



# A Comparative Analysis of State Traffic Safety Countermeasures and Implications for Progress “Toward Zero Deaths” in the United States

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*Note:* This document revises and replaces the Research Note published in April 2017. Implementation criteria determining which States had specific traffic safety countermeasures in place were updated to reflect legislation as of December 2015. Population and VMT fatality rates were updated with 2015 data from NHTSA, which was not available at the time of the original publication. Finally, errors in State countermeasure implementation were corrected and updated to reflect 2015 legislation.

## Introduction

In 2015, the United States experienced 35,092 fatalities and 2.44 million injuries as a result of motor vehicle crashes, a 7.2-percent increase from 2014 (National Center for Statistics and Analysis [NCSA], 2016). This is the largest percentage increase in nearly 50 years. In 2015, motor vehicle crashes accounted for nearly one-quarter (24.7%) of unintentional injury fatalities, ranking as the second-leading cause of unintentional injury fatalities for all age groups combined (National Center for Health Statistics [NCHS], 2016). Furthermore, in 2015, motor vehicle crashes were the leading cause of death for those 15 to 24 years old (NCHS, 2016). From 2014 to 2015, there were increases in the following fatality categories: distraction-affected (by 8.8%), unrestrained passenger occupant (by 4.9%), alcohol-impaired (by 3.2%), and speeding-related (by 3%) (NCSA, 2016). In 2015, nearly half (48%) of all fatally injured passenger vehicle occupants with known restraint use were unrestrained, and of those who survived, only 14 percent were unrestrained. Alcohol-impaired-driving fatalities, defined as “a fatality in a crash involving a motor vehicle driver or motorcycle rider (operator) with a blood alcohol concentration (BAC) of .08 grams per deciliter (g/dL) or greater,” accounted for 29 percent of overall traffic fatalities in 2015.

In 1997, Sweden implemented “Vision Zero” (VZ) as a national transportation policy, with the goal that “no one shall be killed or seriously injured as a consequence of [crashes] in road traffic” (Belin, Tillgren, & Vedung, 2012). This vision shifts responsibility for traffic safety from individual road users to a roadway system designed to accommodate and protect against human error. Examples of Vision Zero interventions include replacing four-way intersections with traffic circles, and implementing “road diets” to decrease vehicle speeds, prevent crashes, and accommodate different modes of travel (e.g., bicyclists). A number of countries have adapted VZ to their traffic safety environments,

including the Netherlands, United Kingdom, New Zealand, and Australia. In the United States, some early adopters of the VZ model include Utah, Minnesota, Washington State, and a few dozen cities.

Formal discussions about adapting VZ in the United States began in 2009. A steering committee comprised of representatives from eight traffic safety organizations convened more than 70 key stakeholders to discuss the need for a national traffic safety vision, advised by the Federal Highway Administration (FHWA), Federal Motor Carrier Safety Administration (FMCSA), and National Highway Traffic Safety Administration (NHTSA) (“Toward Zero Deaths” Steering Committee, 2014).<sup>1</sup> Later that year, the committee published *Toward Zero Deaths: A National Strategy on Highway Safety*, emphasizing shared responsibility for traffic safety among highway and roadway system designers, users, and other stakeholders. This report outlined engineering, technology, and behavior change as playing major roles in making progress toward the vision of zero deaths.

States use a variety of countermeasures to reduce traffic crashes, injuries, and fatalities within their jurisdictions. These countermeasures focus primarily on engineering, law enforcement, and public education (NHTSA, 2006). NHTSA’s bi-annual publication, *Countermeasures That Work: A Highway Safety Countermeasure Guide for State Highway Safety Offices* (henceforth referred to as *Countermeasures That Work* or CMTW), documents existing behavioral traffic safety countermeasures and rates countermeasures for demonstrated effectiveness. However, the most effective countermeasures are not adopted or implemented consistently across States. The objective for this study was to identify proven countermeasures that, if adopted, would help States achieve progress “Toward Zero Deaths.”

<sup>1</sup> The eight steering committee organizations included the American Association of Motor Vehicle Administrators (AAMVA), American Association of State Highway and Transportation Officials (AASHTO), Commercial Vehicle Safety Alliance (CVSA), Governors Highway Safety Association (GHSA), International Association of Chiefs of Police (IACP), National Association of County Engineers (NACE), National Association of State EMS Officials (NASEMSO), and National Local Technical Assistance Program (NLTAP/TTAP) Association.

## Methods

Information was obtained from NHTSA's 2013 *Countermeasures That Work* (7th Edition) (Goodwin et al., 2013).<sup>2</sup> *Countermeasures That Work* is "a basic reference guide, designed to assist State Highway Safety Offices (SHSOs) in selecting effective, evidence-based countermeasures for traffic safety problem areas." *Countermeasures That Work* includes only highway safety countermeasures, and not vehicle- or roadway-based solutions. Countermeasures are listed by traffic safety categories (e.g., Alcohol-Impaired and Drugged Driving) with brief literature summaries, followed by ratings for evidence of effectiveness, cost, use, and the time it takes to implement. Effectiveness is measured by "reductions in crashes or injuries" on a scale of one to five stars, with 1-star countermeasures having "limited or no high-quality evaluation evidence," and 5-star countermeasures having been "demonstrated to be effective by several high-quality evaluations with consistent results."

Thirty-seven out of 116 countermeasures (32%) in *Countermeasures That Work* received 4 stars (demonstrated "effective in certain situations") or 5 stars (demonstrated "effective by several high-quality evaluations with consistent results"). These 37 countermeasures were selected for literature review. PubMed, Google Scholar, Cochrane Review, Campbell Collaboration, the Community Guide, and NHTSA databases were used to search for studies that modeled the number of "lives saved" and/or "deaths prevented" for each countermeasure. Studies were included if they modeled "lives saved" and/or "deaths prevented," or had other quantifiable economic or social indicators of countermeasure effectiveness. Other government and traffic safety industry literature were included when they met search criteria. Studies were excluded if they were more than 10 years old, not conducted in the United States, not written in English, or lacked sufficient statistical power or generalizability.

After consultation with six NHTSA subject matter experts (SMEs), ten 4- or 5-star countermeasures were selected based on strength of evidence for "lives saved" and/or "deaths prevented" in the literature review, representation by countermeasure category (e.g., "Alcohol-Impaired and Drugged Driving," "Seat Belts and Child Restraints"), and the ability to determine implementation by States. For example, publicized sobriety checkpoint programs received five stars and publicized saturation patrol programs received four stars in CMTW. Publicized sobriety checkpoint programs were included because it is relatively simple to determine which States are legally permitted to perform them. In contrast, all States are legally permitted to conduct publicized saturation patrols. This study avoided setting criteria that would have relied on such factors as the quality, intensity, or frequency of implementation.

The 10 countermeasures from CMTW included:

- From Chapter 1: Alcohol-Impaired and Drugged Driving
  - ◆ 1.1.1 Administrative License Revocation or Suspension (ALR/ALS)
  - ◆ 1.2.1 Publicized Sobriety Checkpoint Programs (sobriety checkpoints)
  - ◆ 1.4.2 Alcohol Interlocks (interlocks)
- From Chapter 2: Seat Belts and Child Restraints
  - ◆ 2.1.1 State Primary Enforcement Belt Use Laws (primary belt laws)
  - ◆ 2.4.1 Strengthening Child/Youth Occupant Restraint Laws (CRS laws)
- From Chapter 3: Aggressive Driving and Speeding
  - ◆ 3.2.1 Automated Enforcement (automated speed enforcement)
- From Chapter 4: Distracted and Drowsy Driving
  - ◆ 4.1.3 High-Visibility Cell Phone and Text Messaging Enforcement (primary texting enforcement)
- From Chapter 5: Motorcycle Safety
  - ◆ 5.1.1 Universal Coverage State Motorcycle Helmet Use Laws (universal motorcycle helmet laws)
- From Chapter 6: Young Drivers
  - ◆ 6.1.1 Graduated Driver Licensing (GDL)
- From Chapter 9: Bicycles
  - ◆ 9.1.1 Bicycle Helmet Laws for Children (youth bicycle helmet laws)

In addition, although not in *Countermeasures That Work*, the adoption of "Complete Streets" policies was included as an 11th countermeasure, based on its inclusion in the latest reauthorization, Fixing America's Surface Transportation (FAST) Act (2015), which was signed into law on December 4, 2015. The FAST Act encourages States to adopt policies that "provide for the safe and adequate accommodation...of all users of the surface transportation network, including motorized and nonmotorized users, in all phases of project planning, development, and operation."

Definitions and implementation criteria were developed for each countermeasure based on input from *Countermeasures That Work*, Federal legislation, and SMEs. For example, in CMTW, automated enforcement includes the use of red light and/or speed cameras to deter possible offenders. However, for this study, a State was considered to have automated enforcement only if it was permitted to use speed cameras in certain situations, regardless of the presence of automated speed enforcement programs. Similarly, CMTW includes high-visibility cell phone and text messaging enforcement. For this study, a State was considered to have distracted-driving enforcement if it provided primary enforcement for texting and driving for all ages. For some countermeasures, the study's implementation criteria were stricter than the criteria in use in some States. For example, the implementation criteria for primary belt laws under this study required that the law cover all occupants, age 8 or older, in every seating position, and the law must provide for primary enforcement. States with age or seating position gaps, and States that do not provide for primary enforcement, were deemed not to have a primary belt law for the purpose of this study. The definitions and implementation criteria for all 11 countermeasures included in this study are listed in Table 1.

<sup>2</sup> Since the start of this study, the 2015 version of *Countermeasures That Work* (8th Edition) has been published.

**Table 1: Definitions and Implementation Criteria for Selected Countermeasures<sup>3</sup>**

Countermeasure	Definition	Implementation Criteria	Source(s) <sup>4</sup>	Discrepancy Source(s)
1.1.1 Administrative License Revocation or Suspension (ALR/ALS)	Law enforcement and driver licensing authorities can revoke or suspend a driver's license if s/he fails or refuses to take a BAC test.	Law creates administrative license revocation or suspension, independent of conviction	IIHS, GHSA, MADD	NHTSA's Digest of Impaired Driving and Selected Beverage Control Laws: 30th Edition (current as of December 31, 2015), 2015 State Codes and Statutes
1.2.1 Publicized Sobriety Checkpoint Programs (sobriety checkpoints)	At sobriety checkpoints, law enforcement officers stop vehicles at a predetermined location to check whether the driver is impaired. Officers can stop every vehicle or in intervals (selective breath testing). The purpose of the checkpoint is to deter driving after drinking by increasing the perceived risk of arrest.	Permitted by law or deemed constitutional within the State	GHSA, MADD	NHTSA's Digest of Impaired Driving and Selected Beverage Control Laws: 30th Edition (current as of December 31, 2015), 2015 State Codes and Statutes
1.4.2 Alcohol Interlocks (interlocks)	An alcohol ignition interlock is a device that restricts vehicle use for convicted drunk drivers and prevents a vehicle from starting unless the driver provides a breath sample with a BAC lower than a pre-set level, usually .02 g/dL. Interlocks are typically used as a condition of probation for DWI offenders, to prevent them from driving while impaired by alcohol after their driver's licenses have been reinstated.	Mandatory and/or highly incentivized for all offenders, including first-time offenders	IIHS, GHSA, MADD	NHTSA's Digest of Impaired Driving and Selected Beverage Control Laws: 30th Edition (current as of December 31, 2015), 2015 State Codes and Statutes
2.1.1 State Primary Enforcement Belt Use Laws (primary belt laws)	Law enforcement can stop drivers and issue citations for seat belt use violations.	Covers age 8+ for every seating position, and must be primary enforcement law	IIHS, GHSA, MADD	NHTSA's Summary of Vehicle Occupant Protection and Motorcycle Laws: 12th Edition (current as of November 15, 2013), 2015 State Codes and Statutes
2.4.1 Strengthening Child/Youth Occupant Restraint Laws (CRS laws)	Comprehensive child restraint system (CRS) legislation would have all criteria elements specifying age, weight, height, and technology design requirements; however, these recommendations are varied.	Covers children 7 years or younger	IIHS, GHSA	NHTSA's Summary of Vehicle Occupant Protection and Motorcycle Laws: 12th Edition (current as of November 15, 2013), 2015 State Codes and Statutes
3.2.1 Automated Enforcement (automated speed enforcement)	Automated cameras are used to reduce speeding. A State's support and implementation of speed cameras serve as a proxy to gauge performance relating to speeding.	States are allowed to use speed cameras in certain situations, regardless of whether there are automated speed enforcement programs; States without a State law must allow local ordinances or policies	IIHS, GHSA	NCSL's Traffic Safety Trends: State Legislative Action 2015 (Appendix I: State Policies Regarding Use of Traffic Cameras), 2015 State Codes and Statutes

<sup>3</sup> States that meet the implementation criteria used in this study may not necessarily meet the statutory criteria for receiving NHTSA grants.

<sup>4</sup> The following source websites are updated regularly. IIHS: [www.iihs.org/iihs/topics#statelaws](http://www.iihs.org/iihs/topics#statelaws), GHSA: [www.ghsa.org/state-laws](http://www.ghsa.org/state-laws), MADD: [www.madd.org/laws/](http://www.madd.org/laws/), Smart Growth America: <https://smartgrowthamerica.org/program/national-complete-streets-coalition/policy-development/policy-atlas/>

Countermeasure	Definition	Implementation Criteria	Source(s) <sup>4</sup>	Discrepancy Source(s)
4.1.3 High Visibility Cell Phone and Text Messaging Enforcement (primary texting enforcement)	Law enforcement can stop drivers and issue citations for texting and driving violations (primary enforcement).	Primary enforcement for all ages	IIHS, GHSA	NHTSA's Digest of Distracted Driving Laws: 1st Edition (current as of June 1, 2012), 2015 State Codes and Statutes
5.1.1 Universal Coverage State Motorcycle Helmet Use Laws (universal motorcycle helmet laws)	All motorcycle riders and their passengers must wear helmets when riding.	Covers all riders (no partial coverage)	IIHS, GHSA	Not Applicable
6.1.1 Graduated Driver Licensing (GDL)	Graduated driver licensing is a three-phase system for beginning drivers, consisting of a learner's permit, an intermediate license, and a full license. A learner's permit allows driving only while supervised by a fully licensed driver, and an intermediate license allows unsupervised driving with certain restrictions.	Must have three stages (beginner, intermediate, full privilege), nighttime restriction, passenger restriction, and at least 30 hours of supervised parental driver or driver's education training; nighttime and passenger restrictions cannot be secondary enforcement	IIHS, GHSA	NCSL's Traffic Safety Trends: State Legislative Action 2015 (Appendix E: Teen Driving Restrictions), 2015 State Codes and Statutes
9.1.1 Bicycle Helmet Laws for Children (youth bicycle helmet laws)	Children under a certain age must wear helmets when riding.	State has a youth bicycle helmet law	IIHS, GHSA	Not Applicable
Complete Streets	Complete Streets policies are "the integration of people and place in the planning, design, construction, operation, and maintenance of transportation networks" (Smart Growth America & National Complete Streets Coalition, 2016).	State has an enacted Complete Streets Policy (includes, but not limited to State policy, DOT resolution, executive orders, DOT policies, and city policies)	Smart Growth America	Not Applicable

Note: The number before each countermeasure refers to the section where it can be found in *CMTW 2013 (7th ed.)*.

Detailed information was compiled about the extent to which each countermeasure had been implemented by the States. Sources of this information included the Insurance Institute for Highway Safety (IIHS), the Governors Highway Safety Association (GHSA), Mothers Against Drunk Driving (MADD), and Smart Growth America (through the end of 2015). Countermeasures with implementation information from more than one source (e.g., primary belt use laws, from IIHS, GHSA, and MADD) were checked for consistency, and discrepancies were resolved by consulting legislative digests from NHTSA (e.g., *Digest of Impaired Driving and Selected Beverage Control Laws: 30th Edition*) and the National Conference of State Legislatures (e.g., *Traffic Safety Trends: State Legislative Action 2015*). In all cases in which there were discrepancies among sources, State countermeasures were further checked against 2015 State Codes and Statutes found through legal research databases (e.g., Justia, FindLaw) to determine whether a State had a countermeasure, in consultation with SMEs. Table 1 indicates which sources were used for each countermeasure.

Two reviewers separately coded the implementation status for each countermeasure across the States. States were given one point for each countermeasure when all implementation criteria were fulfilled, and were given zero points for each countermeasure when all implementation criteria were not fulfilled. Implementation status for each countermeasure was totaled for each State. The number of countermeasures each State implemented could range from 0 to 11.

To compare countermeasure totals with an objective measure of traffic safety, traffic fatality rates for 2015 as determined by NHTSA were obtained for each State and the District of Columbia, per 100,000 population as a standard measure of disease burden in public health, and per 100 million vehicle miles traveled (VMT) as a standard measure of risk exposure in traffic safety (NCSA, 2017). Fatality rates were categorized as low, medium, or high if they were in the upper 25 percent, middle 50 percent, or lower 25 percent, respectively (calculated using Tukey's Hinges), with the interquartile range (IQR) set to the "medium" category. Frequencies

and percentages were calculated for the number and type of countermeasures across States, along with the mean total number of countermeasures. The total number of countermeasures was cross-tabulated with fatality rates across States. Pearson’s  $\alpha$  (alpha) was calculated to assess the magnitude of association between total number of countermeasures and traffic fatality rates.

## Results

No State had implemented all 11 countermeasures (Figure 1). The most common number of implemented countermeasures was six. This occurred in 13 (25%) of the States. Only five States (10%) had implemented three or fewer countermeasures.

**Figure 1: Number of Implemented Countermeasures by States, and Percentage of States With Each Number of Countermeasures Implemented**

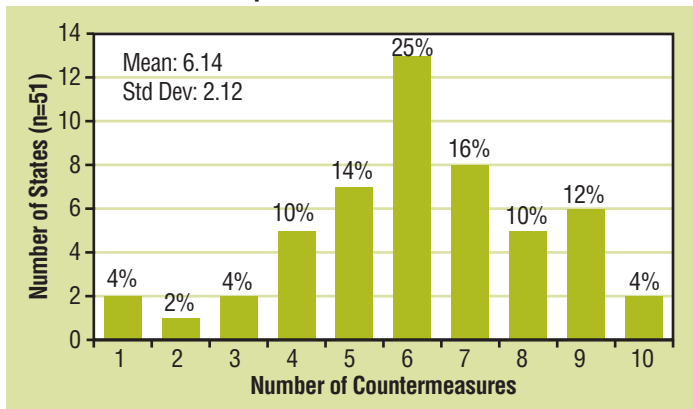
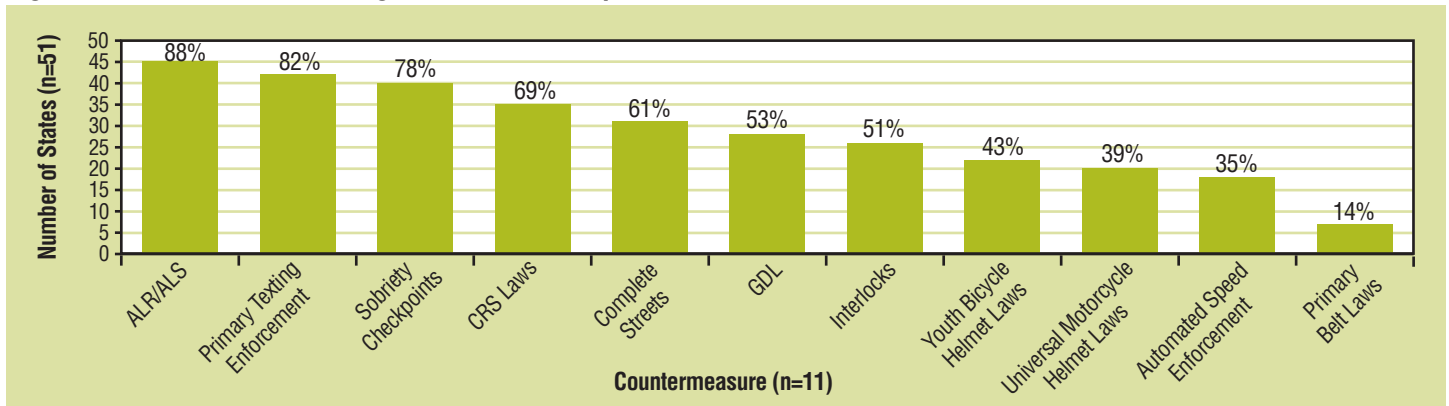


Table 2 (below) shows the number of countermeasures and fatality rates, by population and VMT, for all States. States are listed by their total number of countermeasures, from most to least, and then listed alphabetically within each numerical category, with corresponding fatality rates. For population and VMT fatality

rates, cells in the upper 25 percent (lower fatality rates) are shaded green, the middle 50 percent are shaded gray, and the lower 25 percent are shaded black, respectively. Similarly, for total number of countermeasures, cells with 8 or more countermeasures are in green (25%), those with 5 to 7 are in gray (55%), and those with 4 or fewer are in black (20%). New York and Oregon had implemented the greatest number of countermeasures with 10; Montana and South Dakota had implemented the fewest with 1. Washington, DC, which had adopted 9 countermeasures, had the lowest fatality rate by population (3.42/100,000 population), and Massachusetts, which had adopted 7 countermeasures, had the lowest fatality rate by VMT (0.52/100 million VMT). Wyoming, which had adopted 4 countermeasures, had the highest fatality rate by population (24.74/100,000 population), and South Carolina, which had adopted 6 countermeasures, had the highest fatality rate by VMT (1.89/100 million VMT).

Four jurisdictions (New York; Washington, DC; Hawaii; and Maryland) were included in the top quartile for total number of countermeasures implemented and both fatality rates. Eleven jurisdictions (Colorado, Georgia, New Mexico, Alaska, Indiana, Kansas, Missouri, Pennsylvania, Utah, Michigan, and Nevada) were listed in the middle quartile for total number of countermeasures implemented and both fatality rates. Three jurisdictions (Wyoming, Montana, and South Dakota) were included in the bottom quartile for total number of countermeasures implemented and both fatality rates. The remaining States were included in different quartiles for total number of countermeasures implemented and one or both fatality rates. Two States (Louisiana and West Virginia) were included in the top quartile for total number of countermeasures (with 9) implemented, but were included in the bottom quartile for both population and VMT fatality rates. One State (New Hampshire) was included in the bottom quartile for total number of countermeasures (with 4) implemented, but was included in the top quartile for both population and VMT fatality rates. The U.S. total fatality rate per 100,000 population was 10.92, and per 100 million VMT was 1.13 (NCSA, 2017).

**Figure 2: Number and Percentage of States With Specific Countermeasures**



The most prevalent countermeasure was administrative license revocation/suspension, active in 45 States (88%), while only 7 States (14%) had implemented primary seat belt laws, based on the study criteria (Figure 2). As provided in Table 1, to meet the study criteria for a primary seat belt law, the seat belt law must cover all passengers age 8 or older, in every seating position, and

the law must provide for primary enforcement. Countermeasure implementation by State is shown in Tables 3 and 4. In Table 3, the States are listed alphabetically. In Table 4, the States are listed by their total number of countermeasures, and then listed alphabetically within each numerical category.

**Table 2: Number of Countermeasures, and Population and VMT Fatality Rates by State**

State	Number of Countermeasures	Fatalities/100,000 Population	Fatalities/100 Million VMT
New York	10	5.66	0.88
Oregon	10	11.09	1.24
District of Columbia	9	3.42	0.65
Hawaii	9	6.57	0.91
Louisiana	9	15.54	1.51
Maryland	9	8.54	0.89
Tennessee	9	14.51	1.25
West Virginia	9	14.53	1.35
California	8	8.11	0.95
Delaware	8	13.32	1.27
Illinois	8	7.76	0.95
Maine	8	11.74	1.07
North Carolina	8	13.73	1.23
Colorado	7	10.01	1.08
Connecticut	7	7.41	0.84
Georgia	7	14.00	1.21
Massachusetts	7	4.50	0.52
New Mexico	7	14.29	1.09
Vermont	7	9.10	0.78
Virginia	7	8.98	0.91
Washington	7	7.92	0.95
Alabama	6	17.47	1.26
Alaska	6	8.80	1.29
Indiana	6	12.40	1.04
Kansas	6	12.19	1.13
Minnesota	6	7.49	0.72
Mississippi	6	22.62	1.70
Missouri	6	14.28	1.21
New Jersey	6	6.27	0.75
Pennsylvania	6	9.37	1.19
Rhode Island	6	4.26	0.57
South Carolina	6	19.95	1.89
Utah	6	9.21	0.93
Wisconsin	6	9.81	0.91
Arizona	5	13.08	1.37
Arkansas	5	17.83	1.52
Kentucky	5	17.20	1.56
Michigan	5	9.71	0.98
Nevada	5	11.24	1.25
Oklahoma	5	16.44	1.35
Texas	5	12.80	1.36
Florida	4	14.50	1.42
Nebraska	4	12.97	1.22
New Hampshire	4	8.57	0.87
Ohio	4	9.56	0.98
Wyoming	4	24.74	1.51
Idaho	3	13.05	1.30
North Dakota	3	17.31	1.31
Iowa	2	10.24	0.96
Montana	1	21.69	1.81
South Dakota	1	15.49	1.43
<b>U.S. Total</b>	<b>N/A</b>	<b>10.92</b>	<b>1.13</b>
<b>Range</b>	<b>1 to 10</b>	<b>3.42 to 24.74</b>	<b>0.52 to 1.89</b>

Note: Cells in green were approximately in the upper 25 percent, gray in the middle 50 percent, and black in the lower 25 percent.

**Table 3: Traffic Safety Countermeasure Implementation (1=yes, 0=no) by State, Listed Alphabetically<sup>5</sup>**

State	Total	Fatalities per 100,000 Population	Fatalities per 100 Million VMT	ALR/ ALS	Sobriety Checkpoints	Interlocks	Primary Belt Laws	CRS Laws	Automated Speed Enforcement	Primary Texting Enforcement	Universal Motorcycle Helmet Laws	GDL	Youth Bicycle Helmet Laws	Complete Streets
Alabama	6	17.47	1.26	1	1	0	0	0	1	1	1	0	1	0
Alaska	6	8.80	1.29	1	1 <sup>6</sup>	1	0	1	0	1	0	1	0	0
Arizona	5	13.08	1.37	1	1	1	0	1	1	0	0	0	0	0
Arkansas	5	17.83	1.52	1	1	1	0	0	1	1	0	0	0	0
California	8	8.11	0.95	1	1	1 <sup>7</sup>	0	1	0	1	1	0	1	1
Colorado	7	10.01	1.08	1	1	1	0	1	1	1	0	0	0	1
Connecticut	7	7.41	0.84	1	1	1	0	0	0	1	0	1	1	1
Delaware	8	13.32	1.27	1	1	1	0	1	0	1	0	1	1	1
District of Columbia	9	3.42	0.65	1	1	0	0	1	1	1	1	1	1	1
Florida	4	14.50	1.42	1	1	0	0	0	0	0	0	0	1	1
Georgia	7	14.00	1.21	1	1	0	0	1	0	1	1	0	1	1
Hawaii	9	6.57	0.91	1	1	1	1	1	0	1	0	1	1	1
Idaho	3	13.05	1.30	1	0	0	0	0	0	1	0	1	0	0
Illinois	8	7.76	0.95	1	1	1	0	1	1	1	0	1	0	1
Indiana	6	12.40	1.04	1	1	0	0	1	0	1	0	1	0	1
Iowa	2	10.24	0.96	1	0	0	0	0	1	0	0	0	0	0
Kansas	6	12.19	1.13	1	1	1	0	1	0	1	0	1	0	0
Kentucky	5	17.20	1.56	1	1	0	1	1	0	1	0	0	0	0
Louisiana	9	15.54	1.51	1	1	1	0	0	1	1	1	1	1	1
Maine	8	11.74	1.07	1	1	1	0	1	0	1	0	1	1	1
Maryland	9	8.54	0.89	1	1	1	0	1	1	1	1	0	1	1
Massachusetts	7	4.50	0.52	1	1	0	0	1	0	1	1	0	1	1
Michigan	5	9.71	0.98	1	0	0	0	1	0	1	0	1	0	1
Minnesota	6	7.49	0.72	1	0	0	1	1	0	1	0	1	0	1
Mississippi	6	22.62	1.70	1	1	1	0	0	0	1	1	0	0	1
Missouri	6	14.28	1.21	1	1	0	0	1	1	0	1	1	0	0
Montana	1	21.69	1.81	0	0	0	0	0	0	0	0	1	0	0
Nebraska	4	12.97	1.22	1	1	1	0	0	0	0	1	0	0	0
Nevada	5	11.24	1.25	1	1	0	0	0	1	1	1	0	0	0
New Hampshire	4	8.57	0.87	1	1	0	0	0	0	1	0	0	1	0
New Jersey	6	6.27	0.75	0	1	0	0	1	0	1	1	0	1	1
New Mexico	7	14.29	1.09	1	1	1	0	0	1	1	0	1	1	0
New York	10	5.66	0.88	1	1	1	0	1	1	1	1	1	1	1
North Carolina	8	13.73	1.23	1	1	0	0	1	0	1	1	1	1	1
North Dakota	3	17.31	1.31	1	1	0	0	0	0	1	0	0	0	0
Ohio	4	9.56	0.98	1	1	0	0	1	1	0	0	0	0	0
Oklahoma	5	16.44	1.35	1	1	0	0	1	0	1	0	1	0	0
Oregon	10	11.09	1.24	1	0	1	1	1	1	1	1	1	1	1
Pennsylvania	6	9.37	1.19	0	1	0	0	1	0	1	0	1	1	1
Rhode Island	6	4.26	0.57	0	0	1	0	1	0	1	0	1	1	1
South Carolina	6	19.95	1.89	1	1 <sup>8</sup>	0	1	0	0	1	0	1	0	1
South Dakota	1	15.49	1.43	0	1	0	0	0	0	0	0	0	0	0
Tennessee	9	14.51	1.25	0	1	1	0	1	1	1	1	1	1	1
Texas	5	12.80	1.36	1	0	1	1	1	0	0	0	0	0	1
Utah	6	9.21	0.93	1	1	1	0	1	1	1	0	0	0	0
Vermont	7	9.10	0.78	1	1	1	0	1	0	1	1	0	0	1
Virginia	7	8.98	0.91	1	1	1	0	1	0	1	1	0	0	1
Washington	7	7.92	0.95	1	0	1	0	1	1	1	1	0	0	1
West Virginia	9	14.53	1.35	1	1	1	0	1	0	1	1	1	1	1
Wisconsin	6	9.81	0.91	1	0	0	1	1	0	1	0	1	0	1
Wyoming	4	24.74	1.51	1	0	0	0	1	0	1	0	1	0	0
<b>Total</b>		<b>10.92</b>	<b>1.13</b>	<b>45</b>	<b>40</b>	<b>26</b>	<b>7</b>	<b>35</b>	<b>18</b>	<b>42</b>	<b>20</b>	<b>27</b>	<b>22</b>	<b>31</b>

<sup>5</sup> States that meet the implementation criteria in this table may not necessarily meet the statutory criteria for receiving NHTSA grants.

<sup>6</sup> Alaska does not have a State statutory provision authorizing sobriety checkpoints, but their use is not prohibited. The U.S. Supreme Court upheld the constitutionality of sobriety checkpoints in *Michigan Department of State Police v. Sitz*, 496 U.S. 444 (1990), and the United States District Court of Alaska referenced the constitutionality of sobriety checkpoints, as held in *Sitz*, in a ruling concerning convicted sex offenders' right to privacy. See *Rowe v. Burton*, 884 F.Supp. 1372, 1382 (D.Alaska 1994).

<sup>7</sup> California had a pilot interlock program until July 1, 2017, that was mandatory for all convictions in Alameda, Los Angeles, Tulare, and Sacramento counties, which met our implementation criteria.

<sup>8</sup> South Carolina does not have a State statutory provision or case law authorizing sobriety checkpoints, but their use is not prohibited.

**Table 4: Traffic Safety Countermeasure Implementation (1=yes, 0=no) by State, Listed by Countermeasure Total and Alphabetically<sup>9</sup>**

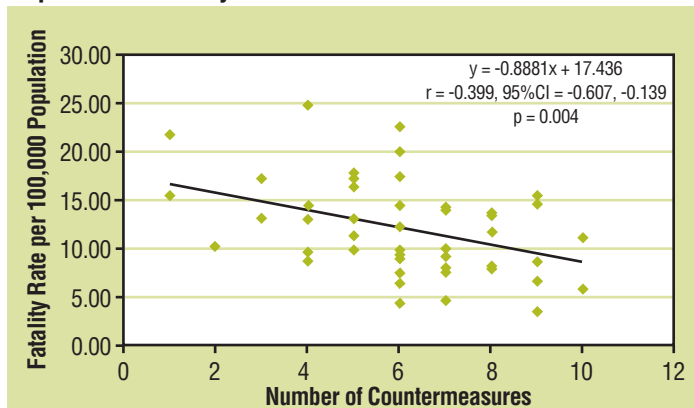
State	Total	Fatalities per 100,000 Population	Fatalities per 100 Million VMT	ALR/ALS	Sobriety Checkpoints	Interlocks	Primary Belt Laws	CRS Laws	Automated Speed Enforcement	Primary Texting Enforcement	Universal Motorcycle Helmet Laws	GDL	Youth Bicycle Helmet Laws	Complete Streets
New York	10	5.66	0.88	1	1	1	0	1	1	1	1	1	1	1
Oregon	10	11.09	1.24	1	0	1	1	1	1	1	1	1	1	1
District of Columbia	9	3.42	0.65	1	1	0	0	1	1	1	1	1	1	1
Hawaii	9	6.57	0.91	1	1	1	1	1	0	1	0	1	1	1
Louisiana	9	15.54	1.51	1	1	1	0	0	1	1	1	1	1	1
Maryland	9	8.54	0.89	1	1	1	0	1	1	1	1	0	1	1
Tennessee	9	14.51	1.25	0	1	1	0	1	1	1	1	1	1	1
West Virginia	9	14.53	1.35	1	1	1	0	1	0	1	1	1	1	1
District of Columbia	9	8.11	0.95	1	1	0	0	1	1	1	1	1	1	1
California	8	8.11	0.95	1	1	1	0	1	0	1	1	0	1	1
Delaware	8	13.32	1.27	1	1	1	0	1	0	1	0	1	1	1
Illinois	8	7.76	0.95	1	1	1	0	1	1	1	0	1	0	1
Maine	8	11.74	1.07	1	1	1	0	1	0	1	0	1	1	1
North Carolina	8	13.73	1.23	1	1	0	0	1	0	1	1	1	1	1
Colorado	7	10.01	1.08	1	1	1	0	1	1	1	0	0	0	1
Connecticut	7	7.41	0.84	1	1	1	0	0	0	1	0	1	1	1
Georgia	7	14.00	1.21	1	1	0	0	1	0	1	1	0	1	1
Massachusetts	7	4.50	0.52	1	1	0	0	1	0	1	1	0	1	1
New Mexico	7	14.29	1.09	1	1	1	0	0	1	1	0	1	1	0
Vermont	7	9.10	0.78	1	1	1	0	1	0	1	1	0	0	1
Virginia	7	8.98	0.91	1	1	1	0	1	0	1	1	0	0	1
Washington	7	7.92	0.95	1	0	1	0	1	1	1	1	0	0	1
Alabama	6	17.47	1.26	1	1	0	0	0	1	1	1	0	1	0
Alaska	6	8.80	1.29	1	1	1	0	1	0	1	0	1	0	0
Indiana	6	12.40	1.04	1	1	0	0	1	0	1	0	1	0	1
Kansas	6	12.19	1.13	1	1	1	0	1	0	1	0	1	0	0
Minnesota	6	7.49	0.72	1	0	0	1	1	0	1	0	1	0	1
Mississippi	6	22.62	1.70	1	1	1	0	0	0	1	1	0	0	1
Missouri	6	14.28	1.21	1	1	0	0	1	1	0	1	1	0	0
New Jersey	6	6.27	0.75	0	1	0	0	1	0	1	1	0	1	1
Pennsylvania	6	9.37	1.19	0	1	0	0	1	0	1	0	1	1	1
Rhode Island	6	4.26	0.57	0	0	1	0	1	0	1	0	1	1	1
South Carolina	6	19.95	1.89	1	1	0	1	0	0	1	0	1	0	1
Utah	6	9.21	0.93	1	1	1	0	1	1	1	0	0	0	0
Wisconsin	6	9.81	0.91	1	0	0	1	1	0	1	0	1	0	1
Arizona	5	13.08	1.37	1	1	1	0	1	1	0	0	0	0	0
Arkansas	5	17.83	1.52	1	1	1	0	0	1	1	0	0	0	0
Kentucky	5	17.20	1.56	1	1	0	1	1	0	1	0	0	0	0
Michigan	5	9.71	0.98	1	0	0	0	1	0	1	0	1	0	1
Nevada	5	11.24	1.25	1	1	0	0	0	1	1	1	0	0	0
Oklahoma	5	16.44	1.35	1	1	0	0	1	0	1	0	1	0	0
Texas	5	12.80	1.36	1	0	1	1	1	0	0	0	0	0	1
Florida	4	14.50	1.42	1	1	0	0	0	0	0	0	0	1	1
Nebraska	4	12.97	1.22	1	1	1	0	0	0	0	1	0	0	0
New Hampshire	4	8.57	0.87	1	1	0	0	0	0	1	0	0	1	0
Ohio	4	9.56	0.98	1	1	0	0	1	1	0	0	0	0	0
Wyoming	4	24.74	1.51	1	0	0	0	1	0	1	0	1	0	0
Idaho	3	13.05	1.30	1	0	0	0	0	0	1	0	1	0	0
North Dakota	3	17.31	1.31	1	1	0	0	0	0	1	0	0	0	0
Iowa	2	10.24	0.96	1	0	0	0	0	1	0	0	0	0	0
Montana	1	21.69	1.81	0	0	0	0	0	0	0	0	1	0	0
South Dakota	1	15.49	1.43	0	1	0	0	0	0	0	0	0	0	0
<b>Total</b>		<b>10.92</b>	<b>1.13</b>	<b>45</b>	<b>40</b>	<b>26</b>	<b>7</b>	<b>35</b>	<b>18</b>	<b>42</b>	<b>20</b>	<b>27</b>	<b>22</b>	<b>31</b>

<sup>9</sup> States that meet the implementation criteria in this table may not necessarily meet the statutory criteria for receiving NHTSA grants. All other footnotes relating to State Statutes or programs present in Table 3 also apply here.

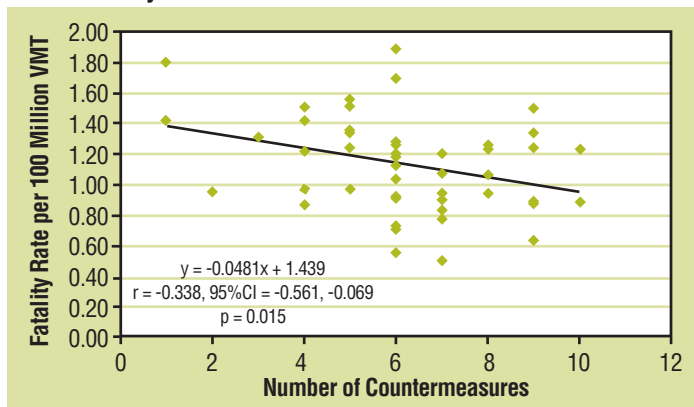


The total number of countermeasures implemented across States was moderately associated with fatality rates by both population and VMT. Fatality rates per 100,000 population tended to be lower for States with a higher total number of countermeasures,  $\alpha = -0.40$ , 95% confidence interval (CI) =  $-0.61, -0.14$ ,  $p = 0.004$  (Figure 3). A similar negative correlation was found between fatality rates per 100 million VMT and total number of countermeasures,  $\alpha = -0.34$ , 95% confidence interval =  $-0.56, -0.07$ ,  $p = 0.015$  (Figure 4, below). The number of countermeasures implemented by States accounts for 15.9 percent of the variance in decreasing population fatality rates, and 11.4 percent of the variance in decreasing VMT fatality rates.

**Figure 3: Number of Countermeasures Implemented by Population Fatality Rate**



**Figure 4: Number of Countermeasures Implemented by VMT Fatality Rate**



## Discussion

Proven countermeasures, effective in reducing traffic fatalities, are useful tools for States and other jurisdictions across the United States, particularly as they increasingly adopt TZD highway safety models. The current study was conducted as an initial high-level examination of the implementation of selected proven countermeasures and their implications for progress “Toward Zero Deaths” in the United States. After an extensive review of the literature, 10 countermeasures were selected from *Countermeasures That Work* for inclusion in the study. Also included were *Complete Streets* policies, which were specified in the FAST Act. All 50 States and the District of Columbia were then examined to determine the extent to which they had imple-

mented these 11 selected countermeasures based on strict criteria established for this study. The number of countermeasures for each State and the District were then compared with their traffic fatality rates by both population and VMT.

Overall, States with a higher number of implemented countermeasures were associated with lower population and VMT traffic fatality rates. It is perhaps unsurprising that two-thirds of States have implemented six or more of the selected countermeasures, as evidence has demonstrated that they save lives. For example, most of the States have implemented ALR/ALS (88%), primary enforcement to prevent texting and driving (82%), sobriety checkpoints (78%), and CRS laws (69%). In contrast, relatively few States have implemented universal motorcycle helmet laws (39%), automated speed enforcement (35%), and primary seat belt laws (14%). The low percentage of States with a primary belt law in the study reflects the study’s strict criteria of protecting occupants of all ages not covered by a CRS law, in all seating positions, which embodies complete implementation of this countermeasure. Given that, from 1960 to 2012, seat belts were a primary contributor in saving more than 600,000 lives (Kahane, 2015), a more complete primary seat belt policy could potentially save many more lives.

There were limitations to this study. Most importantly, data on the level and quality of traffic safety countermeasure implementation across States was neither considered nor available. Thus, the measure of countermeasure implementation was based solely on the adoption of State policies and/or programs based on study criteria. For example, States were considered to have a sobriety checkpoint program if they were authorized to conduct sobriety checkpoints. However, some of these States may perform them sparingly. Conversely, some States that are not permitted to perform sobriety checkpoints may conduct a robust alcohol-impaired and drugged driving program through the use of saturation patrols. Such nuances were not accounted for in this study. This may explain why some States (such as Louisiana and West Virginia) are in the top quartile for the number of implemented countermeasures, but in the bottom quartile for fatality rates by both population and VMT. In addition, weighting was not applied for States with partial policies/programs, such as States with primary seat belt laws that did not conform to all elements of the criteria established for this study. It is important to note that the variance in decreasing traffic fatality rates can be attributed, at least in part, to factors other than the number of countermeasures that States implement, including geography, road infrastructure, socio-economic and traffic safety cultural differences, traffic safety infrastructure, existing legislation, and enforcement across States, which were not accounted for in this study.

## Conclusion

This study suggests that States may be able to save more lives by increasing the number of proven countermeasures that they implement. States that implemented a greater number of proven countermeasures tended to have lower traffic fatality rates. Ideally, policymakers should continue to pursue comprehensive traffic safety legislation in order to adopt as many countermeasures as they can reasonably implement and effectively enforce,

at the State and local levels. Furthermore, both policymakers and practitioners may be able to look at States that have achieved low traffic fatality rates with the adoption of fewer effective countermeasures, as models for how to adapt the strategies that they use to their own jurisdictions, and help States to achieve progress “Toward Zero Deaths.” Future research in this area can consider incorporating injury, economic, and social indicators into countermeasure interactions and effectiveness comparisons; utilize implementation-level indicators for specific countermeasures; and adapt case studies to compare best or promising practices of State implementation of effective traffic safety countermeasures to achieve progress “Toward Zero Deaths.”

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