Where the sidewalk doesn't end: Estimating the health impacts of pedestrian infrastructure

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Annually, 234,000 deaths in the United States are attributable to low physical activity. Physical inactivity is a risk factor for a number of chronic diseases of growing concern, including diabetes, stroke, and hypertension. While physical activity is accrued throughout the day, physical activity from using active transportation – walking and cycling – has been independently associated with improved health outcomes. Changes in the built environment, such as increasing the diversity of land uses, building sidewalks and bike paths, and increasing access to destinations such as shops and cultural venues influence transportation behavior, physical activity from transportation in turn, and ultimately health outcomes. We employ a Markov Chain modeling approach to estimate avoided premature mortality and avoided cases of coronary heart disease (CHD), diabetes, hypertension, and stroke from the construction of pedestrian infrastructure improvement projects in three development contexts (urban, suburban, and rural) in North Carolina. We estimate that, within 40 years, the urban, suburban, and rural projects will avoid 13, 4, and 2 deaths, respectively. Additionally, we estimated that these projects will avoid 0.4, 0.1, and 0.6 cases of CHD per 1,000 persons; 1.1, 0.3, and 1.3 cases of diabetes per 1,000 persons; 2.3, 0.7, and 2.8 cases of hypertension per 1,000 persons; and 0.4, 0.1, and 0.5 cases of stroke per 1,000 persons over 40 years. We apply monetization methods and compare estimated economic benefits to project costs, enabling the consideration of health impacts from changes in the built environment from a cost-benefit perspective. Twenty years in to the future, we find benefit-cost ratios ranging from 23 (rural case) to 1.5 (suburban), with the urban case yielding an intermediate return of 12.1. Forty years in to the future, we estimate that these values grow to 25.5 (rural case), 15.4 (urban case), 1.9 (suburban case).