



# NCHRP 17-72: Update of CMFs for the Highway Safety Manual

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*SCOHTS/SM Joint Meeting*

*April 2017*

# Objectives

1. Assess existing HSM inclusion criteria
2. Develop proposed revisions to inclusion / exclusion criteria
3. Apply revised criteria and develop a list of CMFs for HSM 2<sup>nd</sup> edition

# Project Team

- UNC Highway Safety Research Center
  - Raghavan Srinivasan (PI), Daniel Carter (Co-PI), and Sarah Smith
- VHB
  - Frank Gross, Scott Himes, RJ Porter, and Thanh Le
- Persaud & Lyon
  - Bhagwant Persaud and Craig Lyon
- Kittelson and Associates
  - James Bonneson and Erin Ferguson

# Approach

- Phase 1 (complete)
  - ✓ Task 1: Review inclusion criteria for CMFs
  - ✓ Task 2: Review CMF Clearinghouse star rating system
  - ✓ Task 3: Determine user preferences and practices
  - ✓ Task 4: Develop recommendations for how CMFs may be incorporated in the HSM
  - ✓ Task 5: Interim report
  - ✓ Task 6: Interim meeting

# Approach

- Phase 2 (underway)
  - Task 7: Review existing CMFs
  - Task 8: Assemble CMFs for HSM 2<sup>nd</sup> edition
  - Task 9: Conduct CMF gap analysis
  - Task 10: Develop guidance for practitioner use
  - Task 11: Develop standalone document describing inclusion criteria
  - Task 12: Develop final report and other documents

User Preferences and Practices

# PHASE 1 HIGHLIGHTS

# Selecting and Applying CMFs

- What kind of CMFs do you use?
  - Use aggregate (total) **AND** disaggregate CMFs (specific to crash type or severity)
- What crash value do you apply the CMF to?
  - Most users (60%) applied CMF to historical crash data

# CMF Quality

- Do you use information on CMF quality?
  - Majority (75%) said always or most of the time
- How do you use information on CMF quality?
  - For prioritizing CMFs (62%)
  - As a minimum threshold (21%)
- Focus group: no one used HSM adjusted standard error as indication of quality
  - Some do not understand it



# AASHTO Recommendation

- AASHTO Steering Committee for the HSM
  - No CMFs in Part D
  - CMFs included in CMF Clearinghouse with HSM stamp of approval
  - Periodic report of selected CMFs as PDF
    - Details to be determined

# CMFs in HSM 2<sup>nd</sup> Edition

- What guidance on CMFs should be presented in the HSM 2<sup>nd</sup> edition?
  - Guidance on applying CMFs (almost 100%)
  - Guidance on developing CMFs in research studies (50%)

HSM Stamp of Approval Method

# PHASE 1 HIGHLIGHTS

# HSM Stamp of Approval Method

- Inclusion/exclusion criteria:
  - Must be crash-based
  - Must specifically report CMF or CMFunction
  - Must include 1 or more CMFs with 4+ stars
  - Exclude simple before-after studies
  - Exclude non-regression, cross-sectional studies
  - Combined CMFs should pass homogeneity test

*Applied for supplemental funding*

# HSM Stamp of Approval Method

## 150-point Scoring Process

- Data
  - 55 points
- Confounding and Appropriateness of Statistical Analysis
  - 75 points
- Statistical Significance
  - 20 points

Part D Guidance

# PHASE 2 HIGHLIGHTS

# Part D Outline

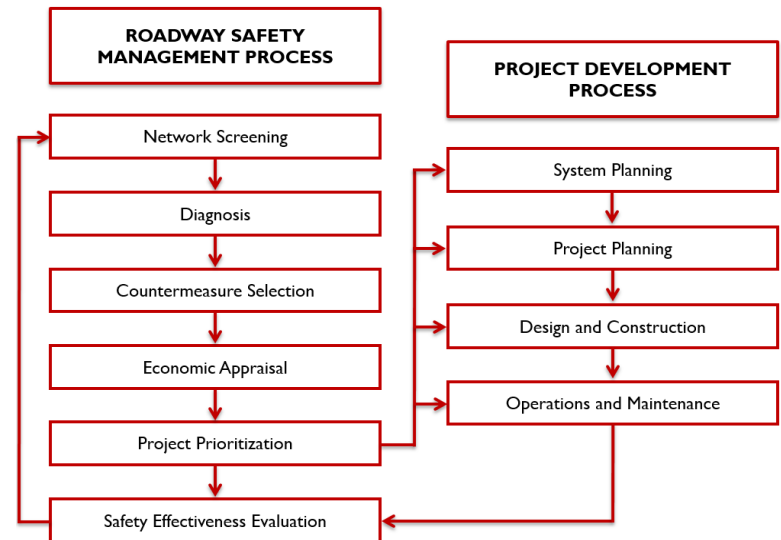
1. Introduction
2. Selecting CMFs
3. Applying CMFs
4. Developing CMFs

*Target Audience*

Practitioners **AND** Researchers

# Chapter 1: Introduction

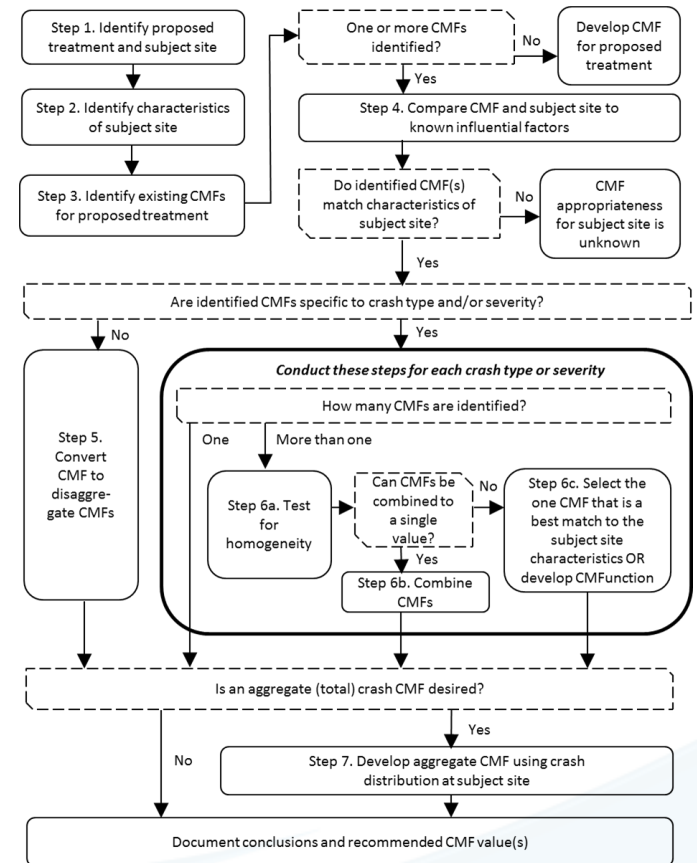
- Purpose of Part D
- Relationship to:
  - Safety Mgmt. Process
  - Proj. Dev. Process
- Relationship to Parts A, B, and C of HSM
- Guide to Applying Part D





# Chapter 2: Selecting CMFs

- Introduction
- Identifying the Most Appropriate CMF
- Searching for CMFs
- Developing a CMF List
- CMF Selection Example

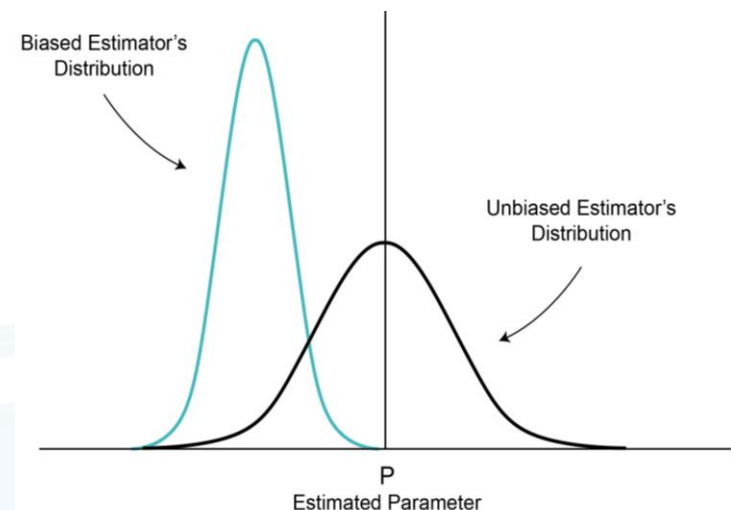


# Chapter 3: Applying CMFs

- Introduction
- Estimate Baseline Crashes
  - Observed, Predicted, Expected
- Apply CMF to Baseline Crashes
  - Single vs. Multiple CMFs
  - Adjusting CMFs (crash type/severity, local)
- Estimate Confidence Interval
- Using Results

# Chapter 4: Developing CMFs

- Fundamentals of CMF Development
- Relevant Statistical Concepts and Terms
- Study Designs and Analysis Approaches
- Alternative Approaches to Developing CMFs
- CMF Reporting
- Developing CMF Functions
- Resources



Review Existing CMFs

# PHASE 2 HIGHLIGHTS

# Review Existing CMFs

- Identification
  - CMF Clearinghouse
  - CMFs from 1<sup>st</sup> edition of HSM
  - CMFs published between 2008 and 2010
  - CMFs from state lists or panel members
- Evaluation
  - Use inclusion/rating process from Phase 1

Conduct CMF Gap Analysis

# PHASE 2 HIGHLIGHTS

# Conduct CMF Gap Analysis

- Gaps in Quality
  - CMFs exist, but do not meet inclusion criteria
- Gaps in Applicability
  - CMFs do not exist for specific conditions (e.g., crash severity or facility type) for a given countermeasure

# Conduct CMF Gap Analysis

Category	Countermeasure	Facility Type									
		Rural, Two-Lane			Rural, Multilane			Urban/Suburban			Freeways
		Crash Severity			Crash Severity			Crash Severity			
		Total	Fatal	Injury	Total	Fatal	Injury	Total	Fatal	Injury	
Segment	W	●	○	●	●		○	○			
Intersection	X	●	●	●	○		○	●	●	●	
Roadside	Y	○	○	●	○						
Interchange	Z										
<p>● = No gap (high-quality CMF available)</p> <p>○ = Gap in quality (CMF available, but does not meet inclusion criteria)</p> <p>Blank = Gap (no CMF available)</p>											



# Questions

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