Overview National Efforts in Highway Safety – AASHTO/TRB HSM and Implementation

2012 South Dakota Transportation Safety Conference

John Nitzel, Principal Traffic & Safety Engineer
CH2M HILL
Albuquerque, New Mexico

Agenda

- Where is SD with traffic safety?
- What is the HSM?
- Safety Basics
- Why do we need the HSM?
- Status of HSM Implementation,concepts that are being considered by DOTs
- Next Steps

Pop Quiz

How many traffic fatalities occurred on South Dakota roads in 2011?

a) 148

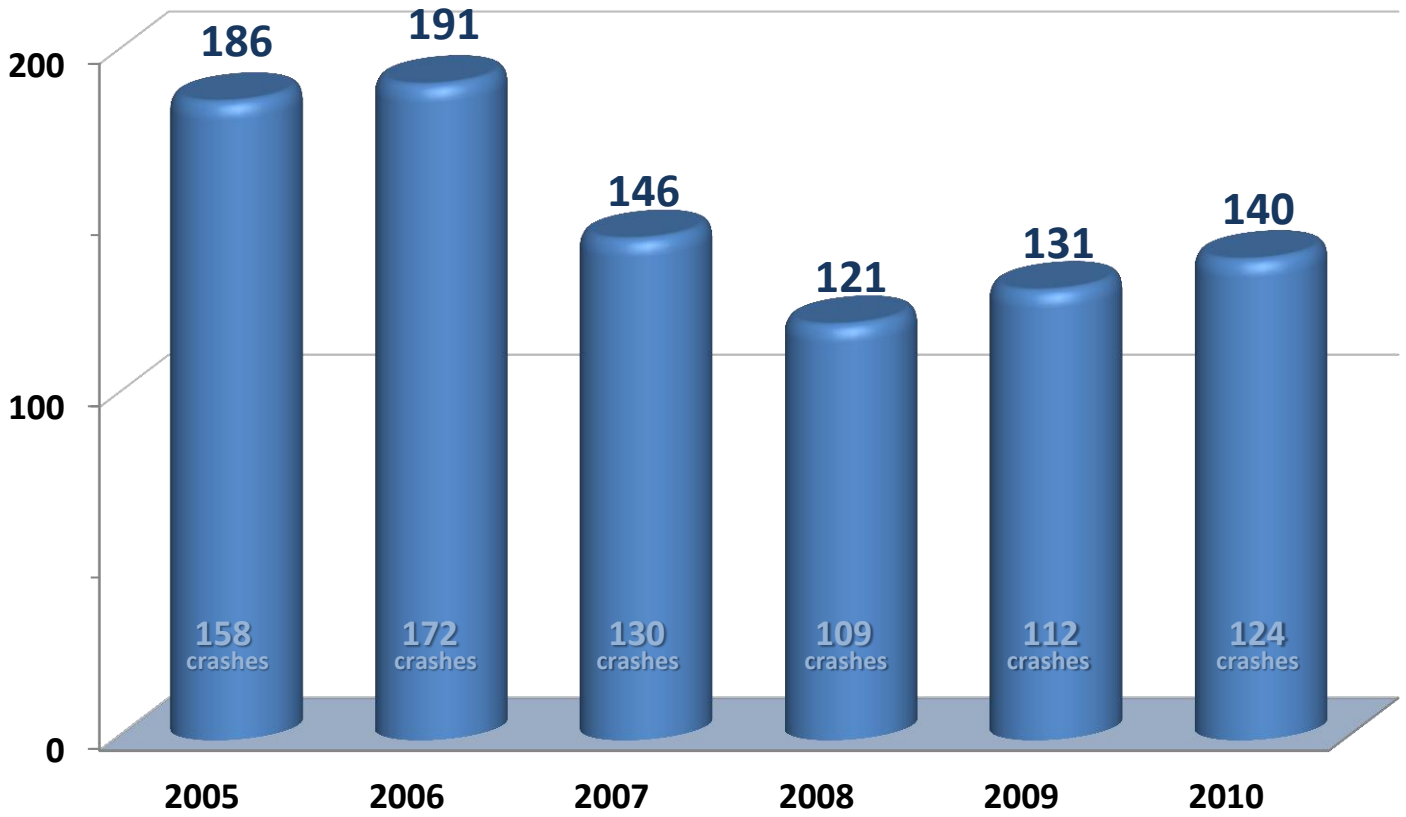
b) 93

c) 45

d) 110

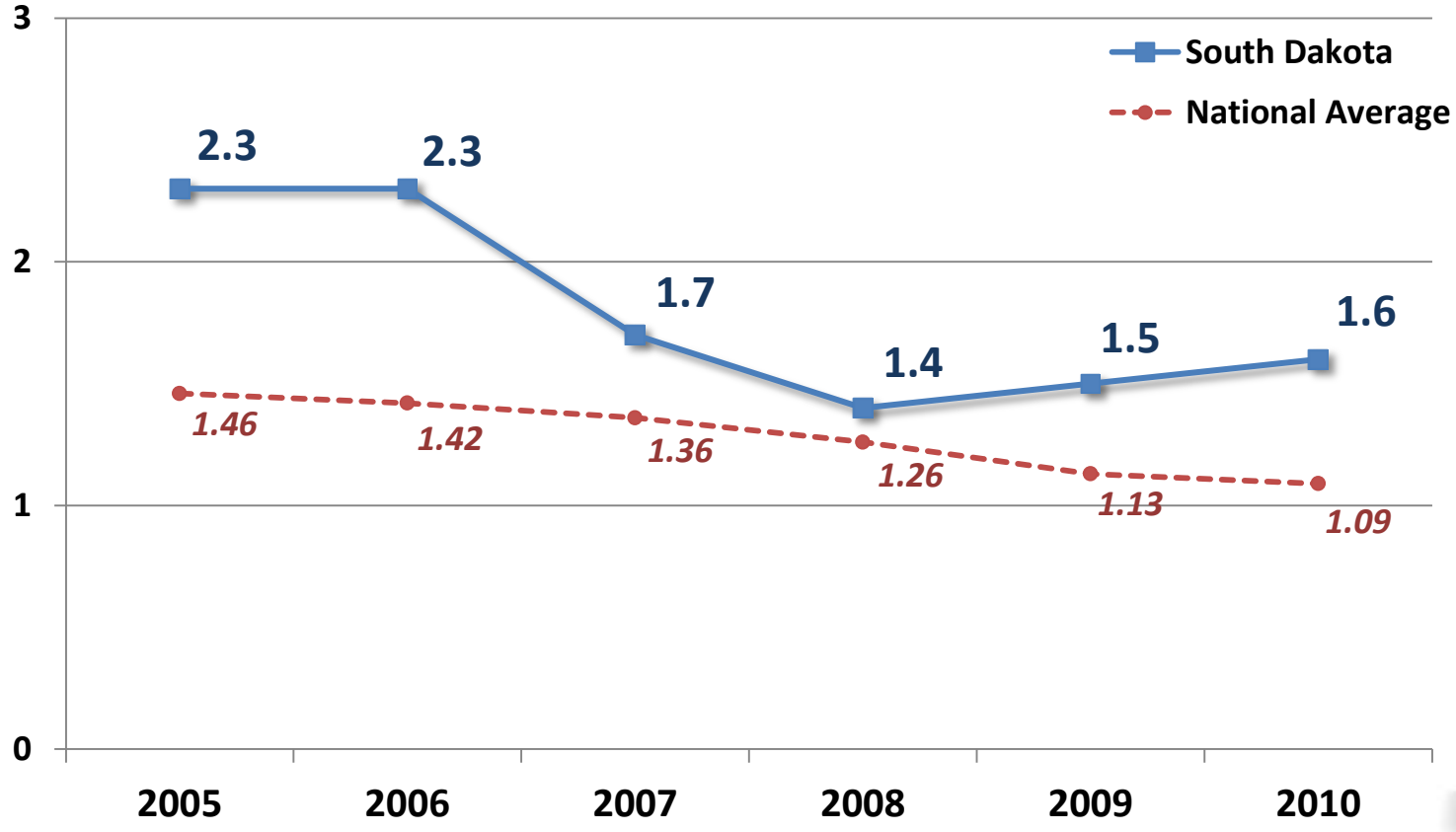
e) 225

South Dakota Traffic Fatalities



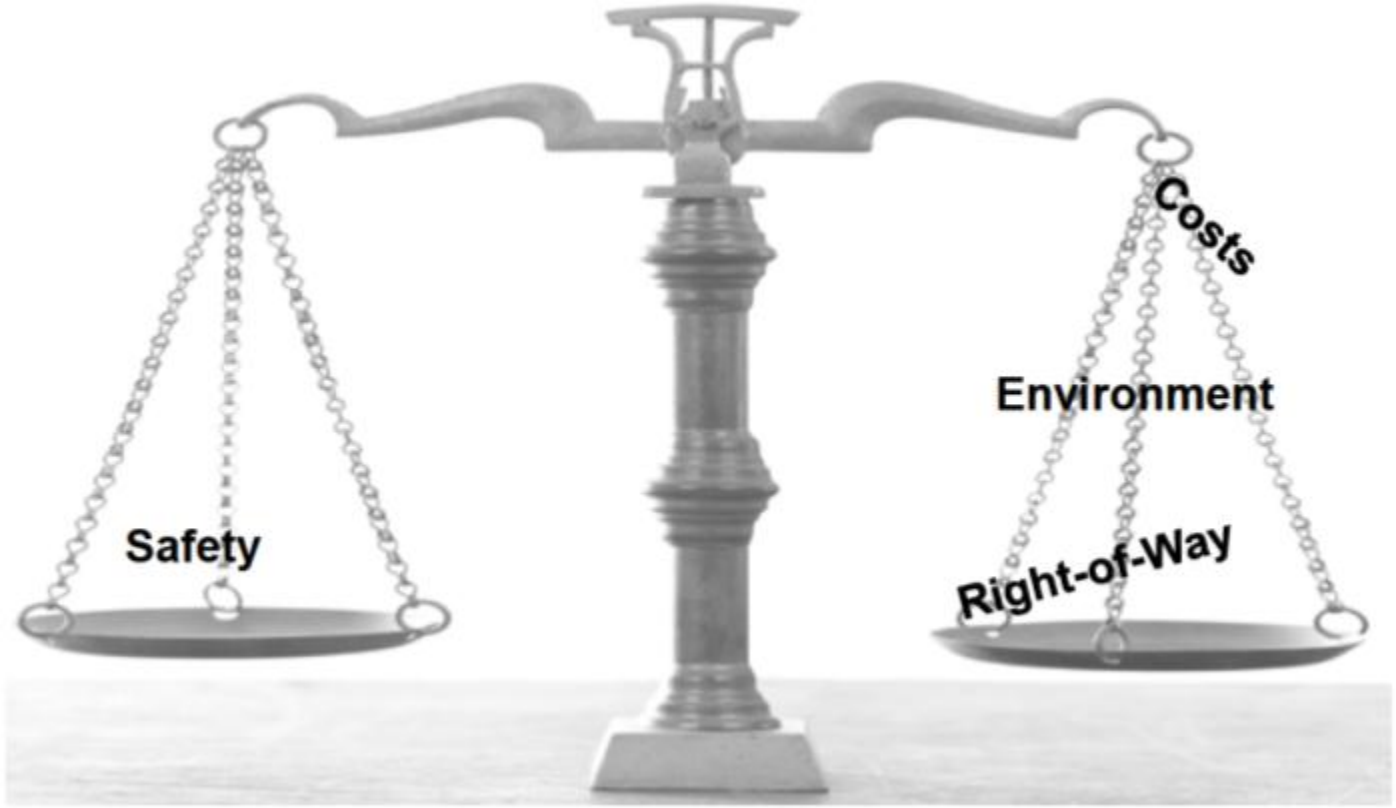
South Dakota Fatality Crash Rate

(per 100MVMT)



The overall declining fatality rate from 2005 to 2008 is good news, but it is still above the National Average. Also the rate for SD has recently been increasing.

Do You Ever Find Yourself Trading Safety Off against Something Else?



What do you do?

The Two Dimensions of Highway Safety

Nominal Safety

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

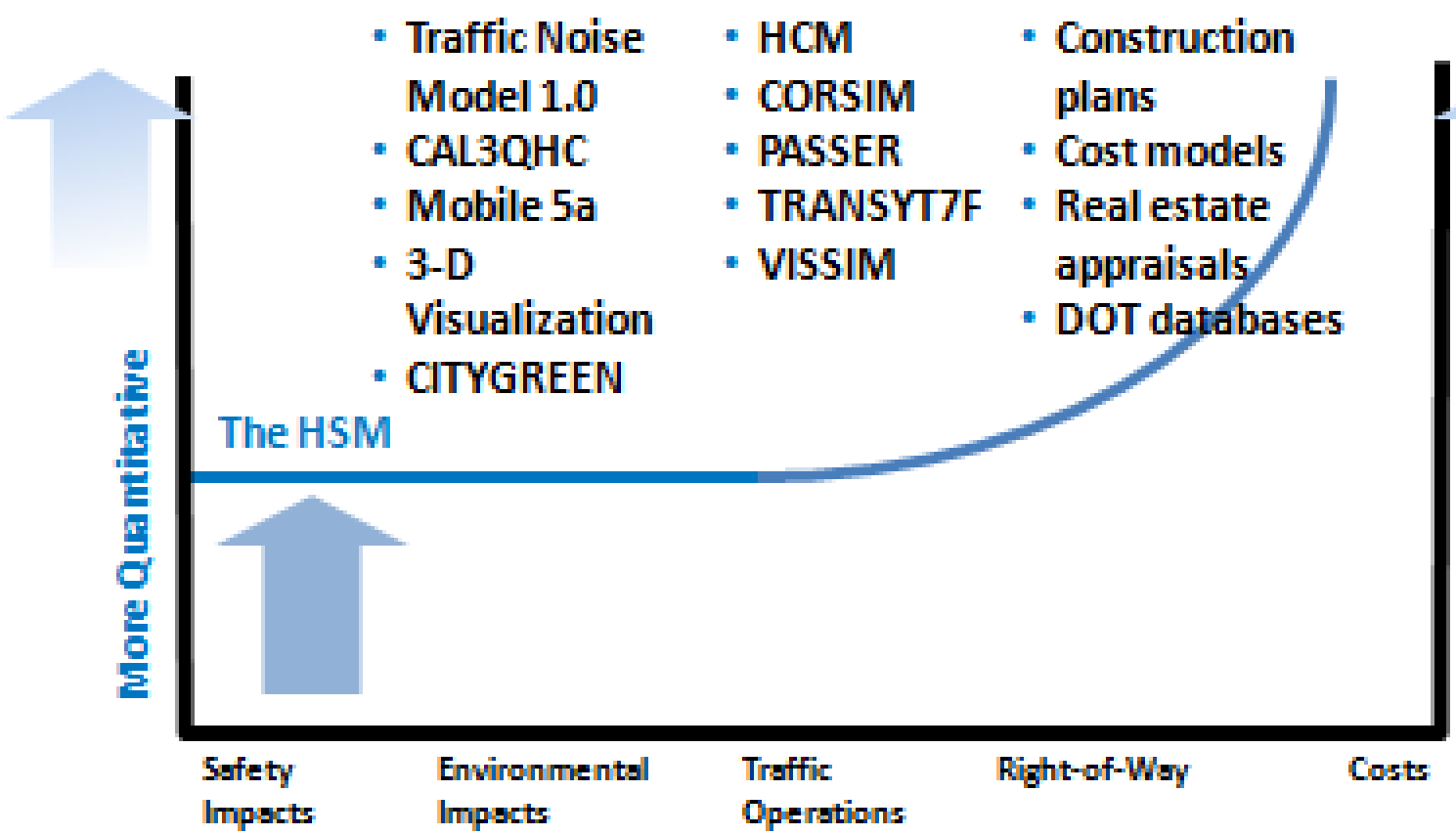
Substantive Safety

HSM
Highway Safety Manual
AASHTO

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

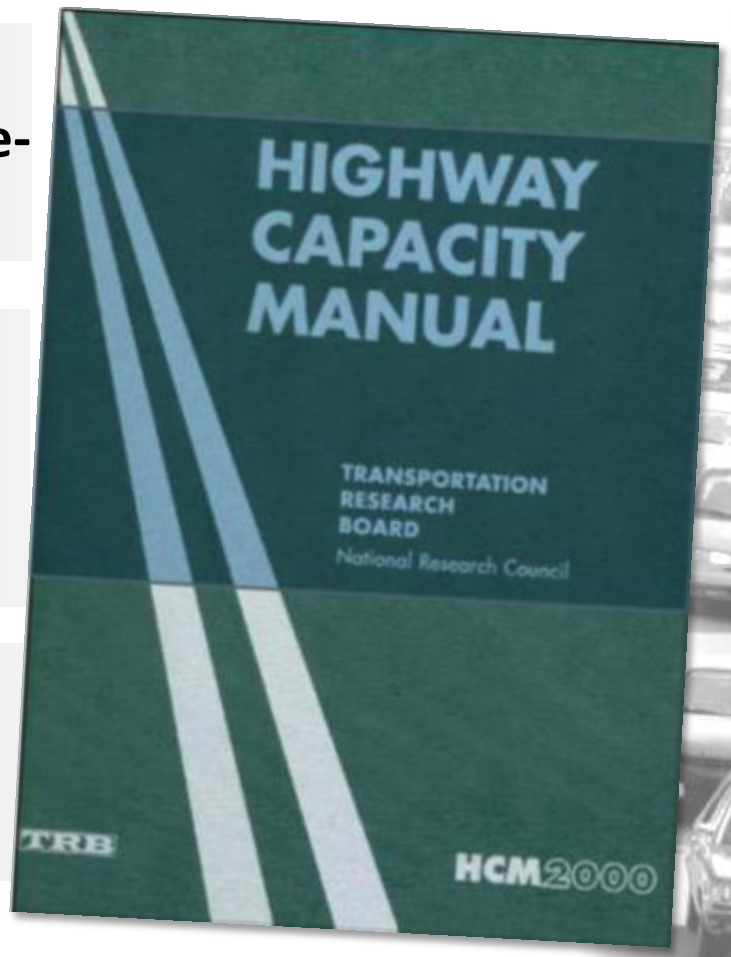
– Ezra Hauer, ITE Traffic Safety Toolbox Introduction, 1999

We're Interested in Many Impacts to Make Project Decisions – What about Substantive Safety?



The Vision of the HSM – A Document Akin to the HCM

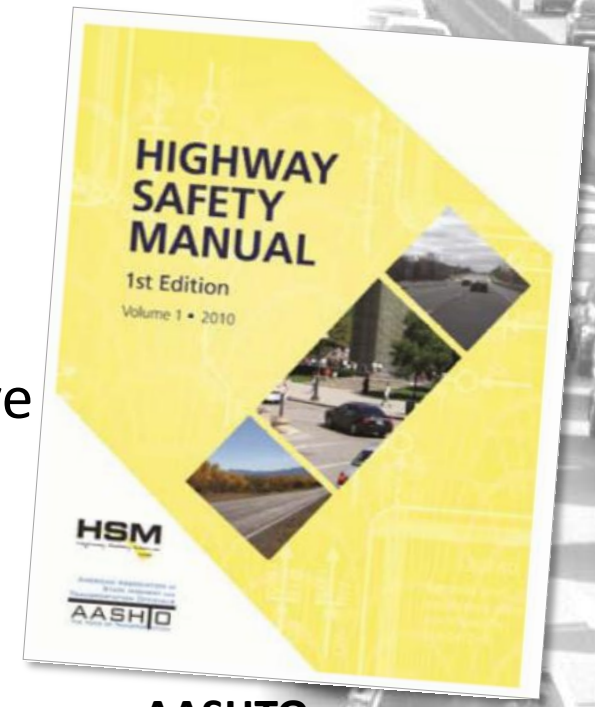
1. Definitive; represents quantitative "state-of-the-art" information
2. Widely accepted within professional practice of transportation engineering
3. Science-based; updated regularly to reflect research



What is This About?

Understanding and applying the HSM is our best opportunity to reduce fatalities, injuries and crashes

- Significant improvement in safety science
  - More rigorous methods, more data…
- Quantifies safety…
  - Provides safety $ estimates for alternative designs during planning and design…
  - Traditional safety studies…
  - Much more…



AASHTO
Highway Safety Manual (HSM)

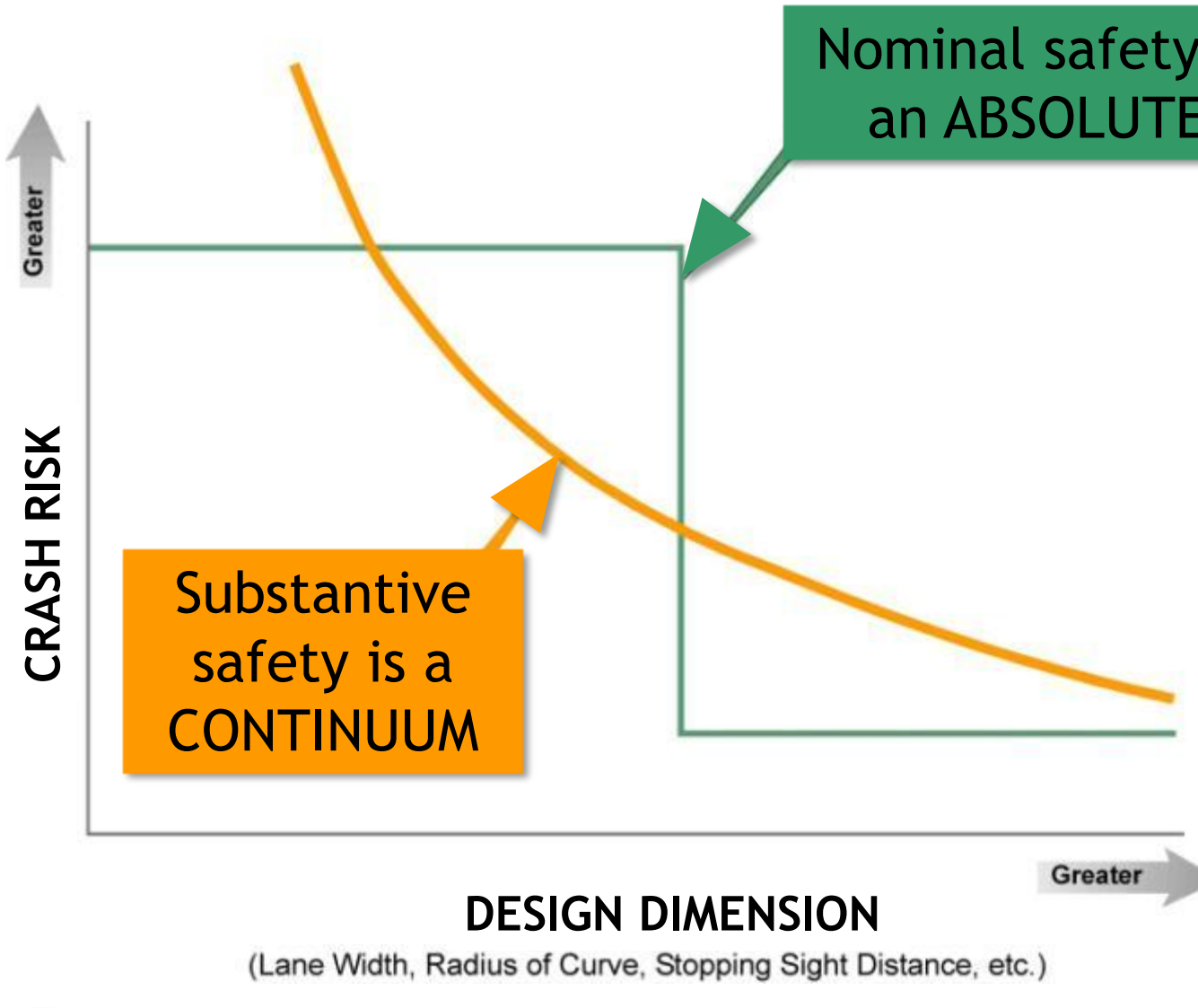
Significant Effort and Professional Support Produced the HSM

- Task Force (now TRB Committee) sponsored by seven TRB committees
- Thousands of hours of volunteer effort
- Multi-million dollar, multi-year research program funded by NCHRP, AASHTO, and FHWA

Incorporating Safety in Project Development Decision Making

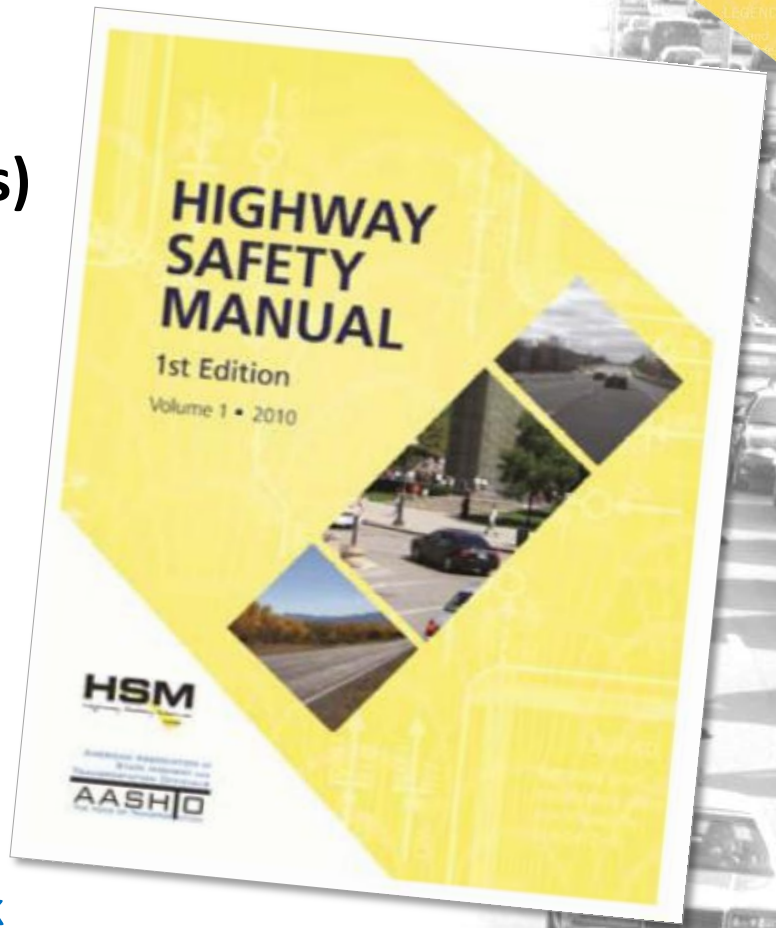
- **How did you account for safety ("pre-HSM")?**
  - "Our design standards tell us what to do."
  - "I don't because I have no basis for doing so."
  - "I don't know how."
  - "I do sometimes but frankly I don't trust the results."
  - "I don't because I don't believe you can predict safety."
  - "I don't because I don't have to and there are too many other things that are required of me."
  - "I don't because if I do, I will get sued if something goes wrong."
  - "That statistical stuff is too complicated for me."

The HSM Provides Insights to Designers



The HSM Brings 'Science-Based' Terms and Approaches to the Profession

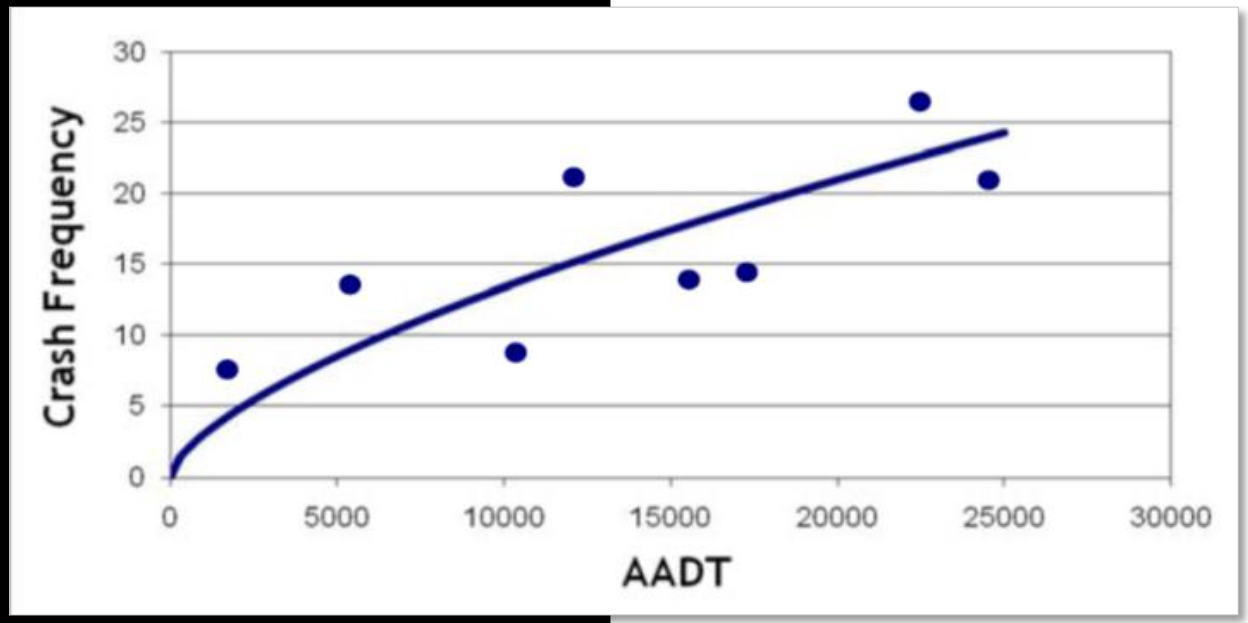
- "Crash frequency"(not rate)
- Safety Performance Functions (SPFs)
- Crash Modification Factors (CMFs)
- Regression to the Mean (RTM)
- Empirical Bayes (EB) procedures
- "Negative Binomial Distributions"
- KABCO (crash severity scale)
- "Standard error"
- Other thrilling new terms



These terms make a big difference in we look at safety

Safety Performance Function

Mathematical model that estimates the expected average crash frequency for a base condition



Crash Modification Factor

A factor or function derived from research that describes the change in expected crash frequency with a change in condition

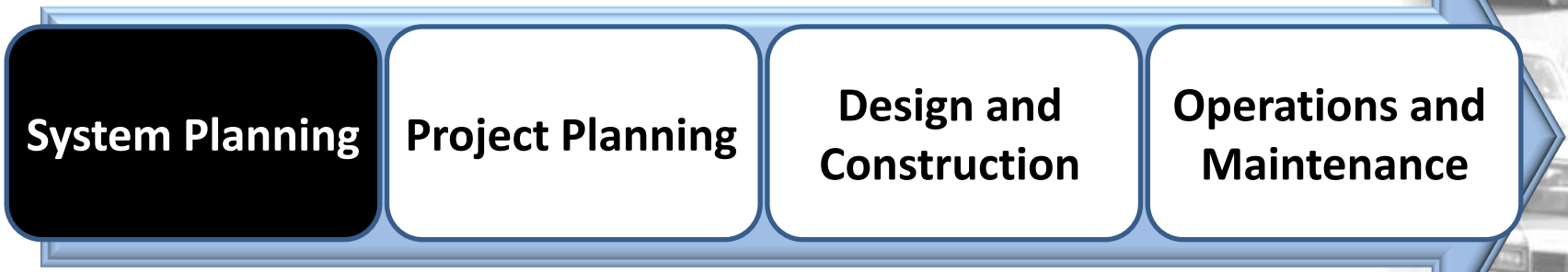
$$CMF = \frac{\text{Expected average crash frequency with condition ' b'}}{\text{Expected average crash frequency with condition ' a'}}$$

What is Your Job?
How Important is Safety in Your Work?

- System planning
- Program administration
- Policy development
- Project development
- Planning
- Design
- Construction
- Operations and maintenance
- Public affairs
- Interagency coordination

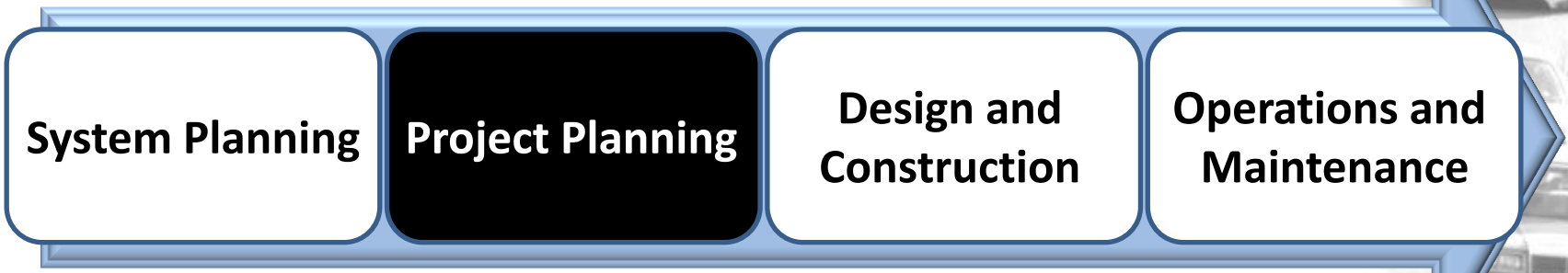
System Planning and Programming

- Assess system needs and identify projects/ studies
- Program projects
- Key aspect — project development
- Evaluate programs system-wide safety effects



Project Development – Planning

- Define problem(s)/assist scoping
- Identify potential solutions
- Evaluate alternatives and expected quantitative safety effects
- Identify preferred alternative



Legal Context

The HSM was reviewed by:

- AASHTO Subcommittee on Legal Affairs
- TRB Committee on Tort Liability and Risk Management
- HSM Task Force

Protected under Federal Law 23 USC 409

The Value of the HSM to those of us in the United States

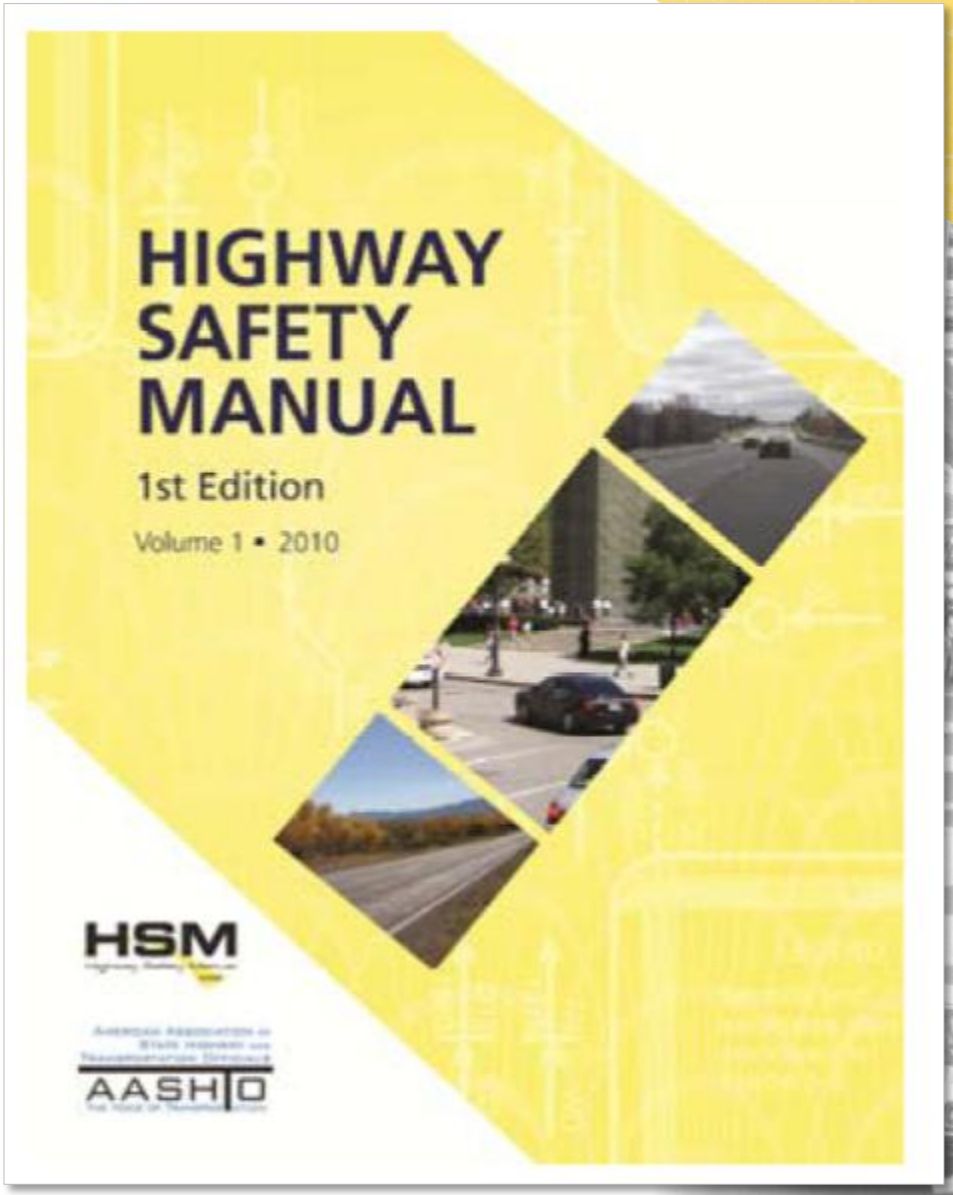
- **Provides a proven and vetted science-based approach to quantifying the safety effects of decisions we make and actions we contemplate**
- **Provides a common knowledge base, language and basis for reasoned judgments about safety**
- **Allows incorporation of safety to the same level of importance as other factors**

We don't have to use it (no one will force us); but if we choose not to learn and apply it…

…How will we be able to say "safety is a top priority"?

HSM Implementation

…an active and ongoing process



Potential Considerations of an HSM Implementation Plan

- Plan should be clear in concept and straightforward
- Respect needs, resources, organization, and timing
- Learn from other experiences of states
- Use national best practices but adapt to State context
- Encourage gradual and practical changes
- Data issues important
- Consider carefully other agencies/safety partners

“Knowing is not enough;
we must apply.”

- Leonardo da Vinci

Sample Support Materials

- **HSM Overview PowerPoint**
- **Obtain the HSM**
  - www.highwaysafetymanual.org
  - safety.fhwa.dot.gov/hsm
  - HSM Spreadsheet Tools
- **SafetyAnalyst**
  - www.safetyanalyst.org
- **CMF Clearinghouse**
  - www.cmfclearinghouse.org
- **Interactive Highway Safety Design Model (IHSDM)**
  - www.ihsdm.org
- **Lessons learned from Lead States Initiative (NCHRP 17-50) and other FHWA/TRB efforts**

Increase Understanding of HSM

- **Meet with Executive team members**
  - Director, High-level managers, etc.
- **Meet with Counsel's Office**
- **Meet with Division Directors**
- **Meet with District Engineers**
- **Present at meetings when opportunity arises**
  - Design
  - Traffic Engineers' meeting

Integrate into Process – Policy Guidance

- **Safety assessments of existing facilities**
  - Determine need for countermeasures
  - Predict performance
  - Select & evaluate optimal countermeasures
  - Value Engineering
- **Project Development**
  - Project selection
  - Design alternatives
  - Design exceptions
  - Planning-level analysis, project prioritization
- **HSIP Safety Projects**
- **Identify other needs**

Challenges

- **Communicating the need**
  - Help users to see it's not just "extra work"
- **Overcoming liability concerns**
- **Obtaining necessary roadway data**
  - Local data needs, crash data
- **Making HSM analysis routine**
  - Implement in phases?
    - Planning
    - HSIP projects
- **Use at the local level**

Future Efforts in Safety

- **New chapter – Freeways**
  - Final Draft under review by NCHRP and TRB Highway Safety Performance Committee, then goes to AASHTO.
  - Contents
    - ✓ Freeway Segments, 4-8 lanes, 10 lane urban
    - ✓ Speed change lanes – ramps (entrance & exits), weaving sections
    - ✓ Barrier evaluations
    - ✓ Multi-vehicle and single vehicle crash distributions
    - ✓ CMFs for various design elements
    - ✓ Severity distributions, KAB
    - ✓ Almost all ramp terminals noted
- **AASHTO and TRB -- Toward Zero Deaths Initiative**
- **Review of new CMFs for HSM and Clearinghouse**
- **Review of Safety Performance Functions**
- **Non constant CMFs, e.g. variable**
- **Added chapters and details -- 8 lane arterials, collectors, roundabouts, non-engineering CMFs**

We Suggest that Our Job Today as Transportation Professionals is to:

- Care about saving lives
- Know enough about the HSM to get it implemented and into use
- Be optimistic about it; look forward to applying it

You have another option

A single death is a tragedy, but a million is only a statistic.

Joseph Stalin

Questions and Discussion
Thank You!

John Nitzel, PE
CH2M HILL
4041 Jefferson Plaza
Albuquerque, NM
505.855.5235