2020 Local Road Safety Workshop

Iowa DOT Update, Pedestrians & Bicyclists

Chris Poole, Traffic & Safety Bureau

Sarah Okerlund, Local Systems Bureau

Sam Sturtz, Systems Planning Bureau

November 17, 2020

Traffic Safety Analysis Efforts

Chris Poole

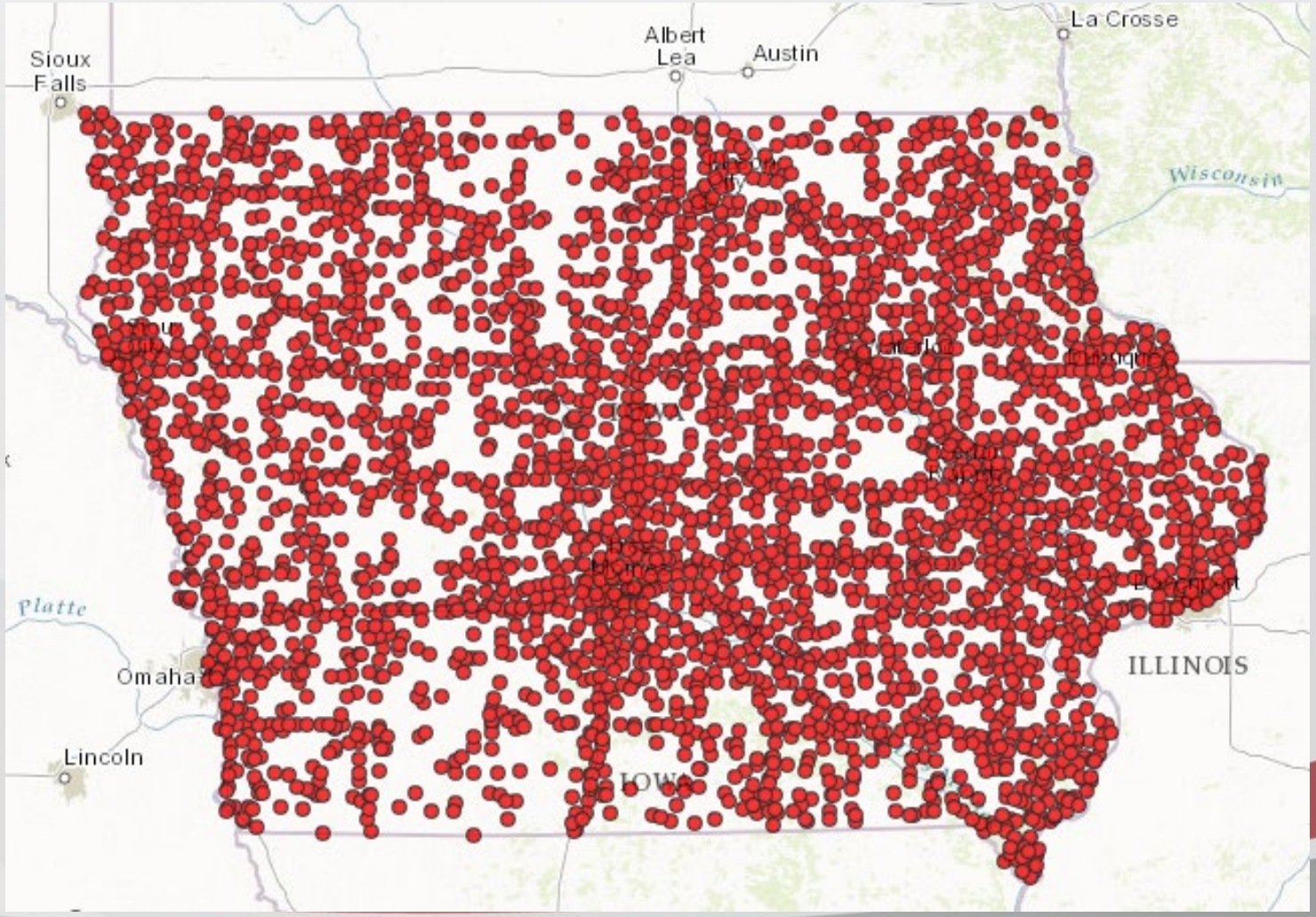
November 17, 2020

Photo by: Rodney White/The Register

Traffic Safety Analysis Efforts

- Iowa Crash Analysis Tool
- COVID-19 effect on crashes
- Crash Reduction Factors
- Safety Performance Functions
- Crash Prediction Tool
- Intersection Configuration Evaluation process

Iowa Crash Analysis Tool (ICAT)



https://icat.iowadot.gov/

Recent ICAT Enhancements

- Ability to upload a KML/KMZ to select crashes
- Show a thematic view of crashes, such as by year or by severity
- Created 12 tutorial videos:

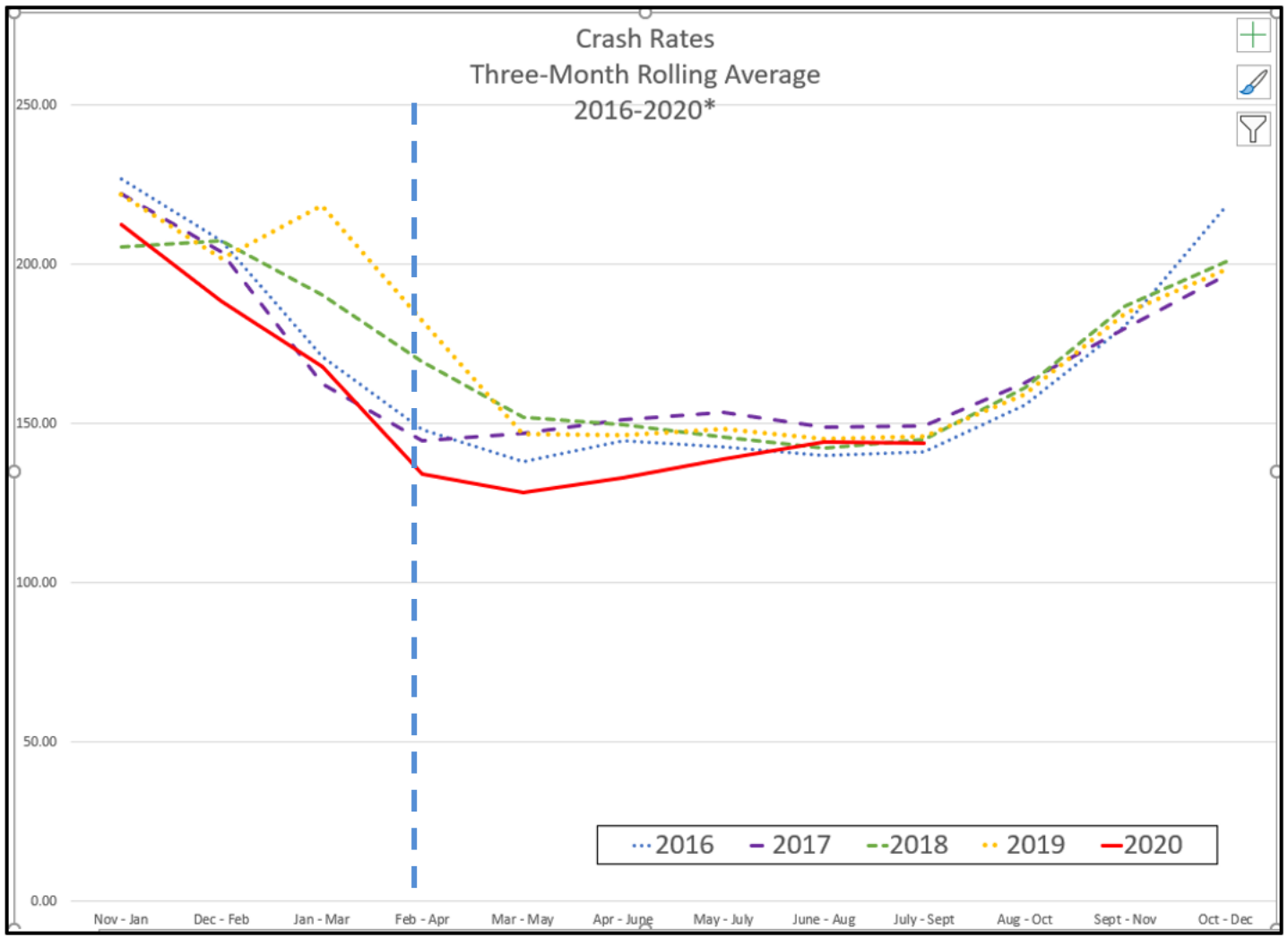
  https://iowadot.gov/traffic/icat-tutorial

COVID-19 Effect on Crashes

- Five-year comparison (through Sept. 2020)
- Crash rates (crashes per hundred million vehicle-miles traveled)
- Three-month rolling average
- Less traffic yielded more excessive speeders, but how did this affect crashes?

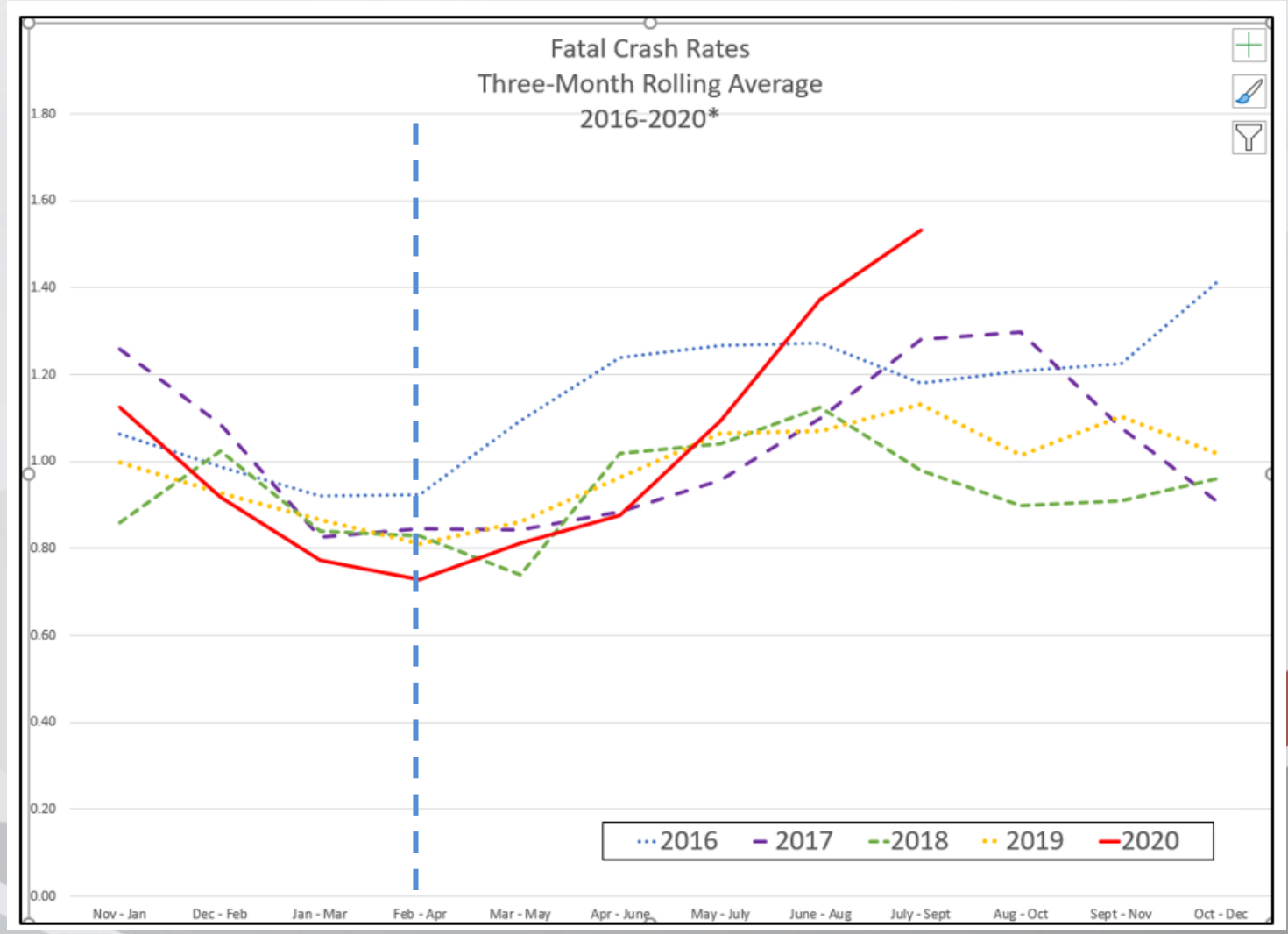
COVID-19 Effect on Crashes

Crash Rates (all crash types, all severities)



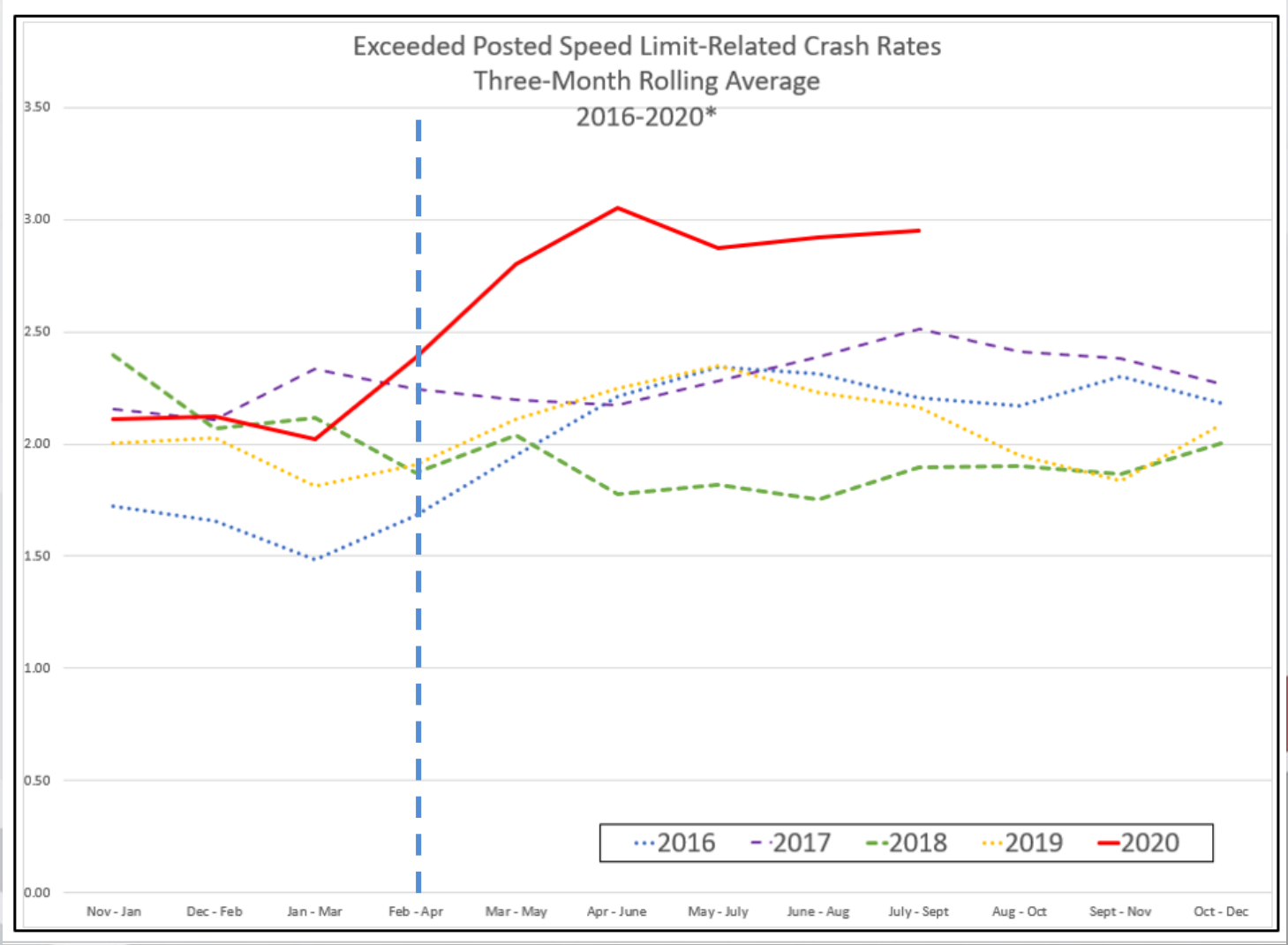
COVID-19 Effect on Crashes

Crash Rates (fatal crashes, all crash types)



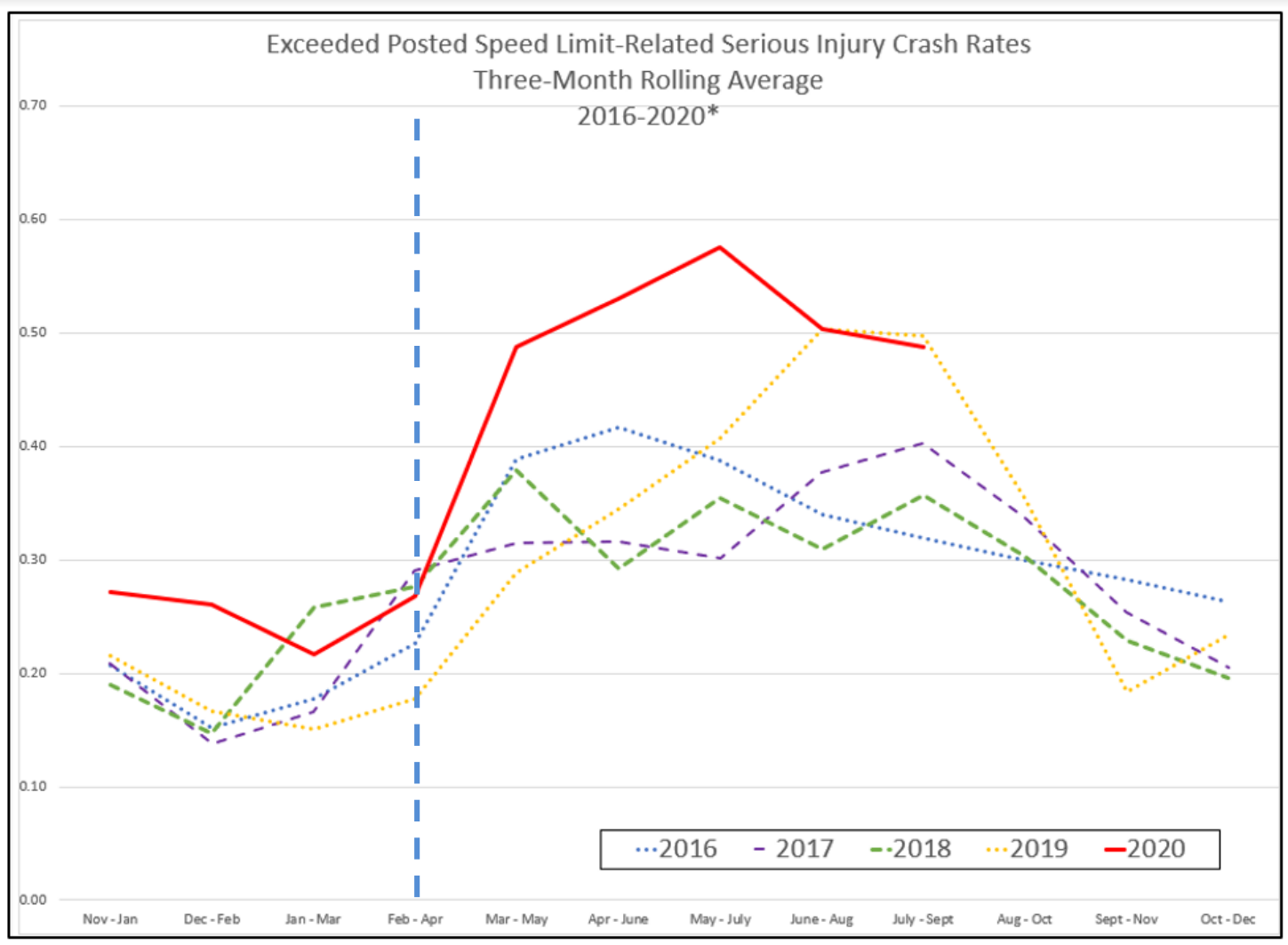
COVID-19 Effect on Crashes

Exceeded Posted Speed Crash Rates (all severities)



COVID-19 Effect on Crashes

Exceeded Posted Speed Crash Rates (serious injury crashes)



Crash Reduction Factors (CRFs)

- Iowa-specific list of planning-level CRFs

  https://iowadot.gov/traffic/pdfs/CRFListVersion.pdf
- Countermeasure → expected crash reduction %
- Segments, curves, intersections, bike/ped, etc.
- For now, factors for all crash types and all severities
- Plans to update with crash types and severities

IOWA PLANNING LEVEL CRFs

CRF #	Facility Type	Countermeasure Type	Countermeasure	Intersection or Roadway Type	Prior Condition	Area Type	Crash Type	Crash Severity
CS-01	Curve Segment	Signs and Markings	Install Chevron and Curve Warning Signs When Warranted	-	No Curve Delineation Treatment	-	All	All
CS-02	Curve Segment	Signs and Markings	Install Chevron Signs	All	Curve Warning Sign but No Chevron Signs	Rural	All	All
CS-03	Curve Segment	Signs and Markings	Upgrade Existing Chevron and Curve Warning Signs (Fluorescent Sheeting and/or Oversized Signs)	-	-	Rural	All	All
CS-04	Curve Segment	Pavement	Install High Friction Surface Treatment	All	History of Friction Related Crashes	All	All	All
IN-01	Interchange	Metering	Install Ramp Meter	-	Freeway On-Ramp with No Ramp Meter	Urban	All	All
IN-02	Interchange	Geometery	Install Grade Separated Interchange	3-Leg, 4-Leg	At Grade Intersection	All	All	All
IN-03	Interchange	Geometery	Covert to Diverging Diamond Interchange (DDI)	-	Diamond Interchange	Urban	All	All
RR-01	Railroad	Crossings	Upgrage Railroad Crossings Signs to Include Flashing Lights	At Grade Roadway/ Railroad Crossing	Signs Only	All	Vehicle/Train	All
RR-02	Railroad	Crossings	Install Automatic Gates at Railroad Crossings	At Grade Roadway/ Railroad Crossing	Flashing Lights and Signs	All	Vehicle/Train	All
RR-03	Railroad	Crossings	Install Automatic Gates at Railroad Crossings	At Grade Roadway/ Railroad Crossing	Signs Only	All	Vehicle/Train	All
BP-01	Bicycle	Lanes	Install On-Street Bike Facility	-	No Bike Lanes	Urban	Vehicle/ Bicycle	All
BP-02	Pedestrian	Crossing	Install a Pedestrian Hybrid Beacon (PHB or HAWK)	Minor Arterial	No PHB	Urban	Vehicle/ Pedestrian	All
BP-03	Pedestrian	Crossing	Install Rectangular Rapid Flashing Beacon (RRFB)	Minor Arterial	No RRFB	Urban	Vehicle/ Pedestrian	All
BP-04	Pedestrian	Crossing	Pedestrian Signal Improvements	Signalized	No Pedestrian Countdown Timer	All	Vehicle/ Pedestrian	All

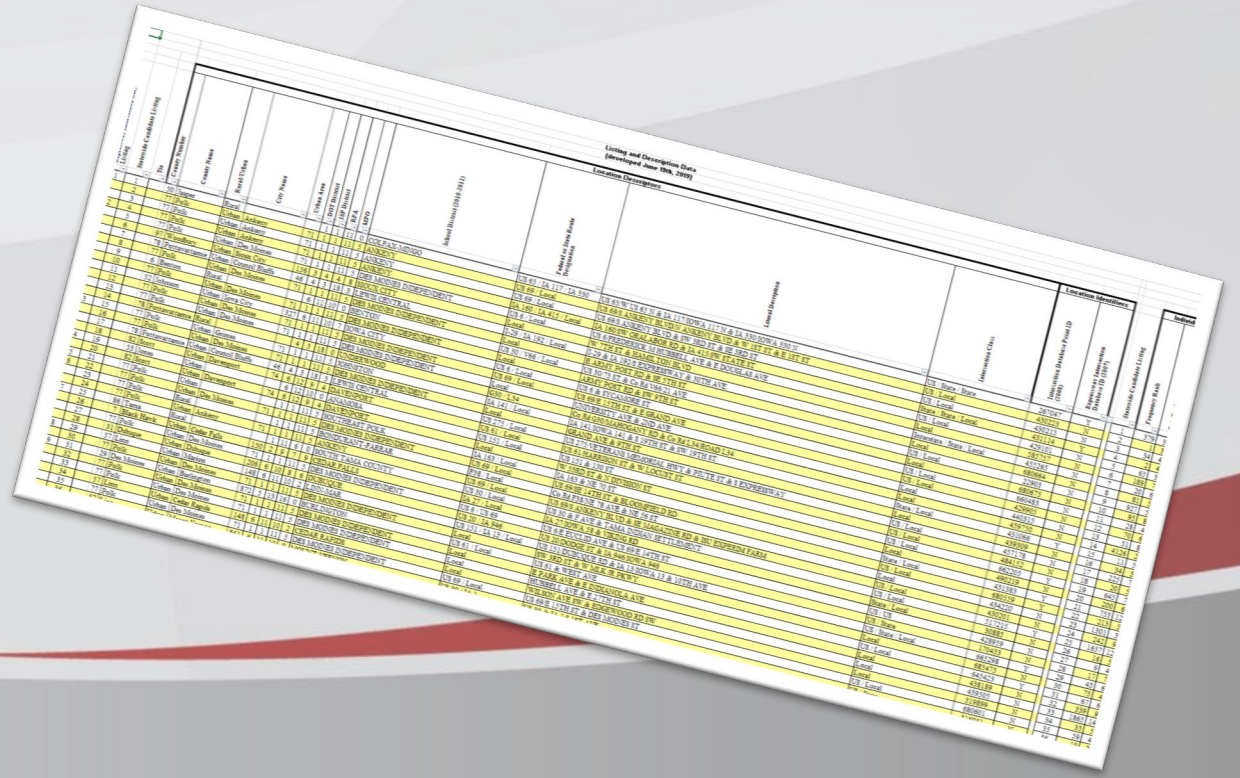
*CRFs that will to be re-evaluated in the future when additional research becomes available

Safety Performance Functions (SPFs)

Used to determine how well an intersection is performing, safety-wise

Historic Intersection Assessment

Intersection Safety Improvement Candidate List (SICL)



Historic Intersection Assessment

Statewide Average – Crash Rates

ACCIDENT AND RELATED DATA FOR RURAL AND MUNICIPAL INTERSECTIONS IN IOWA

Based on 1983 thru 1987 Data ← > 30 yrs old

BY INTERSECTION CLASS

Field Description	RURAL				MUNICIPAL			
	Primary with Primary	Primary with Secondary	Secondary with Secondary	Total Rural	Primary with Primary	Primary with City Street	City Street with City Street	Total Municipal
Number of Intersections	93	345	134	572	162	1,129	1,553	2,844
Average Number of Accidents / Year	1.6	1.1	0.8	1.1	4.8	4.1	3.0	3.6
Average Dollar Loss / Year *	$52,200	$44,200	$37,300	$43,900	$53,800	$43,100	$26,800	$34,800
Average Daily Entering Vehicles	4,500	4,000	2,200	3,600	12,800	12,800	10,500	11,500
Average Accident Rate / MEV	1.0	0.8	1.0	0.9	1.0	0.9	0.8	0.8
Lower Limits of Statistical Rates								
90 % Confidence Level (K=1.282)	1.9	1.8	2.8	2.1	1.7	1.6	1.6	1.6
95 % Confidence Level (K=1.645)	2.1	2.0	3.2	2.4	1.9	1.8	1.8	1.8
99.5 % Confidence Level (K=2.576)	2.8	2.7	4.1	3.2	2.4	2.3	2.4	2.4

← Limited Categories

← Limited Sample

Safety Performance Functions (SPFs)

Predict average number of crashes per year at a location.

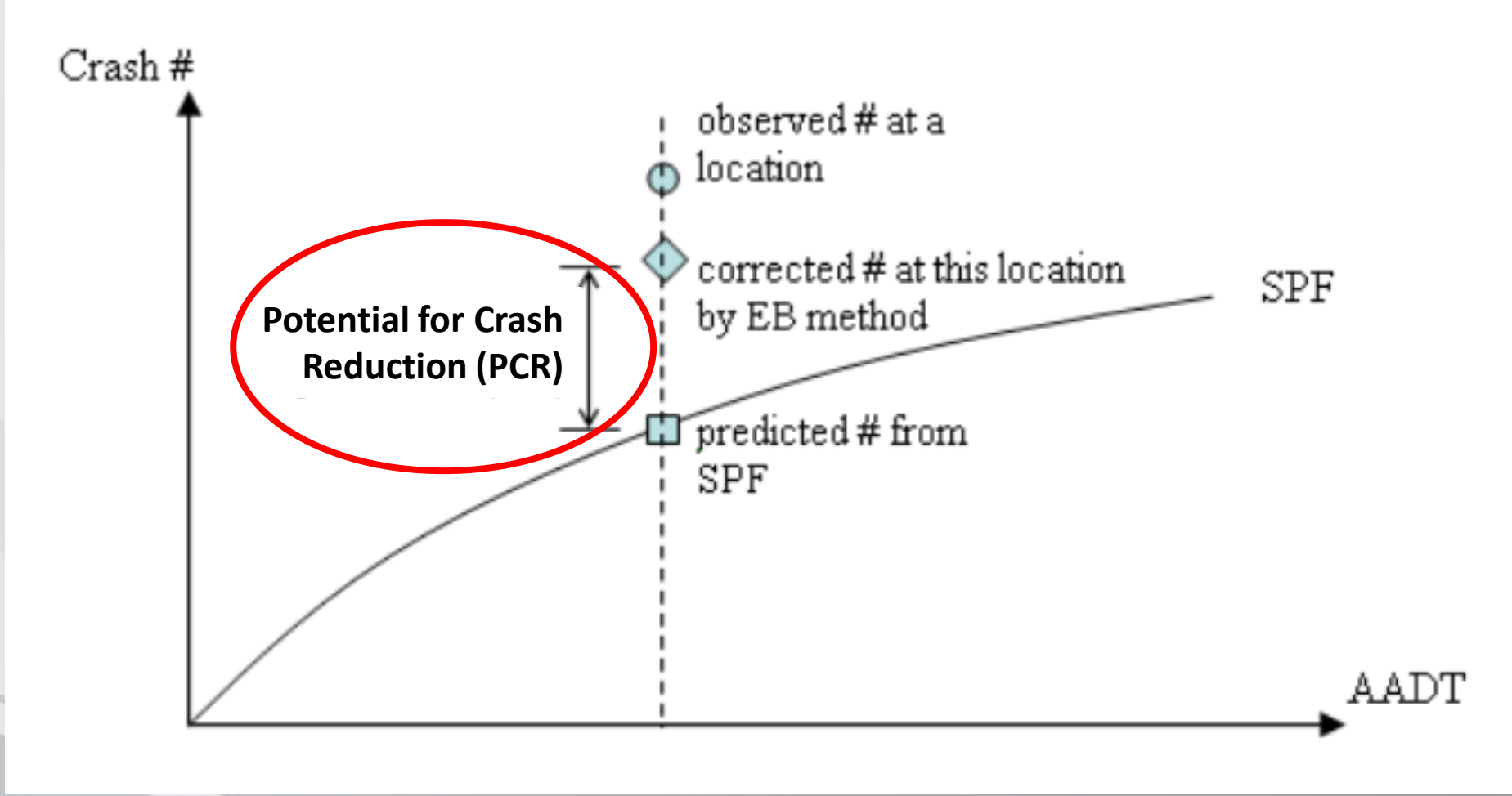
Use of Empirical Bayes statistical method to increase the accuracy and reliability of crash estimates.

Current Efforts

Summary Statistics of Intersection SPFs Data (2014-2018 Crashes; 2016 GIMS)

Category ID	Category Description	# of Intersections
1	High Speed Traffic Signal Control	262
2	Divided High Speed Partial Stop Control	1,102
3	Divided Low Speed Traffic Signal Control	625
4	Divided Low Speed Partial Stop Control	1,299
5	Undivided High Speed Partial Stop Control (1 - 1,500 AADT)	28,049
6	Univided Low Speed Traffic Signal Control	1,568
7	Undivided Low Speed Partial Stop Control (1 - 1,500 AADT)	49,305
8	Roundabouts & Other Circular Intersections	89
9	All Way Stop Control	5,618
10	Uncontrolled	22,047
11	Yield Control	5,538
		115,502

Current Efforts - Results

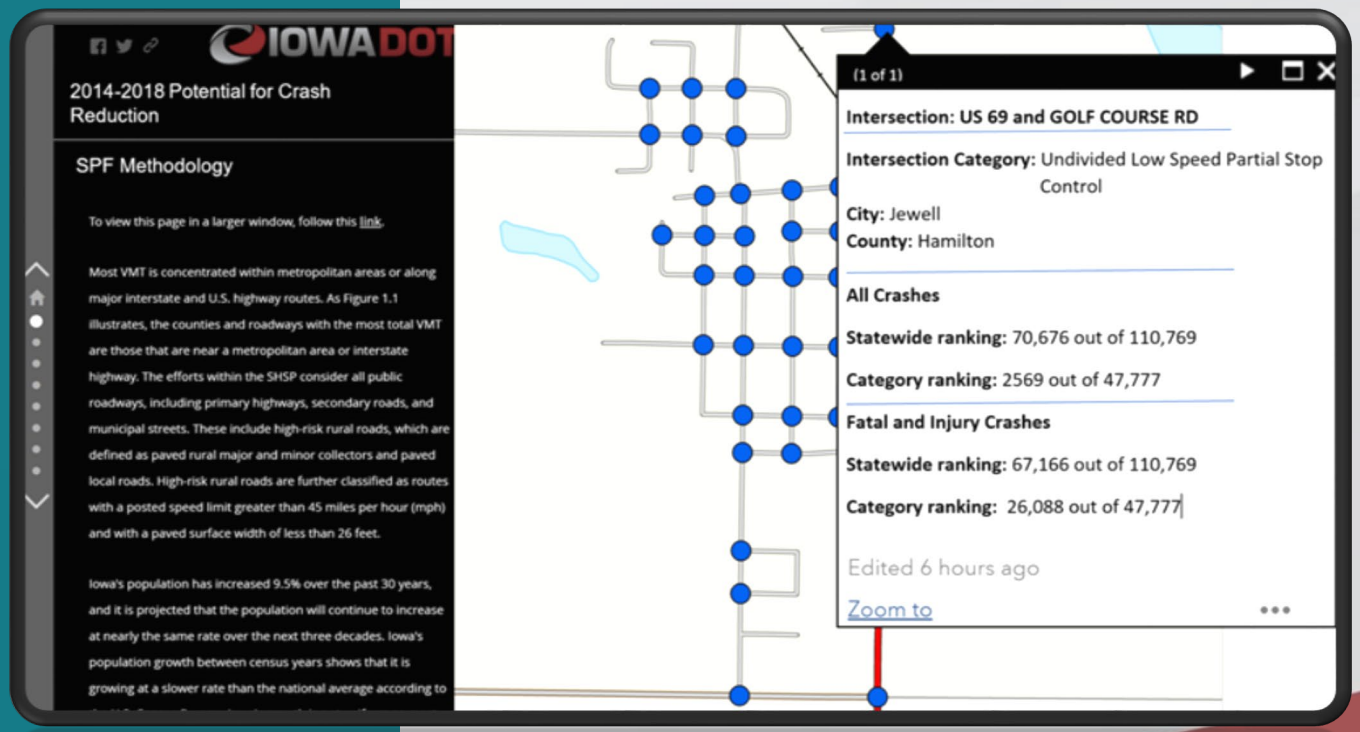


Current Efforts - Results

Potential Crash Reduction for all intersections:

Category ID	Category ID Descriptions	Road 1	Road 2	County	City	All (KABCO) Crashes		
						PCR/Year	Overall Ranking	Category Ranking
3	Divided Low Speed Traffic Signal Control	US 69	W 1ST ST & E 1ST ST	Polk	Ankeny	14.916	1	1
8	Roundabouts & Other Circular Intersections	US 30	IA 1/1st Ave	Linn	Mount Vernon	12.182	2	1
3	Divided Low Speed Traffic Signal Control	US 6/Euclid Ave	US 69/14th St	Polk	Des Moines	9.687	3	2
6	Univided Low Speed Traffic Signal Control	KEO 19TH ST NE EXIT RAMP	19TH ST	Polk	Des Moines	8.701	4	1
6	Univided Low Speed Traffic Signal Control	6TH AVE, N	DAY ST, W	Polk	Des Moines	8.303	5	2
3	Divided Low Speed Traffic Signal Control	US 69	E PARK AVE	Polk	Des Moines	8.192	6	3
4	Divided Low Speed Partial Stop Control	US 6	E Douglas Ave	Polk	Des Moines	8.181	7	1
6	Univided Low Speed Traffic Signal Control	GRAND AVE, E	9TH ST, N	Polk	Des Moines	8.069	8	3
1	High Speed Traffic Signal Control	IA 27	Viking Rd	Black Hawk	Cedar Falls	7.977	9	1
6	Univided Low Speed Traffic Signal Control	7TH ST	SCHOOL ST/7TH ST SW EXIT RAMP	Polk	Des Moines	7.613	10	4
1	High Speed Traffic Signal Control	IA 415	IA 160	Polk	Ankeny	7.474	11	2
6	Univided Low Speed Traffic Signal Control	US 69	SW 3RD ST & SE 3RD ST	Polk	Ankeny	7.111	12	5
3	Divided Low Speed Traffic Signal Control	IA 163	Hubbell Ave	Polk	Des Moines	6.519	13	4
7	Undivided Low Speed Partial Stop Control	US 69	DES MOINES ST	Polk	Des Moines	6.495	14	1
3	Divided Low Speed Traffic Signal Control	US 69	LINCOLIN WAY/GRAND AVE	Story	Ames	6.489	15	5
6	Univided Low Speed Traffic Signal Control	3RD ST	PIERCE ST	Woodbury	Sioux City	6.460	16	6
6	Univided Low Speed Traffic Signal Control	E 14TH ST	E 14TH NW ENTRANCE RAMP	Polk	Des Moines	6.394	17	7
3	Divided Low Speed Traffic Signal Control	US 6	SYCAMORE ST	Johnson	Iowa City	6.366	18	6
6	Univided Low Speed Traffic Signal Control	E 53RD ST	ELMORE CIR	Scott	Davenport	6.346	19	1
1	High Speed Traffic Signal Control	I- 29 SPECIAL CASE NE	US HWY 77	Woodbury	Sioux City	6.161	20	3
3	Divided Low Speed Traffic Signal Control	SERGEANT RD	S LAKEPORT ST	Woodbury	Sioux City	6.072	21	7
3	Divided Low Speed Traffic Signal Control	IA 163	UA 69	Polk	Des Moines	6.029	22	8
6	Univided Low Speed Traffic Signal Control	US 6	E38th St	Polk	Des Moines	5.872	23	8

Sneak Peak


IOWADOT
2014-2018 Potential for Crash Reduction
SPF Methodology
To view this page in a larger window, follow this link.
Most VMT is concentrated within metropolitan areas or along major interstate and U.S. highway routes. As Figure 1.1 illustrates, the counties and roadways with the most total VMT are those that are near a metropolitan area or interstate highway. The efforts within the SHSP consider all public roadways, including primary highways, secondary roads, and municipal streets. These include high-risk rural roads, which are defined as paved rural major and minor collectors and paved local roads. High-risk rural roads are further classified as routes with a posted speed limit greater than 45 miles per hour (mph) and with a paved surface width of less than 26 feet.
Iowa's population has increased 9.5% over the past 30 years, and it is projected that the population will continue to increase at nearly the same rate over the next three decades. Iowa's population growth between census years shows that it is growing at a slower rate than the national average according to
(1 of 1)
Intersection: US 69 and GOLF COURSE RD
Intersection Category: Undivided Low Speed Partial Stop Control
City: Jewell
County: Hamilton
All Crashes
Statewide ranking: 70,676 out of 110,769
Category ranking: 2569 out of 47,777
Fatal and Injury Crashes
Statewide ranking: 67,166 out of 110,769
Category ranking: 26,088 out of 47,777
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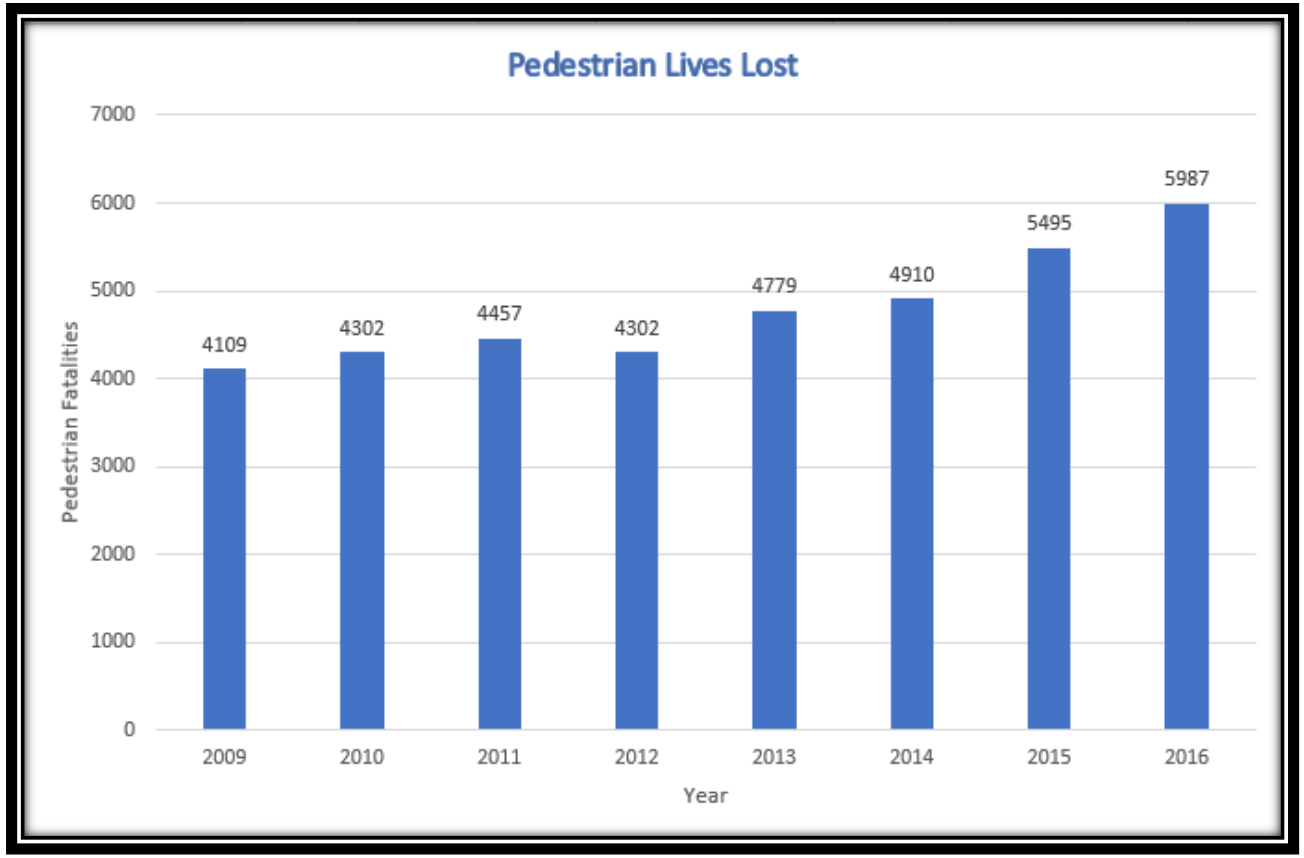
Zoom to

Future SPF Efforts

1. Develop interactive website
2. Segments
3. Other ideas:
   - Interchanges
   - Curves

Pedestrian Safety and Accessibility



2016 witnessed the most pedestrian fatalities since 1990.

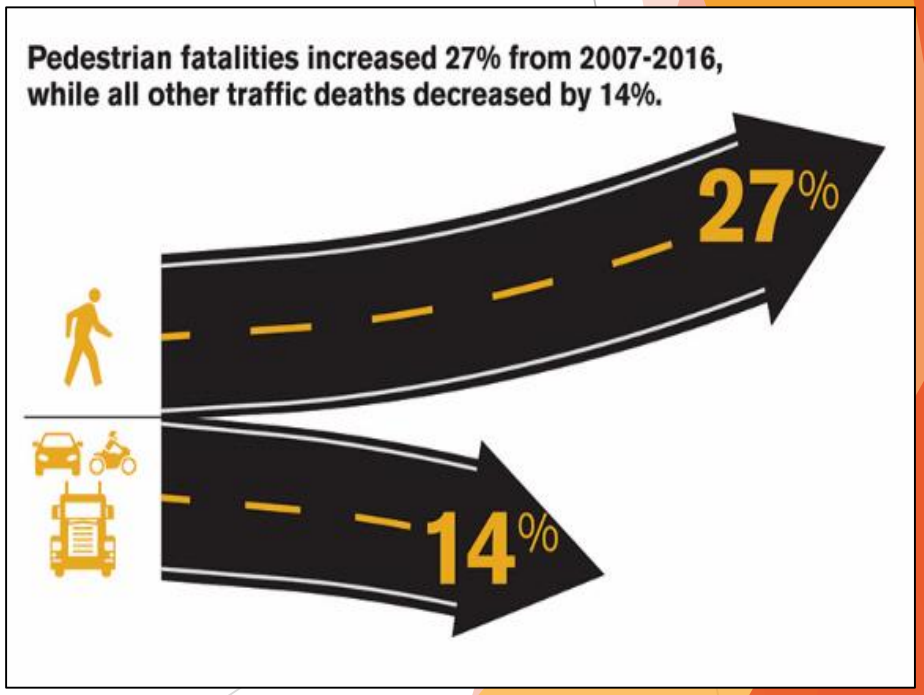
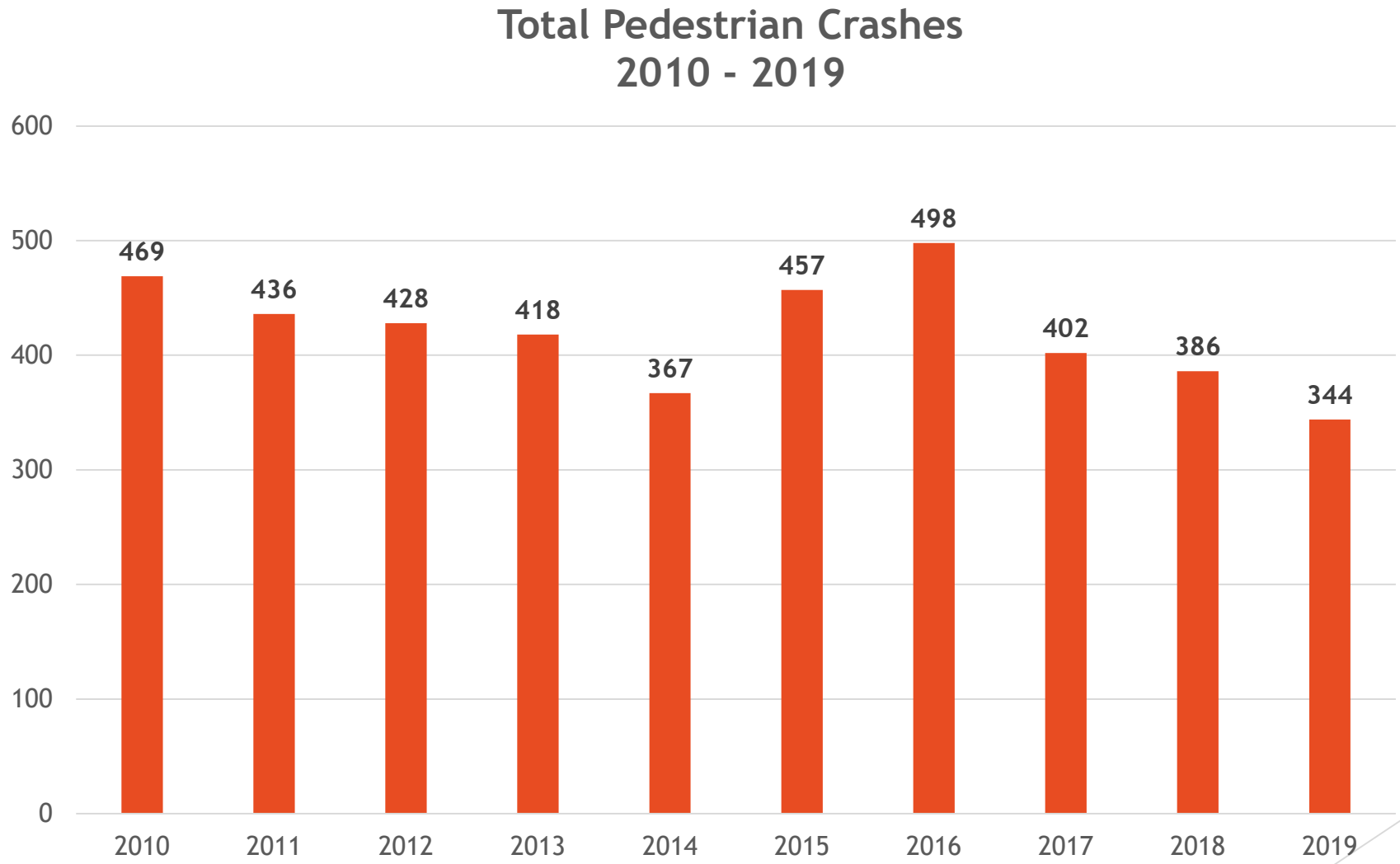


Photo Credit: GHSA

In 2016, pedestrian deaths accounted for 16% of the total motor vehicle deaths.
(Source: NHTSA)

Iowa 10 Year Trend



Iowa 10 Year Trend Subtotals

	Total	Urban	Rural
Crashes	4180	3908	243
Fatalities	220	147	73
Serious Injuries	695	608	80
Minor Injuries	1949	1833	101
Poss. Injuries	1628	1559	58

Note: Not all subcategories equal total figures due to potential reporting issues related to urban/rural locations not noted in crash reports

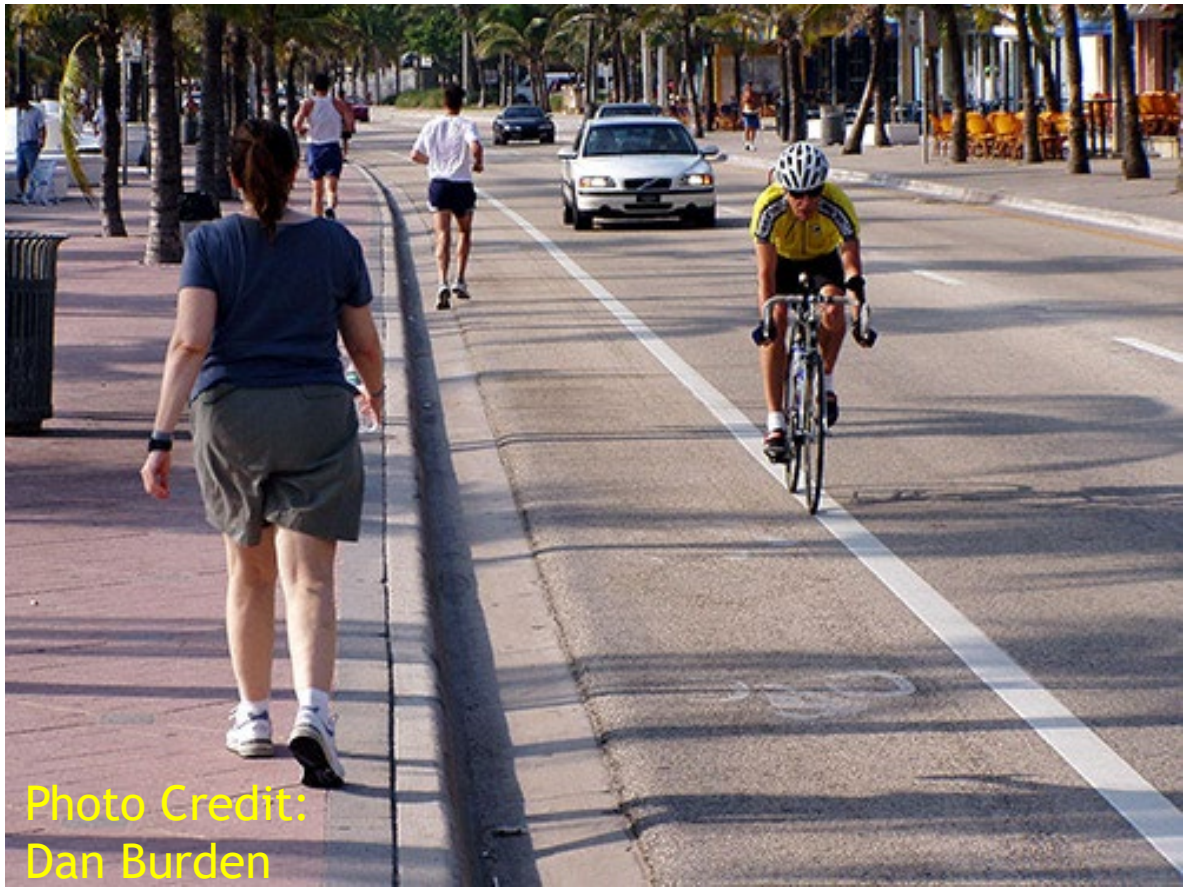
We are all pedestrians at some point.

Many people do not drive.

Other modes depend upon walking.

It is good for local business.

Walking is healthy exercise.



Pedestrians cross where it’s most convenient

Every Day Counts (EDC) – FHWA Initiative via Center for Accelerating Innovation

EDC is a State-based model that identifies and rapidly deploys proven, yet underutilized innovations to shorten the project delivery process, enhance roadway safety, reduce traffic congestion, and integrate automation. Proven innovations promoted through EDC facilitate greater efficiency at the State and local levels, saving time, money and resources that can be used to deliver more projects. EDC is your On-Ramp to Innovation!

FHWA works with State transportation departments, local governments, tribes, private industry and other stakeholders to identify a new collection of innovations to champion every two years that merit accelerated deployment.

https://www.fhwa.dot.gov/innovation/everydaycounts





EDC-5 Innovation (2019-2020 Program)
Safe Transportation for Every Pedestrian (STEP)

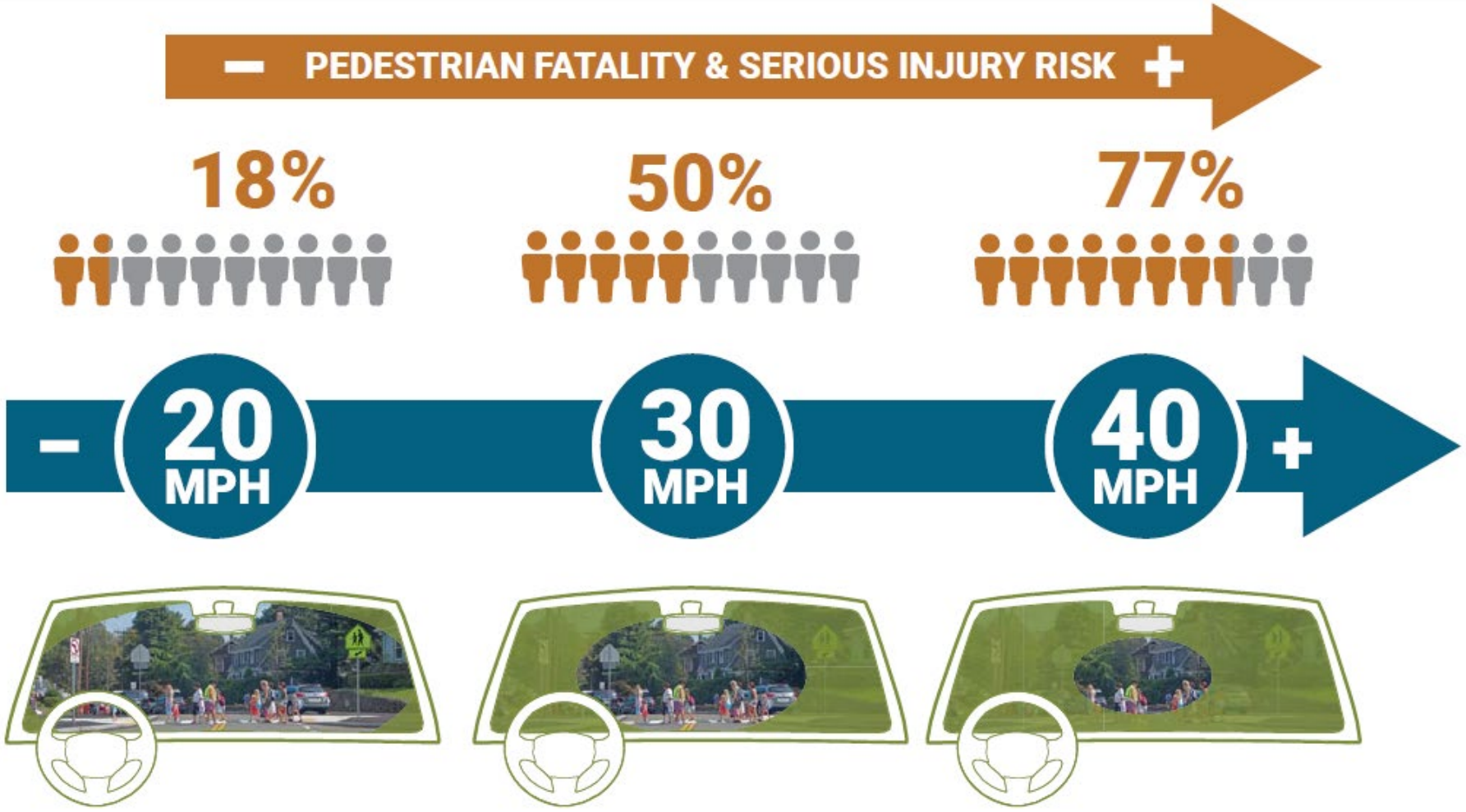
- **Over 74%** of pedestrian fatalities occur at non-intersection locations (NHTSA 2018)

- By focusing on all pedestrian crossing locations, urban and rural, and taking a systemic approach, agencies can comprehensively address a significant national safety problem and improve quality of life for pedestrians of all ages and abilities.

On-Ramp to Innovation
every day counts

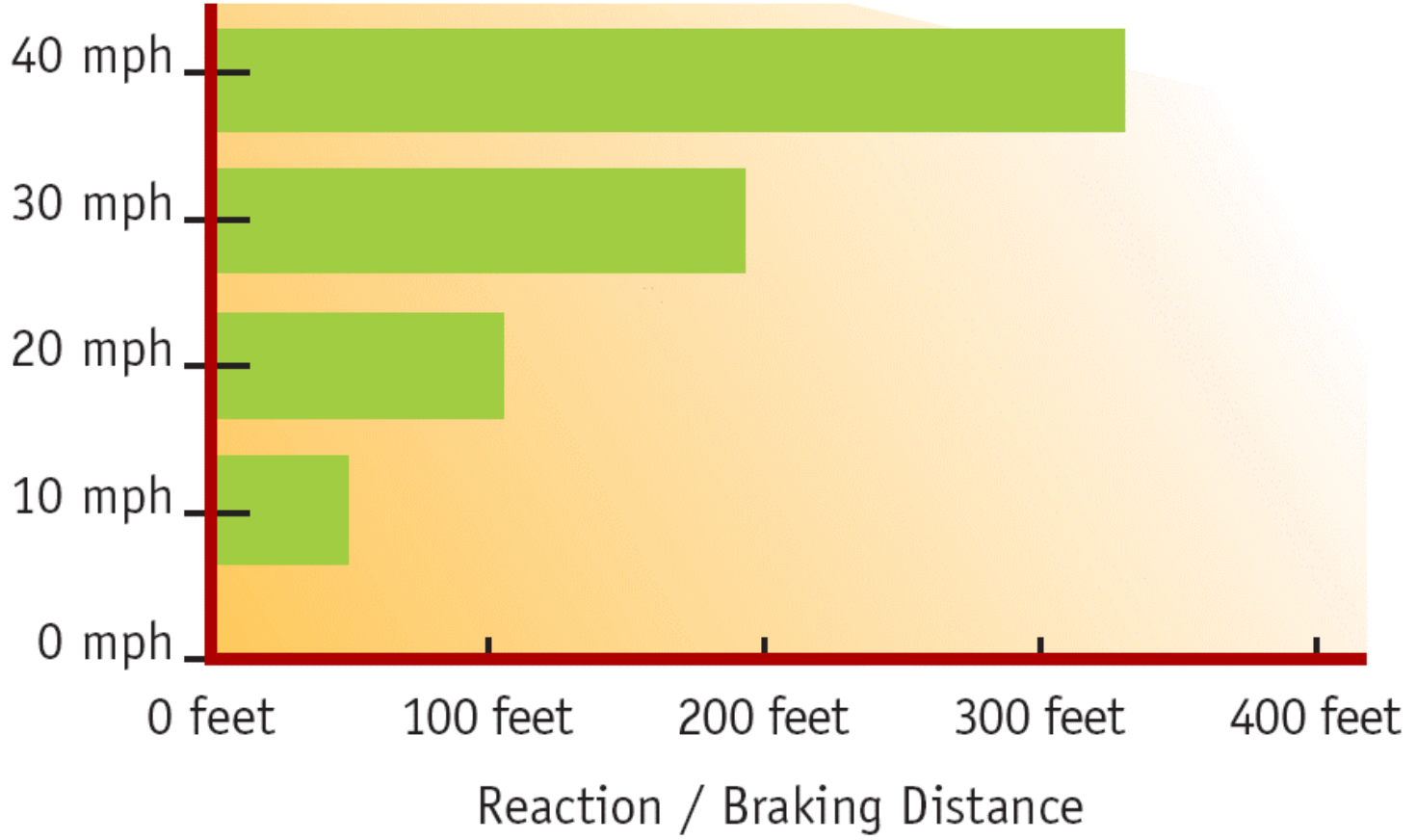
STEP Spectacular Seven Countermeasures

- Crosswalk Visibility Enhancements
- Raised Crosswalks
- Pedestrian Refuge Island
- Rectangular Rapid Flashing Beacon (RRFB)
- Pedestrian Hybrid Beacon (PHB)
- Leading Pedestrian Interval (LPI)
- Road Diets

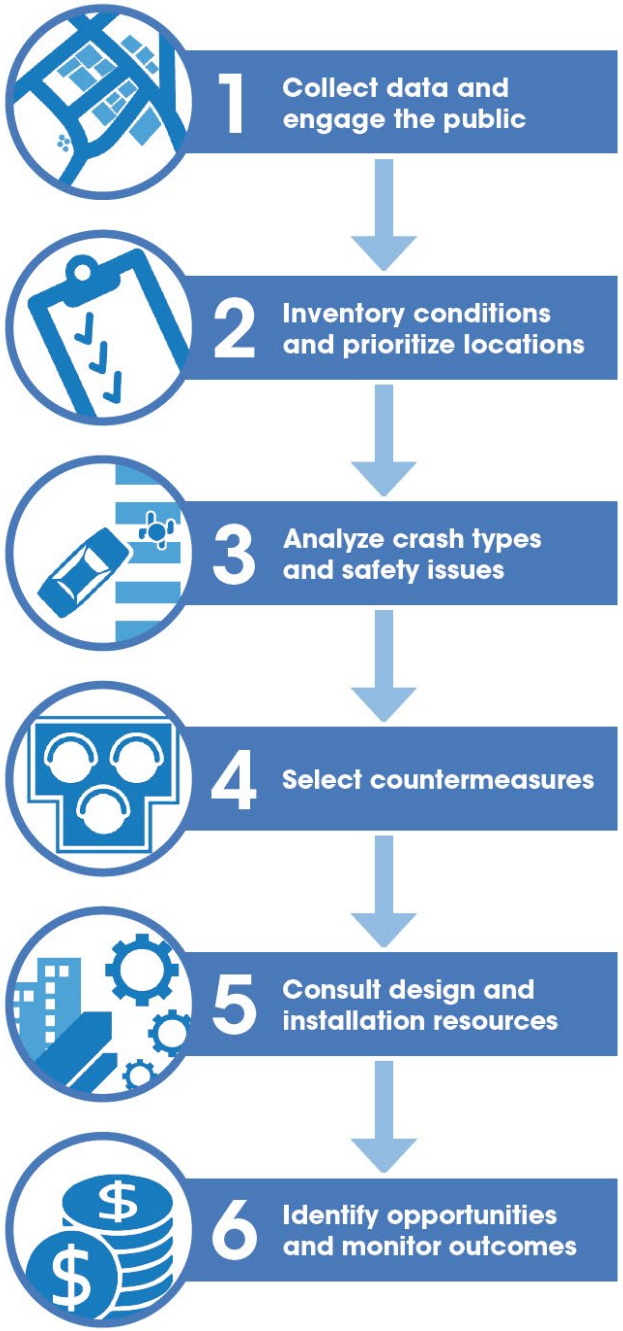


As motor vehicle speeds increase, the risk of serious injury or fatality for a pedestrian also increases (AARP Impact Speed and a Pedestrian's Risk of Severe Injury or Death 2011, p. 1). Also, motorist visual field and peripheral vision is reduced at higher speeds.

Speed Affects Crash Avoidance



High speeds equate to greater reaction and stopping distance



Guide for Improving Pedestrian Safety at Uncontrolled Crossing Locations

(July 2018, Updated)

https://safety.fhwa.dot.gov/ped_bike/step/docs/STEP_Guide_for_Improving_Ped_Safety_at_Unsig_Loc_3-2018_07_17-508compliant.pdf

Table 1. Application of pedestrian crash countermeasures by roadway feature.

Roadway Configuration	Posted Speed Limit and AADT								
	Vehicle AADT <9,000			Vehicle AADT 9,000–15,000			Vehicle AADT >15,000		
	≤30 mph	35 mph	≥40 mph	≤30 mph	35 mph	≥40 mph	≤30 mph	35 mph	≥40 mph
2 lanes (1 lane in each direction)	❶ 2 4 5 6	❶ 5 6 7 9	① 5 6 ❼ ❾	❶ 4 5 6	❶ 5 6 7 9	① 5 6 ❼ ❾	❶ 4 5 6 7 9	① 5 6 7 9	① 5 6 ❾
3 lanes with raised median (1 lane in each direction)	❶ 2 3 4 5	❶ ❸ 5 7 9	① ❸ 5 ❼ ❾	① 3 4 5	① ❸ 5 ❼ ❾	① ❸ 5 ❼ ❾	① ❸ 4 5 7 9	① ❸ 5 ❼ ❾	① ❸ 5 ❾
3 lanes w/o raised median (1 lane in each direction with a two-way left-turn lane)	❶ 2 3 4 5 6 7 9	❶ ❸ 5 6 7 9	① ❸ 5 6 ❾	① 3 4 5 6 7 9	① ❸ 5 6 ❼ ❾	① ❸ 5 6 ❾	① ❸ 4 5 6 7 9	① ❸ 5 6 ❾	① ❸ 5 6 ❾
4+ lanes with raised median (2 or more lanes in each direction)	❶ ❸ 5 7 8 9	❶ ❸ 5 7 8 9	① ❸ 5 8 ❾	① ❸ 5 7 8 9	① ❸ 5 ❼ 8 ❾	① ❸ 5 8 ❾	① ❸ 5 ❼ 8 ❾	① ❸ 5 8 ❾	① ❸ 5 8 ❾
4+ lanes w/o raised median (2 or more lanes in each direction)	❶ ❸ 5 6 7 8 9	① ❸ 5 ❻ 7 8 9	① ❸ 5 ❻ 8 ❾	① ❸ 5 ❻ 7 8 9	① ❸ 5 ❻ ❼ 8 ❾	① ❸ 5 ❻ 8 ❾	① ❸ 5 ❻ ❼ 8 ❾	① ❸ 5 ❻ 8 ❾	① ❸ 5 ❻ 8 ❾

Given the set of conditions in a cell,

- # Signifies that the countermeasure is a candidate treatment at a marked uncontrolled crossing location.
- ● Signifies that the countermeasure should always be considered, but not mandated or required, based upon engineering judgment at a marked uncontrolled crossing location.
- ○ Signifies that crosswalk visibility enhancements should always occur in conjunction with other identified countermeasures.*

The absence of a number signifies that the countermeasure is generally not an appropriate treatment, but exceptions may be considered following engineering judgment.

1 High-visibility crosswalk markings, parking restrictions on crosswalk approach, adequate nighttime lighting levels, and crossing warning sign
2 Raised crosswalk
3 Advance Yield Here To (Stop Here For) Pedestrians sign and yield (stop) line
4 In-Street Pedestrian Crossing sign
5 Curb extension
6 Pedestrian refuge island
7 Rectangular Rapid-Flashing Beacon (RRFB)**
8 Road Diet
9 Pedestrian Hybrid Beacon (PHB)**

*Refer to Chapter 4, 'Using Table 1 and Table 2 to Select Countermeasures,' for more information about using multiple countermeasures.
**The PHB and RRFB are not both installed at the same crossing location.

4 Select countermeasures

Table 2. Safety issues addressed per countermeasure.

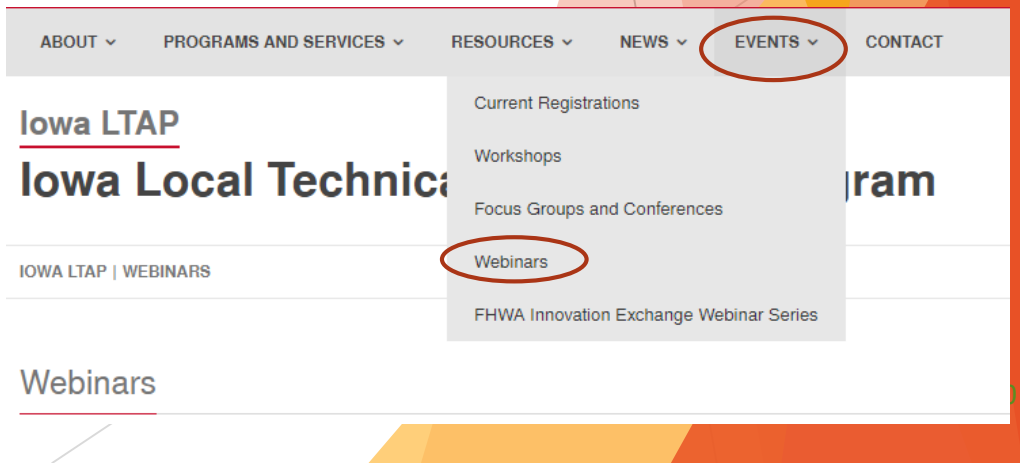
Pedestrian Crash Countermeasure for Uncontrolled Crossings	Safety Issue Addressed				
	Conflicts at crossing locations	Excessive vehicle speed	Inadequate conspicuity/ visibility	Drivers not yielding to pedestrians in crosswalks	Insufficient separation from traffic
Crosswalk visibility enhancement	✓	✓	✓	✓	✓
High-visibility crosswalk markings*	✓		✓	✓	
Parking restriction on crosswalk approach*	✓		✓	✓	
Improved nighttime lighting*	✓		✓		
Advance Yield Here To (Stop Here For) Pedestrians sign and yield (stop) line*	✓		✓	✓	✓
In-Street Pedestrian Crossing sign*	✓	✓	✓	✓	
Curb extension*	✓	✓	✓		✓
Raised crosswalk	✓	✓	✓	✓	
Pedestrian refuge island	✓	✓	✓		✓
Pedestrian Hybrid Beacon	✓	✓	✓	✓	
Road Diet	✓	✓	✓		✓
Rectangular Rapid-Flashing Beacon	✓		✓	✓	✓

Resources

- Guide for Improving Pedestrian Safety at Uncontrolled Crossing Locations
  - https://safety.fhwa.dot.gov/ped_bike/step/docs/STEP_Guide_for_Improving_Ped_Safety_at_Unsig_Loc_3-2018_07_17-508compliant.pdf
- Field Guide for Selecting Countermeasures at Uncontrolled Pedestrian Crossing Locations
  - https://safety.fhwa.dot.gov/ped_bike/step/docs/pocket_version.pdf
- EDC5 STEP Website
  - https://www.fhwa.dot.gov/innovation/everydaycounts/edc_5/step2.cfm
- FHWA Pedestrian Safety Website
  - https://safety.fhwa.dot.gov/ped_bike/

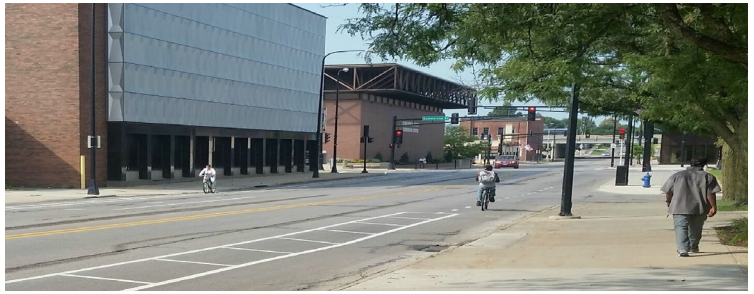
Additional Resources

- Pedestrian Safety Guide and Countermeasure Selection System (PEDSAFE)
  - http://www.pedbikesafe.org/PEDSAFE/index.cfm
- Iowa LTAP Webinars
  - https://iowaltap.iastate.edu/webinars/
  - Safety – General Safety
    - Countermeasures for Pedestrian Safety (2 days)
  - Operations & Maintenance
    - Accessible Sidewalks and Curb Ramps: Design to Installation (2 days)
  - No cost



IOWA DOT
GETTING YOU THERE

Bicyclists and Pedestrian
Systemic Safety Analysis



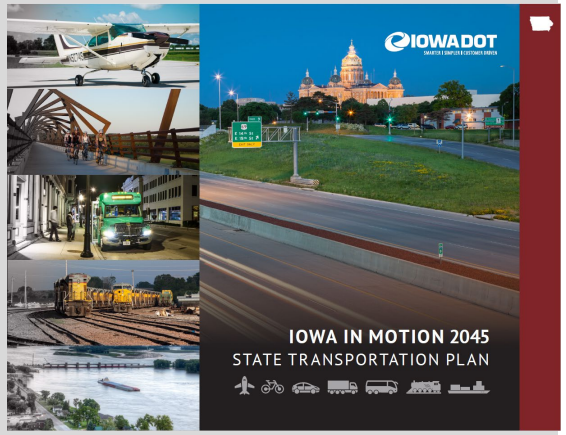
Systemic
Safety Analysis

"The systemic approach to safety involves widely implemented Improvements based on high-risk roadway features correlated with specific severe crash types. The approach provides a more comprehensive method for safety planning and implementation that supplements and complements traditional site analysis." *

*FHWA. 2013. Systemic Safety Project Selection Tool. Safety.fhwa.dot.gov/systemic/fhwasa13019/. U.S. Department of Transportation, Federal Highway Administration. July.

Bicyclists and Pedestrian Systemic Safety Analysis

Iowa in Motion 2045



"Evaluate Key safety challenges pertaining to bicycling and walking and develop crash reduction strategies"

Iowa Bicycle and Pedestrian Long Range Plan

"Identify the primary urban and rural crash types occurring in Iowa and develop strategies for reducing crashes"

"Develop methodology for bicycle and pedestrian safety audits of high crash corridors and intersections to identify adequate counter measures"

Iowa SHSP

"Conduct enforcement campaigns related to bicycle and pedestrian awareness at targeted intersections"

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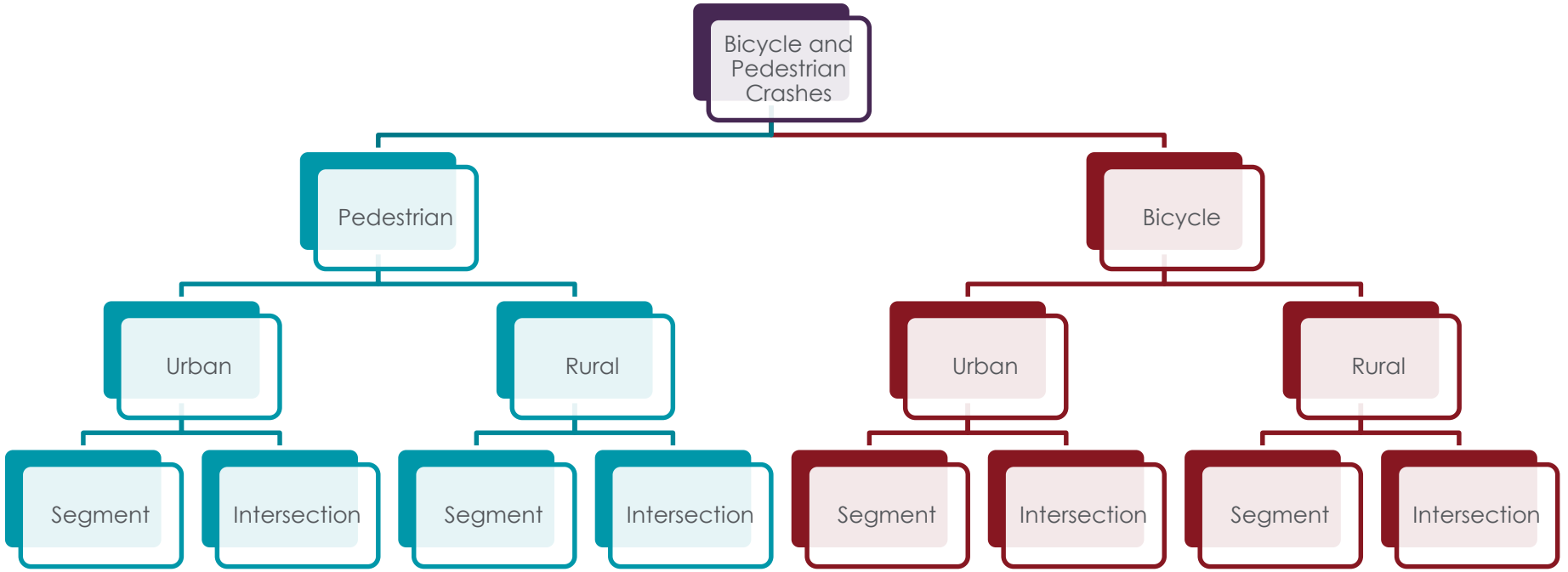


Intersections

- Attributes included
  - AADT
  - Intersection Angle
  - Intersection type
  - Number of Lanes
  - Number of Legs
  - Speed Limit
  - Traffic Control

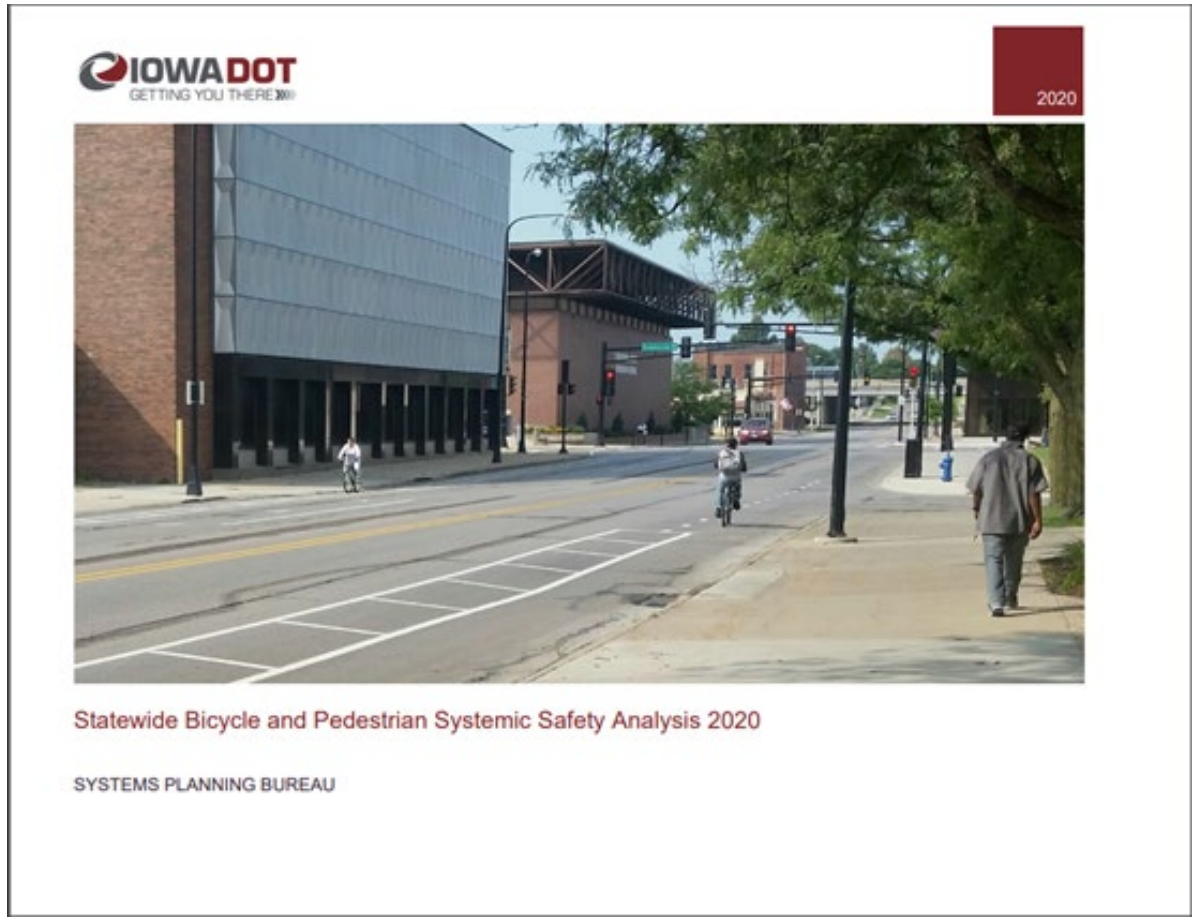
Segments

- Attributes included
  - AADT
  - Median Type
  - Number of Lanes
  - Parking Type
  - Shoulder Rumble
  - Shoulder Type
  - Shoulder Width
  - Speed Limit

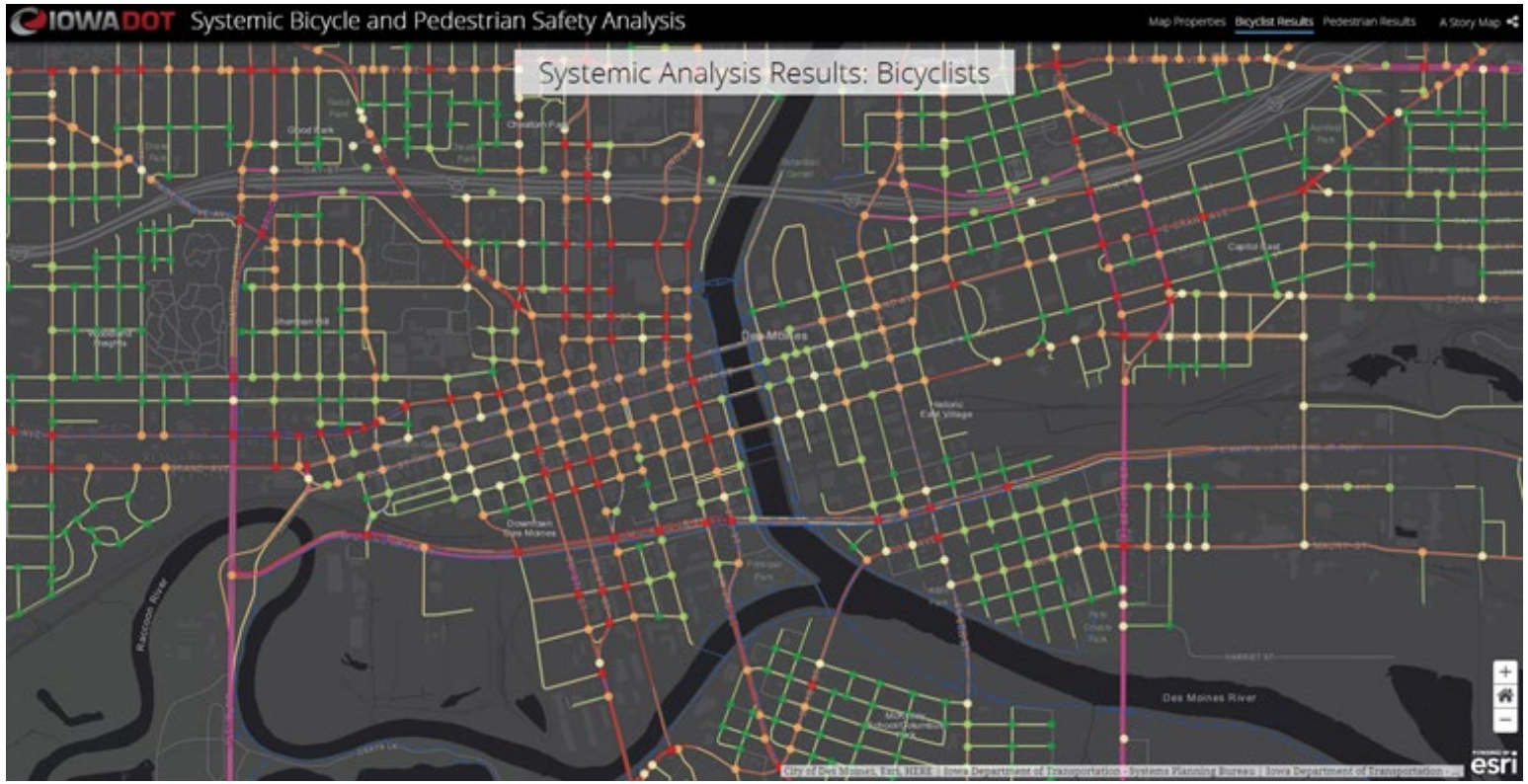
Normalization, Weighting, and Composite score

- Normalization
  - For each element a rate is developed based on the number of crashes and associated mileage related to that attribute.
  - A normalized Score of 1-10 is developed based on the range of possible values for each element attribute.
- Weighting
  - Once all the elements have been normalized to a common scale a weighting multiplier is applied.
  - This is essentially done for two reasons
    - To eventually have a composite score from 0-100
    - In the future the ability to emphasize elements over each other.
- Composite Scores
  - After weighting, all the weighted element scores are added together for each segment or intersection which makes up a composite score.

Outputs and Results



Outputs and Results



Additional Elements to Consider

- Spatial Elements
  - Proximity to existing non-motorist infrastructure
  - Proximity to transit stops
  - Proximity to schools
- Crash Data
  - Segment level non-motorist crashes
- Estimated exposure
  - University of Iowa study/analysis

THANK YOU FOR YOUR TIME AND ATTENTION

Chris Poole
Safety Programs Engineer
Traffic & Safety Bureau
515-239-1267
Chris.Poole@iowadot.us

Sarah Okerlund
Urban Engineer
Local Systems Bureau
515-239-1291
Sarah.Okerlund@iowadot.us

Samuel Sturtz
Transportation Planner
Systems Planning Bureau
515-239-1788
Samuel.Sturtz@iowadot.us