

What Will Be New in HSM2?

2023 TESC
Darren Torbic, Ph.D.



Harwood Road Safety, LLC

Mr. Brelend C. Gowan

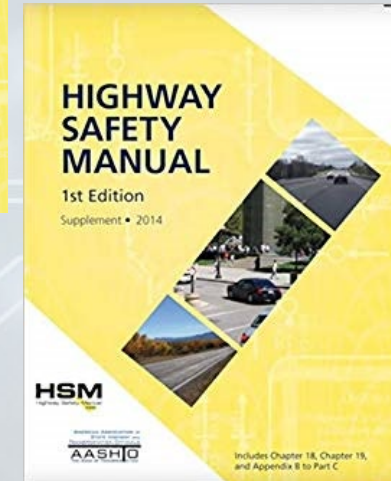
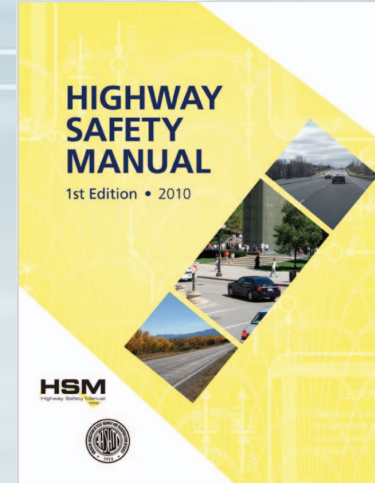
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Agenda

- Background of HSM
- Outline of HSM2
- What is new in HSM2
- Critical issues to consider when implementing HSM procedures

HSM Background

- Premier document for incorporating quantitative safety analysis into the highway transportation project development process
- First edition published in 2010 by AASHTO
 - Supplement published in 2014
- Provides information on
 - Human factors and safety fundamentals
 - Roadway safety management process
 - Predictive methods for safety improvement project development

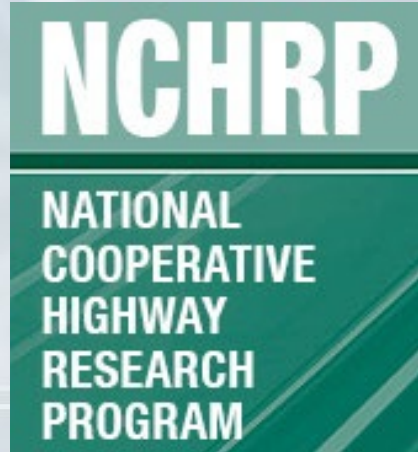


The HSM2 Will...

- Expand upon the methodologies in HSM1
- Incorporate new models and research completed since HSM1

New NCHRP Research

- 17-58: CPMs for Six-Lane and One-Way Urban and Suburban Arterials
- 17-62: Improved Prediction Models for Crash Types & Severities
- 17-63: Guidance for the Development and Application of CMFs
- 17-68: Intersection Crash Prediction Methods for the HSM
- 17-70: Development of Roundabout CPMs and Methods
- 17-72: Update of Crash Modification Factors
- 17-73: Systemic Pedestrian Safety Analyses
- 17-77: Guide for Quantitative Approaches to Systemic Safety Analysis
- 17-78: Understanding and Communicating Reliability of CPMs
- 17-81: Proposed Macro-Level Safety Planning Analysis Chapter for HSM
- 17-84: Pedestrian and Bicycle Safety Performance Functions for the HSM





Outline of HSM2

HSM2 (Ch.)	HSM1 (Ch.)	Chapter Title
		Preface
1	1	Introduction and Overview to the Highway Safety Manual
Part A- Fundamentals		
		Introduction to Part A
2	3	Road Safety Principles (Previously titled “Fundamentals”)
3	2	Human Factors
4		Pedestrians and Bicyclists (NEW)
Part B – Roadway Safety Management Process		
		Introduction to Part B
5		Areawide Approach to Roadway Safety Management (NEW)
6	4	Network Screening
7	5	Diagnosis
8	6	Countermeasure Selection
9	7	Economic Appraisal
10	8	Project Prioritization
11	9	Countermeasure Effectiveness Evaluation
12		Systemic Approach to Roadway Safety Management (NEW)
Part C – Predictive Methods		
		Introduction to Part C
13		General Concepts for Applying the Part C Predictive Methods (NEW)
14	10	Predictive Method for Rural Two-Lane, Two-Way Roads
15	11	Predictive Method for Rural Multilane Highways
16	12	Predictive Method for Urban and Suburban Arterials
17	18	Predictive Method for Directional Freeway Segments
18	19	Predictive Method for Ramps
Part D – Crash Modification Factors		
		Introduction to Part D
19		Selecting CMFs (NEW)
20		Applying CMFs (NEW)

Ch. 4 Pedestrians and Bicyclists

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HSM2 – Ch.5 Areawide Approach to Roadway Safety Management

- Chapter presents a method to predict areawide crash totals within geographical areas of various sizes, using a predictive method based on macro-level safety performance analysis
- An areawide evaluation can serve as a first step in the roadway safety management process
- Provides macro-level CPMs for two levels of analyses:
 - Regional analyses
 - Statewide analyses

HSM2 – Ch.12 Systemic Approach to Roadway Safety Management



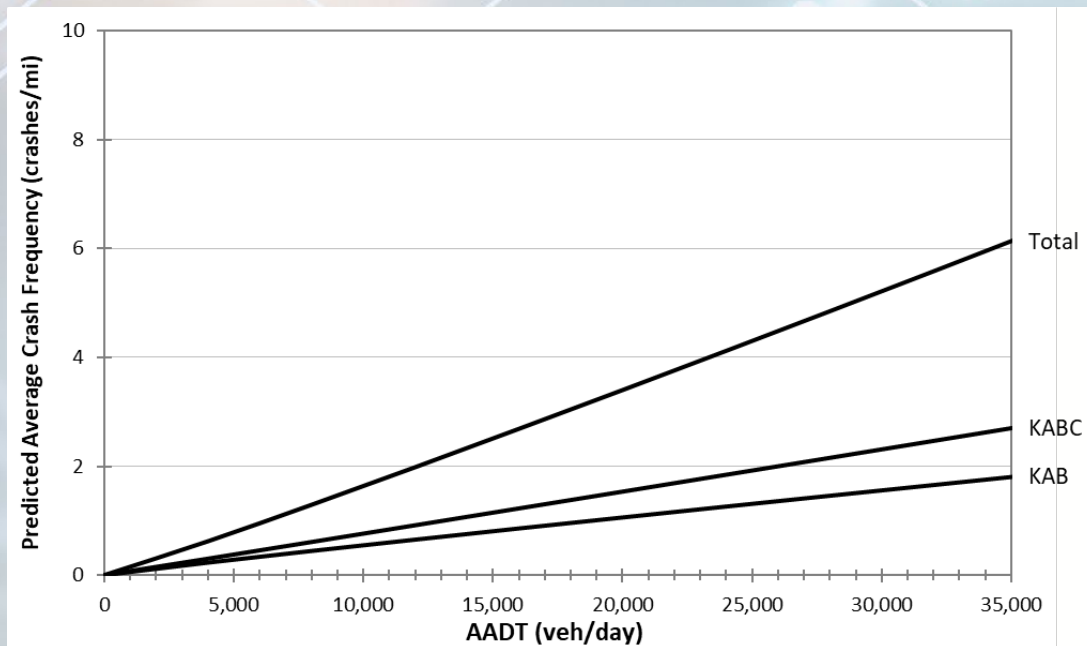
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Ch. 13 General Concepts for Applying the Part C Predictive Methods

- 13.1 Introduction
- 13.2 Overview of Predictive Methods
- 13.3 General Steps of Predictive Methods
- 13.4 General Concepts of Predictive Methods
- 13.5 Empirical Bayes Method
- 13.6 Calibration of Part C Predictive Models
- 13.7 Overview on Developing Jurisdiction-Specific SPFs for Use in Part C Predictive Methods
- 13.8 Methods for Estimating the Safety Effectiveness of a Proposed Project
- 13.9 Limitations of Part C Predictive Methods
- 13.10 Sample Problems

Calibration



KABCO Injury Severity Levels:

K—Fatal injury

A—Suspected serious injury

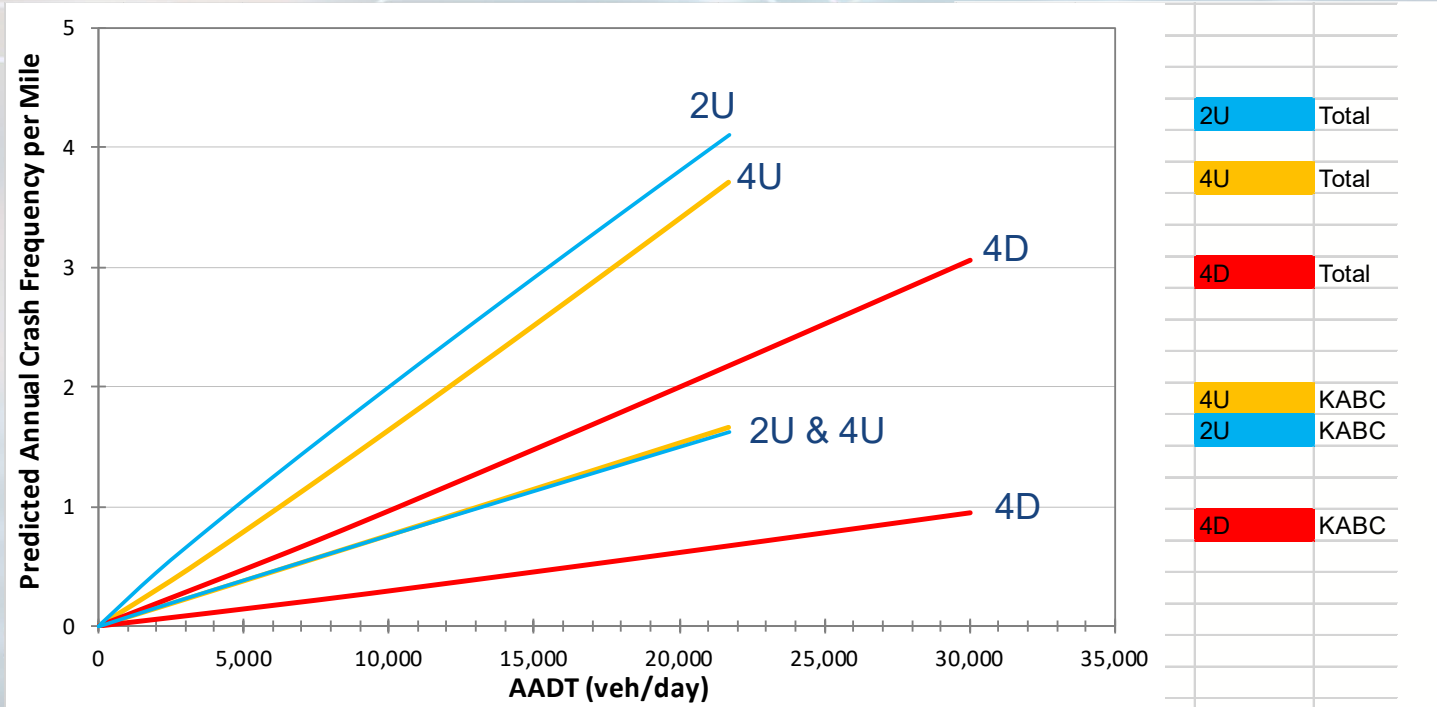
B—Suspected minor injury

C—Possible injury

O—No apparent injury

Comparison of Calibrated SPFs across Severity Levels for a Given Site Type

Calibration



Comparison of Calibrated SPFs across Site Types

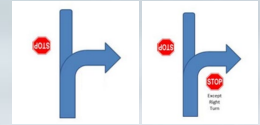
Ch 14. Predictive Method for Rural Two-Lane, Two-Way Roads (Facility Types)

Roadway segments:

- 2-lane undivided (2U)

Intersections:

- 3-leg minor-road stop control (3ST)
- **3-leg turning (3STT)**
- **3-leg signal control (3SG)**
- **3-leg roundabout with one circulating lane (3R1)**
- 4-leg minor-road stop control (4ST)
- **4-leg all-way stop control (4AST)**
- 4-leg signal control (4SG)
- **4-leg roundabout with one circulating lane (4R1)**



3-leg turning configuration (3STT)

Predictive Models for Pedestrian and Bicycle Collisions

Ch 15. Predictive Method for Rural Multilane Highways (Facility Types)



Roadway segments:

- 4-lane undivided (4U)
- 4-lane divided (4D)

Intersections:

- 3-leg minor-road stop control (3ST)
- **3-leg signal control (3SG)**
- **3-leg roundabout with two circulating lanes (3R2)**
- 4-leg minor-road stop control (4ST)
- 4-leg signal control (4SG)
- **4-leg roundabout with two circulating lanes (4R2)**

Predictive Models for Pedestrian and Bicycle Collisions

Black Font: Facility types addressed in HSM1

Red Font (Bold): New facility types planned for HSM2

Ch 16. Predictive Method for Urban and Suburban Arterials (Facility Types – Roadway Segments)

Roadway segments:

- 2-lane undivided (2U)
- 3-lane with center TWLTL (3T)
- 4-lane undivided (4U)
- 4-lane divided (4D)
- 5-lane with center TWLTL (5T)
- **6-lane undivided (6U)**
- **6-lane divided (6D)**
- **7-lane with center TWLTL (7T)**
- **8-lane divided (8D)**
- **2-lane one-way (2O)**
- **3-lane one-way (3O)**
- **4-lane one-way (4O)**

Predictive Models for Pedestrian and Bicycle Collisions

Ch 16. Predictive Method for Urban and Suburban Arterials (Facility Types – Intersections)

3-Leg Intersections:

- Minor-road stop control (3ST)
 - 2×2 (with 5 or fewer lanes)
 - **2×2 (with 6 or more lanes)**
 - 1×1
 - 1×2
- **Minor-road stop control – high speed (3ST-HS)**
- **All-way stop control (3AST)**
- **Turning (3STT)**
- Signal control (3SG)
 - 2×2 (with 5 or fewer lanes)
 - **2×2 (with 6 or more lanes)**
 - 1×1
 - 1×2
- **Signal control – high speed (3SG-HS)**
- **Roundabout with one circulating lane (3R1)**
- **Roundabout with two circulating lanes (3R2)**

4-Leg Intersections:

- Minor-road stop control (4ST)
 - 2×2 (with 5 or fewer lanes)
 - **2×2 (with 6 or more lanes)**
 - 1×1
 - 1×2
- **Minor-road stop control – high speed (4ST-HS)**
- **All-way stop control (4AST)**
- Signal control (4SG)
 - 2×2 (with 5 or fewer lanes)
 - **2×2 (with 6 or more lanes)**
 - 1×1
 - 1×2
- **Signal control – high speed (4SG-HS)**
- **Roundabout with one circulating lane (4R1)**
- **Roundabout with two circulating lanes (4R2)**

5-Leg Intersections:

- **Signal control (5SG)**

Predictive Models for Pedestrian and Bicycle Collisions

Ch 17. Predictive Method for Directional Freeway Segments

- Changed bidirectional models to directional models
- Address rumble strip adjustment factor

Ch 18. Predictive Method for Ramps (Facility Types)

Ramp segments:

- Rural
 - 1-lane entrance (1EN)
 - 1-lane exit (1EX)
- Urban
 - 1-lane entrance (1EN)
 - 1-lane exit (1EX)
 - 2-lane entrance (2EN)
 - 2-lane exit (2EX)

Ramp terminals:

- 3-leg terminals with diagonal entrance ramp (D3en)
- 3-leg terminals with diagonal exit ramp (D3ex)
- 4-leg terminals with diagonal ramps (D4)
- 4-leg terminals at four-quadrant partial cloverleaf A (A4)
- 4-leg terminals at four-quadrant partial cloverleaf B (B4)
- 3-leg terminals at two-quadrant partial cloverleaf A (A2)
- 3-leg terminals at two-quadrant partial cloverleaf B (B2)
- **Single-point diamond interchanges (SP)**
- **Tight diamond interchanges (D4td)**

Part C Predictive Models

- Over 350 SPFs for different:
 - Facility types
 - Two-lane, two-way rural roads
 - Multilane rural roads
 - Urban and suburban arterials
 - Freeways
 - Ramps
 - Severity levels
 - Total (KABCO)
 - KABC
 - KAB
 - PDO
 - Modes
 - Motor-vehicles
 - Pedestrians
 - Bicyclists
 - Crash Types
 - Multiple vehicle
 - Single vehicle

Part D – Crash Modification Factors

- Ch. 19 Selecting CMFs
- Ch. 20 Applying CMFs

Critical Issues to Consider to Implement HSM2 Procedures

- Training
- Data needs
- Priorities
- Calibration
- Appropriate use and application of models (SPFs) and crash modification factors (CMFs)

Thank You

Darren Torbic, Ph.D.
Research Scientist
Texas A&M Transportation Institute
d-torbic@tti.tamu.edu
814-574-9194