

Federal Highway Administration



Safety Target Setting Final Report

December 2013



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Federal Highway Administration



Safe Roads for a Safer Future
Investment in roadway safety saves lives

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Table of Contents

1.0	Introduction.....	1
1.1	Project Purpose	1
1.2	Report Contents.....	1
1.3	Integrating Target Setting into Planning and Programming	2
1.4	Complying with Federal Requirements.....	4
1.5	Addressing the Complex Challenges of Safety Targets.....	5
2.0	How Safety Target Setting Aligns with HSIP and HSP Programs.....	6
3.0	Framework for Safety Target Setting.....	8
3.1	Safety Target Setting Experience.....	8
3.2	State Fatality Target Achievement.....	16
3.3	National Fatality Target Achievement.....	19
3.4	What is Evidence-Based Target Setting?.....	20
3.5	How to Conduct Evidence-Based Target Setting.....	21
4.0	Data for Evidence-Based Target Setting.....	29
4.1	Trend Data.....	29
4.2	Exogenous Factors.....	31
4.3	Countermeasure Impact Data.....	33
5.0	Technical Methods for Target Setting.....	41
5.1	Selection of Baseline Method	42
5.2	Projection Methods	42
5.3	Target Achievement.....	44
5.4	Conclusion.....	45

List of Tables



3.1	Aggregated State Targets Compared to National Target	20
4.1	Georgia Roadway Departure Safety Implementation Plan Countermeasures (sample)	35
4.2	Estimated Ratio of Net Present Benefits to Costs for Geary Corridor Safety Improvements <i>Assuming 20-Year Implementation Period for all Countermeasures</i>	38

List of Figures

1.1	Performance-Based Planning Framework.....	2
3.1	Types of State/Regional Targets.....	10
3.2	Types of Methodologies Use to Set State/MPO Safety Target.....	11
3.3	Washington Traffic Fatalities, Trends, Forecasts, and Goals	14
3.4	Consistency between DOT and SHSO Targets.....	15
3.5	Safety Integration into Other Transportation Plans and Programs	16
3.6	Number of States with Fatalities Higher or Lower than SHSP and HSP Targets, 2008	18
3.7	Number of States with Fatalities Higher or Lower than SHSP and HSP Targets, 2011	19
3.8	Target Setting Steps.....	22
3.9	Alabama Roadway Fatality Trend	25
3.10	National Legislative History and Fatality Trends	28
4.1	Relationship between VMT and Fatalities, <i>by State</i>	30
4.2	National Fatalities per 100,000 Population, <i>Young Drivers versus Total</i>	32
4.3	National Fatalities per 100,000 Licensed Drivers, <i>Young Drivers versus Total</i>	33
4.4	Washington Overlap in Fatalities by Emphasis Area, <i>Impaired, Speeding and Run-Off-The-Road</i>	40
5.1	Example Fatality Trend Figure 1, <i>Single Year Fatality Trend; 2013 Target Year</i>	41
5.2	Example Fatality Trend Figure 2, <i>Five-Year Average Fatality Trend; 2030 Target Year</i>	42
5.3	Example Fatality Trend Forecast Using Exponential Smoothing	43

1.0 Introduction

1.1 Project Purpose

This report is the product of several tasks conducted under the Federal Highway Administration (FHWA) project to develop a Compendium of State Performance Management Practices and Methodologies for Setting Safety Performance Targets. At project initiation the study team conducted an international literature review (http://safety.fhwa.dot.gov/hsip/tpm/docs/literature_review.pdf) on fatality target setting practices to establish the state of the practice, particularly in countries with a strong history of advances in roadway safety. The study team also reviewed domestic literature on target setting practices both within and outside of the transportation sector.

To gain an understanding of current practices by States and regions in setting fatality targets, the study team conducted a survey of Department of Transportation (DOT), State Highway Safety Office (SHSO), and Metropolitan Planning Organization (MPO) representatives on their fatality targets, methods for setting targets, data, other resources used, and desired technical support. The results of the survey, combined with a review of key DOT and SHSO safety planning documents, informed development of *A Compendium of State and Regional Safety Target Setting Practices* (<http://safety.fhwa.dot.gov/hsip/tpm/docs/compendium.pdf>). Analysis was conducted, including the types of targets set, target setting methods, consistency among State fatality targets developed by different State agencies, level of ambition in target setting, and target achievement.

To provide further insight into best practices, a peer exchange (http://safety.fhwa.dot.gov/hsip/tpm/docs/peer_exchange.pdf) was held in February 2013 with representatives of 10 States and regions. Topics of discussion at the one-and-a-half day event were target setting methods, achievements, challenges, and directions for the future in safety target setting. This report assembles the information and analysis from the project to provide States and MPOs with a framework for setting safety targets.

1.2 Report Contents

This report is designed to help States and regions develop and update fatality targets. Target setting improves safety performance by increasing an agency's focus on safety and encouraging agencies to consider how investment and policy decisions impact future safety performance. The document describes the current state of the practice and provides methods States and regions can use to develop or revise fatality targets. The contents of the report are described below:

- **Section 1.0 – Introduction.** This section addresses how target setting fits into the planning and programming process, Federal requirements for target setting, and the complexities of setting safety targets.
- **Section 2.0 – How Safety Target Setting Aligns with HSIP and HSP Programs.** This section provides information on alignment of safety target setting with FHWA's Highway Safety

Improvement Program (HSIP) and National Highway Traffic Safety Administration (NHTSA) Highway Safety Plans (HSP).

- **Section 3.0 – Framework for Safety Target Setting.** This section summarizes the literature and practice of safety target setting; discusses State and regional target types, methods, and level of agreement among State agencies; reviews State target achievement; and presents a framework for conducting evidence-based target setting.
- **Section 4.0 – Data for Evidence-Based Target Setting.** This section presents the key data available to support the evidence-based target setting framework and provides examples of how agencies are using or could use this information in their target setting processes.
- **Section 5.0 – Technical Methods for Target Setting.** This section provides additional detail on methods that can be used in the target setting process.

References and links to noteworthy practices used by States, MPOs, local governments, and other countries in selecting performance measures and targets are provided throughout the document.

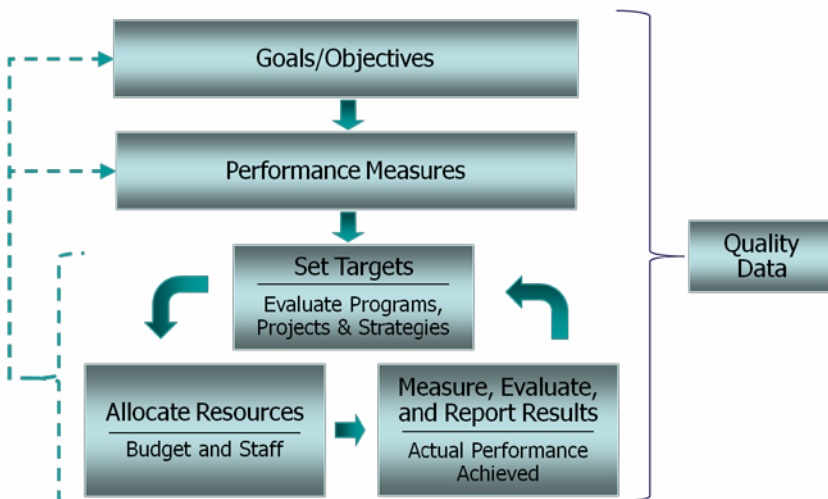
1.3 Integrating Target Setting into Planning and Programming

Performance management provides an approach for increasing accountability for decisions made by transportation agencies. FHWA defines transportation performance management as follows:

Transportation Performance Management of the Federal Highway Program is a strategic approach that uses system information to make investment and policy decisions to achieve national performance goals (<https://www.fhwa.dot.gov/tpm/about/tpm.cfm>).


Six key components comprise performance-based planning at transportation agencies as shown in Figure 1.1.

Figure 1.1 Performance-Based Planning Framework



Source: NCHRP 666: Target-Setting Methods and Data Management to Support Performance-Based Resource Allocation by Transportation Agencies.

Goals and objectives. Together, goals and objectives describe the strategic direction of an agency. Goals and objectives generally remain stable over time, and are only revisited as agency priorities



change. Most successful performance-based planning programs start with a small number of goals (broad statements about the end result an agency wants to achieve) and objectives (attainable components stated in measurable terms) tied to a discrete set of performance measures. After learning from experience and building support over time, the number of goals and objectives can be expanded to encompass a broader range of issues.

Linking **performance measures** to an agency's priorities or strategic direction and the availability of high-quality data are critical to successful measurement. Performance measures track the accomplishment of goals and objectives and evolve over time as data sources, tools, and understanding advance.

A continuous cycle of **target setting, resource allocation, and performance monitoring** links goals and measures to policy and investment decisions. These activities typically occur on an annual or biennial basis depending on an agency's budget or programming cycle. This process includes evaluating alternative policies, programs, and projects to assess the likely performance impacts of various strategies and funding scenarios, and is the basis for defining realistic performance targets that reflect agency policies and priorities.

Within the cycle, **measures and targets** are used to support resource allocation. How much money should an agency spend on various programs or on specific projects? How do these decisions impact current or future performance? Measures provide the perspective for evaluating and communicating the impact of the investment decision *in relation to* the desired end-state or target (i.e., how significant is a particular investment in helping an agency attain a particular goal). They are revisited and updated as necessary, and as more information becomes available.


Tracking performance results, comparing them to expectations, and providing performance information to internal and external stakeholders are critical to help evaluate the effectiveness of programs and projects, maintain accountability, and drive better decision-making.

All elements of the process should be supported by **high-quality data**, which will lead to effective decision-making practices. To track performance measures and set targets, data must be accurate, timely, complete, accessible, integrated and uniform. If decisions are not based on high-quality data, agencies risk internal and external audiences questioning the value of performance-based planning. The Crash Data Improvement Guide (<http://safety.fhwa.dot.gov/cdip/finalrpt04122010/ch1.cfm>) provides useful information on methods for improving State crash data.

Setting Targets to Improve Safety

Traffic crashes continue to be a major global public health problem. In the U.S. numerous strategies have been implemented with varying degrees of success to drive down the number of fatal and injury crashes, including legislative initiatives, infrastructure improvements, high-visibility impaired driving and safety belt campaigns, improved data collection and analysis tools, and others. Adopting transportation safety performance measures and setting targets to support tracking and reporting is a strategy increasingly used in the U.S.

Setting road safety targets and establishing performance measures also are widely advocated practices in other parts of the world, particularly in Europe and Australia. The Organization for Economic Cooperation and Development (OECD) points out that setting targets can improve road safety by encouraging more realistic and efficient road safety programs, communicating the importance of road



safety to people who can affect it, giving direction to policy-makers, motivating stakeholders to act, and holding road transport system managers accountable. The effectiveness of setting road safety targets has been evaluated in only a few studies; however, the available evidence shows reductions in fatalities and fatality rates are associated with target setting.

1.4 Complying with Federal Requirements

Moving Ahead for Progress in the 21st Century (MAP-21) solidifies the need for States and regions to set targets for the core group of performance measures identified in section 150 of title 23 U.S.C. States and regions will be required to demonstrate progress towards those targets. The law creates a streamlined, performance-based, multimodal approach to meeting the country's transportation needs and substantially consolidates programs into a smaller number of broader, core programs. The National Highway Performance Program (NHPP) established under MAP-21 consolidates the Interstate, National Highway System (NHS), and on-system portion of the Highway Bridge Rehabilitation and Replacement programs.


MAP-21 requires SHSOs to use a set of core safety performance measures and set targets. The NHTSA Interim Final Rule (January 23, 2013) notes that safety targets should be coordinated among agencies and aligned when common measures are used.

NHPP has the dual goal of increasing the accountability and transparency of Federal highway programs and improving transportation investment decision-making. MAP-21 defines seven National Goal Areas for the Federal-aid highway program, one of which is safety. It requires the Secretary of Transportation, in consultation with States, MPOs, and other stakeholders, to establish performance measures corresponding with these goals.

Performance targets are then set at the State DOT, MPO, and public transportation provider levels. Within one year of the DOT final rule on performance measures, States are required to set performance targets to support them. States may set different performance targets for urbanized and rural areas. To ensure consistency each State must, to the maximum extent practicable, coordinate with MPOs when setting performance targets and coordinate with public transportation providers when setting performance targets in an urbanized area not represented by an MPO.

In the development of statewide and regional plans, these measures and targets must be integrated into a performance-based approach to decision-making, thereby supporting the national goals. Measures and targets must be considered when developing policies, programs and investment priorities:

- State DOTs and MPOs must establish targets to support national measures;
- State and regional plans must use a performance-based approach to decision-making that supports the national goals, and include measures, targets, and a performance report comparing actual performance to target values;
- Measures and targets must be considered when developing policies, programs and investment priorities;
- State DOTs and MPOs should coordinate setting targets in support of the established measures;

- 
- State DOTs and MPOs must link projects in the Statewide Transportation Improvement Program and Metropolitan Transportation Improvement Program to their performance targets; and
 - State DOTs and SHSOs should coordinate with each other when setting targets.

1.5 Addressing the Complex Challenges of Safety Targets

Among the goal areas specified in MAP-21, safety is perhaps one of the most advanced and consistent among the States: every State collects some type of fatality, injury, and crash data, and national-level standardized datasets for fatalities exist. Further, safety commands a high-level of interest among decision-makers. Despite these positive elements, challenges in consistent data collection and reporting still exist.

Setting reasonable, data-driven targets for safety performance measures is difficult due to the interdisciplinary, multidimensional nature of safety planning. Traffic safety is impacted by a number of factors, including policy measures, enforcement, vehicle design, roadway design, driver behavior, and legislation, among others. A variety of factors outside the realm of safety planning, such as weather or level of congestion, also will affect the number of fatalities and injuries in a given year.

Beyond these safety-specific issues, practitioners must also consider a variety of other factors when setting targets. Factors that may affect the process and methodologies used include:

- Span of control/agency jurisdiction;
- Performance-based resource allocation history/evolution of state-of-the-practice;
- Financial resources;
- Technical resources/planning and forecasting capability;
- Timeframe;
- Political influence;
- Legislative influence;
- Organizational structure; and
- Internal support/culture.¹

While each agency must consider its unique context when setting targets, this report provides a target setting framework that can be applied by State and regional transportation agencies. This document is designed to help agencies work through the benefits and limitations of target-setting, specifically for fatalities. As such, the data and methods included do not address *all* factors that may impact an outcome, but instead focus on those factors that have emerged as significant indicators of successful performance-based safety planning. The process of safety target setting is inherently iterative and practitioners should customize their approach based on data availability and analytic capability.

¹ NCHRP Report 666.

2.0 How Safety Target Setting Aligns with HSIP and HSP Programs

The purpose of the FHWA Highway Safety Improvement Program (HSIP) is to achieve a significant reduction in traffic fatalities and serious injuries on all public roads through the implementation of highway safety improvements. State DOTs are required to submit an annual report to FHWA on HSIP implementation and effectiveness.

State DOTs are also required to develop, implement, and regularly update a Strategic Highway Safety Plan (SHSP) to obligate Federal HSIP funds. The SHSP identifies and analyzes highway safety challenges and opportunities and produces a plan of strategies to address identified safety problems. Most States have established safety targets in their SHSPs. Additionally, per 23 U.S.C. 150(c)(4) under MAP-21, the Secretary will establish performance measures for States to assess:


- Serious injuries and fatalities per vehicle mile traveled; and
- Number of serious injuries and fatalities.

Once FHWA Transportation Performance Management regulations under MAP-21 become effective (anticipated to be spring 2015) performance targets will be required for the HSIP program.

Each SHSO also develops a 23 U.S.C. 402 Highway Safety Plan each year and submits an annual report to NHTSA on progress. Under MAP-21, HSPs report on 14 safety performance measures as defined in the report entitled “Traffic Safety Performance Measures for States and Federal Agencies”². While previously HSP reporting on these 14 performance measures was voluntary, MAP-21 makes it mandatory. States are required to develop annual performance targets for 11 of the measures, and to report annual progress on all 14. The measures include ten core outcome measures, one core behavioral measure and three activity measures. The outcome and behavioral measures are:

- Total number of fatalities;
- Total fatalities per Vehicle Miles Traveled (VMT);
- Total number of serious injuries;
- Number of fatalities involving:
 - Unrestrained occupants;
 - Drivers and motorcycle operators with a Blood Alcohol Content (BAC) of 0.08 and above;
 - Speeding;
 - Motorcyclists;
 - Unhelmeted motorcyclists;

² DOT HS 811-025, August 2008.

- 
- Drivers age 20 or younger; and
 - Pedestrians.
- Observed seat belt use for passenger vehicles, front seat outboard occupants.

Coordination on performance measurement and safety target setting between State DOTs and SHSOs is critical. Currently, three high-level performance measures are identical for FHWA and NHTSA requirements - fatality number, fatality rate and serious injury number. Further, the SHSP process is intended to bring together stakeholders to address all aspects of safety and all strategies for improving safety. MAP-21 also requires States to coordinate their HSP data collection and information systems with the SHSP. This coordination extends to ensuring buy-in by leadership of both the State DOT and the SHSO on coordinated safety targets. While the SHSP and HSP are independent documents, a collaborative approach on performance measurement and target setting will help ensure strategies are coordinated and aimed toward the same goal.

3.0 Framework for Safety Target Setting


3.1 Safety Target Setting Experience

As part of this project an international literature review was conducted on safety target setting practices, with a focus on countries where significant safety progress has been made. The full literature review (http://safety.fhwa.dot.gov/hsip/tpm/docs/literature_review.pdf) includes details on approaches by country. The countries for which information was reviewed include: Denmark, Canada, the United Kingdom, Norway, Australia, Finland, Japan, the Netherlands and the United States. This chapter is organized as follows:

- **Section 3.1** – Safety Target Setting Experience describes fatality target types, methodologies for setting targets, details on best practices from States and regions attending a peer exchange, and the level of consistency between HSIP and HSP targets.
- **Section 3.2** – State Fatality Target Achievement describes the extent to which states achieved fatality targets in 2008 and 2011.
- **Section 3.3** – National Fatality Target Achievement documents how aggregated State targets compare to national fatality results.
- **Section 3.4** – What is Evidence-Based Target Setting? provides a definition of evidence-based target setting.
- **Section 3.5** – How to Conduct Evidence-Based Target Setting provides a framework for evidence-based target setting, including examples from States.

Literature Review

Numerous countries throughout the world (with the majority in Europe) have pursued and achieved safety targets over the years. While limited examples of well described target setting methodologies are available, current good practice involves a combination of top-down long-term goals and bottom-up interim targets (usually of a 7- to 10-year duration). A few agencies are developing interim targets closely aligned to the selection of countermeasures, their estimated effectiveness, deployment of vehicle safety technologies, and the extent to which countermeasures are well implemented. Such a process requires defining the country's level of ambition for road safety, taking into account institutional arrangements, developing methods to measure the effectiveness of strategies needed to improve safety, and identifying resources available. This target setting approach combines an idealistic long-term goal with realistic short-term targets.



Some European countries have 30 or more years of experience in safety target setting. This experience has revealed several lessons learned.

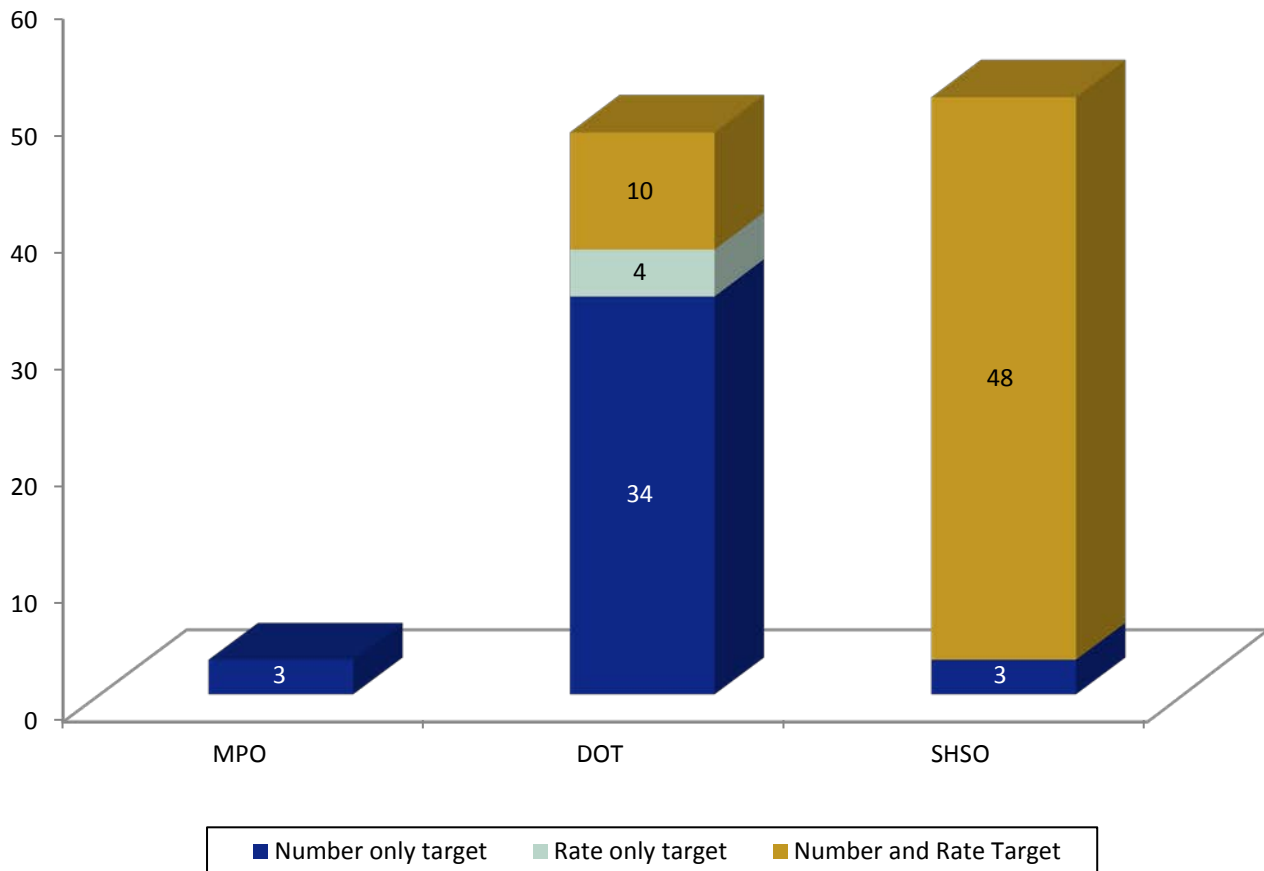
- Targets with political support are more likely to impact funding or the availability of resources.
- Targets should be evidence-based and accompanied by a realistic safety program to ensure progress. A national target should define actions and goals of all responsible key agencies.
- Much can go wrong with implementation. Early problem detection is critical to maintain a course toward achieving the target.
- Targets should be ambitious yet realistic for the defined time period and not require a rate of progress significantly beyond that achieved previously, so they will be perceived as attainable and will be accepted. On the other hand, if the target is too easily obtained, a major opportunity for saving lives may be lost.

State of the Practice

As part of this project, the study team reviewed all State SHSPs and HSPs as of 2012 for information on safety targets. The study team also conducted a survey of State DOTs and SHSOs (for 50 States, Puerto Rico, and the District of Columbia) and a select sample of MPOs to identify State and regional targets and methodologies for setting them. MPOs known to have developed dedicated safety studies, conduct significant safety planning, or maintain safety committees were included. States set fatality targets in terms of the number of fatalities and/or fatality rates. Selected information from the research is presented here and the full document is available at *Compendium of State and Regional Target Setting Practices* (<http://safety.fhwa.dot.gov/hsip/tpm/docs/compendium.pdf>). Figure 3.1 displays the frequency of the target type used. Among the 48 State DOTs with a stated target, 34 set only a fatality number target, four set only a fatality rate target, and 10 set both a number and rate target. Among the three MPOs with a stated fatality target, all were number-only. Among the 51 SHSOs with a fatality target, 48 set number and rate targets and three set a number only target. Puerto Rico was the only SHSO with no overall target, although it sets targets by emphasis area.

Target Setting Methods

Figure 3.1 Types of State/Regional Targets



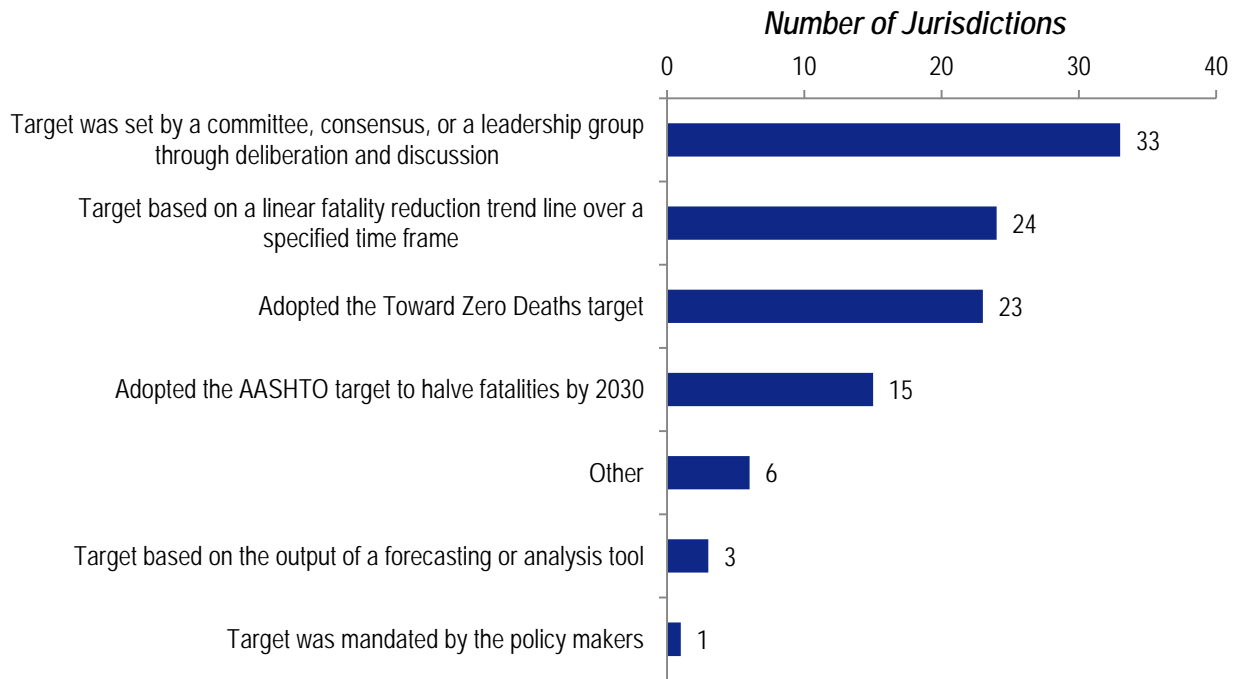
Source: Cambridge Systematics, Inc.

The most common methodology used by 33 of the 47³ jurisdictions responding to the survey was target setting by committee, consensus, or leadership group. The second most common approach was setting a target based on a linear fatality reduction trend line (24). Twenty-three jurisdictions adopted Toward Zero Deaths (TZD). Six jurisdictions used other methods to determine targets, including share of national fatalities, stakeholder focus groups, and creating aggressive targets to reduce fatalities and serious injuries. Those jurisdictions where no methodology is indicated either failed to respond, lacked a target, or lacked knowledge of the approach used. The rate targets ranged from 0.5 to 2.0 fatalities per 100 million VMT, for target years ranging from 2008 to 2030.

³ 44 States and 3 MPOs.

Among the three MPOs that set a regional target, two set it by committee, consensus, or leadership group and one set it by using a linear fatality reduction trend line. The methodologies used by States or regions to create fatality targets, as indicated by survey responses, are shown in Figure 3.2 (each respondent was allowed to select multiple methodologies).


Figure 3.2 Types of Methodologies Used to Set State/MPO Safety Target



Source: Cambridge Systematics, Inc.

At the February 13, 2013 peer exchange, the following ten agencies provided additional detail on their safety targets and target setting methods:

- Mid America Regional Council (MARC) MPO;
- Portland (OR) Metro MPO;
- Georgia DOT;
- Michigan DOT;
- Pennsylvania DOT;
- Rhode Island DOT;
- Utah DOT;
- Washington DOT;
- Delaware SHSO; and
- Maryland SHSO.



The **Mid-America Regional Council (MARC)**, a bi-State MPO for the Kansas City region, sets a fatality target. The current target is to halve fatalities by 2040. The agency also tracks the fatality rate and the number of disabling injuries as part of the regional performance measures in its long-range transportation plan but does not set targets for these measures. The MPO tracks fatalities and serious injuries because the SHSPs of the two States in which the MPO resides (MO and KS) track them. The target-setting process involves a Long-Range Transportation Plan (LRTP) subcommittee that convenes regularly during the plan development process and meets with stakeholders to establish goals. The performance measures for each goal are developed internally by staff.


MARC also is part of a regional safety coalition (Destination Safe), which includes 4 E (education, enforcement, engineering, and emergency response) safety representatives from Kansas and Missouri. The coalition develops a regional safety plan, e.g., a regional version of an SHSP. In setting a target, the coalition chose the more aggressive rate of fatality reduction of the two States: the 15 percent fatality reduction target over four years (2008 to 2012) set by Missouri. Four years is a much shorter timeframe than was set in the LRTP (30 years).

The **Portland Metro** (MPO) LRTP has six desired outcomes, including safe and reliable transportation. In 2008, Portland Metro underwent a Federal certification review and FHWA recommended increased focus on safety. An FHWA-sponsored workshop was held in the fall of 2009, and since then Metro has convened a Regional Safety Workgroup, which developed the MPO's 2035 RTP performance target, the State of Safety in the Region report, and the Regional Transportation Safety Plan. Metro's target is to reduce by 50 percent the number of pedestrian, bicyclist, and motor vehicle fatalities plus serious injuries by 2035, corresponding to the "halving fatalities" approach.

The **Georgia DOT (GDOT)** and the SHSO obtained SHSP leadership approval to adopt the American Association of State Highway Transportation Officials' (AASHTO) goal of reducing the fatality rate to 1.0 per 100 million VMT by 2008. Georgia's share of the goal was calculated at four percent, or a reduction of 40 fatalities per year. Seeking to exceed the goal, Georgia chose a reduction of 41 fatalities per year as its target. Georgia has selected TZD as an overarching vision. While Georgia has reduced its fatality level to nearly 1,000 and seeks to get it below 1,000, the State decided against establishing a target to "get below 1,000" to reduce confusion since it uses TZD.

Georgia measures rural and urban performance separately but does not set targets for each. Each SHSP Task Team estimated the impacts of its proposed countermeasures using nationally accepted crash reduction factors. Georgia, in collaboration with the FHWA Resource Center, has analyzed the expected safety benefits of safety strategies in select emphasis areas which could also be used to set targets. This is described further in Section 4.3.

The **Michigan Department of Transportation (MDOT)** target is to reduce traffic fatalities from 889 in 2011 to 750 in 2016 and to reduce serious traffic injuries from 5,706 in 2011 to 4,800 in 2016. The target represents a 3.4 percent reduction in fatalities per year, compared to the previous 4-year SHSP, which had a 5 percent annual fatality reduction target. The Michigan philosophy is to set an aggressive goal to motivate the State to work hard to make significant progress. Michigan also adopted TZD as part of its mission statement.



For its third SHSP update, Michigan set its SHSP target using five regional focus groups. In the previous iterations, Michigan held a one-day safety summit and the Governor’s Traffic Safety Advisory Commission (GTSAC) selected the target. By reaching out to the regions, Michigan obtained significantly increased involvement in the safety target setting process. At the regional meetings, the SHSP team presented regional crash trend and emphasis area data. Each of the regional focus groups selected essentially the same target. The target was then validated by additional data analysis.

The **Pennsylvania DOT (PennDOT)** adopted TZD as its vision, emphasizing “Toward.” The target is Halving Fatalities by 2030, using a rolling five-year average. PennDOT uses a decentralized structure as most statewide targets represent the combined efforts of 11 engineering districts. Each district develops its own safety plan, with PennDOT determining overall safety targets. Districts range from having significant support for the target to expressing some resistance. Approximately 84 percent of Pennsylvania’s fatalities occur on State roads and 16 percent on local roads. While the majority of Pennsylvania’s safety programs are dedicated towards addressing State-owned facilities, PennDOT also has instituted programs to improve safety on local roads through the Local Technical Assistance Program (LTAP). Pennsylvania has established goals within Emphasis Areas, which added together, exceed the overall goal because of overlap among the emphasis areas.

The **Rhode Island DOT** adopted TZD with an interim goal to halve fatalities and serious injuries by 2030, for an annual reduction of 3.2 percent annually. Therefore the fatality target setting method is adoption of halving fatalities with a long-term vision of reaching zero fatalities.

The **Utah Department of Transportation (UDOT)** established Zero Fatalities with an annual two percent reduction in fatalities target. The selection of zero is not based on numbers or data but on a consensus that zero is the right goal. Utah considered historic trends, but desired a stretch goal. The State consciously uses a fatality number instead of a rate because the population growth in the State could result in a reduced rate without reducing fatalities. Additionally, Utah wanted a target that is understandable by the public; Utah stresses the importance of understanding that public opinion cannot be underestimated. The Executive Safety Leadership Team coordinates goal setting among agencies.

UDOT works with emphasis area leaders to develop targets for the HSP. For engineering emphasis areas, UDOT establishes targets. The HSP incorporates targets from other related plans, and the process also involves motor carriers and transit agencies.

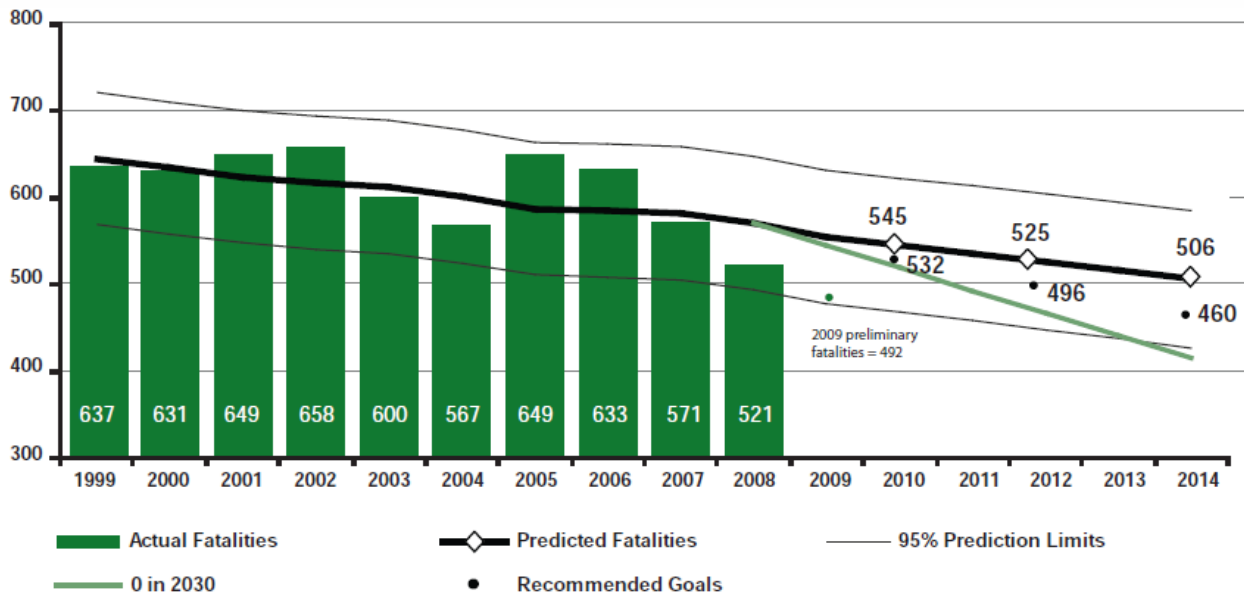
In Utah, safety target setting continually evolves; the State emphasizes the ongoing need to evaluate systems and processes to ensure the target is consistent with the current environment.

The **Washington State DOT** adopted Target Zero by 2030 for fatalities and serious injuries. The State’s philosophy is: what would be the right number if it were not zero? Target Zero has been a long-term goal for Washington, and is now in its fourth iteration.

To establish interim targets, Washington uses the Holt Method of statistical analysis, which is a linear regression to forecast data into the future by weighting the near-term years heavier than the out-years. Washington looks at five- and 10-year trends. Figure 3.3 is an example of how trend analysis and targets can be visualized graphically. The State plots a straight line trend from the present number of fatalities to zero. Standard deviation from the trend line is used to report a range of what the

data are expected to show in the near-term. Washington may improve the target setting process by developing upper and lower controls in the range.

Figure 3.3 Washington Traffic Fatalities, Trends, Forecasts, and Goals



Source: Target Zero Strategic Highway Safety Plan 2010.

The **Delaware Highway Safety Office (DE SHSO)** has set targets since the early 2000s. The agency uses the 14 Governors Highway Safety Association (GHSA)/NHTSA performance measures, with fatalities as the most important measure. The target is to decrease traffic fatalities six percent from the 2008 to 2010 calendar year average of 114 to 107 by December 31, 2013. The DE SHSO relies on Fatality Analysis Reporting System (FARS) and State crash data to develop the target.

The Agency also uses “a healthy dose of intuition” in target setting. Staff knows which levers to push to achieve the target and understands feasibility issues based on years of experience. An eight-member advisory committee, including NHTSA and local and State law enforcement, provides advice and perspective by conducting a high-level review of previous year activities and results. SHSO staff draft the HSP using a detailed problem identification process and establish a goal and potential countermeasures. The director meets with program managers to ensure buy-in on the goal. In May of each year the draft plan is presented to the advisory committee for approval.

The **Maryland SHSO (MD SHSO)** has adopted TZD, with emphasis on “Toward.” The State also has adopted Halving Fatalities by 2030. The safety target is to reduce the number of traffic-related fatalities by 3.1 percent per year, from 592 in 2008 to fewer than 475 by December 31, 2015. From 2007 to 2011 fatalities dropped 3.2 percent annually even though VMT declined little during the economic recession; therefore the future target is based on similar rate of reduction.

The MD SHSO also sets injury and serious injury targets. The injury target is developed using the annual ratio of fatalities to total and severe injuries and applying those ratios to the 2030 fatality goal.

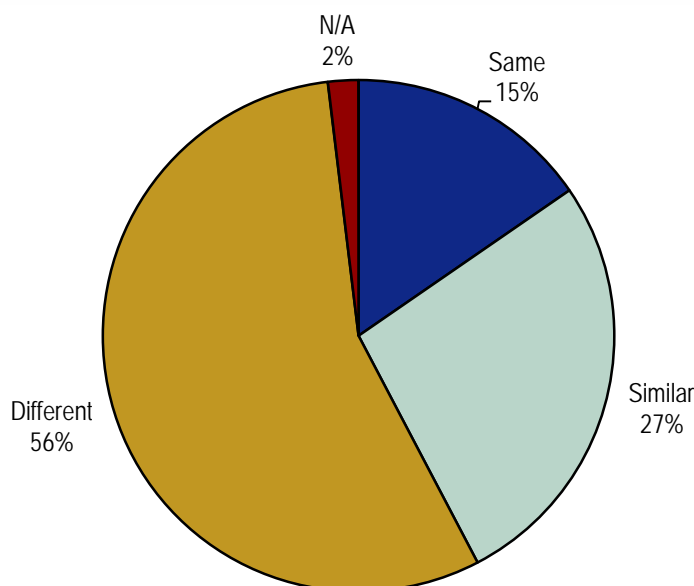
For example, the MD SHSO calculated an annual ratio of fatalities to total injuries of 0.011 (based on 8 years of data). The agency then applied the ratio of 0.011 to the 2030 fatality goal (reduction from 592 deaths in 2008 to 296 deaths in 2030) to determine expected number of injuries. This results in a 44 percent decrease in total injuries target from 2008 to 2030, and an annual reduction target of 2.6 percent. Annual interim targets are set through 2015.

Target Consistency

The Compendium (<http://safety.fhwa.dot.gov/hsip/tpm/docs/compendium.pdf>) research involved review of targets set in SHSPs and HSPs. The two targets were compared for consistency within each State.

As shown in Figure 3.4, the majority (56 percent) of SHSP and HSP targets are different. Only 15 percent are the same, and 27 percent are similar.

Figure 3.4 Consistency between DOT and SHSO Targets



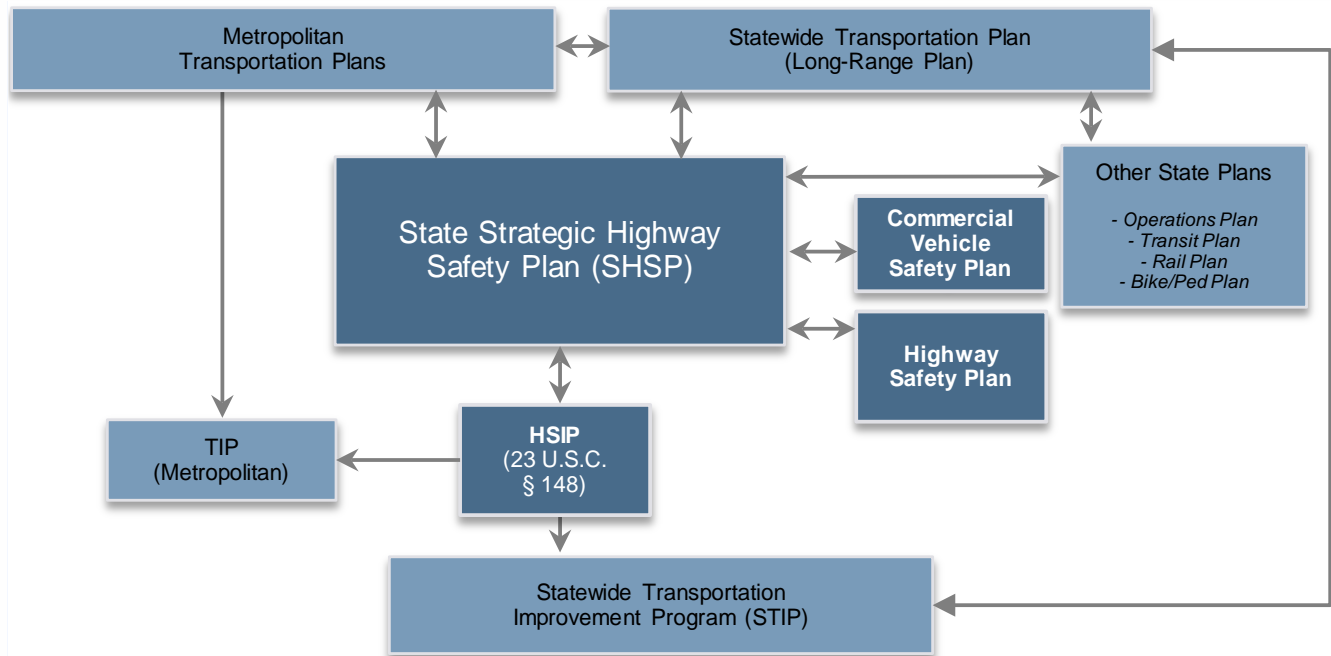
Source: Cambridge Systematics, Inc.

The study of targets for A Compendium of State and Regional Target Setting Practices (<http://safety.fhwa.dot.gov/hsip/tpm/docs/compendium.pdf>) did not investigate the extent to which agencies collaborated in setting targets. However, given the large number of States with dissimilar targets, it appears target setting is not currently coordinated in most States. As noted in Section 2.0, given the selection of common safety performance measures under MAP-21 for both State DOTs and SHSOs, increased coordination will be needed to ensure consistency of targets for the same measures. The NHTSA Interim Final Rule (<http://www.gpo.gov/fdsys/pkg/FR-2013-01-23/html/2013-00682.htm>) states:

“MAP-21 also amended Section 402(b) to require each State to coordinate its HSP, data collection, and information systems with the State strategic highway safety plan as defined in 23 U.S.C. 148(a). Such a requirement to coordinate these elements into a unified State approach to highway safety promotes comprehensive transportation and safety planning and program efficiency in the States. Coordinating the HSP planning process with the programs of other DOT agencies where possible will ensure alignment of State performance targets where common measurements exist, such as fatalities and serious injuries.”

Beyond the issue of consistency among the two core safety plans (SHSP and HSP), a number of other transportation plans in a State or region also address safety and these plans should therefore, reflect a consistent approach to setting safety targets. Safety partners will be able to more effectively work together if they are all directing resources toward meeting the same target. Most importantly, communications about safety will be more coherent when all agencies and their respective plans are reinforcing the same target. Figure 3.5 illustrates key transportation planning documents and how they address safety in relation to one another.


Figure 3.5 Safety Integration into Other Transportation Plans and Programs



Source: FHWA, Strategic Highway Safety Plan Implementation Process Model.

3.2 State Fatality Target Achievement

The information from the Compendium presented in Section 3.1 catalogued the most recent safety targets developed by States as identified in their latest SHSPs, HSPs, and through the results of an electronic survey. This section summarizes the analysis of historical target setting and target achievement by States in 2008 and 2011. Since most State DOTs and SHSOs do not have identical



safety targets, to compare State targets to actual fatality results, SHSP and HSP targets were evaluated separately. These years were selected because 2011 is the most recent year for which FARS data are available and 2008 provides sufficient time to identify trends.

Targets were collected for all 50 States, the District of Columbia, and Puerto Rico from both the SHSPs and HSPs. Particularly for SHSPs, which are completed every several years by States, the target years vary. In cases where SHSP targets were set for years other than 2008 or 2011, targets were interpolated assuming a linear relationship between the years for which data were available.

Most States set fatality targets in terms of a number, or a number and rate. For States that set only a rate target, typically fatalities per 100 million VMT, a fatality number was calculated using VMT reported in FHWA's Highway Statistics Series (<http://www.fhwa.dot.gov/policyinformation/statistics>)⁴ for the year of the target.

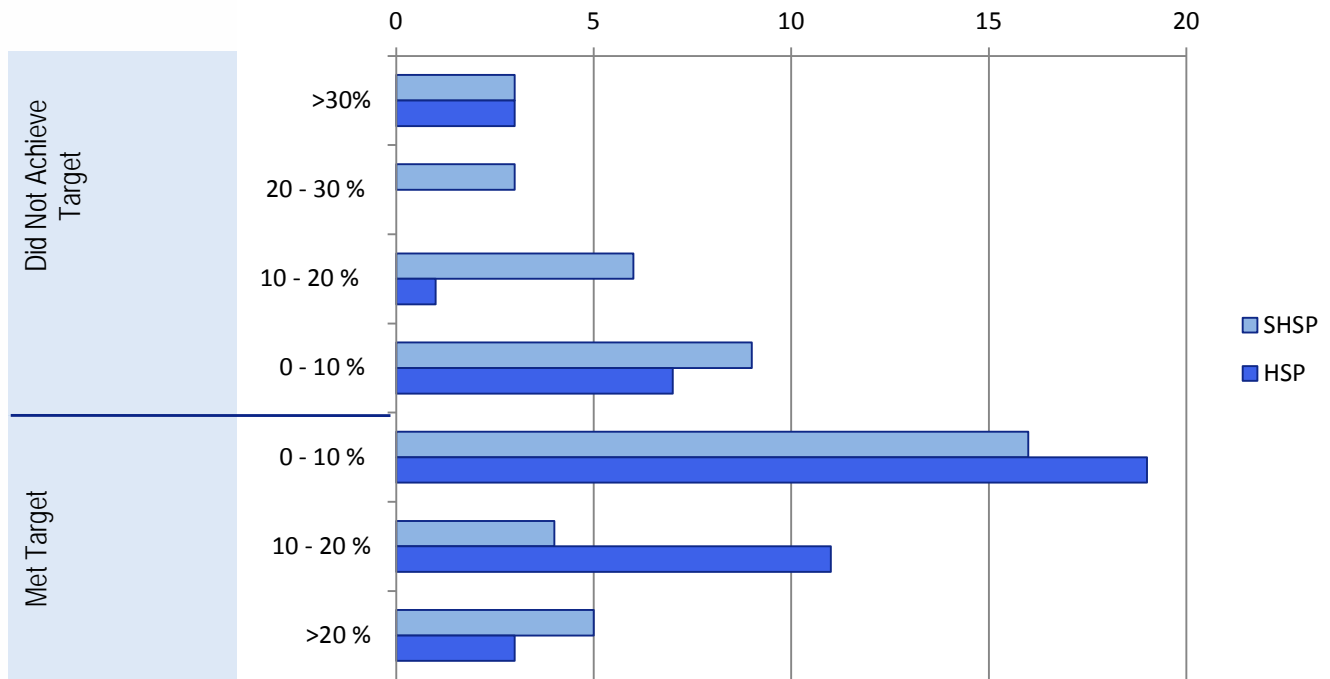
This analysis enables review of the extent to which States achieved their safety target(s) and how targets changed between 2008 and 2011 as transportation safety technical knowledge was increasing and States were updating their SHSPs. FARS-reported fatalities were an average of two percent higher than SHSP targets in 2008 and two percent lower than targets in 2011. Among HSPs, fatalities were an average of four percent below targets in 2008 and three percent below targets in 2011. While the average of percent differences between targets and fatality results by State is only two to four percent, this masks the extent of State-by-State variation between targets and actual fatalities, discussed further below.

Of the 46 States for which an SHSP target was available in 2008, 21 experienced fatalities above the target and 25 below the target. In 2008, 44 States⁵ set HSP targets, of which 11 experienced fatalities above the target and 33 had fatalities lower than the target. A more detailed breakdown of how 2008 SHSP and HSP targets compare to actual fatalities is shown in Figure 3.6.

⁴ Table VM-2. The state fatality rates reported by NHTSA *Traffic Safety Facts* are calculated using these VMT data.

⁵ For Kentucky it is unknown if a 2008 target was set as its 2008 HSP was not available.

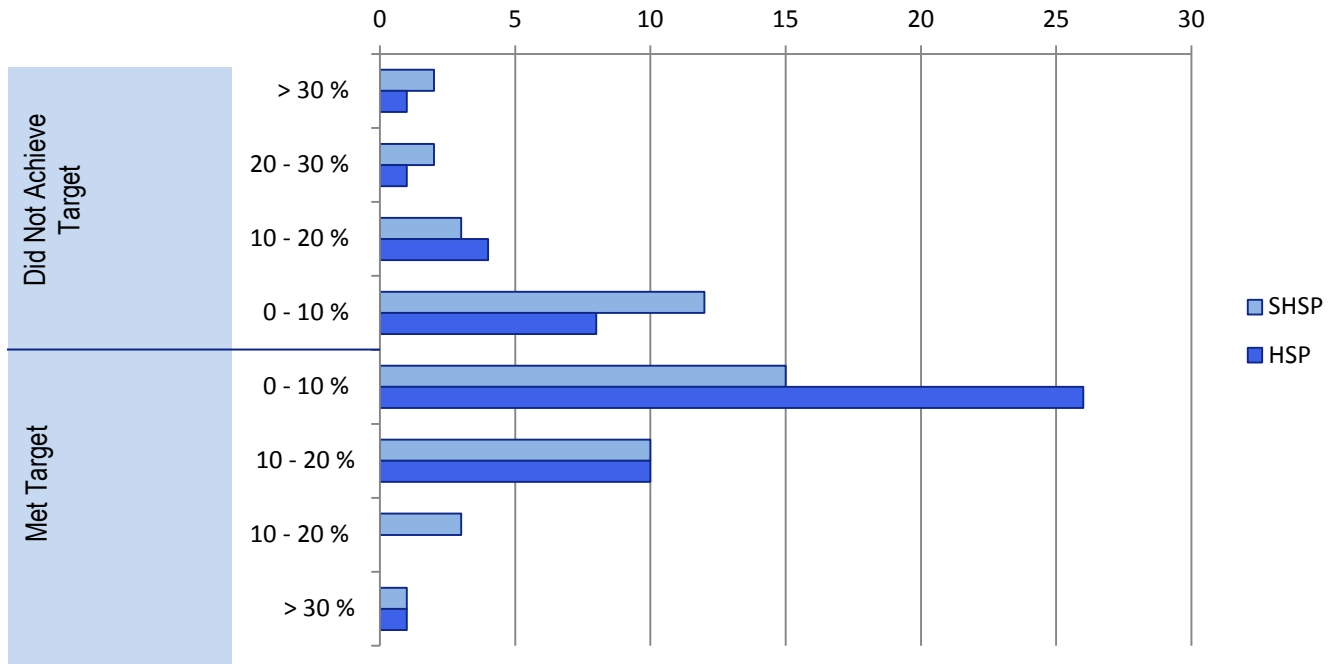
Figure 3.6 Number of States with Fatalities that Met or Did Not Achieve SHSP and HSP Targets 2008



Source: Cambridge Systematics, Inc.

In 2011, 48 States set SHSP fatality targets, of which 19 experienced fatalities above the target and 29 below the target. Of the 51 States that set HSP targets in 2011, 14 experienced more fatalities than the target and 37 had fewer fatalities than targeted. A breakdown of how 2011 SHSP and HSP targets compare to actual fatalities is shown in Figure 3.7.

Figure 3.7 Number of States with Fatalities Higher or Lower than SHSP and HSP Targets 2011



Source: Cambridge Systematics, Inc.

3.3 National Fatality Target Achievement

This effort compared the actual national number of fatalities reported in FARS to what a nationwide target would have been if all the State targets had been aggregated. In the cases where targets did not exist, they were estimated based on the average of the States for which data were available. To estimate targets for States without them, the study team calculated the percent difference between fatality targets and actual fatality numbers. The average percentage variation was then applied to the actual fatality numbers as reported in FARS for that year to calculate what a target would have been if it followed the same pattern as the other States. Among the SHSPs, eight lacked targets for 2008 and four lacked targets for 2011. Eight 2008 HSPs did not include a target, while only one 2011 HSP lacked a target.

Actual fatality numbers were lower than the aggregated State targets for SHSPs and HSPs in both years studied, as shown in Table 3.1. In 2008 actual fatalities were less than one percent below the aggregated State SHSP target, so the target would have been met. Actual fatalities also were lower than the aggregated State SHSP target in 2011, by 4.4 percent. Compared to the aggregated State HSP target, fatalities were 4.2 percent lower in 2008 and 5.3 percent lower in 2011. This shows targets were either slightly less aggressive in 2011 compared to 2008, or that States had more success reducing fatalities in 2011 relative to 2008. Please note that the level of agreement between an aggregated State

target and actual fatality data for these two years masks variation at the State level as discussed in Section 3.2.

Table 3.1 Aggregated State Targets Compared to National Target

	2008	2011
Aggregated State SHSP Fatality Target	37,480	33,478
Aggregated State HSP Fatality Target	38,886	34,183
National Fatalities (FARS)	37,261	32,367
Fatalities variance from SHSP target (percent)	-0.6%	-4.4%
Fatalities variance from HSP target (percent)	-4.2%	-5.3%

Source: Cambridge Systematics, Inc.

3.4 What is Evidence-Based Target Setting?


Target setting is one of the key elements of a performance management framework. As with any management framework, understanding the semantics of the elements of the framework is important to effectively implementing the approach. MAP-21 increased attention on performance measures and target setting. This section presents an approach to evidence-based target setting for FHWA as the state of the practice is moving in this direction. For example, the NHTSA Interim Final Rule states (<http://www.gpo.gov/fdsys/pkg/FR-2013-01-23/html/2013-00682.htm>):

“State HSPs must now provide for performance measures and targets that are evidence-based....The State process for setting targets in the HSP must be based on an analysis of data trends and a resource allocation assessment.”

Therefore, it is important to define the meaning of “evidence-based” target setting. There are two basic ways to think about target setting, one of which is evidence-based:

- **Aspirational or vision-based targets.** Sometimes, agencies will use “target” to refer to a long-term vision for future performance – the ultimate goal. Many transportation agencies are setting vision-based targets for zero fatalities (vision zero, TZD, target zero) and for progress towards this vision (e.g., reduce fatalities by one-half within 20 years).
- **Evidence or investment-based targets.** Evidence-based targets take a more narrow approach to target setting – focused specifically on what can be achieved within the context of a set of investments, policies, and strategies defined within an implementation plan and subject to a shorter timeframe. These targets are usually set for five to ten years in the future when future trends can be forecasted with more accuracy based on available data.

In the context of MAP-21, SHSPs and HSPs will have to include targets and explain how they will reduce fatalities and serious injuries to achieve them. This is target setting in the narrow sense, examining how a specific set of actions contributes to improved performance over the time horizon of the plan. In addition, when a performance measure, such as the number of fatalities, is used by multiple agencies (e.g., State DOT and SHSO) the target will need to be aligned.



While these two approaches are distinct, they are not necessarily in conflict. A zero-based vision or target is useful for galvanizing support around a planning effort and for ensuring successful strategies are considered and/or implemented while keeping the focus on a clear goal.

Evidence-based targets, in contrast, promote accountability and encourage agencies to consider the tradeoffs of their investments across different program areas. Being able to demonstrate the benefits of different levels of investment in safety (and other programs) helps decision-makers better understand the implications of investment in various program areas. Target setting with this approach is derived from considering the tradeoffs among investment levels.

3.5 How to Conduct Evidence-Based Target Setting

The basic concept for evidence-based target setting is to link investments and policy decisions to performance. Typically this is done by reviewing the achievements resulting from previous investments and applying that knowledge to estimate the expected improvement in safety outcomes that are likely to be achieved given varying levels of investment in the future.

To apply this model to safety target setting, several challenges must be overcome, including:

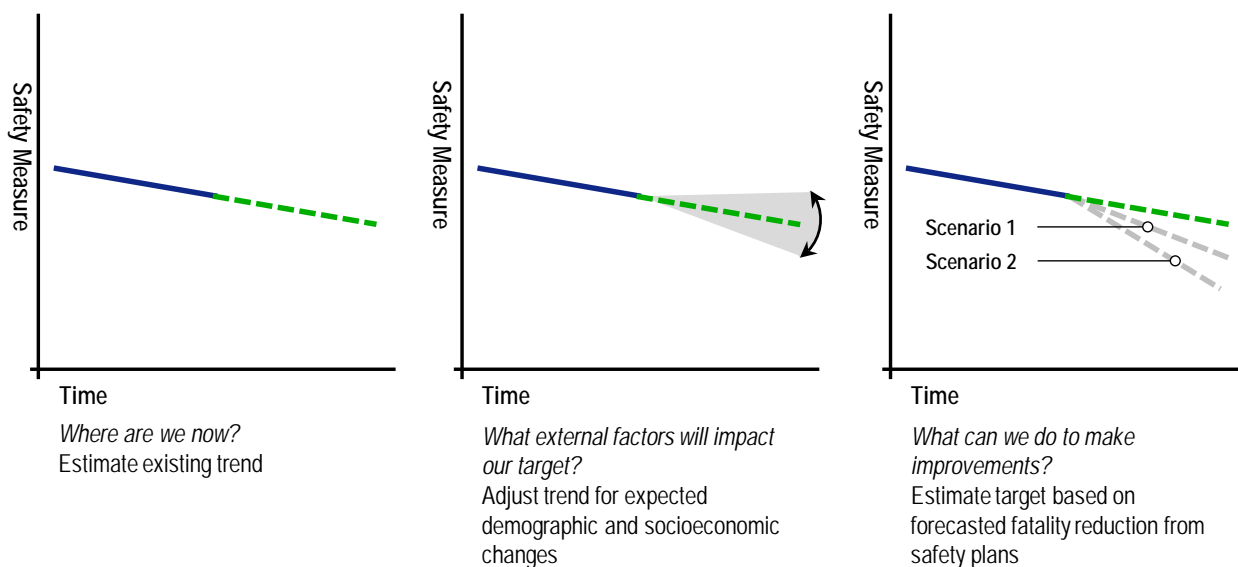
- Crashes and crash severity are impacted by many factors, some of which are not under the direct control of transportation agencies, such as vehicle safety features and weather. Lack of control over these factors affects evidence-based target setting.
- The SHSP, by its nature, is meant to address a comprehensive set of strategies – the 4 Es (education, enforcement, engineering and emergency response). Quantifying the impact of additional investment on behavioral strategies is challenging, and few agencies have attempted to conduct such analysis.
- The impact of background factors – demographic changes such as population growth, changing population distributions, and a changing economy – may interact with various safety strategies in unpredictable ways. While national research is underway, agencies also will have to draw on their own experience and the experience of other agencies to forecast how these background factors are expected to impact safety results.
- While a number of tools are available to help agencies estimate expected crash and fatality reductions resulting from various strategies and countermeasures, they are not universally used or understood. Further, some tools may have another primary purpose, such as those to plan operations strategies (i.e., Tool for Operations Benefit Cost Analysis (<http://www.plan4operations.dot.gov/topsbctool/index.htm>) or evaluate economic requirements (i.e., Highway Economic Requirements System (<http://www.fhwa.dot.gov/infrastructure/asstmgmt/hersindex.cfm>), but have the benefit of helping an agency think about the likely impacts of types and levels of investment on safety.

As agencies begin setting evidence-based targets, the approaches outlined below should be considered. The steps for using countermeasure data in target setting are relatively simple, although implementation may be complex:

- Use trend analysis;
- Consider exogenous factors, i.e., population, demographic distribution;
- Forecast fatality reductions based on planned implementation of proven countermeasures:
 - Identify potential for application of countermeasures (through SHSP, HSP, HSIP⁶, or other planning processes);
 - Identify data on expected countermeasure impact;
 - Develop constrained list of countermeasures based on expected effectiveness and available resources (i.e., expected lives saved per dollar of investment); and
 - Estimate system, region, or State benefits based on the aggregation of expected countermeasures, discounting for potential overlap among emphasis areas.


Once the trend line forecast is developed, consideration of the forecasted fatality reductions and exogenous factors will help quantitatively estimate how aggressive the target can be. Agencies may wish to include countermeasures that they have not previously implemented. For those projects or programs without known effectiveness data, evaluation should be included as a component of the project. Figure 3.8 shows how these steps can be used to develop an evidence-based fatality target and what questions are being answered at each phase.

Figure 3.8 Target Setting Steps



Source: Cambridge Systematics, Inc.

⁶ The Highway Safety Improvement Program is the safety program through which infrastructure-oriented safety projects are identified. The projects identified in the HSIP are also included in the State Transportation Improvement Program (STIP).




The appropriate combination of the steps described above will depend on the factors and issues in each State or region. While these steps are quite general, they point to a direction agencies can pursue, and some illustrative examples are provided in this report. In the short term, agencies will have to triangulate multiple pieces of information to set a meaningful, evidence-based target. Safety analysis tools currently available are described below, as well as an overview of each of the analytical approaches. Details on data and methodologies are provided in Sections 4 and 5.

Safety Analysis Tools

In recent years, a number of safety analysis tools have become available that will aid in forecasting fatality and injury reductions for proposed countermeasures. Estimating the impact of a program of safety projects supports the development and refinement of evidence-based safety targets. Tools include:

- **Highway Safety Manual (HSM)** (<http://www.highwaysafetymanual.org/Pages/default.aspx>) – The HSM provides practitioners with information and tools to consider safety when making decisions related to design and operation of roadways. The HSM assists practitioners in selecting countermeasures and prioritizing projects, comparing alternatives, and quantifying and predicting the safety performance of roadway elements considered in planning, design, construction, maintenance, and operation.
- **Interactive Highway Safety Design Model (IHSDM)** (<http://www.ihsdm.org/>) – The IHSDM is a suite of software analysis tools for evaluating safety and operational effects of geometric design decisions on highways. IHSDM is a decision-support tool that provides estimates of existing or proposed highway designs' expected safety and operational performance, and checks designs against relevant design policy values.
- **Safety Analyst** (<http://www.safetyanalyst.org/>) – SafetyAnalyst provides a set of software tools used by State and local highway agencies for highway safety management. It incorporates state-of-the-art safety management approaches into computerized analytical tools for guiding the decision-making process to identify safety improvement needs and develop a systemwide program of site-specific improvement projects.
- **Highway Safety Improvement Program Manual (HSIP Manual)** (<http://safety.fhwa.dot.gov/hsip/resources/fhwasa09029/>) – The HSIP Manual provides an overview of the HSIP and presents State and local agencies with tools and resources to implement the HSIP. The manual provides information related to planning, implementation, and evaluation of State and local HSIPs and projects.
- **Crash Modification Factors Clearinghouse (CMF Clearinghouse)** (<http://www.cmfclearinghouse.org/>) – The CMF Clearinghouse provides a regularly updated on-line repository of CMFs, which are used to forecast the impact of a countermeasure on crash frequency and severity. The Clearinghouse also provides a mechanism for sharing newly developed CMFs and educational information on the proper application of CMFs.
- **Countermeasures That Work** (<http://www.ghsa.org/html/publications/countermeasures.html>) – This resource updated annually by NHTSA documents the effectiveness of safety countermeasures for non-infrastructure-oriented major highway safety problem areas (e.g.,



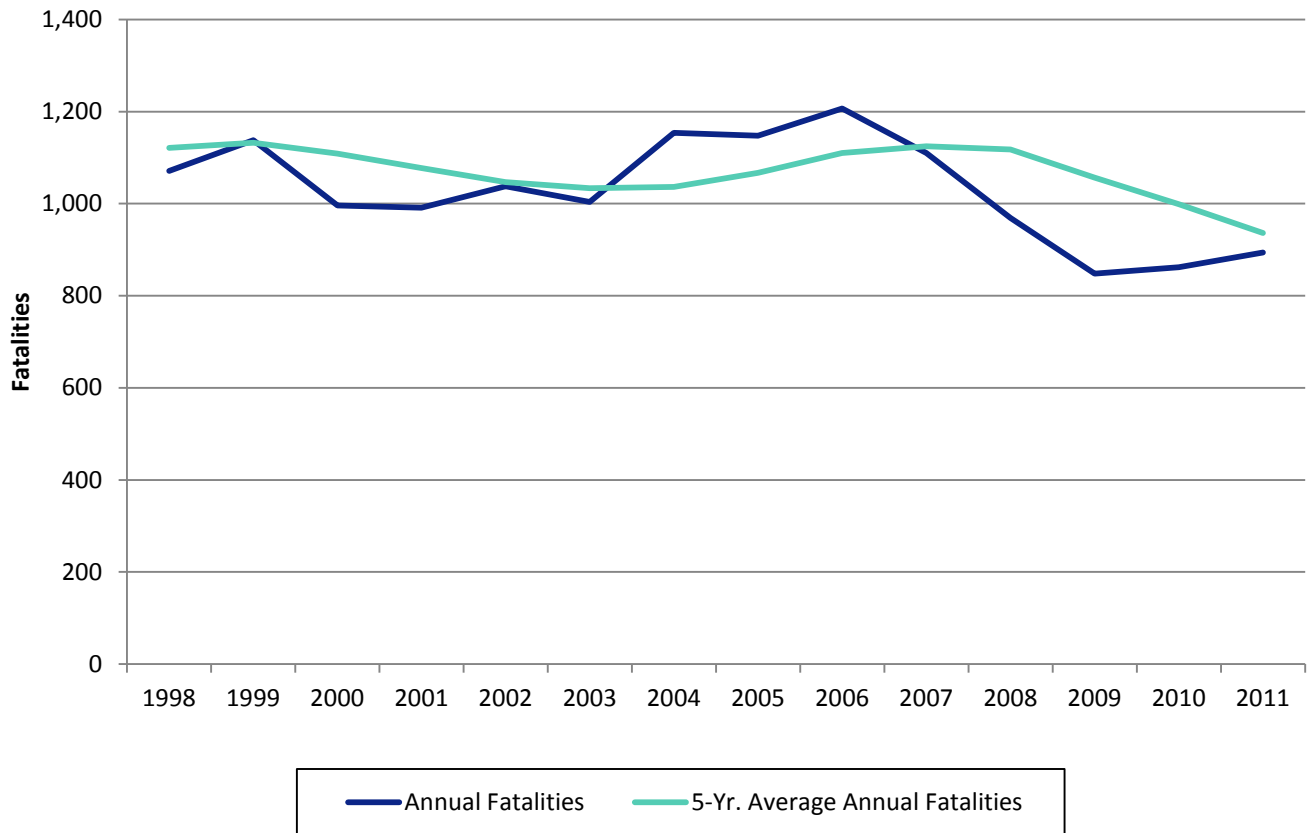
behaviors, population groups and vulnerable user types). Calculating effectiveness of non-infrastructure strategies is more challenging than that for infrastructure-oriented approaches. Nevertheless, this resource provides evidence-based information that can inform project result forecasts and safety target setting.

Using Trend Analysis

One of the simplest things agencies can do is to examine fatality trends. This is generally the first step States take in understanding safety performance and potential future safety gains. Given the potential variation in crashes and severity each year, it is common for States to look at a rolling average of multiple years, as well as single-year results. AASHTO's Standing Committee on Performance Management (SCOPM) recommends in its *SCOPM Task Force Findings on MAP-21 Performance Measure Target-Setting* (SCOPM Task Force Findings on MAP-21 Performance Measure Target-Setting [http://scopm.transportation.org/Documents/SCOPM%20Task%20Force%20Findings%20on%20Performance%20Measure%20Target-Setting%20FINAL%20v2%20\(3-25-2013\).pdf](http://scopm.transportation.org/Documents/SCOPM%20Task%20Force%20Findings%20on%20Performance%20Measure%20Target-Setting%20FINAL%20v2%20(3-25-2013).pdf), p. 13.) that States use five-year moving averages to evaluate trends.

Figure 3.9 is a graphical example of trend analysis showing both a multiyear average and individual year data. More detail on calculating trends is provided in Section 5 on Methods for Developing Safety Targets.

Figure 3.9 Alabama Roadway Fatality Trend



Source: Cambridge Systematics, Inc.

Consideration of Exogenous Factors

Agencies will likely want to consider the impact of exogenous factors, those which are outside the safety field but affect safety, in shaping their targets. Because demographic and technological factors play such a significant role in safety, it is important to consider how these issues impact target setting.

Technology is likely to play a major role in helping the U.S. and other nations reduce fatalities, serious injuries, and crashes. Recently, in-vehicle technology has been one of the biggest contributors to improved roadway safety, such as curtain airbags and rear view cameras. New technologies such as vehicles that “read the road” (e.g., can identify lane markings and help reduce lane departure), and self-driving vehicles will have major safety implications. Because many of these technologies are immature, the task in the short term is to determine how much can be achieved with currently available technologies and other non-technology-oriented strategies.

At present, demographics are the biggest driver of variation in fatalities. Involvement in fatal crashes varies greatly based on age and gender. For example, the crash rate for drivers age 16-19 is 4.6 crashes per 100 million VMT (100MVMT) compared to 1.2 crashes per 100MVMT for ages 30 to 69 (<http://www.ihs.org/ihs/topics/t/teenagers/fatalityfacts/teenagers>). Within these age groups



crash rates are higher for males than females. Taking into account forecasted demographic trends can help States develop better targets.

It is often useful to leverage the experience of other States when evaluating the impact of exogenous factors. States or regions that have undergone similar transitions can provide helpful insights about expected safety impacts.

Forecasting Reductions Based on Planned Implementation of Proven Countermeasures


Agencies can use performance analysis to understand what is likely to be achieved by a planned safety program, which then can then inform the evidence-based target setting process. This approach builds on existing efforts by State DOTs to understand effectiveness of countermeasures implemented in their State. State DOTs, FHWA, and other national research organizations examine countermeasure effectiveness on an ongoing basis.

Particularly for infrastructure improvements, forecasts of safety impacts resulting from implementation of proven countermeasures can be made using CMFs. Agencies can draw upon nationally developed CMFs, such as those provided in the Highway Safety Manual or the CMF Clearinghouse, as well as the knowledge they already have about the effectiveness of projects implemented in their State or region. Results from implemented projects that address the unique conditions of the State or region are likely the most useful. A target is evidence-based if it incorporates the expected results of a set of improvements in a plan.

While traditional benefit-cost analysis estimates the value of potential crash reduction based on CMFs for a given treatment, States can also look at the impact of a broader set of investments on fatalities by comparing historical investment trends against the associated impact on crashes by emphasis area to determine what types of investments are most effective at reducing fatalities. This will help provide a sense of the level of investment required to reduce one fatality in one emphasis area compared to another.

Under MAP-21, States are required to report to the Secretary on progress made implementing highway safety improvements, the effectiveness of those improvements, and the extent to which fatalities and serious injuries on all public roads have been reduced, including a breakdown by functional classification and ownership to the maximum extent practicable (<http://www.fhwa.dot.gov/map21/hsip.cfm>). As part of this reporting process, States have to describe the effectiveness of HSIP-funded projects. States should also determine the benefits and costs of not only infrastructure programs but also behavioral, enforcement, EMS and other programs. This type of evaluation should be incorporated into as many projects as possible for which good effectiveness data do not yet exist to develop new CMFs.

For behavioral programs, where effectiveness data are less available, and which are impacted by the manner of implementation and a State's culture, it is even more beneficial for States to study program effectiveness. This will enable States to know which programs are delivering results and are most cost effective. Moving forward, this State-specific efficacy information will help determine which



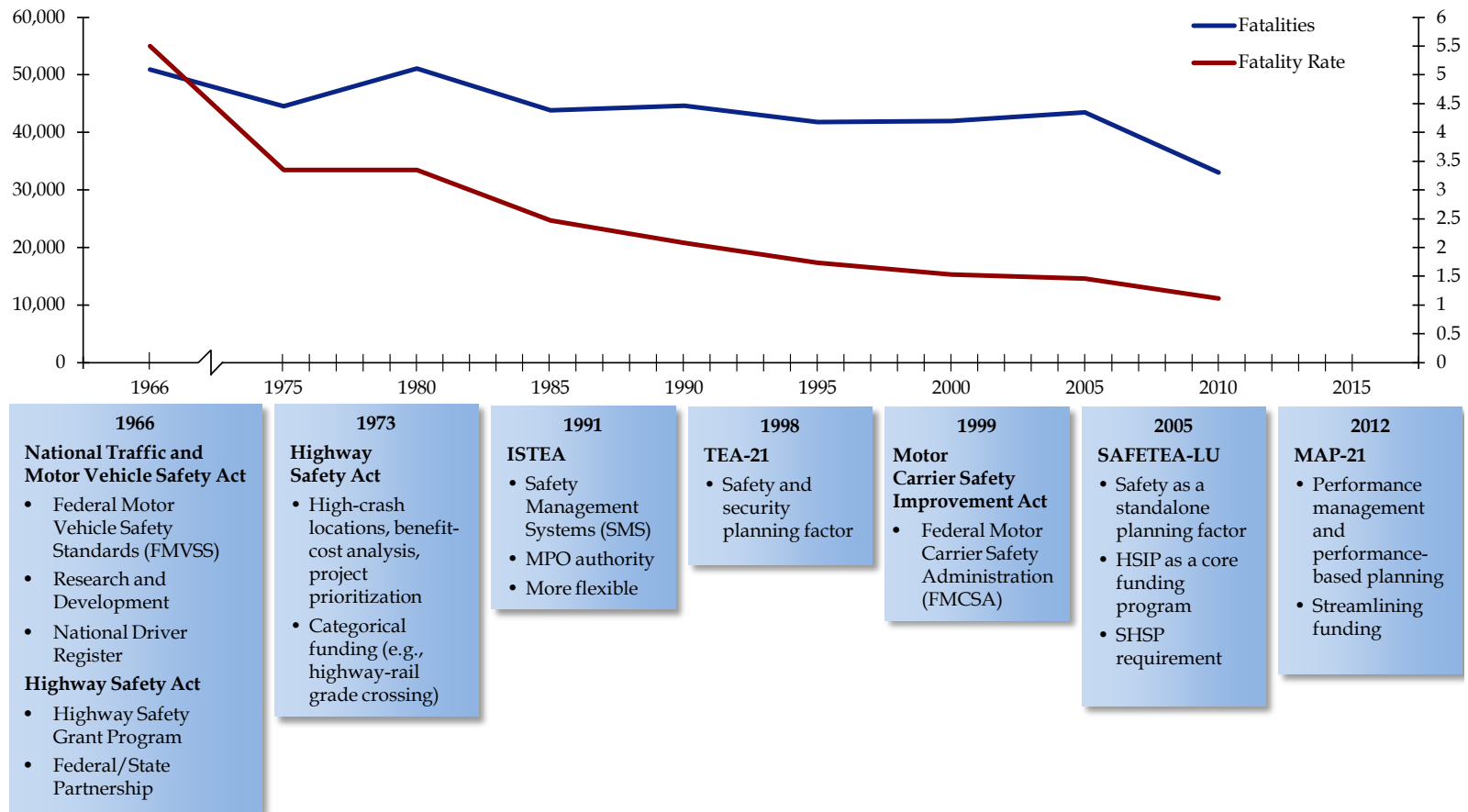
programs to replicate and expand and which to modify or discontinue. The results can be used to forecast the outcomes of a safety plan and support the target setting process.

Impact of Legislative Changes

Implementation of key safety legislation can have a significant impact on traffic safety. As shown in Figure 3.10, at a national level, legislative changes resulting from Federal transportation bills are correlated with reductions in the number of fatalities and the fatality rate. Information about calculating performance of planned improvements is provided in Section 4.0.

Evidence at the State level suggests that enacting legislation such as primary seatbelt laws, motorcycle helmet laws, and strengthened graduated driver licensing (GDL) requirements reduces fatalities. However, the degree of fatality reduction is tied to the level of resources applied to implementation.

Figure 3.10 National Legislative History and Fatality Trends



Source: Cambridge Systematics, Inc.

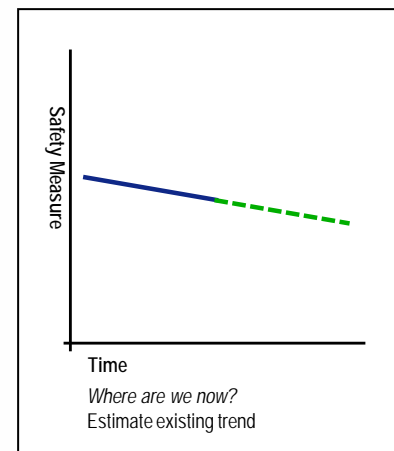
4.0 Data for Evidence-Based Target Setting

Safety analysis is a data-driven process. For performance measures to be useful, relevant data must exist. Consequently, realistic targets also require the existence of appropriate data. Fortunately, all States track fatalities and report them to NHTSA for inclusion in a national database. This section outlines the core data needed for fatality target setting and identifies other data useful for further refining safety targets. The information is grouped into three categories: trend data, data on exogenous factors, and countermeasure impact data.

4.1 Trend Data

Fatalities

A core data element States must collect for trend analysis is fatalities. Fatality trends are identified based on analysis of current and past data from the FARS database. It is useful to observe actual annual data trends as well as 5-year moving average trends, as may be required for Federal safety performance monitoring (shown in Figure 3.9). Planners should separate data by crash type, contributing factors, driver age, location type, and other descriptive variables in the FARS database so the appropriate countermeasure can be matched to the appropriate contributing factor and location type. For example, FARS data can be used to isolate factors, including:



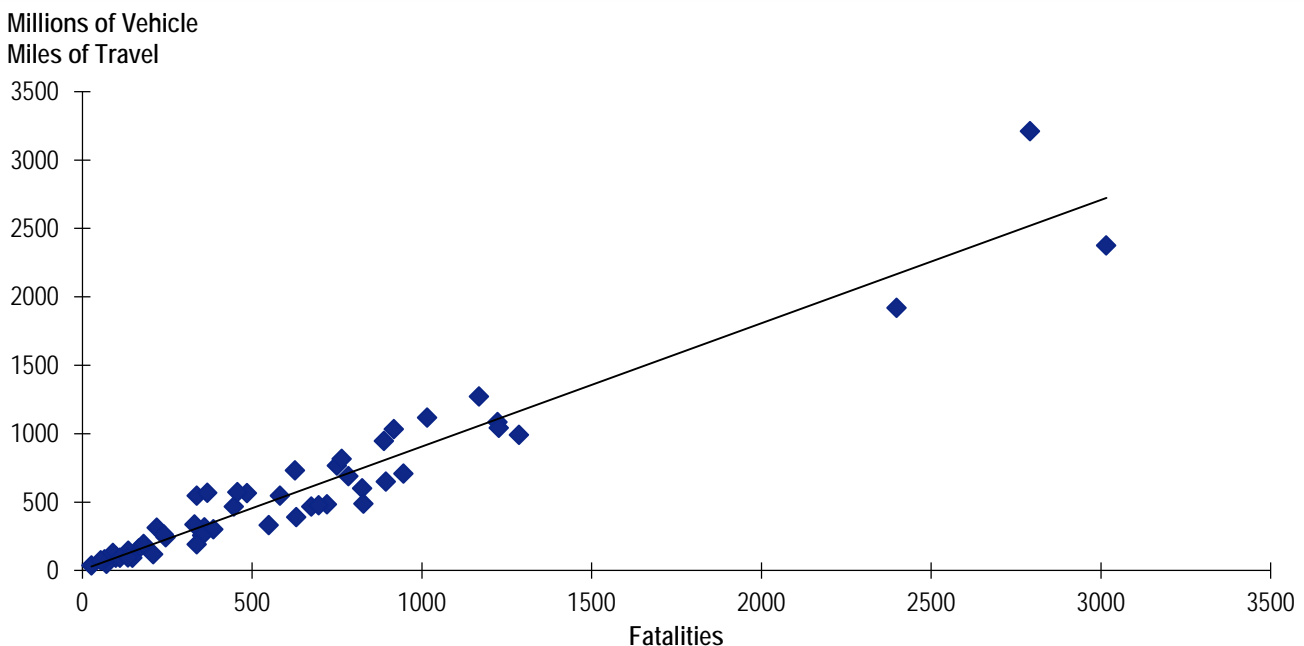
- Number of unrestrained passenger vehicle occupant fatalities, all seat positions;
- Number of fatalities in crashes involving a driver or motorcycle operator with a BAC of 0.08 and above;
- Number of speeding-related fatalities;
- Number of motorcyclist fatalities;
- Number of unhelmeted motorcyclist fatalities;
- Number of drivers of any age range involved in fatal crashes;
- Number of pedestrian fatalities;
- Number of fatalities that are intersection related;
- Number of roadway departure fatalities; and
- Number of fatalities by roadway functional class.

Vehicle Miles Traveled

The second core safety performance measure is fatality rate (the number of fatalities as a function of VMT). VMT data are needed for the geographic area for which the fatality rate is being calculated. They are needed to understand underlying travel demand (total fatalities may be decreasing simply due to less travel) and to normalize fatalities into fatality rates. At a State level this is fairly straightforward, because each State reports VMT annually via the Highway Performance Monitoring System (HPMS). Historical data from FHWA, State and regional sources, as well as forecasts from a travel demand model are needed to calculate fatality rate trends and forecast future fatality rates. VMT data for all States are available at the FHWA Office of Highway Policy Information Highway Statistics (<http://www.fhwa.dot.gov/policyinformation/quickfinddata/qftravel.cfm>). These data should be disaggregated at least by roadway functional classification and urban and rural areas to better isolate safety risks and target countermeasures.

Figure 4.1 shows the linear relationship between VMT and fatalities at the aggregate level – the more exposure to risk in terms of more miles traveled, the higher the number of fatalities. However each State should consider evaluating its own trends as significant variation exists across States. For example, several States, such as Utah and Washington, have experienced increasing population and VMT concurrent with decreasing fatalities, due at least in part to effective safety programs. In addition, given other trends such as declining vehicle licensure among younger drivers, it is useful to carefully monitor VMT trends and the relationship to safety results.

Figure 4.1 Relationship between VMT and Fatalities
by State

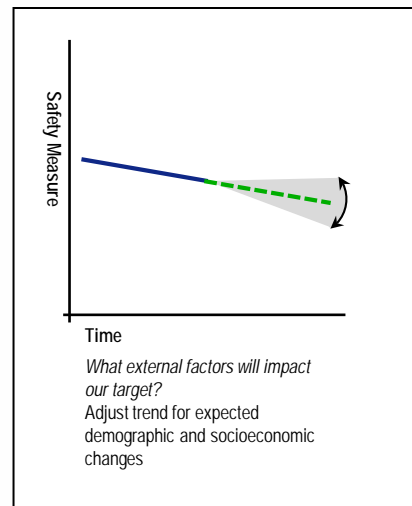


Source: Cambridge Systematics, FARS 2011.

4.2 Exogenous Factors

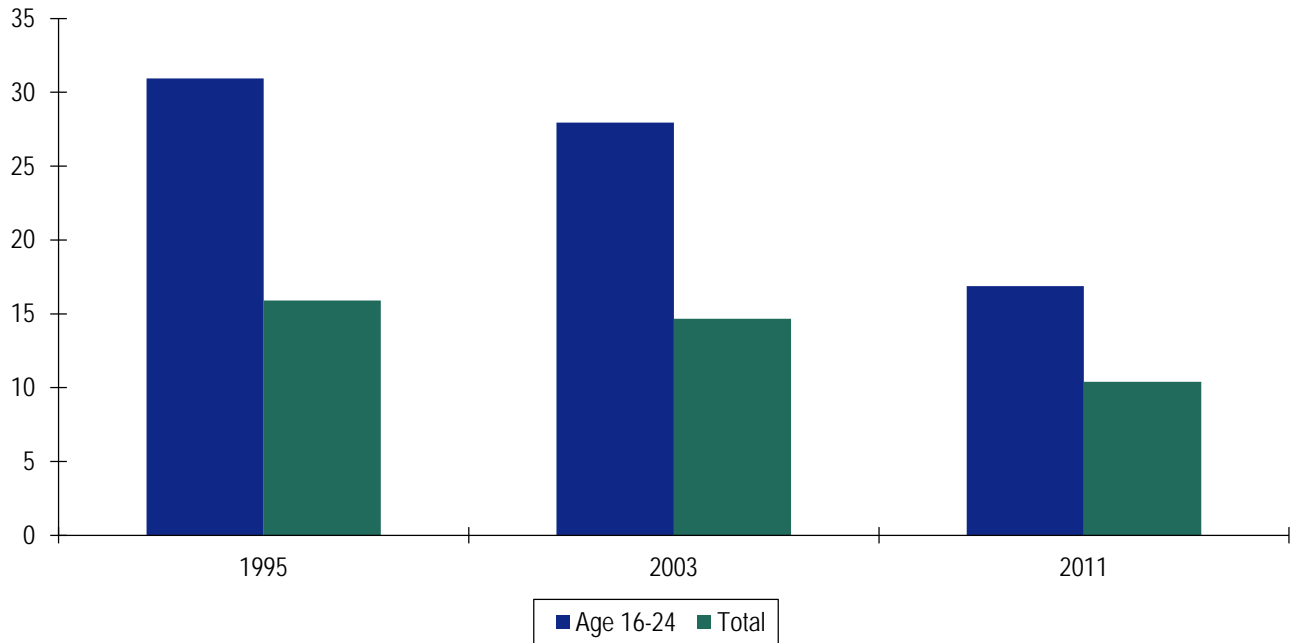
Population

Similar to VMT, changes in population are outside the control of safety planners, yet impact the number of fatalities. Historical and forecasted population data can help with target setting. One important facet of population is the distribution between rural and urban areas. Urban crashes, due to lower speeds, tend to be less severe on average so the fatal crash rate is lower than it is in rural areas where the population is lower but the rate of fatal crashes is often higher. In 2010, 19 percent of the U.S. population lived in rural areas, but 55 percent of all traffic fatalities occurred in rural areas (<http://www-nrd.nhtsa.dot.gov/Pubs/811637.pdf>). Safety analysts will want to keep track of trends in urban/rural population distribution and how they relate to fatality trends.



States should also isolate the proportion of the current population under age 25 and those over age 65. These age groups tend to have higher fatality rates and are disproportionately affected by certain contributing crash factors; therefore, certain strategies are more effective if targeted to these groups. Given the high incidence of crashes and fatalities among younger drivers, analysts should break them down into smaller age groups (such as 16 to 17, 18 to 20 and 21 to 24) for greater precision. States and regions should review recent demographic trends and available forecasts for population distribution by age for the target year. The change in proportions among these age groups over time can impact changes in fatalities over time, even without implementing any safety strategies. As shown in Figure 4.2, the rate of fatalities among drivers ages 16 to 24 is higher per 100,000 population than the rate overall, although it has declined significantly over the last 15 years. Therefore, if a State anticipates a larger cohort of younger or older drivers in its target year, the State may choose to adjust its target accordingly.

Figure 4.2 National Fatalities per 100,000 Population
Young Drivers versus Total

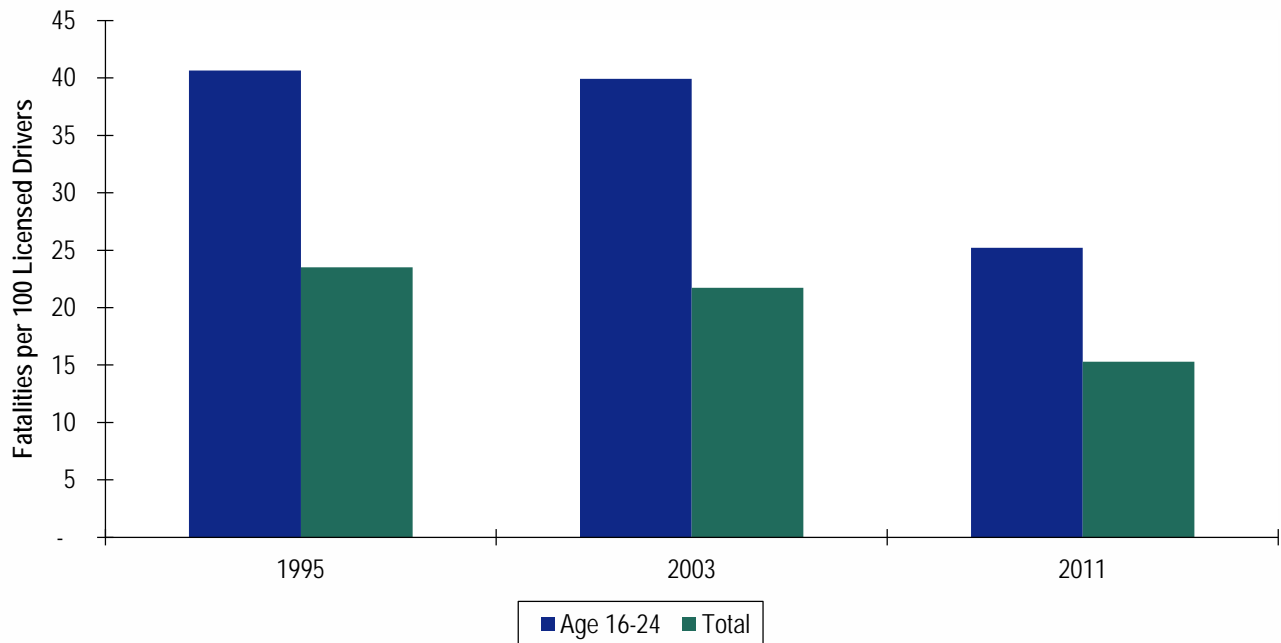


Source: Cambridge Systematics, Inc., FARS; U.S. Bureau of the Census.

State records on licensed drivers may help an agency understand the proportion of at-risk drivers. Changes in automobile ownership and driving rates may impact future safety targets as much as countermeasure selection. For example, from 2000 to 2010, the share of 14- to 34-year-olds without a driver's license increased from 21 percent to 26 percent⁷. This seems to indicate that younger drivers may be choosing to delay or not pursue licensure, which reduces their in-vehicle crash exposure, however, they may be walking or riding a bicycle more often and therefore be more exposed to the risks associated with those modes. Figure 4.3 presents the incidence of fatalities among young drivers and all drivers relative to the number licensed drivers in each category. This figure shows a similar story to that described above.

⁷Davis, Benjamin and Tony Zutzik, Frontier Group and Phineas Baxandall, U.S. PIRG Education Fund, "Transportation and the New Generation: Why Young People are Driving Less and What It Means for Transportation Policy," 2012.

Figure 4.3 National Fatalities per 100,000 Licensed Drivers
Young Drivers versus Total

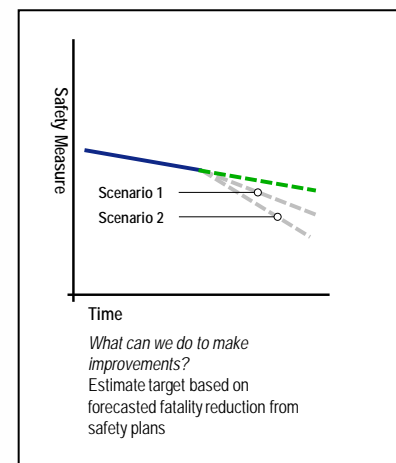


Source: FARS; FHWA – Highway Statistics.


4.3 Countermeasure Impact Data

State Data on Countermeasure Effectiveness

States should use the safety analysis tools listed in Section 3.5 to adjust their targets. Program and project evaluations help agencies determine which countermeasures are most effective in saving lives and reducing injuries. Agencies should determine which countermeasures have not demonstrated the expected effectiveness and reconsider or modify them in the future. The results of all such evaluations should be captured in a knowledge base to improve future estimates of effectiveness and for consideration in future decision-making and planning. This information is a critical input into evidence-based safety target setting. When a State sets or updates a safety target, it should draw upon its body of knowledge of project effectiveness for use in forecasting future fatality reductions given a set level of resources. This information will help the State develop the most effective safety program possible and also ensure its fatality targets are realistic.



To understand the extent to which a particular measure is working, the State should conduct an evaluation. A range of methods are available for evaluating countermeasures depending on the available data and resources. Section 6 of the Highway Safety Improvement Program Manual (<http://safety.fhwa.dot.gov/hsip/resources/fhwasa09029/sec6.cfm#62>) describes options for conducting project and program evaluation, including before/after analysis. It is critical for the purpose of target



setting to continue to improve this information and use it to forecast fatality reductions anticipated from planned safety programs.

Both individual State DOT and FHWA research have examined countermeasure effectiveness for many years. The Crash

Modification Factors Clearinghouse (<http://www.cmfclearinghouse.com/>) database is a continually updated source for effectiveness data for infrastructure-oriented safety countermeasures. For certain projects, a State may pursue high-quality evaluation that is of the caliber to develop a CMF about the countermeasure. FHWA's A Guide to Developing Quality Crash Modification Factors (<http://safety.fhwa.dot.gov/tools/crf/resources/fhwasa10032/>) is a useful resource. Given the limited number of CMFs currently available, States are encouraged to develop CMFs to contribute to this knowledge base so that fatality reduction forecasts can be continuously improved. This will help States improve the accuracy of target setting.

Data on the effectiveness of behavioral programs is limited and varies according to the scale and type of implementation. For these programs the best resource is a State's own evaluation of how the project or program worked on its own roadway system. Therefore, States should evaluate projects without known effectiveness data to ensure they are not implementing ineffective programs and that they are getting the greatest results possible with the resources available. In-house evaluation generates confidence in the validity of the results and fosters their use in future fatality forecasts and target setting.

Emphasis Area Plans

Through the use of efficacy data (either national CMFs or State-developed information) for multiple projects, a State can develop a detailed emphasis area plan and create reasonable fatality reduction forecasts provided all countermeasures are implemented. The combination of evidence-based data with a State's planned safety program will help generate a realistic fatality target given anticipated resources.

Emphasis area plans should use CMFs or other data on anticipated fatality reductions to forecast the safety benefits of the investment and inform target setting. Two approaches for incorporating CMFs into target setting are: 1) CMFs can be used in individual locations to calculate the forecasted fatality or injury reduction of a specific improvement. 2) On a systemic level, improvements can be identified throughout a State or area with a history of or high potential for crashes based on identified characteristics. CMFs can be used to forecast the overall reduction in severe crashes within the countermeasure implementation area. The Georgia DOT, in cooperation with the FHWA Resource Center, recently conducted a study that shows how an emphasis area plan can estimate the expected fatality reduction that can be used in target setting, which is described in the following example.

Georgia DOT Roadway Departure Safety Implementation Plan

In its Roadway Departure Safety Implementation Plan, Georgia established a roadway departure goal to continue the general declining trend of roadway departure fatalities, decreasing the 737 roadway departure fatalities that occurred in 2009 to no more than 560 in 2015 and 413 in 2020.

Georgia combined traditional location specific strategies with systemic application of large numbers of cost-effective, low-cost countermeasures at locations experiencing specific crash types above a specified frequency level. On some corridors targeted education and enforcement initiatives were implemented.

Table 4.1 shows a sample of the calculations in the plan, including the number of crashes as well as the number of annual severe injuries and fatalities the countermeasure was expected to reduce. By dividing the cost of the project by the number of fatalities it is expected to reduce, an estimate is developed of the cost required to save one life per year. This type of analysis is useful in prioritizing projects to ensure the greatest number of fatalities is reduced given a fixed level of safety investment and in setting targets.

Table 4.1 Georgia Roadway Departure Safety Implementation Plan Countermeasures (sample)

Countermeasure	Approach	Estimated Number of Improvements	Associated Costs (\$ Million)	Annual Targeted Crash Reduction	Annual Estimated Severe Injury Reduction	Annual Estimated Fatality Reduction	\$ (Million) Required to Save One Annual Life
State Roads							
Enhanced Curve Sign and Marking Countermeasures – Total State Rural	Systematic	1,054	\$ 10.54	333	4.67	9.94	1.06
Enhanced Curve Sign and Marking Countermeasures Plus High Friction Surfaces – Total State Rural	Systematic	56	\$ 3.36	62	0.84	1.71	1.97
Enhanced Curve Sign and Marking Countermeasures – Total State Urban	Systematic	197	\$ 1.97	261	1.33	2.12	0.93
Enforcement and Education: Alcohol Related – Total State	Education and Enforcement	34	\$ 1.79	37	0.66	0.55	2.49
Enforcement and Education: Speeding Related Crashes – Total State	Education and Enforcement	76	\$ 3.95	132	1.47	1.90	2.74
Local Roads							
Standard Curve Sign and Marking Countermeasures – Local Rural Roads	Systematic	2,776	\$ 8.33	474	6.77	11.46	0.73
Centerline Rumble Stripes – Total Local Rural	Systematic	372	\$ 1.86	86	1.28	1.74	1.07
Edge Line Rumble Stripes – Total Local Rural	Systematic	721	\$ 7.21	342	3.59	5.71	1.26



Benefit-Cost Analysis

Benefit-cost analysis is a useful approach for providing a relative sense of the fatality reduction results expected for a specific investment. Development of project-specific benefit-cost ratios will help prioritize safety investments for an emphasis area plan. If the projects with the best cost-benefit ratio in a specific emphasis area are chosen for implementation, a State will know it has developed the most effective program possible with defined resources. Once emphasis area plans, including fatality reduction forecasts are developed, they can be used to inform development of a fatality target. The use of benefit-cost analysis in combination with emphasis area plan development will help a State know how aggressive the target can be while ensuring it is realistic. Guidance on how to conduct benefit-cost analysis is available in the HSIP Manual (<http://safety.fhwa.dot.gov/hsip/resources/fhwasa09029/sec6.cfm>). An example of benefit-cost analysis for both engineering and non-engineering countermeasures at a corridor level is provided here as an example.⁸

⁸ Greene-Roesel, R., Washington, S., Wier, M., Bhatia, R., Haque, M. M. and Wemple, B. “Benefit cost analysis applied to behavioral and engineering safety countermeasures in San Francisco, California.” In Proc. 92nd Annual Meeting of Transportation Research Board (TRB), Washington DC, USA, 2013.

Geary Boulevard Benefit Cost Analysis

Geary Boulevard is an important east-west arterial in the City and County of San Francisco serving high volumes of transit, automobile, and pedestrian traffic. One 0.8-mile segment of the Geary Corridor from Cook Street to 9th Avenue is the focus of this case study, because it has been identified as a high injury corridor by the San Francisco Pedestrian Safety Task Force. The posted speed is 25 mph, and the 85th percentile speed is about 33 mph.

The methodology used is as follows:

1. Select behavioral and engineering countermeasures for analysis that are to be applied at the corridor level or a wider geographic scale as appropriate to the type of countermeasure, as determined by the crash history of the site as well as known traffic, operational, and behavioral factors.
2. Specify the level of deployment of each countermeasure. For engineering countermeasures, this involves determining where the countermeasure will be implemented (e.g., how many sites). For behavioral countermeasures, it often involves consideration of not only where the countermeasure will be implemented (e.g., across the county, in a portion of the county), but how much investment is necessary to produce crash reductions specified in the research literature (if known). Finally, it can involve consideration of spillover effects – for example, if a countermeasure is implemented in one geographic location, drivers at similar locations may be affected.
3. Estimate the crash reduction effectiveness of each countermeasure using available CMFs from the safety research literature or other current, reputable sources.
4. Specify the time period during which the countermeasure will be effective. This involves considering not only how long the countermeasure will be operable (e.g., the useful life of new infrastructure or the number of years of funding available for a behavioral strategy), but also how long the countermeasure will remain effective after it is installed or implemented. Some behavioral countermeasures, for example, remain effective even after the funded deployment period.
5. Estimate countermeasure costs given the level of deployment.
6. Estimate the target injuries and fatalities that could potentially be affected by the countermeasure. This study focuses on fatal and injury crashes and ignores property damage only crashes due to the much higher social and economic costs associated with the former.
7. Estimate countermeasure benefits and calculate a benefit-cost ratio.

Table 4.2 shows the countermeasures, scale of implementation, and estimated benefit-cost ratio for each type of improvement.

Table 4.2 Estimated Ratio of Net Present Benefits to Costs for Geary Corridor Safety Improvements
Assuming 20-Year Implementation Period for all Countermeasures

Countermeasure and Scale of Implementation	Estimated Annual Target Crashes		Estimated Annual Crash Reduction			Estimated Net Present Worth of Benefits			Estimated Net Present Worth of Costs			
	Fatal Crashes	Injury Crashes	Crash Reduction Factor	Estimated Fatality Crash Reduction (CRFxFat)	Estimated Crash Reduction (CRFxInj)	Fatality Crash Benefit (Unit Cost \$5,389,000)	Average Injury Crash Benefit (Unit Cost \$384,000)	Total Estimated Net Present Benefits	Capital Costs (Initial)	Annual Ongoing Costs	Total Estimated Net Present Costs	BCR
Pedestrian Median Extensions	0.12	2.8	46%	0.06	1.29	\$297,473	\$664,608	\$13,074,992	\$200,000	N/A	\$200,000	65
Automated speed enforcement cameras	0.83	133	20%	0.17	25.94	\$872,210	\$13,382,460	\$193,725,612	N/A	\$54,000	\$733,878	264
School pedestrian training (County)	0.3	10	12%	0.04	1.20	\$194,004	\$619,200	\$11,051,708	N/A	\$625,000	\$8,493,954	1
Sobriety Checkpoints (County)	1	51	20%	0.20	10.20	\$1,077,800	\$5,263,200	\$86,176,259	N/A	\$400,000	\$5,436,131	16

Note: The number of equivalent fatality and injury *crashes* was not readily available for these geographies at the time of analysis; therefore crash ratios (injury to injury crash and fatality to fatality crash) for San Francisco were used to convert the number of fatalities and injuries into equivalent crashes.

Source: “Benefit-cost analysis applied to behavioral and engineering safety countermeasures in San Francisco, California.” In Proc. 92nd Annual Meeting of Transportation Research Board (TRB), Washington, D.C., 2013.



Resource Allocation Data

Resource allocation is a key element of the performance-based planning process (see Figure 1.1). As progress toward achieving targets is made, agencies should engage in a continuous process of re-evaluation and reallocation of resources based on where progress is being made and where problems still exist. One useful exercise may be to evaluate the extent to which expenditures by emphasis area for the infrastructure and behavioral programs align with the proportion of fatalities by emphasis area. This provides a snapshot of how resources are being distributed relative to the largest problem areas based on number of fatalities. Data on strategy alignment with emphasis areas and project costs to conduct this analysis reside in the SHSP, HSP, HSP annual report and HSIP annual report. After reviewing the historical distribution of safety investments, the State or region can consider adjusting expenditures to more closely align with the scale of the problem. This can inform distribution of resources among emphasis area plans so they are optimized based on finite resources. These plans, including the forecasts of fatalities reduced based on planned countermeasures, are an important input to development of safety targets and making progress to achieve targets.

Challenges exist with trying to determine investments by emphasis area, including:

- Significant overlap exists between emphasis areas, making it difficult to isolate investment in each emphasis area.
- HSIP annual reports typically provide lists of projects, locations, and costs with a very brief description that does not identify the emphasis area targeted. Additional work would be needed to categorize projects by emphasis area by drawing upon crash data for justifying the project application. Under MAP-21, HSIP projects are required to align with SHSP emphasis areas, so this information should be clearly identified in future years.

Funding sources have traditionally been limited in their use and organizational structures have been siloed; with infrastructure-oriented funding and countermeasures handled by the State DOT and behavioral funding and countermeasures handled by the SHSO. This arrangement has made it challenging to shift funding between programs. However, State DOTs now have the flexibility to shift significant amounts of HSIP funds to non-infrastructure purposes. Therefore, resource allocation analysis may be even more useful in the future.

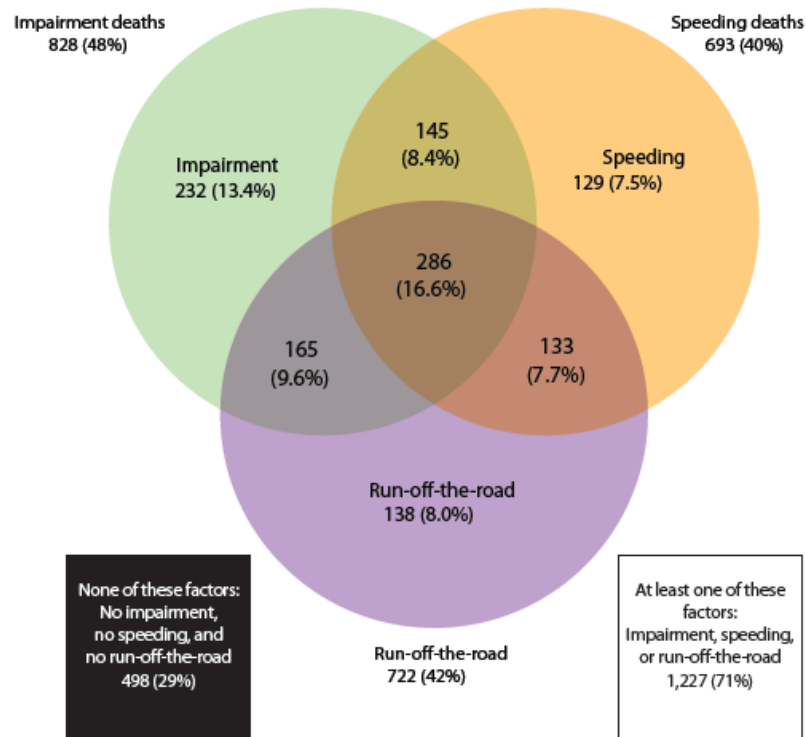
Emphasis Area Target Relationship to Overall Fatality Target

Identifying crash contributing factor or emphasis area overlaps helps to calibrate the net impact on fatality reduction across multiple emphasis area plans. It is also beneficial to review overlaps among emphasis areas so countermeasures that address more than one emphasis area can be prioritized. For target setting, information on emphasis area overlaps should be used to reduce the expected benefits identified in individual emphasis area plans. For example, if an agency develops an emphasis area plan related to roadway departure and one for speeding, it may reduce the expected reduction in fatalities in each by half the amount of overlap between the two.

An example of contributing factor overlaps is illustrated in Figure 4.4, which shows that nearly 27 percent of run-off-the-road fatalities in Washington State also involve impaired driving, and 16.6 percent of fatalities involve speeding as a third factor.

Figure 4.4 Washington Overlap in Fatalities by Emphasis Area
Impaired, Speeding, and Run-off-the Road

The role of impairment, speed, and run-off-the-road collisions in 1,725 traffic fatalities in Washington 2006-2008



Data source: FARS and WSDOT Collision Database.

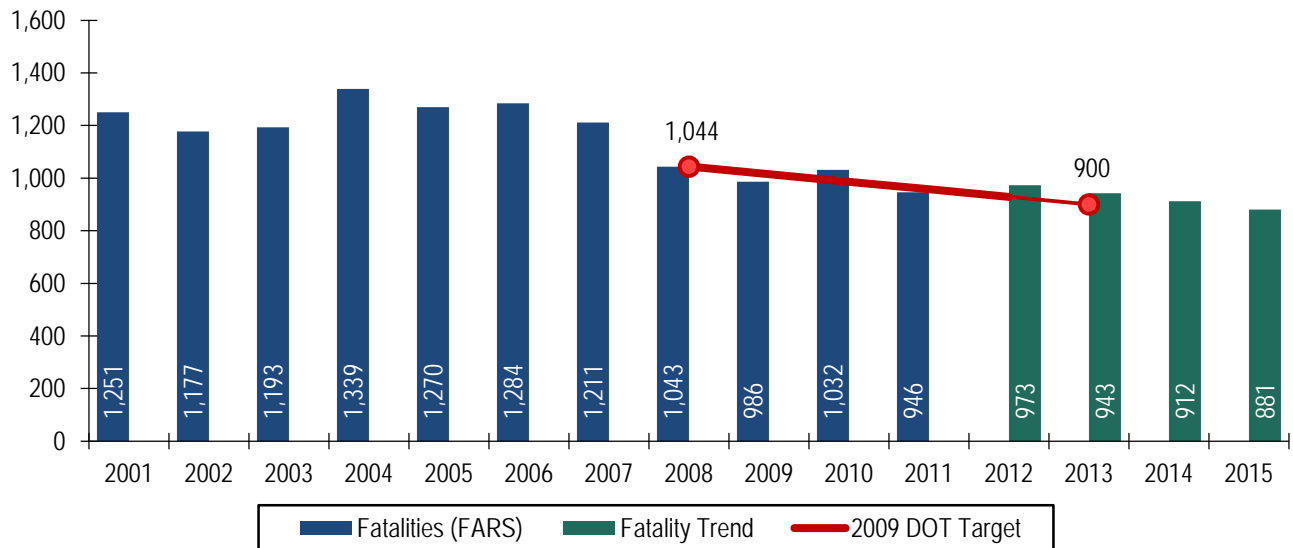
Source: Washington Strategic Highway Safety Plan 2010.

States should seek to conduct similar analysis of overlaps among crash factors using State crash data. This will inform the extent to which a State can assume the strategies in each emphasis area will contribute to overall fatality and serious injury reductions, and how much the anticipated benefits need to be adjusted due to anticipated overlap with other emphasis areas of State safety programs. This will mitigate the potential for double counting the anticipated fatality reduction when aggregating the forecasted results of multiple emphasis area plans and will improve the accuracy of the result for target setting.

5.0 Technical Methods for Target Setting

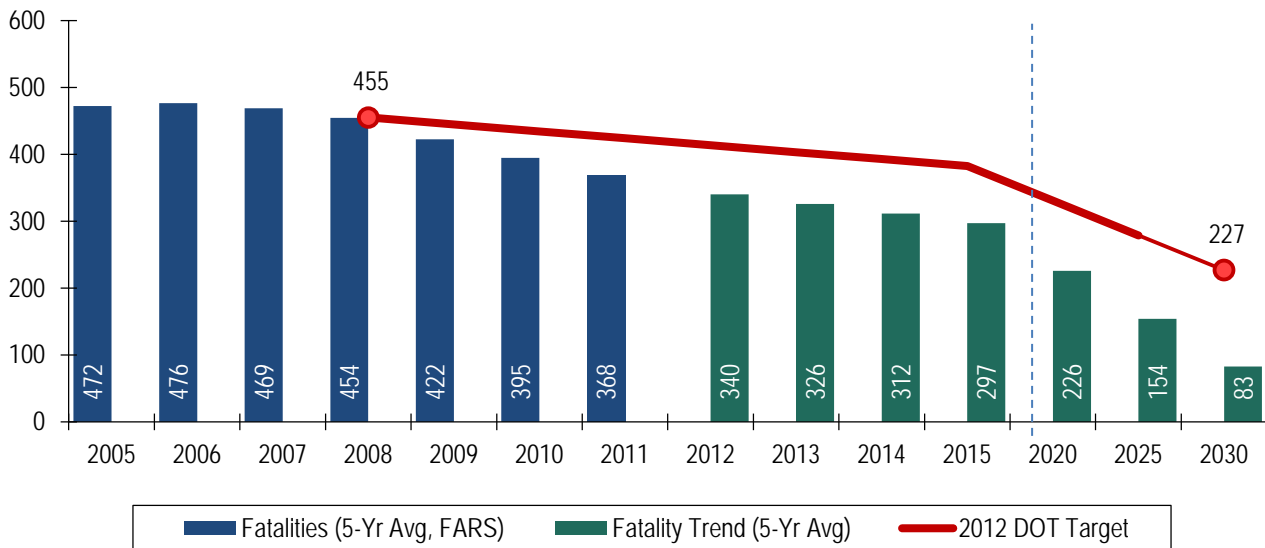
There are several technical considerations or “reality-checks” an agency may want to take into account through the process of setting or refining a target. Figures 5.1 and 5.2 display three types of data: actual fatalities, projected fatalities, and the fatality target. Actual fatalities from 2001-2011 FARS data are shown as dark blue bars. Projected fatalities from 2012 through the target year are shown in green bars. The target itself is shown by a red line or dot. The dots indicate the base and final target values, and the line indicates a linear reduction from the base year number of fatalities to the target-year fatalities. The legend indicates whether single-year or multiple-year average data are used, i.e., Figure 5.1 shows single-year data and Figure 5.2 shows five-year average data.

Figure 5.1 Example Fatality Trend Figure 1
Single-Year Fatality Trend; 2013 Target Year



Source: Cambridge Systematics, Inc.

Figure 5.2 Example Fatality Trend Figure 2
Five-Year Average Fatality Trend; 2030 Target Year



Source: Cambridge Systematics, Inc.

5.1 Selection of Baseline Method

The first consideration when setting a target is what will be used for a base-year value against which the target will be compared. According to *Traffic Safety Performance Measures for States and Federal Agencies*, a three- or five-year rolling average is recommended. Rolling averages show long-term trends more clearly than annual counts. The longer the time period for which the average is used, however, the longer it will take for trends to show up in the data. If a multiyear average is used, a State or region also will likely track annual numbers.

5.2 Projection Methods

To compare fatality targets with fatality trends, a linear regression methodology (also known as a “line of best fit”) is often used to project future fatality numbers and rates. Most spreadsheet software offers a “Linear Trend” function, which projects what the fatalities would be in the future if the trend were to continue. It is a good idea to review the “fit” of the linear regression. As each fatality becomes more challenging to reduce in the future, it will be more likely that the trend line flattens out as fewer fatalities are reduced per year. Therefore, States may want to segment the trend line to estimate separate linear trends for different time periods or use non-linear functions (e.g., exponential, logarithmic, polynomial, or power⁹) to improve the fit of the trend line with the data. By selecting the

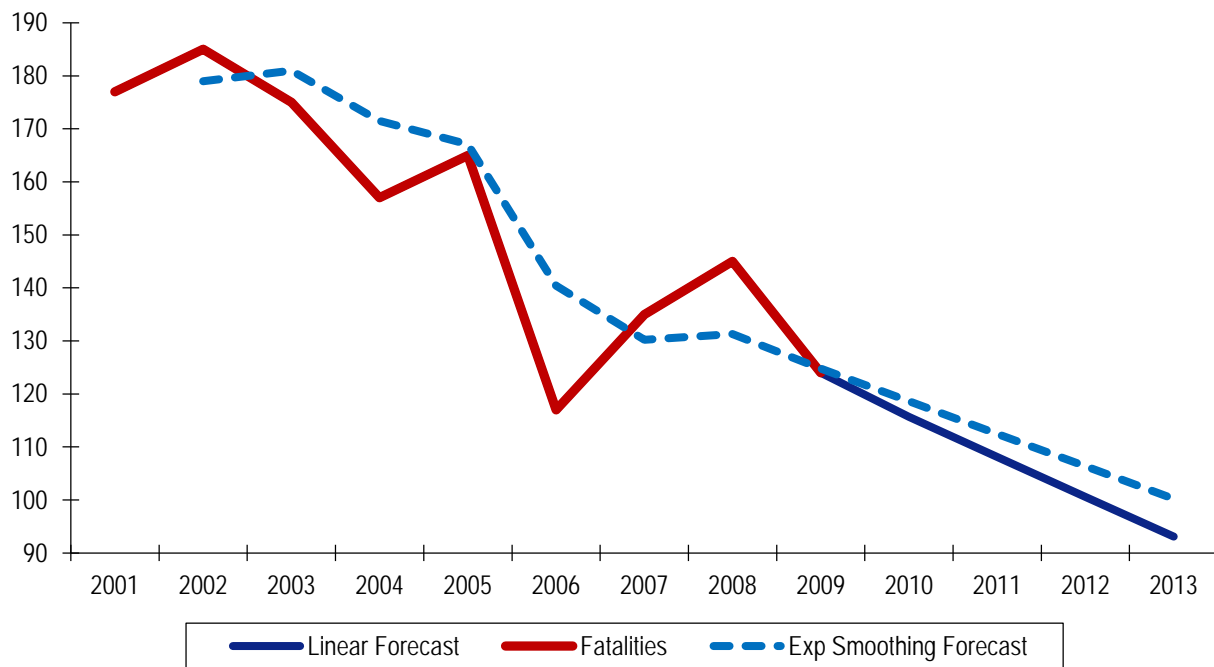
⁹ These methods are available in many off-the-shelf spreadsheet software applications.

R-squared value (in the spreadsheet) to evaluate the fit, different approaches can be compared. The closer the R-squared is to 1, the better the fit of the trend line to the historical data.

To adjust a projection further, other statistical methods such as exponential smoothing or averaging can be used. These techniques are helpful because data collected over time will inherently have some form of random variation. “Smoothing” techniques help reveal more clearly the underlying trend, as well as seasonal and cyclic components. More information about smoothing techniques is available in the Engineering Statistics Handbook by the National Institute of Standards and Technology (<http://www.itl.nist.gov/div898/handbook/>).

To conduct exponential smoothing, analysts can build a customized application or purchase “add-ins” from other commercial software developers for forecasting or commercially available statistical packages. For example, analysts may choose to weight the near-term years in the fatality projection more heavily since they are more likely to be similar to the recent trend. Figure 5.3 shows how trend analysis could be used in concert with exponential smoothing to refine a target. The red line shows the actual fatality data. It is forecast out using linear regression in the solid blue line. The dotted line shows how the line would look if exponential smoothing were used to look at the trend and develop a forecast. Such forecasting should be done on an annual basis as one year of data can impact the forecasted trend line.


Figure 5.3 Example Fatality Trend Forecast Using Exponential Smoothing



Source: Cambridge Systematics, Inc.

Calculation of Annual Rate of Fatality Reduction

While some targets are set for only one year, others are set for as many as 20 years into the future. A check on the level of ambition for a target is to calculate the annual rate of fatality reduction for both the historical trend and the future years and to see how they compare. In the future, as the number of fatalities gets closer to zero, every fatality reduction will become more challenging. Therefore, a sig-



nificantly larger annual reduction than has been achieved in the past may not be realistic. A Compendium of State and Regional Target Setting Practices (<http://safety.fhwa.dot.gov/hsip/tpm/docs/compendium.pdf>) developed calculations of annual fatality reductions for each State where a target was available, and provides a reference for benchmarking.

Forecasting Target Achievement Potential

Once a potential target has been defined, agencies should overlay it on the forecasted trend based on past performance. This gives a sense of whether the target seems achievable. In Figure 5.1 the State is not projected to reach its target (the number of fatalities in the green bar is higher than the target in the red line) while Figure 5.2 shows an example where the State is projected to reach its target. This analysis has been undertaken for every State for which target data were available in A Compendium of State and Regional Target Setting Practices (<http://safety.fhwa.dot.gov/hsip/tpm/docs/compendium.pdf>).

5.3 Target Achievement


The peer exchange conducted for this project addressed not only safety targets and target setting methodologies, but also how safety targets were integrated into the daily practice of transportation safety to achieve results. Safety targets are an important tool to develop a unified culture of safety within an agency and statewide. Safety targets should be communicated broadly to engender buy-in from the widest range of stakeholders – from top State leadership to members of the public – all of whom have a role in transportation safety. Full details of peer exchange outcomes are available in the Peer Exchange Meeting Report (http://safety.fhwa.dot.gov/hsip/tpm/docs/peer_exchange.pdf). Key findings regarding how safety targets can be used to improve safety outcomes are discussed below.

Communications

While target setting should be evidence-based, targets also play an important role in motivating action to reduce fatalities by safety stakeholders, including the public. Communicating targets promotes accountability of those responsible for meeting them through increased attention and scrutiny. Engineering alone will not reduce fatalities to zero. Other factors such as weather and behavior play a significant role. People have to want to change their behavior so it is important to get their buy-in. When SHSPs are adopted or safety targets set, it can be effective to use these benchmarks as opportunities for senior leadership to publicly express their support for safety. For example, the Maryland governor and chiefs of police signed proclamations supporting TZD. In Rhode Island, the governor signed the SHSP in a formal ceremony that received significant media coverage.

Institutionalizing Safety Targets

To ensure safety targets serve as a central goal over the long term, they must be adopted and understood by multiple individuals and departments and integrated throughout agency programs. This can be achieved by integrating safety into agency processes and staff performance evaluations, developing ongoing collaborative structures, and integrating proven safety practices into design guidance. Institutionalization of a commitment to safety processes ensures that when leadership moves on and institutional knowledge and experience leave an agency, the safety mission lives on.



One approach to institutionalization is to develop a safety training curriculum for key stakeholders within the organization and individuals who interact with the agency on safety issues.

Safety is typically included as an overarching State DOT goal. However, safety is often not fully integrated as an organizational imperative. To have a substantial impact on reducing fatalities and achieving targets an agency must move from safety being expressed only as a goal statement to full integration of safety throughout the culture of an agency. UDOT accomplished this transition. Historically, UDOT had identified safety as one of several strategic directions for the agency. However, in Utah the concept of transportation safety has now been rebranded as the State's safety target, Zero Fatalities. The strategic direction is no longer "safety" but "zero fatalities," which reflects a significant cultural evolution and promotes a more concrete understanding of the role and impact of safety. As the fatality numbers continue to decrease, UDOT staff are increasingly supportive and convinced that Zero Fatalities is achievable. Safety outcomes are also a component of UDOT staff leader performance evaluations. This reinforces the culture shift by focusing not only on pavement condition and structure ratings but also on fatality reduction.

The larger the number of agencies and individuals that "own" the safety target, the greater likelihood of continuity and success. It is important to look outside the champion agency and encourage partners to take ownership of the process, so they can expand their realm of influence.

Institutionalization also requires considering how to maintain a focus on safety over time. Succession planning should be conducted not only for staff but also for programs. The incorporation of safety into long-range plan targets will ensure some level of ongoing safety engagement, but safety also needs to be integrated into planning scopes of work and design guidelines/standards to become part of routine practice.


Practice Substantive Safety

The way to get better safety outcomes is to use better tools. Now new tools exist that provide specific safety outcomes, such as the Highway Safety Manual and Crash Modification Factors Clearinghouse. For a specific roadway improvement engineers and planners should seek to forecast the impact on fatalities and serious injuries as part of the design and development process. If a planned project is not anticipated to improve safety, it can be reconsidered or redesigned to generate better safety outcomes. This is the practice of substantive safety, which is the optimum approach to ensuring all roadway improvements also result in safety improvements.

5.4 Conclusion

Safety target setting has been associated with improved safety outcomes in several countries studied. MAP-21 mandated a safety performance management framework, including a requirement for State DOTs, SHSOs and MPOs to set safety targets. Recent research on safety targets has revealed a lack of consistency among identical performance measures in some States and a need for improved consistency moving forward.

This report provides agencies with information on a core set of data and methods that they can draw from as they set, update and refine their fatality targets on an ongoing basis. Target setting is largely dependent on trends and an understanding of the fatality reduction anticipated from a planned set of safety countermeasures. Practitioners should work toward systematically assembling programs of



activities by emphasis area, forecasting fatality reductions, and accounting for overlaps among emphasis areas. Proven countermeasures should be used where available and evaluation of experimental programs should be conducted to determine efficacy. Resource allocation should be reviewed on an ongoing basis to ensure investments are aligned with the highest priority safety problems and that resources are being maximized. Knowledge gained should feed back into future efforts to continually optimize safety plans and improve the accuracy of fatality reduction forecasts and target setting.

Ultimately, practitioners should develop safety targets using multiple data sources and analytical methods to check assumptions and provide a “reality check” in terms of both ambition and achievability. Over time as the knowledge base for proven countermeasures continues to grow, the practice of safety target setting will gain greater precision.

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