Do bike lanes make cycling safer? Researchers don't know

For years, researchers have been identifying "hotspots" for crashes – street segments or zones where a high proportion of crashes occur. Often features of the built environment – features such as population density, the number of intersections, the speed of vehicles, and commercial development – are correlated with these crash hotspots. However, as even a beginning student of statistics knows, correlation does not imply causation. As a result, researchers cannot answer whether many features of the built environment, such as greater population density, cause crashes.

In fact, there are two paths by which features of the built environment are thought to relate to crashes. The first path is *risk*, or how hazardous travel is on a per-mile basis depending upon its context, i.e., are you driving, biking, or walking, and in what environment. The second path is *exposure*, which relates to how much travel you or others are engaging in. Even if the risk per mile is low, if the number of people traveling within an environment is high, a certain number of crashes are likely to occur. Walking in Tokyo is pretty safe, but because of the sheer number of people walking there, a couple of crashes are likely to happen each year.

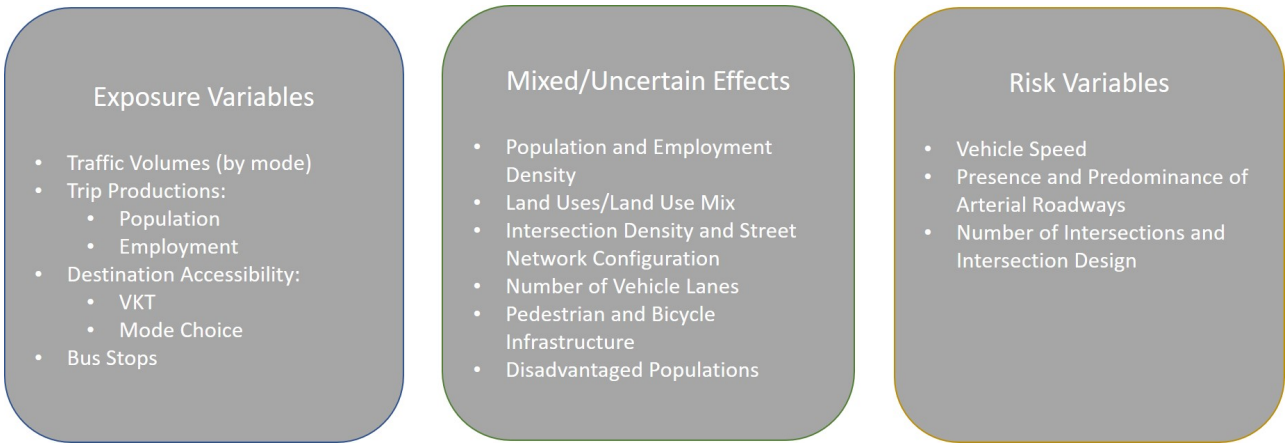

Fig. 1. Built Environment Variables Likely Mechanism of Association with Increased Crashes.

Researchers consistently find that streets with bike lanes have more bike crashes. However, does this mean that bike lanes are dangerous for bicyclists? Likely not. It is more likely that bicyclists prefer to bike where bike lanes are, and the crashes occur where the cyclists are. The only way to ascertain the danger, or the safety, of bike lanes, is to accurately control for the actual number of cyclists present on a particular street. For the most part, this kind of research, which controls for mode-specific exposure variables for pedestrians and cyclists, has not been done. Research data on vehicular exposure is moderately accurate, but for other modes, much less so.

So, based on a thorough review of the literature, what is our best guess about whether different

built environment variables are proxies for exposure or for risk? Figure 1 explains our current understanding. Population, employment, bus stops, and destination accessibility are likely proxies for exposure, or the number of trips occurring. Vehicle speeds, arterial roadways (high-speed roadways with much commercial activity), and the number of intersections are likely proxies for risk. That is, each of these features likely raises the odds of a crash occurring. Researchers also have found that 3-way intersections are safer than 4-way intersections. Meanwhile, population and employment density, the mix of land uses, the street network configuration, sidewalks, bike lanes, and disadvantaged populations have an uncertain role in crash production. These factors have all been correlated with crashes. However, it may be through the mechanism of increased exposure, or through the mechanism of increased risk, or both. Additional research is needed to ferret out why these features are associated with more crashes.

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