COVID-19 and Movement Patterns in New Jersey

Piyushimita (Vonu) Thakuriah
Edward J Bloustein School of Planning and Public Policy
Rutgers Urban and Civic Informatics Lab
Rutgers University, New Brunswick, New Jersey
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Changes in NJ Movement Patterns

As of July 7, 2020, New Jersey continues to have the second highest number of COVID-19 confirmed cases, and the highest deaths, per 100,000 population, among all US states[1]. Caseload rates are highest in the northern counties, but have spread to coastal counties such as Ocean and Monmouth Counties, as well as to central counties such as Middlesex, with a surge that started by the weeks of March 22 and 29. Cases were on the rise in all the counties, including in southern counties such as Camden by the first week of April.

Using data from anonymized mobile location data panels and building footprints provided by Safegraph[2], we examine how mobility patterns changed in NJ for the period of March 1, 2020, to May 17, 2020. The purpose of this note is to highlight how, where, and to what types of locations travel changed during the pandemic. We also make a preliminary assessment of the types of challenges faced by low-income communities in accessing food and health services.

New Jersey instituted stay-at-home on Saturday, March 21. As a part of a multiphase reopening process, NJ ended maximum restrictions and moved to Stage One Reopening on May 18, 2020. The period considered here includes three weeks prior to the shutdown, followed by the 8-week period post-March 21, which had the maximum restrictions in mobility. The data we used includes visits to over 150,000 Points-of-Interest throughout NJ, including retail, commercial, healthcare, food establishments and other essential and non-essential establishments.

Travel changes by location

The location data shows that mobility in the state had already slowed by early March. The stay-at-home order issued on March 21 required residents to stay home except for specific circumstances such as emergency healthcare, essential work, and obtaining necessities like food and medicine. However, travel did not decline below 80 percent of the travel levels in the first week of March, during the period examined. Still, that is a substantial decline, and New Jerseyans were clearly gearing up for the pandemic by restricting travel.

Figure 1 shows weekly change in visits, compared to the week of March 1, by county. After a gradual decline in the second week of March, there was a sharp drop over the next two weeks to the lowest levels of travel starting the week of March 22. Reduction in travel varied by location of counties, with the greatest declines in the northern and central counties.

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[1] https://coronavirus.jhu.edu/testing/states-comparison

[2] The author would like to thank Mr Gavin Rozzi, Research Computing Specialist at the Rutgers Urban and Civic Informatics Lab, for acquiring this dataset from Safegraph.

By the week of April 12, there was a gradual uptick in travel, with increases more visible in some areas compared to others. For example, the coastal and southern counties saw the greatest percentage increase in visits to locations post-April 12.

Figure 1: Percent change in visits attracted by Points of Interest in different NJ regions (March 1 to May 10, 2020)
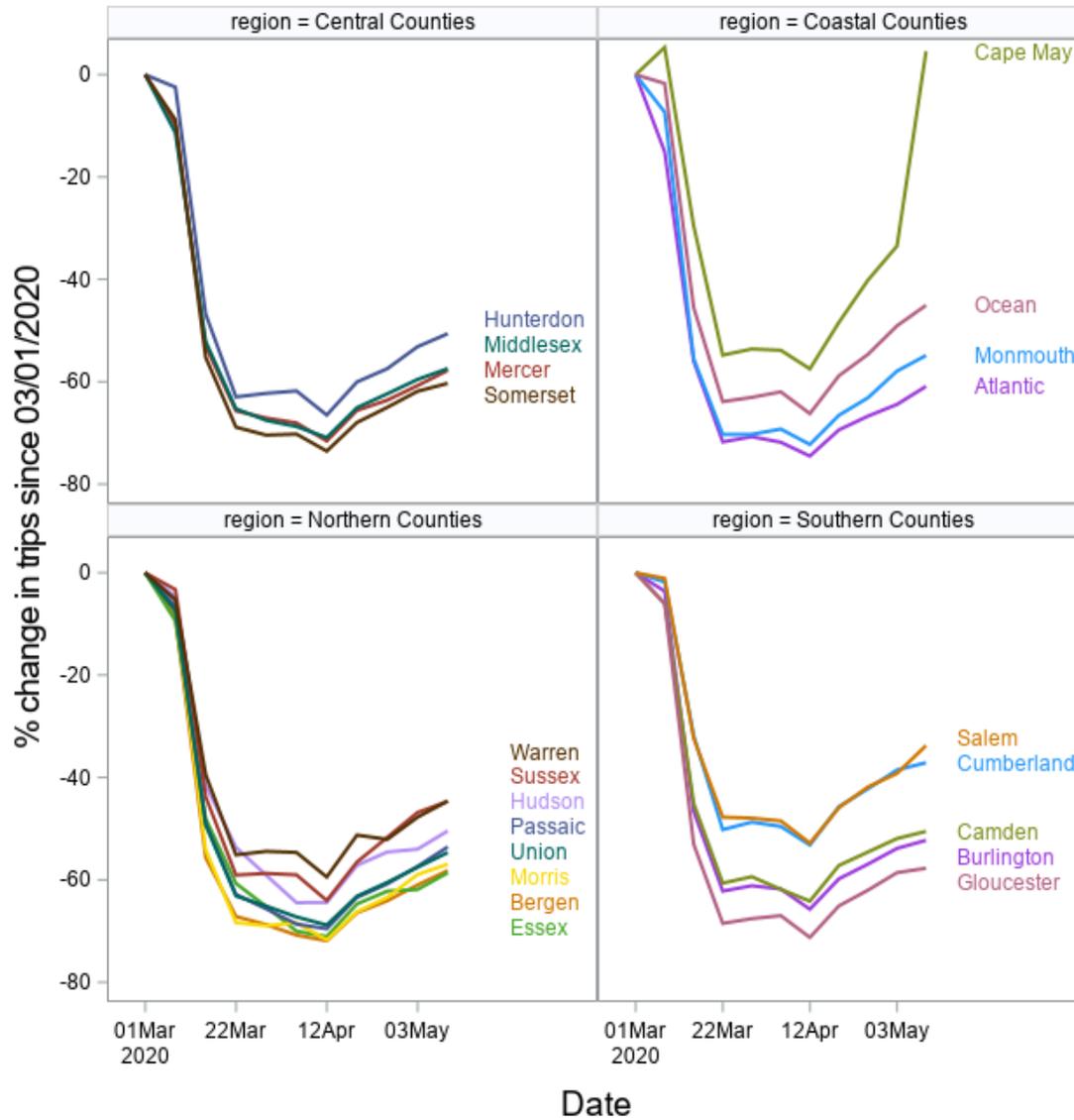

Figure 2 shows distances traveled per visit, as well as the time spent at each location ("dwell time"). During the March 8 to May 10 period, the median distance traveled to reach each location declined for all counties compared to the first week of March. Distance traveled rose again by the third week of April. Figure 3 shows that the same is true of the amount of time people spent at each location – median dwell time declined as well. Generally speaking, the longer people traveled to a location, the less time they spent at that location, undoubtedly to reduce the total out-of-home time. However, there are important differences to this overall trend by type of establishment. Distance-wise, the shortest visits were to

locations in the worst-hit northern counties; but generally, the time spent at the destination was higher in those areas as well.

Figure 2: Changes in distances traveled by NJ region
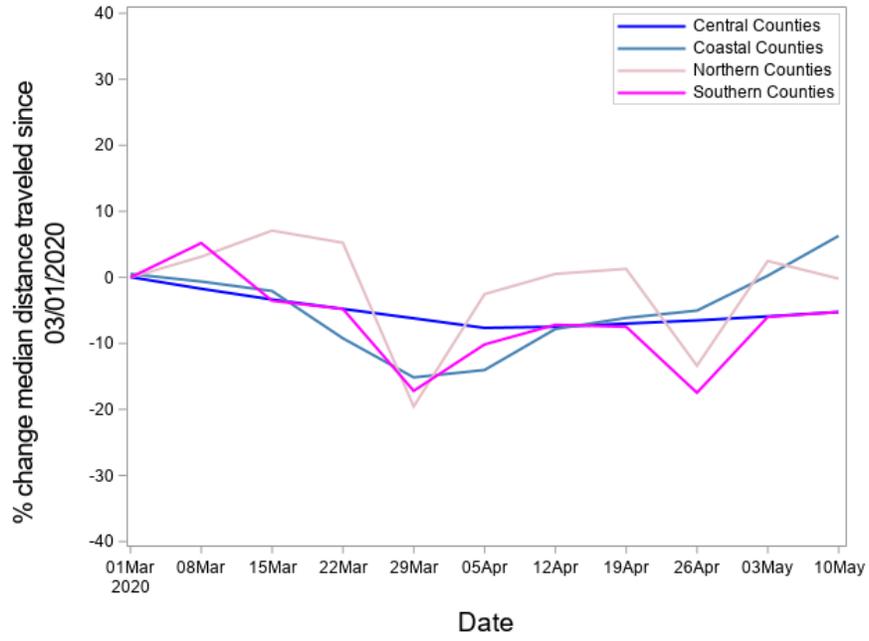
Figure 3: Changes in time spent in each location (dwell time) by NJ region
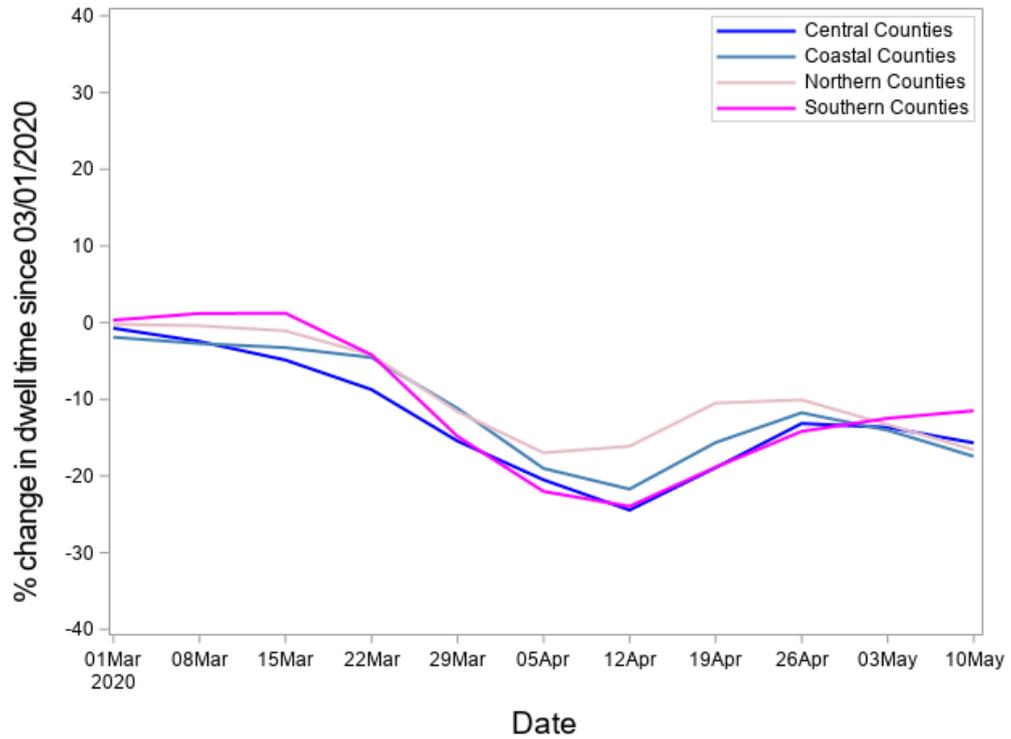
Travel by COVID-19 Rates

Figure 4 shows percentage change in the number of visits during the week of May 10 compared to the week of March 1 by COVID-19 deaths and cases per 100,000 population. The percentage changes were greater in areas with higher COVID-19 cases and death rates. This implies that although the whole state slowed down in terms of travel, there was a greater slowdown in areas with higher prevalence of the disease. There are clearly exceptions especially at the low-end of the cases and death rates – for instance, Cape May continued to have low levels of confirmed cases and deaths by May 10 and travel levels were notably higher at that time compared to the first week of March.

On the other hand, Atlantic County also had lower rates; however, travel levels during the week of May 10 remained very low. The counties with higher COVID-19 cases and death rates remained relatively closed by May 10, with an average of 50 to 60 percent decline in visits compared to the first week of March.

Figure 4: Percent changes in all visits by county-level COVID-19 cases and deaths
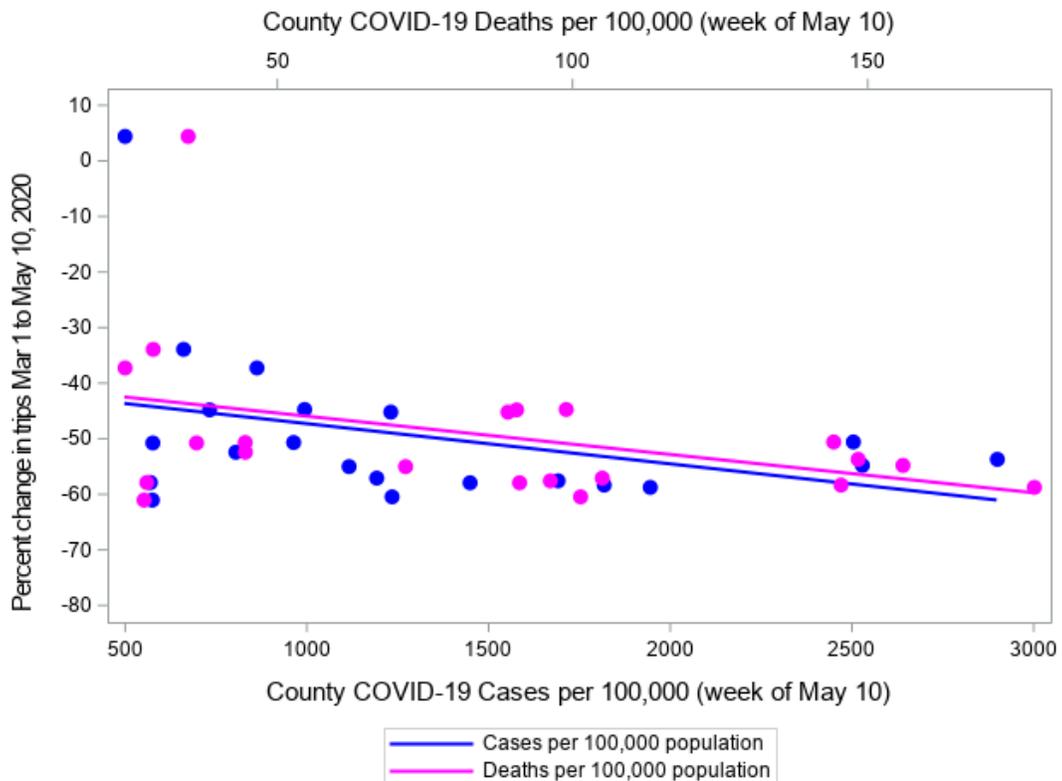

Movements by Type of Establishment

People traveled to certain types of establishments more than to others during the 10 week period. Trips to certain facilities actually increased slightly, particularly a month after the shut-down compared to the levels seen during the week of March 1. These establishments are in the following categories: "General Line Grocery Merchant Wholesalers", "boat dealers", "hardware stores", "Appliance Repair and Maintenance", "Home and Garden Equipment Repair and Maintenance", "Nursery, Garden Center, and

Farm Supply Stores", "Masonry contractors", "Miscellaneous Durable Goods Merchant Wholesalers", and "Farm Supplies Merchant Wholesalers"

There was a rise in the second week of March in the number of visits to supermarkets, and food, alcohol, and convenience stores in almost all NJ counties (Fig 5). People everywhere engaged in panic-shopping in the face of an imminent pandemic. These trips during the second week of March were highest in Morris, Monmouth, Sussex, and Warren counties.

Figure 5: Percent changes in all supermarket and other food, alcohol and convenience store trips
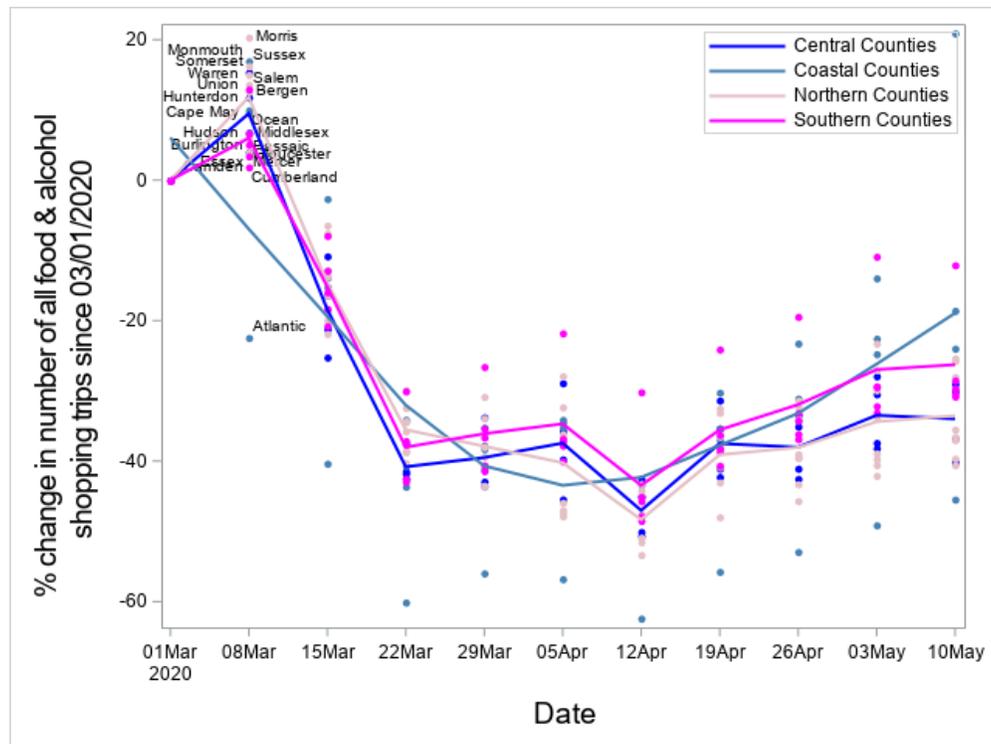
After the second week of March, trips to food and grocery stores declined the most in Atlantic, Bergen, Passaic, Mercer, and Somerset counties, implying that many people were either well-stocked or used delivery services. At least two of those counties, Bergen and Passaic, also had very high per capita COVID-19 caseloads through the period. After three-weeks of reduced visits to buy groceries and other food items in significant numbers, food and related establishments gained visitors again, but at greater rates in the southern and coastal counties.

During the pandemic, the distances people traveled for food and grocery shopping, and convenience stores varied by location. Shopping trips to facilities located in Bergen, Essex and Atlantic counties attracted short trips from home, implying that when people went out to buy food and groceries, they traveled to locations close to home. In contrast, people traveled quite far, in fact farther than they did during the week of March 1, in counties such as Burlington, Hudson, and Middlesex counties, where closures adversely affected the ability to stay at home or to at least locally travel.

Movement Patterns and Disparities

The period of the pandemic highlighted significant disparities in health and wellbeing by race and income. As a first-stage approach to this complex and multi-faceted subject, we take a simple approach and focus on mobility patterns by poverty rates of NJ towns and cities. We assess trips to supermarkets in particular, and all food, alcohol and convenience store locations, by poverty levels of NJ communities. We also look at health services. NJ community data were obtained from the Census Bureau. We also use data on COVID-19 caseloads by county from NJ Department of Health.

Figure 6: Percent changes in food and related establishment visits against poverty rates of NJ places, coded by county COVID-19 caseloads
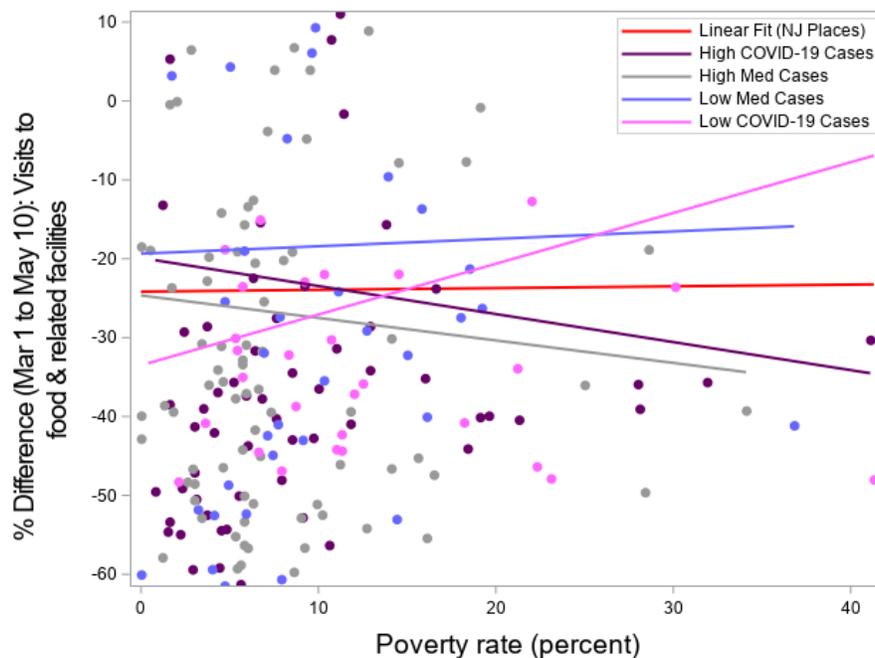

Figure 6 shows the percentage change in the number of visits to food, alcohol and convenience stores during the week of May 10 compared to the week of March 1, against the poverty rates of NJ communities. The types of stores include supermarkets, grocery and convenience stores, fish and seafood markets, fruit and vegetable markets, baked goods and confectionary stores, all other specialty food stores, and beer, wine and liquor stores.

The figure shows that the decline in the number of visits to food stores stayed about the same, on average, across places with different poverty levels. However, there are variations by COVID levels. In towns and cities with higher COVID cases, percentage decline in food shopping increases as poverty levels increase. Greater store closures in high-COVID areas, together with reduced public transportation services, may have played a role in less frequent food shopping trips in high poverty areas, potentially leading to hardship in accessing food.

On the other hand, in places with low COVID levels, the percentage decline in food shopping trips decreases compared to the pre-crisis period, as poverty levels increase. People doing food shopping in poorer areas with low COVID-19 cases, either by choice or due to financial hardship, made more trips. The inability to transport back large quantities of goods without access to a car or not having the ability

to pay for large quantities of groceries during a single visit may have played a role in more frequent food shopping trips.

We noted earlier that the longer people traveled to a location, the less time they spent at that location, undoubtedly to reduce the total out-of-home time. However, this is not the case with food shopping. Figure 7 shows dwell time against distance traveled for food shopping, and the relationship is in fact the inverse. During the pandemic, when people traveled farther to buy food, alcohol and related items, they also spent more time in those facilities. This is irrespective of whether the community has high levels of households in poverty or not, although increases in dwell time as well as distance traveled are greater in places with higher poverty.

Health services is a different matter. By "health services", we mean non-hospital health facilities such as dentists, medical labs, mental health practitioners, HMO medical centers, kidney dialysis centers, diagnostic imaging centers, and myriad other services. As distance traveled to such facilities increase in low poverty areas, time spent for health services increases (Figure 8). However, the opposite is true for high poverty areas. Even after traveling long distances, there are places where the average time spent at health services facilities is quite short (less than 50 minutes). There could be many reasons for this including the possibility that uptake of telehealth for minor illnesses has not been as prevalent in low-income areas as it has been in higher-income areas.

Figure 7: Dwell time and distance traveled for food shopping by poverty level
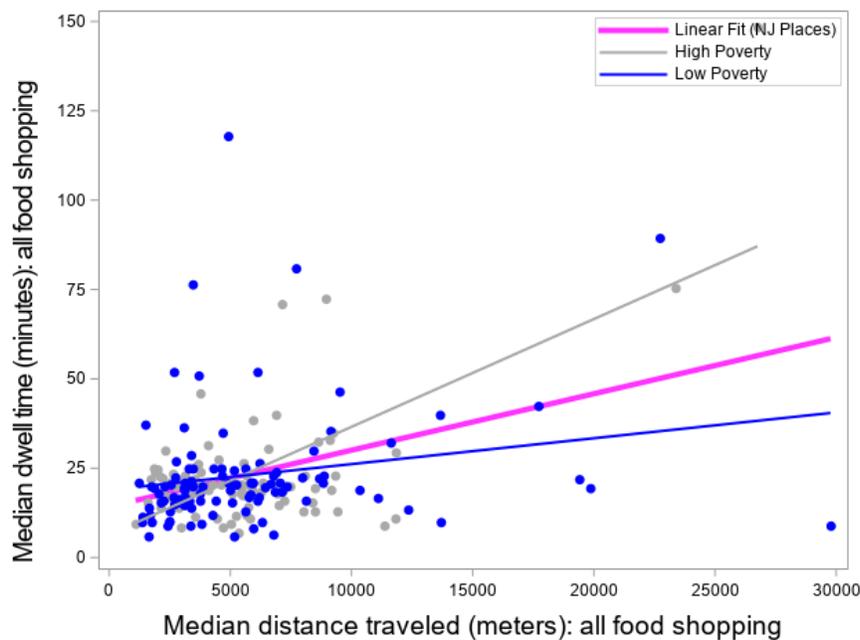
Figure 8: Dwell time and distance traveled for health services by poverty level
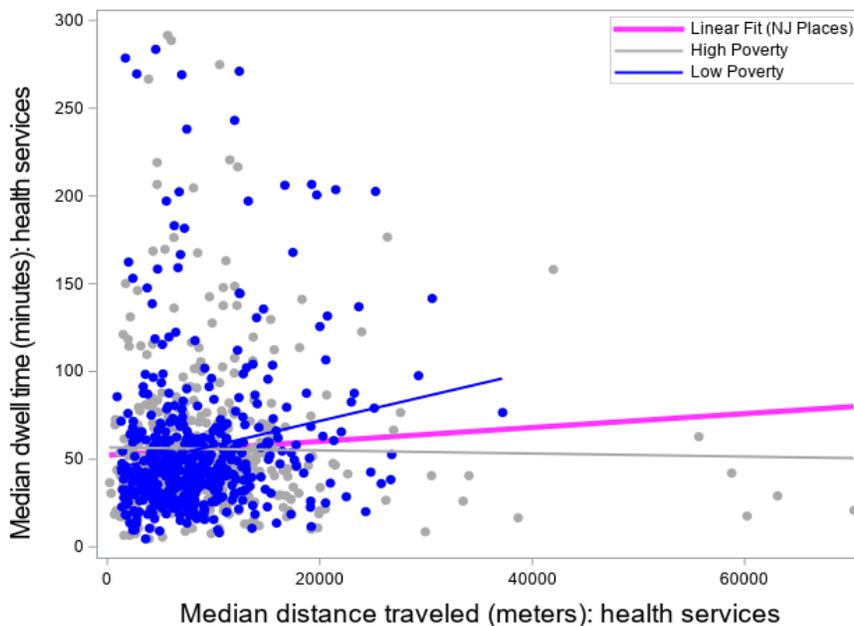
Conclusions

Even under normal circumstances, there are tremendous geographic differences in economic, social and health outcomes in NJ. These differences translate to disparate impacts on the amount, distance and time spent in travel during the COVID-19 shutdown. Differences in travel are seen among different geographical regions, among areas with different COVID levels and different sociodemographic characteristics, as well as by type of establishment, and periods of time.

While the pandemic is global, its effects are local. Localized efforts, that emphasize strategies to address the effects of mobility disruptions, are needed for an economically-sound and socially-just recovery. In what is termed as humanity's first "data-driven pandemic", a starting point to a robust and inclusive recovery will require a multi-faceted analysis of the what, how and when of mobility disruptions during COVID-19.

What are the impacts of changes in travel on access to healthcare, jobs, food, and recreation? There is a need to comprehensively identify the effects, both positive and negative, of changes in travel on the wellbeing of residents and business owners to determine an overall strategy and a range of solutions necessary at the local level for recovery, as well as during future shutdowns.