Frequently Asked Questions

SPIS Background Questions

What is the Safety Priority Index System?

Like a road sign warning of potential hazards ahead, the Safety Priority Index System (SPIS) developed by ODOT alerts transportation officials to public roadway segments exhibiting unusually high occurrence of crashes.

SPIS compares the number of crashes on the entire roadway network across Oregon, including city streets, county roads and state highways. It generates both "on-state highway" and "off-state highway" annual reports, listing public roadway segments with a calculated SPIS score. The SPIS score is based on crash rate, frequency and severity over the prior three calendar years. The higher a SPIS score, the higher the potential safety needs for the identified roadway segment.

The consistent, data-driven and unbiased methodology of SPIS enables the ranking and comparing of roadway safety at local, regional and statewide levels. Transportation officials may use the annual SPIS reports to guide their investigations and evaluations of public roadway safety issues within their jurisdictions, and to prioritize roadway segments to investigate for potential safety improvements.

Why did ODOT develop SPIS?

ODOT originally developed SPIS in 1986 as a network-wide process to identify segments of state highways to investigate for potential safety improvements.

In response to the Intermodal Surface Transportation Efficiency Act (ISTEA) of 1991, ODOT developed its Safety Management System and identified SPIS as one of several essential building blocks.

How does ODOT use SPIS?

SPIS is ODOT's primary tool for selecting and identifying highway locations for investigation. The ODOT Traffic-Roadway Safety (TRS) section uses SPIS to generate annual "on-state highway" reports for each of its five regions. These SPIS reports rank state highway segments within each ODOT region based on the calculated SPIS scores.

Note: They do **not** include information for SPIS segments on county roads or city streets, hence the reference to "on-state highway."

The regions use the annual SPIS reports to prioritize their investigations and evaluations of highway safety issues within their regions; they may focus on the top 5 to 10 percent of the SPIS-identified locations. If a correctable situation is identified, the region performs a benefit/cost analysis and initiates appropriate projects to address the safety issue at the SPIS site, as feasible.

How can Oregon counties and cities use SPIS?

SPIS generates annual "off-state highway" reports that list the segments of county roads and city streets, within each county, that have a calculated SPIS score.

Note: To calculate a SPIS score for a county road or city street, SPIS must have a documented traffic volume captured for the roadway. Additionally, the off-state highway reports **only** capture information for SPIS segments on county roads and city streets; they do **not** include information for SPIS segments on state highways.

Counties, cities and other jurisdictions may use the annual off-state reports to:
- Guide investigations, assessments and evaluations of local roadway safety issues
- Prioritize crash reduction countermeasures and safety efforts at specific locations
- Validate an existing methodology for prioritizing roadway safety projects
- Bring a new, consistent, unbiased, data-driven perspective to an existing roadway safety prioritization process
- Evaluate or compare the safety of the overall roadway system within, across or outside its jurisdiction
- Make "safety" a factor and remove politics from roadway-related decision-making
- Focus limited resources on the highest safety priorities or those that deliver the "biggest bang for the buck"
- Respond to questions and concerns from citizens and public officials regarding local roadway safety
- Develop a local roadway safety public awareness campaign

Section 1-6: Using Annual SPIS, of the SPIS and OASIS User Guide includes examples of how to use SPIS reports to guide roadway safety investigations.

Why is it important to have a safety priority system like SPIS?

A data-driven safety priority system helps to consistently identify and rank roadway sites most likely to benefit from crash reduction countermeasures. It also helps to prioritize safety on the overall roadway system and to make safety a factor in decision-making.

A safety priority system like SPIS also demonstrates that a jurisdiction has an established roadway safety prioritization policy that guides its decision-making process. It helps a jurisdiction to be proactive to safety and not just reactive: Instead of reacting to the latest complaint, the jurisdiction can show it has a process and has thought about how to prioritize safety.

Can a county or city develop its own safety priority system?

Yes, a county or city may develop its own roadway safety prioritization process and system. Such a program may or may not use the annual SPIS reports from ODOT. ODOT makes these reports available for local transportation officials to use or not use as best meets with each jurisdiction's needs.

If a county or city chooses to develop its own safety priority system, it may want to consider using the Oregon Adjustable Safety Index System (OASIS) available from ODOT. Similar to SPIS, OASIS calculates an annual safety score and ranks public roadway segments based on crash rate, frequency and severity. While SPIS uses a defined set of formulas to calculate an annual SPIS score, OASIS allows users to modify these formulas to perform "what-if" type queries.

Questions about the Annual SPIS Reports

What information is on the annual SPIS reports?

The annual SPIS reports list roadway segments with a calculated SPIS score. The reports provide a snapshot of crash data for the prior three calendar years. For example, the 2011 SPIS reports reflect crash data for 2008 through 2010. Data captured on the annual off-state reports for each identified roadway segment includes:

- Road name and number, as applicable
- Description of segment's begin point reference location
- Distance along road (in feet) and straight line direction (0-359 degrees) from reference location to segment begin point
- Distance along road (in feet) and straight line direction (0-359 degrees) from segment begin point to segment end point
- County and City (if applicable)
- Nearest intersection within roadway segment
- Average daily traffic (ADT)
- Total crash count for three calendar years, plus counts by type of crash (i.e., fatal, injury A, injury B, injury C or property damage only)
- Percentile ranking of annual SPIS score
- Annual SPIS score

Learn more about data sources in Section 1-8: Understanding the Annual SPIS Report, from the SPIS and OASIS User Guide.

Do the annual SPIS reports sort the results by SPIS score or location?

Six report options exist for the off-state highway SPIS reports:

- All SPIS Sites, sorted by roadway location (Adobe® PDF document)
- All SPIS Sites, sorted by SPIS score (Adobe® PDF document)
- Top 10% SPIS Sites, sorted by roadway location (Adobe® PDF document)
- Top 10% SPIS Sites, sorted by SPIS score (Adobe® PDF document)
- Top 10% SPIS Sites, Investigative Reports, sorted by location (Microsoft® Excel spreadsheet)
- All SPIS Sites, sorted by score (Microsoft Excel Spreadsheet)

For each of the above report options, except the All SPIS Sites report, you may choose the report for a specific county or for all Oregon counties combined.

What additional information appears on the All SPIS Sites report?

The annual SPIS report data for all Oregon counties may also be downloaded as a Microsoft Excel spreadsheet. In addition to the data on the other annual SPIS reports, this spreadsheet includes:

- SPIS segment ID
- ODOT Region and District
- County road number
- Latitude and longitude of segment's begin point and end point
- Latitude and longitude of segment's reference locations for begin and end points
- Mile points of segment's begin point and end point
- Description of segment's begin and end point locations
- Description of segment's end point reference location
- Direction (0-359 degrees) and distance (feet) from segment's end point to end point's reference location
- City and County FIPS (federal information processing standard) codes
- ZIP code of the segment's begin point

Why does the annual SPIS report list multiple SPIS segments and scores for the same roadway location?

To adequately screen the public roadway network, SPIS uses a "sliding window" approach to identifying SPIS segments and calculating SPIS scores. This is accomplished by calculating a SPIS score for each qualifying 0.10-mile segment along a roadway in 0.01-mile increments.

For example, the first qualifying SPIS segment begins at milepoint 5.50 and ends 0.10-mile away. A SPIS score is calculated for this segment. The segment is shifted by 0.01-mile increment to begin at milepoint 5.51 and end 0.10-mile away. If this shifted segment qualifies as a SPIS segment, another SPIS score is calculated. This sliding window approach continues until there is a break in qualified SPIS segments greater than 0.10 miles along the roadway.

Based on this approach, one crash location may be associated with more than one SPIS segment. Additionally, each qualifying SPIS segment along a roadway will have a SPIS score calculated and listed on the annual SPIS report.

For more information about the sliding-window approach, refer to Section 1-5: Annual SPIS Segment "Sliding Window," of the SPIS and OASIS User Guide.

Some of the road names and traffic counts appear inaccurate on the reports. Can this be corrected?

Yes. The ODOT Transportation Data Section collects and maintains road information necessary to classify and monitor the highways, roads and streets within Oregon. It also collects and maintains traffic counting information. A county or city may contact the ODOT Transportation Data Section to verify, update or correct local road-related data.

What is the difference between the off-state and on-state highway reports?

Similar information is reported on both the off-state and on-state highway reports. However, the off-state SPIS reports (for use by county and city transportation officials) do **not** include data for SPIS segments on state highways. They only include SPIS segments on county roads and city streets. Conversely, the on-state SPIS reports (for use by ODOT) do **not** include data for SPIS segments on county roads and city streets. They only include SPIS segments on state highways.

While the on-state and off-state reports focus on different roadway systems, the percentile rankings that appear on the reports are based on the on-state SPIS results only; the off-state SPIS results are **not** used in determining the percentile rankings nor is there a separate percentile ranking based on the off-state results. This approach to the percentile rankings assures consistency for comparing on-state reports over multiple years and when comparing on-state and off-state SPIS segments against each other.

Why is state highway information not included on the annual SPIS reports for counties and cities?

By separating the on-state and off-state highway SPIS data and reports, each transportation entity may focus on the roadways within its jurisdiction.

When are the annual SPIS reports available for counties and cities?

ODOT publishes the annual SPIS reports once a year after the crash data is finalized and checked for quality.

SPIS Score and Ranking Questions

How is the SPIS score calculated?

The SPIS score is calculated for qualifying 0.10 mile-long roadway segments based on the frequency, rate and severity of crashes occurring within each segment over a three-year period.

The SPIS score is the sum of three indicator values ($IV_{Freq} + IV_{Rate} + IV_{Severity}$), where:

- IV_{Freq} (Crash Frequency Indicator Value) equals 25 percent of the SPIS score
- IV_{Rate} (Crash Rate Indicator Value) equals 25 percent of the SPIS score
- $IV_{Severity}$ (Crash Severity Indicator Value) equals 50 percent of the SPIS score;

The higher a SPIS score, the higher the potential safety needs for the identified roadway segment. The highest SPIS score possible is 100. This is reached when a 0.10-mile segment over three calendar years has:

- 150 or more total crashes,
- Seven or more crashes per million entering vehicles, and
- A combined severity rating equal to or greater than 300.

The formulas used to calculate the indicator values that comprise the SPIS score are available in Section 1-4: Annual SPIS Score Calculation and Formulas, of the SPIS and OASIS User Guide.

What is the source of data for calculating the SPIS score?

The SPIS process calculates the SPIS scores for public roadway segments using the following data sources:

- Statewide crash database (HCDS) maintained by the ODOT Crash Analysis and Reporting Unit for number, location and severity of crashes
- Oregon Transportation Network (ORTRANS) system for off-state roadway location information
- TransInfo for on-state highway inventory, feature and location information
- ODOT Federal Functional Class System database for average daily travel (ADT) counts
- Various ODOT GIS data layers for additional information

SPIS data sources are available from Section 1-1: Sources of SPIS Data, and Section 1-2: Sources of Annual SPIS Crash Data, of the SPIS and OASIS User Guide.

Does every roadway in Oregon have a SPIS score?

No. To qualify for a SPIS score, a public roadway segment (0.10 mile section) must have:

- At least one fatal crash or three other crashes over a three-year period that has been captured in the statewide crash database, and
- An average daily traffic (ADT) count captured by the SPIS process
  (**Note:** Typically, only functionally-classed roads, such as arterials and collectors, have ADT counts associated with them.)

Public roadways include all state, county and city-owned roads, along with roads accessible by the general public (e.g., on tribal or federal lands). It does not include other public locations where a motor vehicle crash may occur (e.g., worksites, state beaches, parking lots, etc.).

How did ODOT come up with the SPIS score formula?

The SPIS formula combines the best of various crash indicators – rate, frequency and severity – to overcome the weaknesses of any one measure. For example, crash rate alone tends to over-emphasize low volume roads with a few crashes, while crash frequency alone tends to over-emphasize higher volume roads with many crashes. Without considering crash severity, a fatal crash has equal value as an accident involving property damage only.

Given a primary safety focus on reducing fatal and severe crashes, crash severity is given the greatest weight (50 percent) in the SPIS score. Crash rate and frequency have equal weight, with each accounting for 25 percent of the SPIS score.

What are the limitations of the SPIS process and scores?

The SPIS process is recognized as an effective problem identification tool for identifying roadway segments with crash histories worthy of further investigation. However, it does have its limitations:

- The SPIS scores give no clues as to the real problems or root causes for a high occurrence of crashes.
- SPIS segments with the highest scores may not result from roadway deficiencies, have cost-effective solutions or be the locations most likely to benefit from measures to reduce crashes.
- A SPIS score is only as good as the supporting crash records; the crash data cannot be guaranteed to represent all qualifying crashes or to accurately reflect the details associated with each crash.
- Regression to the mean can still be a problem for SPIS. A SPIS segment may experience a randomly higher number of crashes over three calendar years. Do nothing and the number of crashes may go down the following year.

Therefore, ODOT encourages the use of the annual SPIS reports to guide further safety investigations to determine the need and appropriateness of potential safety measures.

Why does ODOT calculate the percentile rankings? Isn't the SPIS score all that is needed?

ODOT calculates the percentile rankings as part of its process to identify at least the top 5 percent of highway segments for our ODOT regions to investigate to develop safety projects.

The percentile ranking also provides needed context when looking at a SPIS score. For example, Lane County may find the top SPIS site on its annual SPIS report has a relatively low SPIS score of 53.30 compared to the highest SPIS score possible (100). However, if 95 percent of all SPIS scores are below 53.30, then this score gains greater significance. Therefore, the percentile ranking provides a consistent method to compare SPIS scores across the state or over multiple years.

How does ODOT calculate the percentile rankings and top 10 percent of SPIS sites?

Each year, ODOT determines a "top 10% cutoff" SPIS score. This is the SPIS score below which 90 percent of all 0.10-mile state highway segments with a calculated SPIS score fall. This score is derived from on-state highway crash data, but applies to both on-state and off-state highway SPIS segments.

For example, the annual "on-state highway" SPIS report identifies 41,700 SPIS segments. When ranked from highest to lowest, the top 10% cutoff SPIS score is the score associated with roadway segment number 417 on the list of 41,700 SPIS sites (41,700 x 10% = 417). If this SPIS score is 44.32, then 44.32 is the top 10% cutoff SPIS score. All SPIS segments – whether on a city street, county road or state highway – with a SPIS score at or above 44.32 are considered within the top 10 percent of all SPIS sites in Oregon.

What if a county or city doesn't agree with the SPIS score or ranking?

ODOT recognizes the limitations of the SPIS process, which is why ODOT uses it as one tool to guide its safety investigation efforts. Therefore, ODOT encourages counties and cities to use the annual SPIS reports as best fits with their road safety assessment programs.

If a county or city doesn't agree with the SPIS score or ranking, it may want to consider using the Oregon Adjustable Safety Index System (OASIS) available from ODOT. Similar to SPIS, OASIS calculates an annual safety score and ranks public roadway segments based on average daily traffic and crash rate, frequency and severity. While SPIS uses a defined set of formulas to calculate an annual SPIS score, OASIS allows users to modify these formulas to perform "what-if" type queries.

Can a county or city calculate a SPIS score for its local roads?

Yes. If a county or city has crash data for the past three calendar years and the average daily traffic (ADT) for a .10-mile segment of a road, then it may use the SPIS score formulas to calculate annual SPIS scores.

Click here for the excel spreadsheet to calculate a SPIS score by hand.

Questions about Available Resources

1. *What assistance does ODOT offer in understanding and using the SPIS reports?*
2. *Where can a county or city get more information or assistance regarding crashes at sites listed on the annual SPIS reports?*
3. *How does a county or city get funds to address its top SPIS sites?*

What assistance does ODOT offer in understanding and using the SPIS reports?
ODOT has prepared documentation on the SPIS process and reports to help answer questions about the annual SPIS reports at http://www.oregon.gov/ODOT/Engineering/Pages/Highway-Safety.aspx, under Safety Priority Index System.

The ODOT Highway Safety Investigation Manual is also available for counties and cities to use when investigating roadway safety issues. Local jurisdictions may easily adapt this manual's procedures for their roadway safety project screenings and evaluations. The manual includes:

- Checklists and analysis procedures suitable for a variety of field and office safety investigations and assessments
- Information about the ODOT highway safety programs and tools
- Links to current standards and resources where design and operations methods are stipulated
- A comprehensive procedure for safety investigation at both intersection and highway segments
- Countermeasure definition and guidance

ODOT also has SPIS contacts within each of its five regions who can help to explain the data on the annual SPIS reports. A current list of these contacts is available on the SPIS report webpages:

- Off-state highway reports: http://www.oregon.gov/ODOT/Engineering/Pages/SPIS-Reports-Off-State.aspx
- On-state highway reports: http://www.oregon.gov/ODOT/Engineering/Pages/SPIS-Reports-On-State.aspx

Where can a county or city get more information or assistance regarding crashes at sites listed on the annual SPIS reports?
More detailed crash data is available by accessing the online Crash Data System. This tool allows users to generate various crash reports for specified state highways and local roads.

How does a county or city get funds to address its top SPIS sites?
Counties and cities may carve-out funds within their respective transportation budgets and set these aside for roadway safety improvements. Counties and cities may also work with ODOT Region Traffic Manager for their area to coordinate roadway safety improvement efforts.

Related Resource Documents

Documents and Tools

- SPIS and OASIS User Guide
  http://www.oregon.gov/ODOT/Engineering/Docs_TrafficEng/SPIS-User-Guide.pdf
  - Introduction to SPIS
  - Sources of SPIS data
  - Sources of Annual SPIS Crash data
  - SPIS ETL (Extract, Translate and Load Data) Process
  - Annual SPIS Score Formulas
  - Annual SPIS Sliding Window
  - Using Annual SPIS
  - Annual SPIS Cut-off Values and Percentage Ranks
  - Understanding Annual SPIS Reports
  - SPIS Glossary
  - SPIS Available Resources
- ODOT Annual SPIS Score calculation tool (Excel spreadsheet)
  http://www.oregon.gov/ODOT/Engineering/Docs_TrafficEng/SPIS_Calculator.xls
- ODOT PowerPoint explaining SPIS
  http://www.oregon.gov/ODOT/Engineering/Docs_TrafficEng/SPIS-GIS-Presentation.pdf

Other Websites

- ODOT Traffic-Roadway Section – Highway Safety
  http://www.oregon.gov/ODOT/Engineering/Pages/Highway-Safety.aspx
- ODOT Crash Data System
  https://keiko36.odot.state.or.us/whalecome5690917adb26326abdb252e22d8/whalecom0/SecureKeiko36PortalHomePage
- ODOT Region Contacts
  - Off-state highway reports: http://www.oregon.gov/ODOT/Engineering/Pages/SPIS-Reports-Off-State.aspx
  - On-state highway reports: http://www.oregon.gov/ODOT/Engineering/Pages/SPIS-Reports-On-State.aspx