The Urban Congestion Report (UCR): Documentation and Definitions

Urban Congestion Reports

What Has Changed in the UCR?

Previously, the UCR was developed using archived traffic operations data from roadway sensors. The biggest change is that the UCR is now developed (starting with the October 2014-December 2014 report) using vehicle-probe-based travel times from FHWA's National Performance Management Research Data Set (NPMRDS). There are a number of other updates in the UCR, including:

- the number of cities being reported (from 23 to 52),
- the definition of city boundaries using metropolitan statistical areas (MSAs),
- more complete roadway coverage within the cities, and
- use of Highway Performance Monitoring System (HPMS) database traffic counts from 2013 for vehicle miles traveled (VMT) weighting.

How Are the Measures Developed?

Congested Hours are computed as the average number of hours during specified time periods in which road sections are congested — speeds less than 90 percent of free-flow speed (e.g., 54 mph if free-flow speed is 60 mph). This measure is reported for weekdays (6 am to 10 pm). Averages are weighted across road sections and urban areas by VMT using volume estimates derived from FHWA's HPMS.

The ***Travel Time Index*** is the ratio of the peak-period travel time to the free-flow travel time. This measure is computed for the AM peak period (6 am to 9 am) and PM peak period (4 pm to 7 pm) on weekdays. Averages across urban areas, road sections, and time periods are weighted by VMT using volume estimates derived from FHWA's HPMS.

The ***Planning Time Index*** is the ratio of the 95th percentile travel time to the free-flow travel time. The measure is computed during the AM and PM peak periods as defined in the TTI, and averages across urban areas, road sections, and time periods are weighted by VMT using volume estimates derived from FHWA's HPMS.

The free-flow speed is calculated as the 85th percentile of off-peak speeds, where off-peak is defined as Monday through Friday, 9 am to 4 pm and 7 pm to 10 pm, as well as Saturday and Sunday 6 am to 10 pm. For the purposes of UCR, the free-flow speeds are calculated for each TMC path and are based on the previous 12 months of data.

What data is used to calculate the measures?

In an effort to use the best data available for the FHWA UCR program, FHWA's Office of Operations acquired the National Performance Management Research Data Set (NPMRDS). This historical traffic speed data set covers the entire National Highway System (NHS). It includes observed measurements only (collected 24 hours a day) and provides the user with average travel times in 5-minute intervals in three ways — freight truck, passenger vehicles, and all vehicles combined. FHWA has made the data set available to State Departments of Transportation and Metropolitan Planning Organizations for use in their performance management activities. The NPMRDS data sets are updated on a monthly basis.

The UCR measures also include volume estimates derived from FHWA's HPMS database. Each state DOT reports average annual daily traffic (AADT) volumes and other required roadway inventory attributes to FHWA on an annual basis. The Texas A&M Transportation Institute has conflated the HPMS roadway segments to the NPMRDS-defined segments, and then developed analytics to estimate time-of-day traffic volumes from AADT values. Each road segment length is multiplied by the time-of-day volume to produce VMT estimates, which are then used in all three UCR measures to compute VMT-weighted averages across time periods, road segments, and urban areas.

Initial UCR quarterly reports used 2010 HPMS traffic volumes, which was the most recently available conflated data at the time of production. However, a more recent conflation completed by TTI in 2015 provided 2013 HPMS traffic volumes. Therefore, all UCR quarterly reports produced using NPMRDS use the 2013 HPMS traffic volumes, which is the most recent conflated data available.

How Are the Data Processed?

The following highlights key calculation procedures of the NPMRDS-based UCR:

- The basic spatial unit of analysis is traffic message channel (TMC) paths, which are relatively short (an average of 1.3 miles among all 52 MSAs) directional roadway segments that are defined by a consortium of commercial traffic information providers.

- As a first step in the performance measure calculation, researchers summarized the 5-minute day-by-day travel times into 15-minute monthly average travel times by day of week (e.g., each TMC path should have a travel time value for 6:00 to 6:15 a.m. for Mondays in January, 6:00 to 6:15 a.m. for Tuesdays in January, etc.). The monthly 15-average 15-minute statistics were used to address missing travel time values in the day-by-day 5-minute data set. In addition to the monthly averages, percentile values were calculated for use in the reliability measure calculation.

- Once the monthly 15-minute travel time values are computed, the UCR measures are then calculated for each TMC path within each of the 52 cities. The Congested Hours measure is calculated on a daily basis, whereas the Travel Time Index and Planning Time Index are calculated for each 15-minute period (within the morning and evening peak period) for each of the average weekdays.

- VMT is used to calculate summary monthly and quarterly values for each of the 52 cities. For Congested Hours, VMT weights are used to compute weighted average values across all days, months, and road sections. For Travel Time Index and Planning Time Index, VMT weights are used to compute weighted average values across all peak time periods, days, months, and road sections.

- To make meaningful year-to-year comparisons, it is necessary to keep certain calculation parameters as consistent as possible. For example, the same 3 months are compared within each year to minimize differences due to seasonal variation. Similarly, a 12-month trailing average of monthly free-flow speeds is used in the performance measure calculations.

A more detailed description of UCR calculation procedures was provided in a [February 5, 2015 FHWA webinar](#).