

Benefits

SafetyAnalyst goes beyond the tools currently available for highway safety management. In addition to improving procedures for functions already automated by some highway agencies, *SafetyAnalyst* will automate procedures that are now performed manually. The benefits of specific *SafetyAnalyst* capabilities are described below.

Network Screening

SafetyAnalyst will use new effectiveness measures and statistical methodologies to overcome the drawbacks of current systems. Agencies will now be able to conduct network screening analyses using numerous measures or indices of the potential for safety improvement, based on expected crash frequency or excess crash frequency and on assessment of the overrepresentation of specific crash types. Using state-of-the-art scientific techniques, this tool will enable agencies to identify sites where safety improvements have the greatest potential for safety benefits.

Diagnosis and Countermeasure Selection

Today, most highway agencies manually diagnose safety concerns at specific sites. *SafetyAnalyst* will automate these diagnostic processes and prepare a list of questions for office and field investigations. The answers to these questions will assist in drawing up suggestions for countermeasures. Countermeasures will be selected by the user (not the software), but *SafetyAnalyst* will suggest appropriate countermeasures for consideration by the user at any given site or in any given situation. The automation of these procedures will benefit agencies by assuring comprehensive diagnoses and countermeasure selection. Checklists and countermeasure suggestions will help less-experienced engineers consider difficult decisions on a sound scientific basis. Although *SafetyAnalyst* will include a basic collision diagramming capability, the diagnosis tool also will be able to interface with some commercially available collision diagramming software packages, including collision diagramming software with interactive capabilities.

Economic Appraisal and Priority Ranking

SafetyAnalyst will permit users to conduct economic appraisals of the costs and safety benefits of any selected countermeasures. Users can then compare the results with alternative countermeasures and develop improvement priorities across sites. *SafetyAnalyst* will provide users with a consistent approach to economic appraisals. This approach not only complies with the requirements of FHWA's Highway Safety Improvement Program, but also is sufficiently flexible so that users can adapt it to meet their own needs and comply with their policies. In addition, an optimization program will enable agencies to select improvements by maximizing benefits within a limited budget and ensure that they get the most safety value for their money.

Evaluation of Implemented Improvements

SafetyAnalyst will enable users to evaluate safety improvements after their implementation. Most highway agencies do not conduct such evaluations, and the few that are conducted are not well designed. This tool will facilitate quality evaluations, helping agencies to document the benefits of their improvement program and better assess the effectiveness of countermeasures for use in future improvements.

Participants

SafetyAnalyst is being developed through a cooperative effort between FHWA and 27 State highway agencies.

Arizona	Kentucky	Nevada
California	Louisiana	New Hampshire
Colorado	Maryland	New York
Florida	Massachusetts	North Carolina
Georgia	Michigan	Ohio
Illinois	Minnesota	Vermont
Indiana	Mississippi	Virginia
Iowa	Missouri	Washington
Kansas	Montana	Wisconsin

Participating Local Agencies

- Delaware Valley Regional Planning Commission
- North Jersey Transportation Planning Authority
- Traffic Improvement Association, Oakland County, MI

SafetyAnalyst



Development Activities

Planning for *SafetyAnalyst* development began in April 2001. The schedule of *SafetyAnalyst* development activities follows:

•2006•

Complete interim software development for Diagnosis, Countermeasure Selection, Economic Appraisal, and Priority Ranking Tools and complete beta testing of software for interim tools.

•2007•

Assess user experience with interim tools and develop and test software for final tools.

•2008•

Release final tools to participating State highway agencies for testing and evaluation.

•2009•

Establish mechanism for long-term distribution, maintenance, technical support, and enhancement of *SafetyAnalyst*.

Contact FHWA for more information about *SafetyAnalyst*:

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U.S. Department of Transportation
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Vision

SafetyAnalyst will provide state-of-the-art analytical tools for use in the decision-making process to help highway agencies identify and manage a systemwide program of site-specific improvements to cost-effectively enhance highway safety.



Overview



SafetyAnalyst is a set of software tools under development to help State and local highway agencies advance their programming of site-specific safety improvements. *SafetyAnalyst* will incorporate state-of-the-art approaches to safety management to guide the decisionmaking process on safety improvement needs and a systemwide program of improvement projects. *SafetyAnalyst* also will include economic analysis tools to ensure that transportation agencies get the greatest possible benefit from each dollar committed to improving highway safety.

Scope

SafetyAnalyst will address site-specific highway safety improvements involving physical modifications of the highway system. The software is not intended for general driver or vehicle programs developed to improve systemwide highway safety. *SafetyAnalyst* will be able to identify crash patterns at specific locations and determine whether crashes occur more frequently than expected. In addition, *SafetyAnalyst* will be able to review the frequency and percentage of particular crash types either throughout the entire highway system or for predetermined portions of the system, such as particular roadway segments or intersections. Highway agencies also will be able to use *SafetyAnalyst* to investigate the potential benefits of specific engineering improvements at specific sites.



Need

According to a recent survey of State highway agencies, the best way to increase the effectiveness of safety management is to improve the data analysis process. State and local highway agencies need *SafetyAnalyst* software tools to help update their existing automated capabilities, such as network screening to identify potential improvement sites that are based on out-of-date analytical techniques, and to automate capabilities that currently are performed manually, such as diagnosis of potential safety concerns and selection of appropriate countermeasures.



Tools

The *SafetyAnalyst* toolkit will include six software programs to help transportation agencies analyze the safety performance of specific sites, suggest appropriate countermeasures, quantify their expected benefits, and evaluate their effectiveness.

Network Screening Tool

The network screening tool will help users identify potential sites for safety improvements. Algorithms will identify:

- Sites with higher-than-expected crash frequencies that may indicate the existence of safety problems that are correctable in a cost-effective manner.
- Sites where crash frequencies are not higher than expected but that experience enough crashes to warrant cost-effective measures to improve highway safety.

The network screening tool also will identify sites with a high number of severe crashes and high levels of specific crash or collision types and identify extended roadway segments as potential sites for corridor- or route-based improvements.

Diagnosis Tool

This tool will help users understand the nature of problems at specific sites. The tool will generate collision diagrams to identify the predominant collision patterns and assess whether these patterns represent higher-than-expected frequencies of particular collision types. The tool also will guide users through office and field investigations to identify safety concerns at the specified location. The diagnosis tool will help users consider both traditional engineering criteria and human factors needs. The result will be the identification of existing crash patterns and a list of safety concerns that could potentially be mitigated by countermeasures. The diagnosis tool also will include a basic collision diagramming capability and will be able to interface with select commercially available collision diagramming software packages, including collision diagramming software with interactive capabilities.

Countermeasure Selection Tool

The countermeasure selection tool will focus on the selection of appropriate countermeasures to mitigate the crash patterns identified by the diagnosis tool. The tool will help users identify candidate improvements that address the safety concerns at a particular site. In addition, the tool will recommend potential countermeasures pertinent to each diagnosis, and the user will be informed of which countermeasures under consideration have known and reliable effectiveness measures, such as accident modification factors (AMFs). Users will be able to tentatively select specific countermeasures (or combinations of countermeasures) for potential implementation, subject to the results of an economic analysis.

Economic Appraisal Tool

This tool will perform three types of economic appraisals of proposed countermeasures: cost-effectiveness, benefit-cost ratio, and net present value analyses. To estimate the safety effectiveness of potential countermeasures, the tool uses data on crash frequency and severity and crash patterns along with AMFs. Analyses will include consideration of the service life of each countermeasure and the time value of money. The tool also will be able to conduct evaluations that are consistent with the requirements of the Federal Highway Administration's (FHWA) Highway Safety Improvement Program so results can be implemented using Federal funds.

Priority Ranking Tool

This tool uses the results of the economic appraisals to rank sites and proposed improvement projects. To develop the ranking, the tool compares the benefits and costs of countermeasures across sites, and then ranks projects based on their cost effectiveness, benefit-cost ratio, or net present value. The rankings enable users to decide whether to fund projects based on their priority measure. In addition, users will be able to use an optimization tool to select a set of countermeasures that maximizes the safety benefits of an improvement program within a specific budget.

Evaluation Tool

This tool will enable users to conduct before and after evaluations of safety improvement projects. These evaluations are important to increase knowledge of project effectiveness and to refine the safety measures available in *SafetyAnalyst*. The primary statistical approach to before and after evaluation will be the Empirical Bayes technique.