Safety Index Calculation Methodology

The UDOT Safety Index is a value that combines multiple safety statistics into a single, zero to ten scale number. UDOT uses the Safety Index for project prioritization and roadway safety assessment. This page describes the current (updated Apr 2013) safety index calculation.

Four factors comprise the UDOT Safety Index:
1. Ratio of crash rate vs. statewide average crash rate
2. Number of crashes per mile per year
3. Ratio of severe crash rate vs. statewide average severe crash rate
4. Number of severe crashes per mile per year

To develop the Safety Index, individual, zero to five scores are derived for the four factors by comparing the value of an individual road segment against the statewide distribution for roadways of similar volume and functional class. The scoring breakdown is:

> 0 – segment with no crashes
> 1 – segment below the 50th percentile
> 2 – segment from the 51st to the 75th percentile
> 3 – segment from the 76th to the 90th percentile
> 4 – segment from the 91st to the 95th percentile
> 5 – segment above the 95th percentile.

After each factor receives a score, the scores are summed. The summation results in a zero to 20 value, which is then divided by two to create the final zero to ten Safety Index.

$$SI = \frac{S_{CR} + S_{CPM} + S_{Sev\,CR} + S_{Sev\,CPM}}{2}$$

where SI is the Safety Index,

S_{CR} is the Crash Rate Score,
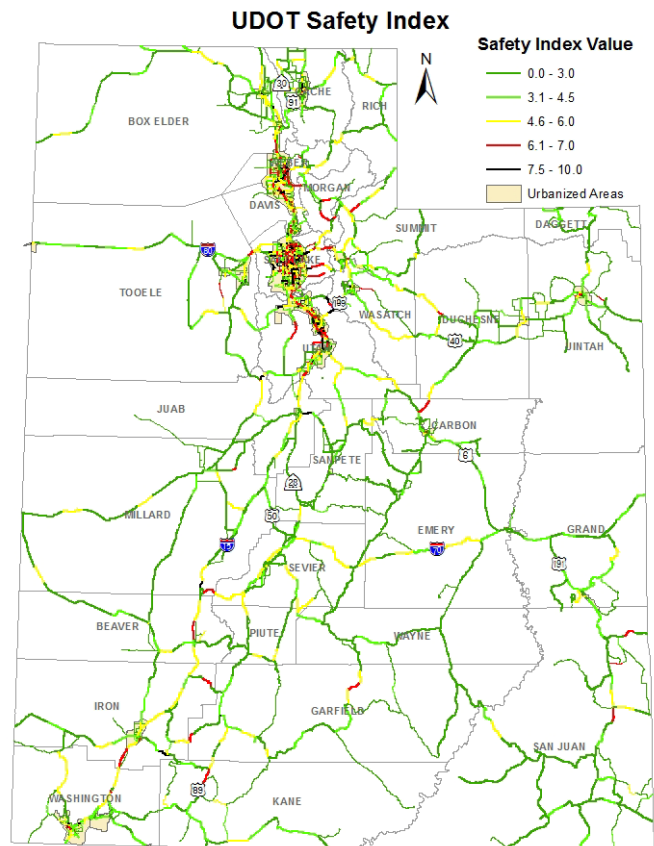
S_{CPM} is the Crashes per Mile Score,

$S_{Sev\,CR}$ is the Severe Crash Rate Score, and

$S_{Sev\,CPM}$ is the Severe Crashes per Mile Score.

The four factors comprising the UDOT Safety Index each offer a unique perspective of a roadway's crash history. Both crashes per mile scores (S_{CPM} and $S_{Sev\,CPM}$) indicate which roadways experience the greatest crash frequencies. However, because urban areas generally serve higher traffic volumes than rural areas, the crash occurrences are expected to be significantly higher. Therefore, the crash rate scores (S_{CR} and $S_{Sev\,CR}$) are also used to indicate which roadways have more crashes, after accounting for volume.

The two severe crash scores ($S_{Sev\,CR}$ and $S_{Sev\,CPM}$) help identify the roadways that experience the worst crashes. These scores, in turn, are offset by the total crash scores (S_{CR} and S_{CPM}) because a single severe crash on a low volume road can inflate the severe crash rate dramatically. The balance created using these four factors yields a safety index that is intuitive and comprehensive.

Originally, the UDOT Safety Index was developed for the Utah State Highway system, but has since been expanded to include the Utah Federal-Aid Road system. Theoretically, the UDOT Safety Index can be calculated for any road segment for which crash data, functional class data, and traffic volumes are available. The below map shows the safety index values derived from 2009-2011 UDOT crash data.

UDOT Safety Index

Safety Index Value
- 0.0 - 3.0
- 3.1 - 4.5
- 4.6 - 6.0
- 6.1 - 7.0
- 7.5 - 10.0
- Urbanized Areas

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