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Setting New Directions in Traffic Safety

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Safety in Numbers

Surprising insights into how streets and buildings shape driver and pedestrian interactions

Infrastructure changes aren't the sole cause of safer walking environments, according to two new studies, including one conducted by researchers at UC Berkeley's Traffic Safety Center. New evidence suggests that the more people walk, the safer streets become.

The Center's study, along with an earlier one conducted by Peter Jacobsen in 2003(1), give strong evidence that the traditional method of ranking the dangerousness of an intersection according to the number of pedestrian-vehicle crashes that occurred there over a period of time has given an inaccurate picture of the actual threat posed to pedestrians at those intersections. By also taking pedestrian volumes into account—the number of pedestrians that use an intersection ov a period of time—both Jacobsen and the Center researchers found that, surprisingly, the "risk" that any one pedestrian might be hit by a motor vehicle is often lower at intersections with greater pedestrian volumes—even if those intersections experience more collisions.

For the TSC project, Center researcher Noah Radford used Space Syntax, a suite of modeling tools and simulation techniques developed by the University College of London, to estimate pedestrian volumes in the city of Oakland, CA.

In their report, "Space Syntax: An Innovative Pedestrian Volume Modeling Tool for Pedestrian Safety," Raford and Center Director David Ragland describe how pedestrian volume estimates generated by the Space Syntax model were used to calculate exposure, or the rate of pedestrian contact with potentially harmful situations involving motor vehicles, and risk, or the probability that a pedestrian-vehicle collision would occur.

"The Space Syntax tools analyzed the layout and connectivity of urban street grids and generated 'movement potentials,' which were then compared to sampled pedestrian counts at key locations and land-use indicators such as population and employment density," Raford and Ragland write. "The resulting correlations were extrapolated to predict pedestrian volumes on a street-by-street level for an entire city."

Using this method, Raford and Ragland found that 10 of the city's 12 most dangerous intersections

were clustered in the eastern area of the city, an area with relatively low pedestrian volumes. Of th intersections surveyed, only one was in the downtown area.

"This finding suggests that although the highest volume intersections may be within the downtown area, these intersections are much safer than those in East Oakland because they accommodate a greater number of pedestrians with fewer pedestrian accidents, even though they may have a higher number of absolute pedestrian crashes."

Raford and Ragland use as an example two Oakland intersections, one in downtown and one in east Oakland. The downtown intersection was considered one of the most dangerous intersections in the downtown area, experiencing "an average of three pedestrian-vehicle crashes per year." Using Space Syntax, Raford and Ragland determined the intersection's annual pedestrian volume to be 998,000. The researchers found that these figures can be contrasted to those for an intersection in East Oakland where the average pedestrian volume was much lower, 343,000 a year. Pedestrians crossing at this intersection were approximately 5.6 times more likely to be involved in a collision than they were at the intersection in downtown. Data from every intersection studied for this report yielded similar results.

"From a public policy standpoint, from a safety standpoint, the message is, if you want safer streets have more people on them," Raford said.

In his 2003 study, "Safety in numbers: more walkers and bicyclists, safer walking and biking"(1) Jacobsen observed a similar phenomenon, but on a much broader level of analysis. Jacobsen examined the relationship between the rates of pedestrian and bicycle activity and the number of times pedestrians (or cyclists) were hit by cars in 68 California cities and multiple European countries and found that in most cases, the risk of collision went down as pedestrian and bicycle activity increased. For example, Jacobsen found that the per capita fatal injury rate for pedestrians and bicyclists in the Netherlands and the U.S is comparable: about 1.9 per 100, 000, even though the share of bicycle/pedestrian trips in the Netherlands is much higher, 46 percent versus 6 percen in the U.S.

Drivers Become More Careful

The results were consistent across several regions and countries and could not be explained solely by changes in pedestrian behavior, Jacobsen noted. According to Jacobsen, it is unlikely that pedestrians obey traffic signals or defer to vehicles simply because there are more pedestrians around. In fact, common sense would suggest that the opposite is true—the more pedestrians are around, the more confident, and less careful, individual walkers and cyclists become. Rather, Jacobsen sees the results as an expression of the relationship between motorist behavior and pedestrian activity. In other words, drivers drive more carefully when they observe large numbers o walkers and bicyclists.

"Adaptation in motorist behavior seems more plausible [than other alternatives] and other discussions support that view," Jacobsen writes. "In addition, motorists in communities or time periods with greater walking and bicycling are themselves more likely to occasionally walk or bicycl and hence may give greater consideration to people walking and bicycling."

Further analysis of this phenomenon may help planners find ways of improving the safety and walkability of built environments. For instance, if motorists change their behaviors according to the

number of pedestrians on the street, how might the presence of design elements such as continuous sidewalks, crosswalks, bike lanes, medians and rows of trees further influence drivers' conduct? Will the presence of such elements further decrease risk of pedestrian injury simply because pedestrians walk and bike more in environments designed to accommodate them? Adding crosswalks, bike lanes and medians to an existing built environment could make pedestrians safer not just by virtue of the added safety provided by a crosswalk, but also because pedestrians are interacting with that environment in greater numbers.

"If shown to be true and to be the result of more careful driver behavior, these findings have very strong implications for policy," Ragland said. "I think it will become clear that programs for promotir walking, and maybe biking, may not have the feared effects of dramatically increasing the number ped/bike injuries, but may actually reduce risk for individual peds and bikes."

"We're really at an amazing stage in research," Raford adds. "The data doesn't say what gets people out [walking and biking], but it has the potential to show what types of neighborhoods would be safer."

References

(1) P. L. Jacobsen "Safety in numbers: more walkers and bicyclists, safer walking and bicycling" Inj. Prev. Sep. 01, 2003 9: 205-209.

Photos: Dan Burden, ***http://www.pedbikeimages.org***