Transit Investment and Health Outcomes:
A Retrospective Investigation of Atlanta's MARTA System

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Abstract

This paper seeks to acknowledge that first and foremost, human health is greatly affected by the environments we live in. Health disparities we observe today are often the product of past discriminatory policies by local governments. Through a case study looking at public transportation investments in the Atlanta Metropolitan Region, I investigate the disparities in public transportation infrastructure investment and differential mortality rates from diseases most likely to be influenced by such disparities. Specifically, I investigate the level of investment of subway lines versus bus lines of the Metropolitan Atlanta Rapid Transit Authority (MARTA). The link between health and the built environment, as evidenced in this case study, points toward a future opportunity for planning departments to work with public health departments to create living spaces that promote health more effectively.

Introduction

The innovations of the automotive industry that brought the car to the masses have also led to sprawling developments throughout the United States. Sprawl is described as the expansion of human populations away from central urban areas into low-density, homogenous, and usually car-dependent communities.

Yet despite our inclinations, humans have a remarkable capacity to plan ahead and shape new environments. These efforts to shape future developments do encounter external influences, such as new innovations and politics, which results in the execution of initiatives that may not be necessary for a region. For example, many of these decisions have led to sprawling developments throughout the nation. Sprawl is a huge problem, especially for equity. For example, because owning an automobile is so necessary for living in sprawling suburbs, those without cars are at a disadvantage because sprawl's transportation accessibility issues create disparities in accessibility of resources in the community. This paper focuses more on the disparities of transportation investment and their impacts on health, mainly because recently, a new school of urbanism has emerged within the past 30 years, New Urbanism. Members of this school argue for the importance of "neo-traditional" planning that would reclaim older models of planning - bungalows, set back slightly from the street, for instance, instead of larger totally detached single family homes. Perhaps the most salient focus of the New Urbanists with respect to our focus on the link between transit and health is their support of Transit-Oriented Developments (TODs) to promote economic activity and human health in urban space. These TODs are essentially planned communities linked to a public transportation system. The focuses of the New Urbanists have put addressing urban challenges from a multidisciplinary perspective at the forefront and now, many stakeholders are calling for a stronger push to understand how we can plan for spaces that help promote healthier communities.

If an effective public transportation system is built with well-spaced transit catchment areas, meaning that the distance from any given location to the nearest station will be within a reasonable walking distance, as well as well-lit and safe stations, people will likely be more incentivized to use public transit instead of driving personal vehicles, provided that the benefits outweigh the costs of using public transit. As a result, people are increasingly likely to walk to transit stations and from transit stations to their desired destination. With effective transit investment, we should see improved health outcomes related to increased urban walkability, a hypothesis supported by scientific literature. European and Asian studies have documented significant relationships between greater active commuting or transit use frequency and positive health indicators, including lower body mass index, healthier blood lipid profiles, and lower blood pressure associated with active commuting. Therefore, I hypothesize in locations with fewer public transit investment, we will likely see worse health outcomes.

Background: Health and the Influence of the Built Environment

Figure 1 shows the age-adjusted prevalence of obesity and diagnosed diabetes among U.S. adults aged 18 years or older. Essentially, the redder a state is, the greater the percentage of diagnosed diabetes and obesity is prevalent in that state. Overall, the general trend for both obesity and diabetes is that they are becoming greater national health problems. Obesity prevalence may have been as low as fewer than 14 percent of the population in a given state in 1994 and has now risen to at least 22 percent. Diabetes prevalence used to be as low as less than 4.5 percent and has now risen to at least six percent.

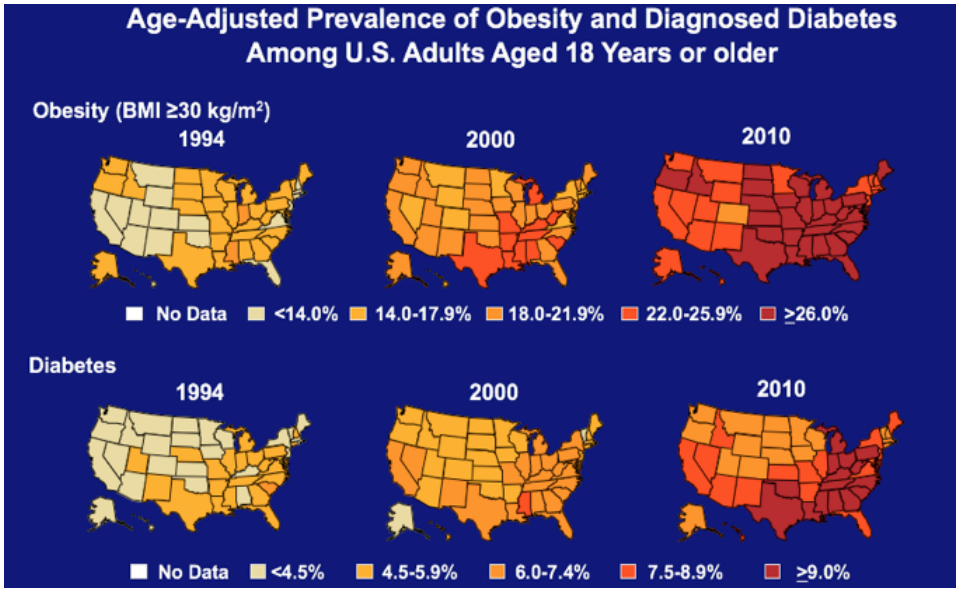


Figure 1. Age-Adjusted Prevalence of Obesity and Diagnosed Diabetes among US Adults Aged 18 Years or older

Background II: The Vehicular-Centric Built Environment and Health

The answer to this increase in diabetes and obesity prevalence may lie partially in the history of how the built environment has changed over the past century. The 1956 Federal Highway Act played a key role in the transformation of our urban landscape by setting aside 25 billion dollars to fund construction of 41,000 miles of the Interstate Highway System. As a result of the construction of the highway system, private motor vehicles became the dominant form of transportation. Richard Jackson, one of the nation's leading experts on the built environment's relationship with public health, argues that such a relationship exists partly because private motor vehicle transportation made necessary by extensive low-density land use has led to implications for health: people are less active because they walk less, vehicle exhaust degrades air quality, motor vehicle injuries increase, and mental health and social capital are adversely affected. Jackson makes a reference to sprawl through his use of the words, 'low-density land use.'

Selected health outcomes were based on health outcomes identified by Richard Jackson, who acknowledges a relationship between private motor vehicle transportation and effects on physical activity, respiratory health, and injuries sustained from vehicular accidents. I ended up investigating all diseases of heart and diabetes mellitus.

Background III: Why Atlanta and MARTA's history

The 50s marked the beginning of business corporations moving to southern and western states to escape higher labor costs in the industrial North and to take advantage of a vast pool of low-wage, non-unionized labor. The combination of Atlanta being a major city in the Sunbelt region that developed in a sprawling pattern as well as a city that experienced significant public transit investment, despite growing reliance on private automobile for transportation, made it my city of interest.

MARTA is split between subway and bus transportation formats. MARTA's subway project was a highly contested development plan during the several years leading up to its passage. In the 1950s, planners desired to implement a new rail system as they believed that grandiose public transportation systems would help boost the growth of Atlanta and its surrounding metropolitan area. A study conducted in 1954 by the Atlanta Region Metropolitan Planning Commission (ARMPC) recommended the construction of a 60-mile, fixed-rail system that would connect city proper with 5 metro area counties: Fulton, DeKalb, Cobb, Gwinnett, and Clayton. Atlanta already had a

bus system in place at that time but the ARMPC argued that buses were a 'second rate' means of transportation. The state of Georgia is also interesting in the sense that the original state Constitution did not recognize the legal authority of local governments to provide transportation services. However, due to the proposed amendment obtaining the unqualified support of the newspapers and business community, it passed in 1964 and in 1965, the Metropolitan Atlanta Rapid Transit Authority (MARTA) was created.

After the transit authority was created, MARTA faced several voter referendums before the fixed rail plan was approved. The first referendum which appeared on the ballot in 1968 was voted down by voters in the city of Atlanta and Fulton and DeKalb counties. Key to its defeat was black areas voting against it more than 2-to-1 due to African Americans' discontent with a lack of adequate rail service planned for the city's public-housing developments. Throughout the 1970s, MARTA received grants of more than $800 million from the federal government for planning, design, land acquisition and construction of a rapid rail system. The bond referendum went to the ballot again in 1971 and this time it passed in three of the five jurisdictions: the city, Fulton County, and DeKalb County. Key to its passage was a last minute decision to heed the warnings of black political leaders and an agreement to satisfy 90 percent of the black political agenda by substituting a rail line for the proposed busway to the Perry Homes community, endorsing minority contracting, and committing to maintaining a fifteen-cent fare for seven years. As a result, construction began and even though, sadly, many of the promises to the African Americans were not kept, the rail system was built and the first train began operating on June 30, 1979.

Methods

Selection of site

The Atlanta metropolitan region was selected as the case-study region. A city located in the Sunbelt region of the United States was chosen because these Sunbelt cities are often newer and created after the invention of the automobile and around the time of the passage of the Federal Highway Act of 1956, which led to construction of an enormous amount of interstate freeways in the United States. As automobiles began to dominate the transportation scene of the United States, people have been left with little or no opportunities to walk or cycle for transportation, which may partially explain the shift in American health outcomes, such as the rise in obesity rates. Research has indicated that between 1980 and 2002, obesity prevalence in the United States doubled in adults aged 20 years or older and overweight prevalence has tripled in children and adolescents aged 6 to 19 years.

Counties in the Atlanta metropolitan region were selected for analysis based on the African-American population in the county, as well as total population for each county. To address demographics differences, I looked for two counties in the Atlanta metropolitan area that had similar demographics prior to the construction of MARTA. Two counties of similar demographics prior to the construction of MARTA with significant MARTA stations were DeKalb and Fulton County. I looked at percentages of minorities in DeKalb versus Fulton County and found that in 1980, both DeKalb and Clayton counties had a population of mostly caucasians. Clayton County had a population of 91.4 percent white and 7.6 percent black. DeKalb County had a white versus black split of 71.3 percent and 27.5 percent, respectively. By selecting these counties versus other counties, I tried to control for potential effects of counterurbanization which, in this case, would be the flight of whites away from areas that experienced growth in the African American population.

Obtaining Health Indicators Information:

After establishing the two counties for our retrospective analysis: Clayton County and DeKalb County, I compared health outcomes between the two counties by using the US Census Bureau's vital statistics, specifically using mortality statistics categorized by cause of death and county. In order to identify any correlations, I compared data from the most recent vital statistics with vital statistics from 1980. To further strengthen my correlations, I also made sure to identify correlations between physical activity and potentially related health conditions such as obesity and also attempted to track down data comparing population growth between the two counties and ridership levels.

Hypothesis

We identified Clayton County as the county without significant hard-rail MARTA investment and DeKalb

County as the county with significant MARTA investment. Thus, if my hypothesis that counties without significant hard-rail (subway) MARTA investment will have worse long-term health outcomes is correct, we should see the percent change of mortality based on a few causes of death related to public transit investment to worsen progressively in Clayton County and either no change or improvement in DeKalb County.

Analysis

I successfully obtained the necessary information on mortality from the years 1980 through 1993 using the US Census Vital Statistics. The key causes of mortality I used in my analysis were diabetes mellitus and diseases of the heart. Diseases of the heart was a comprehensive grouping of major cardiovascular diseases, rheumatic heart disease, hypertensive heart disease, ischemic heart disease, and a category called 'other heart diseases.' I compiled my data together for mortality from diseases of the heart and diabetes mellitus into the tables (Figure 2) below:

Diseases of Heart *(year)*	*1980*	*1981*	*1982*	*1983*	*1984*	*1985*	*1986*	*1987*	*1988*	*1989*	*1990*	*1991*	*1992*	*1993*
Clayton County (n=)	193	242	239	248	250	320	312	319	340	292	263	276	318	353
DeKalb County (n=)	989	1036	930	979	1019	1016	1082	988	1102	1074	979	1038	988	1054

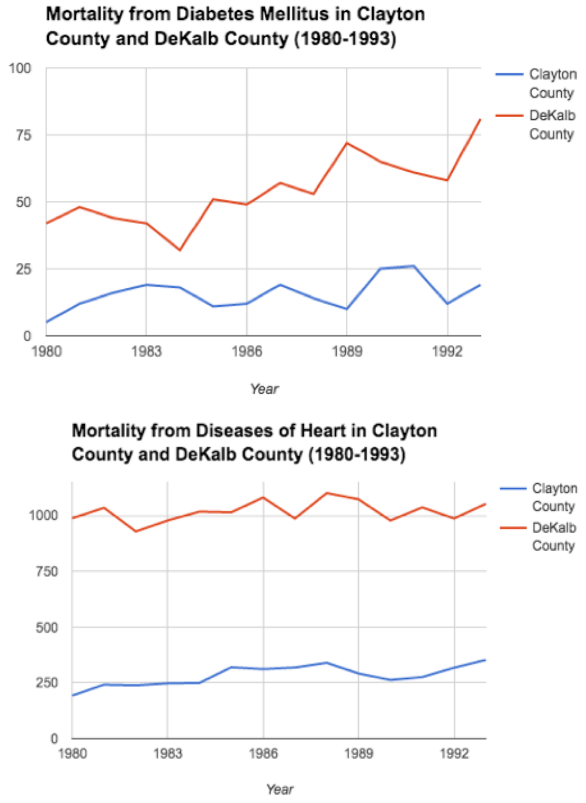
Diabetes	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993
Clayton	5	12	16	19	18	11	12	19	14	10	25	26	12	19
DeKalb	42	48	44	42	32	51	49	57	53	72	65	61	58	81

Figure 2. Vital Statistics Data on Mortality from Diseases of Heart and Diabetes

Figure 3 shows mortality from diabetes mellitus in Clayton County and DeKalb County, specifically indicating that more people are dying in DeKalb County than in Clayton County, as highlighted by the seemingly steeper red curve. Figure 4 shows mortality from diseases of heart in Clayton County and DeKalb County, with both counties seem to see a stable number of people dying from diseases of heart. To provide a more robust analysis of the trends, percent change was calculated at the five-year level from 1980 to 1985 as well as the percent change from 1980 to 1993.

Based on the above percentage change calculations, we observe that there are greater percentage changes in Clayton

Figure 3 and Figure 4.



	Diseases of heart (Clayton County)			Diseases of heart (DeKalb County)		
	Vital Statistics 1980	Vital Statistics 1985	Vital Statistics 1993	Vital Statistics 1980	Vital Statistics 1985	Vital Statistics 1993
Total	n=193	n=320	n=353	n=989	n=1016	n=1054
% change	+65.8% (1980-1985) +82.9% (1980-1993)			+2.73% (1980-1985) +6.57% (1980-1993)		

	Diabetes Mellitus (Clayton County)			Diabetes Mellitus (DeKalb County)		
	Vital Statistics 1980	Vital Statistics 1985	Vital Statistics 1993	Vital Statistics 1980	Vital Statistics 1985	Vital Statistics 1993
Total	n=5	n=11	n=19	n=42	n=51	n=81
% change	+120% (1980-1985) +280% (1980-1993)			+21.4% (1980-1985) +92.9% (1980-1993)		

Figure 5. Percentage change for Vital Statistics.

County for both mortality causes over both the 5 year and the 13 year periods than in DeKalb County.

Tracking down correlations between population growth in the two counties and ridership totals would help make any argument for a correlation between transit investment and health outcomes in my two counties more robust. According to population statistics from the United States Census, the population for Clayton County in 1980 was 150357 people and 182052 people in 1990. DeKalb County had a population of 483024 people in 1980 and 545837 in 1990. When we calculate the percent change in population, we get growth of 21 percent in Clayton County and 13 percent in DeKalb County. While I was unable to obtain ridership statistics on a county level, I did obtain overall ridership data in the form of a graph depicting transit ridership trends in Atlanta (MARTA) measured in linked passenger trips which is defined as a trip from origin to destination on the transit system (see Figure 5 below) . Even if a passenger must make several transfers during a one-way journey, the trip is counted as one linked trip on the system. Unlinked passenger trips count each boarding as a separate trip regardless of transfers. Not having the unlinked passenger trip data likely does not affect our analysis; however, the data would be useful in identifying if the amount of transfers needed to make a trip is a potential reason for any decrease in public transit ridership. Overall, rail ridership has grown from 10,000,000 linked passenger trips in 1980 to around 25,000,000 linked passenger trips in 1993. Bus linked passenger trips has fallen from 65,000,000 to 40,000,000 from 1980 to 1993. That translates to a 150 percent growth for rail ridership and a shrinkage of 38.5 percent for bus ridership. Total ridership has changed from 75,000,000 linked passenger trips in 1980 to 65,000,000 in 1993, which is a decrease of 13.3 percent. Population growth is similar in both counties but we observe an overall decrease in total transit ridership.

Conclusion

Based on our analysis, while diabetes and diseases of heart have seen greater percent changes in mortality from 1980 to 1993 in Clayton County than DeKalb County, this may potentially be confounded by population growth. There may still be evidence of a correlation between transit investment and health outcomes due to population growth not being tremendously substantial: 21 percent in Clayton County and 13 percent in DeKalb County. Yet, even though population may have grown by a little, MARTA ridership across Atlanta has dropped by a little. It is possible that decreased ridership means that people are driving private cars more often and consequently, their health outcomes may have suffered due to increased adoption of private transport. As much of the existing literature on the built environment and health concludes, there needs to be further robust studies examining the relationship between built environment investments and health outcomes to produce stronger correlations.

Challenges and Future Directions

I outlined some of the challenges involved with this project earlier in my methodology and analysis sections. First, it was difficult to locate incidence data on health conditions before the current decade so I had to resort to using vital statistics on mortality instead. The populations involved in the mortality statistics are of an advanced age so it was not an ideal arrangement. One such future direction could be to obtain data on incidence rates for a specific age-group in order to avoid the skewed datasets I had to work with. Second of all, there are no standardized built environment indicators so I had to pool together the limited literature on the relationship between the built environment and health to make inferences about the health outcomes that would be affected by transportation investment. In my analysis section, I detailed the difficulty of locating ridership statistics by county in the limited time I had to write this paper. It may also be possible that the MARTA county offices no longer have the data on file. Finally, I will also add that interdisciplinary investigations are difficult because there are so many possible confounds and interactions that could play a role in these relationships. It should be noted that there needs to be further investigations of correlations between health outcomes and ethnic background and careful consideration of potential confounds, such as socioeconomic status and consequent factors such as diet and stress, if future studies are to be conducted.

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