R. Michael Robinson, Ph.D.
rmrobins@odu.edu

**Forecasting the Ability of Active Transportation Paths to
Reduce Future Healthcare Costs
R. Michael Robinson, Ph.D.**

## Abstract

The United States spends far more on health care than other high-income countries, committing the highest percentage of national GDP of the 36 members of the Organisation for Economic Co-operation and Development (OECD) – nearly twice the average (1). Despite this, Americans have poorer health outcomes than other leading countries and the gap is growing (2). Life expectancy in the U.S. is lower than the OECD average and high obesity rates are a major concern (3). The Center for Disease Control and Prevention (CDC) reports that almost 40% of Americans are obese. Obesity related conditions include heart disease, stroke, and type-2 diabetes. The estimated annual cost of obesity in the U.S. is nearly $150M; medical costs for obese individuals are more than $1400 more than for those of normal weight (4).

A key contributor to obesity is the lack of regular physical exercise. Creating safe spaces for exercise, such as construction of active transportation paths, encourages increased exercise. The ability to show a direct, predictable contribution to the public health per unit distance of active transportation path would support estimates of public health savings, encouraging path construction and providing for the public good.

## Background

High levels of obesity continue to contribute to significant health problems for many Americans. The American Heart Association reports that 1 in 3 adults have high blood pressure; rates are higher for African Americans and increase for all who are not physically active and for those who are overweight or obese. Additionally, nearly 800,000 people of have strokes each year, making strokes the 5th leading cause of death in the country. The CDC reported on July 18, 2018 that nearly 1 in 10 Americans has diabetes and almost 1 in 4 have prediabetes; more than 1 in 3 adults! These rates have remained steady for several years (6).

Despite the overwhelming need for increased exercise and the benefits of exercise to improved long-term health, some communities have remained reluctant to committing financial resources to construction of active transportation paths.

Numerous researchers have employed statistical analyses to explore the health effects of the choice to commute using bicycles as a form of physical activity or to assess the benefits of bicycle paths. Previous researchers have captured bicycling habits of individuals using an array of instruments. These include bicycle related longitudinal data (7), web-based surveys (8), weather data (9), and information related to bicycle infrastructure (10). In addition, this data has been rigorously analyzed to explore additional variables related to bicycling and health effects (11). However, none of these analyses construct a county-specific model of the health effects of added bicycle paths at the census tract-level. Other efforts to explore the health and safety impacts of planned bicycle routes include assessments of the importance in quantifying how health

R. Michael Robinson, Ph.D.
rmrobins@odu.edu

may be affected during transportation planning (12, 13, 14). These studies have had significant impact and demonstrate the need for granular analysis. However, they are more focused on the risk of catastrophic injury caused by a bicycling accident as opposed to improving chronic disease outcomes.

**Proposal**

We[1] propose a methodology that considers demographics and habits of individuals using publicly available data to forecast anticipated, quantifiable improvements in public health for unit lengths of active transportation path construction. The methodology uses factor analysis to assess data from the American Community Survey (ACS), and CDC 500 Cities Project along with bike/pedestrian path location and usage data to construct a county-specific model with insight at the census tract-level.

The 500 Cities Project (https://www.cdc.gov/500cities/) is a partnership with the CDC, the CDC Foundation, and the Robert Wood Johnson Foundation which identifies, analyzes and reports on 27 chronic disease measures focusing on conditions, behaviors, and risk factors that affect the public's health. The project provides the first-of-its kind release of data on a large scale for cities and neighborhoods within cities.

An initial test of the methodology using publicly available data at the census tract level was completed for San Francisco County, CA as a proof of concept. Results show a measurable, verifiable link between additions of active transportation paths and improvements in chronic disease rates. Additionally, results indicate that reasonably accurate, credible forecasts of improvements in chronic disease rates per unit distance of trail length increase are possible.

**Requirement**

Data for the U.S. census, the American Community Survey, and 500 Cities Project is publicly available. However, few cities have (or have made available) the detailed information needed to compare use rates for active transportation paths needed to support analysis. Once made available, such data could be analyzed to assess improvements in select chronic disease rates. Improvements may then be compared to regional health care rates to forecast savings in health care costs.

---

[1]The concept development and testing team included Mike Robinson, Ph.D., Ross Gore, Ph.D., Andrew Collins, Ph.D., Caitlin Cornelius, Ph.D., and Craig Jordan, all from Old Dominion University

R. Michael Robinson, Ph.D.
rmrobins@odu.edu

**REFERENCES**
**(1)** Organization for Co-Operation and Economic Development, at: http://www.oecd.org/health/ accessed July 2018.

(2) S. H. Woolf and L. Aron (eds.), *U.S. Health in International Perspective: Shorter Lives, Poorer Health* (National Academies Press, 2013).

(3) OCED Health at a Glance 2017: OECD Indicators, Key findings for the United States, downloadable .pdf at: http://www.oecd.org/unitedstates/Health-at-a-Glance-2017-Key-Findings-UNITED-STATES.pdf accessed July 2018.

(4) Craig M. Hales, M.D., Margaret D. Carroll, M.S.P.H., Cheryl D. Fryar, M.S.P.H., and Cynthia L. Ogden, Ph.D., National Center for Health Statistics Data Brief No. 288, *Prevalence of Obesity Among Adults and Youth: United States, 2015–2016*, October 2017, at: https://www.cdc.gov/nchs/data/databriefs/db288.pdf, accessed July 2018.

(5) American Heart Association, *Heart disease and stroke statistics—2018 update: a report from the American Heart Association* [published online ahead of print January 31, 2018].

(6) CDC, *New CDC report: More than 100 million Americans have diabetes or prediabetes*, at https://www.cdc.gov/media/releases/2017/p0718-diabetes-report.html.

(7) Eva Heinen, Kees Maat, and Bert Van Wee, "Day-to-day choice to commute or not by bicycle," *Transportation Research Record: Journal of the Transportation Research Board*, vol. 2230, pp. 9-18, 2011

(8) Monique Stinson and Chandra Bhat, "Frequency of bicycle commuting: internet-based survey analysis," *Transportation Research Record: Journal of the Transportation Research Board*, vol. 1878, pp. 122-130, 2004.

(9) Justine Sears, Brian Flynn, Lisa Aultman-Hall, and Greg Dana, "To bike or not to bike: seasonal factors for bicycle commuting," *Transportation Research Record: Journal of the Transportation Research Board*, vol. 2314, pp. 105-111, 2012.

(10) Gulsah Akar and Kelly Clifton, "Influence of individual perceptions and bicycle infrastructure on decision to bike," *Transportation Research Record: Journal of the Transportation Research Board*, vol. 2140, pp. 165-172, 2009.

(11) Michael Baltes, "Factors influencing nondiscretionary work trips by bicycle determined from 1990 US census metropolitan statistical area data," *Transportation Research Record: Journal of the Transportation Research Board*, vol. 1538, pp. 96-101, 1996.

R. Michael Robinson, Ph.D.
rmrobins@odu.edu

(12) Robert Noland and Mohammed Quddus, "Analysis of pedestrian and bicycle casualties with regional panel data," *Transportation Research Record: Journal of the Transportation Research Board*, vol. 1897, pp. 28-33, 2004.

(13) Cheryl Allen-Munley, Janice Daniel, and Sunil Dhar, "Logistic model for rating urban bicycle route safety," *Transportation Research Record: Journal of the Transportation Research Board*, vol. 1878, pp. 107-115, 2004.

(14) Andrew Dannenberg et al., "Use of health impact assessment for transportation planning: importance of transportation agency involvement in the process," *Transportation Research Record: Journal of the Transportation Research Board*, vol. 2452, pp. 71-80, 2014.

.