Transportation Equity in the Age of COVID-19

A Connecticut Department of Transportation Case Study

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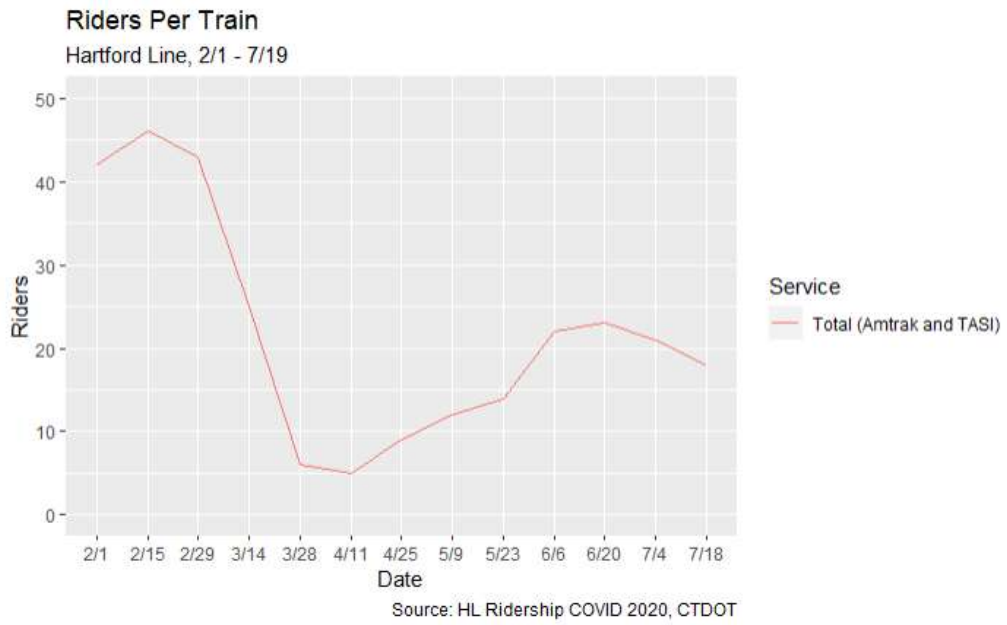
October 2, 2020

Introduction

Transit ridership in Connecticut has seen drastic changes during the course of the COVID-19 pandemic. From a drastic drop in ridership across all modes at the beginning of March to a tentative return of riders in May, the pandemic has presented clear challenges for transit. This presentation offers several case studies: We first evaluate changes in train ridership on the Hartford Line and then changes in bus ridership from the Hartford, New Haven, and Stamford bus systems.

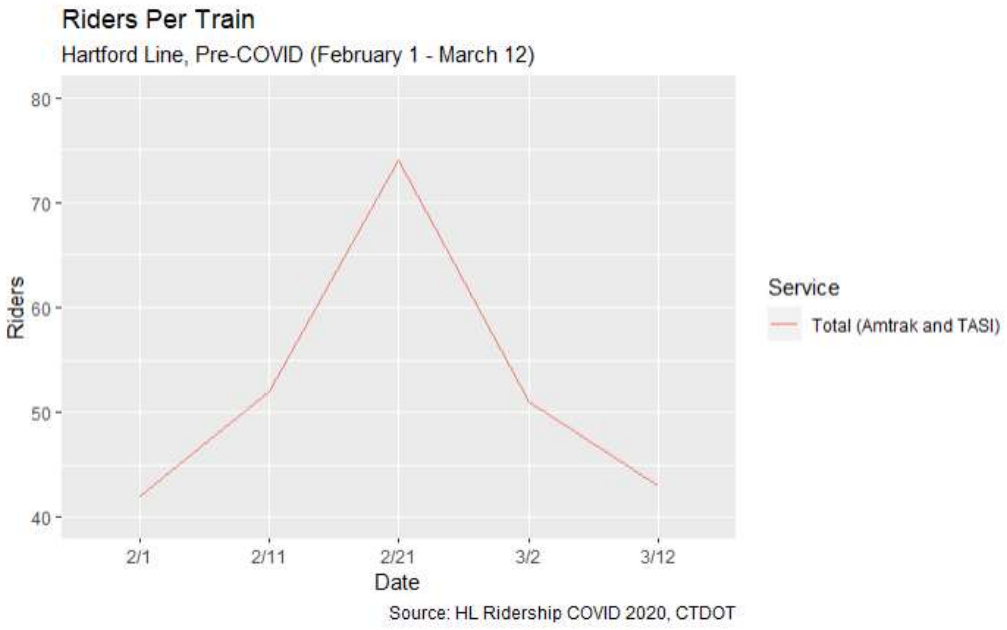
While these visualizations represent a comprehensive assessment of the available data, our hope as GFA Fellows is that these maps and images will provide a starting ground for future CTDOT analyses with more context about the transportation system as a whole.



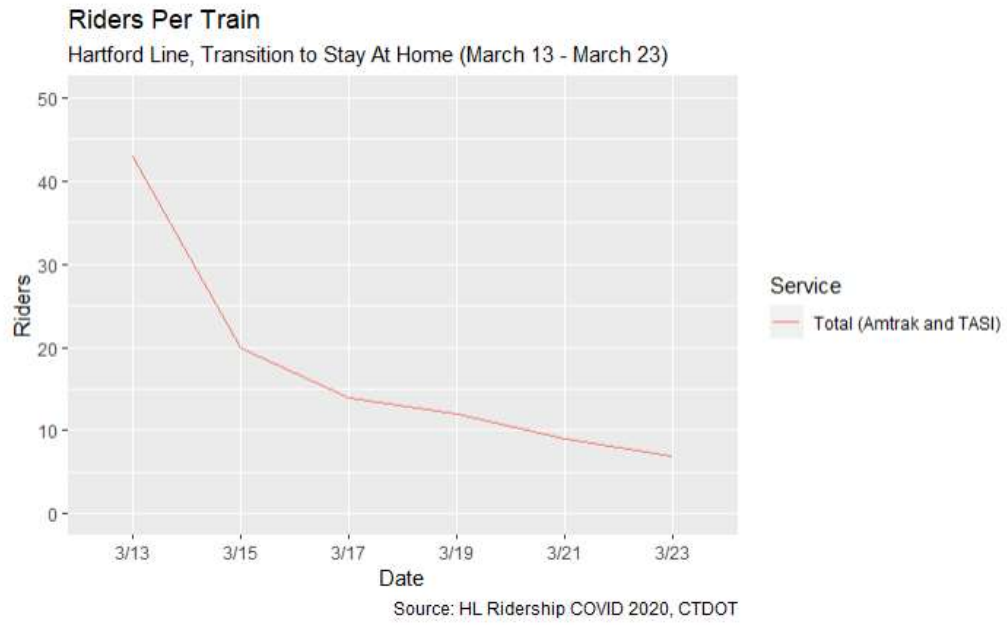
Train Ridership

First, we consider the average ridership per train on the Hartford Line between February 1 and July 19. This is a decidedly more accurate metric than total ridership since the latter does not account for the addition of new trains on the HL during this period. The average ridership is also inclusive of all services (TASI and Amtrak) operating on the line. This data was retrieved from CTDOT.

The chart on the right shows the substantial decline in average ridership during March and early April from its peak level in February. Although ridership has since increased, it has not returned to its pre-pandemic levels. The following charts focus on ridership during specific periods of time over the course of the COVID-19 pandemic.

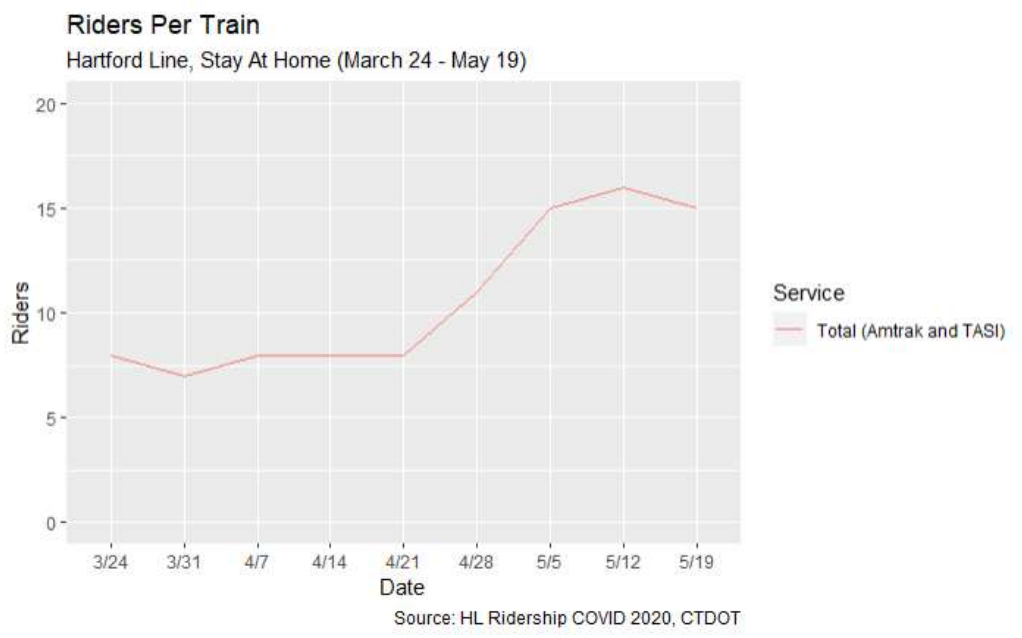


Here, we see the average ridership per train during the pre-pandemic period (February 1 - March 12). Peaking at nearly 75 riders per train on February 21, the Hartford Line was a popular mode of transportation for Connecticut travelers and commuters before the onset of the pandemic. However, as cases began to increase in early March, it's possible that travelers opted to avoid public transit on the HL, which explains the decline of average ridership in early March.



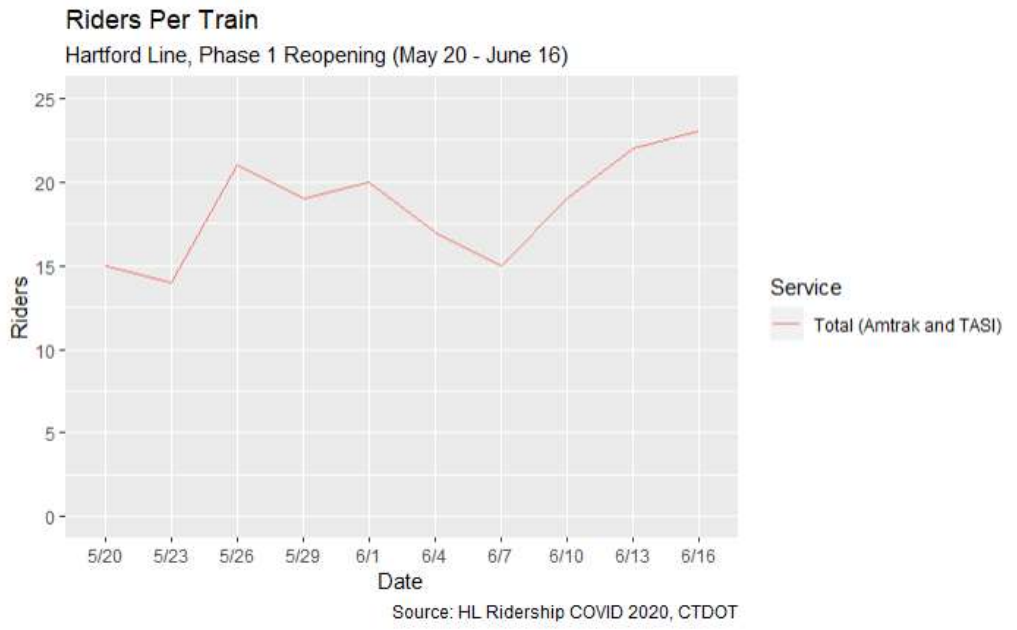
Mid-March witnessed a substantial decline in average ridership on the Hartford Line as the pandemic escalated

across Connecticut. On March 13, all schools were ordered to close; on March 20, the "Stay Safe, Stay Home" executive order closed all non-essential, in-person businesses in the state. This was followed with a substantial drop (over 80%) in commuter ridership during the ten-day period between March 13 and March 23.

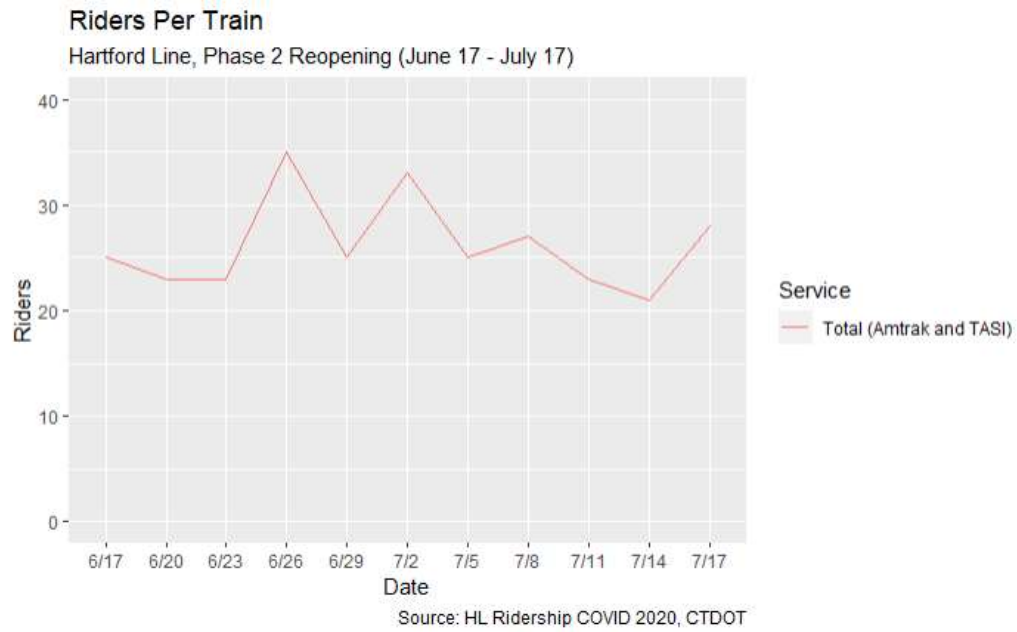


Towards the end of April -- between 4/21 and 4/28 -- we see a dramatic uptick in riders per train on the Hartford Line. This sudden and dramatic ridership increase is echoed across other modes of travel, such as highway travel, and could be attributed to a sense of "quarantine exhaustion" among Connecticut citizens.

This same week, we see the single-day maximums for new cases of COVID-19 (April 22) and deaths due to COVID-19 (April 24). After these dates, new case and death counts respectively begin to drop. Given this, it could be that the increased ridership numbers are associated with a sense of confidence and progress in Connecticut's fight against COVID-19.

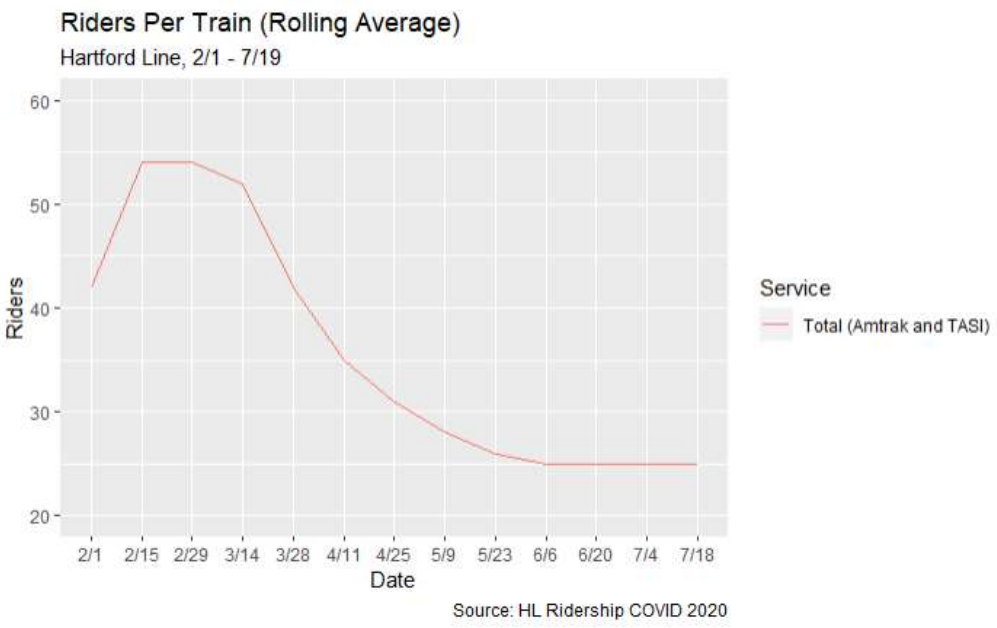


Governor Lamont's stay-at-home order was lifted on May 20 as Connecticut began phase 1 of a statewide plan to reopen. As restaurants, retail stores, malls, and a limited number of businesses began to reopen, we see that average ridership gradually increased through late May and into early June. These changes, however, were not particularly substantial and ridership was still much lower than prior to the pandemic.



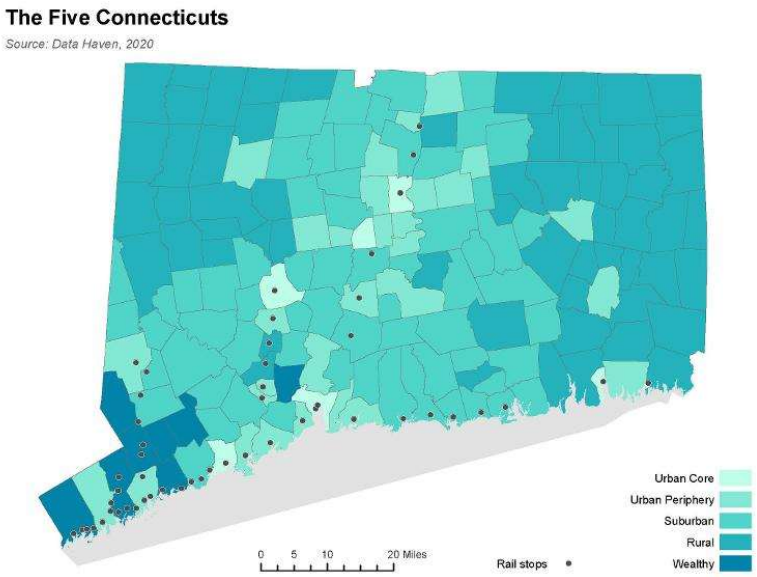
Phase 2 of the statewide reopening began on June 17. Restaurants, hotels, and gyms were allowed to reopen as confidence rose in Connecticut's efforts against the pandemic.

However, as cases increased across the United States, Governor Lamont suspended the Phase 3 reopening for bars and public gatherings. These orders possibly explain the initial Phase 2 uptick in average ridership on the Hartford Line and the subsequent stabilization in July. As of July 17, ridership remains substantially below pre-pandemic levels.



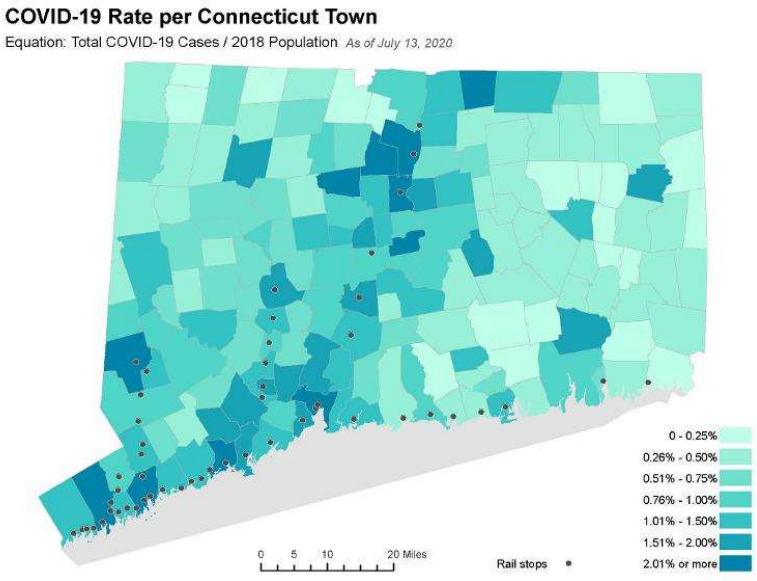
The graph on the right presents an alternative visualization of ridership on the Hartford Line. Instead of the daily average riders per train, this graphs considers the rolling average over time beginning on February 1. Despite an initial increase in the pre-COVID period, we again see a substantial decline in March and April. From May into July, the rolling average has essentially remained constant.

Statewide Analysis



Connecticut is a small but diverse state. Data Haven's 2020 *Towards Health Equity in Connecticut* report categorizes the state's towns into five different groupings to understand how access to opportunity often varies by geography.

These categories are: Urban Core, Urban Periphery, Suburban, Rural, and Wealthy.



As of July 13, 2020, COVID-19 rates vary across the state. The general trend shows that more urban areas have a greater percentage of cases of COVID-19 and rural areas having a lower rate of cases.

Interestingly, cases also appear to generally be higher along rail lines and get lower further from the rail lines.

Hartford, New Haven, and Stamford each have a case rate greater than 2%.

Hartford Bus Ridership Analysis

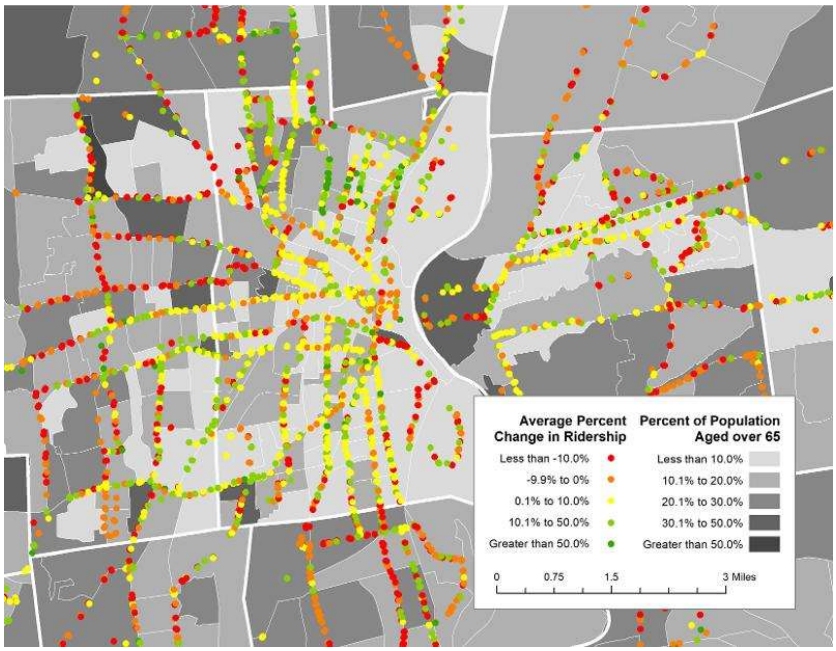
To analyze the bus ridership during the COVID-19 pandemic, the average percent change in ridership (APCR) over each week between March 1 and July 12 was calculated for each stop. Additionally, transit ridership is based on onboardings.

Within Hartford, most bus stops experienced a neutral average percent change. Stops in the northern part of the city saw a positive average percent change, with some stops seeing over 50% percent change. This means that, on average, these stops saw increases in ridership.

Most stops outside of Hartford saw a negative average percent change in ridership, meaning that between March and July, most stops saw decreases in ridership without recovering. Some stops in southern West Hartford and in southern Bloomfield saw a positive APCR.

The five stops with the highest average percent change in ridership were:

- Union St & Main St;
- Vine St & Winchester St;
- Weston St & Opp Rehabilitation Center;
- Walsh St & Opp Neighborhood Center; and
- Talcottville Rd & 483 Talcottville



Population Over 65

There does not appear to be a significant trend between people over 65 years of age (those most vulnerable to COVID-19) and change in ridership. There are greater percentages of people over 65 years of age living outside of Hartford, where there is generally a negative percent change in ridership.

However, some block groups in northern Hartford where 20-30% of the population is over 65 also saw a positive average percent change in ridership.

Population Living Below the Poverty Level

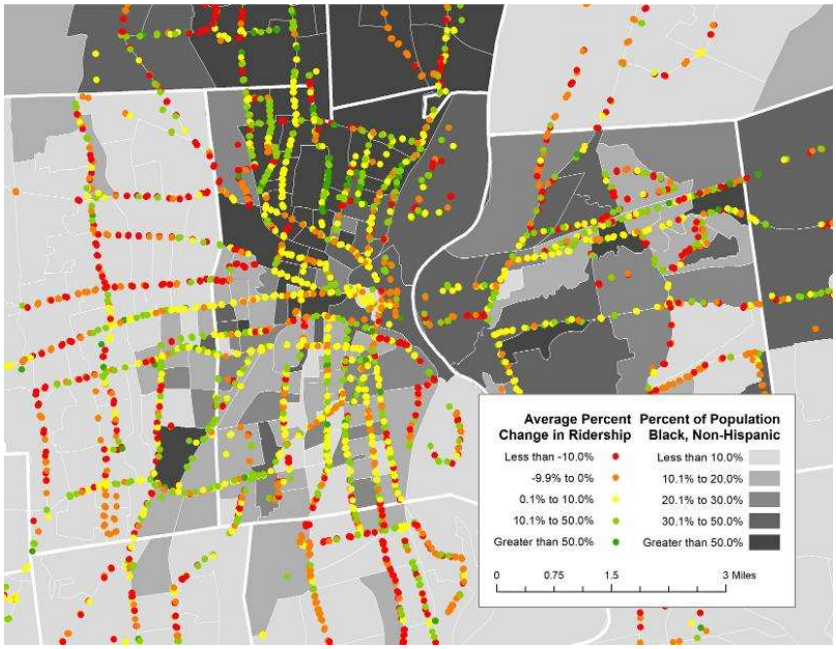
The relationship between a change in ridership and populations living below the poverty level is much more apparent. In Hartford, many block groups with 20% or more of its population living below the poverty level also have bus stops whose ridership saw an average increase of 10% or more since March.

In contrast, block groups with less than 10% of their population living below poverty level, such as in West Hartford and Wethersfield, there is a significant number of stops that saw decreasing APCR.

White, Non-Hispanic Population

When overlaid with the block group showing percentages of White, Non-Hispanic people, the demographic differences in bus ridership become the most obvious.

The majority of the red and orange points, corresponding with decreasing ridership numbers, correspond to heavily white neighborhoods. In contrast, block groups with less than 20% white population see more bus stops with an increase in APCR, particularly in northern areas of Hartford.

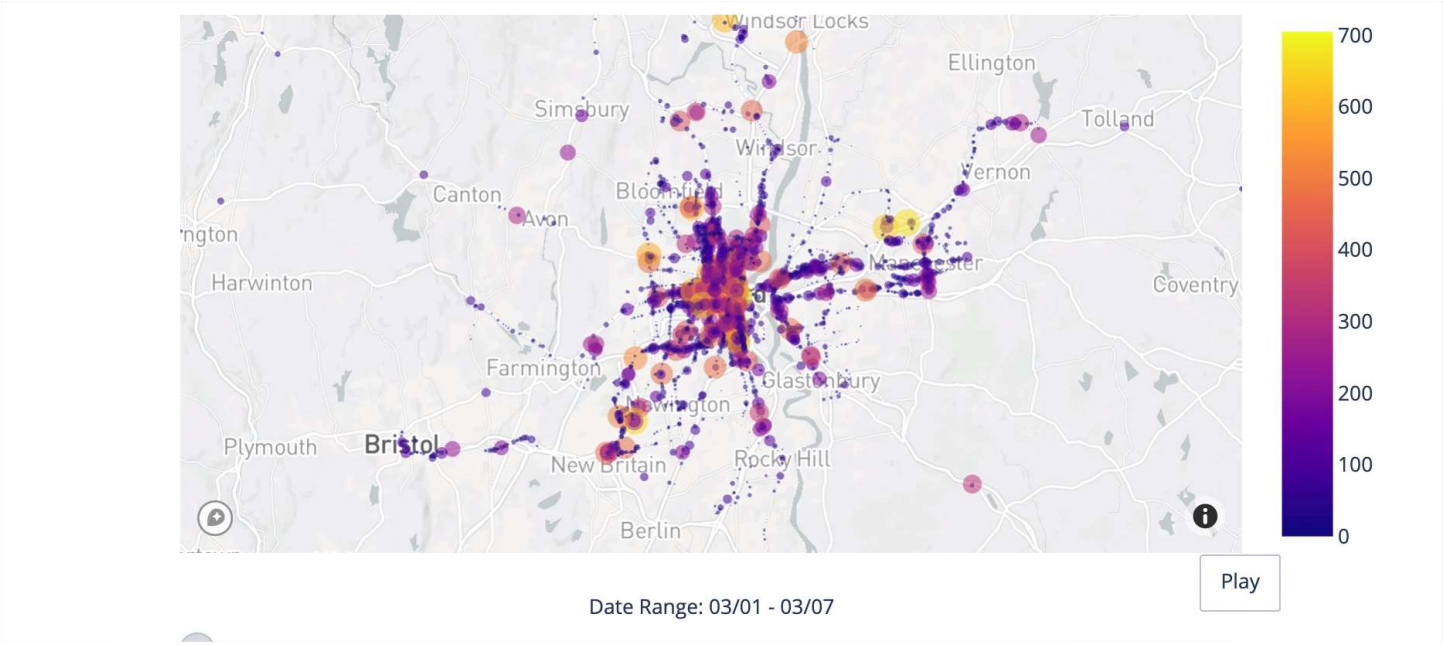


Population Black, Non-Hispanic

There is a larger proportion of Black, non-Hispanic residents in northern block groups of Hartford, as well as in the southern block groups of Windsor and Bloomfield. These predominantly black block groups in northern Hartford have a significant number of bus stops with an increase in APCR of more than 10%. This area also has the most bus stops that experienced percent changes in ridership of 50% or more.

Even areas with moderate percentages of Black, non-Hispanic residents, such as southeastern West Hartford and southwestern Hartford, saw moderate increases in APCR.

East Hartford also has moderate percentages of Black, non-Hispanic residents compared to other nearby communities, but saw more varied APCR in its bus ridership.

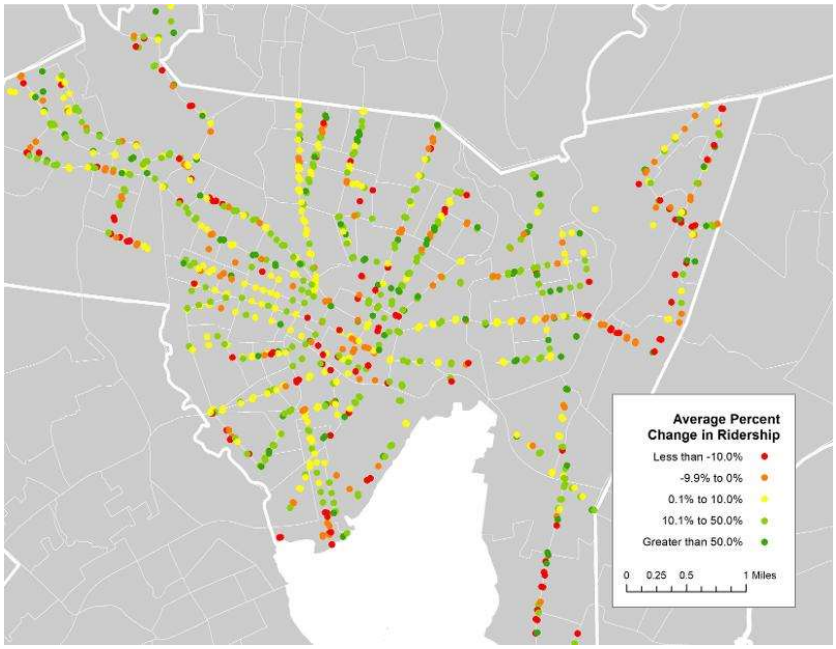


Change over time

This animated time series map shows a subset of the same bus ridership data for Hartford. Each point represents the total number of passengers who boarded a bus at a given stop during that one-week period. The warmer the color, the more passengers at that stop.

As shown in this video, the ridership drop between the first and second weeks of March is the most dramatic change. This corresponds to the start of school, business, government, retail, etc. closures at the beginning of the pandemic.

New Haven Bus Ridership Analysis

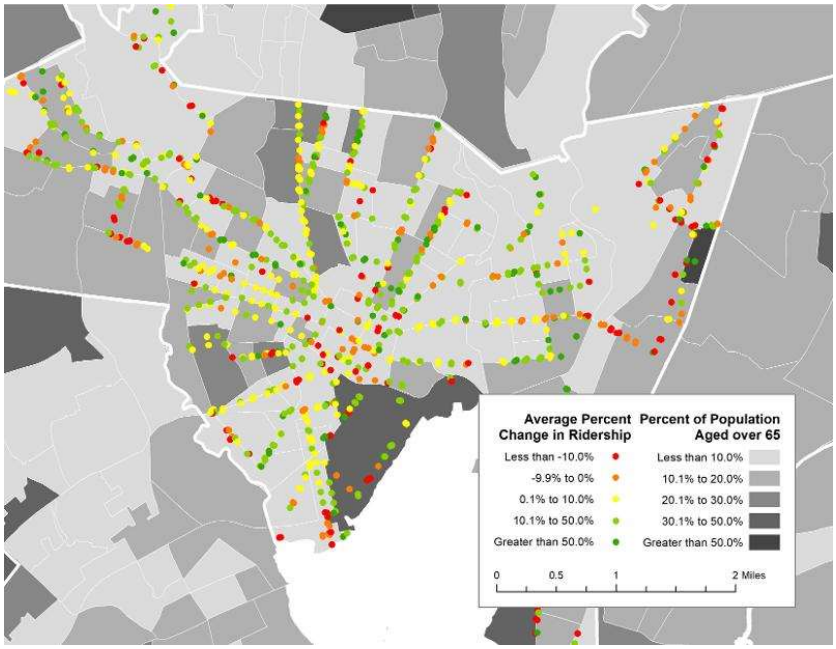


In New Haven, we see more green than Hartford, indicating larger percent change increases in ridership across the city across this period.

Promisingly, ridership along key corridors such as Dixwell Avenue and Chapel Street remained relatively stable throughout the period.

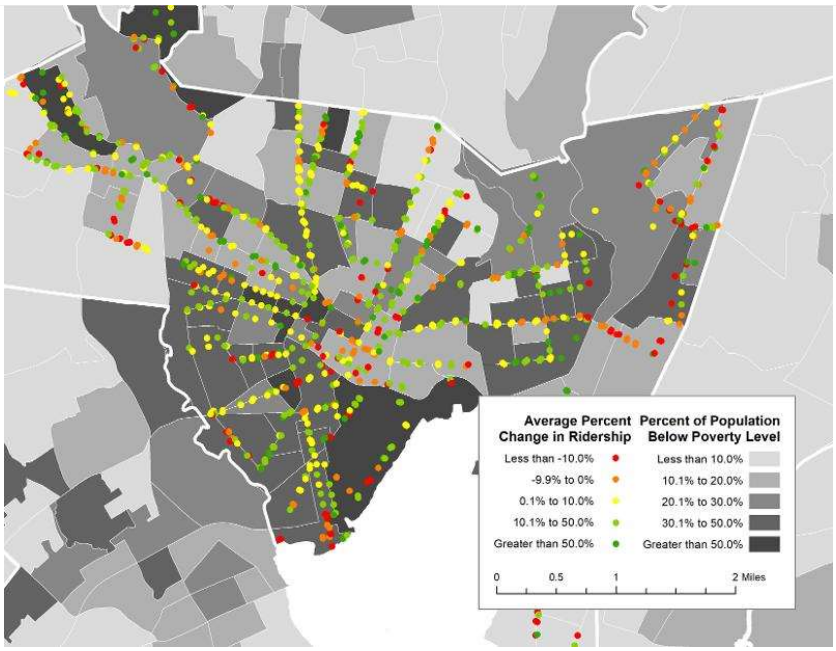
The five stops with the greatest increase in APCR were:

- Short Beach Rd & West Main St;
- Temple St & Chapel St;
- Whalley Ave & 150 Whalley Ave;
- Temple St & N H Green; and
- Sylvan Ave & Winthrop Ave



Population 65 and Over

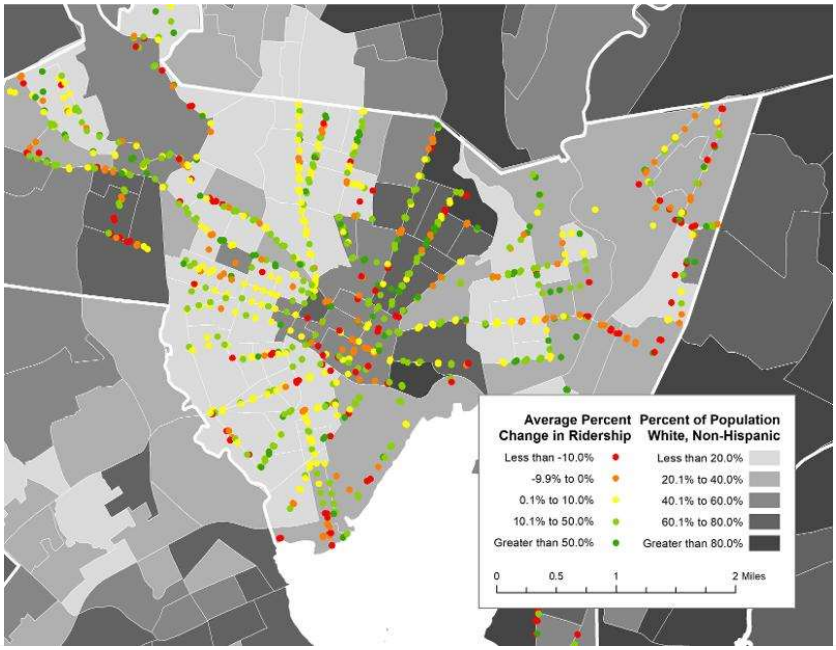
The relationship between age and ridership is not as apparent from this map. The percent of the population over age 65 across New Haven primarily hovers between 10-20%, with no apparent differences between higher and lower percentage blocks. One interesting area for further analysis could be Long Wharf, which saw increased ridership in this period despite a large elderly population.



Population Below Poverty Level

Unlike the Hartford and Stamford bus systems, the New Haven bus system services a population with high poverty levels, with almost all of the bus stops located in areas with poverty levels of up to 30% and approximately half of the stops located in areas where up to 50% of the population is living below the poverty level.

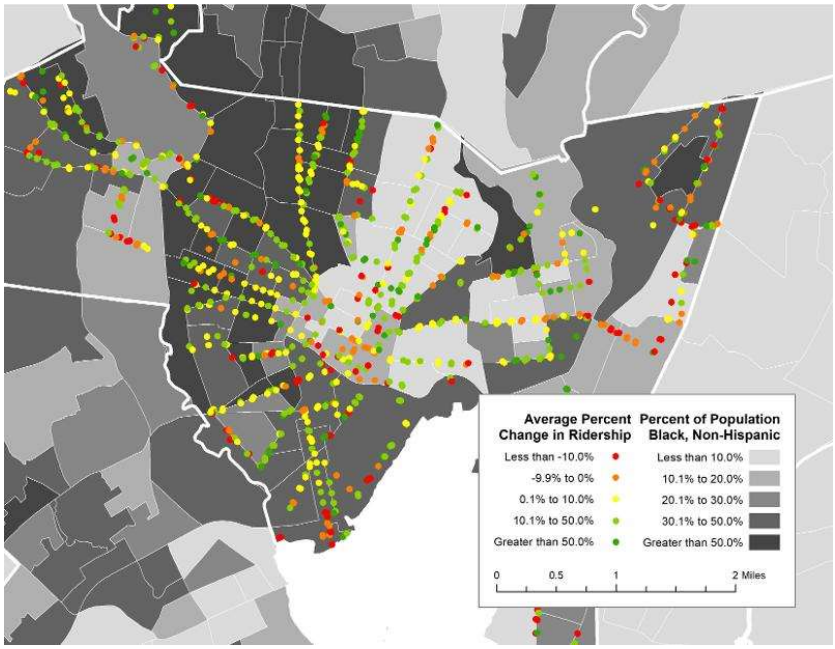
In contrast, Hartford services high poverty-level areas within the city but wealthier populations in the suburbs. Stamford is more wealthy in general, with very few block groups with more than 20% of the population living below the poverty level.



Population White, Non-Hispanic

This map clearly shows a divide between block groups with larger and smaller White, non-Hispanic populations. On the west and southwest portions of the city, the APCR across this period remains low or sees only small increases. In contrast, we see much more green (corresponding to larger APCR) in East Rock and the north and east portions of the city. While there is a stark contrast between white and non-white

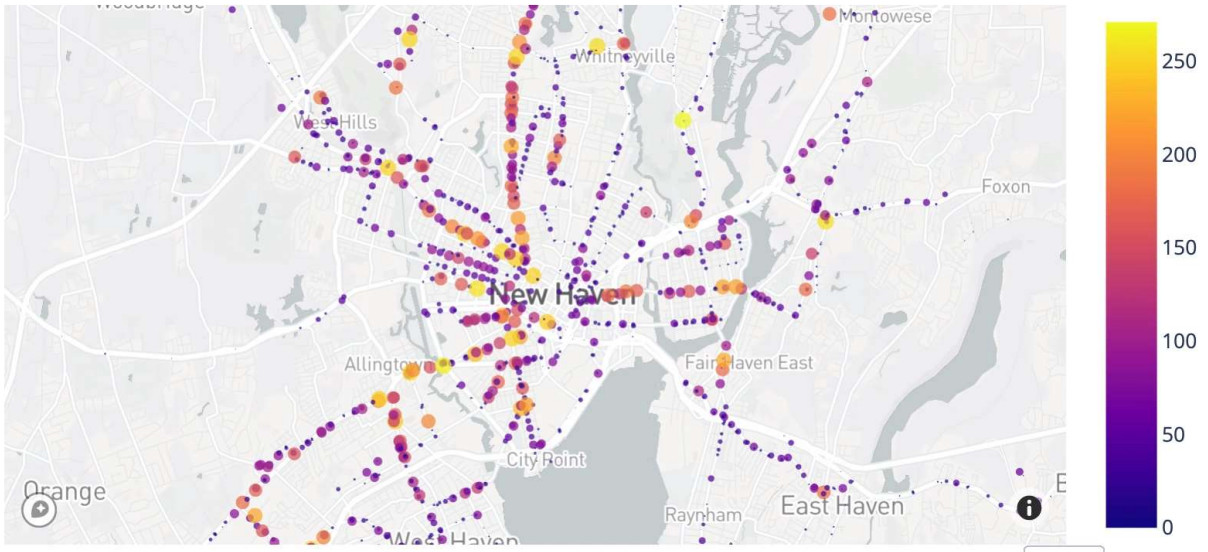
populations in New Haven, there does not immediately appear to be a relationship between APCR and race.



Population Black, Non-Hispanic

Most of New Haven has a large proportion of Black, non-Hispanic residents. The only area with block groups with populations of less than 10% Black, non-Hispanic residents are those that make up the core of Yale University campus and Science Hill, into lower East Rock. These areas encompass both student housing, which has a different demographic distribution, and school buildings.

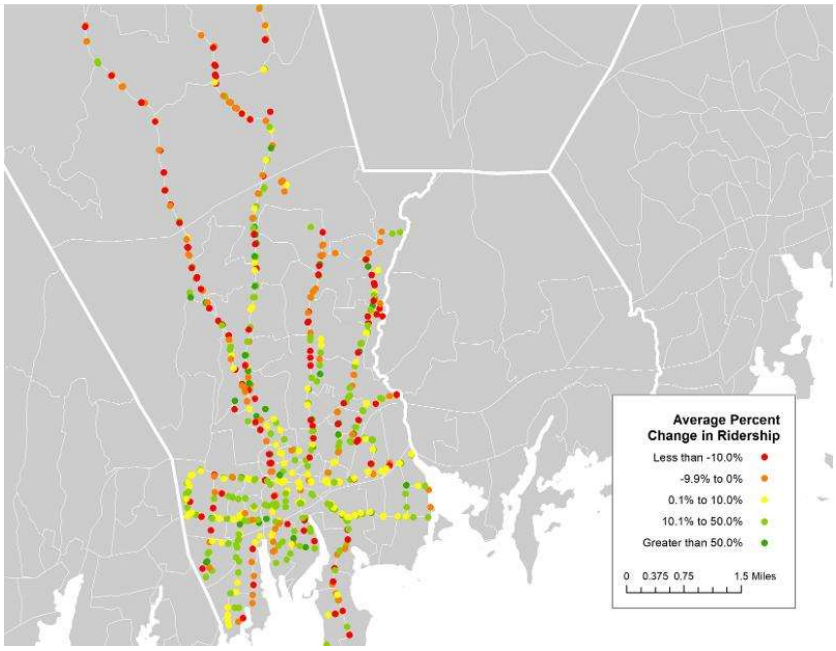
Because so much of the city has Black, non-Hispanic populations of 30% or greater, the differences in APCR across the city are less obvious. More analysis or more granular data is needed to understand the exact effects of COVID-19 on bus ridership in these areas.



In New Haven as in Hartford, we see a dramatic drop in ridership in the second week of March.

Although changes from week to week are more difficult to detect, on the whole we see ridership steadily increasing, with a larger increase in bus ridership at the beginning of June.

Stamford Bus Ridership Analysis



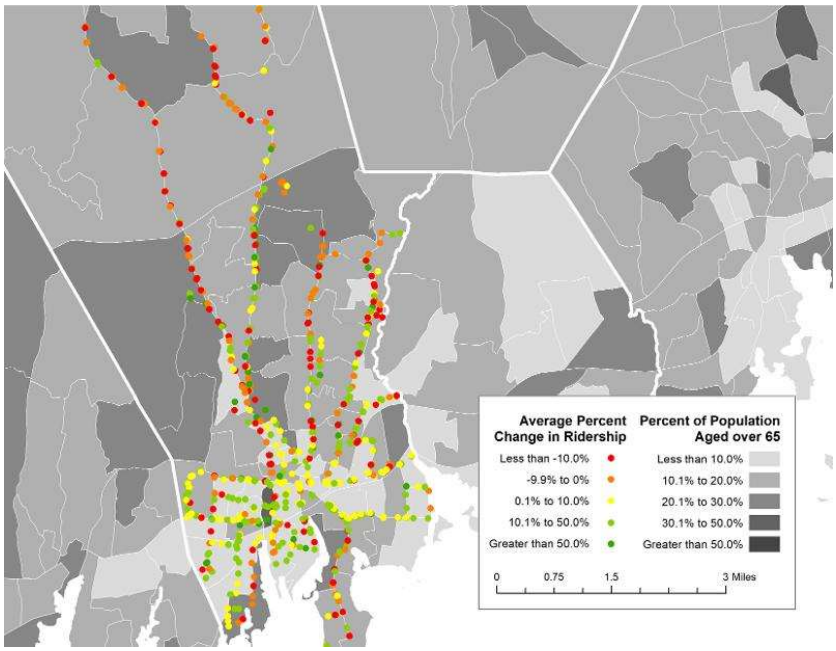
Similarly to Hartford and New Haven, we also see clear spatial

differences in APCR across Stamford.

Most stops within Stamford experienced either a positive or neutral APCR between March 1 and July 12. In the northern limits of the city, however, most stops experienced a negative APCR.

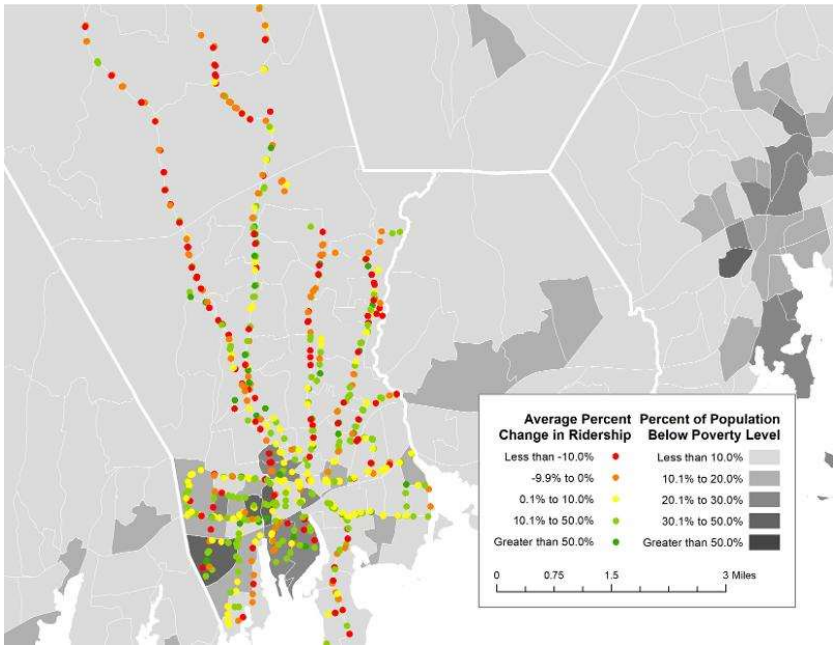
The five stops with the greatest increase in APCR were:

- Atlantic St & N State St;
- Strawberry Hill Rd & Burdick St;
- Strawberry Hill Ave & Stamford H S;
- Washington Blvd & Randall Ave; and
- High Ridge Rd & Turn of River Rd



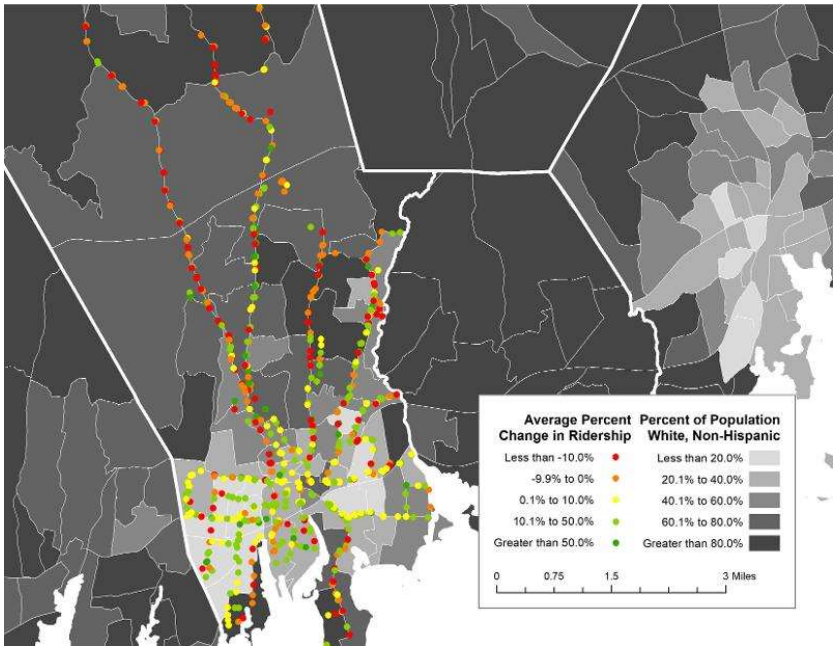
Population Over 65

There seems to be a slight negative correlation between age and APCR. While the younger block groups in the city center mostly experienced an increase or neutral shift in ridership, the older block groups in the periphery generally witnessed a decrease.



Population Living Below the Poverty Level

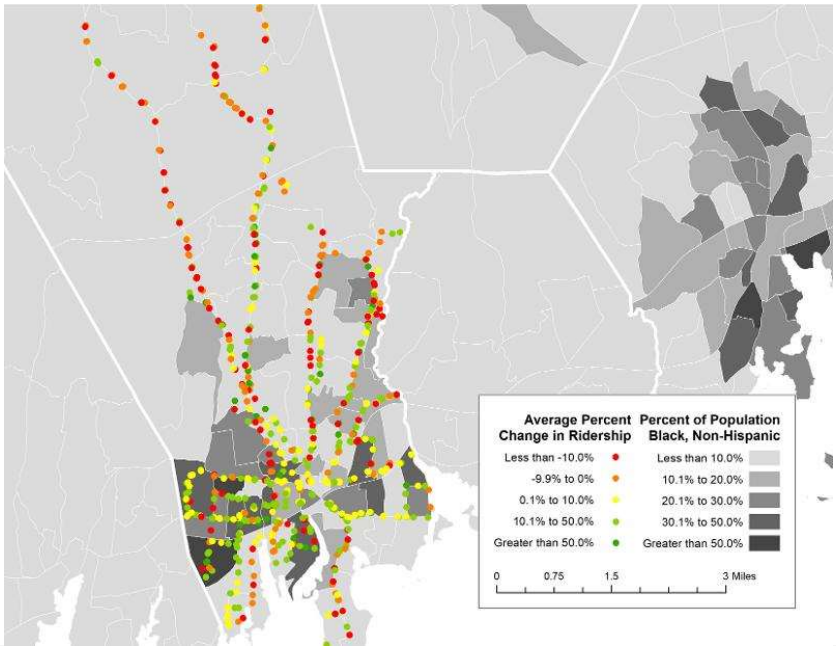
Most of Stamford has low poverty levels, though southwest Stamford has some block groups whose poverty levels range from 10 to 50%. Though the APCR of bus stops is more varied throughout Stamford, these impoverished block groups also see a concentration of bus stops with high APCR.



Population White, Non-Hispanic

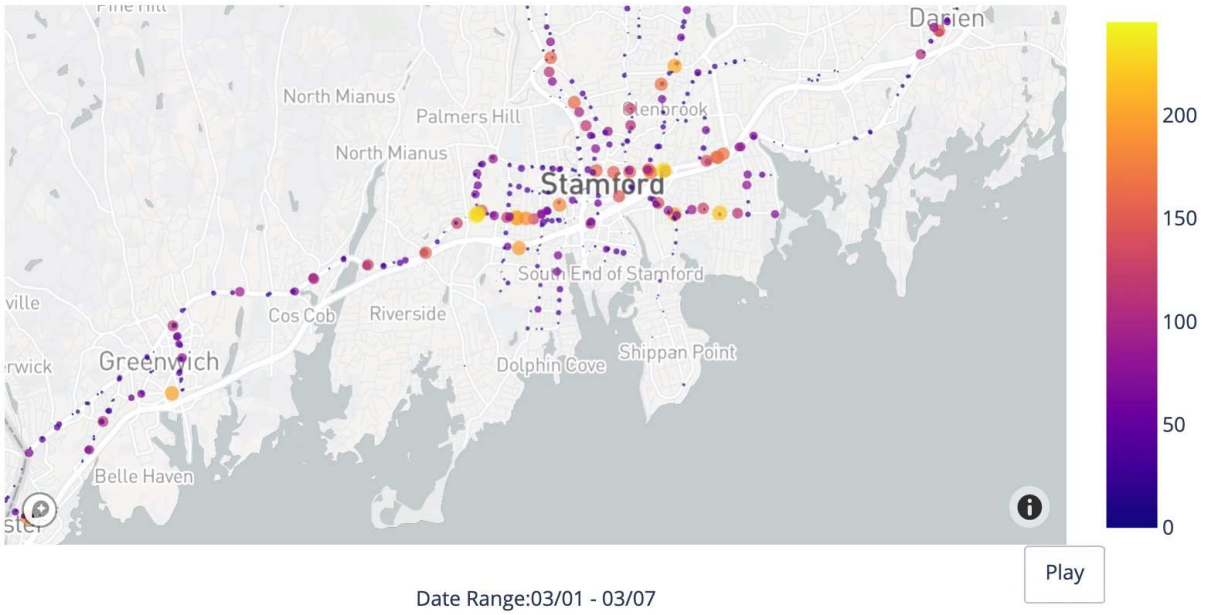
Similarly, block groups in southwest parts of Stamford have a greater percentage of residents who are not white, with several of these block groups having less than 20% white population. There is overlap in this area with poverty levels and the concentration of bus stops that experienced increases in APCR.

Elsewhere in Stamford, the percent of white, non-Hispanic residents varies among block groups. This mirrors the varied APCR levels among bus stops elsewhere in the city.



Population Black, Non-Hispanic

Most block groups in Stamford have less than 10% Black, non-Hispanic population. However, areas in the southern portion of the city have greater Black populations. While there's slightly greater percentages of Black residents in southwest Stamford, where the concentration of bus stops with high APCR lie, there does not seem to be as significant of a relationship between these two variables as what was present in Hartford.



Continuing the trend, Stamford bus ridership drops drastically at the beginning of March, though a week later than in Hartford and New Haven.

Compared to the other two bus systems, it appears that Stamford saw more of its ridership shrinkage at lower volume stops. These stops did not see as many returning riders as summer progressed, whereas larger volume stops in the heart of Stamford core saw riders returning.

Observations and Discussion

This analysis took a deeper dive into Hartford, Stamford, and New Haven's transit systems. Each of these cities are urban or urban periphery communities with a COVID-19 rate of more than 2 percent. Additionally, each of these cities have low car ownership rates, suggesting a relatively high reliance on public transit.

Each observed city experienced an initial decline in bus ridership at the start of the pandemic, though many impoverished, non-white neighborhoods have since seen increases in ridership. In Hartford, this trend is especially true

in predominantly Black, non-Hispanic neighborhoods. The relationship between demographic variables is blurred in New Haven, but there appear to be relationships between race, poverty levels, and APCR in Hartford and Stamford. Overall, there were no significant relationships between populations over 65 years of age and APCR.

These findings indicate that, as the pandemic went on, more people were taking transit from these impoverished neighborhoods and neighborhoods of color than there were in white and wealthy neighborhoods. These populations are more likely to work blue collar or service jobs (i.e. essential workers) and are less likely to own cars, and therefore these residents are more likely to not be able to work remotely and instead take transit to work. However, these findings could be better supported by block group-level employment data and parcel data to confirm whether the differences in APCR among bus stops is an equity issue and whether people took transit in 2020 out of necessity or by choice.

Govern for America Fellows

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