

Comparative Performance Measurement

SAFETY

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Measuring Performance Among States: Sharing Best Practices in Highway Safety Project Panel

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List of Acronyms

AAA	American Automobile Association	MADD	Mothers Against Drunk Driving
AADT	Annual Average Daily Traffic	MCSAP	Motor Carrier Safety Assistance Program
AASHTO	American Association of State Highway and Transportation Officials	MMUCC	Model Minimum Uniform Crash Criteria
BAC	Blood Alcohol Concentration	MOU	Memorandum of Understanding
CIOT	Click It or Ticket	MPO	Metropolitan Planning Organization
CY	Calendar Year	NHS	National Highway System
DMV	Department of Motor Vehicles	NHTSA	National Highway Traffic Safety Administration
DOT	Department of Transportation	NCHRP	National Cooperative Highway Research Program
DPS	Department of Public Safety	NOPUS	National Occupant Protection Use Surveys
DUI	Driving Under the Influence	PIL	Priority Investigation Location
DWI	Driving While Impaired	RFP	Request for Proposals
EMS	Emergency Medical Services	RSA	Road Safety Audit
FARS	Fatality Analysis Reporting System	RTF	Rural Task Force
FFY	Federal Fiscal Year	RTU	Regional Traffic Unit
FHWA	Federal Highway Administration	RWIS	Road Weather Information System
FMCSA	Federal Motor Carrier Safety Administration	SAFE	Strategic Area Focused Enforcement
GDL	Graduated Driver Licensing	SCOPM	Standing Committee on Performance Management
GHSAA	Governors' Highway Safety Association	SCOQ	Standing Committee on Quality
GIS	Geographic Information System	SES	Strategic Evaluation States
GPS	Global Positioning System	SHSP	Strategic Highway Safety Plan
HEAT	Highway Enforcement of Aggressive Traffic	STEP	Selective Traffic Enforcement Program
HSD	Highway Safety Division	STIP	State Transportation Improvement Program
HSIP	Highway Safety Improvement Program	STP	Surface Transportation Program
HSO	Highway Safety Office	T2	Technology Transfer
IRI	International Roughness Index	TraCS	Traffic and Criminal Software
IM	Interstate Maintenance	TRCC	Traffic Records Coordinating Committee
ITS	Intelligent Transportation System	TZD	Towards Zero Deaths
LEAF	Local Enforcement Assistance Fund	VMT	Vehicle Miles of Travel
LEL	Law Enforcement Liaison		
LSI	Local Safety Initiative		



Executive Summary

1. Executive Summary

Comparative Performance Measurement for Safety

Today's transportation agencies need to find ways to improve service and demonstrate tangible results for their customers—while operating under increasingly tight resource constraints. Comparative performance measurement is a potentially powerful technique for motivating and facilitating changes that result in improved performance. It motivates organizations to pursue improvements by showing them what their peers have been able to achieve. It facilitates improvement by identifying specific best practices that have led to good results. Establishing comparable measures can take considerable effort, but pays off when participating organizations learn from practices employed by their peers to improve their own performance. Comparative performance measurement efforts also have the important effect of shining a spotlight on current approaches to show how data is tracked, how performance is measured, and how results are used. Participating agencies have an opportunity to examine the consistency and accuracy of their measurement practices, learn about differences in measurement across agencies, and work towards a greater degree of commonality.

This report presents results of the third in a series of comparative performance measurement efforts sponsored by the American Association of State Highway and Transportation Officials (AASHTO) Standing Committee on Quality (SCOQ), Performance Measurement and Benchmarking Subcommittee. The purpose of these efforts is to identify states that have achieved exemplary performance, find out what practices have contributed to their success, and document these practices for the benefit of other states. This effort focuses on safety.



Contribution of This Study

This study highlights effective highway traffic safety practices associated with states that significantly “moved the needle” downward with respect to fatality rates in the first seven years of the 21st century. Looking at what these states have done has allowed for distillation of important practices from what is a highly complex and multi-faceted endeavor. It has added to the existing body of information on best practices in safety, providing a snapshot of current practice, and a crystallization of important themes. Its results will add to a growing compendium of best practices for multiple important dimensions of DOT practice.

This study did not yield dramatic new discoveries about how to reduce fatalities on the nation’s highways. This is not surprising given the breadth of the topic and the level of resources that have already been devoted to analyzing fatality data and documenting best practices in safety. However, the study does provide a synthesis of important information that may not be well understood by state DOT managers who have not been actively involved in highway safety planning. Presenting this information in the context of comparative performance information provides a compelling basis for executives to quickly identify where they stand, see the potential for further improvement, and scan the key types of practices that can be explored for achieving that improvement.

Analysis of Safety Data

In this comparative performance measurement project on the topic of safety, the National Cooperative Highway Research Program (NCHRP) research panel suggested that fatality data from NHTSA’s Fatality Analysis Reporting System (FARS) should be used as the primary data source. Use of fatality data (rather than crash or injury data) makes sense for several reasons. Fatalities are a performance measure of interest to states, and are the focus of many national and statewide performance improvement efforts. In addition, FARS provides a solid and reliable data source for comparative analysis. There is currently no comparable national data source that accurately represents individual state performance with respect to crashes or injuries. Unfortunately, definitional differences across states make comparisons using state crash records less reliable.

While fatalities and fatality rates (normalized based on traffic) are compelling performance measures, the selection of fatalities as an indicator poses challenges for comparative performance measurement. Fatalities are relatively rare events and as such, are subject to substantial random variation. Also, studies have found that much of the variation in fatality rates across states can be attributed to differences in travel and socioeconomic characteristics, including the distribution of rural vs. urban travel, population density, income, and age distribution.

In order to compensate for these challenges, it was decided to look at *changes* in fatality rates over time rather than absolute values of fatality rates. The percentage change in three-year average fatality rates between 2000–2002 and 2005–2007 provided the primary measure used in this study. Using the change in fatality rate as the measure for comparison made it easier to draw a causal link between agency actions and observed performance. However, because looking only at fatality rate changes would tend to overlook states that have already achieved relatively low fatality rates through longstanding exemplary practices, the research team also considered the absolute fatality rate as a secondary factor in the selection of top performing states.

Identification of High-Performing States

Identification of high-performing states for discovery of good practice was approached using four different methods:

- **Method 1:** Select the five states with the highest percentage reduction in fatality rate.
- **Method 2:** Screen out the states with overall fatality rates greater than the national average for the period 2005–2007 (1.41). From remaining states, select the five with the highest percentage reduction in fatality rate.
- **Method 3:** Construct peer groups based on geographic region, and select the state with the highest percentage reduction in fatality rate within each group. Use overall fatality rate as a tie breaker where clusters of states have similar reductions in fatality rates.
- **Method 4:** Same as Method 3, but with peer groups constructed based on the percentage of fatalities on urban roadways. This peer grouping was included in recognition of the clear differences in fatality rates across urban and rural roadways.

Six states were selected as top performers based on being ranked highest using two or more of the four methods. States shown with an asterisk are those that were either tied or a close second utilizing the method indicated.

Table 1-1. Performance Results for Top Six States

State	Selected by Which Methods	2000–2002		2005–2007		Percentage Change in Fatality Rate
		Number of Fatalities	Fatality Rate	Number of Fatalities	Fatality Rate	
CO	1,2,3,4	722	1.69	565	1.17	–31%
MN	1,2,3,4	617	1.15	519	0.91	–21%
MI	1,2,3*,4*	1329	1.34	1101	1.06	–21%
UT	1,2,4*	331	1.41	289	1.11	–21%
CT	2,3,4	328	1.06	289	0.91	–14%
MA	3*,4*	456	0.86	429	0.78	–9%

Interviews to identify best practices focused on these six states. However, given that recent in-depth case studies had already been conducted for Michigan and Minnesota as part of an earlier NCHRP project, project resources allowed for inclusion of four additional states that had been highest ranked in only one of the four methods. Therefore, interviews were also conducted with the states of Alaska (top ranked in Method 1), Maryland (top ranked in Method 3), Maine and New York (both top ranked in Method 4).

The figure below shows changes in fatality rate for all 50 states between 2000–2002 and 2005–2007. States with the greatest decreases in fatalities are well below the diagonal line. The top six selected states are highlighted with orange diamonds; the additional four states with noteworthy performance are highlighted with yellow circles.

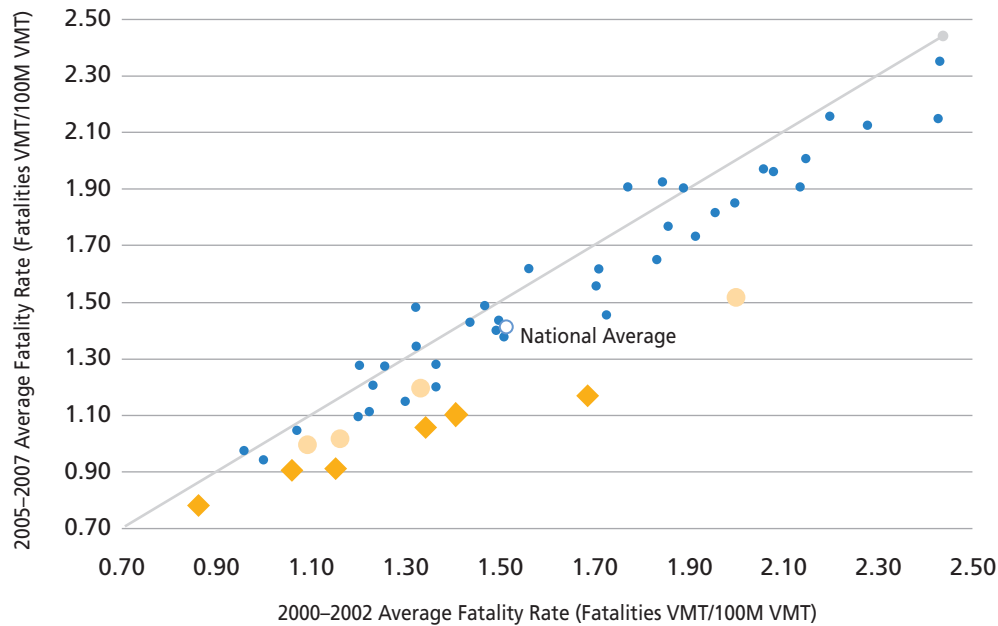


Figure 1-1. Changes in Fatality Rates 2000-2002 to 2005-2007 with Selected States Highlighted

Practices Contributing to Fatality Reductions

Twenty-four agency practices were identified through interviews with representatives of the 10 states that had achieved substantial fatality reductions between 2000 and 2007. When asked what they thought were the most significant factors that impacted fatality reductions, representatives of nearly every state said that it was either (1) seat belt and DUI legislation and associated enforcement, (2) a shift towards more data driven safety planning, (3) strengthened partnerships, or a combination of these. Specific practices are listed below, organized into six themes that were common to all states.

Leadership and Interagency Partnerships

- **Practice #1:** Establish an executive level committee to ensure coordination and cooperation and guide major resource allocation decisions.
- **Practice #2:** Identify and empower safety “champions” including state and local elected officials, safety program managers, police chiefs, and other community leaders. At the same time, ensure involvement of a broader set of staff in both strategic and operational decision making to provide “deep roots” for safety leadership and communication and reduce vulnerability of safety programs to staff turnover.
- **Practice #3:** Ensure that there is regular communication among safety partners to share information about problems and their solutions by maintaining weekly informal communication among lead staff for engineering, behavioral programs, and enforcement.
- **Practice #4:** Maintain two-way information flow between enforcement personnel and central safety office personnel to share information about high-risk locations and problem areas. Enforcement personnel can bring the benefit of extensive field observation and knowledge about input from the community on trouble spots.

Performance Targets and Continuous Monitoring of Progress

- **Practice #5:** Adopt a unifying message for all agencies with a highway safety mission. Agree on a “mantra” or theme (e.g., “Towards Zero Deaths” (TZD) or “Zero Fatalities”) and brand all safety programs and safety-related messaging with this theme. Promote the understanding that everyone is working towards a common goal, that collaboration across agencies is the only way to succeed, and that a multi-disciplinary, multi-faceted approach is required.
- **Practice #6:** Set targets through strategic safety planning processes and actively monitor progress. Keep the “collective eye on the ball” by continually sharing performance results among major safety partners—with daily or weekly updates.
- **Practice #7:** Improve dissemination of crash data by making it accessible on the Internet and publishing or distributing maps of crashes by type.

Support Legislation to Reduce Highway Fatalities

- **Practice #8:** Pass primary seat belt laws to allow for citations to be issued for lack of seat belt use alone.
- **Practice #9:** Strengthen Graduated Driver Licensing (GDL) to impose restrictions on younger drivers while they gain experience.
- **Practice #10:** Pass .08 BAC per se laws to enable immediate license revocation for drunk drivers.
- **Practice #11:** Pass mobile phone usage laws to reduce distracted driving.

Use Timely and Accurate Data to Target Programs and Countermeasures for Greatest Payoff

- **Practice #12:** Use the Strategic Highway Safety Planning process to identify emphasis areas and select appropriate strategies.
- **Practice #13:** Improve timeliness and accuracy (including locational accuracy) of crash data on both state and local roads.
- **Practice #14:** Use crash data to guide allocation of resources across program areas to target crash types or behaviors that account for a large share of fatalities.
- **Practice #15:** Conduct screening of locations for engineering countermeasures based on crash and highway inventory data. Consider appropriate implementation of low-cost engineering improvements with demonstrated effectiveness, including shoulder and median rumble strips, cable guardrail, curve delineation, improved signage, and signalization. Develop countermeasures based on field review and rank based on cost/benefit.
- **Practice #16:** Focus enforcement activities on jurisdictions, highway locations, and time-periods where the highest concentrations of targeted crash types exist.
- **Practice #17:** Target outreach programs to specific populations based on overlaying census, driver licensing, and crash data to identify residential areas and demographic segments with higher than average risks.

Maximize Coordination Across State and Local Law Enforcement Agencies

- **Practice #18:** Use law enforcement liaison(s) (LELs) to maximize involvement of local enforcement agencies in statewide initiatives.
- **Practice #19:** Fund (through federal and state sources) overtime enforcement and equipment purchase, with incentives for resource sharing.
- **Practice #20:** Develop resource sharing agreements among law enforcement agencies.

Pursue Creative and Proactive Public Communications and Messaging

- **Practice #21:** Develop and maintain strong relationships between the Highway Safety Office (HSO) and local media through use of dedicated in-house staff or contractor support to provide consistent communications for all safety messaging.
- **Practice #22:** Involve political leaders in safety-related events to provide enhanced media coverage.
- **Practice #23:** Maximize opportunities to obtain “earned media” coverage (press releases, events) and ensure local media coverage of each fatality.
- **Practice #24:** Develop community-based messaging (e.g., Spanish language, church-based, school-based programs).

Improving Future Comparative Performance Measurement for Safety

The following recommendations were developed to improve the state of the practice in comparative performance measurement for safety:

- **Base Future Comparisons on Fatalities Plus Serious Injuries.** Gain agreement on common definitions and reporting protocols for serious injuries associated with crashes. Use of serious injuries plus fatalities rather than fatalities alone would allow for a more stable and statistically robust basis for making cross-state comparisons. It will also allow for comparative performance analysis based on targeted subsets of crash data. For example, tracking fatalities and injuries associated with speed, impaired driving, and unrestrained vehicle occupants would provide a valuable focus on these key risk factors.
- **Narrow the Focus of Future AASHTO Safety Comparative Performance Analyses.** Conduct more focused comparative performance measurement efforts for particular aspects of highway safety (e.g., work zone safety, two-lane rural road safety, intersection safety) that rely on state crash records rather than FARS data. This type of effort would bring new information to the table and allow for a more detailed look at specific effective practices that are under the control of state DOTs. It would be more consistent in approach with the first two AASHTO comparative performance measurement efforts that involved more active state participation in providing data and selecting measures.
- **Look Beyond the United States.** Extend the scope of future comparative performance measurement to the international community. U.S. state safety programs have a high degree of similarity due to the structure of NHTSA and FHWA grant programs and associated requirements. International scans have found innovative and effective practices that have not yet been widely adopted in U.S. settings.
- **Support the NHTSA/GHSA Performance Measures Implementation.** Support implementation of the recommendations of the NHTSA/GHSA performance measurement initiative, including establishment of

standard, well documented definitions, and measurement methodologies for each measure. While these measures are intended for use within individual states, their implementation will also provide an improved basis for comparative performance measurement.

- **Improve Accuracy of Travel Monitoring.** Continue research to improve monitoring of Vehicle Miles of Travel (VMT), particularly for local roads and for motorcycle travel. Reliable, accurate VMT estimates are crucial for tracking of fatality rates, which are a core measure for comparative safety performance measurement. Current initiatives related to VMT-based user fees in place of the gas tax offer some potential to provide new sources of VMT data that could supplement existing reporting methods.
- **Gather Objective Information on Travel Speeds.** Support initiatives to gather objective information on travel speeds. Currently police accident reports are the only source of information on the extent of speed-related crashes and fatalities. Collection of objective information on travel speeds would provide an improved basis for comparing speeding behavior and associated safety performance across states. The Governor's Highway Safety Association (GHSA) has recommended that Congress fund a biennial, national speed-monitoring data collection study to determine how fast the traveling public is actually going.
- **Reduce the Lag Time in Compiling and Publishing Fatality, Crash, and VMT Information.** Continue support at the state and national levels to improve the timeliness of both VMT and fatality/crash information. National FARS data for a given year is not finalized for over 12 months following the close of that year (to allow for states to complete population of data which may be derived from multiple sources.) Currently, availability of final VMT data from FHWA lags behind availability of preliminary FARS data, making it necessary to either rely on older data or utilize estimated VMT for analysis of fatality rates. In interviews conducted for this study, states that had achieved quick turnaround of their crash data have reported significant benefits in terms of willingness to use the data to target resources where they will have the greatest payoff. Similarly, at the national level, in order to maximize relevance, comparative performance efforts should utilize data that are as current as possible.
- **Standardize Tracking of Behavioral Risk Factors.** Support initiatives to gather behavioral information via standard survey instruments that could provide a basis for comparison of changes over time in known risk factors, including drinking and driving, use of cell phones, and speeding.
- **Standardize Tracking of Enforcement Activity Measures.** Explore development of standard measures of enforcement activity coverage in order to allow for comparison across states—for example, percentage of statewide, weekend, night-time vehicle miles or hours of travel exposed to enforcement activity.
- **Standardize Tracking of Highway Safety Feature Implementation.** Explore development of standard measures for comparing and tracking implementation of safety design feature coverage—for example, percentage of Interstate directional miles with shoulder rumble strips.



Introduction

2. Introduction

Background

In 2004, AASHTO's SCOQ Performance Measures and Benchmarking Subcommittee initiated NCHRP 20-24(37)—Measuring Performance Among State DOTs. This initiative aims to establish a handful of comparative performance measures in key strategic focus areas—for example, project delivery, system condition, congestion, and safety; facilitate comparisons of these measures across a group of volunteer agencies; and use these comparisons as a way to identify and share best practices and lessons learned. On-time, on-budget project delivery was selected as the initial performance area. The final report for this initial comparative performance measures effort—Project 20-24 (37)A—presents data for 20 states, and provides a synthesis of 28 best practices from the nine top performing states. A second project in the series—20-24(37)B looked at pavement roughness, as measured using International Roughness Index (IRI). This effort involved 32 states and identified specific practices that were employed by the agencies with the smoothest pavements. Both agency programs and paving contractor practices that contributed to achievement of smooth pavements were identified. The final report also included recommendations for improvements in data collection and analysis methods to achieve a greater degree of consistency in support of future comparative performance measurement initiatives.

This third effort focuses on traffic safety, a topic of critical importance—in 2007, over 41,000 people died on U.S. roads and approximately 2.5 million were injured. The National Surface Transportation Policy and Revenue Commission report, released in early 2008, recommended that the U.S. DOT establish national a goal to cut surface transportation



fatalities in half by 2025. The AASHTO Board of Directors has set a 20-year goal of cutting traffic fatalities in half, which implies an annual reduction of 1,000. Several states have set their own aggressive targets for fatality reduction, and have shown success moving towards these targets through implementation of comprehensive safety programs.

There is considerable interest in improving consistency and application of safety performance measures. A 2004 FHWA International Performance Measurement Scan found that “safety was viewed as a strategic use of performance measurement that has resulted in a significant decline in fatalities.” The Highway Safety Partners Venture (HSPV) has established a working group (including representatives of AASHTO, Federal Highway Administration (FHWA), the Governors Highway Safety Association (GHSA) and others), to develop national safety performance metrics that could be used to raise public awareness of the scope of the safety problem and the need for investment. The GHSA and the National Highway Traffic Safety Administration (NHTSA) have recently developed guidance on performance measures to be used (on a voluntary basis) by federal, state, and local governments as part of the development and implementation of highway safety plans and programs. In recognition of the critical role of accurate, consistent, timely, and integrated traffic records systems in providing inputs to safety performance tracking, NHTSA and GHSA are currently sponsoring a follow-on effort to develop performance measures for state traffic record systems.

Research Objectives

The objective of this project was to use the techniques developed in NCHRP Projects 20-24(37)A and B to develop comparative statistics on highway safety, identify factors that likely influence the safety experience of states, and identify strategies used by states that have shown greatest improvements in safety performance.

The approach to the first two comparative performance measurement projects was to solicit participation from state departments of transportation (DOTs) that agreed to share their data. In these first two projects, participating states were involved in the process of determining appropriate performance measures and identifying the metadata required to understand variations in performance across states. For this third project, a different approach was taken given that (1) the FARS provided a reliable, publicly available national source of data on traffic fatalities for all states, and (2) practices impacting safety performance are not within the sole purview of state DOTs—they involve significant collaboration and coordination across public safety and law enforcement agencies and across local governments. Rather than requesting specific states to participate in this project from the start, performance measures that relied upon FARS data were selected and analyzed with input from the NCHRP project panel. The seven-year period from 2000–2007 was selected as the time frame for analysis.

Literature Review

A focused review of literature relevant to this project was conducted to provide a baseline of information to guide the research approach. The review covered three areas: national trends, safety performance measurement, and best practices for reducing fatalities. The results of this review are presented below.

National Changes in Fatalities 2000–2007

Prior to looking at comparisons in safety performance across states, it is useful to look at the national trends between 2000 and 2007, the selected time period of interest for this study.

In 2007, 41,059 people were killed in motor vehicle crashes, a 2 percent decrease from 2000. However, due to an increase in traffic during this seven-year period, the fatality rate (fatalities per 100 million VMTs) decreased by 11 percent—from 1.53 in 2000 to 1.36 in 2007.

As shown in Figure 2-1, while car and light truck occupant fatalities decreased by 10 percent; motorcyclist fatalities rose by 78 percent and increased to account for 13 percent of all fatalities (up from 7 percent in 2000).

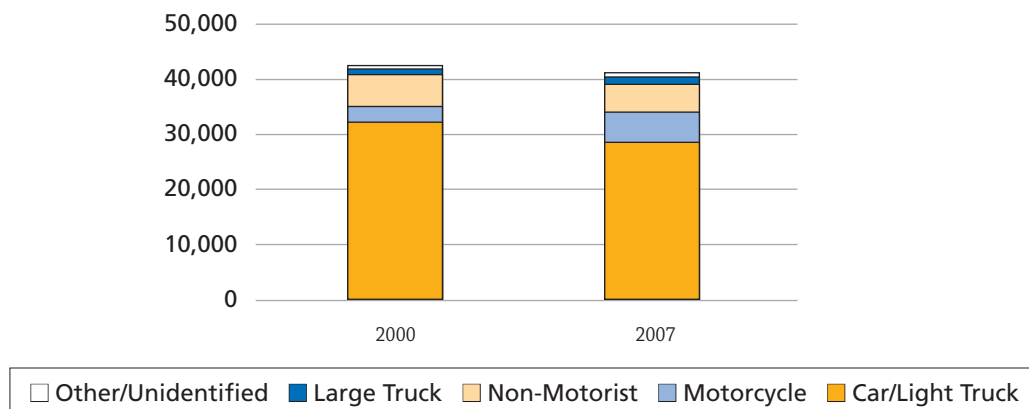


Figure 2-1. 2000 and 2007 Fatalities by Type of Vehicle

As shown in Figures 2-2 through 2-4, fatality trends were different for rural and urban roadways, due in part to changing travel patterns. Between 2000 and 2007, urban fatalities increased by 10 percent, but grown in urban VMT was greater—20 percent, resulting in an 8 percent decrease in the urban fatality rate—from 0.95 to 0.88. Rural fatalities decreased by 8 percent while rural VMT decreased by 5 percent, resulting in a 4 percent decrease in the rural fatality rate—from 2.29 to 2.21.

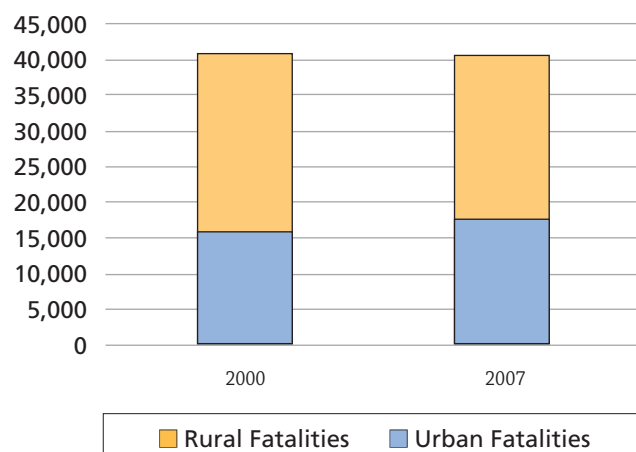


Figure 2-2. 2000 and 2007 Fatalities by Roadway Functional Class

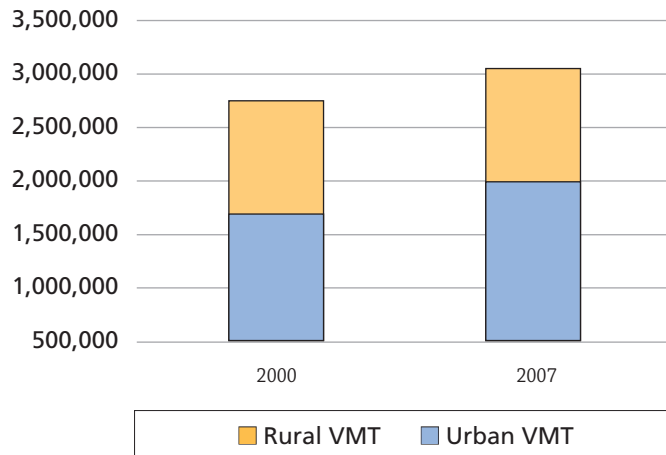


Figure 2-3. 2000 and 2007 VMT by Roadway Functional Class

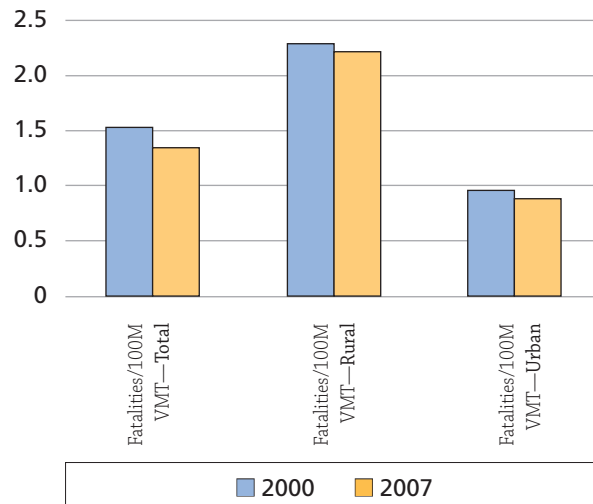


Figure 2-4. 2000 and 2007 Fatality Rates by Roadway Functional Class

Examination of the data with respect to the major contributing factors for motor vehicle fatalities—speeding, driving while intoxicated, and use of safety belts (speed, booze, and belts) provides further insight into the trends. Alcohol-related fatalities (blood alcohol level .08 and above) accounted for 32 percent of all fatalities, and decreased slightly (by 2 percent) between 2000 and 2007. Speeding-related fatalities accounted for 11–12 percent of all fatalities, and increased slightly (by 2 percent)—from 2000–2007. Unrestrained fatalities (in passenger cars and light trucks) declined by a substantial 19 percent—falling from 55 percent of all passenger car and light truck fatalities in 2000 to 50 percent in 2007. This last statistic is consistent with the increase in overall seat belt use observed in the NHTSA National Occupant Protection Use Surveys (NOPUS), from 71 percent to 82 percent during this time period.

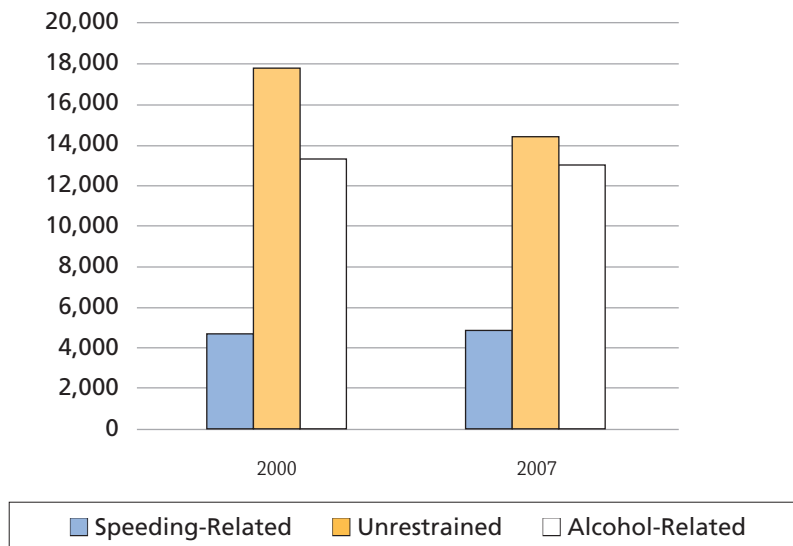


Figure 2-5. 2000 and 2007 Speeding-Related, Unrestrained and Alcohol-Related Fatalities

Safety Performance Measures

All states receiving NHTSA safety funds must submit an annual performance plan with safety goals and associated performance measures. States can choose which performance measures to include in this plan. National fatal accident reporting requirements provide a minimum set of common measures that are reported by all states related to fatal accidents. All states track crashes and injuries, though there is variation across states with respect to data elements collected, and criteria for which crashes are reported and how injuries are defined and tracked. The model minimum uniform crash criteria (MMUCC) provides a standard set of data elements to be tracked for each crash. MMUCC is a voluntary standard, though NHTSA Section 408 grants are made available to states to enhance their traffic safety information systems if they have adopted MMUCC, or if they plan to use the grants to modify their systems to improve match with the MMUCC elements.

Complete data for every state on numbers of crashes and crash-related injuries is not currently compiled. NHTSA's National Automotive Sampling System gathers data on a statistical sampling of police crash reports in the United States, but data from this system cannot be used to infer state-level information.

A recent report (Hedlund, 2008) reviewed safety performance measures in use within the United States and abroad, and presented a minimum set of performance measures developed by an expert panel. The NHTSA and the Governors Highway Safety Association (GHSA) have agreed to move forward with implementation of these measures. The measures are to be used by states and federal agencies in the development and implementation of behavioral highway safety plans and programs. They include three activity measures (measures of what is being done to improve safety), one core behavior measure (how are people responding by changing their behavior), and ten core outcome measures (what is the end result on fatalities and injuries.) State are to set goals for and report progress on the outcome and behavior measures, and report the activity measures beginning with their 2010 Highway Safety Plans and Annual Reports.

Recommended outcome measures are:

- Number of traffic fatalities (FARS)
- Number of serious injuries in traffic crashes (State crash data files)
- Fatalities/VMT (FARS, FHWA)-states should report both rural and urban fatalities/VMT as well as total fatalities/VMT
- Number of unrestrained passenger vehicle occupant fatalities, all seat positions (FARS)
- Number of fatalities in crashes involving a driver or motorcycle operator with a BAC of .08 and above (FARS)
- Number of speeding-related fatalities (FARS)
- Number of motorcyclist fatalities (FARS)
- Number of unhelmeted motorcyclist fatalities (FARS)
- Number of drivers age 20 or younger involved in fatal crashes (FARS)
- Number of pedestrian fatalities (FARS)

Use of 3–5 year moving averages is recommended as a technique for clarifying long-term trends.

The report also presents several recommendations to support implementation of these measures and enable development of new measures that would be of value, including:

- Development of uniform definitions, protocols, and reporting requirements for each of the recommended measures.
- Provision of assistance to states in establishing data collection and analysis systems for measures that not all states currently report.
- Efforts to support states in moving towards common and improved injury data definitions and reporting practices.
- Development of guidance for speed monitoring in order to improve the quality of information on speeding-related crashes and fatalities.
- Efforts to provide common metrics on law enforcement activities, including citations and arrests.
- Efforts to develop common surveys that measure driver attitudes, awareness, and behaviors related seat belt use, impaired driving, and speeding.

Comparative Analysis of Safety Performance

Numbers of fatalities and fatality rates (fatalities per 100 million VMT and per capita) are routinely compiled and reported for all states by NHTSA in annual fact sheets. In addition, NHTSA compiles information on seat belt usage rates reported by each state from probability-based observational surveys conducted based on criteria established by NHTSA.

A number of studies were identified in the literature that made use of comparative performance measures to draw conclusions about influence of various causal factors and to identify effective practices. For example:

- A 2007 paper (Sivak, 2007) entitled “Traffic Safety in the U.S.: Re-Examining Major Opportunities” looked at changes in road fatalities, fatalities per billion kilometers driven, and fatalities per capita between 1994 and 2004 for the United States and 17 other developed countries. It points out that Sweden and the Netherlands had substantially greater declines in fatality rates (31 and 35 percent, respectively) than the United States had (17 percent) between 1994 and 2004. It also cited an earlier study that noted that while the United States was at the forefront of traffic safety for most of the 20th Century, its rank with respect to fatality rate had dropped to 10th place by 2002. The paper then examines a range of countermeasures that have proven to be successful in other countries and, based on this experience, discusses opportunities for improving safety performance in the United States.
- A recent report (Hedland, Gilbert, et. al., 2008) presents case studies of 10 states with relatively high seat belt use rates and draws a number of valuable conclusions about key factors that contribute to high belt use.
- A 2006 FHWA paper (FHWA, 2006) looked at changes across states in three-year average fatalities and fatality rates between 1996–1998 and 2002–2004 and identified five “success states” which had decreases in fatalities and fatality rates much higher than the national average. It then looked at specific types of fatality reductions (unbelted, alcohol-related, speeding-related, etc.) for these states and concluded that “the states achieving the most improvement in their fatality rates have done so through a multi-faceted approach to safety,” given that these states showed improvements across multiple categories.
- A 2008 NHTSA report (Syner, et. al, 2008) presents case studies of three states that participated in the Strategic Enforcement State (SES) initiative focusing on reducing alcohol-related crashes, injuries, and deaths. The SES involved 15 states; those selected for case studies had demonstrated significant declines in alcohol-related fatalities in one or more years of the program.

The ability to identify high-performing states and link their achievements with successful practices is clearly of value. However, comparisons must be done with care. In particular, comparative analysis of fatalities and fatality rates across states must recognize that (1) fatalities are relatively rare events and are therefore subject to substantial random fluctuations from year to year, and (2) variations in fatality rates are due to multiple interrelated causal factors, many of which cannot be impacted through programs to improve safety via the 4Es (Engineering, Enforcement, Education, and Emergency Response.)

A 2006 paper (O’Neil, 2006) analyzed motor-vehicle crash death rates per mile traveled in the 50 U.S. states from 1980 to 2003 using multiple regression models that related death rates to urbanization and demographic factors such as age, income, and ethnicity. It found that almost 70 percent of the variability in passenger vehicle occupant death rates across states could be explained by urbanization and demographic factors. It concluded that motor-vehicle crash death rates are strongly influenced by factors unrelated to highway-safety countermeasures, and therefore that overall death rates should not be used as a basis for judging the effectiveness of countermeasures or to assess the relative effectiveness of overall highway safety policies across jurisdictions.

A recent paper (Kweon, 2007) cautions that “comparing fatality rates among states without controlling for any factors is likely to project an erroneous picture of the relative traffic safety among states.” It reports the results of an analysis in which several demographic, economic, and roadway characteristics were controlled for in order to provide more reliable estimates of fatality rates. State rankings using these new estimates were compared to rankings based on raw fatality rates. About half of the states that appeared in the top 10 use of raw fatality rates (per VMT) dropped out of the top 10 in the new rankings, which took into account control factors. However the author noted that the new rankings, while better than the raw rankings, should not be used as stable traffic safety yardsticks for comparison between states, given the high degree of uncertainty in the estimates.

Population density and degree of urbanization are commonly recognized as key factors explaining variation in highway fatality rates. If fatality rates are separately calculated for urban and rural classified roadways, rates for the urban roadways are considerably lower. Therefore, more highly urbanized states will tend to have lower fatality rates. Hedlund (2008) provides an example of “Simpson’s Paradox,” in which state A has a lower overall fatality rate (fatalities per VMT) than state B, but when fatality rates are calculated separately for urban and rural roads, both of these are higher for state A than state B. This situation was due to the fact that state A had a much higher share of urban VMT than state B.

Lower fatality rates are related to lower travel speeds in urban settings. However, there are other factors that are correlated with rural or lower population density settings that influence fatality statistics. A 2006 study (Muelleman, 2006) looked at four different population density regions over a five-year period in a four-state Midwest region, and found that fatality rates were inversely proportional to population density. Variables related to lower population density were more light and heavy truck types, more frequent alcohol use and higher levels of intoxication, more frequent crashes that are non-collisions on less heavily traveled roads, more frequent crashes on gravel surface types, more frequent occupant ejection, and delayed medical care.

Based on this review of the literature, the research team concluded that it would be more instructive to look at changes in fatality rates over time rather than at current fatality rates as the primary performance measure. It was also decided that the analysis would include examination of changes in urban and rural fatality rates as well as changes in overall rates.

Factors Affecting Fatality Rate Reductions

In order to develop interview questions to explore best practices, the literature review included an investigation of causal factors impacting changes in fatality rates. While there is a vast literature on this topic, the paper by Sivak (Sivak, 2007) was used to provide a foundation for this review given its organization around five major risk factors for traffic fatalities and associated countermeasures, and its incorporation of findings from a wide variety of studies. The five risk factors covered were: speeding, lack of safety belt use, alcohol impaired driving, young drivers, and nighttime driving. It noted that at least one of these five factors were present for about three quarters of all fatally injured drivers in 2004. Key findings from this paper as well as Harsha (2007) and Hedlund (2008) are:

- **Speeding.** Traditional education, enforcement, and engineering countermeasures have had limited impacts on speeding. Education has not been successful because in general, drivers do not appreciate that speed is associated with risk in their own driving; they feel that others are the problem. Traditional enforcement of speeding is effective on a localized basis but more globally it has limited impact, since only a small proportion of all speeding violations are detected. Roadway and vehicle designs generally accommodate rather than discourage speeding. Automated speed enforcement methods (use of cameras with speed detectors) and in-vehicle intelligent speed adaptation technology have both been found to be effective in international studies, but have not yet been widely adopted in the United States.
- **Belt Use.** Safety belt use in the United States has been steadily increasing, from 71 percent in 2000 to 82 percent in 2007. There is further potential to increase belt use and as a result, bring down fatality rates. Twelve states had seat belt use rates over 90 percent; 19 have belt use rates under 80 percent. Hedlund (2008) identified factors leading to high belt use rates including “high-visibility seat belt law enforcement, excellent relations with law enforcement command and officers statewide, effective seat belt law enforcement publicity, high priority for increasing seat belt use, effective planning and implementation of seat belt use programs based on solid data and research, and effective HSO and seat belt program management.” The literature review in Sivak (2008) identified mandatory seat belt laws (particularly primary laws that allow motorists