Traffic engineering has long held that the primary function of an urban arterial is to move vehicle traffic quickly and safely. As a result, design standards have focused on providing enough roadway capacity to ensure that traffic flows smoothly. However, many streets designated as arterials do more than move vehicle traffic through the communities which they pass. It is increasingly realized that they must serve the mobility needs of others as well, in particular those using so-called “non-motorized modes” of transportation such as walking and bicycling. To address these concerns, two important actions were taken in California in 2008: Assembly Bill 1358, The Complete Streets Act, passed by the state legislature, and “Complete Streets - Integrating the Transportation System,” a deputy directive (DD-64-R1) issued by the California Department of Transportation (Caltrans). Both actions require facilities for walking and bicycling to be provided on all roadways owned and maintained by Caltrans, excluding limited-access facilities.

Nationwide, departments of transportation are turning to performance measures to track progress in providing transportation facilities that serve many modes, not just cars and trucks. However, Caltrans’ current framework for gauging performance on its transportation systems contains no objectives or measures concerned with the safety and mobility of non-motorized users. Objectives and measures are needed that are defensible and can be put into practice.

RESEARCH FINDINGS

To address this issue, we undertook a two-phase project: a comprehensive literature review, and the development of suggested performance measures for Caltrans. The literature review examined research dealing with the effects of roadside design features on user safety, walkability, bikability, and environmental concerns, among other things. Approximately 165 research papers and transportation agency studies were reviewed. The second phase included a review of best practices on measuring transportation system performance used by state departments of transportation.
Research points to a number of safety and mobility issues that should be considered when promoting Complete Streets:

- wider travel lanes are associated with higher driving speeds, which are associated with more accidents and severe injuries; the severity of pedestrian injury becomes serious when a pedestrian is hit by a vehicle going 26 mph, critical at 33 mph, and unsurvivable at 37 mph;
- 85 percent of pedestrian fatalities occur on non-local streets, such as arterials and collectors;
- urban arterials with “main street” characteristics have lower numbers of pedestrian injuries than those with a commercial strip character;
- at both signalized and non-signalized intersections, crosswalks supplemented with traffic-calming features (e.g., narrowed road widths) encourage drivers to yield to pedestrians;
- pedestrian countdown signals encourage safer crossing behavior;
- pedestrian safety increases when more pedestrians are present;
- pedestrians’ perceived Levels of Service decrease as the width of driveway intersection crossings and the amount of traffic on adjacent roadways increase;
- the presence of bicycle facilities directly increases the percentage of bicycle commuters;
- perceptions of cycling safety increase with every additional mile of bicycle lane in a city; and
- a highly connected bicycle network is positively associated with the number of bicyclists in a city.

RECOMMENDATIONS

The research evidence plus a review of best practices suggest that Caltrans’ Complete Streets efforts should focus on urban arterials and key objectives, including:

- reducing pedestrian and bicyclist injury and fatality rates;
- reducing the number of pedestrian and bicycle collision hotspots;
- increasing the perceived safety of walking and biking;
- designing urban arterial projects in accordance with Complete Streets principles;
- and increasing the number of Caltrans personnel highly knowledgeable about and trained in Complete Streets.

Suggested performance measures associated with these objectives, many of which would require new types of data gathering, include: rates of pedestrian and bicyclist injuries and fatalities per walking and bicycling trips; percent of Californians who feel safe using non-motorized modes on urban arterials; percent of signalized and un-signalized intersections with marked crosswalks plus one or more additional traffic-calming feature; and, no doubt most controversial, percent of urban arterials where 85 percent of driving speeds are 25 mph or less.