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Evaluation of Michigan's Under Age 21 Zero-Tolerance Alcohol-Impaired Driving Law

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16. Abstract

Michigan enacted a zero-tolerance law on November 1, 1994 which set the maximum allowable blood-alcohol concentration at .02 percent (.02 g/100 ml blood) for drivers under the age of 21 years in an attempt to reduce alcohol-related traffic injuries and deaths among young people. A conviction for violation of the zero-tolerance law can result in a one to three month driving license suspension or restriction, four points on the driving record, a fine up to $250, and community service for up to 45 days. The first objective of this study was to determine the number of underage zero tolerance, drunk driving, open container, and driving-while-license-suspended convictions since the law was enacted and make comparisons to similar convictions prior to the law. The second objective was to determine the number of underage alcohol-related crashes, injuries, and fatalities since the law was enacted and make comparisons to similar events prior to the zero-tolerance law. These objectives were accomplished using the Michigan Department of State's Master Driving Record and Michigan State Police crash data respectively. Conviction rates differed dramatically between males and females in both the 1994 and 1997 data, but conviction rates did not differ between years for youth committing more serious OWI and OUIL offenses. The zero-tolerance law was actively enforced in addition to the OWI and OUIL laws, with 16,356 convictions for youth zero-tolerance violations through April 1997. This suggests that young offenders guilty of a more serious alcohol-impaired driving offense were not being charged with or taking a plea to the less stringent zero-tolerance offense, and that offenders that previously may have been released with a very low BAC are now being processed, thus correcting a serious shortcoming of previous alcohol-impaired laws. Box-Jenkins time-series analysis showed that crashes resulting in fatal or severe injury and the number of persons killed or seriously injured in "had-been drinking" crashes decreased about 30 percent among the under 21 age group following zero-tolerance enactment. None of the comparison groups (under 21 no alcohol involvement, adult "had-been-drinking") showed a significant change in crash or injury frequencies. Fully understanding the impact of zero-tolerance laws in Michigan, however, warrants further study of the other issues involved.

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STATEMENT OF THE PROBLEM AND BACKGROUND

It is well known that crashes involving young people are a serious traffic safety issue. In Michigan, young people age 16 to 24 accounted for 23.6 percent of all crashes and 23.1 percent of all fatal crashes in 1995, even though they represent only 16.5 percent of Michigan's driving population (OHSP 1997). Alcohol aggravates this problem. In 1995, drinking drivers under the age of 21 in Michigan were involved in 14 percent of all under 21 fatal crashes, and accounted for 9.1 percent of all Operating Under the Influence of Liquor (OUIL) arrests in the state (Michgan Traffic Crash Facts 1995). In light of these figures, Michigan's recent enactment of zero-tolerance legislation, which set the maximum allowable blood alcohol concentration (BAC , also referred to as bodily alcohol content) at .02 percent (.02 g/100 ml blood) for drivers under the age of 21 years, is an attempt to reduce alcohol-related traffic injuries and deaths among young people. The Michigan zero-tolerance law went into effect November 1, 1994 (Michigan Public Act 211). A conviction for violation of the zero-tolerance law can result in a one to three month driving license suspension or restriction, four points on the driving record, a fine up to $250, and community service for up to 45 days.

Little is known about the extent to which zero-tolerance laws are effective in the long term. One study in Maryland showed an immediate reduction in alcohol-involved crashes involving young people (Blomberg 1992), and in the few other states that have such legislation, results are tentative but suggest an initial positive impact of the laws (Martin 1996).

To fully understand whether the zero-tolerance laws are effective tools with which to reduce alcohol-related crashes among young people, several questions should be investigated. One way to measure the effectiveness of such legislation is to determine whether the number of alcohol-involved crash injuries and deaths went down after the legislation was passed. A second way to judge the usefulness of such laws is to look at if and how the law enforcement community and judiciary are handling the new legislation in regard to arrests, convictions, and sanctioning. These two topics are the subject of this study, but they answer only some of the questions necessary to decide whether zero-tolerance laws work. Other issues to consider concerning the effectiveness of zero-tolerance laws include whether young people know about the law and its components,

whether young people understand the effects of alcohol, whether there are any changes in young peoples' attitudes and behaviors with respect to drinking and driving because of the legislation, and whether young people perceive the new law as something likely to affect them. Information on attitude and knowledge about the law may help discern whether the legislation will be effective long term, or what steps need to be taken to inspire attitudinal and/or behavioral change. For instance, if no one knows about the zero-tolerance laws, it is unlikely that drunk driving will be seen as a behavior to be avoided any more than before the law's enactment.

Though these social and psychological questions are beyond the scope of this study, there is some background literature on these topics that may shed some light on these issues and enrich the results of this study. For example, there is some evidence that strong efforts to educate young people about the law and its components can significantly affect the number of alcohol-related fatal crashes and serious injuries. Haque and Cameron (1989) studied the effect of zero-BAC (blood alcohol concentration) legislation on fatal crashes in Australia and found no significant effect upon fatal crash rates within the first 18 months of the law's enactment. They attributed the lack of an effect, in part, to an absence of specific enforcement procedures and no media or PI&E (public information and education) campaign. In contrast, in Maryland, a state that did find a decline in alcohol-involved fatal crashes, researchers conducted a survey about the state's .02 percent BAC limit law and its accompanying PI&E campaign and found that young people knew about the law and its components. For example, when asked to state the BAC level that would make it illegal to drive, 90 percent of the respondents answered .02 percent correctly (Blomberg 1992).

Similarly, Hagler et al. (1996) surveyed 159 college student volunteers to examine the impact of peer pressure, risk-taking behaviors, knowledge, and legislative efforts on the drinking and driving habits of college-aged students. The students were shown a one hour video about alcohol awareness and the most recent alcohol-related legislation in their state before taking the survey. In the survey the students were asked 22 questions regarding the effect of legislation upon their behavior and attitudes. The authors found that the prospect of being stopped/arrested for Driving Under the Influence (DUI) was reported to be a deterrent by 76 percent of the males and 80 percent of the females; that the prospect of being jailed for DUI was a deterrent for 74 percent males and 81 percent

females; that a fine served as a deterrent for 73 percent males, 79 percent females; and that license sanctions and curfews were perceived as a lesser deterrent for drinking and driving. The authors suggested that knowledge of existing laws had a deterrent effect on driving after drinking. This type of information suggests that legislation alone may not be enough to deter young people from driving after drinking, and that additional educational efforts might also directly affect whether zero-tolerance legislation is effective.

Another set of issues that has some precedent in the literature concerns young people's knowledge about the effects of alcohol, what the alcohol consumption rates are, and whether knowledge about alcohol affects the decision to drink and drive.

There is some evidence that young people are more knowledgeable today about the effects of alcohol and associated risky behaviors than ever before. However, drinking still remains a significant problem that legislation may or may not directly affect. According to a study conducted by Gonzales (1994), college students surveyed in 1991 were significantly more knowledgeable about the effects of alcohol and consumed less alcohol each month than students surveyed in 1981. Additionally, a survey testing the knowledge of young people conducted by Martens et al. (1991) found that young people could fairly accurately estimate how many drinks would result in a .10 percent BAC. Others corroborate the increased knowledge of young people and an accompanying decrease in alcohol consumption throughout the 1980s and 1990s (e.g., Hilton 1988; Johnston et al. 1991). Unfortunately, though the overall rate of consumption has been declining, episodic heavy or binge drinking (four to five or more drinks in a row) is widespread (Johnston et al. 1991; Wechsler et al. 1994). Still other studies have found that legislation may only modestly affect the rate of alcohol consumption, and underage drinkers still have easy access to alcohol (Stoduto and Adlaf 1996; Mooney et al. 1982; Gonzales 1990; Beck 1981; O'Malley and Wagenaar 1991).

Knowledge about both the effects of alcohol and alcohol-related risky behaviors may not deter young people from making the decision to drive after drinking. Russ and Geller (1986) found that students with high BACs (greater than 0.05 percent) who scored poorly on sobriety tests were more likely to ignore recommendations not to drive than those with lower BACs (0.05 percent or less). In a study conducted biennially since 1971 in Ontario, crash rates have begun to rise after years of decline, even with the advent of graduated licensing (Stoduto and Adlaf 1996). Wechsler et al. (1994) found an effect of binge

drinking upon dangerous driving behaviors, such as drunk driving, and found binge drinking is less likely on college campuses that do not have alcohol outlets within a mile of campus or that prohibit alcohol completely.

Taken together, these data suggest that other factors, such as the availability of alcohol, knowledge about alcohol, attitudes about drinking, attitudes about drinking and driving, and perceived risk of consequences from risky driving behaviors all affect the decisions of young drivers. Beck (1981), for example, determined that the young people he surveyed made decisions to drink and drive if they believed they were safe drivers after drinking and could effectively avoid the known negative consequences of their behavior.

Zero-tolerance legislation and penalties alone, therefore, may not be adequate to reduce or continue the decline in drunk driving fatalities among young people in the long term, and employing additional strategies may be necessary to make the legislation work. Addressing these types of questions in Michigan, coupled with the information presented in this study, may provide comprehensive information about the effectiveness of zero-tolerance legislation.

This report answers only a limited number of the crucial questions which can help us begin to understand whether Michigan's zero-tolerance laws are effective in reducing underage alcohol-related crashes, injuries, and fatalities in the long term. First, this report reviews if and how law enforcement officers and the judiciary handle enforcement and adjudication of the new law, and if the level of enforcement has changed. The second issue the data address is whether there were fewer underage alcohol-related crashes, injuries, and fatalities after zero-tolerance was enacted.

This report focused on four categories of offenses: drunk driving offenses, open container offenses, other alcohol, driving while license suspended (DWLS), and the new zero-tolerance laws. The drunk driving offenses were divided into two categories: impaired driving (OWI) and operating under the influence of liquor, .10 percent BAC or above (OUIL). The open container offenses are those in which open alcohol containers were found in the vehicle at the time of incident. The other alcohol offenses are preliminary breath test refusal and fraudulent ID purchases. The DWLS convictions are those in which people drove while their license was suspended, restricted, or revoked. The new zero-tolerance laws are under 21 with BAC, and possession and/or purchasing laws. The full title, SOS code, and definition of each offense are displayed in Table 1.

TABLE 1. DEFINITIONS FOR DRUNK DRIVING, OPEN CONTAINER, OTHER ALCOHOL, AND ZERO-TOLERANCE OFFENSES.

Department of State Code		Abbreviation	Definition
1994	1997		
DRUNK DRIVING			
23	1200	OWI or OWIL	Operated while impaired by liquor
23	1220	OWI/Controlled Substance	Operated while impaired/controlled substance combined (under .10 percent BAC)
07	1000	OUIL	Operated under the influence of liquor (.10 or above percent BAC)
05	1010	UBAC	Unlawful bodily alcohol content
29	1020	OUIL/UBAC	Operated under the influence of liquor/Unlawful bodily alcohol content combined
41	1030	OUIL-Death, Felony	Felony - operated under the influence of liquor or while impaired by liquor causing death
42	1040	OUIL-Incapacitating Injury, Felony	Felony for operated under the influence of liquor or while impaired by liquor causing serious injury
29	1110	OUIL/Controlled Substance	Operated under the influence of liquor and controlled substance combined, (.10 or above BAC)
OPEN CONTAINER			
52	1300	Open Intoxicants in vehicle/driver	Open Intoxicants in vehicle - driver
No code	1306	Open intoxicants in vehicle/passenger	Open Intoxicants in vehicle - passenger
OTHER ALCOHOL			
72	1330	Under 21 Fraudulent ID Purchase	Under 21 Fraudulent ID used to purchase liquor
24	1310	PBT refusal, CMV	Preliminary breath test refusal, commercial vehicle (CMV)
24	1320	PBT refusal, non CMV	Preliminary breath test refusal, noncommercial vehicle
ZERO-TOLERANCE LAW			
No code	1240	Under 21 with BAC	Unlawful to have any bodily alcohol content while operating a motor vehicle, presumptive levels .02-.07 percent BAC
No code	1360	Under 21 Purchase/ consume/possess liquor	Under 21 Purchase/consume/possess liquor
No code	1307	Under 21 Transport/ possess in vehicle - driver	Under 21 Transport/possess in vehicle - driver
No code	1308	Under 21 Transport/ possess in vehicle - passenger	Under 21 Transport/possess in vehicle - passenger
No code	1350	Under 21 Refuse PBT	Under 21 refusal of preliminary breath test

METHODS

The first objective of the study, to determine the number of underage zero tolerance, drunk driving, open container, and DWLS convictions prior to and subsequent to implementation of the law, was accomplished using the Michigan Department of State Master Driving Record (MDR). The MDR is a complete driver-history database containing, among other things, arrest, conviction, court, and crash information. Depending on the offense, data are kept in the database for seven to ten years. Two sets of data were extracted from the MDR database for this study. Each of these data sets represents a "snapshot" of the driver history records at the point in time they were extracted. The first driving records snapshot was extracted in February 1994, and contains driving records that represent activity prior to the enactment of the zero-tolerance law. The second driving records snapshot was extracted in May 1997, and contains driving records that represent activity subsequent to the enactment of the zero-tolerance law. Frequencies of underage alcohol-related driving convictions were calculated using SAS and ADAAS software. Rates of underage alcohol-related convictions were calculated using the following formula:

$$ConvictionRate = \frac{NumberofConvictions}{NumberofLicensedDrivers}$$

The second objective of the study was to determine the number of underage alcohol-related crashes, injuries, and fatalities that have occurred since the law was enacted and make a comparison with the period before zero-tolerance legislation was enacted. The data used to meet this objective were crash data from the Michigan State Police, which is housed and maintained in the UMTRI Transportation Data Center. This data set contains information on all crashes reported by all law enforcement agencies in the state. Monthly crash, death, and injury frequencies for alcohol-related and single-vehicle nighttime crashes were extracted for a 4-year period preceding the zero-tolerance law (January 1990 through October 1994, excluding 1992, a year in which crash data was significantly affected by a change to the new crash report form), and twenty-six months after zero-tolerance enactment (November 1994-December 1996).

In order to determine if any perceived change in crash outcomes subsequent to the implementation of the zero-tolerance law is within the expected year-to-year variation or is truly a change that merits attention, we must analyze the patterns in the data. Our most effective analysis strategies involve mathematical modeling that requires more data points than are available in the annual data. Therefore, we analyze time-series crash data on a monthly basis. Fortunately, we have available to us a set of statistical techniques, generally called time-series analysis, that enable us to accurately model these types of data so we can determine if perceived changes are "real" or are simply part of the expected variation seen from month-to-month, year-to-year.

In order to measure and understand changes in crash outcome frequencies, we need to know more than the temporal patterns that exist in the crash data alone. We also need to be able to account for several other factors that change and that may have an impact on crash frequency and injury severity. As the amount of travel increases (as measured by VMT or vehicle miles of travel), the opportunity for and subsequent chance of collision also increases. The amount of alcohol consumed within the state also may affect crash death frequencies through an increase in had-been-drinking crashes that are on average more hazardous than nonalcohol-involved collisions.

As mentioned earlier, time-series analytic techniques allow researchers to explore the temporal patterns seen in the month-to-month data. These techniques also allow us to simultaneously account for multiple additional explanatory variables (VMT and alcoholic beverage consumption). These models also allow us to examine the data to identify changes in expected patterns or trends in the time-series. These expected changes most often occur as the result of a new law or special program. In the case of the current question, we are interested in knowing if the pattern of data for the period subsequent to the implementation of the zero-tolerance law differs from what we would expect given what we know from previous years.

In order to make this determination, we used Autoregressive Integrated Moving Average (ARIMA) models from a statistical package called the SAS System for Forecasting Time Series. This package first requires us to enter monthly time-series data for each of the variables of interest (i.e., number of crash deaths, VMT, and alcoholic beverage consumption). Next, several statistical time-series models are fit iteratively until the model that best explains the patterns and relationships in the data is found. We then add an

additional variable to the model we just selected to determine if the time period of interest differs from what the statistical model would have predicted. This new variable is often called the intervention variable because it most often is used to represent an a priori intervention such as a new traffic safety program or a new law.

RESULTS

Objective 1: Determine the number of under 21 drunk driving, DWLS, open container, and zero-tolerance law convictions and compare to the period before the zero-tolerance law was enacted.

Part 1. Under 21 Alcohol-Related Traffic Offenses for 1994 and 1997

Drunk Driving - Impaired

As Table 2a shows, for under 21 impaired driving convictions (OWI), the rate of convictions increased only slightly from four OWI convictions per thousand young people in the driving population to five per thousand between 1994 and 1997. Males had at least 4 times the number of convictions than females.

In 1994, of the 1528 convictions, all but nine males were between 18 and 20 years old, and all females convicted of OWI were 18-20 years of age. In 1997, only ten of 1781 convictions were for male drivers under 18, and three convictions out of 472 were for females under age 18.

TABLE 2A. UNDER 21 IMPAIRED DRIVING RATES FOR 1994 AND 1997

UNDER 21	IMPAIRED DRIVING (OWI) RATES (Codes 23,1200,1220)					
	Male		Female		TOTAL	
	Freq.	Rate per 1000	Freq.	Rate per 1000	Freq.	Rate per 1000
1994	1528 n=234,265	7	297 n=210,178	1	1825 N=444,443	4
1997	1781 n=242,260	7	472 n=221,984	2	2253 N= 464,244	5

Drunk Driving - Operated Under the Influence of Liquor .10 or greater

The drunk driving offenses summarized in Table 2b are OUIL, UBAC, OUIL/UBAC combined, OUIL-Felony (Death or Incapacitating Injury), and OUIL/controlled substance combined. For OUIL offenses, in which drivers had at least a .10 percent BAC, the rates

remained relatively stable for under 21 drivers between years, at a rate of two convictions per thousand in 1994 and three per thousand in 1997. Again, for both years, the rate for males was higher than for females.

In 1994, drivers under 18 accounted for only two percent of all under 21 OUIL convictions. Males under 18 accounted for 12, or 1.4 percent of under 21 male convictions (n=845), while females under 18 only committed eight, or 6 percent of the offenses in the female OUIL category (n=136). In 1997, drivers under 18 accounted for 38, or 3 percent of all under 21 OUIL convictions. Of these, males under 18 committed only 30, or 3 percent, of the 1020 offenses, and females committed only eight, or 3.6 percent of 222 offenses.

TABLE 2B. UNDER 21 DRUNK DRIVING RATES FOR 1994 AND 1997

UNDER 21	OUIL (OUIL, UBAL, COMBINED, AND FELONY-OUIL) RATES (Codes 07,05,29,41,42,29,1000,1010,1020,1030,1040,1110)					
	Male		Female		TOTAL	
	Freq.	Rate per 1000	Freq.	Rate per 1000	Freq.	Rate per 1000
1994	845 n=234,265	4	136 n=210,178	1	981 N=444,443	2
1997	1020 n=242,260	4	216 n=221,984	1	1242 N= 464,244	3

Driving While License Suspended, Restricted, Revoked or Denied (DWLS)

For DWLS offenses, the conviction rate between 1994 and 1997 changed little, from 13 to 14 per thousand (Table 2c). The male conviction rate for DWLS offenses was at least 5 times higher than the female rate in both years. In 1994, the female rate was 3 convictions per thousand, or 723 convictions, compared with a rate of 22 per thousand, or 5375 convictions, for males. The same pattern holds true in 1997, where females had a rate of 4 per thousand, or 961 convictions, while males had a rate of 23 per thousand, or 5682 convictions. In both 1994 and 1997, the percentage of DWLS convictions for offenders less than 18 years old was less than one percent.

TABLE 2C. UNDER 21 DWLS RATES FOR 1994 AND 1997

UNDER 21	DWLS (Codes 74, 3200)					
	Male		Female		TOTAL	
	Freq.	Rate per 1000	Freq.	Rate per 1000	Freq.	Rate per 1000
1994	5375 n=234,265	22	723 n=210,178	3	6098 N=444,443	13
1997	5682 n=242,260	23	961 n=221,984	4	6643 N= 464,244	14

Open Intoxicants/Containers

As seen in Table 2d, the overall rate of open container convictions decreased slightly, from five per thousand in 1994 to four per thousand in 1997. Males in this category were convicted two to three times as frequently as females during both years.

TABLE 2D. OPEN CONTAINER RATES FOR 1994 AND 1997, UNDER 21 GROUP

UNDER 21	OPEN INTOXICANTS, DRIVER AND PASSENGER (Codes 52,1300,1306)					
	Male		Female		TOTAL	
	Freq.	Rate per 1000	Freq.	Rate per 1000	Freq.	Rate per 1000
1994	1844 n=234,265	8	419 n=210,178	2	2263 N=444,443	5
1997	1352 n=242,260	6	355 n=221,984	2	1707 N= 464,244	4

Other Alcohol Category - PBT Refusal and Fraudulent ID Purchases

The rate for under 21 PBT refusal and fraudulent ID purchases remained zero both years, as shown in Table 2e and 2f.

TABLE 2E. REFUSED PRELIMINARY BREATH TEST, COMMERCIAL AND NON-COMMERCIAL VEHICLE RATES FOR 1994 AND 1997, UNDER 21 GROUP

UNDER 21	REFUSED PBT (CMV OR NON-CMV) (Codes 24,1310,1320)					
	Male		Female		TOTAL	
	Freq.	Rate per 1000	Freq.	Rate per 1000	Freq.	Rate per 1000
1994	1 n=234,265	0	0 n=210,178	0	1 N=444,443	0
1997	0 n=242,260	0	0 n=221,984	0	0 N=464,244	0

TABLE 2F. FRAUDULENT ID PURCHASE RATES FOR 1994 AND 1997, Under 21 GROUP

UNDER 21	FRAUDULENT ID PURCHASE (Codes 72,1330)					
	Male		Female		TOTAL	
	Freq.	Rate per 1000	Freq.	Rate per 1000	Freq.	Rate per 1000
1994	51 n=234,265	0	12 n=210,178	0	63 N=444,443	0
1997	103 n=242,260	0	26 n=221,984	0	129 N= 464,244	0

Part 2. Zero-tolerance Laws - 1997 Data

Under 21 with BAC

For under 21 with BAC convictions, the Table 3a shows that 3450 persons were convicted under this new law. Males constituted 82.3 percent of all convictions. Only 46, or 1.3 percent, of the offenders were under 18, and 72 percent of the under-18 offenders were male.

TABLE 3A. ZERO-TOLERANCE LAW: UNDER 21 WITH BAC RATES

UNDER 21	UNDER 21 WITH BAC (Code 1240)					
	Male		Female		TOTAL	
	Freq.	Rate per 1000	Freq.	Rate per 1000	Freq.	Rate per 1000
1997	2838 n=242,260	12	612 n=221,984	3	3450 N=464,244	7

Under 21 Purchase/Consume/Possess Liquor

As shown in Table 3b, there were 12,855 purchase/consume/possess liquor violations in the 1997 data. The rate for this law was 27 per thousand. Seventy-three percent of the convictions were for males. In this category, 11 percent of the offenders were under 18 years old, and of those under 18, 63 percent were male and 37 percent were female.

TABLE 3B. ZERO TOLERANCE LAW: PURCHASE/CONSUME/POSSESS LIQUOR RATES

UNDER 21	Under 21 PURCHASE/CONSUME/POSSESS LIQUOR (Code 1360)					
	Male		Female		TOTAL	
	Freq.	Rate per 1000	Freq.	Rate per 1000	Freq.	Rate per 1000
1997	9391 n=242,260	39	3464 n=221,984	16	12855 N= 464,244	27

Other: Under 21 Refused Preliminary Breath Test, Possess/Transport Liquor (Driver), and Possess/Transport Liquor (Passenger)

As Tables 3c, 3d, and 3e show, the rates for all three of these offenses, under 21 refused PBT, Possess/transport liquor (driver) and Possess/transport liquor (passenger), all had an incidence rate of zero per thousand population. There were 51 convictions of the under 21 Refused PBT law, and no convictions of the latter two.

TABLE 3C. ZERO-TOLERANCE LAW: REFUSED PBT

UNDER 21	UNDER 21 REFUSED PBT (Code 1350)					
	Male		Female		TOTAL	
	Freq.	Rate per 1000	Freq.	Rate per 1000	Freq.	Rate per 1000
1997	33 n=242,260	0	18 n=221,984	0	51 N= 464,244	0

TABLE 3D. ZERO-TOLERANCE LAW: POSSESS/TRANSPORT (DRIVER) RATES

UNDER 21	UNDER 21 POSSESS/TRANSPORT — DRIVER (Code 1307)					
	Male		Female		TOTAL	
	Freq.	Rate per 1000	Freq.	Rate per 1000	Freq.	Rate per 1000
1997	0 n=242,260	0	0 n=221,984	0	0 N=464,244	0

TABLE 3E. ZERO-TOLERANCE LAW: POSSESS/TRANSPORT (PSNGR) RATES

UNDER 21	UNDER 21 POSSESS/TRANSPORT — PASSENGER (Code 1308)					
	Male		Female		TOTAL	
	Freq.	Rate per 1000	Freq.	Rate per 1000	Freq.	Rate per 1000
1997	0 n=242,260	0	0 n=221,984	0	0 N=464,244	0

Objective 2: Determine the number of underage alcohol-related crashes and fatalities and make a comparison to similar convictions before the law.

The purpose of these analyses was to determine if there was any change in the number of alcohol-related crashes and crash injuries involving drinking drivers under age 21 associated with the implementation of the zero-tolerance alcohol law. Time-series analyses were performed on data for under 21 and adult had-been-drinking fatal and serious injury crashes, nonfatal injury crashes, as well as crashes among drivers under age 21 that did not involve alcohol.

The results of these analyses are displayed in Tables 4a, 4b, and 4c. Table 4a shows a statistically significant decrease in the number of crashes involving a driver under age 21 who had been drinking prior to the crash that resulted in fatal or severe injury. The estimate reflecting the effect for the number of fatal and severe crash injuries that were suffered during these crashes nearly reached the generally accepted level for statistical significance. Conversely, the comparison groups that were not affected by the law and thus were not expected to change after the law was implemented saw no change that even approached statistical significance (i.e., had-been-drinking crashes involving adults and crashes involving drivers under age 21 who had not been drinking prior to the crash). Based on these results, we can conclude that the implementation of the zero-tolerance law was associated with approximately a 30 percent decrease in the number of fatal and severe crashes involving drinking drivers under the age of 21.

TABLE 4A. RESULTS OF YOUTH HAD-BEEN-DRINKING TIME-SERIES ANALYSIS

YOUTH - HAD BEEN DRINKING								
	Fatal and Severe Injury				Nonfatal Injury			
	Model	Estimate	T	p	Model	Estimate	T	p
Crashes	(1,0,0) (1,0,0) s	-16.88	-2.25	0.03	(1,0,0) (1,0,0) s	-2.33	-0.18	0.86
Injuries	(1,0,0) (1,0,0) s	-22.16	-1.84	0.07	(1,0,0) (1,0,0) s	-12.56	-0.59	0.55

TABLE 4B. RESULTS OF ADULT HAD-BEEN-DRINKING TIME-SERIES ANALYSIS

ADULT - HAD BEEN DRINKING								
	Fatal and Severe Injury				Nonfatal Injury			
	Model	Estimate	T	p	Model	Estimate	T	p
Crashes	(1,1,0) (1,0,0) s	-11.87	-0.43	0.67	(1,0,1) (1,0,0) s	-10.04	-0.28	0.78
Injuries	(1,0,1) (1,0,1) s	-24.77	-0.70	0.49	(1,0,1) (1,0,1) s	-4.54	-0.09	0.93

TABLE 4C. RESULTS OF NO-ALCOHOL CRASH TIME SERIES ANALYSIS

YOUTH - NO ALCOHOL								
	Fatal and Severe Injury				Nonfatal Injury			
	Model	Estimate	T	p	Model	Estimate	T	p
Crashes	(1,1,0) (1,0,0) s	-28.37	-1.32	0.19	(2,0,1) (1,0,0) s	71.37	1.22	0.23
Injuries	(2,1,0) (1,0,0) s	-18.74	-0.74	0.46	(1,0,1) (1,0,0) s	67.71	0.67	0.51

DISCUSSION

The first objective of the study was to determine the number of underage drunk driving, open container, DWLS, and zero-tolerance convictions and to make a comparison to similar convictions before the law. This objective was met using data from the Michigan Department of State's driving records. Results revealed that conviction rates for drunk driving, open container, and license violations (i.e., those laws that remained unchanged by the zero-tolerance legislation) remained largely the same from 1994 to 1997. More specifically, the rate of OWI (required BAC level .08-.09 percent) and OUIL (required BAC level .10 percent or above) convictions did not change after the zero-tolerance law was enacted. This suggests that young offenders guilty of a more serious alcohol-impaired driving offense are not being charged with or taking a plea to the less stringent zero-tolerance laws. If offenders were being charged with the lesser zero-tolerance offense or if they plead down to the new offense, we would have expected the rate of OWI and/or OUIL convictions to go down (barring some unexplained, and dramatic increase in enforcement activity). Instead, what we observed was that OWI and OUIL conviction rates for drivers under age 21 remained stable, and that an additional 16,356 drivers were convicted for violation of the new zero-tolerance laws. The laws therefore seem to be catching more young, drinking drivers, rather than reclassifying serious offenders merely because of their age. Previously, young drivers who had a very low BAC might have been released if caught, because they did not fit within the more stringent requirements of OWI and OUIL. This has been a serious shortcoming of previous alcohol-impaired driving laws that zero-tolerance laws attempt to correct.

The results showed that compared to drivers under 18 years, drivers age 18 to 20 are the most frequently convicted youthful alcohol-related traffic offenders. This finding suggests that drivers age 18 to 20 either have more access to vehicles and/or alcohol and/or drive more frequently than their younger counterparts, attract the attention of law enforcement more often (e.g., may be on college campuses or in other places with high concentrations of their age group), or that as a group they simply offend more frequently. Additionally, males were convicted at least two to three times more frequently than females in every category studied, illustrating that educational efforts should still be targeted largely toward male young drivers.

. As expected, males were convicted at a much higher rate than females in all zero-tolerance categories that had convictions recorded. This finding again underlines the point that young males should be a main focus with respect to educational efforts about the zero-tolerance law. Another finding, though not very prominent, is noteworthy: even though under-18 drivers accounted for less than 1 percent of all underage DWLS convictions, under-18 females accounted for 37 percent of the under-18 DWLS convictions, with 502 convictions. This, coupled with the number of DWLS convictions generally, suggests young people may not take license sanctions seriously and may be unconcerned with being caught.

Another finding in these data was that the conviction rate for the *under 21 with BAC* violation had few convictions relative to the number of convictions for the lesser offense, *under 21 purchase/consume/possess liquor.* There could be several reasons for this outcome. First, the under 21 with BAC offense, which carries with it a license sanction, four points on the driving record, a fine of up to $250, and community service for up to 45 days, could be routinely pled down to the lesser offense of under 21 purchase/consume/possess liquor, which carries no license sanction until a second offense. There is some evidence that this type of plea bargaining occurs regularly in Michigan. Streff and Eby (1994), for instance, found that in the case of nonfelony drunk drivers in Michigan, drunk driving recidivists frequently pled down to a first offense. A second possibility for the finding could be that young people are purchasing/consuming possessing liquor and getting caught before an illegal of .02 percent BAC is reached. A third possibility is that the law itself is problematic, pragmatically or publicly, being either too difficult to prosecute successfully with the current evidentiary requirements, or seen by the public and criminal justice system as too stiff relative to the perceived severity of the crime (.02 percent BAC).

The second objective of the study was to determine the number of underage alcohol-related crashes, injuries, and fatalities, and make a comparison to similar convictions before the law. This objective was met using Michigan State Police crash data and conducting time-series analysis to determine whether there was a change in types of youth crashes after zero-tolerance legislation was enacted. The results showed a statistically significant decrease of about 30 percent in youth had-been-drinking fatal and severe injury crashes, as well as a decrease in fatal and severe crash injuries (that very nearly reached

statistical significance) after zero-tolerance was enacted. This finding corresponds with prior work examining states with such laws and initial findings in an ongoing study in California (Martin and Andreasson 1996). There was no change in any adult crashes, or youth crashes that did not involve alcohol. Because the only change found were in youth had-been-drinking fatal and serious crashes, the results suggest that zero-tolerance had an effect, significantly reducing the number of youth alcohol-involved fatal and severe injury crashes and subsequent fatal and serious injuries.

The results of this study, while extremely important, capture only a limited part of the information needed to determine whether the zero-tolerance law is effective. This work answers vital questions about the likelihood that zero-tolerance had a specific effect on deaths and injuries presently, but does not give us a comprehensive idea about what other general effects the legislation may have had, and if the current trend will continue over time. By not having more information about the general effectiveness of zero-tolerance laws, namely some of the social and psychological components, it is difficult to predict whether the legislation will remain effective after its initial impact has been felt. Information about whether actual alcohol consumption has gone down, whether young people know about the law and its components, whether young people know about the effects of alcohol, and their attitudes and behaviors with respect to drinking and driving and the perceived risk of being caught and sanctioned, are extremely important variables that warrant further study and likely would be valuable information when coupled with the data in this study. As other literature has shown, the effectiveness of legislation may be related to how other tools are utilized or withheld.

REFERENCES

Beck, K. (1981). Driving while under the influence of alcohol: relationship to attitudes and beliefs in a college population. *American Journal of Drug and Alcohol Abuse*, 8, 377-388.

Blomberg, R.D. (1992). Lower BAC limits for youth: evaluation of the Maryland .02 law. Washington, D.C.: National Highway Traffic Safety Administration.

Fell, J.C. (1984). Alcohol in fatal accidents for various driver groups. Springfield, VA: U.S. Department of Transportation, National Techinical Information Service.

Gonzales, G.M. (1994). Changes in college student drinking and alcohol knowledge: a decade of progress, 1981-1991. *Journal of Alcohol and Drug Education,* 39, 56-62.

Gonzales, G.M. (1990). Effects of drinking age on reduced consumption of alcohol reported by college students: 1981-1986. *Journal of Drug Issues*, 20, 67-73.

Hagler, R., Miller, C., Burling, J., and Smith, C. (1996). The influence of legislation on the driving and alcohol consumption of college students. *American Driver and Traffic Safety Education Association Chronicle*, 44, Spring 1996, 4-5,11.

Haque, M.O., and Cameron, M. (1989). Effect of the Victorian zero BAC legislation on serious casualty accidents: July 1984-Dec. 1985. *Journal of Safety Research*, 20,129-137.

Hilton, M.E. (1988). Trends in U.S. drinking patterns: further evidence from the past 20 years. *British Journal of Addiction*, 83, 269-278.

Johnston, L.D., O'Malley, P.M., and Bachman, J.S. (1991). Drug abuse among American high school seniors, college students and young adults, 1975-1990. Rockville, MD: National Institute on Drug Abuse.

Klein, T.M., and Burgess, M. (1996). Alcohol involvement in fatal traffic crashes 1994. Washington D.C.: National Highway Traffic Safety Administration.

Martens, C.H., Ross, L.E., and Mundt, J.C. (1991) Young drivers' evaluation of driving impairment due to alcohol. *Accident Analysis and Prevention*, 23, 67-76.

Martin, S., and Andreasson, S. (1996). Zero tolerance laws: effective public policy? *Alcoholism: Clinical and Experimental Research*, 20, 147a-150a.

Mooney, L.A., Gramling, R., and Forsyth, C. (1992). Legal drinking age and alcohol consumption. *Deviant Behavior*, 13, 59-71.

National Highway Traffic Safety Administration, National Center for Statistics and Analysis (1996). Traffic Safety Facts 1996. [WWW document]. URL http://www.nhtsa.dot.gov/.

Office of Highway Safety Planning. (1997). 1995 Michigan Traffic Crash Fact Sheets. [WWW document]. URL http://www.voyager.net/ohsp/ .

Office of Highway Safety Planning. (1995). 1995 Michigan Traffic Safety Facts. Lansing, MI: Office of Highway Safety Planning, Michigan State Police.

O'Malley, P.M., and Wagenaar, A.C. (1991). Effects of minimum drinking age laws on alcohol use, related behaviors and traffic involvement among american youth: 1876-1987. *Journal of Studies on Alcohol*, 52, 478-491.

Russ, N.W., and Geller, E.S. (1986). Using sobriety tests to increase awareness of alcohol impairment. *Health Education Research,* 1, 255-261.

Streff, F.M., and Eby, D.W. (1994). An evaluation of the impact and effectiveness of Michigan's drunk and impaired driving laws. Ann Arbor, MI: University of Michigan Transportation Research Institute.

Stoduto, G., and Adlaf, E.M. (1996). Drinking and driving among ontario high school students, 1977-1995. *Canadian Journal of Public Health*, 87, 187-188.

Wechsler, H., Davenport, A., Dowdall, G., Moeykens, B., and Castillo, S. (1994). Health and behavioral consequences of binge drinking in college. *JAMA*, 272, 1672-1677.