

# Gasoline Prices and Their Relationship to Drunk-driving Crashes

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## Introduction

In 2008, there were more than 300,000 alcohol-related automobile crashes in the United States (NHTSA, 2009). While drunk-driving crashes have declined substantially over the past three decades, drunk driving is still a serious problem and the leading cause of deaths on highways (Dang, 2008; NHTSA, 2009). Alcohol consumption has been found to explain much of the variation in drunk-driving crashes (Berger and Snortum, 1986; Young and Bielinska-Kwapisz, 2006), but drunk-driving crashes may also be affected by gasoline price changes. Gasoline prices are found to affect automobile crashes negatively in general—higher gasoline prices lead to fewer traffic crashes (e.g., Grabowski and Morrissey, 2004a, 2006b; Leigh and Geraghty, 2008; Leigh et al., 1991; Wilson et al., 2009). However, to our best knowledge, no studies have investigated gasoline price effects on drunk-driving crashes. This study attempts to fill the gap in the literature by examining the effects of gasoline prices on drunk-driving crashes (fatal, injury, and property damage only) by age, gender, and race.

## Data

The Mississippi Highway Patrol provided data on drunk-driving crashes and all crashes (both by fatal, injury, and PDO categories) by age, gender, and race in Mississippi at the monthly level from April 2004 to December 2008. Monthly per-gallon prices for regular-grade unleaded gasoline are from the U.S. Department of Energy's Energy Information Administration. We also included several variables as controls in our analysis and they are alcohol consumption (from the Beer Institute), unemployment rate (from the U.S. Bureau of Labor Statistics), and seat belt usage (from an annual roadside survey of Mississippi drivers conducted by Mississippi State University).

## Methods

This study has 56 crash measures: 28 for drunk-driving crashes and 28 for all crashes. Each set is composed of all crash types (fatal, injury, PDO, and total) by all demographic groups (young, adult, male, female, white, black, and total). Each crash measure is modeled as a function of gasoline prices, alcohol consumption, unemployment rate, and seat belt usage.

Our analysis suggests that 52 of the 56 crash measures exhibit over-dispersion. Thus, negative binomial rather than Poisson regression models are used for all crash measures. In addition, populations of young, adult, male, female, white, black, and total residents are used as exposure variables in corresponding regression models.

## Results

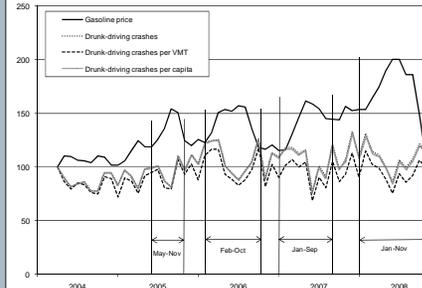
An exploratory visualization with graphs shows that higher gasoline prices are generally associated with fewer drunk-driving crashes. Higher gasoline prices depress drunk-driving crashes among young and adult drivers, among male and female drivers, and among white and black drivers. Results from negative binomial regression models show that when gas prices are higher, there are fewer drunk-driving crashes, particularly among PDO crashes. When alcohol consumption levels are higher, there are more drunk-driving crashes, particularly fatal and injury crashes. The effects of gasoline prices and alcohol consumption are stronger on drunk-driving crashes than on all crashes. The findings do not vary much across different demographic groups. Overall, gasoline prices have greater effects on less severe crashes and alcohol consumption has greater effects on more severe crashes.

**Table 1** Elasticities of crashes per capita with respect to gasoline prices and alcohol consumption, April 2004–December 2008, Mississippi

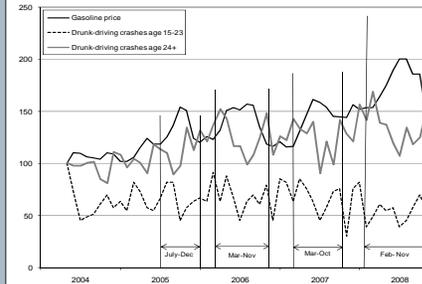
	Drunk-driving crashes				All crashes			
	Fatal	Injury	PDO	Total	Fatal	Injury	PDO	Total
<b>Total</b>								
Gasoline price			-0.309	-0.305				-0.311
Alcohol consumption	16.112	12.037		7.545	13.204	9.202	2.015	13.305
<b>Young (age 15–21)</b>								
Gasoline price				-0.325				-0.190
Alcohol consumption				9.732	9.115	7.898	1.396	3.175
<b>Adult (age 24+)</b>								
Gasoline price			-0.291	-0.182				-0.216
Alcohol consumption	20.416	15.495		7.117	14.553	9.805	2.190	4.241
<b>Male</b>								
Gasoline price			-0.270					-0.187
Alcohol consumption	21.364	10.228		5.920	14.207	9.296	2.005	3.989
<b>Female</b>								
Gasoline price				-0.393				-0.234
Alcohol consumption	50.604	34.068		11.957	10.272	9.250	1.980	3.925
<b>White</b>								
Gasoline price			-0.348	-0.231				-0.226
Alcohol consumption	27.074	16.500		9.138	15.499	10.169	2.999	4.704
<b>Black</b>								
Gasoline price			-0.509	-0.463				-0.169
Alcohol consumption	29.450	15.252		3.725	14.114	8.150		1.898

Note: the elasticities are calculated using the studied period's averages of \$2.60 for gasoline prices and 27.18 gallons for alcohol consumption.

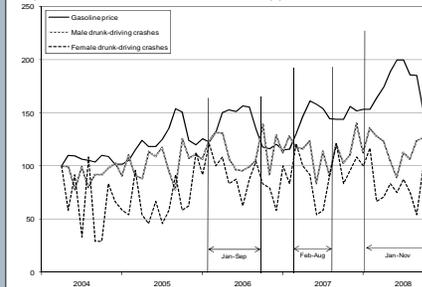
**Figure 1** Gasoline prices and drunk-driving crashes, April 2004–December 2008, Mississippi



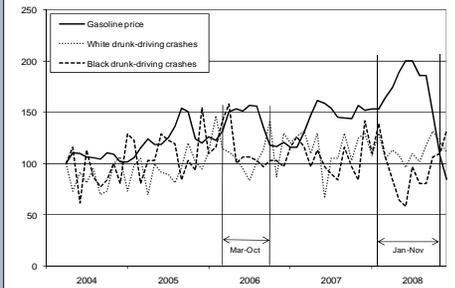
**Figure 2** Gasoline prices and drunk-driving crashes by age, April 2004–December 2008, Mississippi



**Figure 3** Gasoline prices and drunk-driving crashes by gender, April 2004–December 2008, Mississippi



**Figure 4** Gasoline prices and drunk-driving crashes by race, April 2004–December 2008, Mississippi



## Discussion

For drunk-driving crashes, gasoline prices have effects on PDO crashes but not on fatal and injury crashes. The fact that gasoline prices have greater effects on less severe crashes may be because higher gasoline prices are more likely to deter lighter drinkers from drunk driving. In contrast, higher gasoline prices are less likely to deter heavier drinkers from drunk driving, as heavier drinkers are less likely to change driving behaviors due to gasoline price changes and may even drink more in response to economic stress.

The results of this study are limited by the small number of observations (only 57 months). Future research could use a longer time period covering both economic growth and recession. Also, this study is focused on only Mississippi, a rural southern state in the U.S. Future research could examine other geographic areas, such as northern or western states or metropolitan areas. Doing so would provide a more comprehensive understanding of gasoline price effects on drunk-driving crashes.

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## Notes

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