Supply and Demand Drivers in Food Deserts:
Causal Effects and Policy Implications

The relationship between access to fresh food and long-term health outcomes has become a key discussion topic in food and nutrition policy. An important aspect of this discussion is the concept of food deserts—census tracts in the U.S. where the majority of the population does not have access to large grocery stores. Most existing research focuses on low-income food deserts, which are areas where in addition to low access, the majority of the population is also low income. There is general agreement that populations within low income food deserts are at risk for unhealthy diets and poor long-term health outcomes [1].

While there are both supply and demand side factors that contribute to this issue, the key drivers are not well understood. Some argue that the problem mainly lies on the supply side—there is a lack of easily accessible grocery stores. However, a growing number of experts posit that the real issue is on the demand side—for example, that consumers cannot afford to purchase healthy food, in particular fruits and vegetables (FVs), or do not fully realize their benefits. These differing viewpoints lead to drastically different strategies for improving diet and health among low income households.

Strategies related to price and education both target the demand side of the equation. The impact of price on healthy eating is typically discussed in terms of the estimated price elasticity of FVs. There are national programs aimed at making food (and healthy food in particular) more affordable, such as the national food stamp program (SNAP) or the Women, Infants, and Children program. Although price-related strategies are certainly necessary for improving FV consumption among low-income households, there is evidence that they may not be sufficient [2]. The impacts of nutrition education programs or nutritional beliefs/attitudes on FV spending have been widely researched. Most studies have found a positive correlation between education and diet, however there are mixed results depending on the education program or data set as well as the proxies chosen to measure nutritional knowledge or attitudes [3, 4].
Access-related strategies—such as building new grocery stores or increasing healthy options at corner stores—aim to improve the supply side of the equation, and are typically targeted at food deserts. However, not only have interventions in specific neighborhoods seen mixed results, but studies using observational data aimed at drawing broader statements about large populations have also presented seemingly contradictory findings [5, 6, 7, 8].

The key issue is a lack of understanding of the causal mechanisms that guide household decision making and how it should be modeled. We cannot expect to fix the broken link between supply and demand without first understanding why the link is broken. This paper employs the technique of matching in observational studies on the nationally representative Food Acquisition and Purchase Survey (FoodAPS) dataset with the explicit goal of estimating the causal effects of a household’s “value of nutrition” and access on FV spending. We measure access as a combination of distance to grocery stores and vehicle ownership, and classify households as either having a high or low value of nutrition based on self-reported nutrition-related behaviors. The transparent statistical methodology is both easily interpretable and allows for verification of the underlying assumption that plagues every observational study—namely, that there are no unmeasured confounding variables. We also introduce a behavioral mathematical model that is able to explain our observed outcomes through the underlying causal mechanisms that guide household choices related to shopping patterns. To our knowledge this model is the first to capture these dynamics.

Our main contributions are summarized as follows:

1. We estimate the causal effect of access and value of nutrition across a nationally representative sample of U.S. households that receive SNAP benefits.
2. We find evidence that distance can have an effect on FV spending, especially for households with a low value of nutrition. We find, surprisingly, that vehicle ownership does not significantly affect FV expenditure, even among households that have farther-than-normal distances to the store.
3. We find that value of nutrition also affects FV spending, and typically has a larger effect.
than access. This effect is particularly strong for households with father-than-normal distances to the store, where having a high value could increase FV spending by up to an estimated $2.30 per person per week—a dramatic increase on the median FV expenditure for this population of $0.67 per person per week.

4. We gain an understanding of the way in which access- and value-related policies will impact household decision-making through the analysis of secondary outcomes. We show that decreasing a household’s distance to the store influences whether a household visits a large grocery store in a given week, whereas increasing a household’s value of nutrition affects the bundle of goods purchased at the store by increasing the amount of FVs bought (and can also affect the frequency of store visits). We explain why these behaviors occur through our novel mathematical model.

5. Finally, our results emphasize the need for policymakers to carefully consider what distance threshold to choose when discussing access, as we find evidence that the standard distance of one mile may be too large.

In this work we see that increasing FV consumption requires that policymakers consider both supply and demand factors. With hundreds of millions of federal dollars being put into access- and education-related strategies, gaining a better understanding of which strategies have the most potential for success prior to implementation could have immense benefit.

References