QUESTION 6:

What are the potential safety impacts of bicycle lanes along a roadway?

Bicycle lanes provide a shared or exclusive space within a roadway cross section for bicyclists to travel along streets. The provision of this space helps reduce or eliminate conflicts between bicyclists and motor vehicles and can introduce or promote bicycling as a mode of transportation. Bicycle lanes are typically delineated by striping, signing, and on-pavement symbols. This summary explores the material available on the safety impacts of bicycle lanes along a roadway.

BICYCLE LANES

The consideration of bicycle lane(s) in conjunction with a four-lane undivided to three-lane (four- to three-lane) conversion is becoming more and more common. The American Association of State Highway and Transportation Officials (AASHTO) *Guide for the Development of Bicycle Facilities* (AASHTO 2012) proposes that a minimum lane width of 4 feet is sufficient for most bicyclists but that additional width may be needed on grades or where more distance from parallel features (e.g., curbs, parked cars) is necessary. The guide also notes that past studies have found that most crashes involving bicycles in urban areas occur at intersections and driveways. The possibility of hitting an open car door is another urban and suburban safety issue for bicyclists when on-street parking is present, as are crashes involving drivers failing to yield to bicyclists when making left and right turns (AASHTO 2012).

The Iowa Statewide Urban Design and Specifications (SUDAS) *Design Manual* (SUDAS 2024) and Iowa DOT *Design Manual* (Iowa DOT 2019) include design information for various bicycle facilities and selection guidance that identifies and describes the factors involved (e.g., traffic volume and vehicle speed). Separate sections have also been created that include details related to the implementation of on-street facilities and shared use paths (SUDAS 2024, Iowa DOT 2019). For example, Chapter 12 of both the SUDAS and Iowa DOT design manuals includes a table containing preferred (e.g., 5 to 7 feet) and minimum (e.g., 4 feet) widths for one-way bicycle lanes in various situations (SUDAS 2024, Iowa DOT 2019). Additional information on this subject is available within the section of the SUDAS *Design Manual* on Complete Streets (SUDAS 2024).

A document from the Federal Highway Administration (FHWA), the *Bikeway Selection Guide* (Schultheiss et al. 2019), however, proposes that shared lanes (e.g., bicycle routes on general traffic lanes) should be used for posted speed limits up to 25 mph or for traffic volumes of up to 2,000 vehicles per day, that bicycle lanes with buffers should be used for posted speed limits above 25 mph and up to 35 mph or for traffic volumes between 2,500 and 6,200 vehicles per day, and that separated bicycle lanes or shared-use paths should be used for posted speed limits above 35 mph or for traffic volumes above 6,500 vehicles per day.

Iowa LTAP
Bicycle lane

The placement of bicycle lanes may vary depending on existing right-of-way, local preferences, and other factors. Options that have been used in different communities include the following (AASHTO 2012):

- Placement along the curbline (i.e., no roadside parking present)
- Placement between the travel lane(s) and parking (i.e., bicycle lane left of parking)
- Placement between parking and the curbline (i.e., bicycle lane right of parking)
- Separation of the bicycle lane using curbing, bollards, barriers, or other mechanisms (sometimes referred to as a cycle track)

In addition, some general safety and design considerations for bicycle lanes include the following:

- The current causes of bicycle crashes in a jurisdiction or along a roadway and whether a bicycle lane can address them
- The expected reduction in crashes when adding a bicycle lane due to a reduction in bicycle-vehicle conflicts
- The fact that, in some instances, the addition of a bicycle lane may not require a reduction in lane or shoulder width, removal of parking, widening of the right-of-way, etc.

- The provision of a separate bicycle lane in each direction of travel to discourage wrong-way riding in a single bicycle lane
- The fact that some bicycle users will still feel uncomfortable riding adjacent to travel lanes and will continue to use sidewalks

BICYCLE CRASH STUDY RESULTS

The research on crashes involving bicyclists is currently very limited but is growing. The results found during a search of the literature are noted below. Please note, however, that no studies were found that focused solely on these types of crashes in connection to four- to three-lane conversions. The information below about the crash impacts of bicycle lanes is more general in nature.

- A review of police-reported bicycle crashes in New York City (Chen et al. 2012) found that crashes did not increase following the installation of bicycle lanes. These results were thought to be the product of both the reduction in conflicts between vehicles and bicycles and lower vehicle speeds.
- A study to develop bicycle-related crash modification factors (CMFs) in Florida (Abdel-Aty et al. 2014) found that a reduction in total crashes between 27 and 32 percent could be expected after the introduction of a bicycle lane. A reduction in vehicle-bicycle crashes between 58 and 60 percent could also be expected.
- An evaluation of cross-sectional features on urban arterials in Florida (Park and Abdel-Aty 2016) found that crash rates declined as bicycle lane widths were increased from an unspecified nominal width up to six feet.
- An evaluation of bicycle lanes in the urban areas of Washington and Texas (Avelar et al. 2021) found that installing a bicycle lane reduced total crashes between 26.6 and 44.2 percent on two-lane roadways and between 9.9 and 49 percent on four-lane roadways.

SUMMARY

The addition of bicycle lanes within a roadway cross section is a very typical consideration, primarily in urban areas. Guidance related to the physical characteristics of bicycle lanes is described above, along with some considerations regarding the safety impacts that might be expected from the addition of bicycle lanes. However, the body of research on the safety impacts of bicycle lanes is currently very limited. Overall, however, it does appear that the introduction of bicycle lanes does not increase but rather may help reduce crashes. Additional research is needed to confirm these conclusions.

References available in: Knapp, K., and D. Veneziano. 2024. *Roadway Cross Section Reconfiguration: Responses to 14 Commonly Asked Questions.* Iowa Local Technical Assistance Program, Institute for Transportation, Ames, IA. https://intrans.iastate.edu/uploads/2024/10/roadway_cross_section_reconfiguration_w_cvr.pdf.