comparison states on the basis of geographical proximity and similar (high) levels of BAC testing as the .08 law states. Critics (including GAO) have focused on the fact that selection of different states would have produced different results.

Most researchers agree that multi-state comparison groups (such as those used by Foss et. al., and by Apsler et. al.) are more robust than single state comparison groups. As a result, it is preferable to use a combination of states (or even all remaining) states for comparison purposes.

However, it should also be pointed out that the use of single comparison states is common in public health research. *Nearly all of the MDA law studies included single states for comparison with individual law states.* In fact, one of the better multi-state MDA studies included in the GAO review (Williams et al., 1983) used an approach similar to that used by Hingson et al. (1986).

Summary

In summary, many of the current criticisms of the .08 BAC effectiveness literature are inconsistent with the views held regarding similar research conducted with regard to MDA laws. As with the MDA laws, the studies of .08 BAC law impact have been conducted by reputable researchers who have employed sound analytical methods.

RECENT STUDIES OF THE EFFECTS OF .08 BAC LEGISI ATION

NHTSA recently completed three studies of the effects of lowering the illegal blood alcohol concentration (BAC) limit from .10% to .08%. Two of these studies indicate that .08 BAC laws have reduced alcohol-related crash involvement, particularly in conjunction with the presence of other impaired driving laws and programs such as administrative license revocation (ALR). The third study looked at the effect of a .08 BAC law in a single state (NC) and found no statistically significant change in a pre-existing downward trend in factors related to alcohol-related crashes.

The most comprehensive study (covering all 50 states) analyzed the effects of both .08 and .10 illegal per se laws, as well as administrative license revocation (ALR) laws over a 16-year time period. After extensive efforts to control for extraneous factors, this study found that all three laws were associated with reductions in drinking drivers involved in fatal crashes. It estimated that .08 BAC laws had an 8% effect in reducing fatal crashes involving drivers at both high BACs and lower BACs and resulted in 275 fewer fatalities in the 15 states where they were in effect in 1997. If all 50 states had such laws in effect, an additional 590 fatalities would have been prevented.

An 11-state study also examined the effects of .08 BAC (and ALR) laws. It found that 0.08 BAC legislation was associated with reductions in alcohol-related fatalities, alone or in conjunction with ALR laws, in seven of the eleven states studied. In five of these states (VT, KS, NC, FL, NM), implementation of the 0.08 BAC law itself was associated with significantly lower rates of alcohol related fatalities. These results take into account any pre-existing downward trends the states were already experiencing, due to other factors such as the presence of other laws, use of sobriety checkpoints, etc. In two states (CA and VA), significant reductions were associated with the combination of .08 BAC and ALR laws, implemented within 6 months of each other.

The third study analyzed the effects of a .08 BAC law implemented in 1993 in North Carolina, a state which had already been experiencing a sharp decline in alcohol-related fatalities since 1987. This study concluded that there was little clear effect of the lower BAC limit. Results from various analyses suggested that some portion of the reductions may have been associated with the law but the magnitude of these effects was not sufficient to make this conclusion.

In aggregate, these three studies provide additional support for the premise that .08 BAC laws help to reduce alcohol-related fatalities, particularly when they are implemented in conjunction with other impaired driving laws and programs. Nearly all of the findings of these and previous studies show changes that suggest that .08 BAC legislation (as well as .10 BAC laws and ALR laws) have contributed to the trend toward reduced alcohol-related crashes and fatalities that have been experienced across the nation.

- While alcohol-related traffic fatalities have been decreasing (and the 39 percent in 1997 represented an all-time low in the U.S.), we have a long way to go to meet the national goal of no more than 11,000 alcohol-related fatalities by the year 2005.

- We know what works. In order to reduce impaired driving in this Nation, we need tough laws set by the states, highly visible enforcement of these laws, and a change in the public's attitude regarding this problem.

- One step in that direction will be to adopt .08 BAC as the illegal limit for adult drivers in all 50 states. Currently, only 16 states and the District of Columbia have such laws.

- Research shows that virtually all drivers, even experienced drinkers, are substantially impaired at .08 BAC with regard to critical driving tasks (such as braking steering, lane changing, judgement, and divided attention)

- The risk of being involved in a crash increases gradually at each blood alcohol level, but rises very rapidly after a driver reaches or exceeds .08 BAC.

- . 08 BAC is a reasonable limit to set. A 170-lb. male would have to consume 5 or more 12-ounce beers in a 2-hour period on an empty stomach to reach .08 BAC. An average (137 lb.) female would need to consume 4 beers in 2 hours to reach .08.

- Surveys show that most people would not drive after consuming 2 or 3 drinks and that 2 out of 3 Americans favor lowering the limit to .08, when they are made aware of how much alcohol that means.

- Most other industrialized nations have set BAC limits at .08 or lower. For example, Canada and Great Britain have had .08 for many years; Australia, France and Germany are at .05; and Sweden has an illegal limit set at .02 BAC.

- Past research has shown that .08 laws have been effective in reducing impaired driving in several states that have adopted them. However, some have suggested that because these studies have found different results in various states that they provide only "equivocal" evidence of the effectiveness of these laws.

- In fact, the quality and consistency of the results of the past studies is quite similar to that of studies conducted from 1980 -1990 to evaluate the effectiveness of minimum drinking age laws. Any inconsistency found in the studies (in both areas) has generally been in magnitude, not direction of effect, and it has involved primarily smaller states where fatal crashes vary significantly from year-to-year.

- However, because concerns have been raised, the Department of Transportation commissioned these three new studies to further investigate the effectiveness of .08 BAC laws.

effective when coupled with other efforts, including ALR laws, sobriety checkpoints, enforcement blitzes, and public information campaigns.

- Even with these studies, there will undoubtedly be those who will still claim the evidence for the impact of .08 laws is still "equivocal." All research is (equivocal). However, with the addition of these studies, the quantity and quality of studies is reinforced. In fact, it can be argued that both the quality of the studies and the consistency of their results parallels that of the minimum drinking age (MDA 21) studies, which have been widely viewed (including GAO reviewers) as constituting one of the most unequivocal areas of highway safety evaluation]

Questions and Answers Regarding the .08 Issue and the Recent Studies Supporting Its Impact

Questions Directly Related to the .08 Studies

Q. **How do you resolve the fact that in one study of the effects of .08 BAC legislation in North Carolina, the researchers found "no clear effect," while in the other study a significant effect of the law was found?**

There is more consistency than inconsistency in the findings of these two recent studies of the North Carolina .08 law implemented in 1993. Both studies found that the .08 BAC law was *implemented in the midst of a sharp decline* in alcohol-related crashes that had begun in 1987. Thus, both studies attempted to find evidence of an *additional* effect, above and beyond the downward trend that was already occurring.

In fact, both studies did find evidence of an *additional* effect associated with the .08 BAC law. In the 11-state study (Apsler, Char, Harding, and Klein), the outcome (for North Carolina) was a statistically significant reduction in alcohol related fatalities. In the case of the North Carolina study (Foss, Stewart, and Reinfurt), several analyses were conducted, the majority of which found evidence of an *additional* reduction in alcohol related crashes associated with the .08 BAC law (in comparison with all states without .08 laws and in comparison with 11 other states with high BAC testing). In this study, however, the magnitude of these results was not great enough for the researchers to conclude that there was a clear effect. Some of the differences in the size of the effect observed appear to be related to differences in pre/post time periods. In any case, the majority of the outcomes of both studies suggested an *additional* effect associated with the law.

In summary,

Both studies found **long term declines in alcohol-related fatal crashes** in North Carolina, due to a variety of activities and programs implemented within the State.

on this very difficult problem. Thus, many countermeasures are in operation at any one time and it is very difficult try to separate out the impact of specific actions.

In addition, there are many extraneous factors that can affect drunk driving (e.g. alcohol consumption levels and patterns, unemployment, etc.). These factors (at least those which are known to affect alcohol-related crashes) must also be accounted for in any credible study.

Efforts to control for the impact of extraneous variables and to estimate the impact of individual measures are never perfect.

However, primarily because of differences in the timing of various efforts, it is often possible to determine (using time series analysis) with some confidence if a particular countermeasure (such as .08 BAC legislation) is having an impact.

It is also possible to use different measures and comparisons with other states to show differences.

The replication of such impact by an accumulation of studies, conducted over different time periods and using different measures and techniques adds to the confidence of these findings.

Q. **How did you account for public attitude changes to drunk driving mainly due to the work of grass roots groups such as MADD and SADD?**

All of the studies took into account the potential impact of such factors by including a "year trend" factor in their analyses Even taking this trend into account, the two national level studies still found that .08 laws had a significant effect on reducing alcohol related fatal crashes.

Q. **Intuitively a .08 law with lots of publicity and enforcement should work better than a law with little of either. Does that account for some of the variability in your results? Can you be assured that the presence or absence of publicity and/or enforcement in conjunction with these laws has been taken into account?**

Unfortunately, there is not good data available regarding the level of enforcement or publicity that accompanied the implementation of .08 BAC laws in all of the states that enacted them. It is certainly possible that differences in the levels of these complementary activities resulted in differences in measured impact in various states with .08 BAC legislation.

Q. **Everybody knows that the baby boomers are getting older and more health conscious and that alcohol consumption is going down in the U.S. The young population was also decreasing over the years of your study. Those factors cause a long-term decline in drinking and driving along with many other social problems. How did your analyses account for that?**

All of the studies used "time factors" in their analyses to attempt to control for such factors that are highly correlated with time. Again, even after accounting for these time trends, the two

This legislation sends a message to all potential drinking drivers that the standard is being lowered and that their risk of arrest, conviction and sanction is becoming greater.

Q. Doesn't a .08 BAC law mean that a 120-lb woman who has two glasses of wine in two hours will be subject to arrest, fines and jail?

This scenario is extremely unlikely. Obviously, if the woman drinks large glasses of high alcohol-content wine on an empty stomach, her BAC could rise to that level. However, numerous demonstrations have been conducted around the country which have included small-statured women. In those demonstrations, even on an empty stomach, two glasses of wine have not resulted in BACs of .08 -- even though the women often showed obvious signs of impairment.

That is the important point -- all persons, small-statured women or large, heavy men, show significant impairment before reaching a BAC of .08. That is why research shows that the risk of being involved in a fatal or serious injury crash increases significantly by the time one is at a .08 BAC.

Q. If lowering the illegal BAC limit from .10 to .08 saves lives, why not lower it to .06 or .05 and save even more lives?

The research on impairment, risk of crash involvement, and effectiveness of legislation, along with the level of public acceptance of current and proposed BAC legislation all points to .08 as the most appropriate illegal level. If future research suggests that lower levels should be adopted and the public agrees, perhaps lower limits will be considered. Right now, .08 is the level recommended for adults. Keep in mind, all states now have adopted per se levels of .04 BAC for commercial drivers (large trucks, buses, etc) and .02 BAC (or zero tolerance) for drivers under the age of 21.

Q. Some countries with .08 BAC limits (e.g. Mexico, Canada, Austria) have higher alcohol involvement rates in fatal crashes than in the U.S. How do you explain that?

Some countries do have higher alcohol involved fatal crash rates than the U.S., even though they have .08 BAC limits. Such laws are only one among many factors influencing alcohol-related fatality rates. There are many other factors that affect these statistics, such as enforcement levels, sanctions, public attitudes toward drinking and driving, alcohol consumption levels and patterns, availability of alternative transportation, etc.

In the U.S., 39% of the traffic fatality are alcohol-related. In many countries with lower BAC limits, like Sweden, the percent alcohol-related is far lower, usually below 30%.

Q. Even in countries like Sweden, the average BAC of a person involved in an alcohol-related fatal crash is .15. How do you explain that?

The Relationship of Alcohol Safety Laws to Drinking Drivers in Fatal Crashes

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16. Abstract

This paper presents an analysis of the relationships between the passage of key alcohol safety laws and the number of drinking drivers in fatal crashes. The study evaluated three major alcohol safety laws (administrative license revocation laws, .10 illegal *per se* , and .08 illegal *per se* laws) on the proportion of drinking drivers in fatal crashes. Drivers age 21 and older in fatal crashes at two BAC levels--.01 to .09 and .10 or greater--were considered separately. Drivers under age 21 were not included because they are affected by the Minimum Legal Drinking Age law. This study used data on drinking drivers in fatal crashes from the Fatality Analysis Reporting System (FARS) covering 16 years from 1982 though 1997 for all 50 states and the District of Columbia. Also, included in the 'udy were such variables as per-capita alcohol consumption and annual vehicle miles traveled, which could impact the number of alcohol-related crashes. The results indicate that each of the three laws had a significant relationship to the downward trend in alcohol-related fatal crashes in the United States over that period. The paper points out that this long-term trend is not the product of a single law, but the result of the growing impact of several laws over time plus the affect of some factors not included in the model tested, such as the increasing use of sobriety checkpoints and the

Alcohol Safety Laws	Adult drivers in fatal crashes	
	BAC .01–.09	BAC .10+
Illegal *per se* laws (.10)	–13.17%	–8.69%
Per se .08 law	–7.89%*	–8.00%
Admin. license revocation law	–18.96%	–12.81%

* Significant at p=.05; all other significant at p<.001

Because the passage of alcohol safety laws by the states took place over time and is highly correlated with time, it was felt that the introduction of the "time trend" factor absorbed some additional impact properly attributable to the three laws in question and, thus, th' analysis produced conservative estimates of the potential impact of these three laws.

Finally, the attribution of savings to any single law should be made with caution since each new law builds to some extent on existing legislation and on other ongoing trends and act' vities. The synergistic interaction among laws is perhaps most evident in the relationship between illegal per se laws (.10 BAC and .08 BAC) and ALR laws.

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91	.5784	.0882	.9020	.7450	.1569	.4509
92	.5974	.0980	.9412	.7932	.1569	.4750
93	.6373	.1127	.9412	.8300	.1765	.5032
94	.6766	.2158	.9510	.8989	.1765	.5377
95	.7451	.2500	.9608	.9413	.1829	.5621
96	.7626	.2745	.9804	.9608	.2059	.5833
97	.7843	.2843	.9804	.9640	.2283	.5961

* For laws becoming effective part way through the year, state weight was adjusted proportionately to represent time during the year in which the law was in effect.

Fatal crashes result from a multiplicity of factors. Some of the factors that have been shown to affect the number of crashes include amount of travel, the status of the economy, and the quality of vehicles and roadways. Driver alcohol impairment is only one such factor. To properly study the effects of alcohol legislation, it was necessary to control for as many extraneous factors contributing to changes in alcohol-related and non-alcohol-related fatal crash frequency as possible. The most frequently used procedure for studying the legislative impact on crashes is to compare states with and without the stricter BAC laws (for example, see Hingson, Heeren, & Winter, 1994, 1996; and Johnson & Fell, 1995). This approach depends upon selecting *comparison* states similar in significant characteristics to *experimental* states that have enacted the laws in question. An alternative procedure is a panel study that uses all states over a long time. A state-by-year (or state-by-quarter) matrix can be created as a framework for regression analyses where drinking drivers in fatal crashes constitute the dependent variable and where alcohol safety laws and other factors thought to influence fatal crashes constitute the independent (or "predictor") variables.

To conduct such a study, it is necessary to:

1. identify the dependent variable most relevant to the purposes of the study;
2. identify the laws to be evaluated;
3. identify those additional independent variables that can significantly influence the dependent measure, and
4. provide a trend factor to capture those variables omitted from the analysis.

Figure 1 provides a model of the variables thought to be related to crash causation and included in the current analysis. It illustrates the plan for this study. The relationships shown by the arrows are those studied in the current research. Other potential relationships between those measures were controlled, at least partially, through the regression analyses.

Figure 1. Model for analysis of the impact of laws on the proportion of drivers in fatal crashes with BAC >0

involved in fatal crashes are available for all 50 states and the District of Columbia, dating back to 1982 (NHTSA, 1998), and each of the three dependent measures (i.e., number of crashes, drivers, and fatalities) can be related to level of alcohol involvement. Of the 912,954 driver records used in this analysis, 399,348 were fatally injured and 69.2% of those had known BACs. The remaining 513,606 were surviving drivers of which 23.1% had known BACs. The Klein procedure provided a probability estimate for the drivers with unknown BACs in three categories: .00, .01 to .09, $.10.

The laws that were studied were aimed at deterring potential drinking drivers. Therefore, it seemed appropriate to "standardize" the dependent measure by using the ratio created by dividing the number of drivers in fatal crashes with a positive BAC by the number of drivers in crashes who had a zero BAC. Using this ratio assists in controlling for those factors that impact all fatal crashes, not just those related to impaired driving. The total amount of driving, as measured by the vehicle miles traveled in a state, for example, is likely to affect both alcohol and non-alcohol-related crashes, presumably to a similar extent. Using this ratio helps to eliminate the effect of this factor, to the extent that miles of driving has a similar effect on alcohol and non-alcohol-related crashes.

3. Alcohol consumption

Alcohol consumption potentially has a complex relationship with drinking-and-driving laws. Beer has been shown to be the beverage of choice for individuals convicted of driving while intoxicated (DWI) (Berger & Snortum, 1985). For this study, separate state per-capita consumption levels were available for wine, beer, and spirits (Williams, Stinson, Sanchez, & Dufour, 1997). However, only beer and total alcohol consumption correlated significantly with the number of drinking drivers in fatal crashes. Thus, beer consumption was used as the principal relevant measure of alcohol consumption.

The relationship between alcohol consumption, safety legislation, and fatal crashes is complex. It is hypothesized that increased alcohol consumption increases the probability of drivers being involved in an alcohol-related fatal crash. But, it is not clear if decreased consumption has resulted in more alcohol-related safety legislation (and a reduction in alcohol-related fatal crashes) or if such legislation has resulted in a decrease in per-capita consumption.

To determine the direction of this effect, two preliminary analyses were conducted. First, the 1982 annual beer-consumption levels for those states that later adopted .08 laws were compared with consumption levels in those states that, as of 1997, had not enacted such legislation. The average per-capita beer consumption for the .08 BAC law states was 1.42 (±.04 se); the average for the states without .08 BAC laws was 1.40 (±.07 se). This indicates that there was no significant difference (p=.826) in beer consumption between the two groups of states in 1982, prior to the enactment of any .08 BAC laws. Further, an examination of the consumption levels in .08 states, by date of adoption, indicated that the early adopters did not have different levels of per-capita beer consumption than late adopters (p=.311). A second study compared per-capita beer consumption before-versus-after the enactment of .10 BAC, .08 BAC, and ALR laws in states that adopted such legislation. *For all three laws*, there was a reduction in beer consumption following the enactment of the law. The reduction associated with .10 *per se* was 3.22%; the reduction associated with .08 *per se* was 3.49%; and the reduction associated with ALR was 2.16%. All of these differences were significant (p<.001). Thus, the evidence examined in this study favors the hypothesis that the relationship between the safety laws and beer consumption is that the laws affect consumption, rather than the other way around.

4. Drinking-and-driving laws

enacted within 6 months of each other. Rogers (1997) in a study of the .08 BAC law in California found a relatively modest 7% effect on nighttime crashes occurring between 12 AM and 2 AM. Johnson and Fell (1995) reported that four out of five states (California, Maine, Oregon, Utah, and Vermont) implementing .08 BAC laws showed significant reductions in one or more measures of alcohol-related fatal crashes. A study by Hingson and colleagues (1996), which was limited to five states with such legislation and a somewhat controversial selection of five comparison states, found that .08 BAC laws were associated with a significant reduction in the proportion of drivers in fatal crashes who had BACs greater than .08. That study also showed a significant reduction in the proportion of high BAC drivers involved in fatal crashes (i.e., at or above .15 BAC). However, these results were affected by the fact that these states had also recently enacted ALR legislation.

5. Safety belt laws

Occupant restraint programs include three types of laws: child safety seat laws, secondary *safety belt laws*, and primary *safety belt laws*. Secondary laws require the observation of some other traffic offense before a driver can be stopped and cited for nonuse of a safety belt. Primary laws allow an officer to stop and cite the driver based solely on a safety belt violation. Since this study focuses on alcohol use by drivers, child safety seat laws were not included. NHTSA estimates that safety belts have saved 100,000 lives since 1975 (NHTSA, 1997).

Use of safety belts has a complex relationship with alcohol-related crashes. Clearly, usage protects both drinking and nondrinking drivers. However, the usage rates among these two driver groups varies significantly and, depending upon the level of usage, a law requiring usage will affect drinking and nondrinking drivers differently. In the absence of safety belt use laws, safety belt usage is lower among drinking drivers than among nondrinking drivers, but the usage rates of both groups is low. In such a situation, the effect of enacting a safety belt use law generally produces proportionally greater usage among nondrinking drivers than among drinking drivers. At higher usage rates, however, where the use rates of nondrinking drivers are already much higher than those of drinking drivers, an upgrade in the law (which usually makes it more enforceable) is likely to affect drinking drivers to a greater degree than nondrinking drivers since their usage rate is so much lower (Voas & Tippetts, 1998)

Thus, initial safety belt laws (enacted when safety belt use rates are quite low) are likely to increase the ratio of alcohol-positive to alcohol-negative drivers involved in fatal crashes. When upgrades in safety belt laws occur (usually when usage rates are much higher), a larger proportion of alcohol-positive drivers than alcohol-negative drivers will begin to use safety belts (making them less likely to be involved in a fatal crash). Thus, at this level, it is hypothesized that such laws will reduce the alcohol-positive to alcohol-negative ratio of drivers involved in fatal crashes.

Because some states moved directly to primary laws while others first passed secondary laws, attempts in the present research to use two separate variables to represent these laws were complicated by the varying sequence in the enactment of these measures. Ultimately, it was decided to represent secondary and primary safety belt laws with a single three-level variable, with values of zero, 0.5, and one. Primary safety belt laws are weighted twice as effective (value = 1) as secondary laws (value = 0.5). This estimate is based on the fact that initial increases in safety belt usage rates were significantly greater in primary law states than in secondary law states. Furthermore, in recent years when several states have upgraded from secondary to primary laws, significant increases in usage have been observed. Prior to any safety belt use laws, the national usage rate stood at approximately 14%. By 1994, the average usage rate in no law, secondary law, and primary law states was 45%, 62%, and 75%, respectively (NHTSA, 1995).

caused by the sampling size of the state's pool of crashes and, therefore, taps into the size-of-state dimension well (Spearman's rho=.858). In addition, the weighting derived from within-state variability has the desirable qualities of a narrower range and a less extreme distribution. Larger states have lower re-sampling variability because they have more crash-involved drivers and random fluctuations tend to wash out, thereby providing more reliable ratios. Weighting cases by this measure naturally places more importance on the experience of larger states or at least on those states having a larger traffic problem in terms of numbers of fatal crashes. These case weights had a mean of 1.0 across all 51 states (including the District of Columbia) within each period, ranging from a low of approximately 0.25 (North Dakota, Alaska, and Rhode Island) to a high of slightly more than 2.5 (California).

Independent Variables and Covariates

The three alcohol-related laws being evaluated were modeled as dichotomous dummy variables: When a law became effective partway through a quarterly period, the variable represented that portion of the quarter the law was in effect. When a state lowered its *per se* limit from .10 to .08, the dummy variable for the *per se* .10 law was continued so as to ensure that the dummy variable for the .08 law represented only the marginal effect of the lowered limit. Safety restraint laws were modeled as a single three-step variable, with no law represented by a value of zero, a secondary law represented by a value of 0.5, and a primary law represented by 1.0.

Maryland and Massachusetts enacted ALR laws embodying a BAC limit without establishing a *per se* law. Since the ALR limit may have a greater impact in terms of certainty of sanctioning, these two states were modeled as having the corresponding *per se* law BAC limit when they enacted their ALR law. In all other states, the *per se* laws were passed first and then strengthened by the later passage of the ALR.

To avoid over-fitting a model with a dummy parameter for each state and to explain variation over time within states, other variables relating to state environment and conditions were used as covariates. The most important of these in terms of correlating with the prevalence of alcohol in drivers involved in fatal crashes was per-capita beer consumption. Consumption data were not yet available for 1996 and 1997, the two years when many of these laws were enacted. So, rather than eliminate one of the strongest predictors of alcohol-involved crashes, a per-state average beer consumption level, a between state measure that was constant over time within each state, was developed.

As reported earlier in this paper, per-capita alcohol consumption differences between states were unrelated to passage of DWI laws. However, these differences might still be related to the number of drinking drivers in crashes. Where small, but significant, effects of the safety laws on increasing subsequent consumption within states were found, state consumption levels were adjusted for the laws' effects on drinking for those states passing the laws. After averaging the adjusted beer consumption level for each state, this variable served as a between-state covariate only, remaining constant over time within each state.

Among other measures that vary between-states within the same period and within-states over time, three were found to be important predictors: per-capita vehicle miles traveled (VMTPC) changed yearly, urban/rural distribution of the state's population changed yearly, and unemployment rates changed quarterly. The two components of VMTPC—total state VMT and number of licensed

	B	Std. Error	Beta	t	Sig.	Correlations	
						Zero-order	Partial
(Constant)	-4.78598	.146		-32.737	.000		
BEER@ADJ	.58444	.053	.191	11.062	.000	.195	.190
UE@	.01025	.005	.036	2.062	.039	.138	.036
ALR@	-.21021	.027	-.169	-7.764	.000	-.227	-.135
PS@10	-.14125	.028	-.087	-5.031	.000	-.126	-.088
PS@08	-.08224	.041	-.041	-2.019	.044	-.154	-.035
YR2TREND	-.0000851765	.000	-.166	-8.095	.000	-.256	-.141
QTR2	.17652	.023	.124	7.597	.000	.082	.132
QTR3	.21376	.023	.150	9.200	.000	.099	.159
VMT@	.10899	.013	.156	8.153	.000	.183	.142
SB#	.11198	.022	.085	5.016	.000	.132	.088
URBAN	49323	.082	.112	6.016	.000	.213	.105
ALR#	.15287	.031	.105	4.954	.000	.033	.087
PS#08	-.06872	.027	-.050	-2.485	.014	-.026	-.043

Multiple R's—Without trend component: .443; with trend component: .484

Table 3. Variables significantly related to the proportion of drinking drivers in fatal crashes with BACs at or above .10

	B	Std. Error	Beta	t	Sig.	Correlations	
						Zero-order	Partial
(Constant)	-2.39975	.072		-33.150	.000		
BEER@ADJ	.63269	.031	.303	20.687	.000	.258	.341
VMTPERLD	.04778	.004	.233	13.054	.000	-.111	.223
UE@	.01546	.003	.080	4.681	.000	.226	.082
ALR@	-.13708	.014	-.162	-9.489	.000	-.258	-.164
PS@10	-.09090	.018	-.081	-4.979	.000	-.219	-.087
PS@08	-.08340	.025	-.062	-3.334	.001	-.243	-.058
YR2TREND	-.0000889403	.000	-.254	-4.266	.000	-.442	-.075
YR_TREND	-.0050083072	.002	-.220	-3.295	.001	-.441	-.058
QTR2	.11763	.015	.121	8.080	.000	.090	.140
QTR3	.11648	.015	.120	8.003	.000	.069	.139
SEATBELT	.09460	.023	.078	4.201	.000	-.242	.073
PS#08	.04869	.015	.054	3.141	.002	-.023	.055

Multiple R's—Without trend component: .502; with trend component: .594

For both analyses, the adjusted beer consumption factor (BEER@ADJ) was correlated with an increased number of drinking drivers in fatal crashes. This factor represents the difference between states in beer consumption, not a change in sales over time within-state, since our preliminary study indicated that beer consumption fell following the passage of alcohol safety legislation. As previously

* Significant at p=.05; all other significant at p<.001

Interpreting effects sizes: The effect sizes shown in Table 4 are somewhat difficult to interpret because they are percentages of ratios. Further, they are not additive because they are expressed as percentages. Rather, they are multiplicative. This means that the total percentage reduction attributable to a combination of two or more laws is slightly less than it would be if the percentages were simply added together. Thus, two or more of the laws studied account for some involvement of the same drivers. To make these effect sizes more meaningful, the impact of a single law on fatalities can be estimated using the following assumptions and procedures.

The first assumption is that since this analysis included only adult drivers (21 years and older), the calculation assumes that zero lives were saved by a reduction in crasnes involving drivers under age 21. Further, the analyses conducted were based on drivers involved in fatal crashes, not on the number of fatalities. The estimated reductions due to the .08 BAC law "effect" were 7.8% fewer drivers at .01-.09 BAC, and 8% fewer drivers at .10+ BAC. After calculating the number of drivers these percentage reductions represent, that figure is converted into the number of fatalities that would have been associated with those drivers. The conversion rates, calculated from the 1997 FARS data, were .9222 fatalities per driver at .10+ BAC, .8332 fatalities at .01-.09 BAC, and .6901 fatalities at .00 BAC.

To arrive at these conversion "rates," the drivers involved in each crash are divided into three BAC categories based upon the driver-level Klein imputations (.00 BAC, .01–.09, .10+). The total fatalities within each crash are then attributed proportionately to each of the three BAC categories of drivers involved in that crash. For example, if there were four fatalities in a crash involving three drivers, and two of the three drivers were in the .10+ category, with the other driver alcohol-negative, then 2/3 of the 4 fatalities (2.667 fatalities) would be attributed to drivers at the .10+ level, and 1/3 of the fatalities (1.333 fatalities) would be attributed to the driver at the .00 level. This proportional attribution of involvement to drivers implies equal responsibility for the crash to each driver, regardless of BAC level, and ignores the possibility of one or more drivers being more at fault than others. As such, this approach probably underestimates the number of fatalities that alcohol-positive drivers are responsible for, given that these drivers are more likely to be at fault. In the (mathematically) trivial case of single vehicle crashes, the proportional involvement and fault are, with very few exceptions, identical. This procedure yielded the estimate that if, rather than 16 states, all 50 states had .08 laws throughout 1997, 590 (95% confidence interval=200 to 958) additional lives would have been saved. The .08 and .10 illegal per se laws are shown in Table 5.

Table 5. Estimated savings in 1997 for the three alcohol safety laws analyzed in this study

	.08 per se	.10 per se	
States with law in 1997	16	49 & DC*	
Estimated to have been saved in states with laws in 1997	274 95% confidence interval 88 to 472	1115 95% confidence interval 663 to 1586	95% cor 10

shown in Table 4 are probably conservative.

This study is not the first to produce evidence for the effectiveness of the three laws included in the analysis. However, this study covers the longest period (16 years) and more states (all 50 plus the District of Columbia) than most previous studies. It also specifically includes potentially confounding variables such as alcohol consumption and safety belt laws not directly considered in most previous studies. The credibility of the results is strengthened by their conformity to theoretical expectations. Beer consumption, for example, is associated with proportionally more positive BAC drivers in fatal crashes as would be expected. Furthermore, the relationships between alcohol safety laws and reductions in drinking-driver involvements, while significant, are generally consistent with the results of other studies.

Perhaps, more significant than the effect of any one law is the evidence that each of these major alcohol-safety laws has contributed to the downward trend over the last two decades of alcohol-related crashes. As should be expected, this long-term national trend is not the product of any single policy act, and it is undoubtedly influenced by factors not in the present analysis such as the increasing use of sobriety checkpoints in some states. Since factors such as alcohol policies, roadway and vehicle characteristics, and economic conditions all interact in their influence on crashes, it is important to interpret estimates of lives saved due to any single law with considerable caution.

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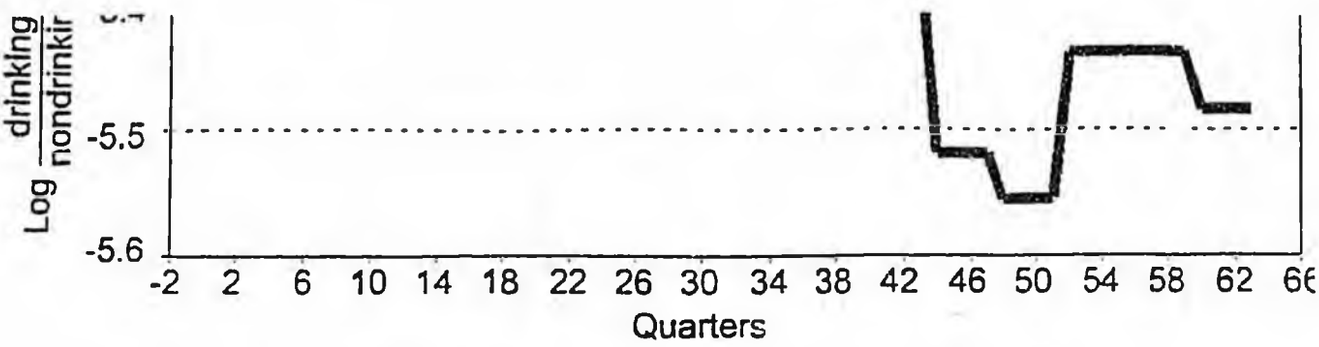
42 Pennsylvania	38.5		59.4	
44 Rhode Island	2.2		3.7	
45 South Carolina	15.3		24.6	
46 South Dakota	2.7		4.4	
47 Tennessee	26.6		43.0	
48 Texas	94.4		155.1	
49 Utah		3.7		6.5
50 Vermont		1.9		3.3
51 Virginia		22.7		39.3
53 Washington	15.3		25.0	
54 West Virginia	8.0		12.7	
55 Wisconsin	17.5		28.4	
56 Wyoming	2.1		3.3	
Total	590.3	274.5	965.0	476.9

Appendix B: Treatment Effects for Analysis Without Time Variable

To illustrate the effect of including the two time trend variables in the analysis, a separate analysis was conducted in which the time trends were not entered. The resulting effect sizes are shown in Table B-1. These should be compared with Table 4 in the text.

Table B-1. Effect sizes for alcohol safety and safety belt laws for two groups of drivers in fatal crashes

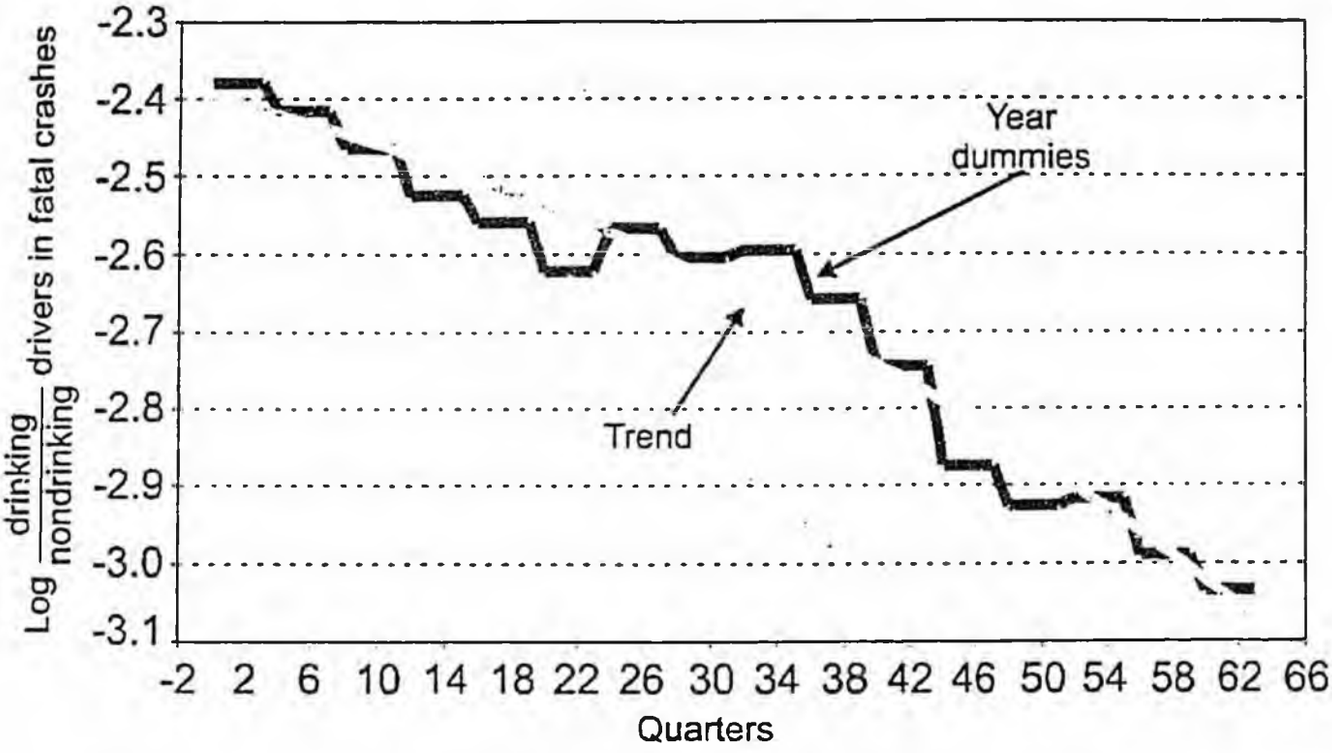
Alcohol safety laws	Drivers in fatal crashes age 21 and older—Estimates
Illegal *per se* laws (.10)	
.01 to .09	*–16.54%*
.10+	*–11.60%*
Per se .08 law	
.01 to .09	*–15.60%*
.10+	*–12.15%*
Admin. license revocation law	
.01 to .09	*–14.60%*
.10+	*–14.88%*



Trend: -.0000851765 x (quarter^2) (where quarter = 0 to 63) (from Jan-Mar 1982 through Oct-Dec 1997)

Year dummies: parameter estimates of the year effects for 50 states and the District of Columbia

Figure C-1. Comparison of trend estimates for impaired drivers with .01 to .09 BACs



Trend: –.0050083072 x (quarter) –.0000889403 x (quarter^2) (where quarter = 0 to 63) (from Jan-Mar 1982 through Oct-Dec 1997)

Year dummies: parameter estimates of the year effects for 50 states and the District of Columbia

Figure C-2. Comparison of trend estimate for intoxicated (.10+) rates

Evaluation of the Effects of North Carolina's 0.08% BAC Law

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March, 1999

Carolina since the early 1980s. To control for the effects of this general trend, as well as seasonal fluctuations, we carried out structural time series analyses examining monthly crash statistics. In each case we looked for evidence of either an immediate decrease in the rate or a change in the general trend of alcohol-related crashes following implementation of the lower BAC limit. There was no significant change in the rate, nor in the trend, coinciding with introduction of the lower BAC limit, for any of the measures examined.

To determine whether the trend in alcohol-related crashes in North Carolina may have benefitted in comparison with a broader general trend in the U.S. (which had leveled out and appeared to be on the verge of increasing again), we compared North Carolina fatal crash data with those from 11 other states that have high rates of alcohol testing for fatally injured drivers. The data series representing the North Carolina proportion of all fatally injured drivers in the 12 states who had BACs in excess of 0.10% was examined for either a step shift or a change in the trend. Again there was no evidence that the pattern in North Carolina changed following enactment of the lower BAC limit, or that it differed in comparison to the other 11 states.

To see whether the BAC levels of persons had been reduced by the 0.08% law, even if not brought below the 0.10% threshold of the previous limit, we examined the mean monthly BACs of fatally injured drivers whose BAC was above 0.10%. Again there was no evidence of an effect of the new BAC limit. The monthly average BACs remained essentially unchanged from 1990 through 1995, with an overall mean of 0.21%.

Finally, we conducted a series of simple before-after comparisons of various indicators of alcohol involvement in fatal crashes. These analyses examined each the six measures that the National Highway Traffic Safety Administration used in its initial examination of the effect of 0.08% laws: (1) driver BAC $\geq$ 0.01%, (2) driver BAC $\geq$ 0.10%, (3) police-reported alcohol involvement, (4) single vehicle nighttime crash, (5) single vehicle nighttime male driver crash, and (6) estimated alcohol involvement. To examine changes in these measures we used the same analytic approach employed by Hingson et al. (1996) in their widely-cited study of the first five states to enact 0.08% limits – comparing changes in North Carolina rates with those in comparison states. To avoid potential pitfalls of trying to select a single appropriate comparison state, we compared North Carolina data with all 37 states that had retained higher per se limits from 1991 through 1996.

Of the six measures considered, two showed a significantly greater decrease in North Carolina than in the comparison states: police-reported alcohol and estimated alcohol, which is based in part on police report as well. For both these measures, the apparent effect of the 0.08% law is an artifact of grouping several months data before the law took effect, rather than an effect of the law itself. During the pre-0.08% period, noteworthy changes occurred in North Carolina that are obscured when the data are grouped. When analyses to ameliorate this artifact were conducted, none of the six measures showed a significantly greater decrease in North Carolina than in the states that retained a higher BAC limit.

Although North Carolina has a reputation for being progressive and aggressive in its efforts to deal with drinking drivers, it does not appear that the state is so different as to render it

THE EFFECTS OF 0.08 BAC LAWS

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months of one another, were modeled as a single intervention.

These findings are consistent with the hypothesis that 0.08 laws work best in conjunction with other laws, especially ALR laws. All of the states which exhibited a significant association between a 0.08 BAC law and a reduction in alcohol involvement already had an administrative license revocation law in effect (Vermont, Kansas, North Carolina, Florida and New Mexico). In two states the reductions occurred when 0.08 BAC and ALR laws were enacted in close temporal proximity to each other (California and Virginia).

Again, it is clear that many factors have been at work since the early 1980's, which have resulted in long-term declines in alcohol-related fatalities in most states. Some of these factors were in operation prior to the implementation of the 0.08 BAC laws. While it is difficult to pinpoint all the factors that have been responsible for these long-term declines, it is likely that the declines resulted from a combination of legislative, enforcement, judicial, sanctioning, and public information activities implemented in the states. These analyses suggest that the 0.08 BAC laws added significantly to this impact in several of the states studied, usually in conjunction with the presence of administrative license revocation laws.

Reduction of the legal BAC limit from 0.10 to 0.08 also appears to be associated with a reduction in beer consumption in 4 of the 5 states for which consumption data were available. The association is strong in two of these five states (California and Vermont). The association in California is weaker and is clouded by increased volatility following implementation of the 0.08 law. The absence of an association in Oregon could be due to an artifact. A substantial reduction in annual beer consumption occurred two years before the 0.08 law was implemented. This sharp reduction may have made it difficult for an additional reduction to occur.

08klein2.sum

MADD NATIONAL OFFICE

PUBLIC POLICY DEPARTMENT

SAMPLE TESTIMONY

ON LEGISLATION TO LOWER THE ILLEGAL BAC LIMIT TO .08

TESTIMONY BY LYNNE GOUGHLER
BEFORE THE _____ JUDICIARY COMMITTEE
OF THE MINNESOTA STATE LEGISLATURE
ON THE MERITS OF A .08 BAC PER SE LAW FOR ADULT DRIVERS

FEBRUARY 5, 1997

Thank you for inviting me to testify today. My name is Lynne Goughler, and I am the Public Policy Liaison for the Mothers Against Drunk Driving Minnesota State Organization. I will be testifying specifically in favor of S.B./H.B. ___ which proposes to lower the illegal blood alcohol concentration (BAC) limit from .10 to .08 per se. We believe that lowering the illegal per se BAC limit to .08 will not only save lives and reduce injuries in Minnesota, but will also save substantial amounts of money in associated health care costs.

The National Highway Transportation Safety Administration (NHTSA) has produced two reports to the U.S. Congress on the subject of blood alcohol concentration (BAC) limits for drivers. In both of those reports, it is recommended that all states and Washington, D.C. should establish .08 BAC as the illegal limit for drivers aged 21 and older.

In addition, a study was published in the September 1996 *American Journal of Public Health* which supports that if every state passed an illegal .08 BAC limit, the proportion of fatal crashes caused by impaired drivers would decrease by approximately 16 percent – or approximately 600 fewer deaths each year.

There are a number of reasons why MADD supports the passage of .08 BAC levels in every state:

1. Virtually all drivers are substantially impaired at .08 BAC. Laboratory and test track research shows that the vast majority of drivers, even experienced drinking drivers, are impaired at .08 with regard to critical driving tasks. There are significant decrements in performance in braking, steering, lane changing, judgement and divided attention, among other measures at .08 BAC. Performance decrements in these tasks are as high as 60 to 70 percent at .08 BAC according to studies.

2. The risk of being involved in a crash increases substantially at .08 BAC. The risk of being in a crash gradually increases at each BAC level, but rises rapidly after a driver reaches or exceeds .08 BAC compared to drivers with no alcohol in their blood systems. Research by the Insurance Institute for Highway Safety indicates that the relative risk of being killed in a single vehicle crash at BACs between .05 and .09 is 11 times that of drivers at .00 BAC (no alcohol).

3. Lowering the BAC per se limit is a proven effective countermeasure which will reduce alcohol-related traffic fatalities. We have evidence in four states that significant reductions in alcohol-related fatalities occurred after .08 BAC laws went into

Remarks of State Senator Ida Ruben (D-20-Maryland)
Maryland Senate Sponsor, .08 BAC Legislation
News Conference on Federal .08 BAC Legislation
May 22, 1997

Thank you Senator Lautenberg, Senator DeWine, Congresswoman Lowey and my former Maryland General Assembly colleague Congresswoman Connie Morella. I am very pleased to be here today with you and my friends from Advocates for Highway and Auto Safety and MADD.

You might wonder what a state legislator is doing on Capitol Hill talking in support of federal legislation that sanctions the states to take a prescribed action. When my friends at MADD and Advocates for Highway and Auto Safety told me about this gathering, I very much wanted to be here. The fact is, the problems we face in Maryland are sometimes not just Maryland problems but also national problems.

I am a chief sponsor of the .08 legislation in the Maryland State Senate, and I can tell you that from my vantage point in Annapolis, the situation there with respect to the .08 issue is not a positive one.

The alcohol industry has a presence in the halls of the State House. They thwarted our efforts in this past legislative session. They relayed information to legislators that would criminalize so-called social drinking, and they misrepresented how many drinks it takes to get to .08

We come together today to face the facts about impaired driving. It is fact that .08 is a lot of alcohol and it's a lot of impairment. We all realize that .08 is not the answer to the nation's impaired driving tragedy. Much needs to be done. But it must start with drawing a safer and saner line in the sand against impaired driving at .08.

08 is the right thing to do. But, it is very very tough competing with the power, influence and money of the alcohol industry as they trip up the safety groups in state capital after state capital. To wage and win this battle state by state will take us into the 21st century.

That is why I, as a state legislator, believe federal action is essential, and I hope the Congress will pass this lifesaving legislation this year. The issue is not a matter of states' rights. It's a matter of life or death. There are times when federal action is needed to solve problems in all the states. And this is one of them.

I thought it was called for in 1984 when Senator Lautenberg sponsored and President Reagan signed into law the national uniform 21 drinking age legislation. You saw how quickly those dangerous blood borders between states with different drinking ages were quickly erased after that federal action. And, I thought it was called for in 1985 when Congresswoman Lowey sponsored and President Clinton signed into law the national "zero tolerance" BAC law.

These national laws are saving so many lives every year. And I now realize that a federal law is essential to make .08 the law of the land.

I would like to see the alcohol industry change its position on this issue because they are wrong. I think they tarnish their image even more in the long-run by fighting MADD, Advocates and the other safety groups than by standing out of the way of progress in this war on impaired driving.

I wanted to be here today to lend my support to your efforts in the Congress. I hope the Congress will pass and the Administration will strongly support your legislation this year. It will make our jobs in the state capitals across this country that much easier. Thank you for allowing me to join you here today. (END)

ADVOCATES
FOR HIGHWAY
AND AUTO SAFETY

TESTIMONY OF BILL BRONROTT
ADVOCATES FOR HIGHWAY AND AUTO SAFETY
BEFORE THE HOUSE JUDICIARY COMMITTEE, MARYLAND HOUSE OF DELEGATES

HB 810: A BILL TO REDUCE "DRIVING WHILE INTOXICATED" TO .08 B-A-C

FEBRUARY 20, 1997

Thank you, Mr. Chairman, and members of the committee.

My name is Bill Bronrott and I am with Advocates for Highway and Auto Safety, which is an alliance of consumer, safety and insurance organizations. I am here to testify in favor of HB 810 which will lower the illegal blood-alcohol concentration (BAC) limit from .10 to .08 for "driving while intoxicated," and from .07 to .06 for the lesser offense of "driving under the influence of alcohol."

In 1995, 671 people were killed in highway crashes in Maryland. Among those killed were 234 people who died in alcohol-related crashes. These 234 alcohol-related traffic deaths represented 35 percent of total motor vehicle fatalities in 1995. On top of this enormous human suffering were the huge economic losses.

The cost per alcohol-related fatality is estimated at about $1.1 million, according to the U.S. Department of Transportation. It is estimated that the 234 alcohol-related traffic fatalities in 1995 resulted in $257 million in societal costs in Maryland.

In addition, among these 234 alcohol-related traffic deaths were 57 people who died in crashes where the driver had a BAC below the current .10 limit. In other words, 23 percent of all alcohol-related traffic fatalities resulted from crashes where the driver had a BAC below the current .10 limit.

Lowering the illegal BAC limit will save lives, reduce injuries and result in a substantial savings in related societal costs, including health and medical care.

The U.S. Department of Transportation has produced two reports to the U.S. Congress on the subject of BAC limits for drivers. In both reports, it is recommended that all states establish .08 BAC as the illegal limit for drivers aged 21 and older.

Also, a study published in the September 1996 *American Journal of Public Health* concludes that if every state passed an illegal .08 BAC limit, the proportion of fatal crashes caused by impaired drivers would decrease by approximately 16 percent, resulting in about 600 fewer deaths each year.

1. **Drivers are substantially impaired at .08 BAC.** Laboratory and test track research shows that the vast majority of drivers, even experienced drinking drivers, are impaired at .08 with regard to critical driving tasks. There are significant decrements in performance in braking, steering, lane changing, judgement and divided attention, among other measures at .08 BAC. All the skills a person needs to drive a car are affected at .08 and performance decrements in these tasks are as high as 60 to 70 percent at .08 BAC according to studies.

Nor did it change in Utah and Oregon the year after .08 went into effect. There is evidence from Maine ıt restaurant sales actually increased 11 percent in 1988, the year .08 went into effect. Recently, ı National Restaurant Association Foodservice Industry's 1996 sales projections reported $312.9 billion in food and drink sales – an increase of $74.1 million from 1990.

In summary, 13 states (AL, CA, FL, HI, KS, ME, NC, NH, OR, UT, VA and VT) have already passed .08 BAC per se laws, and more than 25 states are considering .08 BAC limits in legislative sessions this year. Maryland has long been a leader in highway traffic safety countermeasures. Maryland needs to resume its leadership role in highway safety. We can do that by becoming the 14th state with .08. The time is now.

.08 BAC is a level at which critical driving skills are impaired. It is a level at which the risk of a crash increases substantially. It is a level which most industrialized nations have adopted. It is a proven effective measure which will save lives and reduce injuries. And, it is not just a couple of drinks after work. We are talking about a substantial amount of alcohol when we talk about .08 BAC.

While tremendous progress has been made in the war on drunk driving over the past 16 years in Maryland, the fact that 234 people lost their lives in alcohol-related crashes in 1995 clearly indicates that the war has not been won.

234 people killed due to the combination of alcohol and driving is the equivalent of two 737 jetliners crashing in our state. Whenever a jetliner tragically crashes, there is a blizzard of media attention and a huge public outcry . . . justifiably so . . . demanding answers and action.

ıe drunk driving problem deserves comparable treatment, attention and action. A sudden violent death in one mode of transportation is just as tragic as in another.

Impaired driving remains the most frequently committed violent crime in our country. The FBI reports that the crime resulting in the most arrests of adults in the United States in 1995 was "driving under the influence." Arrests for DUI totaled 1.4 million last year. The U.S. Department of Transportation estimates that only one of every 1,000 DUI incidents results in an arrest, so it is mind-boggling to think of the tens of millions of criminal acts of impaired driving that flood our nation's highways.

There seems to be a false perception in many states that the war on drunk driving has been won. Clearly, the great progress of the 1980s and early 1990s is in serious jeopardy. We, as a nation and a state, can and must do better because it is truly a matter of life or death.

That is why Advocates for Highway and Auto Safety, MADD and other highway safety groups recently joined together with the U.S. Department of Transportation to set a new goal to reduce alcohol-related traffic deaths by at least one-third — down to 11,000 or less per year by the year 2005.

The front lines in this battle are drawn in each state capital and on the streets and highways in every local community. No one believes that .08 is THE answer. But, virtually the entire highway safety community feels strongly that .08 BAC is one essential law that every state should adopt to draw a safer, saner and more sensible line in the pavement against intoxicated driving.

Ve urge the House Judiciary Committee to consider the merits of this legislation and to pass HB 810 to lower the illegal BAC to .08 this year. Thank you very much.

ATTACHMENTS

SENATE TESTIMONY

Distinguished Senators and others who have gathered to speak about this bill, my name is Dawn Richardson. I live in Providence. I am a homeowner, taxpayer and voter, and the mother of two school age boys. In spite of my looking like I just graduated from college, I am a 1988 graduate of the medical school at Brown University. I completed my residency at Rhode Island Hospital this past summer, specializing in Emergency Medicine. That's right, just like the television shows ER and Chicago Hope. I am an attending physician in the Emergency Care Center at Sturdy Memorial Hospital in Attleboro, Massachusetts, and part time at Rhode Island Hospital Emergency Department to keep my skills current. I have been recently appointed to the Medical Advisory Board of the Rhode Island Registry of Motor Vehicles, a position I sought because of my outrage about my daily experiences with the carnage of drunk driving.

The trauma rooms at Rhode Island Hospital are where the majority of serious drunk driving victims in Rhode Island end up. I have spent the last two years in those rooms, sometimes 115 hours a week. I have cared for hundreds of critically injured people in the trauma rooms and trauma intensive care. My time is spent fighting keeping them alive. What I am going to tell you is very graphic, but you must hear what the liquor and hospitality industry won't tell you. This is what happens in the trenches of the war against drunk driving.

If these critically injured people are at all conscious, I put them to sleep with powerful drugs. I then shove respirator tubes down their throats to put them on life support. If they have collapsed lungs, I put large tubes in their chests to empty the blood and air that has leaked from their lungs. If there is a sign of internal injury, I cut a 1 inch hole below their belly button to see if their abdomen is filled with blood from a burst spleen. If they are bleeding to death, I put large IV's in their arms or shoulders and pour blood or saline into their veins, sometimes a gallon or more before they go to the operating room. I put a tube in their penis to see if they are bleeding from a burst kidney, but not before putting my finger in their rectum to see if they have bled from torn intestines. I put a tube down their nose into their stomach to see if it is full of blood. Then my trauma surgery colleagues whisk them off to the operating room for emergency surgery. The photograph you see was taken just after the patient left the trauma room for surgery. If they have hit their head on the steering wheel or been thrown out of the car and damaged their brain, I call one of my brain surgery colleagues to drill a hole in their head to release the blood. If their bones are mangled, I call my orthopedic surgery colleagues to straighten or operate on them. If their faces are broken or cut beyond recognition, I call my plastic surgery colleagues to try to put their faces back together. The stitching that takes an hour or less I do myself. At 7 o'clock on Monday mornings we all meet to argue about how we managed the toughest cases the past week at Trauma Conference. The hardest part of my job is telling family members that their loved

This bill has died in committee six years in a row. I have come here today to put it on life support. It is the law in almost every other New England state and many foreign countries. We're not talking about the right to drink or the right of the hospitality and liquor industries to do business. Drunk people just have to find another way home. This is about public safety. I beg of you, please consider the public safety first, and put special interest pressure aside. You are the trauma surgeons of this law. I am turning the patient over to you, because I have done all I can do. Keep it alive. Send this bill to the floor for a general vote. Thank you.