

Bailey, Andrea L. M.S.C.E., Purdue University, May 2015. Low Income, Supermarket Accessibility, and the Transportation Network: A Multimodal Analysis Identifying Areas of Poor Accessibility and Intervention Strategies in Indianapolis, Indiana. Major Professor: Konstantina Gkritza.

The United States Department of Agriculture (USDA) Economic Research Service estimates that 23.5 million people live in food deserts, over half of which are considered low-income residents. Accurately defining a food desert is crucial as the designated areas can benefit from grant opportunities and funding priority. To qualify as an urban food desert, the USDA requires that at least 500 residents or one-third of the population live outside a one-mile buffer from a supermarket as well as have a median income of less than 80% of the area average or a poverty rate of greater than 20%. Approaches in the literature to identify low accessibility areas (food deserts) include simple spatial analyses, travel cost models, grocery cost models, and activity-based models. Although using cost as a measure of access is beneficial, the travel cost components are ill-defined, especially for transit. Additionally, defining food deserts as a ratio of travel cost to median household income may more accurately reflect areas with poor accessibility to healthy food by utilizing a combined measure instead of distinct income and access components.

This paper develops a cost surface for auto, transit, and walking to determine the average travel cost to the nearest supermarket for each mode in Indianapolis using Spatial Analyst in ArcGIS 10.2. Given the results from ArcGIS, spatial lag models are used to model the proportion of household income spent on traveling to supermarkets as a function of socioeconomic variables. The results show that a higher crime density, no college degree, and living outside of I-465 are all correlated with poorer accessibility to healthy food. These explanatory variables had similar effects for driving and walking, but the transit network was less sensitive to education

and crime and more location-dependent. For this study, working with the police department and community to reduce crime as well as expanding the transit network are both recommended as potential interventions. Results from this analysis can provide valuable insight into the reasons behind the existence of food deserts.