

Dynamic Speed Feedback Signs

Summary of a Comprehensive Review and Proposed Tool for Practitioners

October 28, 2019

Northeast Transportation Safety Conference

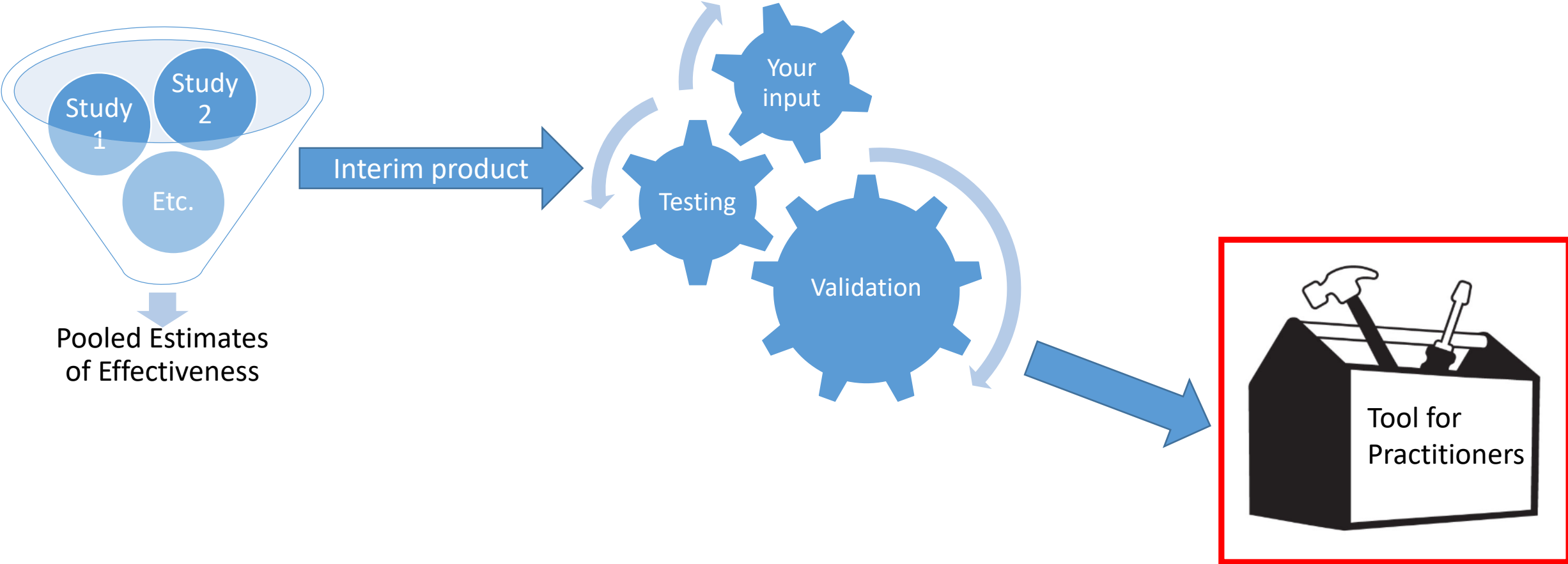


U.S. Department of Transportation

Volpe Center

Advancing transportation innovation for the public good

Meta-analysis and Proposed Supplementary Tool



Presentation Agenda

- **Introduce meta-analysis**
- **Introduce proposed tool**
- **Obtain your feedback**
 - Would you be interested in a tool?
 - How would you use it?
 - Can you provide feedback on functional requirements (now or later)?

What is a DSFS?



(a)



(b)



Why It Matters

- Fatalities



- Cost to society



- Effectiveness



Reductions in speed of just 5 percent can reduce fatal pedestrian-vehicle strikes by 20 percent.

Why This Research?

- Widely varying effects
- Hard to locate best study
 - Varying safety foci
 - 13 different questions of interest!
 - Other variables
 - Different measures of effectiveness



Products

Volume 1

- Literature review
- Meta-analysis

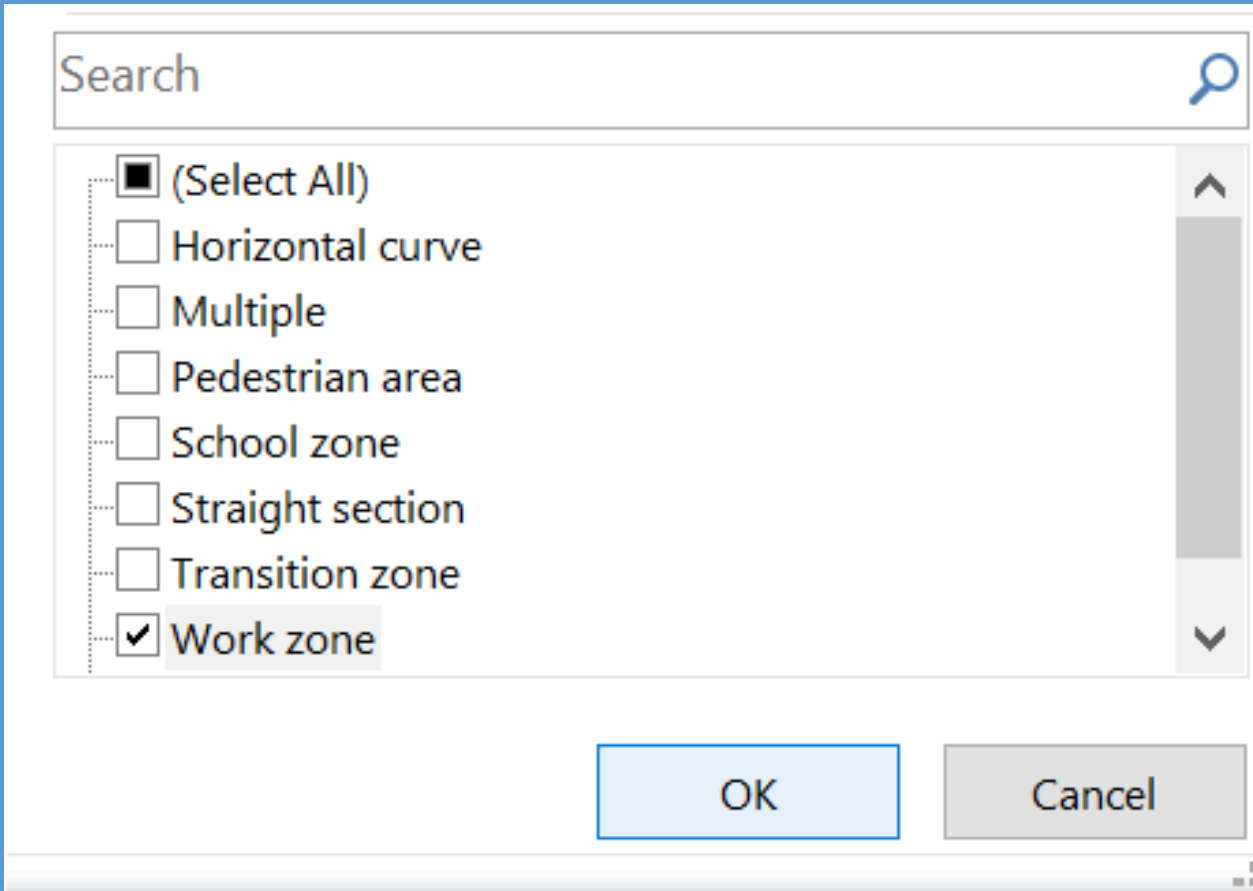
Volume 2

- Appendix
- Annotated bibliography

Unpublished interim product: spreadsheet database of studies, their characteristics, and results

Mock Example of a Proposed Tool

Select a safety focus of interest



A screenshot of a software dialog box titled "Select a safety focus of interest". The dialog has a search bar at the top with the text "Search" and a magnifying glass icon. Below the search bar is a list of safety focus areas, each with a checkbox. The "Work zone" option is selected with a checkmark. At the bottom of the dialog are two buttons: "OK" and "Cancel".

Safety Focus	Selected
(Select All)	Yes
Horizontal curve	No
Multiple	No
Pedestrian area	No
School zone	No
Straight section	No
Transition zone	No
Work zone	Yes

Something like the
Crash Modification
Factor Clearinghouse?

www.cmfclearinghouse.org

Key Questions for You

- Would you be interested in a tool?
- How would you use it?
- Would you be willing to provide feedback on functional requirements (now or later)?

Contact me at andrew.breck@dot.gov or 617-494-2213. We are looking for potential users to determine what would be useful in such a tool.

What Features Could One Filter or Sort On?

Categories:

- Background Information
- Traffic environment
- DSFS characteristics
- Questions (hypotheses) of interest
- Study design
- Measures of effectiveness
- Best practices

26 different
features!

Case 1: Looking for Examples

Plan to install a DSFS at a horizontal curve and use the tool to:

- 1) Locate publications that focused on horizontal curves.
- 2) Filter to select only those that have:
 - Image of the DSFS;
 - Schematic of the site layout; or,
 - Best practice recommendations.
- 3) Peruse and inform implementation.

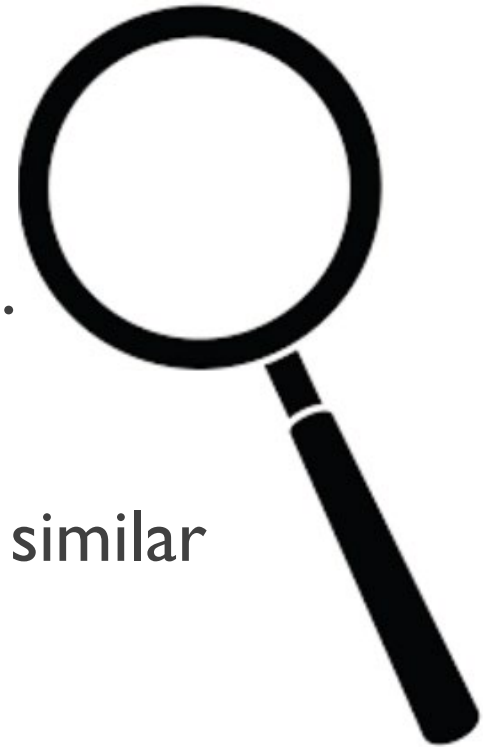


Case 2: Investigating Effectiveness

Seek to understand DSFS effectiveness before pursuing for a work zone.

Use tool to:

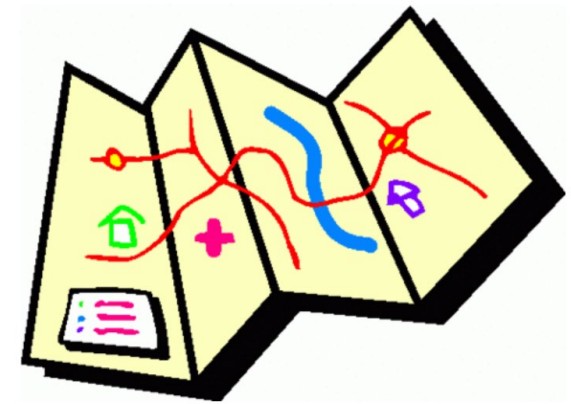
- 1) Identify publications that studied work zones.
- 2) Select a measure of effectiveness (e.g., 85th percentile speed).
- 3) Review the summary of results.
- 4) Investigate publications of interest, such as those that have a similar context or showed unexpected results.



Case 3: Designing a Study

Plan primary research of DSFS effectiveness in a school zone. Use tool to:

- 1) Identify all relevant past publications, such as those that had the same safety focus, hypothesis, experimental design, and/or surrounding context.
- 2) Review past publications to inform the new study design.



Audience Poll


Use case examples:

- #1: Looking for examples
- #2: Investigating effectiveness
- #3: Designing a study





Mock Demonstration of Case 2: Investigating Effectiveness

Select safety focus (or foci) of interest:

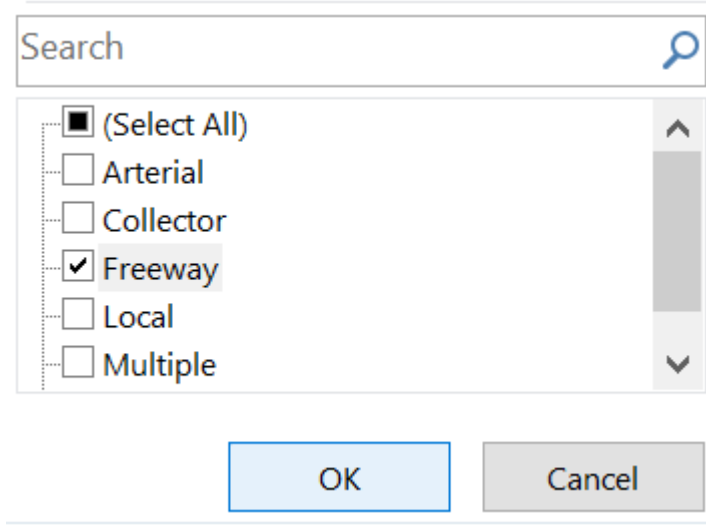
Search 

- (Select All)
- Horizontal curve
- Multiple
- Pedestrian area
- School zone
- Straight section
- Transition zone
- Work zone

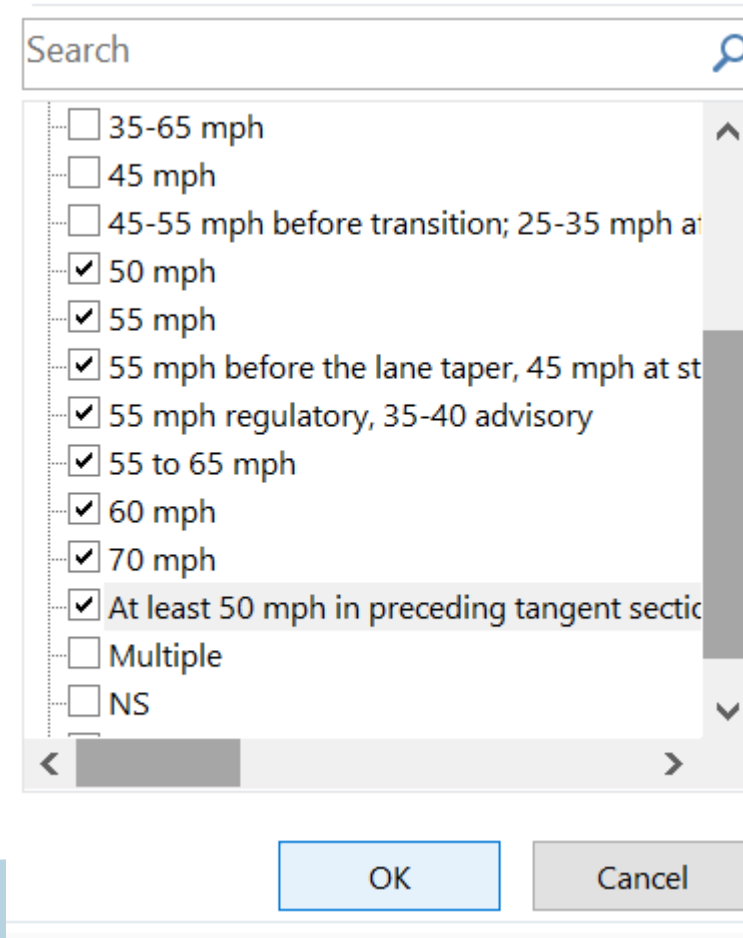
 

Mock Demonstration (Continued)

Filter by roadway type “freeway,” and/or filter based on roadway posted speed.



A search dialog box with a search bar at the top containing the text "Search" and a magnifying glass icon. Below the search bar is a list of roadway types with checkboxes: (Select All) (checked), Arterial (unchecked), Collector (unchecked), Freeway (checked), Local (unchecked), and Multiple (unchecked). At the bottom of the dialog are two buttons: "OK" and "Cancel".



A search dialog box with a search bar at the top containing the text "Search" and a magnifying glass icon. Below the search bar is a list of roadway posted speed options with checkboxes: 35-65 mph (unchecked), 45 mph (unchecked), 45-55 mph before transition; 25-35 mph at (unchecked), 50 mph (checked), 55 mph (checked), 55 mph before the lane taper, 45 mph at st (checked), 55 mph regulatory, 35-40 advisory (checked), 55 to 65 mph (checked), 60 mph (checked), 70 mph (checked), At least 50 mph in preceding tangent sectio (checked), Multiple (unchecked), and NS (unchecked). At the bottom of the dialog are two buttons: "OK" and "Cancel".

Mock Demonstration (Continued)

Select a hypothesis (or hypotheses) of interest (H1, H2, H3), and corresponding level(s) (A, B, C, A', B', C') of interest:

- H1: At the DSFS

- H2: Downstream of the DSFS

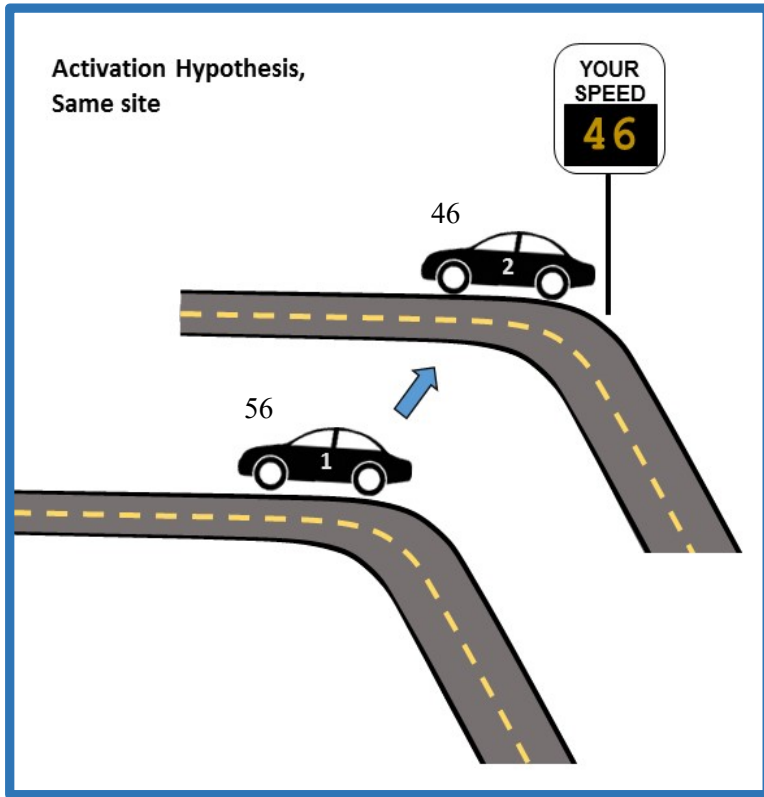
- A: Normalized hypothesis (normalize to upstream)
- ➔ • B: Compare “during” versus “before” speeds at downstream location
- C: Compare “downstream” versus “upstream” speeds during activation
- A': Normalized hypothesis (normalize to adjacent)
- C': Compare “downstream” versus “upstream” speeds during activation

- H3: “Halo effect” after the DSFS has been deactivated

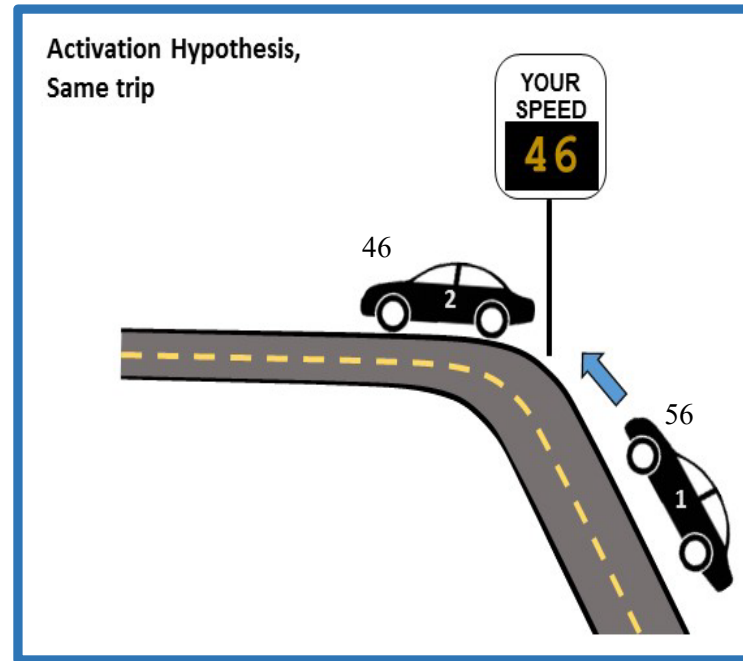
Interlude on Hypotheses: Explanation of Three Primary Types

- **H1, “Activation”**: Effectiveness adjacent to the DSFS?
- **H2, “Downstream”**: Effectiveness downstream of the DSFS?
- **H3, “Deactivation”**: Lingering effectiveness after the DSFS is no longer active?

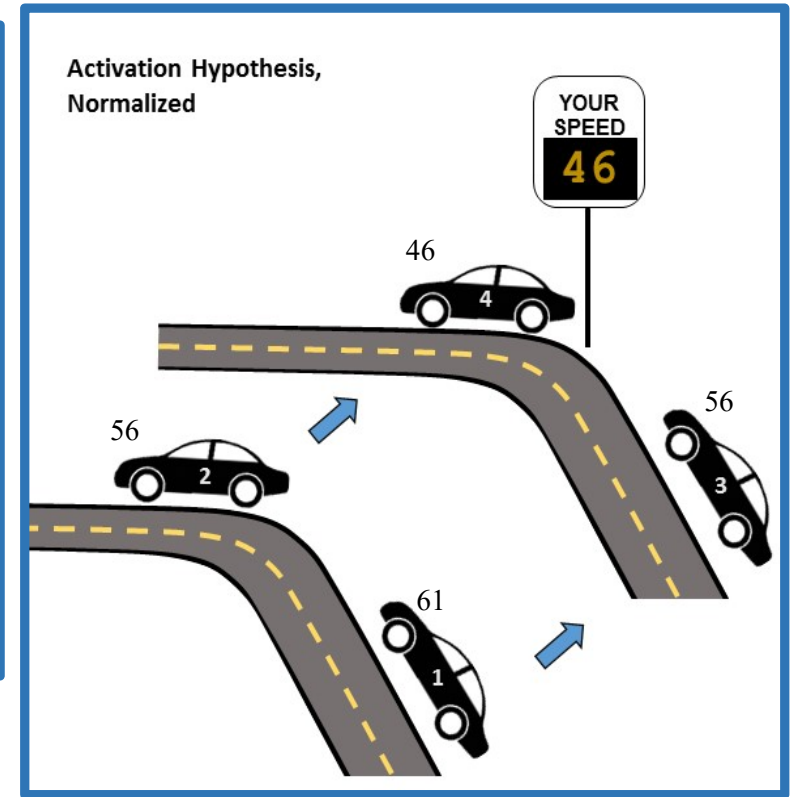
Interlude on Hypotheses: Explanation of Subtypes, Using H1 as an Example



H1B



H1C



H1A (normalized effect)

Resuming Mock Demonstration

Select the measure of effectiveness that you wish to examine:

- Mean speed
- 85th percentile speed
- Percentage of drivers over speed limit
- Distribution of speed

Mock Demonstration (Continued)

Results show the number of publications, sites, and cases

- Number of publications that reported statistically significant reductions in 85th percentile speed downstream of the DSFS (downstream hypothesis).
- Number of publications that did not report any results for 85th percentile speed.

Access publications of interest for further review

Underlying data are also available in spreadsheet format

Mock Demonstration (Continued)

Select the measure of effectiveness that you wish to examine:

- Mean speed
- 85th percentile speed
- Percentage of drivers over speed limit
- Distribution of speed

Mock Demonstration (Continued)

- Number of publications that reported statistically significant reductions in mean speed downstream of the DSFS (downstream hypothesis)
- Number of publications that reported mixed results
- Number of publications that reported results but with no indication of statistical significance.

Review features of the publications with mixed results

Access summaries in the annotated bibliography

Key Questions for You

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Thank You!



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Back-up Slides

Background Information

- Publication year
- Geographical information

Traffic Environment

- Safety focus (e.g., work zone, school zone, transition zone, horizontal curve)
- Free flow level of service?
- Posted speed limit
- Roadway type
- Sidewalks present?
- Area type (urban, rural)
- Time of day when speed is measured
 - AM/PM
 - peak/off peak

DSFS Information

- DSFS:
 - Shows actual speed?
 - Is illuminated?
 - Flashes?
 - Is a mobile unit?
- Graphic of DSFS available?

Questions of Interest

- Hypothesis type
 - H1 activation
 - H2 downstream
 - H3 deactivation
- Classes of vehicles (cars, trucks)

Study Design

- Study design
- Graphic of study layout available?
- Sensor type(s)
- Sensor positions and number of sensors
- Types of treatments
- Number of relevant sites
- Number of cases (sites x relevant treatments x vehicle types separately reported)
- Duration of activation, and exact timing/duration of measurements, etc.
- Caveats

Measures of Effectiveness

- Mean speed
- 85th percentile speed
- Percentage of drivers exceeding the speed limit
- Speed distribution

Features, Continued

- Best practice recommendations included?