

January 2009 PE 08-17-441

# Special Report

# WEST VIRGINIA'S NEW DRIVER'S LICENSE VISION REQUIREMENTS

# AUDIT OVERVIEW

Driver's License Renewal Vision Screening Requirements in Relation to Automobile Crash Fatality Rates



WEST VIRGINIA LEGISLATIVE AUDITOR PERFORMANCE EVALUATION & RESEARCH DIVISION

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John Sylvia Director

January 13, 2009

The Honorable Edwin J. Bowman State Senate 129 West Circle Drive Weirton, West Virginia 26062

The Honorable Jim Morgan House of Delegates Building 1, Room E-213 1900 Kanawha Boulevard, East Charleston, West Virginia 25305-0470

Dear Chairs:

We are transmitting a Special Report of the West Virginia's New Driver's License Vision Requirements, which will be presented to the Joint Committee on Government Operations and Joint Committee on Government Organization on Tuesday, January 13, 2009. The issue covered herein is "Driver's License Renewal Vision Screening Requirements in Relation to Automobile Crash Fatality Rates."

Let me know if you have any questions.

John Lylvia John Sylvia

JS/tlc

Joint Committee on Government and Finance

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# **OBJECTIVE, SCOPE AND METHODOLOGY**

### Objective

The 2008 West Virginia Legislature passed House Bill 4069, which requires vision screening at all driver's license renewals. Following the passage of this legislation, the Legislative Auditor's Office, Performance Evaluation and Research Division, was asked to review the vision requirements for driver's licenses in all states and the District of Columbia. The objective of this review is to evaluate the different requirements states have in place and how these requirements may affect the incidence of vehicle crash fatalities as reported by the U.S. Department of Transportation, Federal Highway Administration.

### Scope

The scope of this review is current driver's license vision renewal requirements in all states and the District of Columbia and vehicle crash fatality rates for 2004 through 2006.

### Methodology

Vision screening requirements by state were obtained through a research report conducted by the state of Connecticut's Office of Legislative Research. PERD tested this information for accuracy by reviewing the web sites of various state departments of motor vehicles. PERD conducted two types of statistical analyses in order to determine the impact of vision screening requirements for driver's license renewal on vehicle crash fatality rates. The first was a correlation analysis to determine the correlation between vision screening requirements and crash fatality rates. The second statistical test was a two-sample t-test to determine whether a statistically significant difference of means exists between crash fatality rates in states with the least and most stringent vision screening requirements.

# RESEARCH REPORT

### Recent Changes in West Virginia Driver's License Renewal Vision Screening Requirements May Lower Automobile Crash Fatality Rates.

### Overview

On March 5, 2008, the West Virginia Legislature passed House Bill 4069, which amended WVC §17B-2-12 to require applicants for renewal driver's licenses to pass a vision screening test. This bill will take effect on January 2, 2009. The Legislative Auditor's Office, Performance Evaluation and Research Division, was asked to review the vision requirements for driver's licenses in all states and the District of Columbia. The intent of this review is to evaluate the different requirements states have in place and how these requirements may affect the incidence of vehicle crash fatalities as reported by the U.S. Department of Transportation, Federal Highway Administration. The Legislative Auditor finds that the recent changes in vision screening for driver's license renewals may lower automobile crash fatality rates.

# West Virginia Has Become the 24<sup>th</sup> State to Require Vision Screening for all Driver's License Renewals

All states require first time driver's license applicants to meet minimum vision requirements, but standards for vision screening at license renewal vary. West Virginia will join 23 states that require vision screening for every driver's license renewal. Ten states – Alaska, California, Colorado, Connecticut, Louisiana, Michigan, Mississippi, New Jersey, Texas and Washington D.C. – require vision screening periodically, but not with every renewal. Drivers in Alaska, California, and Texas with licenses in good standing may be renewed by mail until the driver reaches a certain age; only licenses renewed in person require vision screening. Residents of Colorado, Connecticut, Louisiana, Michigan, and Mississippi must pass a vision screening exam every other renewal. New Jersey residents must have their vision screened at least once every 10 years. Seven states have age-based vision screening requirements and seven states, which currently include West Virginia, have no vision screening requirements for license renewal.

Four states have non-standard vision screening requirements. For example, Pennsylvania randomly selects 1,650 drivers age 45 or older every month for screening six months prior to their license renewal. Illinois requires drivers ages 22 through 74 to have vision screening every All states require first time driver's license applicants to meet minimum vision requirements, but standards for vision screening at license renewal vary. West Virginia will join 23 states that require vision screening for every driver's license renewal.

The Legislative Auditor finds that the recent changes in vision screening for driver's license renewals may lower automobile crash fatality rates. other renewal cycle. Drivers age 75 through 81 years old must have vision screening every four-year renewal cycle, drivers 81 through 86 must have vision screening on a two-year renewal cycle, and drivers 87 and older must renew with a vision screening annually. Massachusetts requires vision screening at renewal, but allows drivers whose license photographs are less than 10 years old to renew online, at which time they answer a question stating that their eyesight meets state requirements. Arizona does not require license renewal until age 65, after which licenses must be renewed every five years. However, licensees are required to get new license photos every 12 years. A vision screening is conducted at that time. Appendix A provides vision screening requirements for all states and Washington, D.C.

# **Greater Frequency of Vision Screening May Reduce Vehicle Crash Fatality Rates**

A study was conducted by the Vision Council of America to determine whether a relationship existed between fatal crash rates and vision requirements for 2006. The study revealed the following:

In comparing those states identified as having the highest fatal crash rates, four states have no vision screening requirements for renewing licenses (Alabama, Kentucky, Mississippi, and West Virginia) and four states require vision screenings at interval of eight or more years (Arizona, Montana, New Mexico, South Carolina).

Of states that have the lowest crash rates, seven require regular vision screenings for all renewal applicants (Hawaii, Massachusetts, New Hampshire, New York, Ohio, Rhode Island, Washington) and three of those states mandate that drivers receive a vision screening at a minimum frequency of five years (New Hampshire, Ohio, Rhode Island).

A correlation analysis was conducted by PERD in order to improve on these findings by expanding the analysis to the three most recent West Virginia had the third highest average crash fatality rate per 100,000 people in the nation during the 2004-2006 time period (see Appendix C). years data were available, 2004 through 2006, and eliminating interstate highway crash statistics in an effort to better represent intrastate driver data. In order to perform the correlation analysis, the vision screening requirements in Appendix A were assigned numerical codes as follows:

- 1 = Vision Screening for Every Renewal
- 2 = Vision Screening Periodically
- 3 = Age-based Vision Screening
- 4 = Non-Standard Vision Screening
- 5 = No Vision Screening for Renewal

The requirements were then run against intrastate crash fatalities per 100,000 people in all states in years 2004 through 2006. These fatality rates are illustrated in Appendix B. Table 1 below illustrates the average crash fatality rates for each vision screening requirement group in all years, 2004 through 2006.

Table 1Average Crash Fatality Rates by Vision Screening Requirement Group2004-2006						
Vision Screening Requirement	Vision Screening for Every Renewal	Vision Screening Periodically	Age-based Screening	Non-Standard Screening	No Vision Screening for Renewal	
Average Crash 14.49 11.95 12.26 14.83 18.44   Fatality Rate 14.83 18.44						
Source: PERD calculations based on data reported by the U.S Department of Transportation, Federal Highway						

There are several factors that influence the fatal crash rate, of which vision screening is one. Because there are so many relevant factors, it is difficult to isolate the impact of vision screening requirements alone on crash fatality rates. Table 1 has one revealing factor, which is that the average fatal crash rate for the seven states that have no vision screening for renewals is higher than those states that have some form of vision screening at renewal. The question is whether the higher fatal crash rate is statistically significant. The Legislative Auditor's Office performed two statistical tests on the average fatal crash rates for the 2004-06 time periods. One test was a correlation analysis and the other test was the comparison of averages.

A correlation analysis provides a measure of the relationship between vision requirements and crash fatalities. A correlation analysis does not determine causality, only if a relationship exists between variables. Correlation coefficients indicate the strength and direction of a relationship, on a range of -1.00 to 1.00, where -1.00 is a perfectly negative correlation, 0 is a complete lack of association, and 1.00 is a perfect positive relationship. The correlation coefficients for each year are shown in Table 2 below.

Table 2Correlation Coefficients for Vision Screening Requirements and CrashFatality Rates per 100,000 People			
Year	Correlation Coefficient		
2004	0.159483156		
2005	0.080397102		
2006 0.229889414			
Source: PERD calculations based on data reported by the U.S Department of Transportation, Federal Highway Administration			

These coefficients show that there is a slight positive correlation between the level of vision screening requirements and the number of crash fatalities. For example, moving further up the code scale from 1, which signifies screening required for every license renewal, to 5, which signifies no vision screening requirements for license renewal, is correlated with an increase in crash fatalities. The correlation coefficients are positive, suggesting that less frequent vision screening is associated with higher fatal crash rates. The correlation coefficients are also statistically significant at the 95 percent confidence interval; however, they are relatively low, indicating a weak correlation.

Another statistical test that was conducted was a two sample ttest to compare the averages of the fatal crash rates of the states with the most stringent vision screening to those in the states that have no vision screening at renewal. These averages are illustrated in Appendix C. The comparison was intended to determine if the difference between the two averages is statistically significant. The t-test report can be found in Appendix D. The results show that the difference between the averages is not zero (the null hypothesis is rejected), and that the average fatal crash rate for states without vision screening at renewals is greater than the average for states with vision screening at renewal. The statistical power at the 95 percent confidence level is relatively high. However, there are some assumptions that cannot pass all normality tests for the average fatal crash rates of states with no vision screening. This is likely due to the limited amount of data for these seven states. This suggests that there may be need to have some reservation on the statistical results.

### Conclusion

There is a great deal of variance in vision screening requirements for driver's license renewal between states, ranging from such stringent requirements as screening at every renewal to such lenient regulations as having no vision screening at renewal. In order to test the relationship between vision screening requirements and intrastate vehicle crash fatalities, PERD conducted a correlation analysis on 2004 through 2006 data. This analysis revealed that there is a positive but weak correlation between crash fatalities and less stringent vision screening requirements for driver's license renewal. However, a two-sample t-test analysis between the crash fatality rates in states with the most and least stringent requirements returned a statistically significant difference in the averages, which suggests the states with the strictest vision screening requirements have lower rates of crash fatalities on average than do states with no vision screening requirements at license renewal. This statistical analysis does have some limitations due to data restrictions. However, with West Virginia moving from being one of the states with the least stringent vision screening requirements to one of the states with the most stringent vision screening requirements, state crash fatality rates may decrease over time

With West Virginia moving from being one of the states with the least stringent vision screening requirements to one of the states with the most stringent vision screening requirements, state crash fatality rates may decrease over time.

Current Vision Screening Requirements for All States as of 2007					
State	Vision Screening for Every Renewal	Vision Screening Periodically	Age-based Screening (Age at Which Screening Begins)	No Vision Screening for Renewal	Non- Standard Vision Screening
Alabama				X	
Alaska		X			
Arizona					Χ
Arkansas	X				
California		X			
Colorado		X			
Connecticut		X			
Delaware	X		XX (0.0)		
Florida			X(80)		
Georgia	NY.		X(65)		
Hawaii	X				
	X				<b>X</b> 7
Illinois					X
Indiana	X				
lowa	X				
Kansas	Å			V	
Кепциску		V		Λ	
Louisiana		<b>X</b>	<b>V</b> (40)		
Maine			X(40)		
Maryland			X(40)		<b>X</b> 7
Massachusetts		N/			X
Michigan	NY.	<u> </u>			
Minnesota	X				
Mississippi		X			
Missouri	X				
Montana	X				
Nebraska	X				
Nevada	X				
New Hampshire	X				
New Jersey		X			
New Mexico				X	
New York	X				
North Carolina	X				
North Dakota	X				

# Appendix A: Current Vision Screening Requirements for All States as of 2007

Current Vision Screening Requirements for All States as of 2007						
Ohio	X					
Oklahoma				X		
Oregon			X(50)			
Pennsylvania					X	
Rhode Island	X					
South Carolina	X					
South Dakota	X					
Tennessee				X		
Texas		X				
Utah			X(65)			
Vermont				X		
Virginia			X(80)			
Washington	X					
Washington, D.C		X				
West Virginia				X		
Wisconsin	Χ					
Wyoming	X					
Source: Connecticut C License Renewals, Jan	General Assembly, O nuary 5, 2007.	ffice of Legislative R	esearch, <u>Research Repor</u>	t: Vision Screening	for Driver's	

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Intrastate Highway Crash Fatality Rates Per 100,000 People					
State	2004	2005	2006		
Alabama	22.49	22.01	22.46		
Alaska	10.13	5.83	8.71		
Arizona	15.67	16.08	17.24		
Arkansas	21.73	20.02	20.75		
California	9.82	10.19	9.82		
Colorado	12.28	11.08	9.27		
Connecticut	7.12	6.68	7.27		
Delaware	14.98	14.63	15.83		
Florida	16.12	17.35	16.37		
Georgia	15.58	16.85	15.89		
Hawaii	10.21	10.49	11.42		
Idaho	14.08	16.34	15.44		
Illinois	9.16	9.17	8.65		
Indiana	13.62	13.17	12.74		
Iowa	11.98	13.43	13.22		
Kansas	14.79	14.08	15.20		
Kentucky	20.68	21.22	19.79		
Louisiana	17.20	17.68	18.97		
Maine	13.45	11.28	13.16		
Maryland	10.13	9.64	10.39		
Massachusetts	6.26	5.85	5.48		
Michigan	10.54	9.99	9.67		
Minnesota	10.22	9.64	8.75		
Mississippi	27.23	28.31	28.04		
Missouri	16.64	17.99	15.97		
Montana	20.29	22.12	23.98		
Nebraska	12.67	13.17	13.49		
Nevada	14.03	15.40	14.52		
New Hampshire	11.51	11.28	8.61		
New Jersey	7.50	7.58	8.01		
New Mexico	18.97	17.06	18.74		
New York	7.23	6.90	6.85		
North Carolina	16.65	16.03	16.21		
North Dakota	14.45	16.83	15.84		
Ohio	9.95	10.22	9.70		
Oklahoma	18.37	19.66	18.20		
Oregon	11.61	12.40	11.87		
Pennsylvania	11.09	12.00	11.30		
Rhode Island	6.24	6.75	6.97		
South Carolina	22.06	22.68	21.02		

# Appendix B: Intrastate Highway Crash Faltality Rates Per 100,000 People

Intrastate Highway Crash Fatality Rates Per 100,000 People					
South Dakota	21.96	20.77	20.55		
Tennessee	18.81	18.50	18.62		
Texas	13.57	12.62	12.57		
Utah	8.06	6.79	8.41		
Vermont	13.74	10.97	11.60		
Virginia	10.70	10.76	10.63		
Washington	8.01	9.34	8.89		
Washington, D.C	7.25	7.39	6.32		
West Virginia	18.29	17.06	20.12		
Wisconsin	13.45	13.65	12.35		
Wyoming	19.67	23.69	26.72		
Source: PERD calculations based on U.S Department of Transportation Highway Statistics					

Average Crash Fatality Rates per 100,000 People by Vision Screening Requirement 2004-2006				
State	Vision Screening	Three Year Average		
Mississippi	2	27.86		
Wyoming	1	23.36		
Massachusetts	4	22.53		
Alabama	5	22.32		
Montana	1	22.13		
South Carolina	1	21.92		
South Dakota	1	21.09		
Arkansas	1	20.83		
Kentucky	5	20.56		
Oklahoma	5	18.74		
Tennessee	5	18.64		
West Virginia	5	18.49		
New Mexico	5	18.26		
Louisiana	2	17.95		
Missouri	1	16.86		
Florida	3	16.62		
Arizona	4	16.33		
North Carolina	1	16.30		
Georgia	3	16.11		
North Dakota	1	15.71		
Idaho	1	15.29		
Delaware	1	15.15		
Kansas	1	14.69		
Nevada	1	14.65		
Indiana	1	13.18		

# Appendix C: Average Crash Fatality Rates Per 100,000 People 2004-2006

Wisconsin	1	13.15
Nebraska	1	13.11
Texas	2	12.92
Iowa	1	12.88
Maine	3	12.63
Vermont	5	12.10
Oregon	3	11.96
Pennsylvania	4	11.47
Colorado	2	10.88
Hawaii	1	10.71
Virginia	3	10.70
New Hampshire	1	10.47
Michigan	2	10.07
Maryland	3	10.05
Ohio	1	9.95
California	2	9.94
Minnesota	1	9.54
Illinois	4	8.99
Washington	1	8.75
Alaska	2	8.22
Utah	3	7.75
New Jersey	2	7.69
Connecticut	2	7.02
New York	1	6.99
Washington, D.C	3	6.98
Rhode Island	1	6.65

## Appendix D: Two-Sample Test Report

#### **Two-Sample Test Report**

Page	1
Database	F:\PERD_PROJECTS\DRIVER'S LICENSE VISION REQUIREMENTS\DRIVER LICENSE VISION
REQUIREMENTS\FATA	LITY DATA BY STATE.S0
Time/Date	16:59:39 12-04-2008

#### **Descriptive Statistics Section**

			Standard	Standard	95% LCL	95% UCL
Variable	Count	Mean	Deviation	Error	of Mean	of Mean
C5	7	18.76429	2.683877	1.01441	16.28211	21.24646
C8	23	14.19217	4.642736	0.9680774	12.1845	16.19984
Note: T-alpha (C5) = 2.4469,	T-alpha	(C8) = 2.0739				

#### **Confidence-Limits of Difference Section**

Variance		Mean	Standard	Standard	95% LCL	95% UCL	
Assumption	DF	Difference	Deviation	Error	of Mean	of Mean	
Equal	28	4.572112	4.298792	1.855642	0.7710021	8.373221	
Unequal	17.86	4.572112	5.362667	1.402213	1.624567	7.519656	
Note: T-alpha (Equal) = 2.0484,   T-alpha (Unequal) = 2.1021							

### **Equal-Variance T-Test Section**

Alternative		Prob	Decision	Power	Power
Hypothesis	T-Value	Level	(5%)	(Alpha=.05)	(Alpha=.01)
Difference <> 0	2.4639	0.020148	Reject Ho	0.662319	0.398567
Difference < 0	2.4639	0.989926	Accept Ho	0.000025	0.000001
Difference > 0	2.4639	0.010074	Reject Ho	0.776016	0.507357
Difference: (C5)-(C8)					

#### Aspin-Welch Unequal-Variance Test Section

Alternative		Prob	Decision	Power	Power
Hypothesis	T-Value	Level	(5%)	(Alpha=.05)	(Alpha=.01)
Difference <> 0	3.2606	0.004376	Reject Ho	0.868882	0.648231
Difference < 0	3.2606	0.997812	Accept Ho	0.000001	0.000000
Difference > 0	3.2606	0.002188	Reject Ho	0.931706	0.752969
Difference: (C5)-(C8)					

#### **Two-Sample Test Report**

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### **Tests of Assumptions Section**

Assumption		Value	Probability	Decision(5%)	
Skewness Normality (C5)		0.0000			
Kurtosis Normality (C5)			1.000000	Cannot reject normality	
Omnibus Normality (C5)	)				
Skewness Normality (C	3)	0.5379	0.590618	Cannot reject normality	
Kurtosis Normality (C8)		-0.7029	0.482108	Cannot reject normality	
Omnibus Normality (C8)		0.7835	0.675883	Cannot reject normality	
Variance-Ratio Equal-Va	ariance Test	2.9924	0.115679	Cannot reject equal variances	
Modified-Levene Equal-	Variance Test	2.6447	0.115101	Cannot reject equal variances	
			DatabaseF:\PERD_	PROJECTS\DRIVER'S LICENSE VISION	
REQUIREMENTS\DRIVER LICENSE VISION		REQUIREMEN	ITS\FATALITY DATA	BY STATE.S0	
Time/Date	16:59:39 12-04-2008				

### Mann-Whitney U or Wilcoxon Rank-Sum Test for Difference in Medians

	Mann	W	Mean	Std Dev
Variable	Whitney U	Sum Ranks	of W	of W
C5	126	154	108.5	20.39404
C8	35	311	356.5	20.39404

Number Sets of Ties = 0, Multiplicity Factor = 0

Exact Probability			Approximation Without Correction Approximation With					
Correction								
Alternative	Prob	Decision		Prob	Decision		Prob	Decision
Hypothesis	Level	(5%)	Z-Value	Level	(5%)	Z-Value	Level	(5%)
Diff<>0			2.2310	0.025678	Reject Ho	2.2065	0.027347	Reject Ho
Diff<0			2.2310	0.987161	Accept Ho	2.2556	0.987951	Accept Ho
Diff>0			2.2310	0.012839	Reject Ho	2.2065	0.013674	Reject Ho

### Kolmogorov-Smirnov Test For Different Distributions

Alternative	Dmn	Reject Ho if	Test Alpha	Decision	Prob
Hypothesis	<b>Criterion Value</b>	Greater Than	Level	(Test Alpha)	Level
D(1)<>D(2)	0.639752	0.5443	.050	Reject Ho	0.0141
D(1) <d(2)< td=""><td>0.000000</td><td>0.5443</td><td>.025</td><td>Accept Ho</td><td></td></d(2)<>	0.000000	0.5443	.025	Accept Ho	
D(1)>D(2)	0.639752	0.5443	.025	Reject Ho	

### Two-Sample Test Report

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#### **Plots Section**





#### **Two-Sample Test Report**





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