Ohio · Kentucky · Indiana
Regional Council of Governments

OKI Prioritization Process: Safety

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Goal: Improve Safety Ranking Method

Current Method:

1. Compute crash rates for road segments.
2. Ranges of crash rates correspond to 0-5 points in prioritization.
3. For a project the *highest* point value of any road segment is used as the safety ranking.

Goal: Improve Safety Ranking Method

Concerns:

1. Crash rates are highly susceptible to segment length.
2. HSM recommends other options for assessing roadway safety.
3. Assigning a project the highest point value among all segments does not necessarily give an accurate representation of safety issues.

Proposal: Use Excess Crash Costs to Rank Safety

- Excess crash costs estimate the cost of crashes *beyond what are expected* on a given roadway.
- More reflective of a road segment’s traffic volume and road geometry.
- Capture varying severity of crashes more effectively than crash rates.
- Less susceptible to changes in segment length, though segment length does still influence some.

Geometry Example: 4 way stop

Geometry Example: Roundabout

Computing Excess Crash Costs

1. Create **safety performance functions** for functionally classified road segments in the OKI region.
2. Compute **excess expected crashes** for each type of crash (Fatal (K), Incapacitating Injury (A), Minor Injury (B), Property Damage Only (PDO))
3. Use CDC and FHWA estimates of the costs of each type of crash to compute the **cost of the excess expected crashes**.

Safety Performance Functions

- Introduced for jurisdictions to use in HSM 2010.
- Two options:
  - Use functions created on national data sets and calibrate to local conditions.
  - Create functions on local data directly.
- We created safety performance functions on crash data from the OKI region for 2016-2020.
- Functions rely on roadway geometry and traffic volume.
- Only road segments and intersections involving functionally classified roads were considered in the analysis.

Segment characteristics						
Features						
Urban/ Rural	Number of lanes	Two way turn	One way	# of segments	# of crashes	# of crashes w/injury
urban	2	No	No	5,358	39,066	4,857
urban	4	No	No	2,619	48,797	5,684
rural	2	No	No	1,873	9,614	1,807
urban	2	Yes	No	734	8,686	931
urban	4	Yes	No	634	14,690	1,757
urban	2	No	Yes	364	4,265	440
urban	3	No	No	299	3,441	401
urban	6	No	No	143	2,994	308
urban	4	No	Yes	114	2,283	223

Intersection characteristics

Features			# of intersections	# of crashes	# of crashes w/injury
Urban/ Rural	# of legs	Stop Control			
urban	3	minor stop	6,800	13,879	1,866
rural	3	minor stop	1,416	1,308	230
urban	4	signal	1,412	20,752	2,586
urban	4	minor stop	1,294	3,832	517
urban	3	signal	958	7,651	954
rural	4	minor stop	246	480	125

Observed

- Obtained from ODOT,KYTC, and INDOT crash reports.
- Typically undercount PDO crashes.

Predicted

- Output of the safety performance function.
- May not be an integer.
- Based on roadway geometry and traffic volume.

Expected Crashes

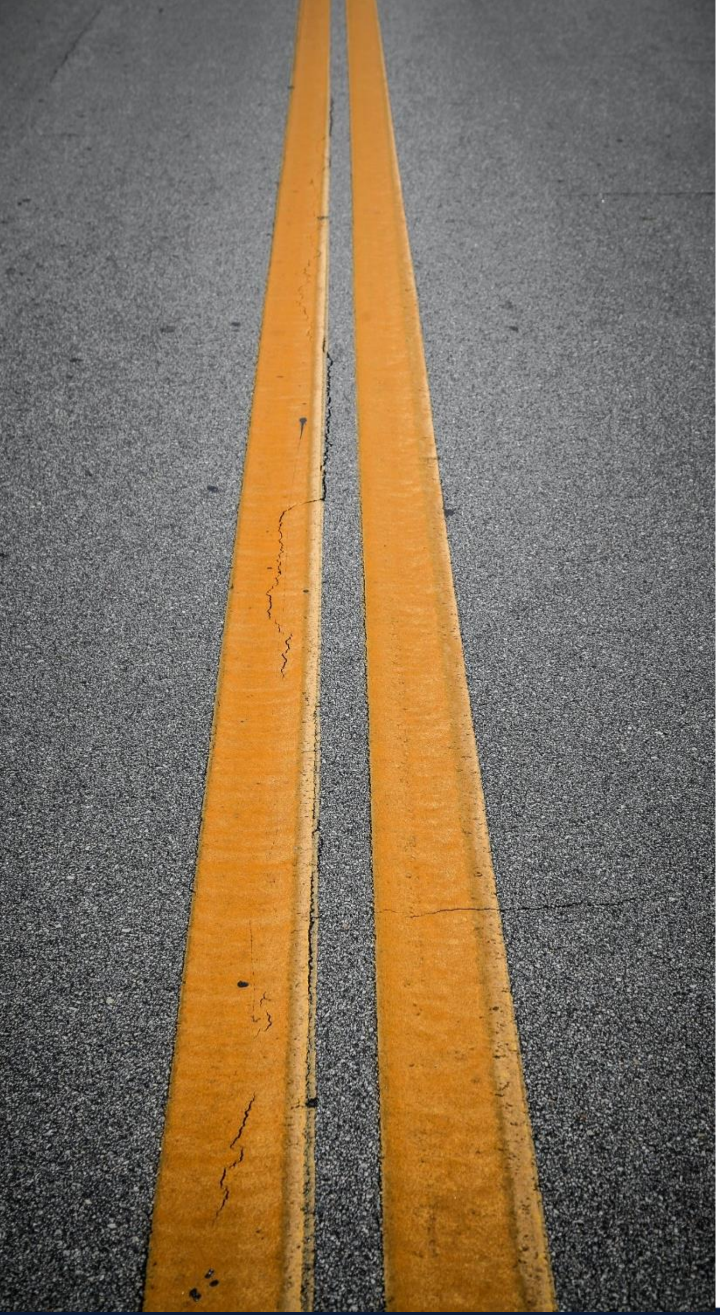
- A weighted average of observed and predicted crashes.
- Moderates the impact of observed crashes that may be far outside the norm for this particular 5 year cycle.

Excess Expected Crashes = Expected Crashes – Predicted Crashes

Winton Road

Between Dutch Colony Dr and Kings Run Dr

Accident Type	Number of Accidents	Excess cost
Fatal – Observed	3	
Fatal – Excess	0.2	$2,393,603
Serious Injury – Observed	7	
Serious Injury – Excess	2.3	$760,490
Minor Injury – Observed	16	
Minor Injury – Excess	9.2	$949,915
PDO – Observed	53	
PDO – Excess	23	$301,300
		$4.4 million



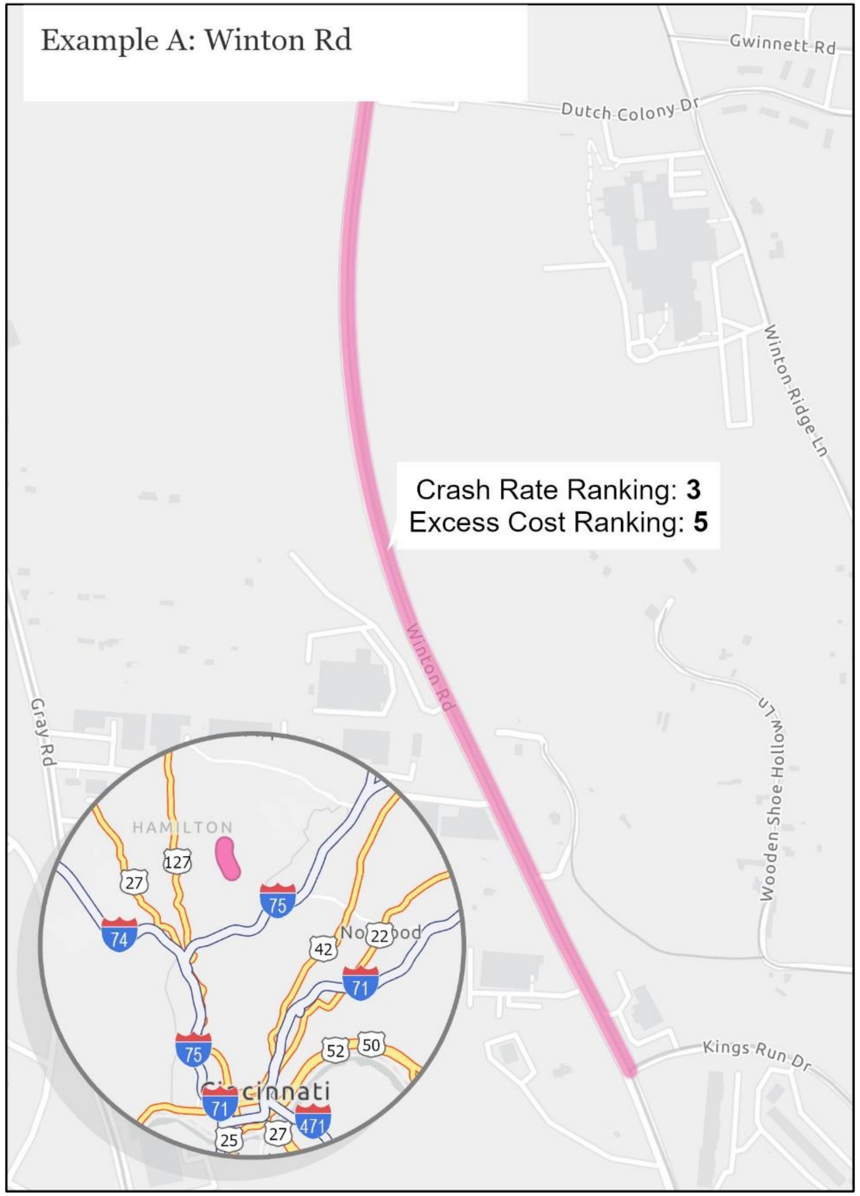
Use in prioritization process

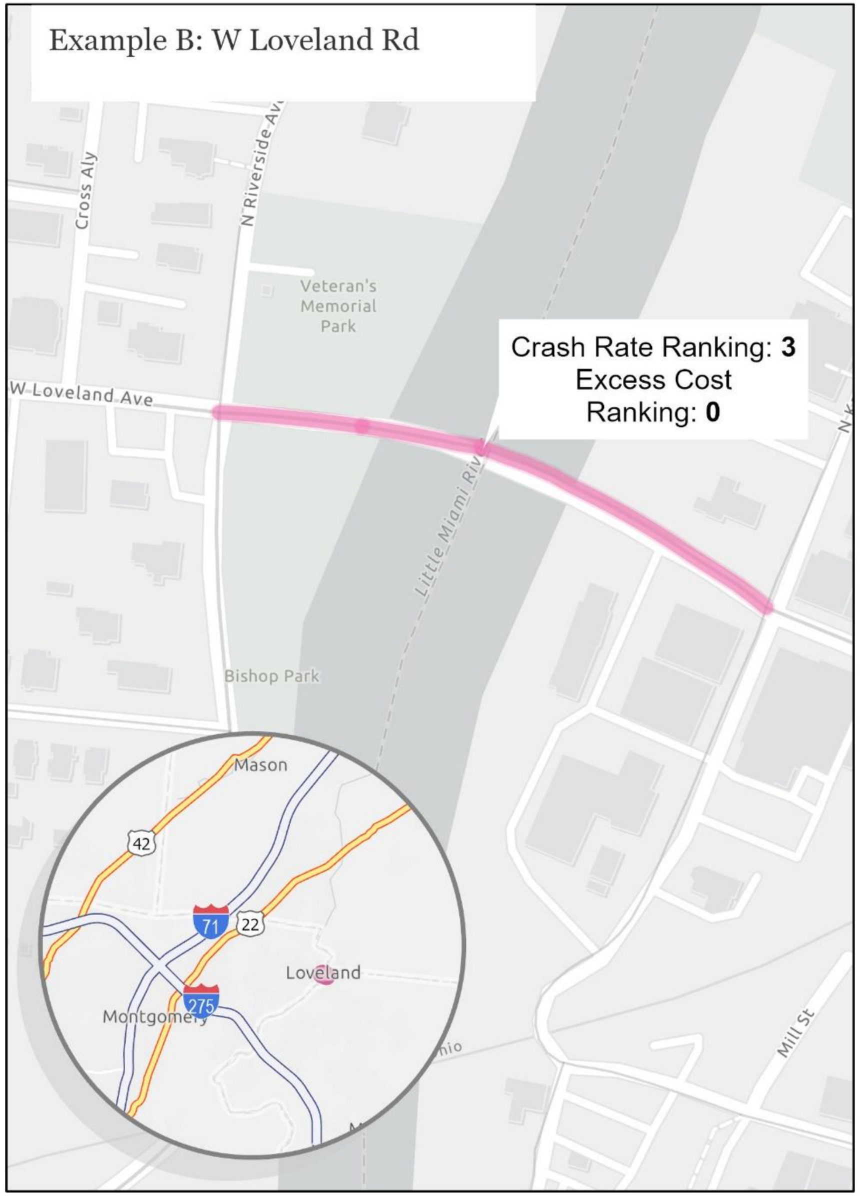
1. Excess crashes are converted to excess crash costs. This captures the severity of the crashes in addition to the quantity.
2. For segments, costs are converted to excess cost per mile to allow direct comparison. No conversion is needed for intersections.
3. A ranking for each segment (resp. intersection) is obtained by determining the segment's (resp. intersection's) excess cost per mile quintile among those segments (resp. intersections) with an excess cost.
4. The average of all segment rankings is used to assign a score between 0 and 5.

Ranking ranges (by quintile)

Ranking table for segments		
Rank	Range	
0	$0	$0
1	$127	$76,020
2	$76,068	$197,768
3	$197,859	$469,801
4	$469,852	$1,300,343
5	$1,301,032	$30,583,055

Ranking table for intersections		
Rank	Range	
0	$0	$0
1	$5	$4,034
2	$4,044	$11,161
3	$11,162	$20,966
4	$20,985	$51,247
5	$51,297	$1,551,792


Example A: Winton Rd
Crash Rate Ranking: 3
Excess Cost Ranking: 5
Winton Rd
Gwinnett Rd
Dutch Colony Dr
Winton Ridge Ln
Gray Rd
Wooden Shoe Hollow Ln
Kings Run Dr
HAMILTON
Cincinnati


Example B: W Loveland Rd
Crash Rate Ranking: 3
Excess Cost Ranking: 0
W Loveland Ave
Cross Aly
N Riverside Ave
Veteran's Memorial Park
Little Miami Riv
Bishop Park
Mill St
Mason
Loveland
Montgomery

Other options for ranking using excess crash costs

1. Define fixed ranges instead of using quintiles.
2. Use a different method to compute a project’s safety score, such as maximum ranking or median ranking.
3. Create rankings within each type of segment/intersection grouping, or based on urban/rural. This would cause the highest excess crash costs *within* each grouping to get a ranking of 5, regardless how those compare to costs for other groupings.

Questions?

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