

Session IV
*Effective Performance
Assessment and Communication*

Module III
Measuring Safety

What Is Traffic Safety ?

Traffic Safety is the process of reducing traffic accidents, deaths, injuries and property damage through vehicle, traffic and roadway safety improvements.

Why Measure Safety?

- **Accountability**
- **An internal management tool**
- **Establishes benchmarks by which to measure performance**

Motor Vehicle Travel is the primary means of transportation in the U.S. Yet for all its advantages, motor vehicle crashes are the number one cause of death for individuals aged 3 to 33. According to the National Highway Traffic Safety Administration, traffic safety is the process of reducing traffic accidents, deaths, injuries and property damage through vehicle, traffic and roadway safety improvements. The American Road and Transportation Builders Association reports that there has been an encouraging reduction in highway fatalities, from a record level of 54,589 in 1972 to 43,443 in 2005, while vehicle miles traveled have grown. By collecting and tracking data, it has been proven that this reduction is due largely in part to federal, state and local safety programs and improved highways.

Why do state governments have safety performance measures? **Safety performance measures keep the state accountable to its citizens, Governor, Legislature and Transportation Organizations.** Safety performance measures are used as an internal management and integration tool – as the popular saying in the business world goes, “**What Gets Measured, Gets Managed**”. Performance measures establish benchmarks for progress, and provide documentation for taxpayers, assuring them they are getting the best possible return for their dollars.

[\[1\] NHTSA Traffic Safety Facts 2005](#)

[\[2\] ARTBA Intermodal Transportation Safety Policy](#)

Topics Covered

- I. SAFETEA-LU
- II. National Initiatives With Safety Performance Measurement Implications
- III. Examples of Safety Performance Reporting
- IV. Guidance for Safety Performance Measurement

1. SAFETEA-LU: The Safe, Accountable, Flexible, Efficient Transportation Equality Act: A Legacy for Users: SAFETEA-LU represents a paradigm shift in federally required transportation planning in regards to safety performance.
2. Additional measures promoted by federal transportation authorities and (national) professional transportation organizations can supplement or integrate with SAFETEA-LU
3. Examples of Safety Performance Reporting: Looking at work from other countries as well as examples from U.S. states performing and reporting on safety performance measures
4. Practicalities of Safety Performance Measurement: Developing effective safety performance measures requires an understanding of the process, and the tools required to make effective planning decisions

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Section 1

SAFETEA-LU

SAFETEA-LU: Core Principles

SAFETEA-LU (Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users)

Key Objectives:

- To raise the stature of the highway safety program by establishing highway safety improvement as a core program, tied to strategic safety planning and performance.
- To devote additional financial and technical resources and support innovative approaches to reducing highway fatalities and injuries.

The Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU) was signed into law on August 10, 2005. The ‘Safety’ component of SAFETEA-LU is designed to provide a financial incentive to plan for highway safety improvements with accountable performance measures.

SAFETEA-LU is aimed at accomplishing two goals:

1. Build upon [pre-]existing national safety performance measures to reduce serious injuries and highway fatalities on the most dangerous locations on the nation’s highways, and distribute additional funding allocated by Congress to address the problems highlighted in each state plan.
2. **Enable state’s to build a flexible performance plan that target’s sites, corridors, or highways that represent the “worst offenders” when it comes to collisions and fatalities & Hold states accountable for their plans by reviewing them on a designated timeline, and assist them when they fall short of their goals**

The Highway Safety Improvement Program (HSIP) is established as a core SAFETEA-LU program, separately funded for the first time, with integrated flexibility to allow states to target funds for their most critical safety needs.

State Strategic Highway Safety Plans (SHSPs) will be used in the HSIP to identify and analyze highway safety problems and opportunities, include projects or strategies to address them, and evaluate the accuracy of data and the priority of proposed improvements.

The State Highway Safety Plan must be based on:

accurate and timely safety data

consultation with safety stakeholders

and performance-based goals that address infrastructure and behavioral safety problems on all public roads.

States that do not develop a strategic plan by October 1, 2007, will be locked in at their FY 2007 HSIP apportionment level pending development of a plan.

States with SHSPs have additional flexibility to use up to 10% of their HSIP funds for behavioral and other safety projects if they meet rail grade crossing and infrastructure safety needs as defined in their SHSPs.

SAFETEA-LU: State Highway Safety Plans and "The Four E's"

Each state strategic highway safety plan (SHSP) should include performance measures which encompass the 'Four Es':

1. Education
2. Enforcement
3. Engineering
4. Emergency Medical Services (EMS)

The SHSP is a data-driven, four to five year comprehensive plan that integrates the 4Es "" engineering, education, enforcement and emergency medical services (EMS). There are the four subjective elements that a state DOT can influence and have a positive impact on highway safety.

1. Education

Education efforts focus on giving drivers the knowledge they need to avoid hazardous driving practices. Many education initiatives focus on new drivers through mandatory education and licensing programs; education can also improve the performance of mature drivers.

2. Enforcement

Traffic controls, driver licensing requirements, drunk-driving laws, and other safety related regulations are known to be effective - when drivers obey them.

3. Engineering

Modification or reconstruction of an existing roadway can be challenging and time consuming. Careful evaluation of road characteristics is the key to a solid investment in public safety.

4. Emergency Trauma Care

Emergency response crews keep accidents from becoming tragedies. Here's how your community can help them be most effective.

[1] Minnesota Department of Public Safety and Minnesota Department of Transportation Co-Agency partnership "Towards Zero Deaths"

SAFETEA-LU: Performance Data Requirements

The **Strategic Highway Safety Plan (SHSP)** requires states to be able to do the following with their performance data:

- SAFETEA-LU requires States to have in place a crash data system with the ability to perform safety problem identification and countermeasure analysis on all public roads.
- SAFETEA-LU also requires States to advance their capabilities for traffic records data collection, analysis, and integration with other sources of safety data.

SAFETEA-LU Performance Data Requirements

The focus of the SHSP is on each state's (self-identified) roadways that exhibit above average accident rates. These areas make up the 5% quotient of the additional federal funding granted for performance measurement under SAFETEA-LU.

States must maintain crash data (fatalities and incapacitating injuries) and exposure data (vehicle miles traveled - VMT or average daily traffic – AMT) for the roadways covered by the SHSP. Data can be gathered cumulatively from national resources (such as Fatality Analysis Reporting System – FARS) or from municipal transportation organizations.

States must also account for area immigration and emigration patterns as they might affect accident data in the future. Performance plans must account for these potential variations, and good collaboration with municipal planning organizations is critical.

Essentially, states are given flexibility on data methodologies and gathering processes but SAFETEA-LU requires a defined and well-developed process included within each SHSP. Above all, SAFETEA_LU and SHSP encourage DOTs to pursue the use of more sophisticated data gathering methodologies in order to develop improved safety performance measures to target their 5% above average roadways included in their plans.

[1] SAFETEA-LU: High Risk Rural Roads Interim Guidance Report: U.S. Department of Transportation, Federal Highway Administration

SAFETEA-LU: Requirements for Hazardous Locations

In each SHSP, a state must identify 5% of eligible roadways that represent [*significantly*] above average accident and/or fatality rates.

1. Identify potential remedies to the hazardous locations
2. Estimate costs of the remedies; and
3. Identify impediments to implementation of the remedies other than costs

One requirement of SAFETEA-LU is for each state to describe at least 5% of its locations currently exhibiting the most severe highway safety needs. The report is to include potential remedies to the hazardous locations identified; estimated costs of the remedies; and impediments to implementation of the remedies other than costs.

Washington State's report for fiscal year 2006 addresses collision analysis capabilities which addresses e-trip (an initiative to create a integrated system through which information can travel from point of origin to its end use and analysis), an incident location tool, a collision analysis tool, collision location update capability for cities, web-based citizen collision report submittal, updating WSDOT's statewide collision records and imaging system, high crash location methodology, and high crash corridor methodology

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Section 2

National Initiatives with Safety
Performance Measurement
Implications

National Initiatives with Safety Performance Measurement Implications: FHWA Strategic and Performance Plans

FHWA's National Strategic Plan outlined specific safety performance measures for 1998-2008 including:

- Reducing highway fatalities and serious crashes by 20%
- Promoting improved safety management processes at the state and local level

In 2003, FHWA completed a five year performance review for its strategic plan to assess its progress towards its 20% fatality/serious accident reduction safety performance measure.

The performance measure was refined to focus on the highest fatality rates:

- Run off road crashes
- Intersection related crashes
- Speed related crashes
- Pedestrian and bicyclist related crashes

In the 1998 National Strategic Plan FHWA sets out long term goals and accomplishments, and sets targets to measure progress towards these goals and objectives. The FHWA developed five strategic goals in order to achieve their overall goal of creating the safest, most efficient highway system in the world - safety, mobility, productivity, natural environment, and national security.

In its 2003 Performance Plan FHWA focuses on reducing four types of crashes that result in the most fatalities and injuries nationwide. 38% of all fatal crashes involve run off road situations, speeding is a contributing factor in 30% of traffic fatalities, 21% of fatal crashes occur at intersections and 13% of all fatalities are pedestrians and bicyclists involved in collisions with vehicles.

The strategic objective for safety is to reduce the number of highway-related fatalities and injuries. FHWA's key strategies in highway safety include:

- 1) Promoting safety management processes by developing information and analysis systems to better identify the causes of crashes and develop crash avoidance programs.
- 2) Deploying lifesaving technologies on the highways by identifying and promoting deployment of safety technology including ITS technologies to enhance the safety of the roadway, vehicles and users.
- 3) Focusing on commercial vehicle and driver safety by promoting safe driving practices in the vicinity of large trucks.
- 4) Focusing on human behavior through education and enforcement to change human behavior with such activities as increasing the use of seat belts, reducing the number of red light running crashes, and reducing the number of alcohol related crashes.

[1] FHWA 1998 National Strategic Plan

[2] FHWA 2003 Performance Plan

National Initiatives With Safety Performance Measurement Implications: AASHTO Strategic Highway Safety Plan

In 2004, the American Association of State Highway Transportation Officials (AASHTO) developed the Strategic Highway Safety Plan.

Key Provisions Include:

- The AASHTO Strategic Highway plan has one central safety performance measure, to reduce highway fatality rates nationally by 1.0 per 100 million vehicle miles traveled a year, which could save roughly 9,000 lives.
- The Strategic Highway Plan has 22 goals that are designed to achieve this goal that can be implemented by any state or municipal DOT in their own efforts to improve highway safety.
- Many of the 22 goals are well developed, yet flexible enough for states to adopt and/or integrate in their required SHSP planning.

The American Association of State Highway Transportation Officials (AASHTO) Strategic Highway Safety Plan is a invaluable tool to DOTs looking for established safety performance measures with proven program results. Hypothetically, the cumulative effect of every state enacting the 22 strategic goals in the plan could have an impact in helping to reduce the level of highway fatalities by at least 1.0 every year – that amounts to roughly 9,000 lives a year.

The plan has six categories (Drivers, Special Users, Vehicles, Highways, Emergency Medical Services and Management) with 22 performance goals distributed between the categories. Most of the programs outlined by the Strategic Highway Safety Plan are modeled around the ‘Four E’s’ principles advocated by SAFETEA-LU: Engineering, Education, Enforcement, and Emergency Services.

AASHTO has held its Strategic Highway Safety Plan as an essential toolbox for states looking to develop or refine their SAFETEA-LU Strategic Highway Safety Plans (SHSP). **Since states are allowed flexibility to use any performance measure as long as its tied to a performance goal, the well documented programs in AASHTO’s Strategic Highway Safety Plan can go a long way in helping states meet their SHSP 5% strategic safety goals.**

[1] *The Strategic Highway Safety Plan: American Association of State Highway Transportation Officials*

Resources for SAFETEA-LU and National Strategic Safety Plans

- AASHTO “Self Assessment Tool”
 - <http://safety.transportation.org/assessment.aspx>
- NCHRP Project 17-18 “Guidance for Implementation of the AASHTO Strategic Highway Safety Plan”
 - <http://www4.trb.org/trb/crp.nsf/>
- FHWA/FTA Transportation Planning Capacity Building website
 - <http://www.planning.dot.gov/>
- NCHRP Report 501 “Integrated Safety Management Process”
 - http://trb.org/publications/nchrp/nchrp_rpt_501.pdf
- FHWA Office of Safety, “HSIP Manual”
 - <http://www.fhwa.dot.gov/tfhrc/safety/pubs/81218/intro.htm>

For more information related to safety performance measurement, SAFETEA-LU or other national highway safety plans, the following websites can provide helpful information, research and other resources.

AASHTO “Self Assessment Tool”

<http://safety.transportation.org/assessment.aspx>

NCHRP Project 17-18 “Guidance for Implementation of the AASHTO Strategic Highway Safety Plan

<http://www4.trb.org/trb/crp.nsf/>

FHWA/FTA Transportation Planning Capacity Building website

<http://www.planning.dot.gov/>

NCHRP Report 501 “Integrated Safety Management Process”

http://trb.org/publications/nchrp/nchrp_rpt_501.pdf

FHWA Office of Safety, “HSIP Manual”

<http://www.fhwa.dot.gov/tfhrc/safety/pubs/81218/intro.htm>

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Section 3

Examples of Safety Performance Reporting

Examples of Safety Performance Reporting

- 2004 FHWA International Safety Performance Reporting Scanning Tour
 - Japan
 - Australia
- Examples of U.S. state's safety performance reporting
 - Maryland
 - Utah
 - Washington

Now that we have an idea of the magnitude of safety performance measurements that are encompassed in programs such as SAFETEA-LU and the AASHTO Strategic Highway Safety Plan, we'll examine some examples of safety performance reporting being carried out in other countries, as well as some examples from U.S. states that have established safety performance measures and/or reporting.

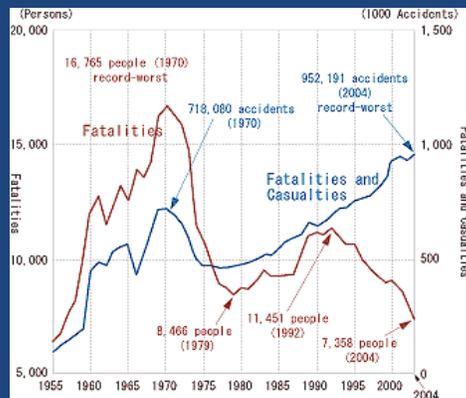
The international examples are gathered from a Federal Highway Administration (FHWA) scanning tour that took place in December, 2004. The tour, which covered countries on the Pacific Rim including Japan, Australia, New Zealand, and Canada establish the international role that safety performance measurement plays in nations' transportation planning. We'll look specifically at examples from Japan and Australia.

The next session contains safety performance reporting from U.S. States. Utah was recently included along with Washington state as being 'on-track' for safety-belt usage laws and enforcement. They also produce regular performance reports on their efforts related to safety. Maryland's DOT has recently completed its 2007 Attainment Report which also includes good examples of safety performance reporting.

[1] *Transportation Performance Measures in Australia, Canada, Japan, and New Zealand – FHWA Dec 2004*

Examples of Safety Performance Reporting: Japan

This trend graph is from a national safety performance report issued by the Japanese Ministry of Land, Infrastructure and Transportation (MLIT) depicting fatality and disabling injury performance measures from 1955 to 2004



Bicycle & Pedestrian Fatalities and Disabling Injuries: Japan

Use of Safety Performance Measures in Japan

Here we have an example of a trend line that plots the number of fatalities against the number of disabling collisions in Japan from 1970 to 2004. This graph was taken from a new public performance reporting website by the newly formed Ministry of Land, Infrastructure and Transportation (MLIT) Transportation Bureau's website.

Although traffic related fatalities have continued to decline in Japan, disabling accidents continue to rise dramatically in the country, especially in locations close to home (60% of collisions occur in a range of 500 meters or less). In response, the Japanese government has been shifting to a performance oriented focus over the past several years. A 2002 national law on policy evaluation and program performance required that government ministries adopt such a focus in their activities. The road-oriented recommendations made by a Cabinet-level Infrastructure Development Council in 2002 that came from this law were the following:

Road program administration should shift to an outcome-based approach.

Policy evaluation that links program and project consequences to these outcomes should be incorporated into this administration.

Results of this policy evaluation and program monitoring should influence the budgeting process.

In effect, the Japan Performance measurement consists of monitoring transportation system and organizational performance in relation to a set of politically defined and publicly reviewed performance indicators.

[1] *Transportation Performance Measures in Australia, Canada, Japan, and New Zealand – FHWA Dec 2004*

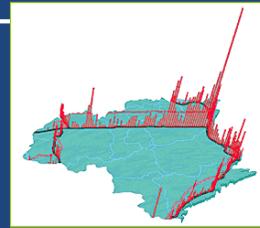
[2] *Roads in Japan– Road Bureau, Ministry of Land, Infrastructure and Transportation*

Examples of Safety Performance Reporting: Japan

An example of new, three-dimensional performance graphic reporting.

The top image conveys the frequency of accidents in urban intersections in the prefecture of Tokushima on the island of Shikoku.

The image at right is a traditional map of the prefecture



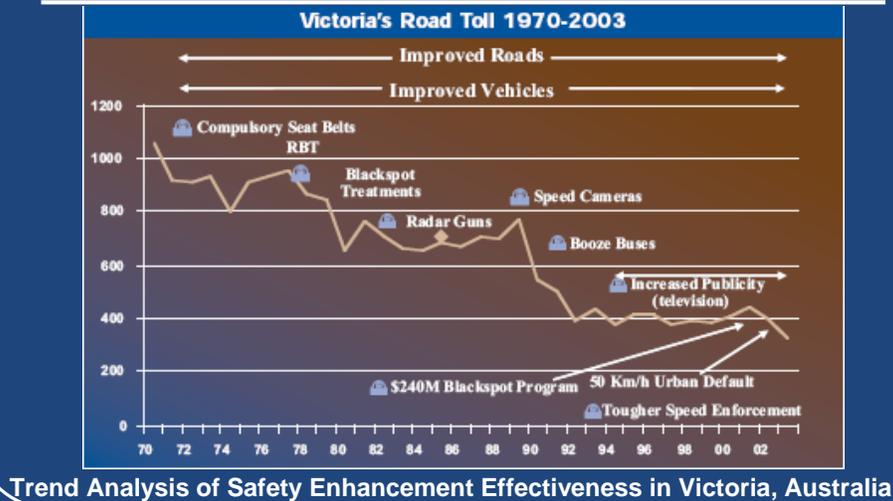
Moving from Japan as a whole, here is an individual example of safety performance measurement in a prefecture (the map in the lower right hand corner). The prefecture of Tokushima has developed an innovative three-dimensional map that shows the frequency of accidents occurring at an urban intersection within the prefecture. On the map, one can see the outline of the main highway used by residents to travel through Tokushima, one can also see that the greatest occurrence of pedestrian and bicycle fatalities in Tokushima occurs in more urbanized settings.

Like SAFETEA-LU, transportation planners in Tokushima can examine the worst locations and determine how they can apply safety performance measures in order to target the problem and deliver on safety goals.

In reality, the prefecture has incorporated a number of low cost enhancements (Engineering features) to reduce the occurrence of accidents and fatalities in urban areas. They include cement ‘cranks’ that resemble ‘zig-zag’s’ that force motorists to slow down on side streets where pedestrians and bicyclists are more likely to be hit or killed. Other more traditional approaches include speed bumps in roads and increased speed regulation signage.

[1] *Roads in Japan– Road Bureau, Ministry of Land, Infrastructure and Transportation*

Examples of Safety Performance Reporting: Australia



Here we see a performance reporting example from the Australian state of Victoria's long term safety performance program, *Arrive Alive!*. Much of the authority for transportation and safety planning rests with the Australian states and territories, and not the national government. The state of Victoria, which contains the 2nd largest Australian city of Melbourne has extensive safety performance measures and a wealth of data collection going back decades.

Arrive Alive! Is a five year performance plan that tracks VicRoads, the state's transportation authority's progress on reducing highway fatalities 20% by the end of 2007. Utilizing a number of education, engineering, and enforcement activities, VicRoads has tracked the decline in the number of fatalities set against milestones in safety performance program initiations. The FHWA scanning tour noted that Victoria is one of the most successful in developing and achieving safety performance goals, not just in Australia, but globally. As of 2006, VicRoads has reported a 22% fatality rate decrease four years into the *Arrive Alive!* plan.

The FHWA analysis was not focused on the safety programs carried out in *Arrive Alive!* as potential models (many would probably not pass judicial review in the U.S. in regards to civil liberties) but as an accomplished state-produced program for tracking, presenting, and developing safety performance measures over the long term.

[1] *Transportation Performance Measures in Australia, Canada, Japan, and New Zealand – FHWA Dec 2004*

[2] *Insurance Institute for Highway Safety*

[3] *Victoria Online: Transport and Vehicles*

Examples of Safety Performance Reporting: Utah and Maryland

Maryland's "Attainment Report"



Improve Safety
Focus Areas and Results

Reduce Fatalities: Safety improvements made to the state highway system can help reduce the number of traffic related deaths.

Performance Targets: The department is committed to an ultimate goal of eliminating traffic related deaths by reducing the amount of fatalities on Utah highways by 2 percent each year. The target reduction is calculated from a baseline of 379 fatalities in the year 2000.

Results: In 2004, 296 people lost their lives on Utah roads, a reduction of 4 percent from the previous year.

Improve Safety

The most important mission of the department is to safely deliver its customers from one point to another. Each year, approximately 300 people lose their lives as the result of crashes on Utah's roadways.

By implementing innovative safety programs and identifying safety improvement locations, the department can significantly reduce the number of traffic fatalities. Partnerships forged with law enforcement agencies and public education programs will also help to make Utah a safer place to live, travel, do business and recreate.

Utah's "Final Four"

Here we have two 'vivid' examples of safety performance reporting from Maryland and Utah.)

Maryland (our current location) recently released it's performance measurement report for all state transportation agencies the "[2007] Attainment Report". As you can see, the image is colorful depiction of Maryland's highway fatality numbers and the fatality rate per 100 million VMT. The graph also indicates the short term performance goal (the end date is not given), which is to have less then 500 fatalities on Maryland roads. The text also indicates how Maryland will reduce highway fatalities through its education initiatives including "Drive Safely to Work". The text also indicates that it will conduct before and after analysis to evaluate the success of the programs to see if MDOT is making progress towards its short term goal.

Below Maryland's example we have Utah's annual strategic performance report referred to as the "Final Four". In the lower left corner we see how Utah's DOT shows the number of fatalities on state highways from 1996 to 2005. The graph also has a secondary line that exhibits the agencies goal of reducing highway fatalities by 2% from the previous year. This graph shows that the state has made progress towards its short term goal, which is 299 fatalities in 2008.

The second image illustrates performance reporting on UDOT safety efforts. Recently, Utah was identified by FHWA as one of five states in the US as being on-track with safety performance goals and measurement. In the "Final Four" Utah has indicated that its engineering efforts ('Four E's) in addition to accommodating rapid capacity growth (Utah is one of the fastest growing states), roadways are being collaboratively designed with low cost safety enhancements such as the cable median barrier depicted.

Both of these examples have clear reporting on required objectives outlined under SAFETEA-LU's SHSP planning objectives.

[1] 2007 Attainment Report on Transportation System Performance, Maryland Department of Transportation, February 2007

[2] Strategic Direction – UDOT's "Final Four", Utah Department of Transportation, January 2007

III. Examples of Safety Performance Reporting: WSDOT

From the 22nd Gray Notebook: Highway Safety Annual Update

Current Combined Fatal and Disabling Accident Rate on State Highways by County*

Average Annual Fatality Rate per 100 Million VMT Traveled on Non-Interstate Routes, 2004-2005

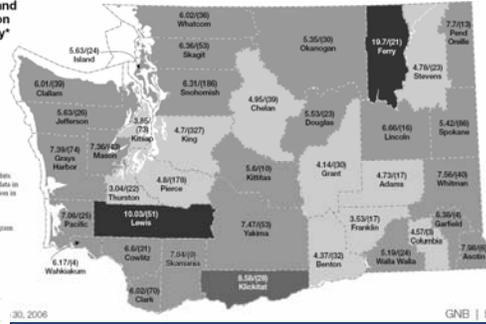
Total Number of Accidents Shown in Parentheses

Fatal/Disabling Accident Rate

*Note: Combined, Rural, and Urban Rates do not include Interstates

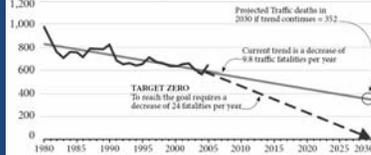
Federal Law Title 23 U.S. Code Section 409 prohibits the discovery or admission into evidence of this data in federal or state court proceedings or consideration in any action for damages.

Source: WSDOT Transportation Data Office. Provided by WSDOT Systems Analysis and Program Development



Target Zero: Traffic Deaths in Washington State

1980-2005 Actual, 2006-2030 Projected



Source of data for actual traffic deaths: Fatal Accident Reporting System (FARS)

Provided by Washington State Traffic Commission

Washington State Traffic Fatalities, 2000-05

Year	2000	2001	2002	2003	2004	2005
Fatalities	631	649	659	600	567	649 (Preliminary data)

Source: Fatal Accident Reporting System (FARS)
WSDOT counts an additional 0 deaths for 2005. See gray box to the right.

As mentioned earlier, Washington, like Utah, was one of five states that the FHWA stated as being on-track with safety performance measures, particularly as they pertain to SHSP planning under SAFETEA-LU. Washington's quarterly performance report, *The Gray Notebook* has a rotating set of quarterly and annual performance reports that involve or pertain to safety. In the 22nd edition (for the quarter ending June 30th, 2006), WSDOT reported it's annual highway fatality safety performance measures and the progress the agency has made towards short and long term goals established under *Target Zero* its SHSP.

- The map shows each of the 39 counties and the number of highway fatalities for each county. The higher the accident rate, the darker the shade of gray.
- The second graph in the lower left corner depicts the highway fatality trends in Washington since 1990. The angled line depicts the actual trend and the gray line depicts the "average" trend from 1990 and the predicted course to 2030. That date is the date in Washington's *Target Zero* long term goal for having zero fatalities. Although fatalities continue to decline on average, they appear to be off in meeting this goal. The dotted line indicates the trend Washington needs to take from 2006 to 2030 in order to have zero fatalities to meet its SHSP long term goal.
- The third image is a chart that illustrates the years 2000-2005 and the number of recorded fatalities that occurred statewide.

Each of the examples is backed by performance reporting that delves into the graphical analysis that is depicted on the slide, including the safety performance measures, the established goals, the programs involved, and the progress that has or has not been made.

Although not required for NHTSA review, regular interval safety performance reviews like those found in *The Gray Notebook* are of invaluable assistance to stakeholders looking to make improvements in planning efforts like those required in SAFETEA-LU's SHSP.

[1] WSDOT Measures, Markers and Mileposts, June 2006

[2] NHTSA Traffic Safety Facts, April 2004

Examples of Safety Performance Reporting: WSDOT

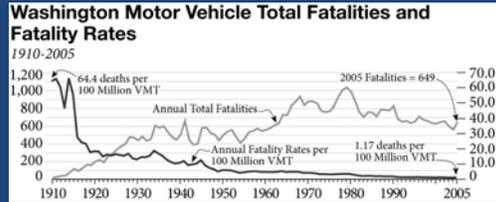
WSDOT evaluates its key safety performance measures reported in the *Gray Notebook* through two methodologies:

Annual Reduction in Number of Collisions and Total Societal Costs for Northwest Region Low-Cost Enhancements

Accident Type	Before Collisions	After Collisions	% Change
Enter at angle	15	13	-13%
Opposite Direction Left Turn	7	4	-42%
Sideswipe	18	5	-72%
Rear-end	96	56	-42%
Misc	32	20	-12%
Total Accidents	168	98	-42%
% Injury Accidents	41%	41%	0%
Injuries per accident	.66	.52	-22%
Ave. societal cost	\$33,428	\$26,834	-20%
Total Societal Cost (Millions of Dollars)	\$5.6	\$2.6	-54%

Before & After Studies

Long Term (Trend) Analysis



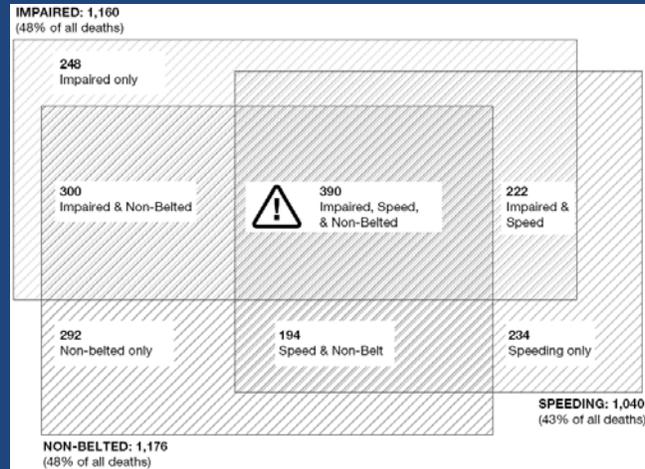
The challenges of presenting accurate and relevant data do not end with the gathering process itself; safety performance measures must be accurately presented in order to convey a clear message on progress.

WSDOT's *Gray Notebook* highlights two important methods for presenting data on safety performance: the Before and After model, and the Long Term or Trend Analysis model. WSDOT uses these models to great extent in its performance reporting and adapts the display of data to reflect on each performance goal or measure.

Before and after analysis is useful in comparing numerical or unit results that have occurred after or during program implementation for performance comparison. Trend analysis is useful for evaluating overall progress on safety performance measurements over the short and long term.

1] Measures, Markers and Mileposts, September 30, 2006

Challenges: Measuring What We Influence



An example of direct and indirect influences in managing highway safety: reducing fatalities associated with impaired, speeding, and unbelted drivers in Washington State.

An initial analysis by WSDOT indicates impaired driving (alcohol and drug influence), speeding, and failure to wear seatbelts to be a major contributing factor to highway fatalities.

Recommendations for reducing the fatality rates focus on making (direct) improvements through a series of approaches:

1. Targeting known locations with recurring accidents.
2. Improving short sections of corridors with accident rates above the average for roadway type.
3. Making low cost safety improvements (like rumble strips or guardrail upgrades).

By using this three-prong approach WSDOT intends to take action against the factors within its control to help reduce fatal and disabling accident rates. Understanding the relationship the three-prong approach plays is critical to developing improved planning and performance measurements.

[1] *Measures, Markers, and Mileposts, June 30, 2006.*

Module III

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Section 4

Guidance for Safety Performance Measurement

Guidance for Safety Performance Measurement: Data Analysis

Safety performance data from collisions are commonly analyzed through the use of before and after models to evaluate program effectiveness.

Examples include:

- **Cable median barrier installation**
- **Roundabout installation**
- **Rumble strip installation**
- **Low cost safety enhancements**

Before and after analysis of safety performance measures examples include

Collision data for highway safety improvement projects, for cable median barrier installation and for roundabout installation

Analysis on the low cost safety enhancement and incident response program

All before and after analysis of safety performance measures is discussed in GNB issues. Key examples in GNB issues are:

GNB Benchmarks Annual Update - 2nd Q 2004, 2005, 2006 – WSDOT & Traffic Commission use *State Motor Vehicle Fatality Rate* – compares Washington's annual fatality rate (per 100 million Vehicle Miles Traveled VMT). Also use federal FARS reporting system to include certain criteria that state does not track.

We also discuss select aspects of Fatalities on ongoing feature articles in GNB.

Guidance for Safety Performance Measurement: Data Analysis (cont'd)

Safety performance data from fatality and injury rates are commonly analyzed through long term or trend analysis:

- **Fatality and Injuries**
 - Highway
 - Pedestrian
 - Bicycle
- **Crashes**
 - **Number of crashes in key corridors and locations**

Guidance for Developing Safety Performance Measures (FHWA Criteria)

1. Understand the Safety Problem
2. Establish institutional leadership, responsibility and accountability
3. Define desired safety outcomes
4. Identify safety performance indicators
5. Compare with other safety measurements
6. Develop and implement systematic safety data collection and analysis processes
7. Develop a safety plan and integrate it into agency decision making
8. Monitor effectiveness of implementation safety strategies and actions

Taking what we've learned in both the international and national examples, we ask how can safety performance measurement be developed? FHWA developed eight criteria:

Criteria 1 –

The problem needs to be understood before strategies or investments are identified. This is looking at the numbers and incidence of road-related fatalities and injuries, as well as knowing the leading factors that cause such an outcome. The best examples of a performance-based approach to improving road safety begin with the comprehensive collection and analysis of data. The Japanese know through detailed analysis of crash data that a disproportionate number of crashes involve pedestrian and bicyclists, which lead to pedestrian oriented safety measures and strategies to improve this record.

Criteria 2 –

In order to communicate, coordinate and agree on top level strategy between agencies on road safety issues, clear lines of responsibility for implementing the safety program are necessary. Enforcement agencies are critical partners in any road safety program.

Criteria 3 -

Performance based safety planning needs to be based on clear outcomes. A key factor in effective performance measurement efforts is establishing an achievable target.

Criteria 4 -

Identifying safety performance indicators that relate to both the desired outcome and the organizational outputs expected to lead to that outcome. Transportation agencies usually use number of fatalities or total societal or social costs as measurements.

Criteria 5 -

Comparing safety performance measures with other jurisdictions can help to determine whether the record is out of the ordinary. The comparison becomes the screening tool to identify major differences. If differences are significant, further examination is needed to determine why.

Guidance for Developing Safety Performance Measures (FHWA Factors)

- Factor 1: Identify processes used for tracking and reporting relevant data
- Factor 2: Identify methodology used for assessing performance
- Factor 3: Identify key analytical tools and specific measures that will be used

Based on the results gathered from the scanning tour, FHWA also created three primary factors to address the planning and decision making process.

FACTOR 1) What processes are used for tracking and reporting relevant data? The best examples of a performance-based approach to improving road safety begin with the comprehensive collection and analysis of data, which includes conducting research on the most important factors leading to a fatality or personal injury. A key factor in the effective performance measurement efforts is the establishment of an achievable target. The next step is to identify performance indicators that relate to both the desired outcome and the organizational outputs expected to lead to that outcome.

FACTOR 2) What methodology is used for assessing performance? All state DOTs track measures of highway safety. The standard safety measures are the number of crashes, injuries, and fatalities per million vehicle miles traveled, but some states also compare numbers of crashes occurring at high-accident locations after safety improvement projects have been completed with the numbers before the projects were undertaken. Examples of what we measure to assess safety are number and rate of fatalities, injuries, run-off-the road crashes, pedestrian crashes, heavy-vehicle crashes, impaired driver crashes, repeat offender crashes, uninsured driver crashes, and unlicensed driver crashes.

FACTOR 3) Identify the key analytical tools and specific measures that will be used. A key to the success of any road safety program is the existence of a data collection and analysis system that provides continual information on the safety performance of the transportation system. This information is used to monitor progress toward performance targets, identify topics or areas where further action is necessary, educate officials and the public on the importance of the topic, and evaluate the effectiveness of implemented projects and strategies. The key is to take the data being collected on a wide range of factors linked to road safety and turn it into information that road safety officials can use to determine the most cost-effective actions to meet their performance targets.

[1] *Transportation Performance Measures in Australia, Canada, Japan, and New Zealand – FHWA Dec 2004*

Conclusion: Challenges to Measuring Performance

- Developing safety performance measures that meet federal planning requirements or proposals
- Creating and effectively utilizing safety performance measurement reporting
- Refining safety performance for both short and long term strategies

Developing safety performance measures is no longer an internal DOT decision it's a community and national mandate under current planning regimes. The challenge remains however, to develop effective safety performance measures that contribute to other DOT goals and continue to deliver relative to a level of service deemed appropriate by the agency or state government.

SAFETEA-LU was a paradigm shift in centralized safety performance planning in the U.S. upon its passage in 2005, yet it did not mandate specific performance measures only data collection procedures and reporting timeline requirements. It's a critical first step in helping DOTs achieve performance goals long advocated by NHTSA, FHWA and the National DOT as well as professional organizations such as AASHTO.

There are benefits to SAFETEA-LU for performance management though. The flexibility written into the legislation allows states to pursue reporting styles and systems that allow for accurate reflection of data collection and methodologies (related to SAFETEA-LU protocol of course) that works on behalf of state and municipality collaboration. We've seen vivid examples of performance reporting from abroad and from here in the U.S. on many of the same basic safety performance measures. Each state *must* tailor its reporting to reflect the accuracy of progress made on its safety performance measurement, for say its State Highway Safety Plan (SHSP).

In addition, SAFETEA-LU presents rigorous data collection and analysis requirements that can be burdensome for state's not accustomed to regular safety performance reporting in the past. The additional pressure of securing and retaining the 5% supplemental funding related to SHSP's amounts to additional pressure already evident in today's DOT environment. Yet there are simple, proven data collection and analysis methodologies established for safety performance measurement. And this reality should encourage states to pursue more involved, or perhaps rigorous SHSP planning rather than shy away from the new challenges presented under this national planning/strategy shift.

Measuring Safety: Related Resources

- National Highway Traffic Safety Administration (NHTSA). Traffic Safety Facts: Overview (2005)
- American Road & Transportation Builders Association (ARTBA). Intermodal Transportation Safety Policy (*No Date Given*)
- U.S. Public Law 109-59. The Safe, Accountable, Flexible, Efficient Transportation Equity Act – A Legacy for Users (2005)
- Federal Highway Administration (FHWA). A Summary of Highway Provisions in SAFETEA-LU (2005)
- NHTSA. Budget Overview, Fiscal Year 2007 (2006)
- Minnesota Department of Public Safety and Minnesota Department of Transportation Co-Agency Partnership. Towards Zero Deaths (2006)
- FHWA. SAFETEA-LU: High Risk Rural Roads Interim Guidance Report (2007)
- Washington State Traffic Safety Commission (WTSC). Washington State 2006 Highway Safety Performance Plan (2005)
- WTSC. Target Zero: A Strategic Plan for Highway Safety (2000)
- FHWA. 1998 National Strategic Plan (1998)
- FHWA. Performance Plan (2003)
- American Association of State Highway Transportation Officials (AASHTO). Strategic Highway Safety Plan (2005)

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- FHWA. Transportation Performance Measures in Australia, Canada, Japan, and New Zealand (2004)
- Japanese Ministry of Land, Infrastructure and Transportation (MLIT), Road Bureau. Roads in Japan (2005)
- Insurance Institute for Highway Safety (IIHS). Statement before the Kentucky Senate Transportation Committee on Red Light Violations and Red Light Cameras (2000)
- Victoria Department of Infrastructure. Planning Our Transportation System (2006)
- Maryland Department of Transportation. 2007 Attainment Report (2007)
- Utah Department of Transportation. Strategic Direction: Utah’s ‘Final Four’ (2007)
- Washington State Department of Transportation (WSDOT). Measures, Markers and Mileposts: The Gray Notebook (2006)
- NHTSA. Traffic Safety Facts: Overview (2004)
- FHWA. White Paper: Safety and Asset Management (2005)
- National Cooperative Highway Research Program (NCHRP). Guide to Effective Freeway Performance Measurement: NCHRP Project 3-68 (2002)
- NCHRP. Synthesis 311 – Performance Measures of Operational Effectiveness for Highway Segments and Systems (2003)

Measuring Safety: Related Resources (cont'd)

- FHWA. Transportation Performance Measures in Australia, Canada, Japan, and New Zealand (2004)
- Japanese Ministry of Land, Infrastructure and Transportation (MLIT), Road Bureau. Roads in Japan (2005)
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