NCHRP Project 17-71A

Proposed AASHTO Highway Safety Manual, Second Edition

ACS20 Midyear Meeting 2023

Texas A&M Transportation Institute

HDR **Exponent**

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Agenda

- Project objective and scope

- Status of draft chapters

- Single state calibration and sensitivity analysis

- Remaining major activities

- Schedule

- Questions

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Project Objective And Scope

Project Objective

- Complete work initiated as part of NCHRP Project 17-71 to develop and prepare a proposed HSM2 in a format suitable for adoption as an AASHTO publication

  - Proposed HSM2 will synthesize and incorporate relevant ongoing and completed research including completed NCHRP Project 17-71 deliverables, related documents, and user feedback to expand the scope and quality of HSM2 to increase application and improve its usability

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The HSM2 Will…

- **<u>Expand</u>** upon the methodologies in HSM1

- **<u>Incorporate</u>** new models and research completed since HSM1

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Status of Draft Chapters

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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 Method		
		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 Freeways**
18	19	Predictive Method for Ramps
Part D – Crash Modification Factors		
		Introduction to Part D
19		Selecting CMFs (NEW)
20		Applying CMFs (NEW)
		Glossary (Applicable to all Parts)

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Ch. 4 Pedestrians and Bicyclists

Table of Contents

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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 Development of 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 Guide to Applying Part C

13.11 Sample Problems

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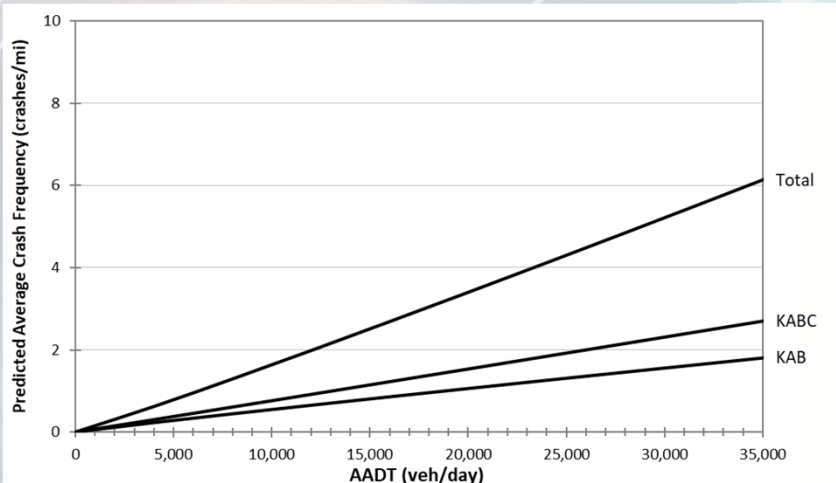
Calibration

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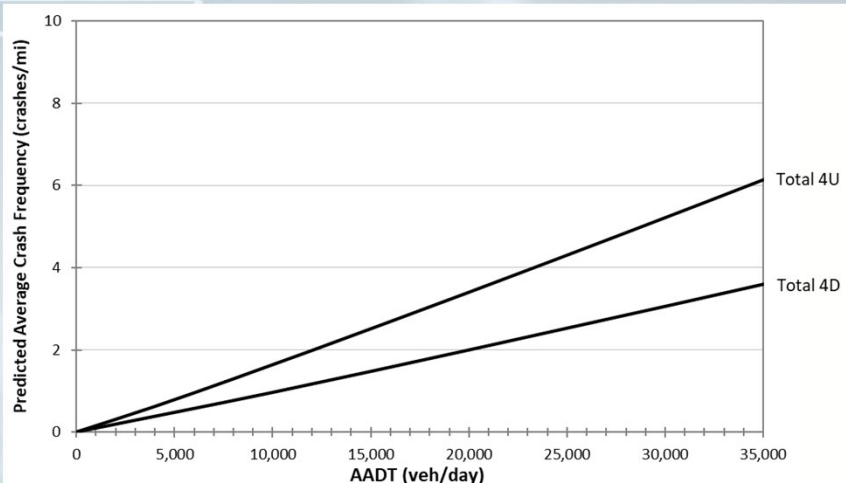
Comparison of Calibrate SPFs across Site Types

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Methods for Estimating the Safety Effectiveness of a Proposed Project
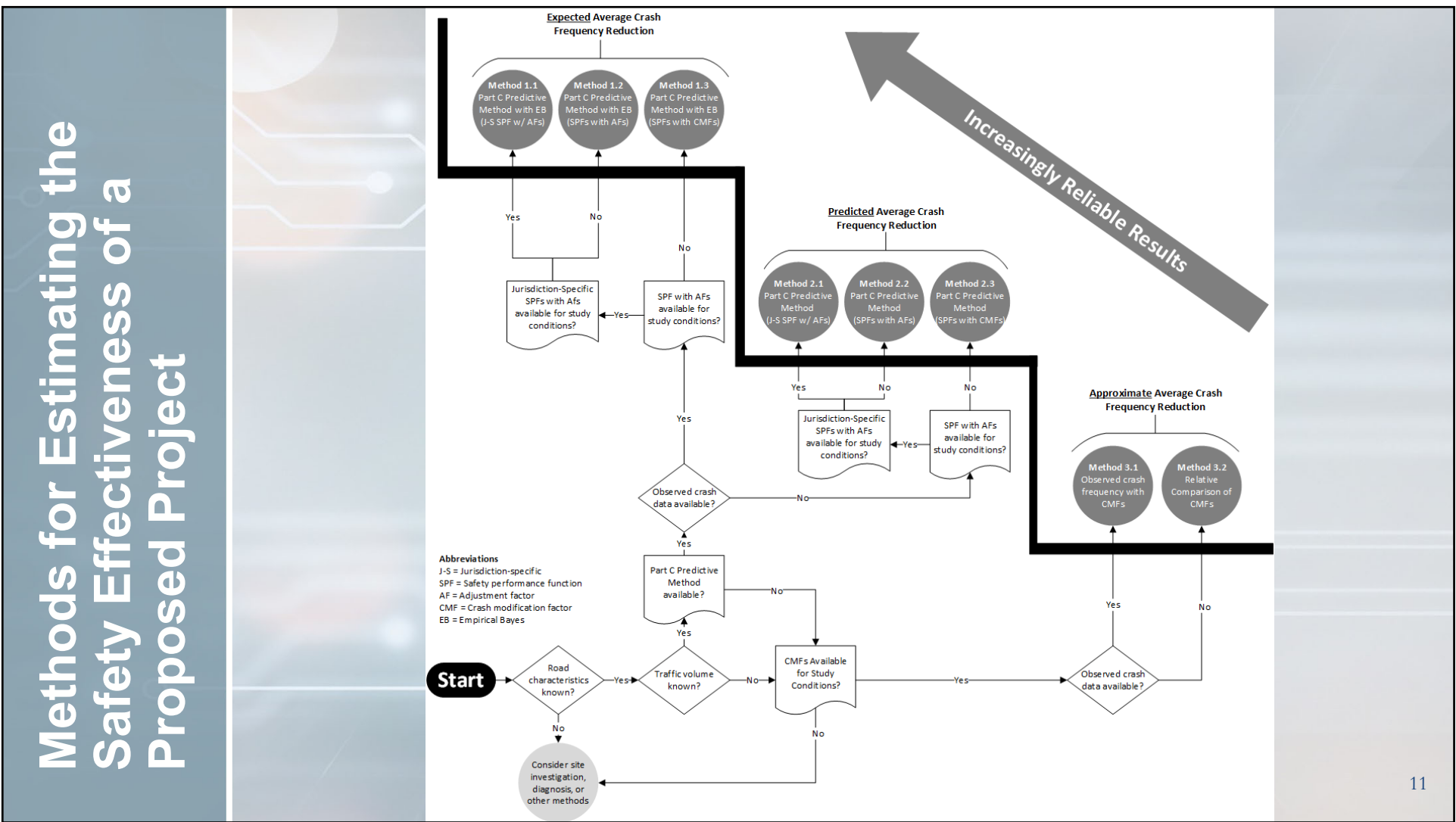
Ch. 16 Urban and Suburban Arterials

- Incorporated updated SPFs from NCHRP 17-62 for roadway segments and intersections on two-way arterials with five or fewer lanes

- Incorporated new SPFs from NCHRP 17-68 for selected intersection types not addressed in HSM1

- Incorporated new SPFs from NCHRP 17-70 for roundabouts

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Ch. 16 Urban and Suburban Arterials

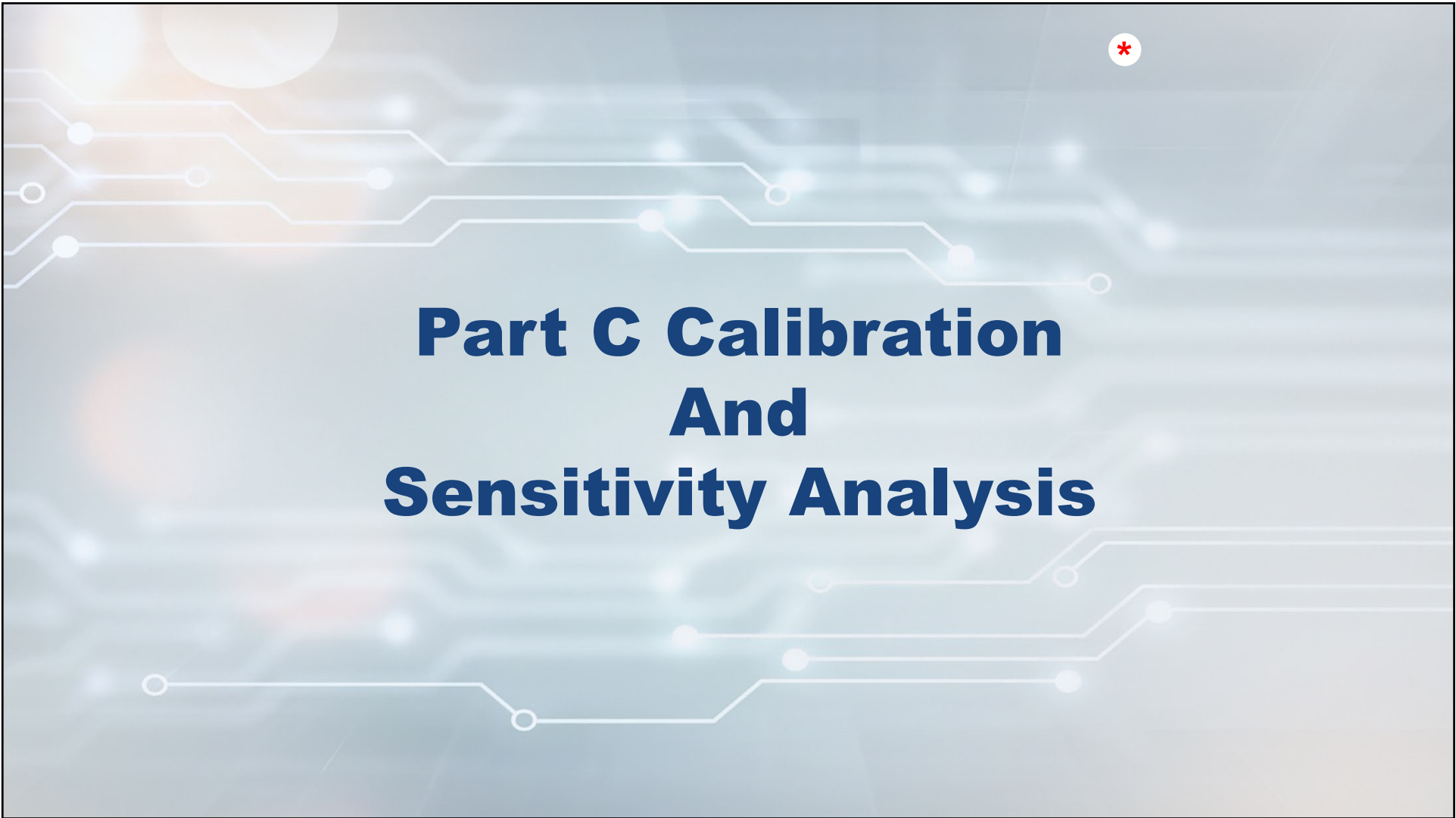- Incorporated new SPFs from NCHRP 17-58 for roadway segments and intersections on two-way arterials with six or more lanes and one-way arterials

- Incorporated new method from NCHRP 17-84 to predict pedestrian and bicycle crashes

- Working on updates to implement single-state calibration from NCHRP Project 17-72

- Work on sample problems in progress

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Ch. 17 Freeways

- Predictive method for freeway segments and speed-change lanes is essentially the same as in HSM1 Supplement except:
  - Method has been updated to address directional segments rather than two-way segments
    - Revised text descriptions and figures to address one-way segments
    - Used existing two-way segment models with directional segment characteristics

- Research NOT addressed in HSM2
  - Part-time shoulder use procedures from NCHRP Project 17-89
  - HOV/HOT lane procedures from NCHRP Project 17-89A
    - With conversion to directional procedure, results from 17-89 & 17-89A could be added in the future if the current issues are resolved

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Part C Calibration And Sensitivity Analysis

Single-State Calibration

- Single-state calibration for many of the Part C models was performed in NCHRP Project 17-72

- The 17-72 results are being used where they make sense.

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Sensitivity Analysis

- Every candidate HSM2 Part C model has been plotted:
  - Crash frequency vs. AADT for roadway segments
  - Crash frequency vs. major-road AADT for intersections for separate curves for various representative values of minor-road AADT

- Comparisons have been made:
  - Curves for total vs. KABC vs. PDO models
  - Multiple-vehicle vs. single-vehicle crashes, where relevant

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Sensitivity Analysis

- Groups of HSM2 Part C models for related facility types have been plotted on the same set of axes:
  - All roadway segment models for each chapter for a given crash severity level
  - All intersection models for each chapter for a given crash severity level
- Plots have been made for:
  - Original models from the underlying research projects
  - Calibrated models using single-state calibration from Project 17-72
- Comparisons have been made between the plotted models to:
  - Assess whether the models make sense in absolute terms
  - Assess whether the models make sense relative to one another
  - Assess whether the original or calibrated models should be used

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Sensitivity Analysis

- Issues identified:
  - Most (but not all) roundabout models predicted more crashes than comparable signalized and minor-road stop-controlled intersections
  - One all-way stop-controlled intersection model predicted more crashes that comparable signalized or minor-road stop-controlled intersections

- Adjustments to the roundabout and all-way stop-controlled intersection models have been made using appropriate CMFs (from the CMF clearinghouse)

- We believe we have final SPFs for Chapters 14, 15, and 16, but final checks are underway

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Remaining Major Activities

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Remaining Major Activities

- Revise chapters in response to comments
  - Single state calibration
- Address consistency issues within and across chapters
- Sample problems
  - Part C worksheets
- Update freeway chapter
  - Resolve shoulder rumble strip issue
- Sensitivity analysis
  - Ramps
- Equations / figures
- Glossary

Schedule

Schedule

- ## End of July 2023
  - Submit revised draft chapters for review (entire manual)

- ## End of November 2023
  - Workshop to review and address substantive comments

- ## Mid-March 2024
  - Submit final draft HSM2 to NCHRP (ballot draft)

- ## AASHTO balloting process outside scope of current project

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Questions

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