2020

December 2, 2020

Nevada Traffic Safety Summit

The Safe System Approach

An Explanation
&
Framework

ite Learning HUB

Safe System Explanation

- Seeks safety through vehicle or roadway design and operational changes rather than relying primarily on behavioral changes.
- Fully integrating the needs of all users (pedestrians, bicyclists, older, younger, disabled, etc.) of the transportation system.

ite Learning HUB

Dutch Cycling Embassy

System Stewards have a responsibility to:

Recognize that users make mistakes and poor decisions

Reduce opportunities for mistakes & mitigate consequences

ite Learning HUB

What it will take to achieve a Safe System:

Traditional	Using what we know works
Novel	Trying & evaluating new ideas

What are essential components in achieving a Safe System:

Focuses on Changing the Travel Environment -

Engineering

Relies on User Compliance-

Education and Enforcement

ITE Learning HUB

Responsibilities

Does not absolve user responsibilities

User decisions and mistakes do not absolve the system designer and operator

Tradeoffs

May decrease vehicle throughput

May limit user choices

Safe System Goals

Design and Operate Transportation System

Anticipates Human Error & Accommodates Human Injury Tolerance

Anticipating and Reducing Human Error

Separating Users in Space

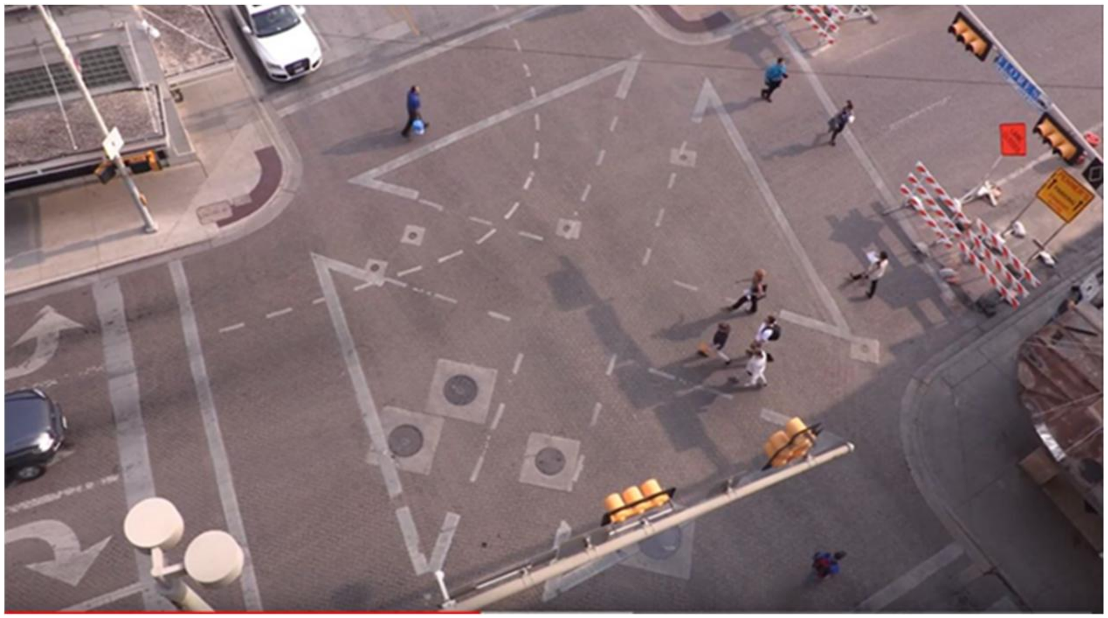
Example of a right-turn lane.

Source: FHWA

Source: TTI

ite Learning HUB

Separating Users in Time



Source: TTI

"Scramble"

Exclusive or Protected Phases

Source: FHWA

Attentiveness, Awareness and Performance

Increasing visibility

75% of US pedestrian fatalities occur at night

Source: NYC DOT

Clear Sight Lines, Stop Lines, Set Backs

Is Black the new Silver?
Hip reflective clothing?

Source: Robert Wunderlich

Increasing Attentiveness

RRFBs

Source: PBIC

Rumble Strips

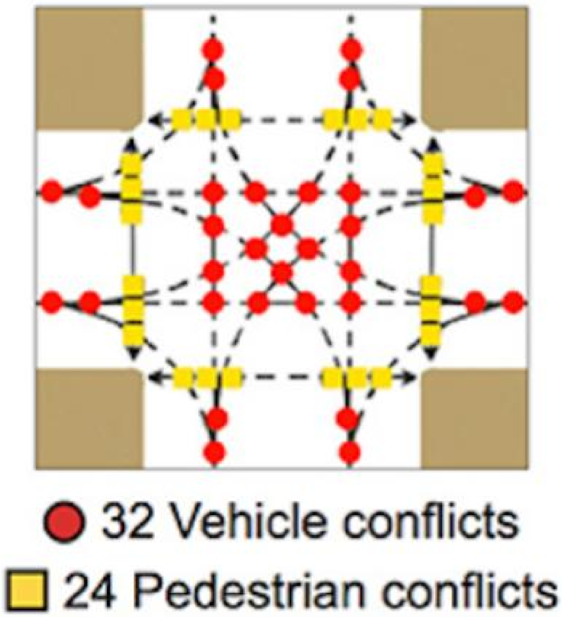
Shoulder rumble strips and center line rumble stripes are installed on this roadway.

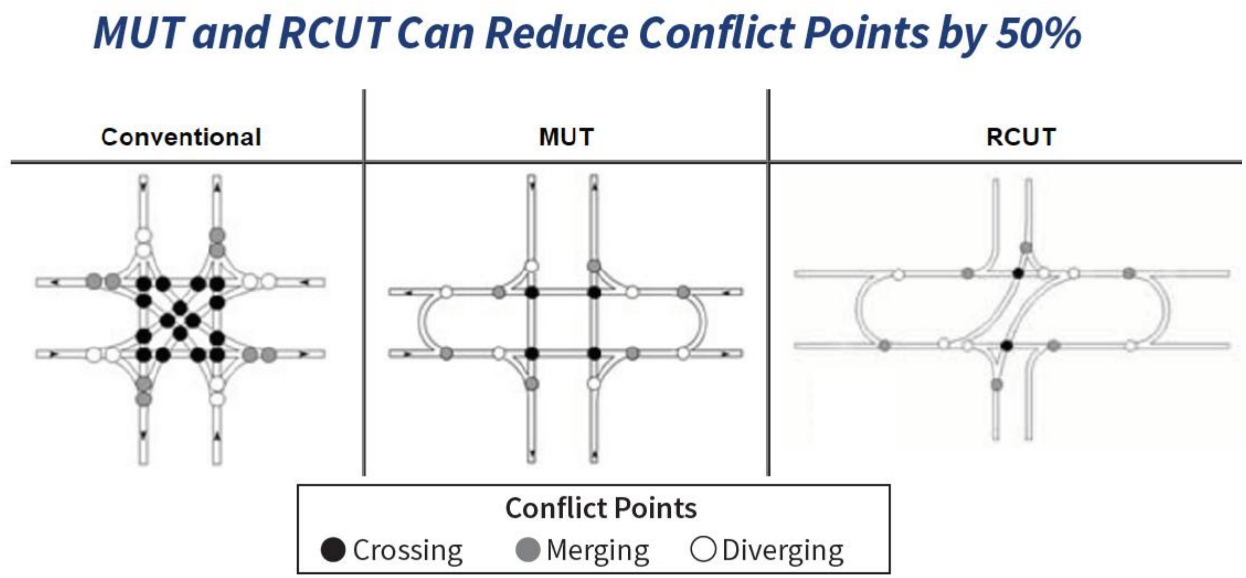
Source: FHWA

PHBs

Source: PBIC

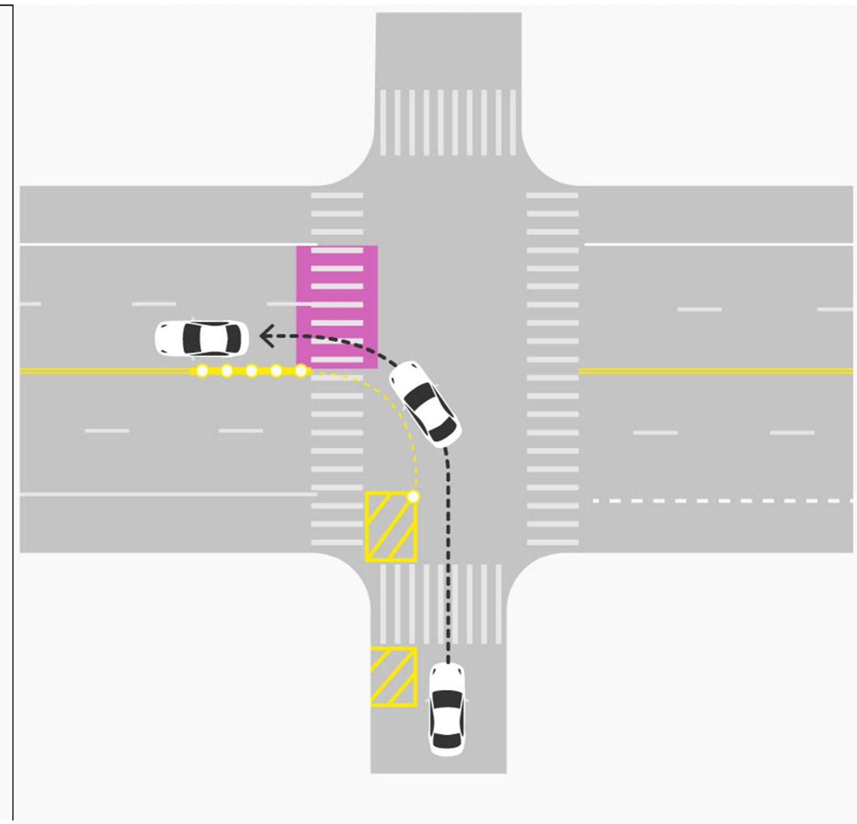
Limit Opportunities for Errors by Simplifying





Source: FHWA

Channelize for Clarity

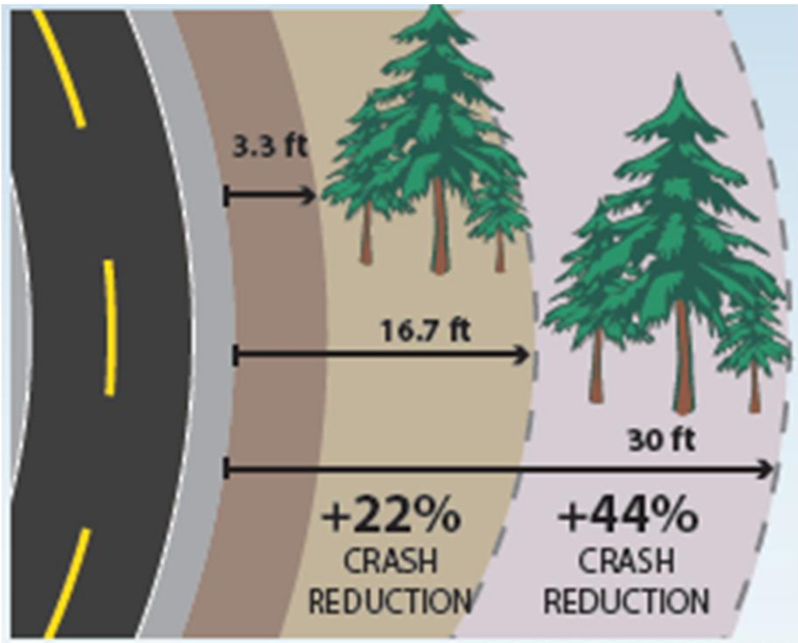


Source: NYC

ite Learning HUB

Provide Space for Recovery

Clear Zones

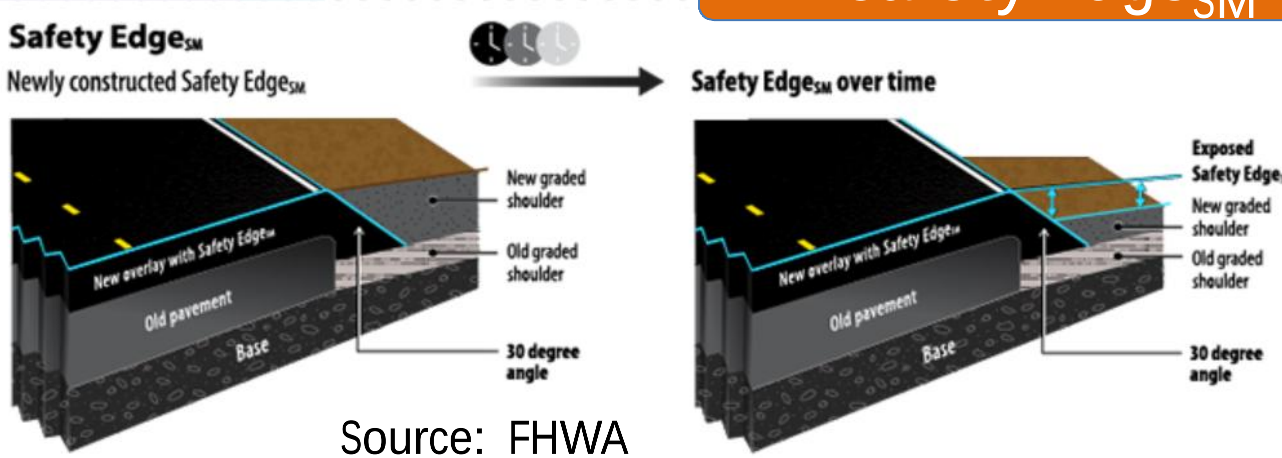


Source: FHWA

Wide Shoulders

Source: TTI

Safety Edge$_{SM}$



Source: FHWA

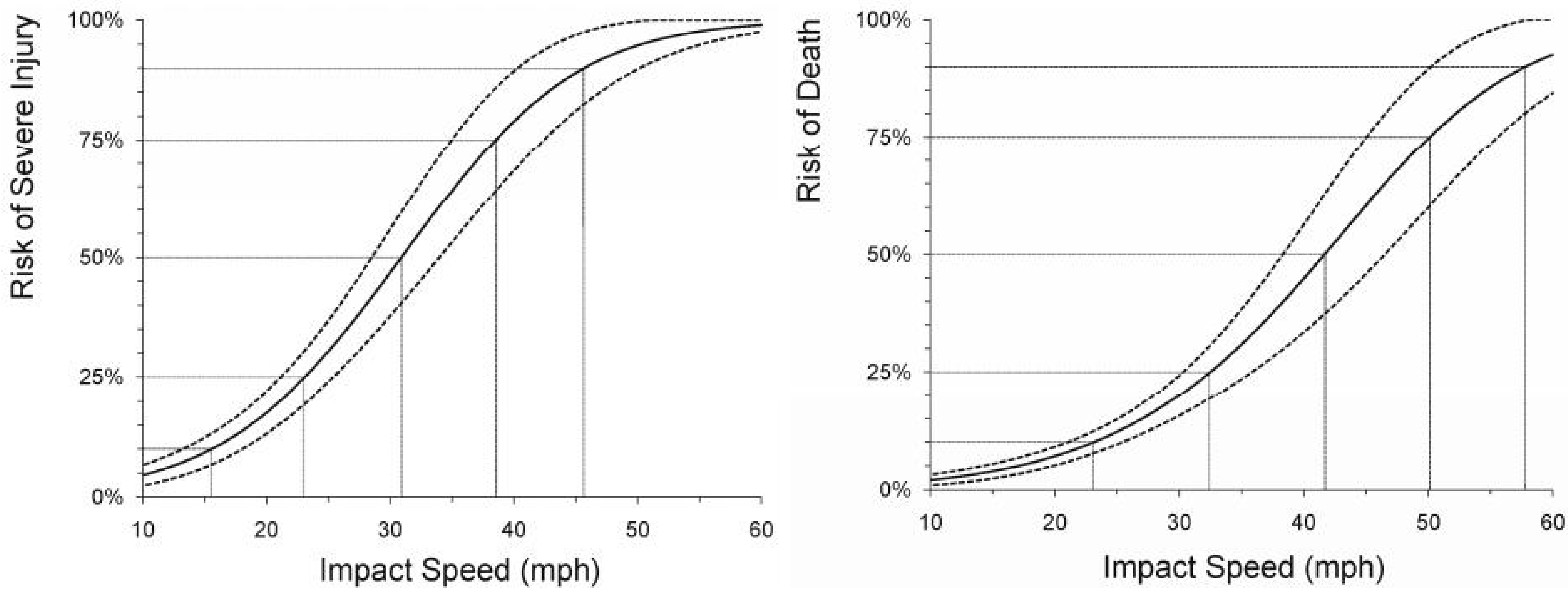
ite Learning HUB

Accommodating Human Injury Tolerance

Reduce Speeds

Reduce Impact Forces

AAA FTS Impact Speed Risk



Reprinted from "Impact Speed and a Pedestrian's Risk of Severe Injury or Death," p. 9, September 2011 by Brian C. Tefft , Copyright (2011), with permission from AAA Foundation for Traffic Safety

Power Model of Speed from Elvik

10% reduction in Speed

=

38%
reduction in fatalities

27%
reduction in serious injuries

Elvik R, et al. *Handbook of Road Safety Measures, Second Edition*. Amsterdam: Elsevier, 2009

Target Speed

Philosophy

Typical Current Practice:
Motorists makes risk/speed judgement

SS places priority on impact on safety
based on kinetic energy consequences

Target speed considers other users

Challenges

No “Formula”

Setting ≠ Achieving

Limited Tools

ite Learning HUB

Speed Management through physical configuration

In addition to making East Boulevard in Charlotte, N.C., more attractive, a road diet reduced travel speeds, bicycle and pedestrian injury rates and the number of rear-end and left-turn collisions. Photo courtesy city of Charlotte

Source: FHWA Resource Center

Other Speed Management Techniques

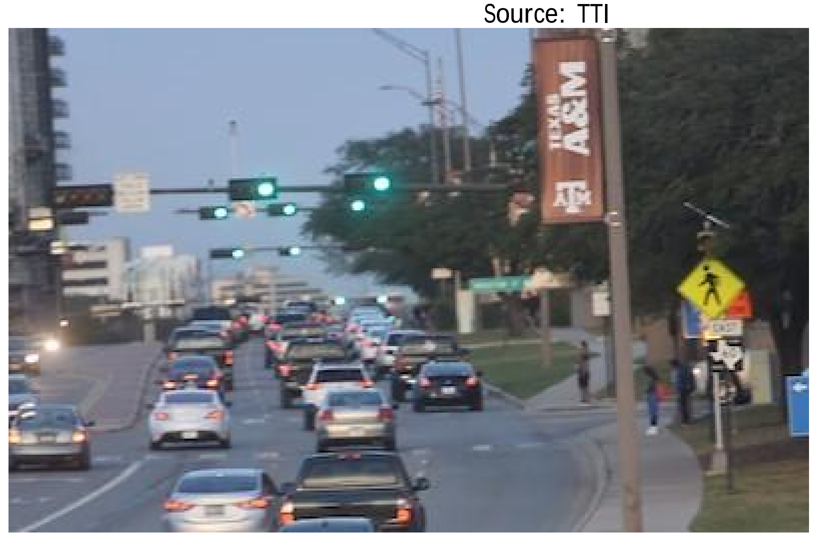
Vertical alignment

Source: FHWA – Google Street View

Sanctions

Source: TTI

Signal Timing



Source: TTI

Reducing Impact Forces

Source: TTI

Cable Barrier

Source: TTI

Breakaway Sign

Reducing Impact Forces

Source: PBIC

Source: Rock Miller

Source: PBIC

ite Learning HUB

Impact Angle and Kinetic Energy

N. Candappa et al. / Accident Analysis and Prevention 74 (2015) 314–323

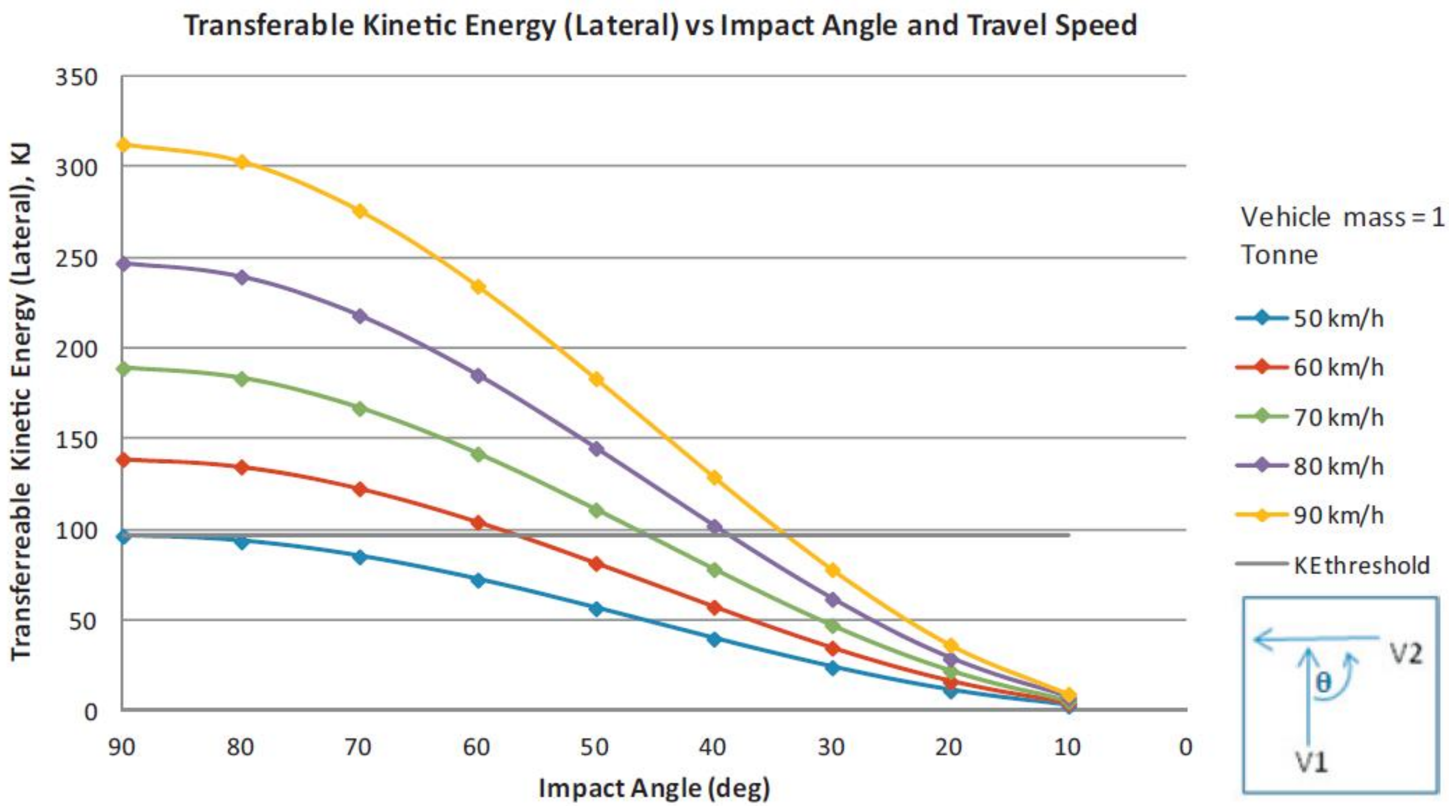
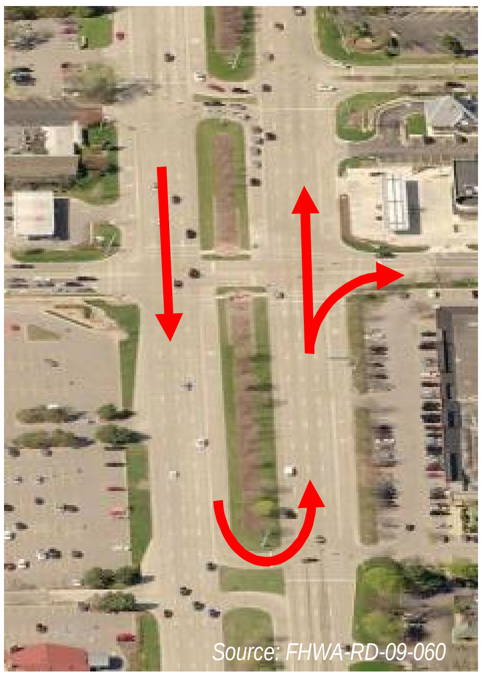


Fig. 1. Influence of impact angle on transferrable kinetic energy.

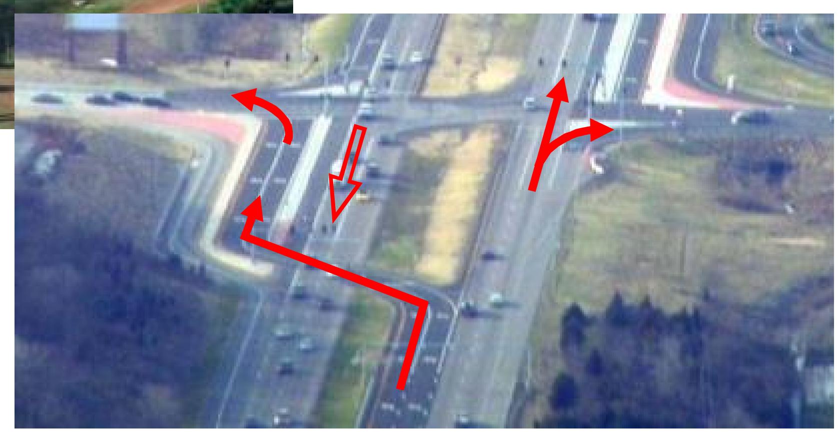
Reducing Impact Forces through Intersection Design

Median U-Turns



Diverging Diamond Interchange (DDI)

Restricted-Crossing U-Turn (RCUT)



Displaced Left-Turn (DLT)

Source: FHWA Resource Center

Roundabouts: The Trifecta

8

conflict points

75% reduction in Motor Vehicle conflicts

- ➔ ***Low*** **speed impacts**
- ➔ ***Low*** **angle impacts**

Example of a single-lane roundabout.

Safety of All Users Paramount

May decrease vehicle throughput

May limit user choices

and will take:

Systemic vs. Isolated Approach

Public Acceptance

Integration of Elements

Enforcement, Adjudication and Policy Maker Support

ite Learning HUB

Why all of this is especially important

Now

Risk - Exposure

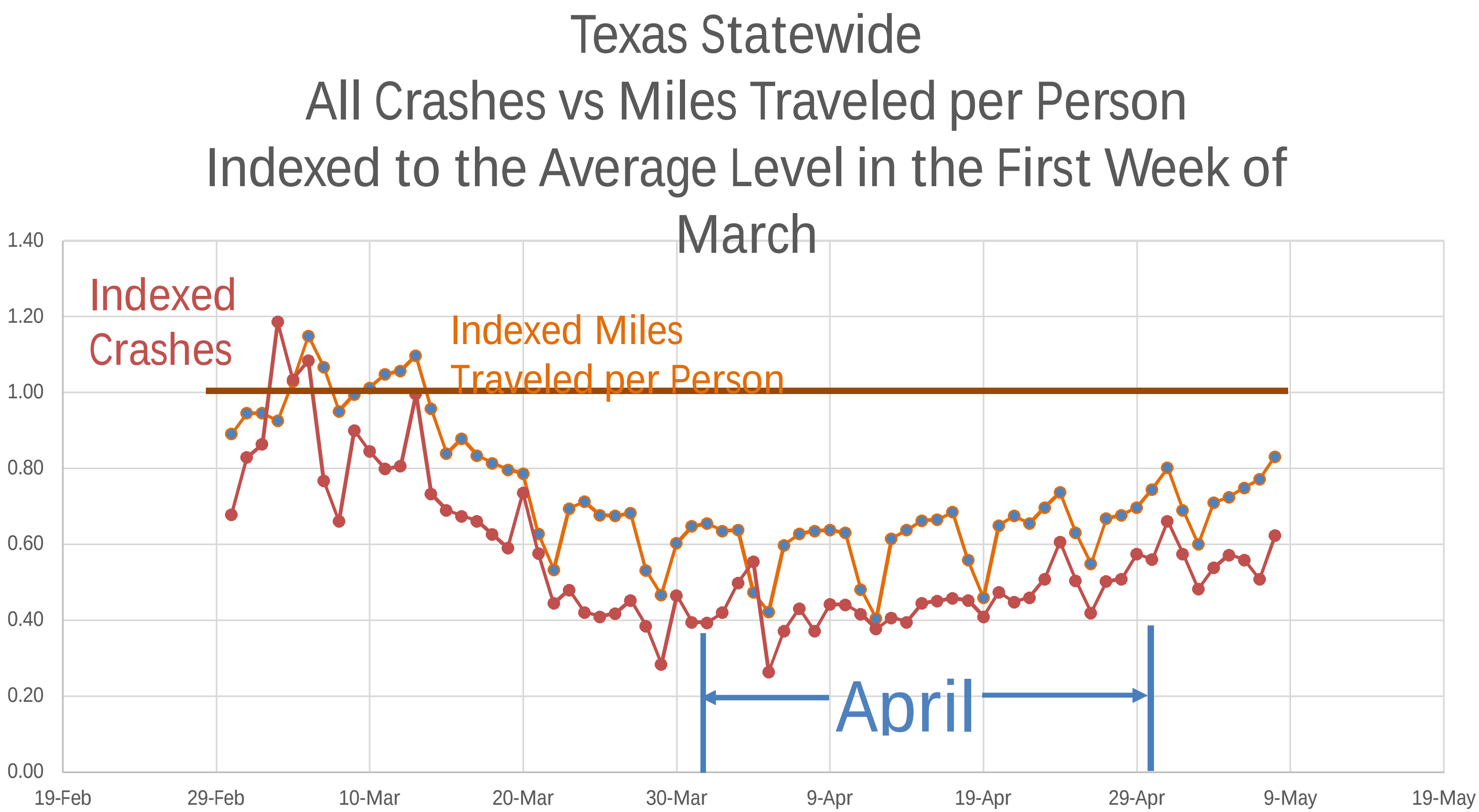
Crashes = Risk × Exposure

Risk: Chance of Crash, Fatality, etc per unit of travel

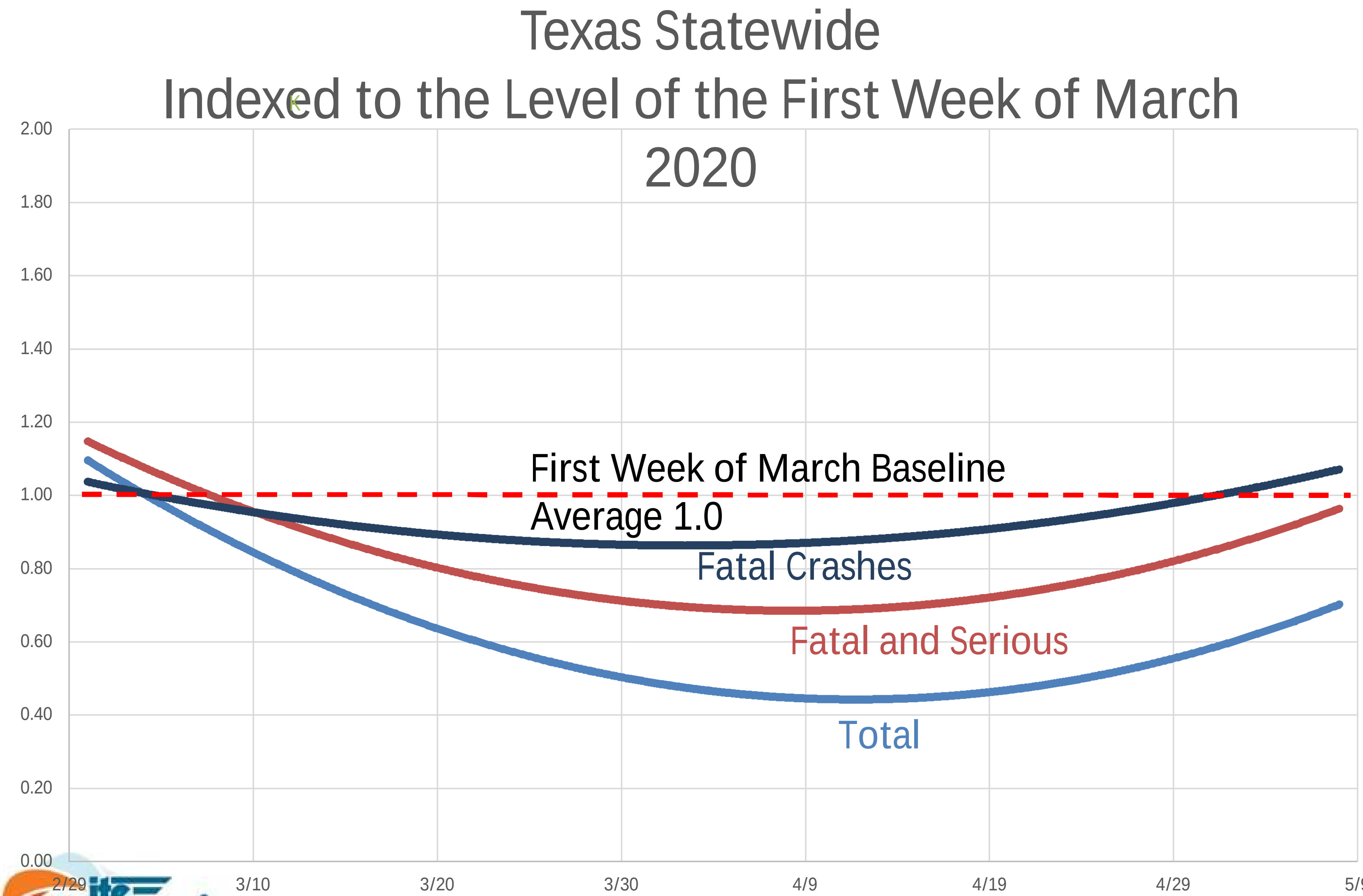
Exposure: Amount of Travel

(Vehicle-Miles of Travel)

During Great Recession – Decline in Fatalities associated with Reduction in Risk

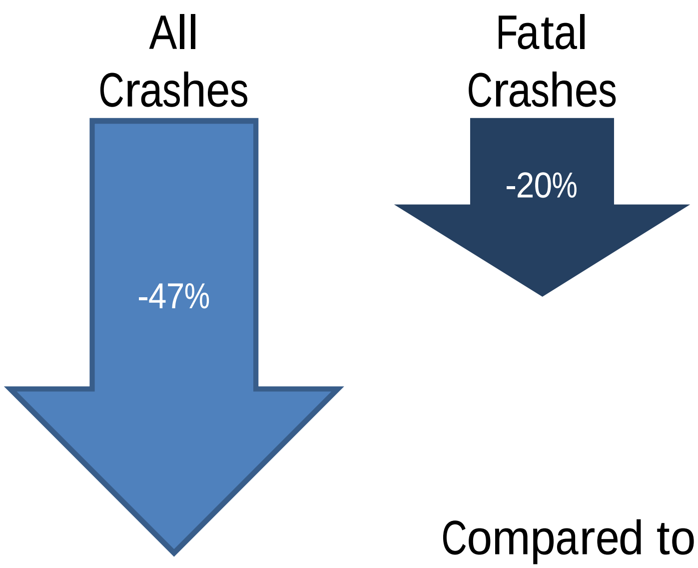


Texas Statewide
All Crashes vs Miles Traveled per Person
Indexed to the Average Level in the First Week of March
Indexed Crashes
Indexed Miles Traveled per Person
April
1.40
1.20
1.00
0.80
0.60
0.40
0.20
0.00
19-Feb
29-Feb
10-Mar
20-Mar
30-Mar
9-Apr
19-Apr
29-Apr
9-May
19-May



Texas Statewide
Indexed to the Level of the First Week of March
2020
2.00
1.80
1.60
1.40
1.20
1.00
0.80
0.60
0.40
0.20
0.00
2/29
3/10
3/20
3/30
4/9
4/19
4/29
5/9
First Week of March Baseline
Average 1.0
Fatal Crashes
Fatal and Serious
Total

April Statewide
Fatal and All Crashes

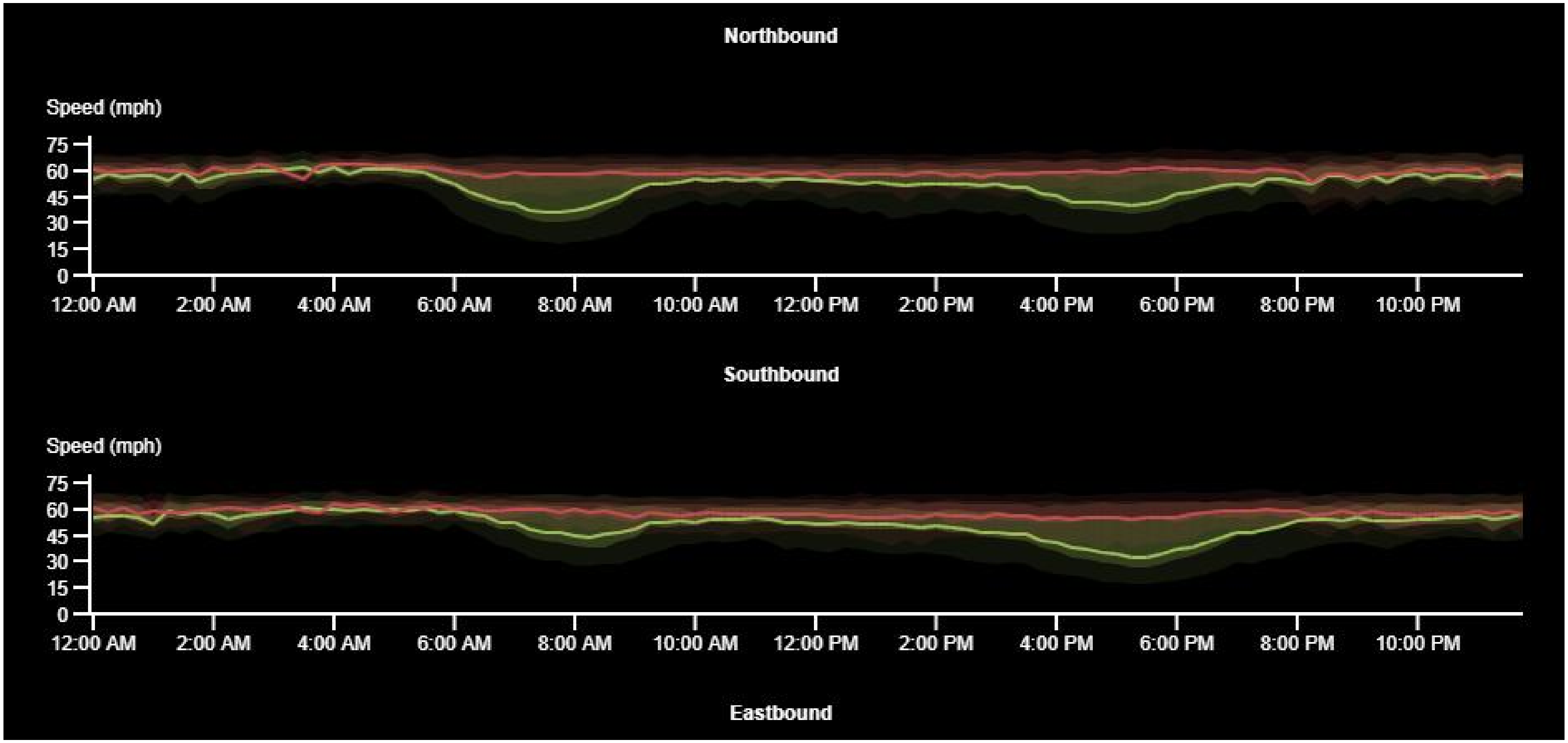


Proportion of all crashes that are fatal

1.5 X

Compared to average level for previous 3 years

Dallas County Freeway Speeds
February vs April 2020



Questions?

Robert Wunderlich
Director
Center for Transportation Safety
Texas A&M Transportation Institute

rwunderlich@tamu.edu