The true effect of MLDA reform: An analysis of the mortality displacement in youth traffic accidents caused by the drinking age reform of the 1980s.

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Abstract

In this paper I will examine the effects on mortality due to motor vehicle accidents among those 18 to 24 years old caused by exposure to a Minimum Legal Drinking Age of less than 21. Previous research has established that an MLDA under 21 increases mortality among teens. However, there is a question whether the heightened mortality among teens represents mortality displaced from the early teens. If an MLDA of 21 delays entrance into drinking, mortality may simply be shifted from the teen years to the early 20s. In my analysis I use a fixed effect model to illustrate that between 1972 and 1994, exposure to a MLDA of 18 years led to an increase in mortality among teens but a 2.7% decrease in mortality amongst the those aged 18-24, a result suggesting significant mortality displacement. The results indicate that a lower MLDA reduces mortality among males but has no impact on female deaths. This evidence is consistent with the 'experienced drinker hypothesis'.

Introduction

The Minimum Legal Drinking Age (MLDA) has long been a topic of heated debate. After the end of prohibition most states implemented a MLDA of 21; however 29 states lowered their MLDAs in the early 1970s. The effects on youth drinking and mortality caused by an MLDA of less than 21 have been widely studied. The two areas of focus surround increases in the amount of alcohol consumed by youths and the effects on youth mortality caused by a MLDA of less than 21. In his paper "State alcohol policies, teen drinking and traffic fatalities" Thomas S. Dee found that "exposure to a minimum legal drinking age of 18 increased the prevalence of heavy teen drinking by 3.1 percentage points." The increased mortality in 18 to 20 years olds can be found in the 1990 paper of Peter Asch and David T. Levy, as well as in Asch et al., 1987; Cucchiaro et al., 1974; Douglas et al., 1974; Wagenaar, 1983, 1993; Whitehead, 1977; Whitehead et al., 1975; and Williams et al, 1974. This increase in mortality will also be shown in the data used in this paper with those 18 to 24 exposed to a MLDA of 18 having an increase in mortality of 1.97%. According to the CDC, motor vehicle crashes are the leading cause of death for U.S. teens, accounting for more than a third of deaths in this group. In 2006 35% of all deaths for those 16 to 20 were caused by motor vehicle accidents and 27% of those aged 21 to 24, according to the National Center for Health Statistics. Because of the young age of these deaths motor vehicle accidents were the third leading cause of life years lost in 2003, ranking behind only cancer and heart disease. Life years lost is the number of years the person was expected to live had they not died.

In the early 1980s, Mothers Against Drunk Driving (MADD) led an aggressive campaign to reduce drunk driving. Part of the campaign was directed at changing behavior, but much of their efforts were directed at changing state and federal laws concerning drinking and driving. One noted success in this campaign was the passage of The National Minimum Drinking Age Act of 1984, which required States to adopt a MLDA of 21 years or to forfeit 10% of their federal highway funds. The proponents of the bill used the increase in mortality among 18 to 20 year old persons exposed to a MLDA of 18 years compared with that of an MLDA of 21 years, as evidence to raise the national MLDA to 21 years.

However, the decrease in mortality may not be the only effect of raising the MLDA. When Carpenter and Dobkin analyzed the effect of the MLDA on mortality from 1997 to 2004 they found a statistically significant 9% increase in mortality during the first year of exposure to a MLDA of 21. A similar result was found by Michael Males in his paper "The Minimum Purchase Age for Alcohol and Young-Driver Fatal Crashes: A Long-Term View" where he showed increased mortality in the first year of legal drinking for MLDAs of 18, 19, 20 and 21. This increase in mortality in the years following the legal onset of drinking may show that the decreased mortality in 18 to 20 year old persons may be a mortality displacement rather than a reduction. Is mortality in youths reduced by a MLDA of 21 or is the mortality being delayed three years? To test if this was in fact the case mortality rates from those aged 18 to 24 must be evaluated to examine the true effect of raising the MLDA on youth mortality.

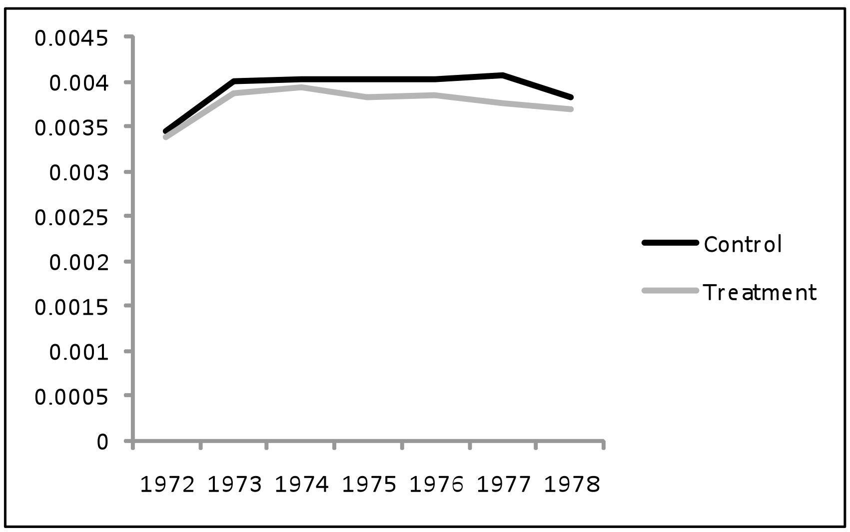
When the data is examined including young people up to age 24 years, a better analysis of the effect of the law can be achieved. Asch and Levy developed the idea of the 'experienced drinker'. Their theory suggests that young adults learn how to drink by experiencing the way alcohol affects their bodies, and by allowing 18 year old persons to drink they can gain this knowledge early in their development, especially early in their driving experience. Assuming an average age of 16 when people receive their driver's license, exposure to a MLDA of 21 increases the years of driving experience from 2, under a MLDA of 18, to 5 before an individual is legally exposed to alcohol. The experienced drinker theory proposes that with years of experience, young people become more comfortable and confident in their driving, when they are exposed to legal drinking they may be more likely to drive while impaired since they are overconfident in their driving skill level, but unfamiliar with the effects of alcohol on their bodies and judgment. The theory would suggest that a MLDA of 18 would not increase mortality in youths but rather allow them to gain experience drinking and be more knowledgeable about how alcohol will affect their bodies than their counterparts that were exposed to a MLDA of 21, possibly reducing their mortality.

Empirical Analysis

Data

I employed a type of difference-in-difference model called a fixed effects model to examine the outcomes of exposure to a MLDA of 18 on traffic fatality rates. A difference-in-difference model measures the result of treatment in a given time period. It does this by comparing the effect of a treatment on a group before and after the event to those of a similar group who did not receive the treatment, the control group, before and after the event. This allows for the control of general trends common to both groups. An important aspect of a difference-in-difference model is that the trends of the treatment and control groups are similar before the treatment occurs. This allows for the true effect of the treatment to be analyzed. If the trends are different prior to the treatment, the resulting estimates will be skewed. The differences in trend will be mistaken for effects of the treatment. Note that it is not important what the absolute levels of the two groups are, but only that the trends prior to treatment are similar. Relating to the model employed in this paper, the difference-in-difference process eliminates the bias that could be present across all states due to things like increased information in the media about the dangers of drunk driving, that could reduce mortality in all states in a given year. Figure 1 displays a graph of the trends in mortality for the treatment and control groups leading up to the first reform in 1978. It shows that the trends in these two samples for this period are similar.

Figure 1. Pre-Treatment Trends in mortality



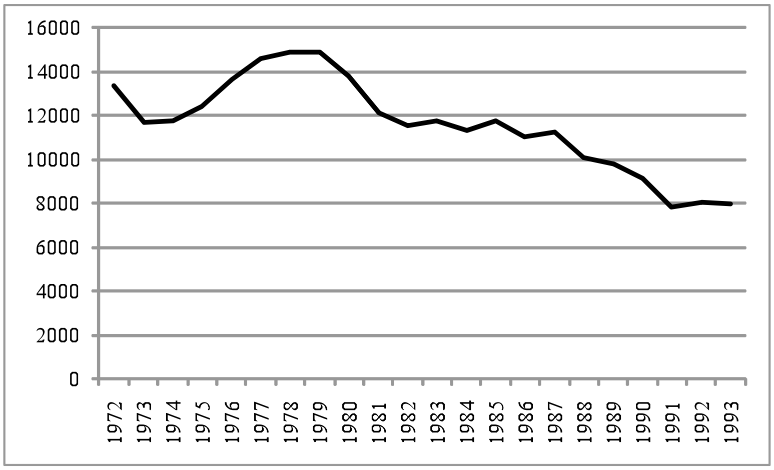
The basic difference-in-difference model can be represented in a square diagram where the changes in the treatment effect are compared to the changes in the control sample. An example of this can be found in Table 2 that shows what a difference-in-difference model including only Alabama, as the treatment state, and Arkansas, as the control state, before and after the reform in 1985 in Alabama, would look like. In this model the mortality rate in Alabama after the reform would be subtracted from the mortality rate in Alabama before the reform was enacted to arrive at the change in Alabama that occurred during the reform, or the change in the treatment group. The mortality rate in Arkansas after the 1985 reform in Alabama would be subtracted from the mortality rate in Arkansas before the reform of 1985 to arrive at the change in Arkansas that occurred during the reform, or the change in the control group. The change in the control group must then be subtracted from the change in treatment group to find the true effect on the treatment group, eliminating any time series trend in the data common to both groups. The model in this paper is a more complex form of a difference-in-difference model that compares all 17 states in the treatment and 12 control states at once.

Table 2. Example Difference in Difference Model

	Before Change	After Change	
Treatment Group	Alabama before 1985	Alabama after 1985	Δ in treatment = Alabama after - Alabama before
Control Group	Arkansas before 1985	Arkansas after 1985	Δ in control = Arkansas after - Arkansas before
			Δ in treatment - Δ in control = ΔΔ = effect of treatment

A fixed effect model controls for trends among all states over time as well as heterogeneities among states. This trend among all states over time is different from the time series control of the general difference-in-difference model. The general model eliminates immediate trends before and after the treatment, while the fixed effects model controls for trends across the 23 years of data analyzed. For example the mortality rates of the 1970's are much higher than those of the 1990's. This can be seen in figure 3, a graph of total fatalities caused by motor vehicle accidents in those 18-24 by year. The year effect allows for results from early in the sample, when mortality rates were higher, to be accurately compared to results from later in the sample, when overall mortality rates had fallen.

Figure 3. Total Death of those 18-24 caused by motor vehicle accidents



The model contains 29 states, 17 states where the 'exposure' was a change in MLDA from 18 to 21 between 1978 and 1988, and 12 states that had no change ('control' group) throughout this period. The remaining 21 states were excluded from the sample as they had intermittent changes in MLDA during the period. The states included are shown in table 4 along with the years when the state adopted an MLDA of 21:

Table 4. States included in the Model

Treatment States

State	Year MLDA becomes 21
Alabama	1985
Alaska	1984
Arizona	1985
Colorado	1987
Delaware	1984
Hawaii	1986
Idaho	1987
Illinois	1980
Kansas	1985
Louisiana	1987
Maryland	1982
Massachusetts	1982
Michigan	1978
Mississippi	1986
Oklahoma	1985
Vermont	1986
Wyoming	1988

Control States

State	Year MLDA becomes 21
Arkansas	1935
California	1933
Indiana	1934
Kentucky	1938
Missouri	1945
Nevada	1935
New Mexico	1934
North Dakota	1936
Oregon	1933
Pennsylvania	1935
Utah	1935
Washington	1934

When a state raises its MLDA from 18 to 21, those that were already allowed to drink but are younger than the current MLDA are “grandfathered” in meaning that states never eliminate a cohort’s ability to purchase alcohol. This distinction allows me to clearly identify cohorts exposed to different MLDA environments. Figure 2 uses a period/cohort diagram to demonsrate how MLDA law changes impact various cohorts. Birth cohorts are defined along the verticle axis and calender years are portrayed along the horizontal axis. Data elements are the age that a cohort turns in the year. In this figure we consider cohorts exposed to a low MLDA for a state that raises its MLDA to 21 in 1985. The light grey area represents the years of exposure to a MLDA of less than 21 while the darker area represents years exposd to an MLDA of 21. Notice that those born in 1966 turn 18 in 1984 and this cohort begins drinking legally that year. However, the next year the MLDA is raised to 21 but because these cohorts already had been legal drinkers, they maintain their drinking status. Because of the law change, those born in 1967 are not legally allowed to drink until 1988. The key result from the table is that those born in 1966 and before have 6 years worth of exposure to legal drinking by age 24 while those born in 1967 and on have 3 years worth of legal drinking by age 24.

Figure 5. Example Cohort Table for State that changed to MLDA of 21 in 1985

	Year															
Cohort	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	Years exposure to legal drinking	Teen years exposure to MLDA <21
1961	18	19	20	21	22	23									6	3
1962	17	18	19	20	21	22	23								6	3
1963	16	17	18	19	20	21	22	23							6	3
1964	15	16	17	18	19	20	21	22	23						6	3
1965	14	15	16	17	18	19	20	21	22	23					6	3
1966	13	14	15	16	17	18	19	20	21	22	23				6	3
1967	12	13	14	15	16	17	18	19	20	21	22	23			3	0
1968	11	12	13	14	15	16	17	18	19	20	21	22	23		3	0
1969	10	11	12	13	14	15	16	17	18	19	20	21	22	23	3	0

Can drink this year due to MLDA < 21
Can drink this year in any state

The mortality data was collected from the National Center for Health Statistics' Multiple Cause-of-Death Mortality Data from the National Vital Statistics System for the years 1972 to 1994. The dataset consists of a census of all deaths in the United States by individual observation. Individual states collect the data, and then file it with the Center for Disease Control (CDC) who compiles and produces the data. Each observation contains information on year of death, month of death, city and county of death, age, sex, race, county and state of residence and cause of death by International Statistical Classification of Diseases and Related Health Problems (ICD) code given by the World Health Organization (WHO). The data set is available for public use and was downloaded from the National Bureau of Economic Research (NBER) website (http://www.NBER.org). The data collected included six years of data before the first MLDA reform, (Michigan, 1978), and six years after the last reform went into effect, (Wyoming, 1988), allowing for those individuals who turned 24 in 1978 to be included from the time they turned 18, as well as including those who turned 18 in 1988 to be followed through the age of 24. Deaths coded under the ICD code for motor vehicle accidents were included in the dataset. Individual observations were then summed into cohorts by state of residence at death and year of birth. Ideally cohorts would have been totaled by state of birth; however this information was not available in the pre 1980 period. Therefore state of residence was used. These totals were kept for total deaths as well as male and female figures for later calculation into mortality rates.

In order to generate mortality figures, we need to divide mortality counts by the population in a state as the cohort turns 18. This population data was obtained from the Census website. (http://www.census.gov/popest/archives/) Populations of 18 year old persons from the states of residence were collected over the time period. This was used instead of births in the state during the cohort birth year as deaths were totaled by state of residence at the time of death, therefore the population of 18 year olds in the state at the time it turned 18 was a better proxy as we know the individuals were residents of the state at the time of their death between ages 18 and 24. This data was then used for that cohort through the age of 24 in order to estimate mortality rates. Gender information was only available in the post 1980 period; therefore state averages were created for gender distributions from 1980 to 1994. These averages were then applied to the total population for the entire sample to create gender specific populations for each cohort. This was not an ideal approximation but was preferred to maintain consistency throughout the model, and did not affect the results of the full population model.

The population data was then merged with the mortality data to allow for mortality rates to be calculated. Morality was defined as deaths per 100,000 persons that were in a cohort at the time it turned 18. This was calculated by dividing the number of deaths in a cohort in a year by the population of that cohort in the year that it turned 18. The same process was then used for the male and female figures as well. The natural log of these variables was then created for use in the later regressions.

The dummy variable of interest, whether a given cohort was exposed to a MLDA less that 21, was then created. It was given a value of 1 if the cohort was in a state that experienced reform during the sample, and that reform had not yet occurred. Otherwise the value was set to 0. This concluded the completion of the dataset.

Table 3 displays descriptive statistics for each variable used. The data follows cohorts from 29 states over 23 years, totaling 667 observations. 32% of all cohorts were exposed to a MLDA of less than 21, totaling 216 of the 667 observations. The mortality rate ranged from 76 deaths per 100,000 persons born in North Dakota in 1975 to 831 deaths per 100,000 persons born in Wyoming in 1955. Total deaths per cohort also saw a wide range from 7 in North Dakota born in 1975 to 1,556 for the cohort born in California in 1959. The deaths were overwhelmingly male, 77% of all deaths, with both the average mortality rate and maximum mortality rate three times higher for males than their female counterparts.

Table 6. Description of Dataset

Data	Observations	Mean	Standard Deviation	Minimum	Maximum
Year turned 18	667	1983.00	6.64	1972	1994
State of Residence at 18	667	22.55	14.80	1	51
Total deaths of Cohort	667	205.44	239.63	7	1,556
Male deaths of Cohort	667	158.75	189.92	4	1,245
Female deaths of Cohort	667	46.70	50.48	1	352
Population of 18 year olds in State of Residence when turned 18	667	70,485	81,925	6,221	449,443
Proportion of Population Females in Cohort	667	0.49	0.01	0.47	0.51
Population of 18 year old Females in State of Residence when turned 18	667	34,416.72	39,207.92	2,942	212,618
Proportion of Population Males in Cohort	667	0.51	0.01	0.49	0.53
Population of 18 year old Males in State of Residence when turned 18	667	36,068.08	42,744.28	3,279	236,825
Exposed to a MLDA less than 21	667	0.32	0.47	0	1
Total deaths per 100,000 persons 18 in State of Residence at 18	667	320.8000	106.0460	76.0704	831.3372
Male deaths per 100,000 persons 18 in State of Residence at 18	667	481.2003	165.5100	86.5154	1,402.9480
Female deaths per 100,000 persons 18 in State of Residence at 18	667	154.0465	60.6773	13.8672	443.3716
Natural Log of Total Deaths per 100,000 persons 18 in State of Residence at 18	667	5.7211	0.3152	4.3317	6.7230
Natural Log of Male Deaths per 100,000 persons 18 in State of Residence at 18	667	6.1224	0.3296	4.4603	7.2463
Natural Log of Female Deaths per 100,000 persons 18 in State of Residence at 18	667	4.9616	0.3994	2.6295	6.0944

Model

The fixed effect model employed examines the effect on mortality by cohort due to motor vehicle accidents in persons 18 to 24 caused by exposure to a MLDA less than 21. The model is a difference-in-difference specification that evaluates the effect of treatment by comparing the changes in the treatment group to those that occurred during the same time in the control group. The estimating equation is shown in model 1.

(1) $LnMort_{s,y} = \beta_0 + \beta_1 * Exp_{s,y} + \mu_s + \nu_y + \varepsilon_{s,y}$

Where:

LnMort	is the natural log of deaths per 100,000 persons in a cohort when it turned 18	
Exp	is the dummy variable reflecting whether a cohort was exposed to a MLDA less than 21	
μ	is the state specific effect	
ν	is the year specific effect	
ε	is the error term	
s	= 1…51	(state of residence)
y	= 1972…1994	(year cohort turned 18)

The dependent variable is the natural log of deaths caused by motor vehicle accidents in a cohort per 100,000 persons in that cohort when it turned 18. Ideally motor vehicle accidents would be replaced by motor vehicle accidents that involved alcohol; however there is no reliable data on alcohol related motor vehicle deaths available over this time period. According to the National Institute of Health in the mid 1970's over alcohol was a factor in 60% of all fatal accidents and over two thirds of traffic fatalities among 16 to 20 year olds, therefore motor vehicle fatalities is a good proxy for alcohol related motor vehicle fatalities during this period. The model includes controls for year fixed effects (ν_y) and state fixed effects (μ_s). The state effects control for permanent differences between states in their underlying traffic fatality rate. For example Utah has low mortality rate, an average of only 263 deaths per 100,000 persons during the period, because of the historically low amount of drinking in the state; while Wyoming has a consistently high mortality rate with an average of 539 deaths per 100,000 persons, possibly due to the long distances in between destinations in the state. The year effect controls for any variation that is common to all states but that varies over time to be removed from the results, allowing for the effect of the exposure to a MLDA of less than 21 to be isolated. An example of an effect that would be seen across all states would be public push to limit drunk driving in the 1980s that caused a large drop in drunken driving deaths in the late 80s and early 90s. This can be seen in figure 3, the graph of total deaths by motor vehicle accidents among those 18-24 across all states. Using year fixed effects allows for changes in mortality from the beginning of the sample, where overall mortality was high, to be compared to changes in mortality from the end of the sample where overall mortality had significantly decreased. The coefficient of interest is β_1, on the covariate $Exp_{s,y}$, the dummy variable that identifies whether a cohort was exposed to a MLDA of less than 21.

The populations of the states in the sample had a large range; therefore equally weighting each cohort would bias the data, over emphasizing results of smaller states and reducing the effect of larger sample states. For this reason analytic weights were used in the regression. The results were scaled by population of 18 year old persons at the time the cohort turned 18. Using analytic weights creates a model that would resemble equation 2:

(2) $LnMort_{s,y,t}*\sqrt{(\rho_{s,y})} = \beta_0*\sqrt{(\rho_{s,y})} + \beta_1*Exp_{s,y}*\sqrt{(\rho_{s,y})} + \mu_s*\sqrt{(\rho_{s,y})} + \nu_t*\sqrt{(\rho_{s,y})} + \varepsilon_{s,y,t}*\sqrt{(\rho_{s,y})}$

Where: ρ is the population of 18 year old persons in a cohort when it turned 18.

Analytic weights are weights that are inversely proportional to the variance of an observation. This allows for the states with larger populations to be more heavily weighted. This is important as states with larger sample sizes will have less noise in the data. Smaller states variances are more volatile as they are drawing from a smaller sample. Analytic weights help to address this problem as well.

The model will be run 9 times with the same structure but with different selections of the data. There are 3 groups of people, the full population, males, and females; as well as 3 age groups, 18 to 20, 21 to 24, and the full 18 to 24. The three groups of people are to show the effects on the total population, as well as the effect on each gender**,** specifically. Historically males are more aggressive drivers and therefore have significantly higher mortality rates. The increased mortality among male drivers can be seen in the sample data as the average male mortality rate is over three times larger than females, as well as in Asch and Levy's paper Does the Minimum Drinking Age Affect Traffic Fatalities?" where they found the coefficient on male drivers to be positive with respect to mortality in all samples analyzed. The breakdown by gender not only demonstrates the differences between the genders, but the higher mortality rates in males will allow for more variation in the data to be analyzed, due to the increased sample size, allowing for more statistically significant results. Breaking the results down by gender allows for comparison as well as the identification of the driving forces behind the full population results.

The breakdown of the three age groups allows for further analysis of the results of the full sample, comparing the results of the 18-20 year old sample to that of the 21-24 year old sample will help to analyze how these groups drive the 18-24 year old results.

Results

Most of the variation on mortality was picked up in the state and year effects as can be seen by comparing the R^2 and adjusted R^2 in Tables 7 & 8. Table 7 represents a traditional difference-in-difference model that does not used fixed effects, while table 8 has the fixed effects results. The change in R^2 and adjusted R^2 in this model show how much of the variation in mortality was caused by trends in states and time. Although there was a great increase in R^2 in the fixed effect model, the fixed effects lowered the confidence levels on the coefficients significantly.

Table 7. Non-Fixed effects Difference-in-Difference model

Non-Fixed Effects	18-20	21-24	18-24
R^2	0.0444	0.0614	0.0756
Adj R^2	0.0430	0.0600	0.0742
Exposure to MLDA under 21	0.1403	0.2669	0.1851
Standard Error	(0.0252)	(0.0405)	(0.0251)
T Statistic	5.5606	6.5939	7.3763

Table 8 presents the results of the 9 fixed effects models. In all three populations the traditional belief that a MLDA of 18 increases mortality in those 18 to 20 years old holds true. This supports the findings of Levy et al., 1990; Cucchiaro et al., 1974; Douglas et al., 1974; Wagenaar, 1983, 1993; Whitehead, 1977; Whitehead et al., 1975; and Williams et al, 1974. However the interesting result is that exposure to an MLDA of 18 years decreases mortality in all three populations for those 21 to 24 and that this result causes overall mortality for 18 to 24 years old persons to decrease due to exposure to a MLDA of 18. This result supports the idea by Peter Asch and David T. Levy in their paper "Young Driver Fatalities: The Roles of Drinking Age and Drinking Experience" that drinking experience plays an important role in traffic fatalities.

Table 8. Fixed Effect Results

Full Population Model		18-20	21-24	18-24
	R^2	0.7247	0.8432	0.8161
	Adj R^2	0.7019	0.8301	0.8009
	Exposure to MLDA under 21	0.0197	-0.0645	-0.0272
	Standard Error	(0.0199)	(0.0251)	(0.0175)
	T Statistic	0.9921	2.5684	1.5520
Male Only				
	R^2	0.6957	0.7972	0.8026
	Adj R^2	0.6705	0.7804	0.7862
	Exposure to MLDA under 21	0.0228	-0.0737	-0.0306
	Standard Error	(0.0219)	(0.0301)	(0.0188)
	T Statistic	1.0372	2.4522	1.6252
Female Only				
	R^2	0.4653	0.6373	0.6427
	Adj R^2	0.4209	0.6073	0.6130
	Exposure to MLDA under 21	0.0106	-0.0299	-0.0128
	Standard Error	(0.0362)	(0.0442)	(0.0270)
	T Statistic	0.2913	0.6759	0.4750

The coefficient on exposure to a MLDA of less than 21 reflects a percent change in mortality. The final result of interest is the coefficient for the full population including observations for 18 to 24 year old persons. This figure, -0.0272, reflects a 2.72% decrease in mortality due to motor vehicle related accidents in those 18 to 24 who were exposed to a MLDA of 18 compared to a similar group that are exposed to a MLDA of 21. The results for the male specific model were even more pronounced with a 3.06% drop in mortality for those 18 to 24 year old persons exposed to a MLDA of 18.

The gender specific models show that males drive up the mortality of the total population and that females have no statistically significant impact. In all three age groups it holds that males are driving up the results while females are putting downward pressure on the results of the full population. However none of the female only results are statistically significant. This result could be expected from the limited magnitude and variance of the female mortality data seen in Table 6. The mean of female deaths is less than a third that of males, with the maximum figure less than 30% of the maximum male figure.

All of the coefficients in the 18 to 20 year range are positive, indicating an increase in mortality due to exposure to a MLDA of 18, as was expected, however they all fail to be significant at desirable levels. The full population coefficient on 18 to 20 year old persons is only significant at a 68% confidence level, while the male coefficient is significant at a 70% confidence level. The coefficients for the 21-24 year old population are both negative, indicating a decrease in mortality due to exposure to a MLDA of 18, and significant at the 98 and 99% confidence intervals for the full and male populations respectively. This result suggests mortality displacement caused by a MLDA of 21. The coefficients on the full model were also negative and were significant at the 88 and 89% confidence intervals for the full and male populations respectively. This negative coefficient suggests that an MLDA of 18 actually reduces mortality for those 18 to 21, despite the increased mortality in those 18 to 20 due to the mortality displacement in 21 to 24 year old persons. Ideally the results for the full 18 to 24 year old range would have been significant at the 95% confidence interval, however with the high R^2 values the relatively high confidence intervals for these coefficients were encouraging.

Conclusions

The results of this analysis infer that raising the drinking age from 18 to 21 not only displaces mortality from the 18 to 20 to the 21 to 24 year old time period, but increases mortality caused by motor vehicle accidents in persons 18 to 24 years old. This result is consistent with the experienced drinker hypothesis. I believe these results show that when exposed to a MLDA of 18 teens are able to gain experience drinking, better learning the effects of alcohol on their bodies, while those that are subject to an MLDA of 21 first become experienced drivers before they are able to legally drink alcohol, gaining confidence in their driving abilities. Then when they are then exposed to the MLDA they are less educated as to how their bodies will respond to alcohol. This paired with their confidence in their driving abilities can cause them to attempt to drive when they would have known better had they gained the experience privy to those who were exposed to a MLDA of 18.

These results would suggest that a change in the MLDA from 21 to 18 years would decrease mortality among 18 to 24 year old persons by 2.7% and among males by 3.1%, ceteris paribus. This shows that the bump in mortality at age 18, when exposed to a MLDA of 18, that was used as the major motivation for raising the MLDA in the 1980's, is more than offset when mortality of 18 to 24 year old persons is included. A possible explanation for this is the experienced drinker hypothesis developed by Asch and Levy.

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