The Effects of Zero Tolerance Laws on Driving Fatalities

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**I. Introduction**

Nearly one million high school teenagers drank alcohol and got behind the wheel in 2011. Teenage drivers are three times more likely than more experienced drivers to be in a fatal crash and drinking even a small amount of alcohol only increases this risk for any age group. (CDC, 2012). The National Highway Systems Designation Act of 1995 was enacted to control the problem of underage drinking. This new program required states to define a .02 blood alcohol content level or lower for drivers under 21 as “driving while intoxicated.” If states did not comply by 1999, they risked losing Federal-Aid Highway Funds, so as expected, all 50 states and the District of Columbia had a zero tolerance law by July 1st, 1998 (Liang, 2008). Zero tolerance laws increase the probability of underage drunk drivers getting caught and increase the penalties when they do get caught, including sanctions such as license suspensions and fines.

 Although these zero tolerance policy for alcohol laws seem like a good solution to the problem of driving after drinking, it is important to analyze the results of these laws. Many studies have been done across the world to answer the question of the effectiveness of zero tolerance and similar laws. This paper examines how driving fatalities change before and after zero tolerance laws were enacted in 48 American states. Contrary to policy makers hopes in 1995, zero tolerance laws do not seem to decrease the fatalities while driving rates across the nation.

**II. Literature Review**

 An immense amount of research has been done on the topic of underage drinking habits, especially drinking and driving. These studies are hugely important because of the obvious significance of drinking and driving deaths around the world.

 Donald Freeman studied drunk driving legislation and traffic fatalities, corresponding specifically to blood alcohol content of .08 laws. Using state level data and correcting for autocorrelation, Freeman found no evidence that lowering BAC limits to .08 reduced fatality rates in total or in crashes likely to be alcohol related. Although alcohol related fatalities per 100,000 population was downward sloping, it only mimics the similar downward slope of total traffic fatalities between 1975 and 2004 (Freeman, 2007).

 Lan Liang and Jidong Huang approached the underage drinking and driving issue from a different angle, using surveys of college students between 1993 and 1999 of 119 schools across forty states and the District of Columbia. Their results concluded that although zero tolerance laws reduce drinking and driving in underage college students, the effects of these laws on alcohol use in general are less effective (Liang, 2008).

Darren Grant’s study titled “Dead on Arrival: Zero Tolerance Laws Don’t Work” performed a panel analysis for the years 1988 to 2000 using Fatality Analysis Reporting System’s data. Grant’s results indicate that zero tolerance laws have no material influence on the level of fatalities. He explains that although this legislation generates strong marginal disincentives against taking the first drink, the effect is much smaller after the first drink (Grant, 2010).

 Jason M. Lindo, Peter Siminski, and Oleg Yerokhin did a similar study to others, but focused their research in New South Wales, Australia where the drinking age is 18. Expecting young people to become more responsible between the ages of 18 and 21 years old, they anticipated legal access to alcohol would have more severe effects at age 18 years compared to the studies done of 21 year olds in the United States in the past. There was no evidence that legal access to alcohol had any effects on motor vehicle accidents of any type in New South Wales, despite having large effects on drinking and on hospitalizations (Lindo, 2016).

 Another study performed in Ontario, Canada by Christopher Carpenter inspected the effects of a zero tolerance policy on drinking and driving among youth. Ontario effectively set the legal BAC threshold at zero for the first few years of a youth’s driving eligibility in 1994, around the same time as most American states. Although the rates of drunk driving reported by 16 to 17 year olds who faced lower legal limits of a zero tolerance policy were about 5% lower after the law was implemented, this estimated reduction was only due to a pre-existing trend of drunk driving rates falling steadily in this age group throughout the 1980’s and 1990’s. Even after adding slightly older and slightly younger groups of people as controls in a difference-in-difference framework, there were no effects on drinking participation. These results suggest that Ontario’s new age-targeted drunk driving law was not responsible for Canadian youth road fatalities over the past two decades (Carpenter, 2006).

**III. Methodology**

Using the “Driving” dataset from Wooldridge (2013) to examine around 1,200 observations, spanning the 48 continental states of the United States of America between the years 1980 and 2004, this regression analyzes if a zero tolerance law for alcohol consumption while driving under the age of 21 impacts traffic fatalities. The table below explains each variable used in this regression, including mean, standard deviation, minimum and maximum for each variable. Two separate regressions were taken, the first using total driving fatalities per 100,000 population and the second using nighttime driving fatalities per 100,000 population as the dependent variables. Because more alcohol related driving fatalities occur in the nighttime, the effects of a zero tolerance law might have been different for that time of day. The main independent variable of interest is the zero tolerance law dummy variable. In the presence of a zero tolerance law, the dummy variable equals 1.

 Other independent variables that were used in these models are blood alcohol content limits of .08 and .10 laws, the percent of the population aged 14 through 24, the presence of both primary and secondary seatbelt laws, highway speed limits of 55 miles per hour, and per se laws that allows administrative license revocation. All of the other dependent variables, excluding percent of population between 14 and 24 years of age, are dummy variables with the presence of the given variable resulting in “1” input.

Like most policy related laws, this regression used panel data and a first-differencing process to retrieve the effectiveness of zero tolerance laws on driving fatalities. Clusters by state control for serial correlation in the data. The following equation is estimated from the panel data, where βo is the intercept, β1 is the coefficient on the change in zero tolerance, β2-β8 are the corresponding coefficients from the table, and u is the unobserved characteristics.

∆fatalityrate*it* = βo + β1∆zerotol*it* + β2∆x*it*.. β8∆x*it* + ∆u*it*

i = AL, AK, ... state, t = 1980, 1981, ..., 2004

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| --- | --- | --- | --- | --- | --- |
| **Variable**  | **Description**  | **Mean** | **Standard Deviation** | **Minimum** | **Maximum**  |
| totfatrte | total fatalities per 100,000 population | 18.9185 | 6.3674 | 6.2 | 53.32 |
| nghtfatrte | nighttime fatalities per 100,000 population | 8.7956 | 3.2834 | 2.66 | 29.6 |
| zerotol | zero tolerance law | 0.4519 | 0.4905 | 0 | 1 |
| bac08 | blood alcohol limit .08 | 0.2135 | 0.4006 | 0 | 1 |
| bac10 | blood alcohol limit .10 | 0.6231 | 0.4722 | 0 | 1 |
| perc14\_24 | percent population aged 14 through 24 | 15.3291 | 1.8772 | 11.7 | 20.3 |
| sbrpim | primary seatbelt law | 0.1792 | 0.3837 | 0 | 1 |
| sbsecon | secondary seatbelt law | 0.4683 | 0.4992 | 0 | 1 |
| sl55 | speed limit = 55 | 0.3533 | 0.4698 | 0 | 1 |
| perse | administrative license revocation, per se law  | 0.5471 | 0.4929 | 0 | 1 |

**IV. Results**

 After running both regressions, it is clear that the zero tolerance laws for drinking and driving did not have the effect on driving fatalities that was expected by policy makers in 1995. Positive coefficients on the zero tolerance variable, found in the two tables below, in both total fatalities rate and nighttime fatalities rate suggest that after the presence of a zero tolerance law, both of the fatalities rates actually increased, instead of decreased as hoped. The p-value corresponding to zero tolerance laws is only statistically significant in the total fatalities regression at the 94% level, and not very significant at all in the nighttime fatalities regression.

 Some other coefficient estimates were also insignificant on both tests, including blood alcohol content .08 and .10 laws, secondary seatbelt laws, and per se laws. Although insignificant, the coefficients on blood alcohol content .08 and .10 laws and per se laws suggest a negative relationship between the presence of these policies and fatalities rates. Surprisingly, the coefficient on secondary seatbelt laws suggest a positive relationship between them and fatalities rates in this dataset.

 Both percentage of the population aged 14 through 24 and the presence of a highway speed limit of 55 miles per hour show significant effects to total fatalities and nighttime fatalities per 100,000 population. An increase in the percent of population aged 14 through 24 results in an increase in fatalities, while the presence of the 55 miles per hour speed limit results in a lower fatalities rate. Although the primary seatbelt law dummy variable was only significant in the nighttime fatalities model, it suggests that having this law will increase the fatalities rate.

 All of the variables tested together exhibit significance, with F-statistics higher than 8 in both the total fatalities per 100,000 population and the nighttime fatalities per 100,000 population models. The R-squared values for both models are about .04, telling that these models only explain about 4% of the variation in the dataset.

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| **Total Fatalities Per 100,000 Population** |
| **Standard Error Adjusted for 48 Clusters in State** |
| **Variable**  | **Coefficient** | **Robust Std. Err.** | **T Statistic** | **P Value** |
| zerotol | 0.5776 | 0.2944 | 1.96 | 0.056 |
| bac08 | -0.3238 | 0.5351 | -0.61 | 0.548 |
| bac10 | -0.6956 | 0.4009 | -1.73 | 0.089 |
| perc14\_24 | 1.2351 | 0.2411 | 5.12 | 0 |
| sbrpim | 0.4936 | 0.4314 | 1.14 | 0.258 |
| sbsecon | 0.219 | 0.3029 | 0.72 | 0.437 |
| sl55 | -1.0577 | 0.3124 | -3.39 | 0.001 |
| perse | -0.3447 | 0.4463 | -0.77 | 0.444 |
| constant | -0.1921 | 0.0522 | -3.68 | 0.001 |
|  | Number of Observations:  | 1152 |  |
|  | F Statistic:  |  | 8.53 |  |
|  | R-Squared |  | 0.0403 |  |

\*Highlighted are the values that are statistically significant at the 94% level.

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| **Nighttime Fatalities Per 100,000 Population** |
| **Standard Error Adjusted for 48 Clusters in State** |
| **Variable**  | **Coefficient** | **Robust Std. Err.** | **T Statistic** | **P Value** |
| zerotol | 0.0871 | 0.1596 | 0.55 | 0.588 |
| bac08 | -0.3955 | 0.3769 | -1.05 | 0.299 |
| bac10 | -0.5739 | 0.3148 | -1.82 | 0.075 |
| perc14\_24 | 0.8922 | 0.1514 | 5.89 | 0 |
| sbrpim | 0.5999 | 0.2484 | 2.42 | 0.02 |
| sbsecon | 0.1847 | 0.1839 | 1 | 0.32 |
| sl55 | -0.5147 | 0.2243 | -2.29 | 0.026 |
| perse | -0.3038 | 0.2657 | -1.14 | 0.259 |
| constant | -0.1224 | 0.0301 | -4.07 | 0 |
|  | Number of Observations:  | 1152 |  |
|  | F Statistic:  |  | 9.74 |  |
|  | R-Squared |  | 0.0492 |  |

\*Highlighted are the values that are statistically significant at the 94% level.

**V. Conclusion**

 Although these results mirror the results of similar studies, that zero tolerance laws do not have much of an effect on fatalities rates, this regression is far from perfect. The data used accounts for all driving fatalities, not only those related to underage drunk driving. Unfortunately, many states collect data on alcohol related fatalities differently, with some not requiring a blood alcohol test if the driver died in an accident. Other variables need to be considered in this model, including the percent of the population who drives (opposed to using public transportation or walking) and the presence of other policies and organizations who could have effected drunk driving in this time period.

 After reviewing research from Ontario, New South Wales, multiple studies from the United States, and running regressions using the Wooldridge dataset, the zero tolerance laws seem to have little to no effect on driving fatalities. It is often argued that laws such as zero tolerance unfairly penalize moderate drinkers who are unlikely to cause crashes, while doing nothing to deter heavily intoxicated drivers who pose the more serious risk to themselves and others. Other legislation, like the 55 mile per hour speed limit, tend to be more effective in reducing driving fatalities. Drunk driving is the cause of many deaths and the issue should be recognized with legislation, yet the idea of zero tolerance does not seem to fix this problem.

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