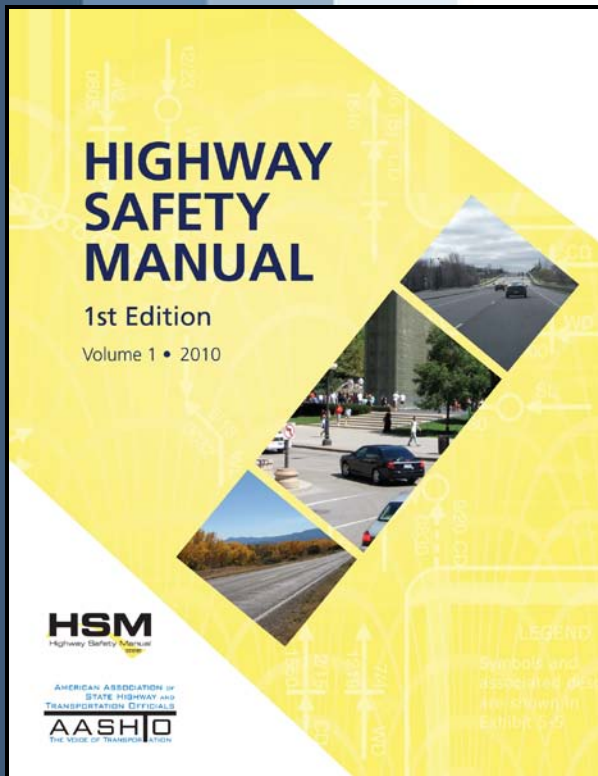


Introduction to the HSM



Martin Bretherton
HNTB Corporation

Dr. Steven Jones
Univ. of Alabama

Experience with HSM

Martin Bretherton

- NCHRP G17-26, Panel Chair, Urban & Suburban Arterials, 2002-2008
- NCHRP G17-29, Panel Member, Rural Multilane Highways, 2004-2008
- NCHRP G17-36, Panel Member, Writing HSM, 2005-2009
- NCHRP G17-38, Panel Member, Training for HSM, 2007-2010

Introduction to the HSM

Outline

- What is the HSM?
- Why should we use the HSM?

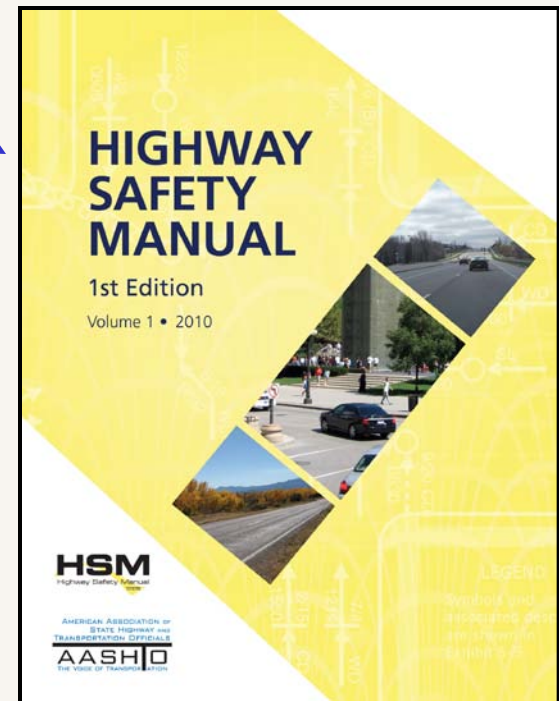
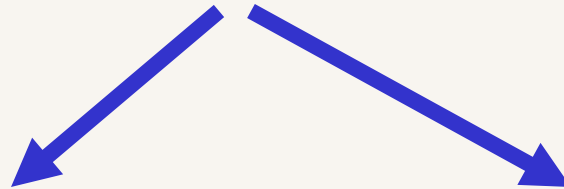
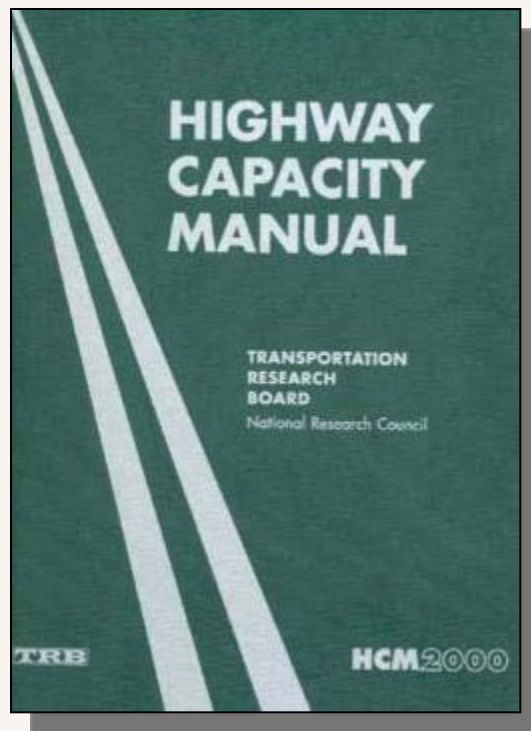
Is This Road “Safe” or “Unsafe”?



What does safety really mean?

New Highway Safety Manual of 2010

- ▶ Methodology is like that for assessing and assuring the adequacy of Capacity
- ▶ HSM allows the transportation professional to understand and quantify highway safety performance for informed and balanced decision making



“What Can HSM do For You?”

- ✓ Predict safety performance of geometric design features
- ✓ Calculate safety effects in terms of crashes
 - ✓ Forecast safety performance of intersections
- ✓ Help choose alternates based on measures of safety
 - ✓ Provide basis for a revised business model

“WOW !

What is the HSM?

An AASHTO Publication that...

- Provides information and **tools** to conduct quantitative safety analyses.
- Facilitates **explicit** consideration of safety throughout the project development process.

What is the HSM?

A compilation of:

- Methods for developing an **effective** roadway safety management program and evaluating its benefits.
- **Predictive** methods to estimate crash frequency and severity to support project level decision making.
- **Catalog** of crash modification factors for estimating the effect of a variety of geometric and operational treatments.

What is the HSM?

Akin to the HCM, but for safety...

1

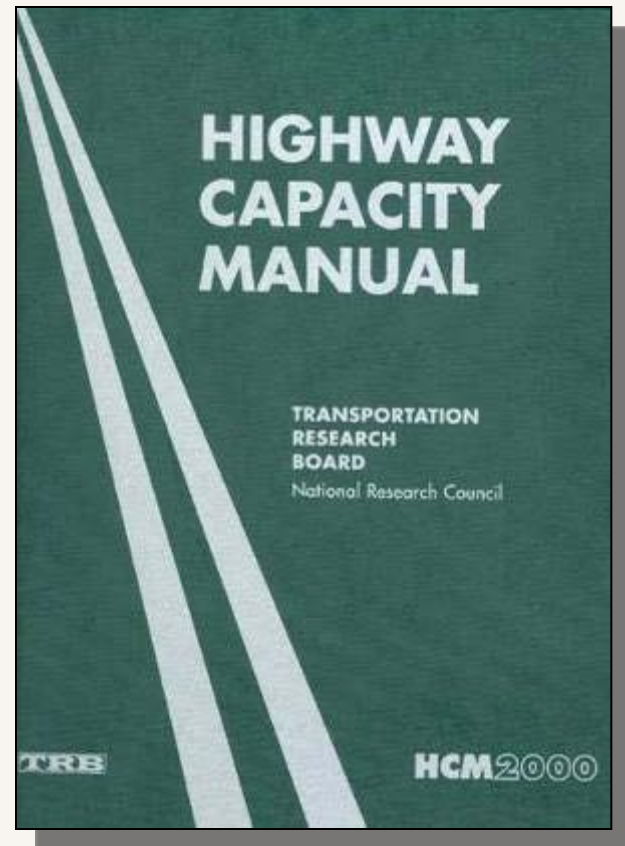
Definitive; represents quantitative 'state-of-the-art' information

2

Widely accepted within professional practice of transportation engineering

3

Science-based; updated regularly to reflect research



What is the HSM?

It's the product of:

- \$7 million, 10-year research program funded by NCHRP, AASHTO & FHWA
- Thousands of hours of effort in reviewing the research results:
 - TRB Task Force on Development of the HSM
 - AASHTO Joint Task Force on the HSM, with members from Safety, Design, and Traffic Engineering



RESEARCH PATH TO THE HSM V.1

NCHRP Project 17-18(04)

- Development of a HSM - Draft Table of Contents for the HSM.

NCHRP Project 17-25

- Crash Reduction Factors for Traffic Engineering and ITS Improvements

NCHRP Project 17-26

- Development of Models for Prediction of Expected Safety Performance for Urban and Suburban Arterials

NCHRP Project 17-27

- Prepare Parts I and II of the HSM

NCHRP Project 17-29

- Safety Prediction Models for Rural Multilane Highways for Use in the HSM

NCHRP Project 17-34

- Prepare Parts IV and V of the HSM

NCHRP Project 17-36

- Production of the First Edition of the HSM

NCHRP Project 17-37

- Pedestrian Predictive Crash Methodology for Urban and Suburban Arterials

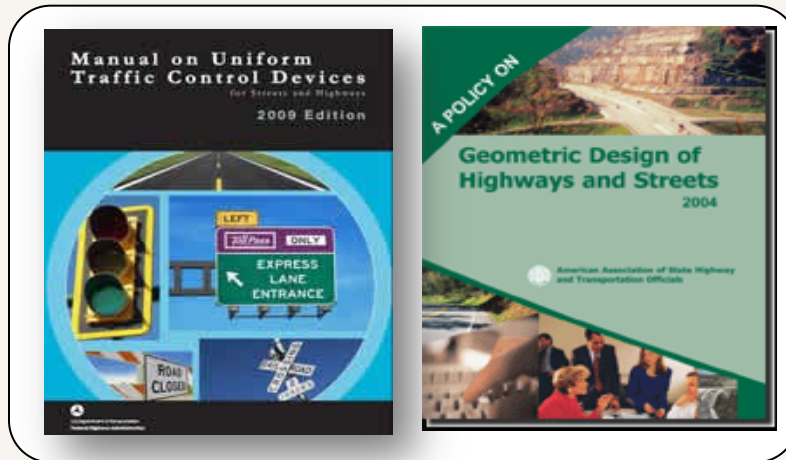
NCHRP Project 17-38

- HSM Implementation and Training Materials

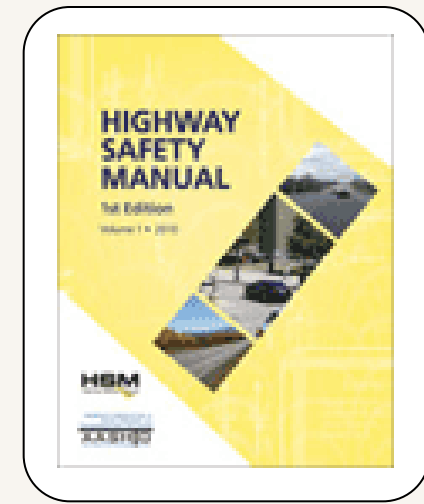
What is the HSM?

- ▶ **A set of tools** for Prediction of Crash Frequency and for Analysis of safety
- ▶ Provides a **synthesis** of validated highway safety research
- ▶ Provides analytical **tools** for predicting the impact of decisions on road safety

WHAT THE HSM IS NOT



VS



- **NO** requirements or mandates
- **NOT** a best practice document
- **NO** warrants or standards
- **DOES NOT** supersede other publications



The HSM does ***not*** establish a legal standard of care **nor** does it create a duty to the public.

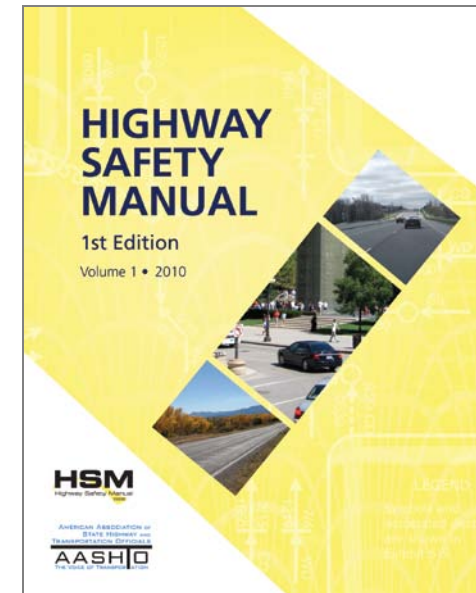
Legal Context:

HSM studies, reports, data, etc. would likely be protected from discovery and admission of evidence in a Federal or State court proceeding... Title 23

USC 409

New Highway Safety Manual of 2010

Contains Best Science & Research



- Synthesis of previous research
 - New research commissioned by AASHTO and FHWA

Why should we use the HSM?

- We need quantitative estimates of safety performance for many planning and project development **decisions**.
- More **reliable** estimates lead to more safety cost-effective decision making.
- The estimation methods in the HSM are based upon good **science/research** and improve upon much of current practice.

Why should we use the HSM?

Decisions requiring quantitative safety estimates:

- Identifying sites with the most **potential** for crash frequency or severity reduction
- **Identifying** crash patterns and treatments to address those patterns
- Conducting **economic** appraisals of projects
- **Evaluating** the crash reduction benefits of implemented treatments
- Estimating the **effects** of design decisions on crash frequency and severity

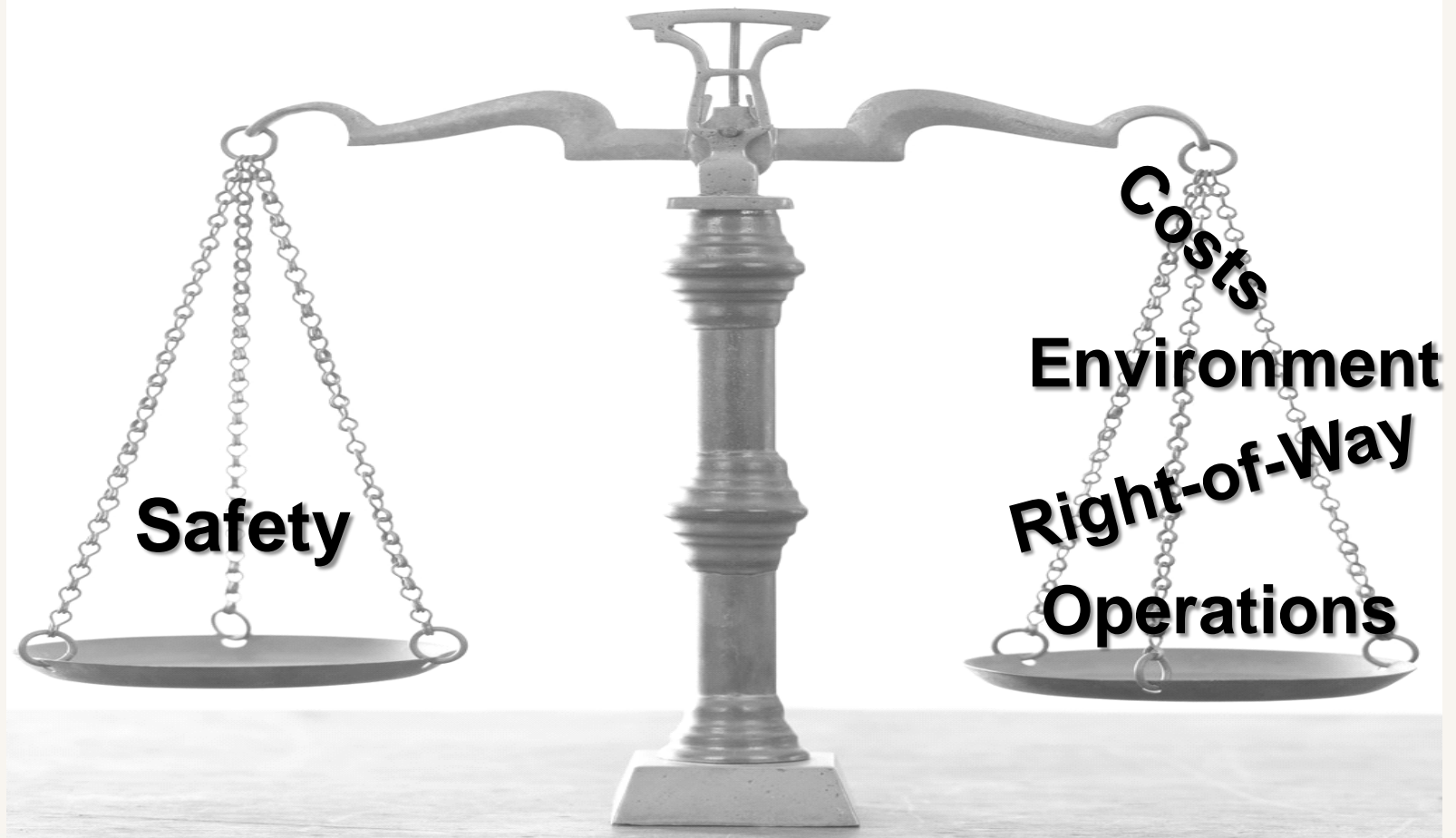
What Can the HSM Do for You?

- Predict Safety Performance of Geometric Design Features? **YES**
- Quantitatively calculate Safety Effects? **YES**
- Predict Safety Performance of Intersections? **YES**
- Better Decisions for Safety? **YES**

Definitely YES

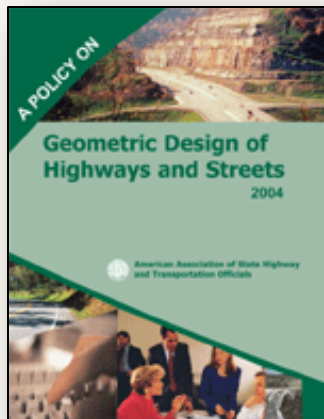
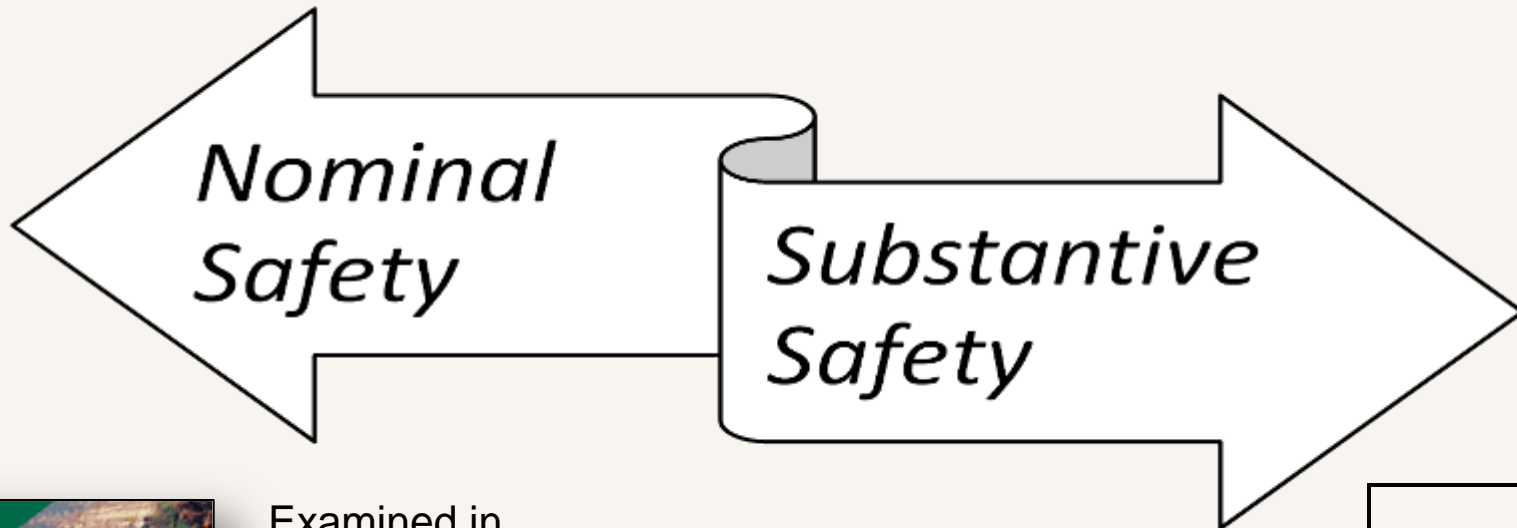
Why should we use the HSM?

Quantifying safety facilitates tradeoff analysis...



Why should we use the HSM?

HSM methods complement design guidelines...



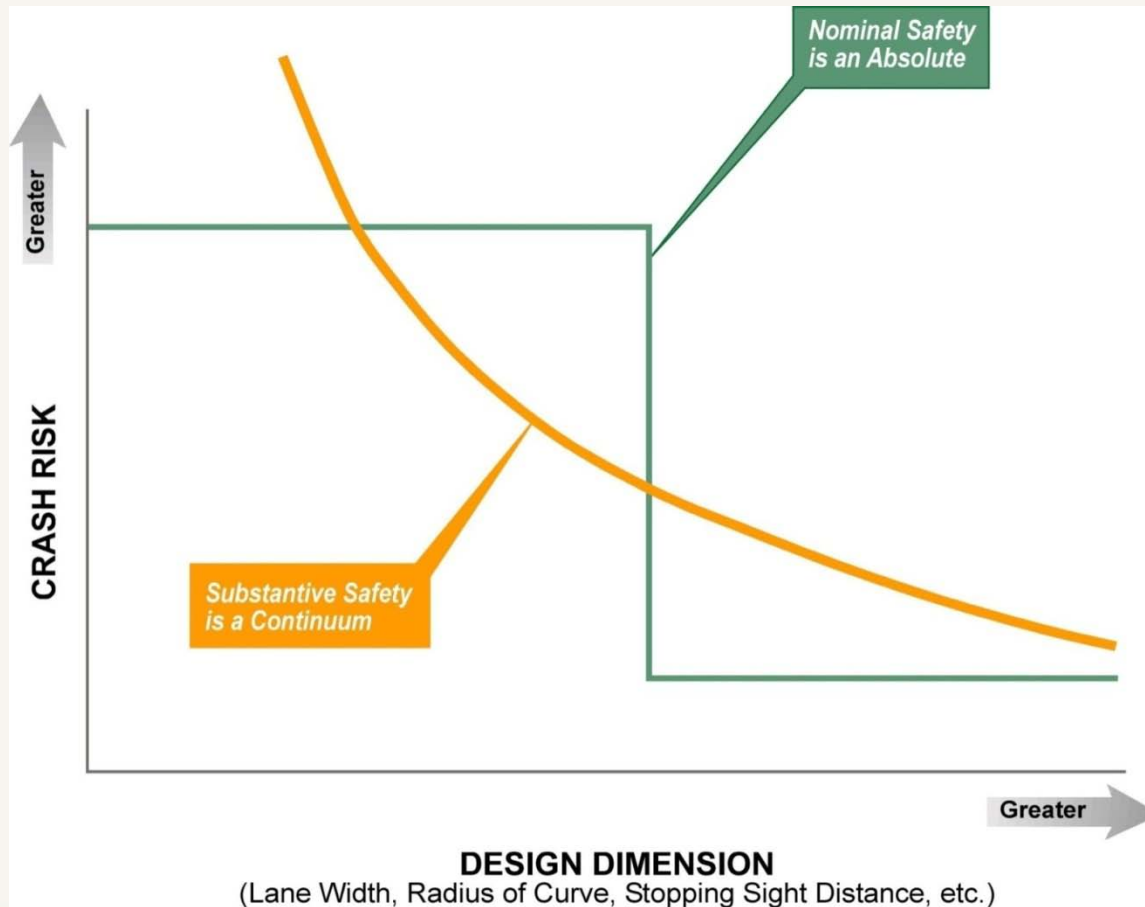
Examined in reference to compliance with standards, warrants, guidelines and sanctioned design procedures

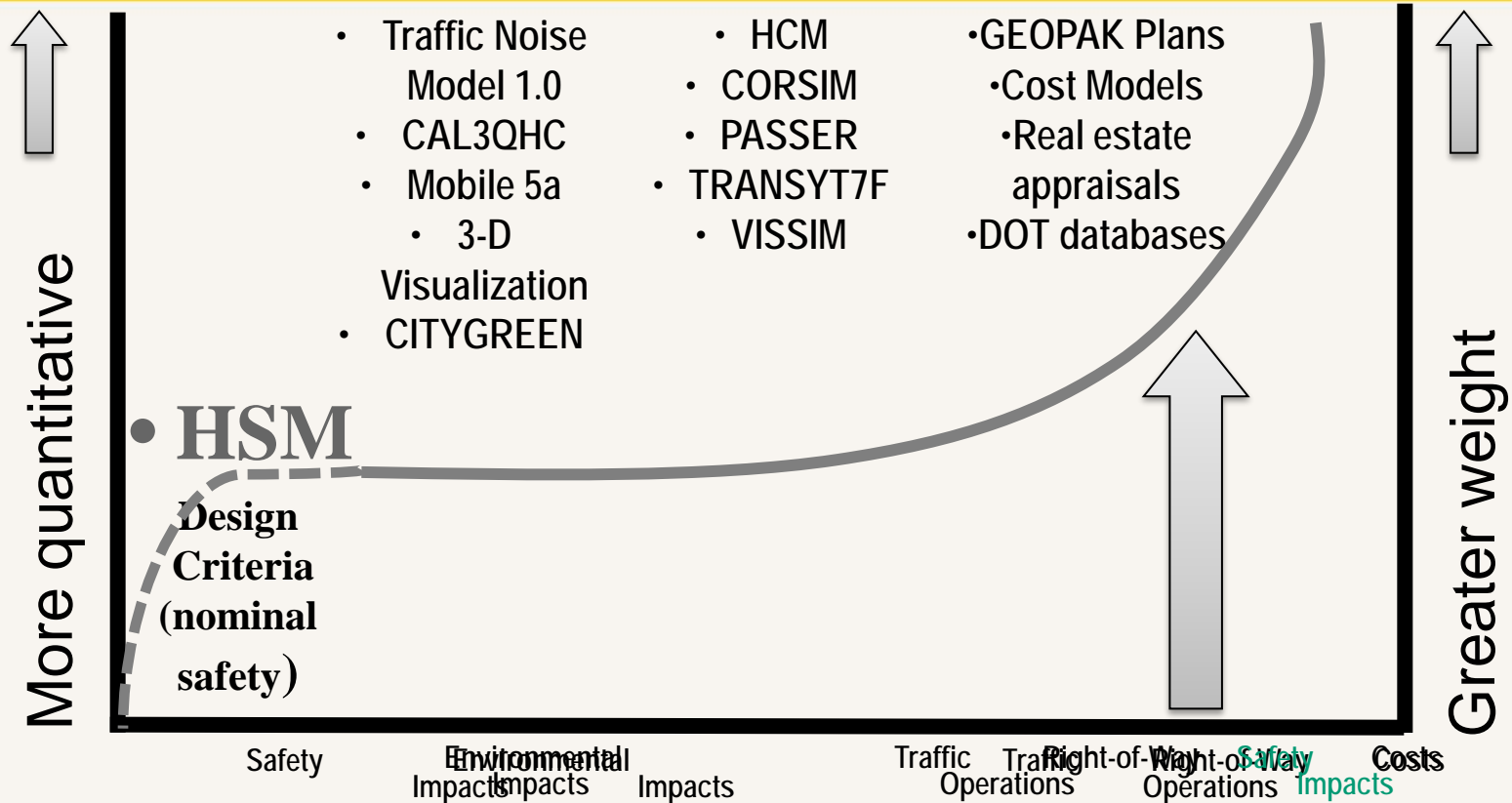
The expected or actual crash frequency and severity for a highway or roadway

**Ezra Hauer, ITE Traffic Safety Toolbox Introduction, 1999*

Why should we use the HSM?

HSM estimates the safety effects of design decisions...





***Safety** can now be integrated into the decision making processes*

Why should we use the HSM?

Better methods improve the “bottom line”



- Better safety analysis tools to support decision making

- More safety cost-effective investments

- More lives saved and injuries avoided per dollar invested

Why should we use the HSM?

HSM methods improve upon current practice:

- Safety is measured in terms of expected (long-term) average crash **frequency**
- Alternative ways to estimate:
 - Crash counts
 - Statistical (predictive) methods
 - Combination of crash counts and predictive methods (**Empirical Bayes** method)

Why should we use the HSM?

HSM predictive methods:

- Apply appropriate statistical methods to:
 - Model the variability in crash data
 - Compensate for **regression to the mean**
 - Account for changes in traffic volumes
- Include the following components:
 - Safety performance functions (**SPFs**)
 - Crash modification factors (**CMFs**)
 - State/local calibration factors
 - Empirical Bayes weightings

Why should we use the HSM?

In summary:

- We need quantitative estimates of safety performance for many planning and project development decisions.
- More reliable estimates lead to more safety cost-effective decision making.
- The estimation methods in the HSM are based upon good science/research and improve upon much of current practice.

SUBSTANTIVE SAFETY MAY VARY

Even when meet NOMINAL Geometric Requirements

At 20,000 ADT



26.3 crashes/mile

Existing Conditions



17.2 crashes/mile

Alternative 1



8.6 crashes/mile

Alternative 2



4.2 crashes/mile

Alternative 3

THE END

Beginning

***FHWA Resource Center
Safety and Design Team***

HSM Webinar Series

HSM Webinars Series on HSM:

1. HSM Introduction and Content Overview
2. HSM Applications to Two-Lane Rural Roads
3. HSM Applications to Urban/Suburban Intersections
4. Project Identification Using the HSM
5. HSM Applications to Two-Lane Rural Intersections
6. HSM Applications to Rural Multilane Highways
7. HSM Applications to Urban/Suburban Roads
8. HSM Applications to Pedestrians
9. HSM Applications to Rural Multilane Intersections
10. HSM Applications to Horizontal Curves
11. HSM Relationship to Roadway Departure Crashes
12. HSM Applications to the HSIP

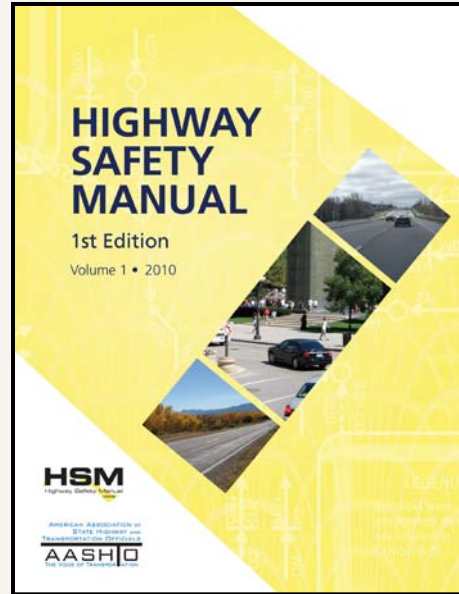
Current Training

Training Courses	HSM	Title and Availability
IHSDM	Part B	<i>Interactive Highway Safety Design Model</i> (NHI 380071) Currently available
SafetyAnalyst	Part C	<i>New Approaches to Safety Analysis</i> (NHI 380075) Currently available updated course under development <i>Using SafetyAnalyst</i>
HSM Webinars 2-hour introductory webinars		2-hour introductory overviews of HSM with background, manual contents, and application examples

Current training (cont'd)

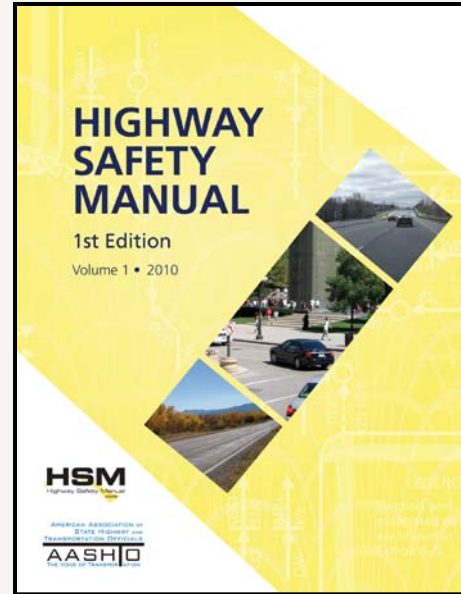
Courses	HSM	Title and Availability
NHI Courses 380070A (2 In rural rd) 380070B (multi In rd)	Part C	Safety Effects of Geometric Design
2-day HSM Overview	All Parts	NHI course developed from NCHRP 17-38 material available Summer 2010
Crash Modification Factors CMF	Part D	Online training

Highway Safety Manual



<http://www.highwaysafetymanual.org>

Highway Safety Manual



**Cost \$325 each from AASHTO
or \$275 each when purchased for training
class**

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