What is Safe or Unsafe?

The three studies below show examples of some of the complex issues surrounding the question of what is "safe," and how the context of a project can play a role in that definition.

From: PRACTICAL SOLUTION CONCEPTS FOR PLANNING AND DESIGNING ROADWAYS IN KENTUCKY, Research Report KTC-08-30/SRP369-08. Stamatiadis, et al. 2008.

Traditional design tends to seek as high a design speed as practical with the aim to reduce travel time. Practical design requires that levels of service should not be taken as absolutes, but rather be viewed as starting points. Each project should be viewed as an investment and as such requires an understanding of the returns to be realized. As in any financial situation, there is always a point of diminishing returns, i.e. greater investment will have no or little effect on increasing the return. The same is true for transportation projects.

System based evaluation of practical design in this study examined the safety and operational performance of various cross section alternatives, based on Highway Capacity and Highway Safety Manual procedures. The various alternative cross sections ranged from an improved two-lane section representing a practical solution approach to a four-lane divided highway.

The data shows that there is a limit of returns based on the road width. Safety improvements are achieved continuously when a two-lane road with 10-foot lanes and no shoulders is upgraded to wider two-lane road cross sections. In this case (road with 15,000 ADT), the number of crashes per year is anticipated to be reduced from 5.45 to 2.86 with a two-lane facility with 12-foot lanes and 8-foot shoulders. From this point forward, wider roadways will have marginal safety improvements with the maximum been achieved with a four-lane undivided roadway with 12-foot lanes and 8-foot shoulders. Even in this case, the expected number of crashes is 2.41 per year offering a 15 percent reduction but at a significantly higher cost. The data supports the notion that even though wider roadways will have a safety improvement, it may not be practical to develop such solutions due to the low effectiveness and small gains in safety.

This example indicates that for a limited budget (example used was $500 million), the use of the two-lane cross section would potentially result in a system wide reduction of 173.5 crashes per year, whereas, the four lane cross section would only have a reduction of 69.9 crashes per year. Even though the four lane cross section provides a "safer" solution on a project basis, it does result in addressing fewer miles and thus limits the potential for greater safety gains.

The concept of Practical Solutions has been introduced in order to encourage developing more appropriate solutions that meet specific safety and/or mobility targets. This approach encourages the designer to use creative design and move away from the "typical cross section" concept, where a standard "oversized' template is traditionally used. The development of a new set of standards or guidelines for design element values is not advisable if Practical Solutions are to be successful in reaching their potential benefit. What is required is a procedure that assures that project goals/objectives are targeted with an acceptable solution that balances all issues and constraints and considers the points of diminishing returns for the project's elements.

From: Rural and Urban Safety Cultures: Human-Centered Interventions Toward Zero Deaths in Rural Minnesota, Minnesota DOT Office of Research Services. Rakauskas, et al, 2007.

The total number of annual traffic fatalities and the rate of fatalities per vehicle mile traveled are considerably higher in rural areas compared to urban areas (NHTSA, 2001). A number of explanations have been offered with respect to the higher fatal crash rate in rural areas: Road design; Emergency Medical Services; Human Factors. This project, comprised of two parts, aimed to be one of the first studies to systematically explore the potential contribution of rural driver behavior and attitudes that may be related to the increased rural fatal crash risk. Overall, this study attempts to provide insights into the role of human factors in rural fatal crashes. Moreover, this study provides policy suggestions for developing safety interventions that are designed for the psychosocial factors that appear to define the rural (versus urban) culture:

- Education programs to improve seatbelt compliance in rural areas should focus on increasing the perception of danger associated with not using a seatbelt while driving
- The higher seatbelt noncompliance reported by rural drivers in this study suggests that seatbelt enforcement campaigns could target rural areas
- The higher seatbelt noncompliance reported by rural pickup truck drivers in this study suggests that seatbelt enforcement campaigns could specifically target rural pickup truck drivers
- In addition to education and publicity campaigns to increase the saliency of the dangers of driving while intoxicated, alcohol enforcement campaigns could target rural areas. Such enforcement and the cost of being apprehended would introduce additional salient costs for driving while intoxicated. These enforcement programs would need to have saturated advertisement so that the probability and cost of apprehension is apparent to drivers (Creaser, Aflleje, & Nardi, 2007)
- More cautious driving behavior may be afforded in both rural and urban areas by including speed calming measures in road design development
- There may be a general need for traffic safety policy directed at driver distraction to recognize the potential increased risk amongst elderly drivers in complex urban driving environments
- Given the low density and isolation of some rural roadways, enforcement (and education) may not always be a practical tool. In these instances, Intelligent Transportation Systems embedded in the infrastructure or fitted to vehicles may be of assistance, e.g. monitoring devices used in teen vehicles that not only support the choice of safe speeds, but also monitor compliance with speed limits (Brovold et al., 2007)
- The observation that rural (versus urban) residents were generally less favorable to all types of traffic safety intervention attests to the need for traffic safety policy to be guided by local cultural factors and to incorporate the psychosocial factors that govern driver behavior in rural communities (Ward, 2007)

From: Dan Burden, Walkable Communities, Inc. and Harrison Bright Rue, Charlottesville-Albemarle Metropolitan Planning Organization

Road diets are projects that convert four-lane and five-lane undivided roadways into two-lane to three-lane facilities. These have become increasingly common in recent years, both for their potential safety and traffic flow benefits.

The Seattle Road Diet chart shown below is circa 1998. Many newer road diets have been added since then and all are working quite well. Cities like Seattle, with well-established road diet programs, have reached volumes of 18-19,000 ADT on these facilities, have not seen any redirected traffic, report that emergency responders do better with third lanes (a place to pass), find significant safety improvements, uniform flow rates, reduced sound levels and even some capacity improvements (fewer lanes to cross), etc.

Roadway Location	Date Change	ADT Before	ADT After	Collision Reduction
Greenwood Ave N N 80th St to N 50th	Apr-95	11872	12427	24 to 10 58%
N 45th Street Wallingford Area	Dec-72	19421	20274	45 to 23 49%
8th Ave NW Ballard Area	Jan-94	10549	11858	18 to 7 61%
Martin Luther King Jr W North of I 90	Jan-94	12336	13161	15 to 6 60%
Dexter Ave N Queen Ann Area	Jun-91	13606	14949	19 to 16 59%
24th Ave NW NW 85th to NW 65th	Oct-95	9727	9754	14 to 10 28%

Other noted benefits include:

- Pedestrian crossing safety and convenience improve, particularly when crosswalk median refuges are created in the new 3rd lane.
- Sidewalks become more comfortable to use as the vehicle lane is moved away from the curb, making the usual sidewalk abutting the curb feel separated from traffic by the bicycle lanes.
- Smoother, more even traffic flow, even with high ADTs. With the typical 4-lane section, left turns, natural driver urgency and competition lead to lane-changing and confusion over which is the through lane, passing lane, or turning lane. With an 'urban' 3-lane section you get a moderate but steady speed on the through lane, and the middle lane is clearly reserved for left turns. For right turns, since travel is already at lower speeds, there's no need for a separate right turn lane.
- For emergency vehicles, when a full median is present other vehicles can pull over into the bike lane and stop, or when the middle lane is available emergency vehicles can use it to pass and to maneuver through intersections. This cross section has become such a standard in Seattle and surrounding communities that the fire departments there have good information on how well it's working.

There are also well documented road diets of streets at the 20-21,000 ADT level ... and not only were problems solved while no new ones added, but property values along these corridors and the success of adjacent businesses increased. A study of a road dieted street in West Palm Beach, FL, carrying 18,000 ADT and narrowed from 5 lanes to 2 to 3, found that the adjacent property values went up 40% to 80% in one year.