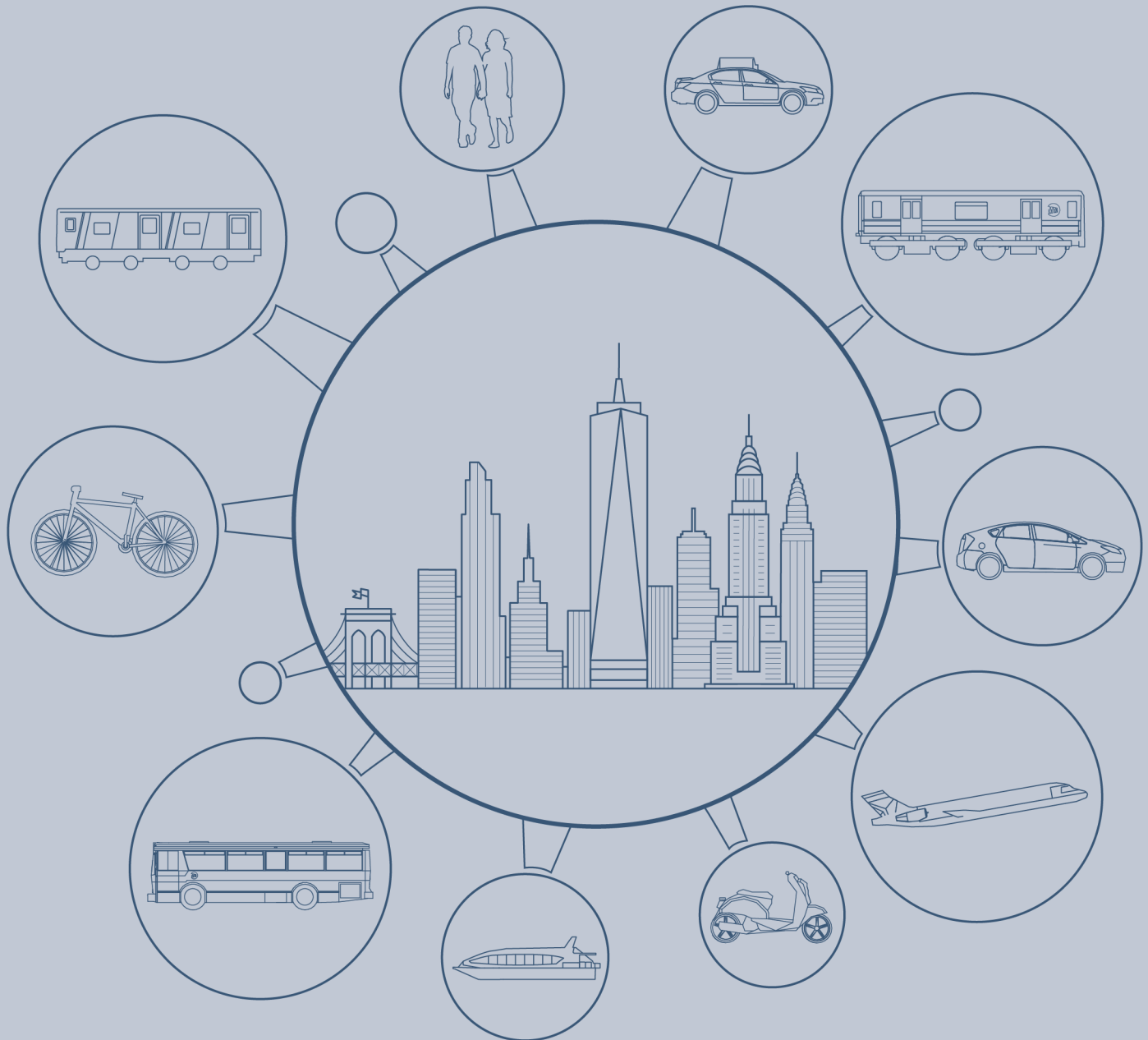


Transportation During Coronavirus in New York City

July 2020



TRANSPORTATION DURING CORONAVIRUS IN NEW YORK CITY

July 2020

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EXECUTIVE SUMMARY

The COVID-19 pandemic and the shutdown of non-essential business transformed mobility in, through and around New York City. This report provides a detailed analysis of the way in which the transportation systems in New York City and the surrounding region were affected by the pandemic and curtailed economic activity through May 31, 2020.

1. Prior to the COVID-19 pandemic, New York City Transit carried 5.5 million subway riders on a typical weekday, or 2.5 times the total ridership of all other U.S. subway systems combined. On April 12th, 2020, subway ridership had dropped 96% to 213,424, its lowest point during the pandemic, and likely the lowest number in 100 years.
2. Of the modes, commuter rail suffered the greatest losses at up to 97.9% less than 2019 levels; this was followed by subways at 91.7% and buses at 78.3%. Vehicular traffic volume on bridges and tunnel crossings fell by the least amount, hitting 65.5% below 2019 levels and rebounded at a faster pace by the end of May.
3. The closing of non-essential activities in New York City on March 22nd, 2020, hurt Manhattan's Central Business District, leading to the decline of most commuter travel, reductions in subway and bus usage, commuter rail ridership, Citi Bike usage, and pedestrian activity.
 - a. Travel to the fifty subway stations in Manhattan south of 61st street declined to 43.3% and 4.4% of 2019 levels in March and April 2020, respectively. Grand Central Station saw the greatest decline, with April 2020 ridership 96.6% below 2019 levels.
 - b. Bridge and tunnel vehicular crossings into the Manhattan Central Business District experienced major declines between February and April 2020, falling by a total of 70.2%.
 - c. Citi Bike ridership decreased substantially in Midtown, with trips ending in Midtown 70.5% lower in April 2020 than in April 2019. Overall, Citi Bike trips in April ending in CBD neighborhoods fell 67.7% from 2019 levels.
- d. Pedestrian counts in four key Manhattan business improvement districts fell by 83.5% between March and May, 2020.
4. From the outset of the pandemic, essential workers, an estimated 25% of NYC's workforce, depended on subways and personal vehicles, lacking sufficient access to rapid transit and micromobility options in their neighborhoods. On a normal day, essential workers account for 38% of transit commuters.
 - a. This report draws on the definition of essential workers established by the New York City Office of the Comptroller, which includes direct-service employees in the grocery, pharmacy, transit, delivery & storage, cleaning, healthcare, and social services industries.
 - b. Essential workers relied on the subways throughout the pandemic: Manhattan experienced the greatest decline in subway ridership, falling 93.4% from February 2020 levels. The Bronx experienced the least decline in ridership, falling 80.6% between February and April 2020.
 - c. With the overnight closure of the subway system, essential workers relied more on buses and other services such as the MTA Essential Connector program, which provided 18,870 trips in May.
 - d. Private companies such as Citi Bike and Revel mopeds offered free or discounted memberships to essential workers, and expanded their service areas. In April, 12% of Revel rides were made by essential workers.
5. As vehicular trips on New York City streets fell by 84%, traffic speeds rose 27%.
 - a. The most significant drop in vehicle miles traveled occurred in Manhattan, where drivers traveled 93% less in April 2020 than they had in January 2020.

- b. Bridge and Tunnel Crossings: by April, vehicle traffic on MTA crossings fell by 61.3% and Port Authority fell by 57.3% from February levels, which was less of a decline than other modes. Moreover, these bridge and tunnel crossings are rebounding more quickly than other commuter modes. By June, traffic volumes were estimated at about 70 to 80% of normal.
6. Several benefits of reduced traffic emerged:
 - a. During the NYS on PAUSE order, bus speeds throughout New York City were 15% higher than those in 2019. In Manhattan, bus speeds were 30% higher, due in part to reduced vehicle traffic.
 - b. In March and April 2020, vehicle crashes dropped to one-quarter of 2019 levels; pedestrian injuries reduced by approximately 80% during this time period.
7. Ridership in taxis and for-hire-vehicles declined substantially after the March 16th, 2020 school, bar, and restaurant closures: taxi pickups dropped 86.8% and for-hire vehicle pickups declined 60.8% by April 16th.
8. Cycling was a relatively popular and resilient mode during the NYS on PAUSE order; Citi Bike ridership rebounded back to 2019 levels by late May.
9. Commuting from suburban and exurban New York City fell sharply once non-essential workplaces were closed. Ridership on trains to New York City, including Metro-North, Long Island Railroad, New Jersey Transit, and PATH, reached as low as 2.1% of pre-pandemic levels.
10. Tourism from across the nation and globe declined precipitously as air travel was cut sharply: passenger counts across LaGuardia, Newark, and John F. Kennedy airports fell 98.4% below 2019 levels.

In June, New York City began its phased reopening. Subway ridership hit its highest levels since the start of the pandemic on June 10th at 851,241 riders. However, vehicle travel seems to be recovering more quickly: between April and May, subway ridership increased 28.5% while MTA crossings increased by 54.6%, Port Authority cross-

ings increased by 55.3%, and daily vehicle miles traveled increased by 78.9%. The chasm suggests there may be an overwhelming influx of vehicles without short and long-term measures to reduce traffic and encourage mass transit.

Confronting death and disease, drastic budgetary cuts, and a curtailed workforce, New York's transportation leaders adopted public health measures and safety procedures that required cutting back subway service for four hours every night. This has proven to be a bold but necessary policy. The MTA maintained subway, bus and rail service, unlike most transit systems across the United States, many of which shut down. The PATH has provided vital service for bringing essential workers into New York City throughout the pandemic. The New York City Department of Transportation developed the open streets and outdoor dining plans, and the Taxi and Limousine Commission mobilized taxi drivers to deliver meals to homebound New Yorkers.

The report's recommendations include:

- **Ensure a Safe Return to Mass Transit:** The subway and bus system is fundamental to New York City's economy. Deploying advanced technologies to meet safety standards, the MTA has made progress on vital capital projects throughout the spring of 2020.
- **Implement Congestion Pricing:** The law to implement congestion pricing in order to reduce traffic and fund mass transit is essential.
- **Reconsider the Curb:** The city's efforts to devote more street space for dining, biking, and walking should be expanded.
- **Accommodate and Encourage Micromobility:** Bike commuting should be made safer with more protected bike lanes and better enforcement to keep them free of vehicles.
- **Improve Planning with Coordinated Data:** Transportation agencies in the New York Region should require relevant and consistent data be provided to them for analysis and agile planning.

These and the report's other recommendations are explained in full starting on Page 74 of this report.

A photograph of a subway station platform, likely in New York City, showing blue support pillars, overhead tracks, and a tiled floor. A large, semi-transparent '01' is overlaid on the image, with the word 'INTRODUCTION' in bold black capital letters across it.

01 INTRODUCTION

Photo By: Sam Schwartz Engineering

On March 22, 2020, the Governor of New York issued a shelter-in-place executive order to limit the spread of the virus. In New York City, only essential workers, including healthcare, public safety, food service, drugstore and grocery workers—approximately 25% of the city’s workforce—were permitted to travel.

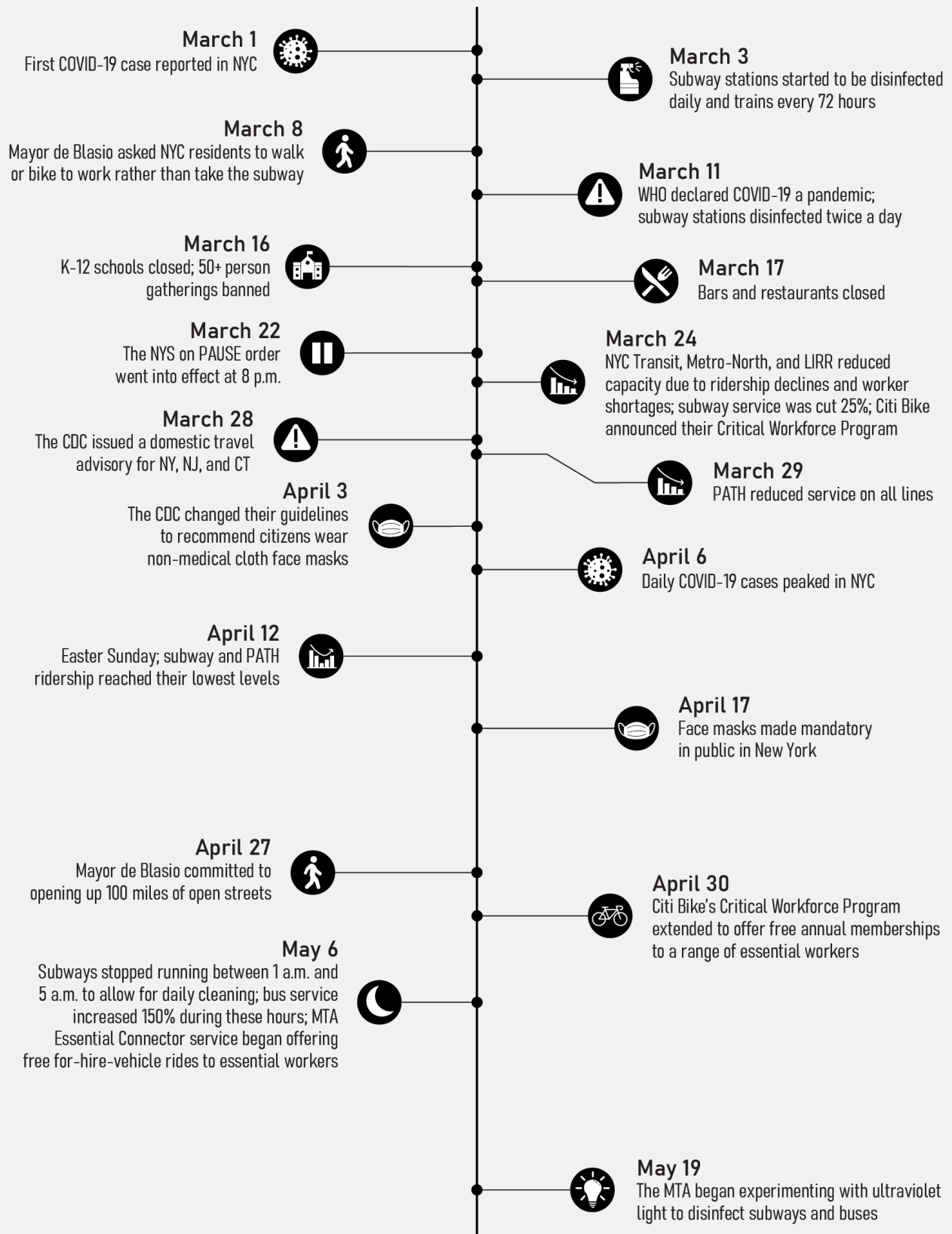
Travel throughout and into New York City declined sharply. Subway usage fell from 5.5 million on a typical weekday to less than 500,000 a day; vehicle traffic decreased 84%, and pedestrian flows in the Central Business District declined 83.5%. As a result, tolls and fares were vastly reduced while operating costs were increased, financially damaging the MTA and other regional transit agencies. In addition, the MTA’s transit employees have made great sacrifices during this time: since March, 132

MTA transit workers have died from complications of the coronavirus. At least 10,000 employees have become ill, while making it possible for health care and essential workers to serve New Yorkers during this crisis.¹

This report describes and analyzes the effects of the pandemic on New York’s transportation systems during the spring of 2020. We examine a multiplicity of transportation modes—from subways and buses to bicycles and taxis and for hire vehicles—as well as commuter rail and vehicular use of bridges and tunnels. New York City and the surrounding region face tough challenges to rebuild ridership and restore faith in public transit—critical factors in any economic recovery. We identify and recommend potential policies to foster the renewal and expansion of mobility in the coming months and years.



COVID-19 and Transit Timeline in New York City





00 TRENDS IN TRANSPORTATION

Photo By: Sam Schwartz Engineering

2.1 ESSENTIAL TRAVEL

Approximately 22% of trips remained essential in New York City

Key Finding:

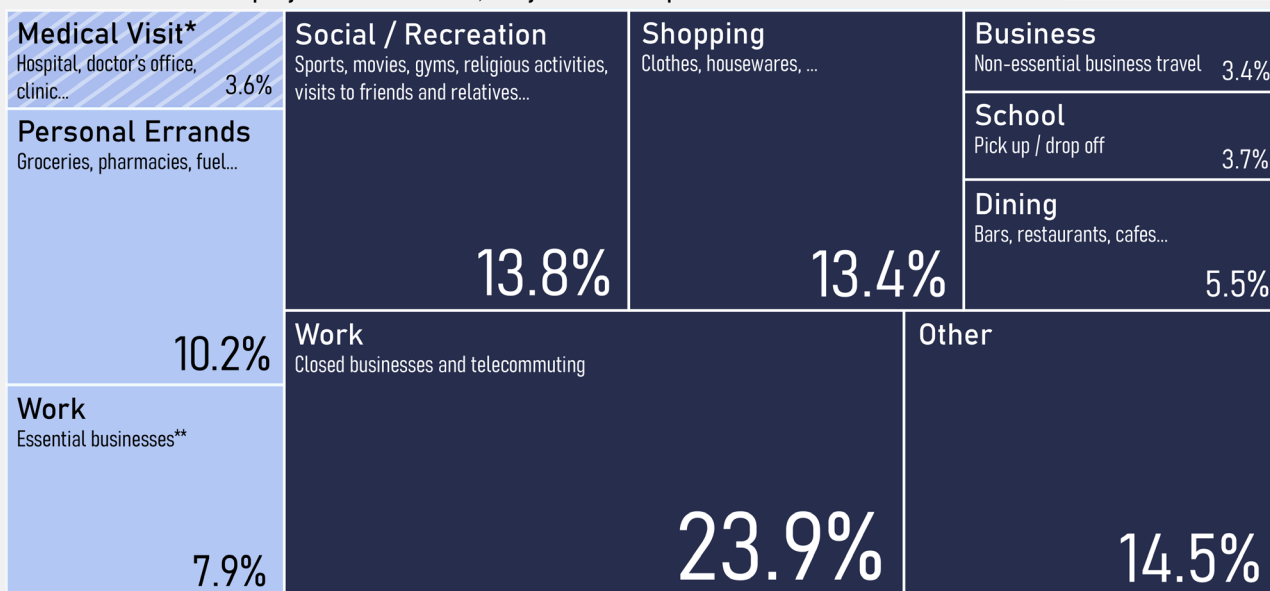
1. With the New York State on PAUSE order in effect on March 22nd, 2020, all but approximately 21.7% of trips were cancelled (due to non-essential status) and an estimated 70% of (non-essential) workers began working from home.

When the NYS on PAUSE order took effect on March 22nd, 2020, discretionary movement was close to zero across all five boroughs. The coronavirus outbreak in New York City led to a massive increase in work from home for those with information-based-jobs that could be done remotely, using advanced telecommunications systems. But approximately one million New Yorkers lost their jobs as firms and organizations shut down or reduced their activities, laying off and furloughing workers and, in some cases, ceasing business operations. According to calculations conducted by researchers of this report, approximately 69.9%

of the New York City labor force worked from home in March, declining to 57.2% and 53.4% in April and May as an increasing portion of the labor force lost their jobs. (See Appendix A for expanded explanation). However, essential trips continued, including essential worker commutes, medical/health care treatment, and grocery shopping. During normal times, essential trips comprise about 21.7% of all travel.^{2,3,4} The tree map below was based on a similar analysis conducted by 6-t Recherche, which found that about 30% of France residents' trips are essential.⁵

What Percentage of Trips are Essential?

Based on the 2018 Citywide DOT Mobility Survey and American Community Survey (ACS) 2014-2018 5-Year employment estimates, only **21.7%** of trips are essential.



*It can be assumed the number of medical trips is different than usual given that elective surgeries are canceled, people have been forgoing generic medical visits in fear of COVID-19 infection, and on the flip side, many more trips have occurred for people infected with the disease

**Essential businesses were pulled from American Community Survey (ACS) employment data as workers in the following industries: (1) grocery, convenience, and drug stores, (2) public transit, (3) trucking, warehouse, and postal services, (4) healthcare, (5) childcare, homeless, food, and family services, and (6) building cleaning services

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Sources: NYC DOT; NYC Office of the Comptroller

2.2 TRENDS IN NEW YORK CITY

Movement of people in New York City dramatically declined for all modes of transportation once the coronavirus pandemic became a matter of widespread public concern in March 2020

For almost all modes of transportation, the last peak day was Monday, March 9th, two days before the World Health Organization (WHO) declared COVID-19 a pandemic. When public schools and large gatherings were closed on March 16th, there was a steep decline in mobility.

This section will describe and analyze the transportation choices made by New Yorkers who continued to travel in the city and region during March, April, and May 2020, when mobility was limited by executive orders in New York and neighboring states.



2.2.1 SUBWAYS

Ridership dropped to 10% of pre-pandemic levels during the NYS on PAUSE order as 9 out of 10 people stopped taking the train

Key Findings:

1. Between February and April 2020, total subway ridership fell by 90.6% from 129 million riders in February to 12 million in April. By May, ridership began to return, reaching 15.7 million for the month.
2. Manhattan experienced the greatest decline in subway ridership, falling 93.4% from February 2020 levels; the Bronx experienced the least decline in ridership, falling 80.6% between February and April 2020.
3. On a typical weekday, 5.5 million people ride the subway—2.5 times the ridership of all U.S. subway systems combined.* Subway ridership dropped precipitously after March 10th, 2020, reaching its lowest point on April 12th, when 213,424 people rode—roughly the population of Des Moines, Iowa.

New York is a subway city. On a typical weekday, 5.5 million people ride the subway. However, during the NYS on PAUSE order, nearly all New Yorkers avoided subway travel: subway ridership fell 90.6% between February and April 2020, representing New Yorkers staying and/or working from home or using other modes of mobility.[†]

Subway ridership declined gradually, starting in the

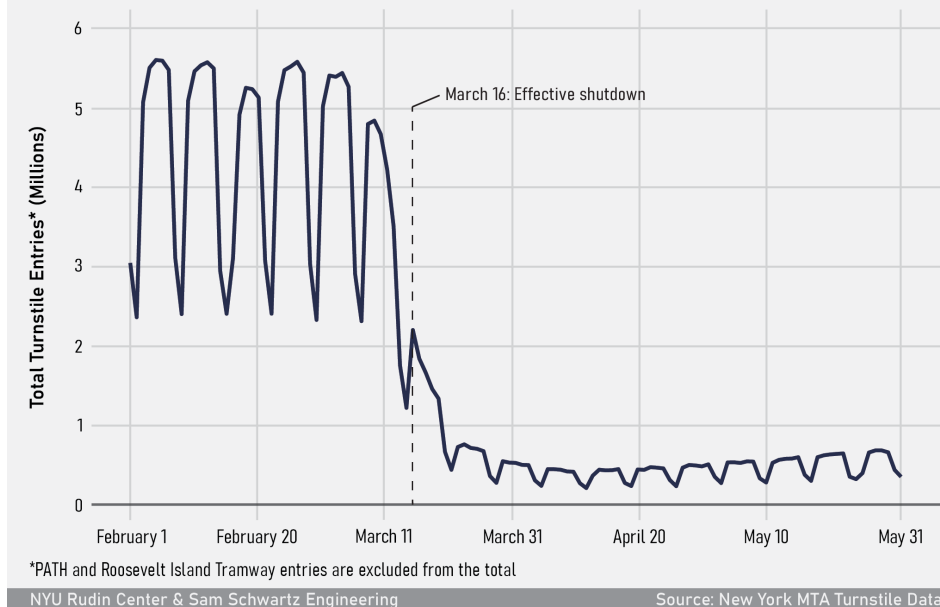
last week of February 2020, and then sharply fell after March 10th, 2020. In the second week of March 2020, subway entries fell 69%. Despite the MTA announcing on March 2nd that subway cars would be cleaned every 72 hours, ridership remained relatively unchanged that week. On March 16th, the beginning of school and office closures, 2.2 million people rode the subway—less than half the riders of the previous Monday, March 9th.

* Transit agency reported numbers.

[†] Data publicly available: <http://web.mta.info/developers/turnstile.html>. Metropolitan Transportation Authority. Turnstile Data. Aggregated by Chris Whong/Qri: https://qri.cloud/nyc-transit-data/turnstile_daily_counts_2020.

5.4 Million Fewer Subway Riders in Two Months

Between February and April, ridership fell by 91% from 5.6 million daily riders to 200,000.



February. During this same time period, subway entries decreased the least in the Bronx—80.6%. Compared to April 2019, subway entries were down by 94.3% in Manhattan and 82.4% in the Bronx. The variation is likely due to the residential distribution of essential workers, which will be discussed in section 3.1 of this report.

Although New York City was still officially under the NYS on PAUSE mandate, subway ridership slowly returned during May. Systemwide May ridership was 87.9% of February

On March 23rd, the first business day of the PAUSE order, ridership reached 443,284—down 90.8% from March 9th levels. From March 16th to the end of April, weekday subway ridership fell by 78%. The nadir occurred on April 12th, Easter Sunday, when 213,424 people rode, 91.4 % fewer than the same holiday in 2019 on April 21st.

In March and April 2019 ridership averaged 146 million riders per month. In 2020, monthly ridership levels reached only 74 million in March and 12 million in April—a 49.4% and 91.7% drop, respectively.

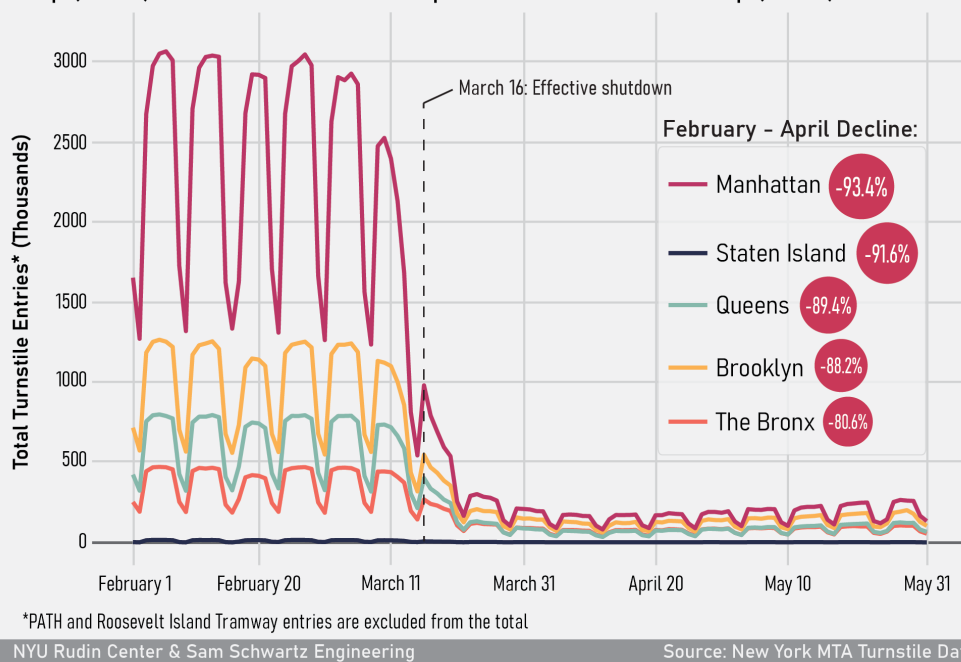
Subway ridership variations were not equally distributed across New York City. By April 2020, Manhattan experienced the largest decrease in subway entries, a 93.4% drop from

levels—up from the April low of 90.6%. (See Appendix B, Table 2.2.1).

On April 30th, Governor Cuomo announced that subway service would be suspended between 1 and 5 a.m. nightly in an effort to clean the trains, stations, and

Unequal Subway Ridership Decline Across the Boroughs

Although all boroughs experienced a decline in ridership, Manhattan had the largest drop (93.4%) meanwhile the Bronx experienced the smallest drop (80.6%).



equipment daily. For the first time in the NYC subway's 116-year history, service would no longer be 24/7—arguably the most defining feature of the system. For the 11,000 riders that rely on the subway during these hours, alternate modes were made available, including buses. For those essential workers whose bus-only trips

would take 80 minutes or longer, require more than two transfers, or require more than a half-mile walk to a bus stop, free for-hire vehicles and yellow and green taxis were made available.⁶ More information about the Essential Connector service is found in the Essential Workers section of this report (Section 3.1).



2.2.2 BUSES

Ridership reached a weekly low in mid-April, with ridership just over one-fifth of 2019 levels

Key Findings:

1. Bus ridership reached a weekly low in mid-April, with ridership 77.9% below 2019 levels.
2. Bus ridership declined by 43% from 2019 levels on March 16th, 2020.
3. During April and May, average bus speeds were 15% and 17.7% higher than those in 2019 throughout New York City, and 31% in Manhattan, likely due to reduced vehicle traffic.
4. Perceived safety may have contributed to buses being more popular than subways during the early phases of reopening.

As of March 23rd, 2020 the MTA mandated rear-door boarding on all buses to protect drivers from possibly infected passengers. Additionally, only half of the physical space on all buses was available to riders due to a mid-bus partition intended to protect drivers. Because payment was not required for rear-door boarding, ridership data was not collected in the typical way via MetroCard swipes.⁷ In late June, the MTA released bus ridership data estimated from Automatic Passenger Counter data that is available on a portion of the bus fleet.* The numbers, while imprecise, provide insight into ridership during the pandemic.

Ridership began to decline in mid-March. On Monday March 9th, 2,124,770 passengers rode MTA buses. By Monday, March 16th, the beginning of school closures, ridership was 1,237,309. The following

Monday, March 23rd and the beginning of the NYS on PAUSE order, ridership was 578,200—just over a quarter of March 9th levels. By the last week of March, ridership was 69.6% below 2019 weekly levels. Bus ridership hit the lowest point on Easter Sunday April 12th, with 279,100 riders, 86.9% below March 9th levels. That week also had the lowest weekly total riders, with ridership of 2,821,200—77.9% below 2019 levels.

By May, ridership had begun to increase. Due to the May 6th closure of subway service between 1 and 5 a.m., 344 buses (a 150% service increase) were added to nighttime routes to accommodate the estimated 11,000 workers who utilize the system nightly.⁸ In late May, the MTA announced that bus ridership was increasing at a faster rate than subway ridership.⁹ The last full week of May saw nearly 4.5 million total riders, with weekday

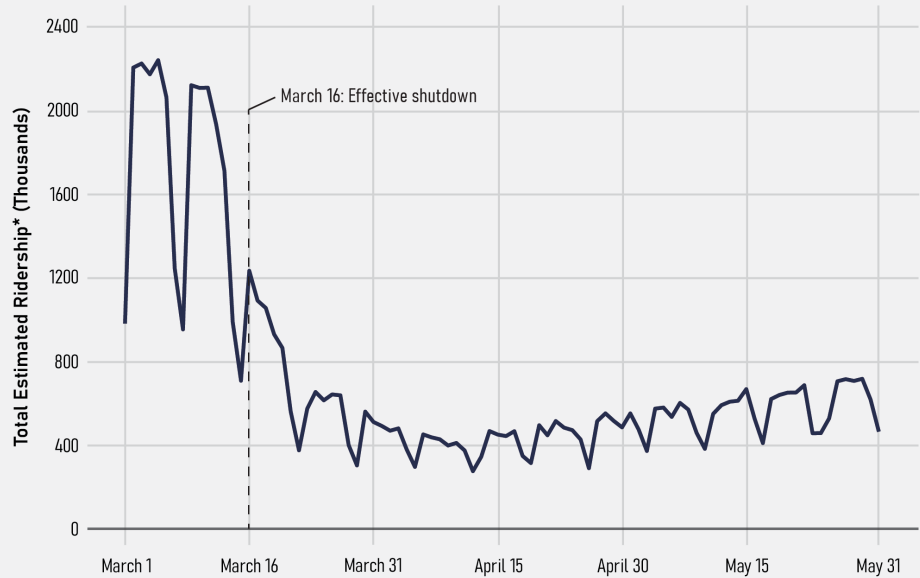
* Data publicly available: <https://new.mta.info/coronavirus/ridership>. Metropolitan Transportation Authority. Day-By-Day Ridership Numbers. Accessed June 24, 2020.

ridership averaging 625,790 riders per day or 64.4% below 2019 levels (See Appendix B, Tables 2.2.2A & 2.2.2B).

Bus speeds have declined since 2012, but during the pandemic it was apparent that bus reliability improved due to a reduction of vehicle traffic on streets.¹⁰ The effect of the pandemic on speeds began in March but was most apparent in April and May.* Systemwide, bus speeds increased 15%: from 8 miles per hour in April 2019 to 9.2 miles per hour in April 2020. Speeds continued to climb modestly in May, 17.7% greater than 2019 levels. Manhattan experienced the greatest increase in speeds, with average bus speeds up 31%, from 5.9 and 5.8 miles per hour in 2019 to 7.7 and 7.6 miles per hour in April and May 2020 (See Appendix B, Table 2.2.2C).

1.8 Million Fewer Bus Riders in One Month

Between March 9 and April 12, the city's buses experienced an 87% drop in ridership.



*Data estimated from MetroCard and OMNY swipes and Automatic Passenger Counter data that is available on a portion of the bus fleet

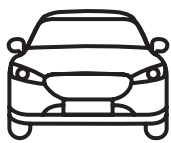
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Source: New York MTA

Average Bus Speeds

| Month | 2019 Bus Speed, MPH | 2020 Bus Speed, MPH | YOY % Change |
|----------|---------------------|---------------------|--------------|
| February | 8.0 | 8.0 | 0.0% |
| March | 8.0 | 8.3 | 3.8% |
| April | 8.0 | 9.2 | 15.0% |
| May | 7.9 | 9.3 | 17.7% |

Source: MTA



2.2.3 VEHICLES

As vehicular trips on New York City streets fell by 84%, traffic speeds rose 27%

2.2.3.1 Vehicle Miles Traveled

The most significant drop in VMT took place in Manhattan, where drivers traveled 93% less in April than they had in January

Key Findings:

1. Average daily vehicle miles traveled (VMT) fell during March and April 2020, down to just 16.2%

of January levels by April.

- From January 2020 to April 2020, vehicle miles traveled declined by 92.9% in Manhattan, the greatest decline of any of the five boroughs of New York City.
- Citywide average daily VMT increased slightly in May, with vehicle miles traveled down 71.1% of the January daily average.

* Data publicly available: <http://busdashboard.mta.info/>. Metropolitan Transportation Authority. Bus Performance Dashboard. Accessed June 26, 2020.

4. Manhattan saw the least recovery in May, increasing the least from April lows of any of the other boroughs.

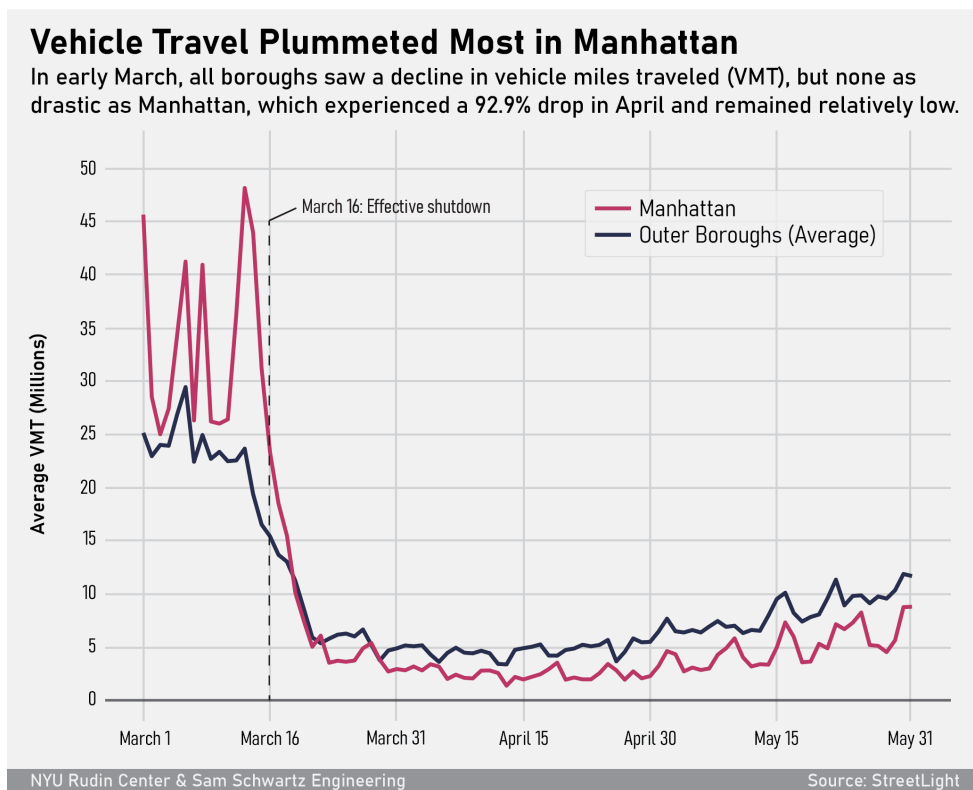
Average daily vehicle miles traveled (VMT) in New York City declined 39% between January and March and 83.8% between January and April 2020, according to data obtained from StreetLight, a mobility analytics company.* In March, the daily average VMT among New York City counties (New York, Richmond, Bronx, Kings, and Queens) was 81,336,129 miles. By April, the average daily VMT had dropped to 21,549,001 miles. It should be noted that StreetLight VMT counts exceed those calculated by the NYC Department of Transportation due to a different methodology, and may unintentionally include mileage from bus riders, cyclists and other non-vehicle users.

Daily VMT began to drop in mid-March. When schools closed on Monday, March 16th, 2020, daily VMT was 36.7% below the January daily average; by that Friday, March 20th, VMT had fallen an additional 30%. The greatest decrease in daily VMT from January levels occurred on Monday, April 13th—where the daily VMT reached only 12% of the January average.

There was an increase in daily VMT in Manhattan, (New York County) on March 13th—the last Friday before the NYS on PAUSE order went into effect. This spike may be tied to the day many Manhattan residents chose to leave Manhattan for the duration of the quarantine. By the following Friday (March 20), Manhattan experienced the steepest decline in VMT compared to the January

average—a 78.9% decrease. By comparison, Richmond County (Staten Island), Queens County, Kings County (Brooklyn), and Bronx County experienced decreases of 73%, 66%, 61.7%, and 59.6% respectively.

Daily VMT increased slightly in May to 28.9% of January levels. Daily VMT remained the lowest in Manhattan—recovering from the April low to 12.5% of January average in May. By contrast, Brooklyn saw the greatest increase between April and May, increasing from 22.3% of January levels in April to 34.6% in May (See Appendix B, Table 2.2.3.1).



2.2.3.2 Traffic Speeds

On several major corridors, speeds rose an average of 27% during the PAUSE order

Key Findings:

1. Following the PAUSE order, speeds on several major corridors in Manhattan, Queens and Brook-

* Data publicly available: <https://www.streetlightdata.com/VMT-monitor-by-county/>. StreetLight. VMT Monitor. Accessed June 24, 2020. All data is collected on a county level and compared to the daily average VMT in January 2020.

lyn increased by an average of 27.2%, with the average speed increasing from 24.4 miles per hour to 31 miles per hour.

2. The largest speed increase occurred on the southbound Brooklyn-Queens Expressway, where traffic speeds increased by 59.4% from 31.7 miles per hour to 50.5 miles per hour.
3. Increased speeds may have contributed to an increased number of speed camera violations, which increased by 64.2% between February and March.

In typical conditions, New York City suffers from extreme traffic congestion, particularly in peak hours. In 2018, the city was ranked the 4th most congested city in the country and the 14th in the world.¹¹ In 2019, data collected from taxis found that the average vehicle speed in New York's central business district had been steadily declining since 2010, averaging 7.0 miles per hour on a typical weekday in 2018.¹²

With a vastly reduced number of vehicles, speeds on New York City streets increased substantially. According to INRIX, a traffic data company, speeds on several major corridors increased an average of 27.2% following the NYS on PAUSE order.*

2.2.3.3 Speed Violations

Speed violations reached 129% of February levels the week of April 6th

Average Traffic Speeds Before and During the NYS on PAUSE Order

| Corridor | Jan–Feb 2020 (mid-week averages) | April 1–7 2020 (mid-week averages) | Percent Change |
|----------------------------------|-------------------------------------|---------------------------------------|----------------|
| Brooklyn/Queens Expressway North | 37.8 | 49.8 | 31.6% |
| Brooklyn/Queens Expressway South | 31.7 | 50.5 | 59.4% |
| Atlantic Ave West | 15.0 | 17.7 | 18.5% |
| Atlantic Ave East | 15.3 | 17.5 | 14.0% |
| Queens Blvd East | 15.7 | 16.4 | 4.4% |
| Queens Blvd West | 15.5 | 15.6 | 0.6% |
| FDR Drive North | 36.6 | 48.4 | 32.3% |
| FDR Drive South | 34.0 | 46.5 | 37.0% |
| Westside Highway North | 26.3 | 30.8 | 16.9% |
| Westside Highway South | 28.3 | 32.0 | 13.2% |
| 5th Avenue | 11.9 | 15.8 | 32.7% |
| Average | 24.4 | 31.0 | 27.2% |

Source: INRIX

Key Findings:

1. Speed violations, likely resulting from reduced traffic decongesting city streets, reached 128.7% of February levels the week of April 6th.
2. Violations in May remained on average 80% higher than those in February.

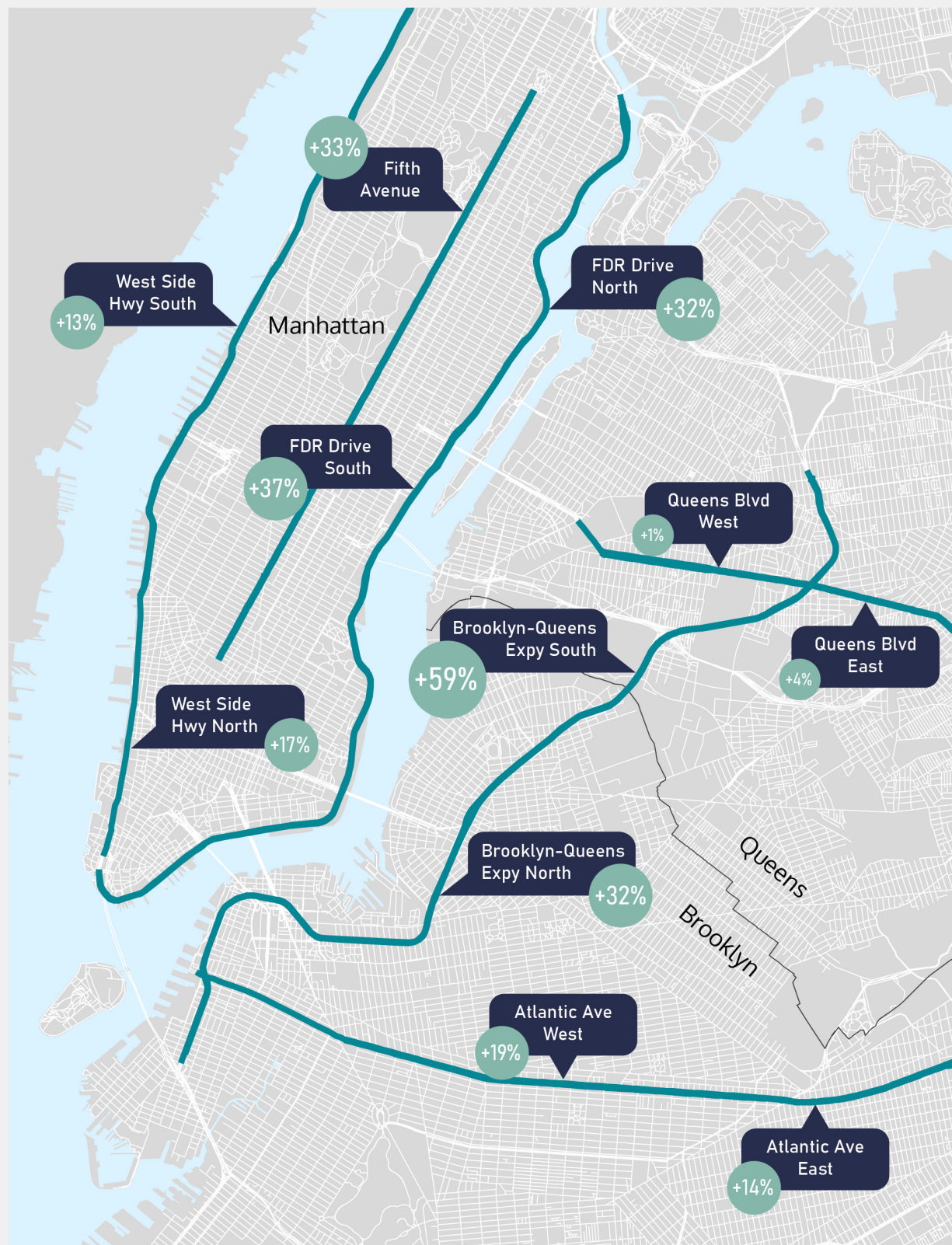
With fewer vehicles traveling at higher speeds, a higher percentage of drivers committed speed camera violations in school zones.[†] This upward trend seemingly began the week of March 16th, when NYC schools were first closed to students. Violations continued to increase after the NYS on PAUSE order until early April before declining slightly: the number of weekly violations increased hit a high point of 128.7% of February baseline levels by the week of April 6th before de-

* Data provided directly to the authors of this report.

† Data publicly available: <https://data.cityofnewyork.us/City-Government/Open-Parking-and-Camera-Violations/i4p3-pe6a>. Open Parking and Camera Violations.

Average Traffic Speeds Rose on Major City Corridors

With fewer vehicles on the road, average traffic speeds on major city corridors rose dramatically the first week of April as compared to January and February averages.

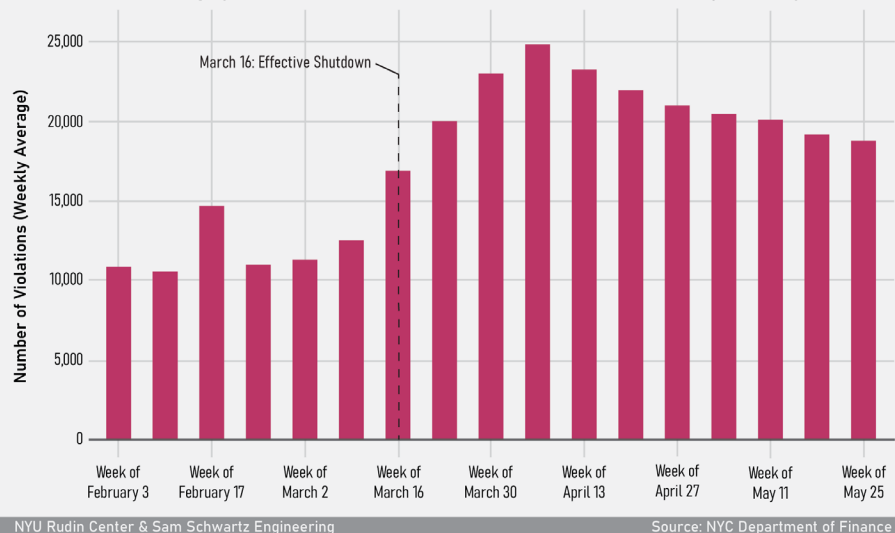


NYU Rudin Center & Sam Schwartz Engineering

Source: INRIX

School Zone Speed Camera Violations More Than Double

As vehicle traffic declined and average speeds rose, the city saw a 128.7% increase, on average, in drivers committing speed camera violations between the weeks of February 3 and April 6.



Daily Average Speed Camera Violations

| Month | Daily Average | MOM % Change |
|----------|---------------|--------------|
| February | 11,770 | — |
| March | 15,754 | 33.8% |
| April | 22,927 | 45.5% |
| May | 18,864 | -17.7% |

Source: NYC Department of Finance

clining to 73% of February levels by the end of May (See Appendix B, Table 2.2.3.3).*

2.2.3.4 Vehicle Crashes

Vehicle crashes dropped to one-quarter of 2019 levels, and pedestrian injuries were reduced approximately 80%

Key Findings:

1. Traffic crashes declined by 70.3% between February and April 2020.
2. Compared to 2019 levels, traffic crashes were down by 37.9% in March and 75.9% in April 2020.

Vehicle Crashes by Month

| Month | 2019 Crashes | 2020 Crashes | YOY % Change |
|------------------|--------------|--------------|--------------|
| February | 16,067 | 13,671 | -14.9% |
| March | 17,760 | 11,021 | -37.9% |
| April | 16,828 | 4,059 | -75.9% |
| May | 19,588 | 6,101 | -68.9% |
| % Change Feb–May | 21.9% | -55.4% | |

Source: New York City Police Department

* School zone cameras are active 6 am to 10 pm Monday through Friday regardless of whether school is in session. DOT has continued to increase the number of cameras, which could also account for at least some of the increase.

† Data publicly available: <https://data.cityofnewyork.us/Public-Safety/Motor-Vehicle-Collisions-Crashes/h9gi-nx95>. Motor Vehicle Collisions - Crashes.

3. Vehicle traffic injuries and fatalities in April also declined from 2019 levels, falling 73.1% and 35.0%, respectively.
4. Between March 17th and April 30th, pedestrian injuries were reduced approximately 80% on average; there was one pedestrian death.
5. The NYPD stopped responding to and reporting non-injury crashes, so data collection is uneven.

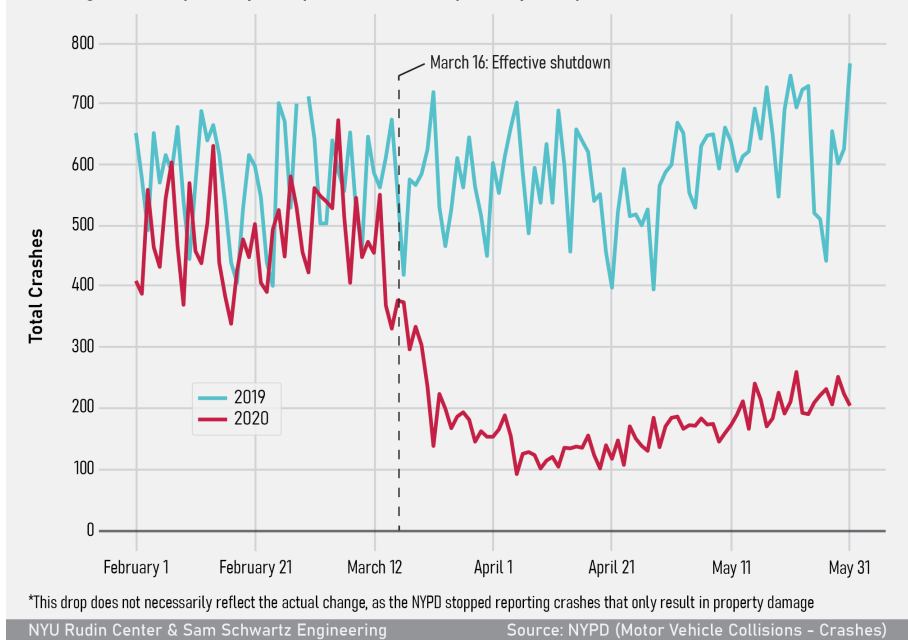
Vehicle traffic crashes decreased from an average of 560 per day in April 2019 to 135 per day in April 2020, but the traffic decline was only one cause.[†] The other was the NYPD stopped responding to and reporting non-injury crashes.¹³ Compared to 2019 levels, traffic crashes were down by 37.9% in March and 75.9% in April 2020.

Vehicle crashes plummeted across all five boroughs, starting in early March, even before the March 22nd NYS on PAUSE order. The highest number of crashes took place in Brooklyn, the fewest in Staten Island. Manhattan crashes, usually at a similar number to the Bronx, declined further and were consistently lower

than Bronx figures (See Appendix B, Figure 2.2.3.4A).

Due to the reduced number of reported crashes, related injuries and death also dropped. Unlike other crashes, those resulting in injuries and fatalities are still recorded, thus painting a fuller and more accurate picture: injuries and fatalities in April declined from 2019 levels, falling 73.1% and 35.0%, respectively. Further breaking down recent crashes, crashes with pedestrians have seen both a decline in injuries and a historically low number of deaths. In April, pedestrian injuries were reduced 80% on average from 2019. Moreover, between March 17th and May 31st, there were three pedestrian deaths, as compared to 21 deaths

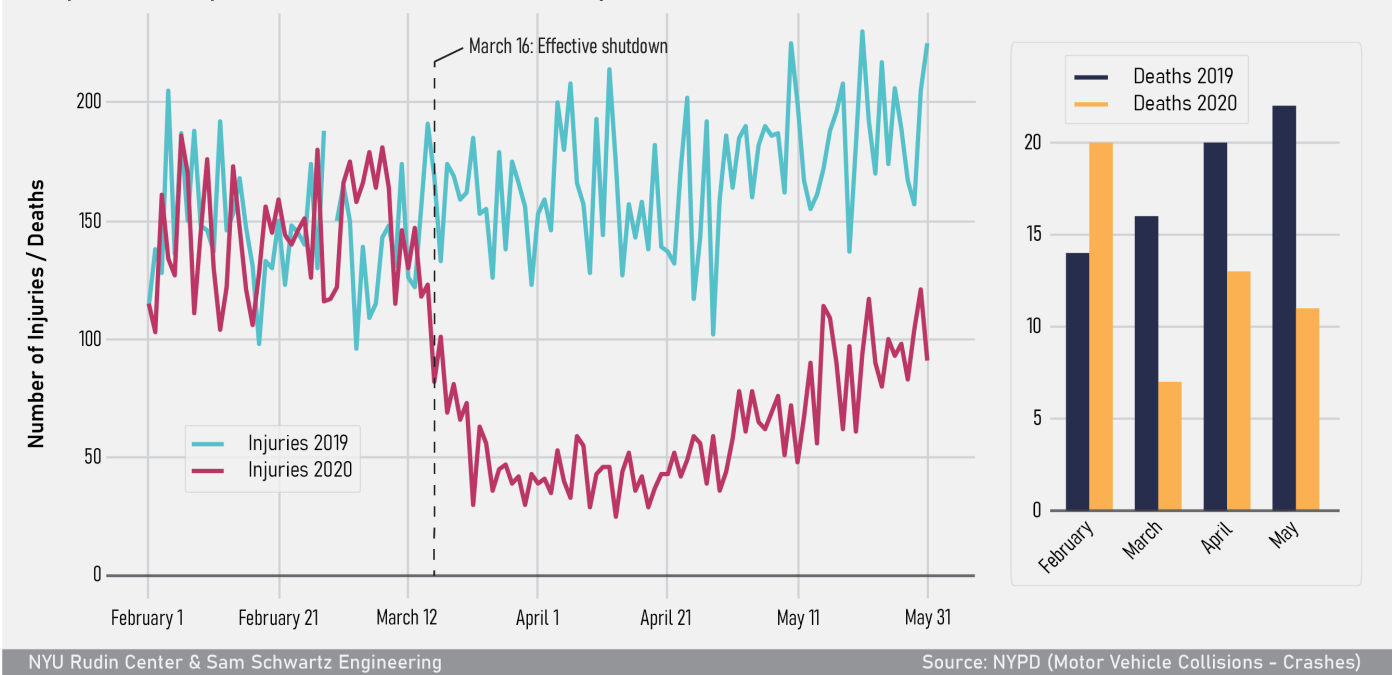
Vehicle Crashes Dropped to One-Quarter of 2019 Levels
With the decline in vehicle traffic, crashes also decreased significantly, down from an average of 560 per day in April 2019 to 135 per day in April 2020, a 75% reduction.*



in 2019 over the same period (See Appendix B, Table 2.2.3.4A, Table 2.2.3.4B, & Figure 2.2.3.4B).

Vehicle Crash Injuries and Fatalities Decreased

Total vehicle crash injuries were down roughly proportionately with the drop in crashes overall, with a year-over-year drop of 73% in April; fatalities also declined but only 35%.





2.2.4 TAXIS AND FOR-HIRE VEHICLES

After the March 16th closures, taxi pickups declined 86.8% and FHV pickups by 60.9% by April 16th

Key Findings:

1. Taxi and FHV total trips decreased 64.5% between March 16th and April 16th.
2. Trips in April often started or ended in areas near medical centers.
3. Before the effective shutdown of March 16th, yellow taxis provided an average of 177,779 pickups per day. Afterward, yellow taxis provided an average of 12,099 pickups per day - a 93.2% decrease.
4. High Volume For-Hire Vehicle (Uber, Lyft, and Via) pickups declined from a daily average of 684,282 before the March 16 effective shutdown to 158,022 afterwards, a 76.4% decrease.
5. In Manhattan's Central Business District, pickups among all providers declined from 4,773,249 in March to 466,206 in April, a 90.2% decrease.

Until COVID-19 hit New York City, approximately one million taxi and for-hire vehicle trips were taken every day.¹⁴ Due to the pandemic-related shutdown, the average number of daily trips gradually declined in March, until reaching a minimum of 112,423 on April 5 - an 88.5% decrease from the 973,832 rides on March 5th.*

Yellow taxi pickups fell from a total of 2,985,571 in March to 225,557 in April, a 92.5% decrease. Between March 1st and 15th, yellow taxis provided an average of 177,779 pickups per day. Afterward, yellow taxis provided an average of 12,099 pickups per day—a 93.2% decrease. Trip stabilization began in May and continued to increase into July, according to the Taxi and Limousine Commission.

Yellow taxi pickups dropped precipitously after Friday, March 13th—falling 33% overnight. This trend comports with the overall reduction in vehicle miles traveled, and may represent many residents' departures from Manhattan shown in VMT trends.

The top yellow taxi pickup locations in March

were: Upper East Side South and North, Midtown Center and East, Penn Station and Times Square. By April, the top yellow taxi pickup locations had shifted to areas containing or close to major medical facilities: Kips Bay, Lenox Hill East, Upper West Side North, East Harlem South and Yorkville West. Only one of these top locations is found in the Central Business District. Of note, approximately 70% of the taxi fleet is equipped with a partition, providing a COVID-19 safety amenity lacking in other for-hire vehicle sectors.

For-hire vehicle pickups fell from a total of 13,391,697 in March to 4,141,540 in April, a 69.1% decrease. Between March 1st and 15th, FHV's provided an average of 684,282 pickups per day. Afterward, FHV's provided an average of 158,022 pickups per day—a 76.9% decrease and far less of a decrease than experienced by yellow taxis.

The FHV top pickup neighborhood for both March and April was Crown Heights North, perhaps due to the Interfaith Medical Center and a concentration of essential workers. Likewise, East New York, Ca-

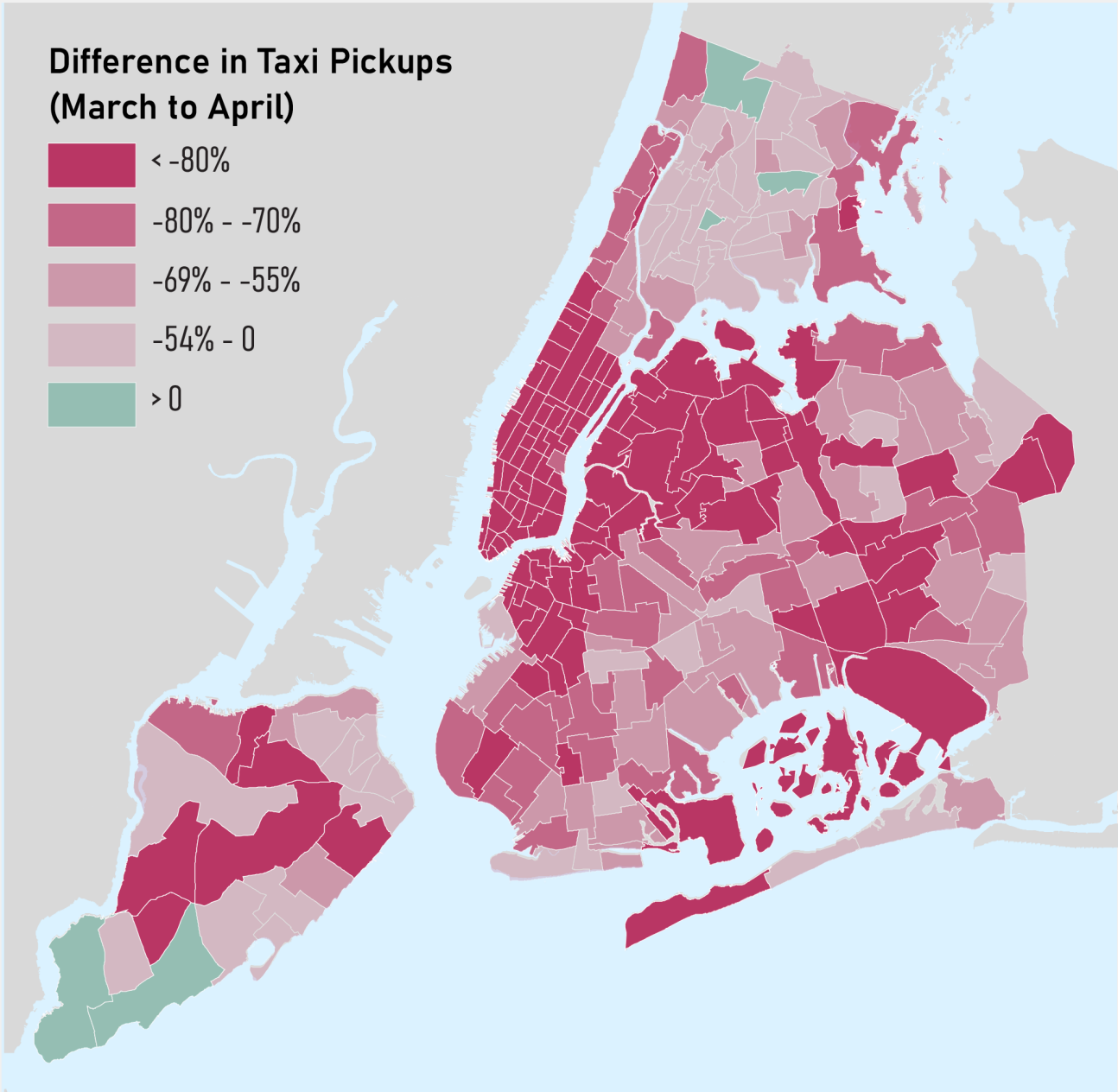
* Data provided directly to the authors of this report.

narsie and Brownsville emerged as three of the top five FHV pickup locations in April, all neighborhoods containing major medical centers. Notably, LaGuardia and JFK Airports, which totalled 319,610 FHV pickups in March, registered only 20,260 pickups in April. FHV

activity, which had, in March, been mostly distributed across New York City, was concentrated in April in Upper Manhattan, the Bronx, and eastern Brooklyn (See Appendix B, Tables 2.2.4A, 2.2.4B, & 2.2.4C).

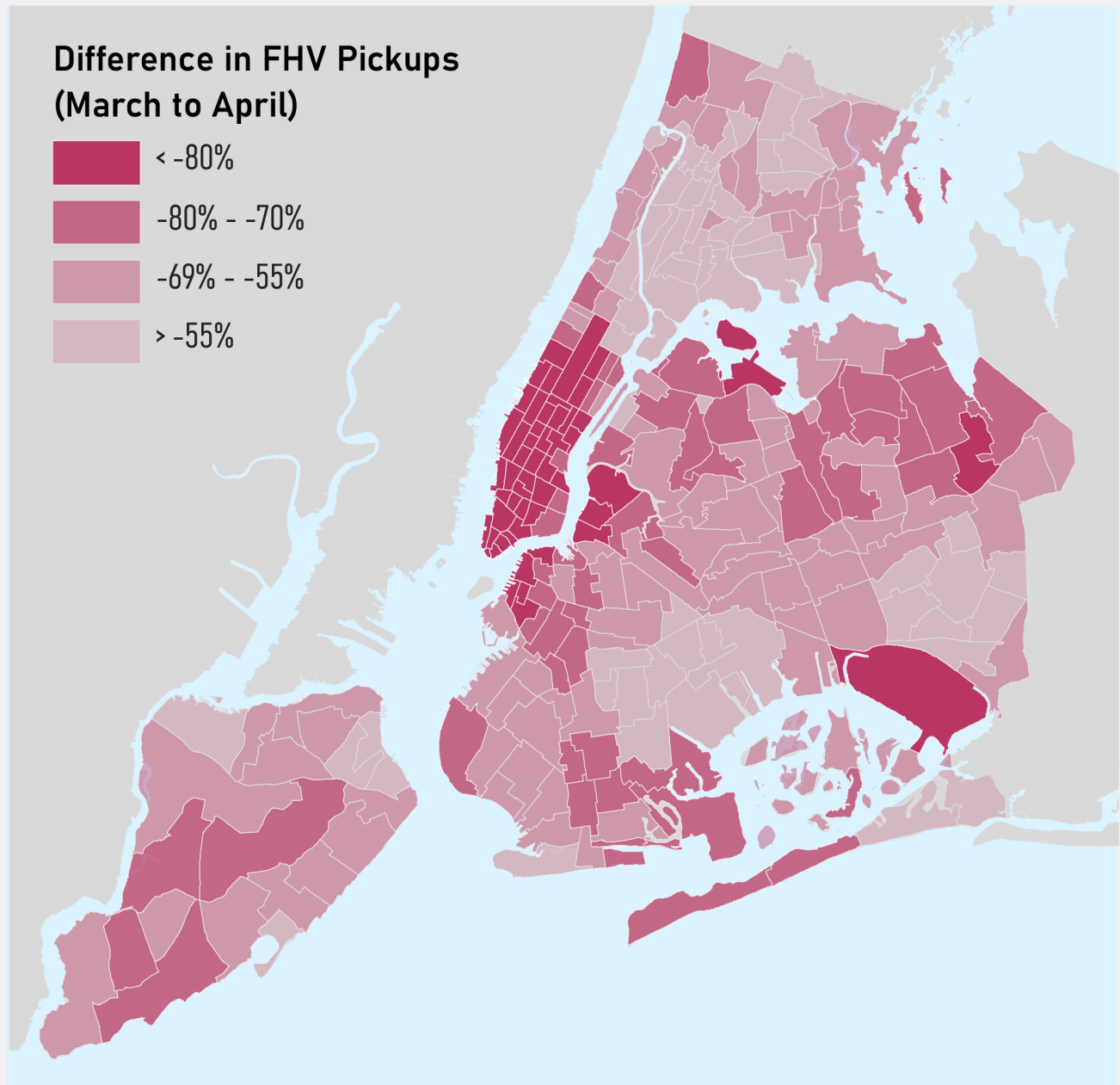
Yellow Taxis Experienced a 92.5% Decline in Trips

Apart from a few neighborhoods where taxi pickups increased between March and April, yellow taxi trips fell dramatically, especially in Manhattan, Queens, and northwest Brooklyn.



For-Hire Vehicles Experienced a 69.1% Decline in Trips

Across NYC, FHV trips fell between March and April, especially in Manhattan and at JFK and LaGuardia airports; nevertheless, this decline is notably less than that of yellow taxis.



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Source: NYC Taxi & Limousine Commission



2.2.5 FERRIES

Ridership declined 92% between February and April 2020

Key Findings:

1. Total ferry ridership declined 91.6% between February and April 2020. Compared to 2019, ridership declined by 54.1% in March and 93.5% in April.
2. Staten Island Ferry ridership fell 91.6% in April from the April levels in 2019.
3. NYC Ferry's East River route, which includes Greenpoint, Williamsburg, Dumbo, and Manhattan, had the greatest decline in riders between February and April, with counts falling by 91%. The South Brooklyn route (including Bay Ridge, Sunset Park, and Manhattan), which fell by 86.6% between February and April, saw the greatest decline between April 2019 and 2020 (93.6%).
4. Total ferry ridership began to recover in May with levels climbing from the April lows to an average 89.8% below 2019 levels. Recovery was uneven, with NYC Ferry experiencing the greatest uptick in riders while service still remained suspended on some private ferries.

Ferries carry passengers within the five boroughs of New York City and into Manhattan from New Jersey. On a typical weekday in March–April 2019, approximately 122,544 people rode the ferry system—including the Staten Island Ferry, NYC Ferry, or other private ferries.* During the same months in 2020, however, only 30,555 trips were taken on a typical weekday, a 75% decrease.

During the first two weeks of March, the NYC Ferry System had higher ridership than the same time last year—30% and 10% increase respectively. This increase may reflect the increased popularity of the service, the addition of new ferry stops, and the warmer weather in March 2020. On March 1, Staten Island Ferry ridership peaked at 61,280. For both the Staten Island and NYC Ferry systems, the last peak was on March 9th—the Monday prior to the WHO officially declaring COVID-19 a pandemic. Through the first two weeks of March, trans-Hudson ferries were on pace to at least

match March 2019 ridership. Trans-Hudson ridership peaked on March 4th at 32,032.

Ridership steadily declined afterward, with the exception of some small peaks toward the end of April, perhaps because of warmer weather. During the PAUSE order, March ridership on NYC Ferry never topped 11,573; once the order was put in place, Staten Island Ferry ridership immediately declined 61% from the prior Monday, March 16th. All but one of more than 20 trans-Hudson routes were suspended beginning Monday, March 24th.

On Monday, March 31st, DOT announced reduced Staten Island Ferry service from normal 15, 20, and 30-minute headways to 60 minutes. That day, Staten Island Ferry ridership declined to 7,929 riders—a nearly 90% drop from the same time in 2019, and continued to decline throughout April.

On March 23rd, NYC Ferry's 30% reduced sched-

* Data publicly available: <https://www1.nyc.gov/html/dot/html/about/datafeeds.shtml#ferry>. NYC DOT Data Feeds. Ferry Division: "Private Ferry Monthly Ridership", "Staten Island Ferry Passenger Counts - by Month."

Average Daily Weekday Passengers, New York City Ferry Systems

| Ferry Service | Month | 2019 Average Daily Passengers/Weekday | 2020 Average Daily Passengers/Weekday | YOY % Change |
|------------------------|------------------|---------------------------------------|---------------------------------------|--------------|
| Staten Island Ferry | February | 68,203 | 58,634 | -14.0% |
| | March | 72,666 | 33,350 | -54.1% |
| | April | 79,170 | 6,668 | -91.6% |
| | May | 79,472 | 9,538 | -88.0% |
| | % Change Feb–May | 16.5% | -83.7% | |
| NYC Ferry System | February | 9,665 | 11,867 | 22.8% |
| | March | 10,903 | 7,474 | -31.5% |
| | April | 15,730 | 1,410 | -91.0% |
| | May | 18,166 | 3,446 | -81.0% |
| | % Change Feb–May | 88.0% | -71.0% | |
| Other Private Ferries* | February | 24,393 | 29,297 | 20.1% |
| | March | 31,172 | 11,875 | -61.9% |
| | April | 35,446 | 332 | -99.1% |
| | May | 33,983 | 474 | -98.6% |
| | % Change Feb–May | 39.3% | -98.4% | |
| Total | February | 102,261 | 99,798 | -2.4% |
| | March | 114,741 | 52,699 | -54.1% |
| | April | 130,346 | 8,410 | -93.5% |
| | May | 131,621 | 13,458 | -89.8% |
| | % Change Feb–May | 28.7% | -86.5% | |

Source: NYC Department of Transportation

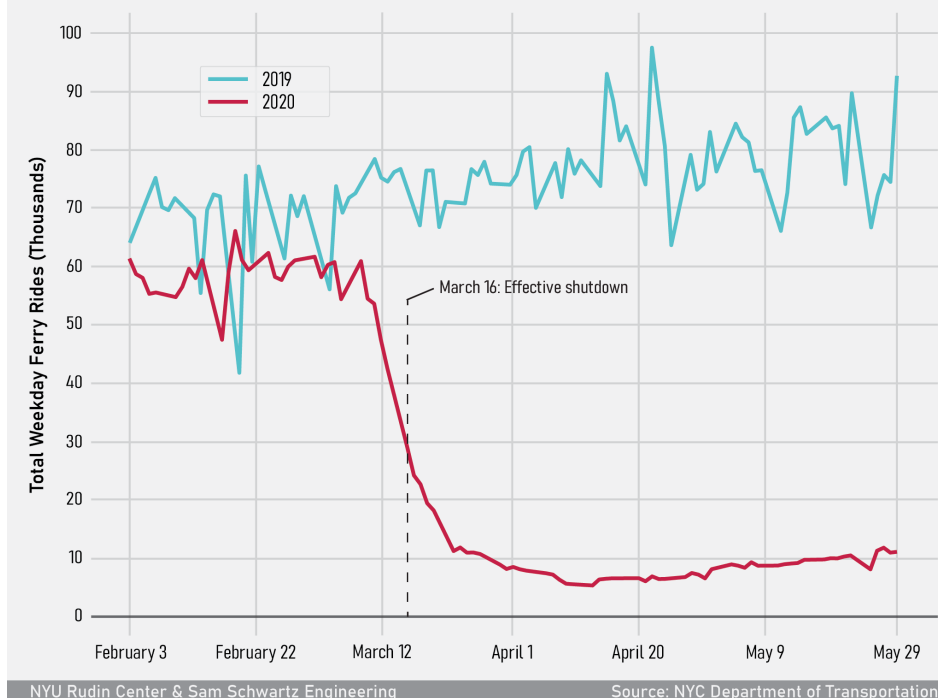
* NY Waterway, Seastreak, NY Water Taxi, Liberty Landing

ule went into effect.¹⁵ The lowest weekday ridership on NYC Ferry took place on Monday, April 13th, with only 720 riders. The East River route only had 225 riders that day—more than a 95% drop from the prior month. The lowest weekday ridership on the Paulus Hook to Brookfield Place Terminal route occurred on April 13th, with 59 riders that day—more than a 95% drop from the prior month.

In April 2020, weekend ridership tended to be higher than weekday ridership on NYC Ferry, perhaps due to the warming weather and the perceived safety of outdoor travel. This follows similar trends in April 2019. In April, weekday ridership across all six routes peaked on Tuesday, April 28th, a day with warmer temperatures than the two weeks prior. All weekend trans-Hudson routes remained suspended in April.

72,500 Fewer Staten Island Ferry Rides than Usual

In April, the Staten Island Ferry experienced a 90% difference in ridership from the same time last year.



Ferry ridership began to recover in May with levels climbing from April lows to an average 89.8% below 2019 levels. Recovery was uneven, with NYC Ferry experiencing the greatest uptick in riders while service still remained suspended on all but one private ferry route. This occurred despite NYC Ferry implementing a further 20% service reduction, including the permanent elimination of Lower East Side ferry service, on May 18th.¹⁶ Ridership on the single trans-Hudson route remained down significantly, but stable (See Appendix B, Figure 2.2.5 & Table 2.2.5).



2.2.6 ACCESS-A-RIDE

Bookings fell 80.1% during the NYS on PAUSE order

Key Finding:

1. Access-a-Ride trips reached their lowest weekly reservations in early April, 80.1% lower than pre-pandemic levels.

Access-a-Ride (AAR), the MTA's paratransit service for people who are unable to use the subways and buses due to disabilities, also experienced a decrease in use.* AAR passengers booked 30,340 AAR trips on Monday, March 2nd. Sunday, April 26th, had the lowest daily reservations at 2,506—a 91.7% decrease from March 2nd and 87.4% below baseline levels, the week of February 24th. The following Monday, April 27th, AAR trip reservations only reached 6,922, 77.2% below

baseline levels.

Trips began to decrease the week before the NYS on PAUSE order, averaging a 3.2% drop, until Friday, March 13th, when bookings began to fall rapidly. On March 19th, the MTA stopped offering shared AAR trips, in line with Mayor de Blasio's executive order to stop similar shared rides in TLC licensed vehicles, many of which are used to provide MTA's AAR service.¹⁷ AAR trips are frequently non-emergency med-

* Data provided directly to the authors of this report. Daily and weekly ridership estimates are based on bookings. While 2019 data was not provided, data from a baseline week (2/24–3/1), prior to declining ridership volumes, is utilized in this report as a proxy for comparative riderships.

ical appointments, many of which were presumably cancelled due to the PAUSE order. Weekly AAR bookings fell until the week of April 6th before increasing slightly through May. More than 56,000 bookings occurred the last week of May, an increase from April's lows but still 71.3% less than baseline levels.

AAR rides did not decline as much as other services because it is likely more of these trips are “essential,” keeping vulnerable users visiting doctors and running errands safely. In addition, the AAR decrease does not reflect the same weather-based fluctuations that bike and pedestrian trips show in their trends. Furthermore, the AAR trips were also likely faster due to reduced traffic congestion, providing a better service for customers.

Access-A-Ride Ridership, Based on Bookings, Weekly 2020

| Week of | Booked AAR Rides | % Change Week over Week | % Change Baseline Week (2/24–3/1) |
|----------|------------------|-------------------------|-----------------------------------|
| March 2 | 199,188 | – | 0.5% |
| March 9 | 176,459 | –11.4% | –11.0% |
| March 16 | 93,421 | –47.1% | –52.9% |
| March 23 | 53,623 | –42.6% | –73.0% |
| March 30 | 45,916 | –14.4% | –76.8% |
| April 6 | 39,465 | –14.0% | –80.1% |
| April 13 | 40,273 | 2.0% | –79.7% |
| April 20 | 42,393 | 5.3% | –78.6% |
| April 27 | 46,649 | 10.0% | –76.5% |
| May 4 | 51,746 | 10.9% | –73.9% |
| May 11 | 53,196 | 2.8% | –73.2% |
| May 18 | 57,663 | 8.4% | –70.9% |
| May 25 | 56,965 | –1.2% | –71.3% |

Source: MTA

2.3 PATTERNS OF WALKING AND MICROMOBILITY

As pedestrian traffic decreased during NYS on PAUSE, micromobility was the most resilient of all transportation modes



2.3.1 WALKING

Requests for walking directions decreased 75%, indicating less travel to new locations

Key Finding:

1. Apple Maps, which tracks the number of requests for directions via their app service, saw a 75% decrease in queries for walking directions within New York City.

Apple Maps data shows the number of requests for directions via public transit, car, and walking for major cities, as well as 63 countries and regions.* Apple Maps

data provides insights into pedestrian trends in New York City. Every time a request for directions is made, the information is counted and then data sets are compared

* Data publicly available: <https://www.apple.com/covid19/mobility>. Apple Mobility Trends Report.

to reflect changes in the volume of people walking. The data is set to a baseline of January 13th, with all increases or decreases relative to the traffic experienced on that day.

Beginning on March 15th, there was a steep decline in walking direction searches, indicating New Yorkers' acclimation to the effective shutdown, the reduction in visitors, and a drop in walking trips to unfamiliar locations. The reduced demand for walking directions continued through the PAUSE order. The lowest number of planned pedestrian trips came on Friday, March 29th, when there were only 18% of the normal walking directions searched. This decrease is even more signifi-

cant given the warmer weather in April, which would likely have increased walking patterns beyond those during February (See Appendix C).

The drop in searches aligned with patterns throughout the United States (20% decrease between February 1 and May 31st), though the numbers dropped more significantly in New York City (39% decrease in the same timeframe). This suggests that local residents adhered to social distancing measures more strictly. Starting in the last two weeks of April, pedestrian movement crept upward, reaching 40% of pre-quarantine traffic levels on May 30th (See Appendix B, Figure 2.3.1).



2.3.2 BIKING

As a relatively popular and resilient mode during the NYS on PAUSE order, Citi Bike ridership rebounded back to 2019 levels by late May

Key Findings:

1. Cycling was one of the most resilient modes in the beginning phases of the pandemic, with overall Citi Bike ridership for March 2020 down by only 19.6% from 2019 levels. The increase in riders prior to March 16, 2020 may have been due to an increased number of commuters opting for biking over public transit, as well as increased numbers of recreational riders and favorable warm weather.
2. Ridership dropped 36.3% between March and April. There were 61.5% fewer riders in April 2020 than April 2019.
3. Between the first and second half of March, Citi Bike origins and destinations shifted unevenly, with trips originating or ending in Midtown Manhattan falling dramatically and trips increasing in Upper Manhattan, with the addition of new docks.
4. Overall, trip volumes in April were less than 2019 levels in all neighborhoods except for Upper Manhattan. By May, North Brooklyn, Upper East Side, Harlem, and Queens joined Upper Manhattan in having positive growth from the year prior.
5. Private bike shops experienced a demand boom, with bike shops reportedly selling bikes at rates three times greater than normal—levels not seen since the transit strike in the 1980s.

In March 2019, Citi Bike riders took 1,327,661 trips; they took 1,066,857 trips in March 2020, a 19.6% drop.* The effective shutdown of March 16th resulted

in a total reduction of ridership: 73% of Citi Bike trips taken in March 2020 occurred before that date. Afterward, the number of trips steeply declined, likely due

* Data publicly available: <https://www.citibikenyc.com/system-data>. Citi Bike System Data. "Citi Bike Trip Histories", "Citi Bike Daily Ridership and Membership Data."

to closures of businesses, universities, and other organizations.

On March 25th, Citi Bike launched its Critical Workforce Membership Program to accommodate essential workers. The initial phase of the program offered a free 30-day membership to healthcare providers, first responders, and transit workers through April 30th. The program was later expanded into a full year membership and added access for critical City of New York employees. The membership includes unlimited 45-minute rides for traditional and e-bike models. In

pared to 2019, Citi Bike experienced a 6% increase in customer trips in March 2020, perhaps attracting new riders.

A more drastic decline in Citi Bike ridership occurred in April. The month of April 2020 only had 679,381 Citi Bike trips, a 36.3% decrease from the previous month, and a 61.5% decrease in ridership compared to the 1,765,644 total trips taken in April 2019. During this month, 9% of the total Citi Bike trips taken were by members of the Critical Workforce Program.

While overall monthly May ridership was less than 2019, daily ridership numbers rebounded to 2019 levels

by the end of the month—presenting Citi Bike as more resilient than the other, still-recovering modes, including transit and taxis.

Citi Bike Monthly Ridership, March–May, 2019 and 2020

| Month | 2019 Trips | 2020 Trips | YOY % Change |
|---------------------------|--------------|--------------|--------------|
| March | 1,327,661 | 1,066,857 | –19.6% |
| April | 1,765,644 | 679,381 | –61.5% |
| May | 1,924,563 | 1,487,890 | –22.7% |
| <i>% Change March–May</i> | <i>45.0%</i> | <i>39.5%</i> | |

Source: Citi Bike

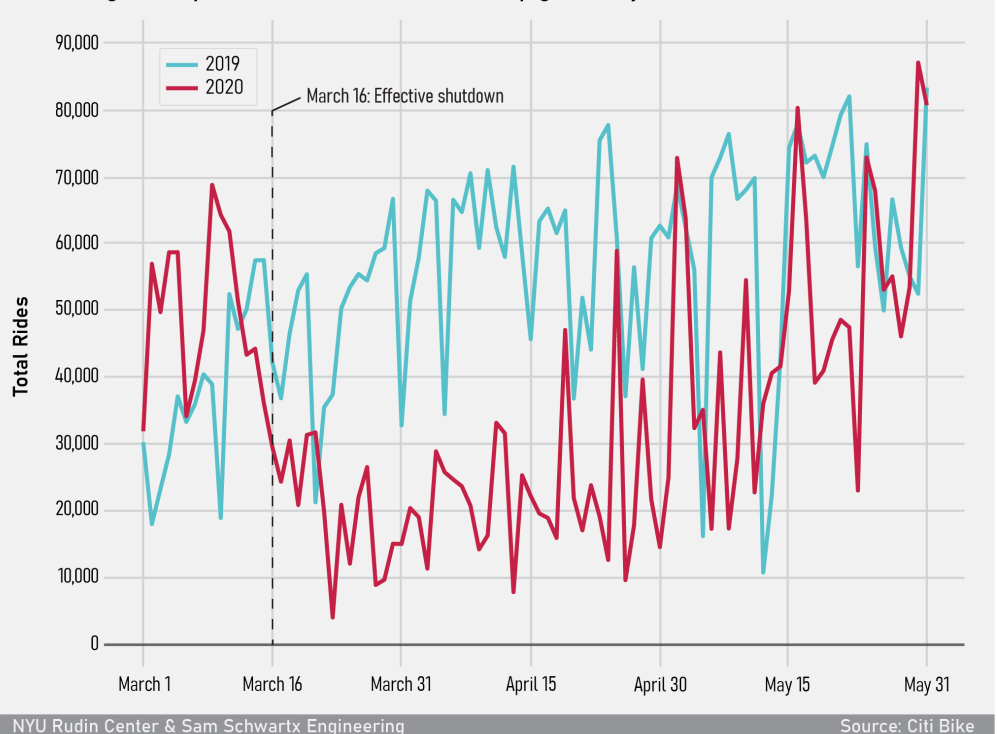
the first six days of the Critical Workforce Membership Program, 838 members signed up for the free 30-day trial.

In April 2019, riders took 1,765,644 trips, and in April 2020 they took 679,381—a 61.5% drop. April ridership peaks corresponded with warm spring temperatures on the 19th and 25th (See Appendix C). The day with the lowest record of trips taken in April was on the 13th, one day after Easter Sunday.

Citi Bike rides were taken by 86% annual subscribers and 14% customer (non-member) trips. Com-

Citi Bike Ridership Caught Up to 2019 Levels

Following a steep decline on March 9, ridership gradually rose back to normal levels.



NYU Rudin Center & Sam Schwartz Engineering

Source: Citi Bike

2.3.2.1 Bike Trends by Neighborhood

May trips from Upper Manhattan to the Upper West Side skyrocketed by 3,740% from 2019 levels

Key Findings:

1. Overall Citi Bike ridership recovered to 2019 levels, in part due to additional stations built in Upper Manhattan and South Bronx
2. Citi Bike trips between boroughs saw the greatest increase from 2019 levels, more than intra-borough trips.
3. In both March and April, the largest number of trips both began and ended in Midtown Manhattan, even though the area experienced the greatest decline in such trips.*

In March 2019, 325,103 trips began and ended in Midtown. In March 2020, a total of 219,121 rides occurred within Midtown—a 32.6% decrease. In April, 74.8% fewer trips started and ended trips within Midtown. In May, Midtown trip volume had recovered slightly to 46.8% of 2019 levels.

Conversely, areas outside of Midtown experienced large increases in ridership compared to 2019 levels. March trips from the Upper West Side to Upper Manhattan jumped 561.7% as 622 riders traveled between these locations, compared to 94 in March 2019. Beginning April 14th, Citi Bike began to expand into Upper Manhattan and the South Bronx with more than 100 new docks.¹⁸

The expansion had been planned for several months but took on new urgency with the pandemic as a way to provide mobility options to healthcare workers and underserved low-income populations. As a result, April had an even greater increase over previous year's levels as well with 984 riders compared to 112 riders, a 778.6% increase from the year prior. This development may account for the Citi Bike trip patterns in May as well: as overall Citi Bike ridership recovered to 2019 levels, some areas saw massive growth. May trips from Upper Manhattan to the Upper West Side skyrocketed by 3,740% from 2019 levels.

Overall, trip volumes in April were lower than 2019 levels in all neighborhoods except for Upper Manhattan. By May, trips grew in North Brooklyn, Upper East Side, Harlem, and Queens from the previous year.

While the largest number of trips began and ended within the same neighborhood and borough in both 2019 and 2020, the pandemic likely contributed to behavior changes in types and duration of rides. Of the ten origin-destination pairs with highest year-over-year

Origin-Destination Pairs with the Highest Year-Over-Year Growth in April

| Origin | Destination | April 2019 | April 2020 | YOY % Change |
|----------------------------------|----------------------------------|------------|------------|--------------|
| Upper West Side | Upper Manhattan | 112 | 984 | 778.6% |
| Upper Manhattan | Upper West Side | 131 | 1094 | 735.1% |
| Upper Manhattan | Harlem | 195 | 471 | 141.5% |
| Harlem | Upper Manhattan | 213 | 496 | 132.9% |
| Queens* | Harlem* | 140 | 250 | 78.6% |
| Harlem* | South of 14th Street (Non-FiDi)* | 435 | 608 | 39.8% |
| Upper West Side* | South Brooklyn* | 94 | 129 | 37.2% |
| Upper West Side* | North Brooklyn* | 76 | 100 | 31.6% |
| South of 14th Street (Non-FiDi)* | Harlem* | 385 | 492 | 27.8% |
| Queens* | South Brooklyn* | 371 | 428 | 15.4% |

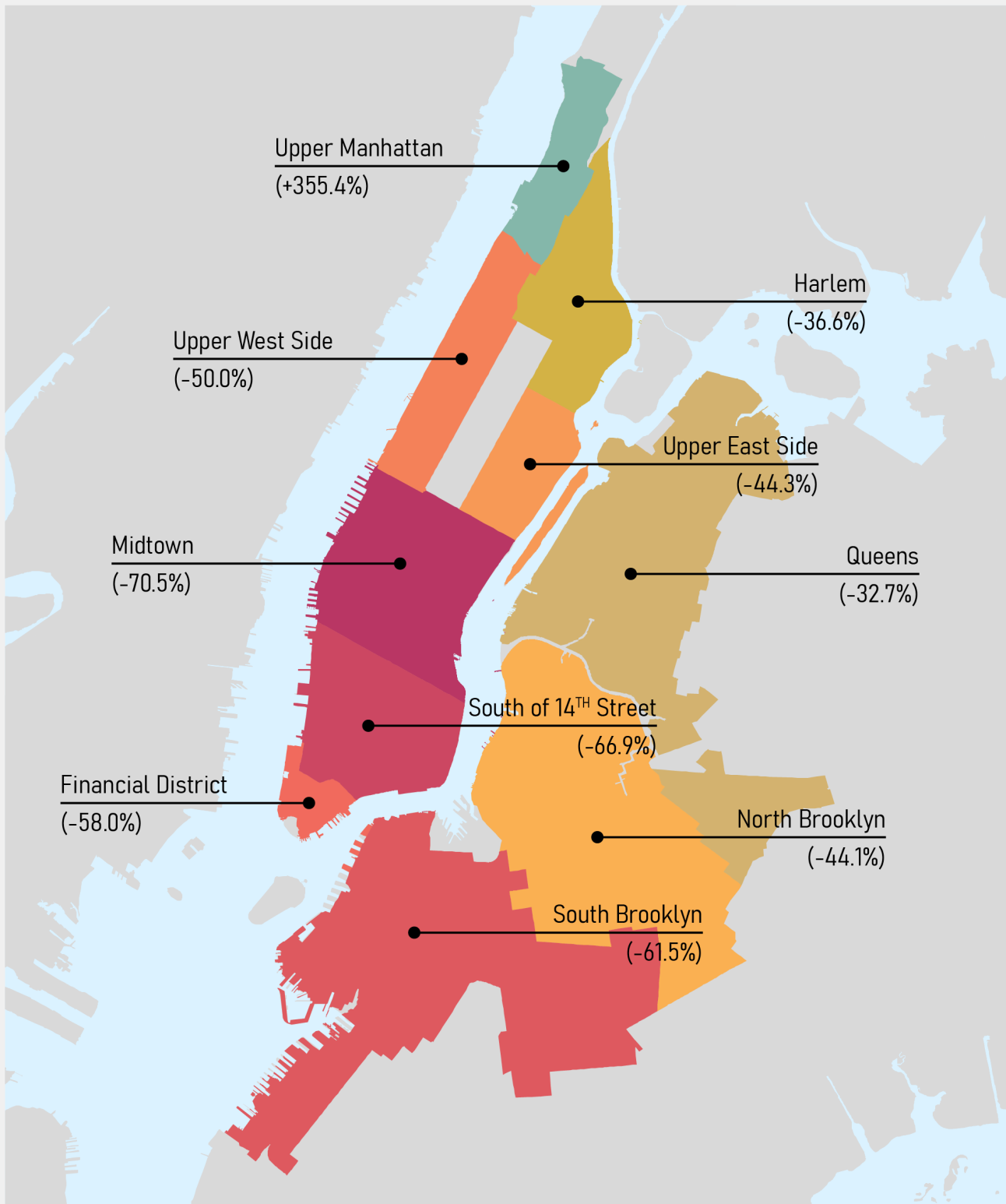
Sources: Citi Bike; Joanna Simon/Waywiser Spatial

* Indicates non-adjacent or interborough trips

* Data publicly available: <https://www.citibikenyc.com/system-data>. Citi Bike System Data. "Citi Bike Trip Histories". Aggregated by Joanna Simon/Waywiser Spatial: <https://www.waywiserspatial.com/>.

Citi Bike Ridership Declined in Almost Every Part of NYC

Citi Bike trip destinations fell dramatically across the city in April as compared to 2019 levels, except in Upper Manhattan where trips increased 355%.*



*This massive increase is primarily accounted for by Citi Bike's expansion into the area earlier than anticipated due to the pandemic

NYU Rudin Center & Sam Schwartz Engineering

Sources: Citi Bike; Joanna Simon/Waywiser Spatial

Origin-Destination Pairs with the Lowest Year-Over-Year Growth in April

| Origin | Destination | April 2019 | April 2020 | YOY % Change |
|---------------------------------|---------------------------------|------------|------------|--------------|
| Midtown | Midtown | 402,865 | 101,499 | -74.8% |
| Midtown | South of 14th Street (Non FiDI) | 111,360 | 33,204 | -70.2% |
| South of 14th Street (Non FiDI) | Midtown | 105,839 | 32,255 | -69.5% |
| South of 14th Street (Non FiDI) | South of 14th Street (Non FiDI) | 251,970 | 78,436 | -68.9% |
| South Brooklyn* | Financial District* | 3,182 | 992 | -68.8% |
| Financial District | Financial District | 46,134 | 15,529 | -66.3% |
| South Brooklyn | South Brooklyn | 170,550 | 60,376 | -64.6% |
| South of 14th Street (Non FiDI) | Financial District | 35,091 | 12,746 | -63.7% |
| Upper West Side | Midtown | 31,799 | 11,627 | -63.4% |
| North Brooklyn* | Financial District* | 1,471 | 538 | -63.4% |

Sources: Citi Bike; Joanna Simon/Waywiser Spatial

* Indicates non-adjacent or interborough trips

growth in April, the majority were non-adjacent inter-neighborhood trips or interborough trips. Of the trip types with greatest decrease from 2019 levels, nearly all started and ended within the same neighborhood or directly adjacent neighborhoods. This shift indicates that riders may be using Citi Bikes for longer trips than before, perhaps as a substitute for public transportation (See Appendix B, Tables 2.3.2.1A, 2.3.2.1B, 2.3.2.1C, & 2.3.2.1D).

2.3.3 REVEL



The moped company expanded its service area throughout the pandemic, benefiting from new interest in micromobility and programs serving more users

Key Findings:

1. Revel averaged 2,987 trips per day in February, 2,955 in March, 2,544 in April and 7,284 in May.
2. Revel expanded its service area during the pandemic, adding Upper Manhattan, parts of Lower Manhattan, and the South Bronx.

Revel operates a fleet of mopeds in New York City. It launched in Brooklyn and Queens in 2018, and on March 20th, 2020, expanded its service area to Upper Manhattan, parts of Lower Manhattan, the South Bronx, and East Queens as a response to the pandemic. The company also launched two new programs: one for restaurant deliveries, and an essential workers membership program providing free rides to healthcare work-

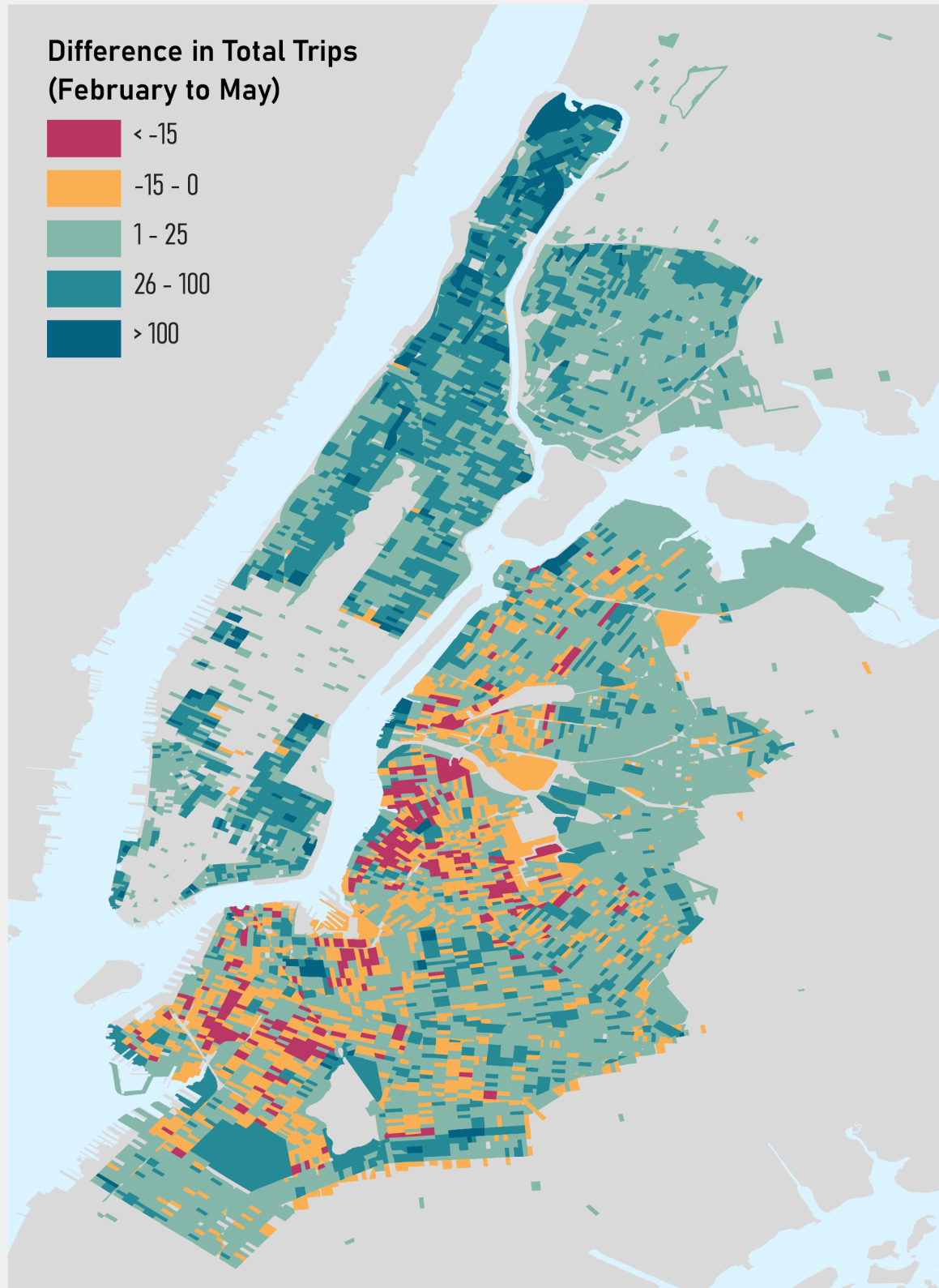
ers, which ended on June 1st.¹⁹ As a result, although Revel trips plummeted in mid-March, they quickly rebounded.*

After peaking on March 9th with 5,534 trips, Revel ridership declined until March 23rd, and then began to rebound. The largest number of trips took place on May 30th with 12,713, more than doubling the March pre-pandemic peak.

* Data provided directly to the authors of this report.

Revel Trips Are Quickly Spreading To New Service Areas

On March 20, Revel announced their service area would expand to Manhattan, South Bronx, and East Queens. Ever since, although trips have fallen in previously popular areas, they have grown exponentially in all new areas.



Revel's new service areas account for the increase in ridership. In February, when Revel was only available in Brooklyn and Queens, 86.6% of trips started in Brooklyn—heavily concentrated in the neighborhoods of Williamsburg and Greenpoint—and the remainder in Queens. The distribution of trips shifted as the service coverage increased throughout the boroughs: in March, 80.3% of trips started in Brooklyn, 18.6% in Queens, and 1.1% in Manhattan. By April, there was a surge in trips seemingly made possible by the expanded service area and more evenly distributed across the city, with 58.3% starting in Brooklyn, 18.2% in Queens, 23.3%

in Manhattan, and a handful in the Bronx. This trend continued into May, growing into Lower Manhattan and the South Bronx: 41.8% of trips started in Brooklyn, 13.5% in Queens, 37.2% in Manhattan, and 7.5% in the Bronx. Although May trips were lower in the areas they were concentrated in February, the service area expansion has resulted in an overall increase in ridership. That is, although total trips in April were lower than the previous two months, by May, daily Revel trips consistently exceeded March pre-pandemic levels (See Appendix B, Table 2.3.3).

2.4 TRAVEL TO NEW YORK CITY

Both commuting and tourism declined sharply as non-essential workplaces and tourist destinations were closed



2.4.1 COMMUTER RAILROADS

Ridership on trains to New York City, including Metro-North, Long Island Rail Road, New Jersey Transit, and PATH, reached as low as 2.3% of pre-pandemic levels

Key Findings:

1. Metro-North Railroad's monthly ridership fell by 94% from 2019 levels in April 2020.
2. Long Island Rail Road (LIRR) ridership fell by 96.7% from 2019 levels in April 2020.
3. New Jersey Transit (NJ Transit) carried 85.1% fewer riders in April than in February 2020 across its commuter rail, bus, and light rail systems. Compared to 2019, ridership was down 38.1% in March and 86.4% in April.
4. Of NJ Transit systems, commuter rail declined by 97.7% between February and April; bus ridership was least affected, falling 76.7%.
5. Port Authority Trans-Hudson (PATH) ridership declined 94% between February and April, with monthly ridership in March and April 54.2% and 94.7% lower than levels in the previous year, respectively.

2.4.1.1 Metro-North Railroad

Ridership fell 94% from 2019 levels in April

Key Findings:

1. Rail ridership recovered slightly in May, gaining ap-

proximately 62,000 riders.

2. During April, average weekday ridership reached only 9,659 riders—an 85% drop from February baseline levels.

Metro-North Railroad Ridership

| Month | 2019 | 2020 | YOY % Change |
|-------|-----------|-----------|--------------|
| March | 7,232,960 | 2,797,795 | -61.3% |
| April | 7,459,243 | 448,977 | -94.0% |
| May | 7,227,827 | 511,064 | -92.9% |

Source: Metropolitan Transportation Authority Joint Long Island and Metro-North Committees Meeting, April 2020; May 2020; June 2020

In March 2020, 2.8 million riders boarded the Metro-North Railroad (MNR), 61.3% fewer total monthly riders than the previous year. By April, ridership had plummeted to less than one-tenth of 2019 levels, with May ridership only recovering slightly.^{20,21,22}

Weekday ridership in the February baseline week (2/24 to 3/1) averaged 66,145 daily riders; in March, the average daily ridership was down to less than half of baseline levels with only 29,032 (43.9%) commuters.* By April, the drop was even more dramatic, with the average daily weekday ridership reaching only 9,659—an 85% drop from baseline levels. Average daily weekend ridership declined by an even greater degree, with March and April 58.0% and 93.3% below the baseline average, respectively.

On March 9th, the Monday prior to the NYS on PAUSE order, 52,724 riders used MNR; by the following Monday, March 16th, ridership declined by 61% to 20,557. MNR started reducing service on March 27th on its Harlem, Hudson, and New Haven lines, reaching hourly service on April 13th—a near 50% decrease in the number of trains. The lowest ridership date in March occurred on Saturday, March 28th, when only 4,343 riders boarded Metro-North trains; a 93.5% drop compared to Saturday in the baseline week. On a weekday, the lowest ridership in March occurred on Tuesday March 31st, when 4,759 riders utilized the trains—92.4% lower than Tuesday in the baseline

week. Weekly ridership reached its lowest point the week of March 23rd, the first week of the NYS on PAUSE order, less than one-tenth of baseline ridership levels. Levels remained low throughout April, with weekly ridership close to 87% below the baseline levels. Bookings increased through May, climbing to 79.4% below baseline levels by the last week of the month.

On May 27th, MNR returned some service on previously suspended lines, while also making 14 additional on-call trains available to provide additional capacity (See Appendix B, Table 2.4.1.1).²³

2.4.1.2 Long Island Rail Road

Ridership fell 97% from 2019 levels in April

Key Findings:

1. In April 2020, the Long Island Rail Road lost 7.5 million riders compared to April 2019.
2. Ridership hit its lowest point on April 13th, with only 5,783 riders.

Long Island Rail Road Ridership

| Month | 2019 | 2020 | YOY % Change |
|-------|-----------|-----------|--------------|
| March | 7,681,912 | 3,274,069 | -57.4% |
| April | 7,724,038 | 253,571 | -96.7% |
| May | 7,645,149 | 515,918 | -93.3% |

Source: Metropolitan Transportation Authority Joint Long Island and Metro-North Committees Meeting, April 2020; May 2020; June 2020

In March 2020, 3.3 million riders boarded the Long Island Rail Road (LIRR)—57.4% fewer riders than the previous year. Ridership continued to decline through April to 96.7% less than 2019 levels, before increasing slightly in May to a decline of 93.3% from May 2019.^{24,25,26}

Compared to ridership of the baseline week (2/24

* Data for Metro-North Rail (MNR) and Long Island Rail Road (LIRR) daily and weekly ridership was provided directly to the authors of this report. Daily ridership estimates are based on ticket sales, though the data does not include 10-trips, weeklies, Mail and Ride monthlies and on-board one way tickets. Data from a baseline week (2/24–3/1), prior to declining ridership volumes, is utilized in this report as a proxy for comparative riderships.

to 3/1) prior to March, the daily weekday average for March (36,904 riders) was 51.5% less than the weekday baseline of 76,054 daily riders. The decline continued in April, which experienced 91.6% less weekday ridership than the baseline levels with an average of 6,390 daily weekday riders. Weekends experienced greater decline than weekdays, with the average daily weekend ridership declining by 56.5% and 96.9% in March and April, respectively.

On March 9th, the Monday prior to the major closures, 66,875 people rode the LIRR. On March 16th, the week of the NYS on PAUSE order, ridership was down by more than 56% as 28,810 utilized the service. Ridership continued to drop through March, reaching a low on Sunday March 29, with only 3,199 riders. The lowest weekday ridership in March occurred on the following Tuesday, March 31st, with 3,871 riders—94.8% below the ridership of corresponding baseline Tuesday. By mid-March, weekly ridership was less than one-tenth of baseline ridership. LIRR began running 35% fewer trains in late March, and slowly reintroduced service in

May.²⁷ In April, ridership remained low, with the lowest daily ridership (1,655) occurring on Sunday, April 26th and the lowest weekday ridership (5,783) occurring on Monday, April 13th. Weekly ridership in April hovered near 93% of baseline levels, before slowly increasing through May (See Appendix B, Table 2.4.1.2).

2.4.1.3 New Jersey Transit

April commuter rail trips reached only two percent of 2019 levels

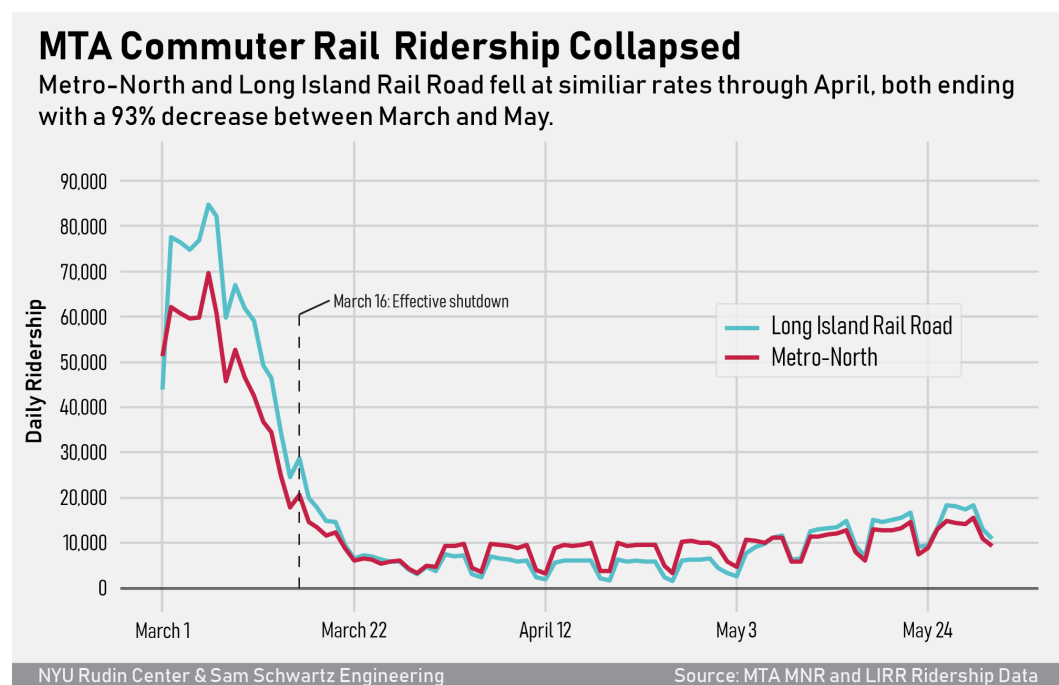
Key Finding:

1. The largest drop in NJ Transit ridership was on commuter and light rail lines, with buses experiencing the least decline.

New Jersey Transit (NJ Transit) operates commuter rail, bus, and light rail systems. In 2019, the system served 263 million riders.²⁸ The effects of the pandemic were apparent in March.* In February 2020, a total of 20,391,400 trips were made via NJ Transit rail, bus, or light rail. By March 2020, trip numbers were down to

13,472,500 (a 33.9% decline) and by April, trip counts only reached 3,036,900—an 85.1% drop from February levels. Systemwide trip numbers increased in May, reaching 5.3 million trips—73.9% less than February levels and 76.8% less than the same month in 2019.

The most dramatic drop was on NJ Transit commuter rail and



* Data provided directly to the authors of this report. NJ Transit provided daily ridership estimates based on monthly ticket sales. Trip numbers analyzed in this section includes monthly totals for unlinked trips on each of these modes. Unlinked trips (the total number of boardings onto the specific mode) may overcount the total number of commuting trips, or linked trips including transfers from origin to destination.

light rail: by April, trips had declined 97.2% and 92.5% from February levels, respectively. Bus systems, which had the highest trip counts in February 2020, experienced the least decline—falling 76.7% from 11,775,800 to 2,741,500 monthly trips.

Total unlinked trips reached 61.8% of 2019 levels in March and 13.6% in April. Again, rail was most affected—reaching 154,600 trips in April, one-fiftieth of the trips from April of the previous year. Buses experienced the least impact, with trip counts falling 37.6% in March and 78.7% in April. Light rail, which fell by the second greatest amount in April behind commuter rail, experienced the greatest rebound in trip numbers between April and May, climbing from 6.8% of 2019 levels to 30%.

New Jersey Transit, Unlinked Trips

| Service | Month | 2019 Trips | 2020 Trips | YOY % Change |
|------------|------------------|------------|------------|--------------|
| Rail | February | – | 6,735,200 | <i>N/A</i> |
| | March | 7,242,900 | 4,517,400 | –37.6% |
| | April | 7,353,700 | 154,600 | –97.9% |
| | May | 7,552,000 | 954,100 | –87.4% |
| | % Change Feb–May | <i>N/A</i> | –85.8% | |
| Bus | February | – | 11,775,800 | <i>N/A</i> |
| | March | 12,557,800 | 7,833,500 | –37.6% |
| | April | 12,899,800 | 2,741,500 | –78.7% |
| | May | 13,323,400 | 3,733,900 | –72.0% |
| | % Change Feb–May | <i>N/A</i> | –68.3% | |
| Light Rail | February | – | 1,880,400 | <i>N/A</i> |
| | March | 1,980,600 | 1,121,600 | –43.4% |
| | April | 2,077,000 | 140,800 | –93.2% |
| | May | 2,140,900 | 641,500 | –70.0% |
| | % Change Feb–May | <i>N/A</i> | –65.9% | |
| Systemwide | February | – | 20,391,400 | <i>N/A</i> |
| | March | 21,781,300 | 13,472,500 | –38.1% |
| | April | 22,330,500 | 3,036,900 | –86.4% |
| | May | 23,016,300 | 5,329,500 | –76.8% |
| | % Change Feb–May | <i>N/A</i> | –73.9% | |

Source: New Jersey Transit

2.4.1.4 PATH

April ridership fell 95% from the previous April

Key Findings:

1. PATH Ridership usage collapsed with a 94.7% decline between April 2019 and April 2020.
2. Newport and Hoboken stations experienced the largest declines of all PATH stations, falling by 97.3% and 97% between February and April.

3. Overall monthly ridership increased between April and May, with average weekend ridership increasing at a faster rate than weekday ridership.

As on other transit lines, the effects of the pandemic on Port Authority Trans-Hudson (PATH) ridership became apparent beginning in March.* In February 2020, PATH served 6.24 million riders; by March, ridership was more than halved to 3.11 monthly users. In

* Data publicly available: <https://www.panynj.gov/path/en/about/stats.html>. Port Authority of New York and New Jersey. Traffic & Volume, PATH Ridership Report 2019 and 2020.

PATH Monthly Ridership, 2019 and 2020

| Month | 2019 Monthly Totals | 2020 Monthly Totals | 2020 % Change from February | YOY % Change |
|----------|---------------------|---------------------|-----------------------------|--------------|
| February | 6,050,283 | 6,237,505 | – | 3.1% |
| March | 6,792,568 | 3,109,698 | –50.1% | –54.2% |
| April | 7,063,001 | 376,606 | –94.0% | –94.7% |
| May | 7,239,937 | 530,856 | –91.5% | –92.7% |

Source: Port Authority of New York and New Jersey

April, even fewer people rode PATH—a 94% decline since February. The lowest ridership day occurred on Easter Sunday, April 12th. On that date, the PATH system saw a total of 5,643 riders—93.1% less than the weekend day average in February 2020 and 94.2% less than the weekend day average in April 2019. The lowest weekday ridership occurred the next day, Monday April 13th when 11,794 riders used the PATH system. This weekday ridership was 95.8% below the February 2020 weekday average and 95.9% below the weekday average in April 2019.

Compared to the same period the year before, March 2020 fell 54.2% from 2019 levels and April down 94.7%. The average weekday ridership, 282,850 in February 2020, fell 94.9% below 2019 levels to a low of 14,596 in April. Weekend ridership fell to 92.8% below 2019 levels. Ridership picked up slightly in May, growing from under four hundred thousand total monthly riders to over five hundred thousand, but still remained under 10% of 2019 levels. Interestingly, weekend ridership increased at a faster rate than weekday ridership: between April and May 2020, average weekday ridership

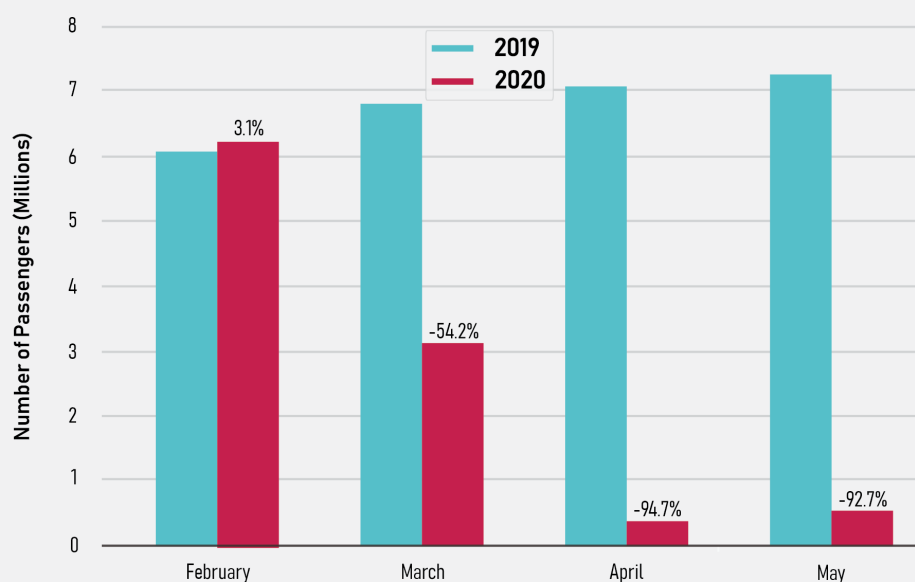
increased 40.1% while average weekend ridership increased by 57.0%.

New York City PATH stations (Christopher Street, 9th Street, 14th Street, 23rd Street, 33rd Street, and the World Trade Center) fell to just 5% of 2019 levels by

April, before recovering slightly to 7% by May. New Jersey PATH stations (Newark, Harrison, Journal Square, Grove Street, Exchange Place, Newport, Hoboken) experienced a similar decline: by April, ridership was 5.6% of 2019 levels and 7.6% by May. The World Trade Cen-

PATH Ridership Fell 95%

From February to April, the PATH system monthly ridership went from 6.2 million to approximately 377,000.



NYU Rudin Center & Sam Schwartz Engineering

Source: Port Authority

ter station is the busiest PATH station, typically seeing over 1.3 million monthly riders. In February 2020 the station had 1,281,652 riders. Ridership plummeted by 49.4% in March and by 93.6% by April. The stations experiencing the greatest change in ridership by April were Newport and Hoboken, which were down by 97.3% and 97.0% from February levels respectively.

The least change in ridership occurred at the Newark and Journal Square stations, which fell by 90.1% and 88.2% in April respectively. Ridership increased slightly by May at all PATH stations, with the greatest recovery

occurring at the Christopher Street station, as ridership increased 84% from April levels by May (See Appendix B, Tables 2.4.1.4A, 2.4.1.4B, & 2.4.1.4C).



2.4.2 BRIDGE AND TUNNEL CROSSINGS

Vehicle traffic on MTA and Port Authority crossings fell by 61.3% and 57.3% between February and April, less severely than other modes and rebounded more quickly than other commuter modes

Key Findings:

1. Vehicle traffic over MTA crossings fell by 61.3% between February and April 2020. Compared to 2019, March and April saw 31.4% and 65.5% fewer vehicles.
2. Vehicle traffic over Port Authority crossings fell by 57.3% between February and April 2020. March and April 2020 were 27.7% and 60.7% lower than the same period of the previous year, respectively.
3. Bridges and tunnels connecting to Manhattan saw some of the largest declines in traffic, compared to those connecting the outer boroughs.

Of the agencies that manage major New York City bridges and tunnels, the MTA and Port Authority track volume on their tolled crossings, while New York City Department of Transportation does not, as their crossings are untolled. Available data for crossings reflected in the following section does not include every bridge, but does illustrate a dramatic decline in movement beginning in March.*

2.4.2.1 MTA Bridges and Tunnels

April 2020 vehicle traffic was 65% less than that of April 2019, but began to rebound in May

Key Findings:

1. In March and April of 2020, 23.5 million fewer ve-

hicles crossed MTA bridges and tunnels compared to the same months in 2019.

2. In April, the Henry Hudson Bridge experienced the greatest decline while the Cross Bay Veterans Memorial Bridge saw the least.

The MTA tracks daily vehicle traffic on nine crossings: Bronx-Whitestone Bridge, Henry Hudson Bridge, Robert F. Kennedy Bridge, Marine Parkway-Gil Hodges Memorial Bridge, Cross Bay Veterans Memorial Bridge, Queens Midtown Tunnel, Hugh L. Carey Tunnel, Throgs Neck Bridge, and Verrazzano-Narrows Bridge.[†] In 2019, tolled MTA crossings carried a total of 289 million vehicles within New York City.[‡] Between March and April 2019 alone, 48 million vehicles uti-

* When examining crossings over tolled bridges, it is important to note that during periods of low congestion, such as during the NYS on PAUSE order, drivers are more likely to avoid toll bridges in favor of untolled bridges. Thus, these declines may be slightly distorted in representing actual travel into and out of the city, as some drivers may have instead chosen alternative routes to get to the same destination.

[†] Only outbound traffic (Brooklyn to Staten Island) is tolled and tracked on the Verrazzano-Narrows Bridge.

[‡] Data publicly available: <https://data.ny.gov/Transportation/Daily-Traffic-on-Metropolitan-Transportation-Authority/cwhc-n4ek>. MTA Bridges and Tunnels. "Daily Traffic on Metropolitan Transportation Authority (MTA) Bridges and Tunnels: Beginning 2010."

Vehicle Traffic Plummeted on Bridges and Tunnels

Compared to April 2019 figures, traffic on tolled NYC crossings was drastically lower in April 2020, especially on crossings entering Manhattan.



NYU Rudin Center & Sam Schwartz Engineering

Source: MTA; PANYNJ Traffic and Volume Data

lized these crossings. In March and April of 2020, that number reached only 25 million vehicles—just over half of the previous year’s volume.

The effects of the pandemic on traffic volume over these crossings became apparent by March, which had 16 million monthly crossings—a 23.4% decrease from February levels, and a year-over-year decline of 31.4%.

April saw even less traffic volume, reaching a mere 8.4 million total crossings. This put April at a 61.3% decrease from February 2020 levels, and at a year-over-year decline of 65.5%. April also had slightly more outbound traffic than the year prior—51.5% versus 50.3%.

March traffic volume peaked on Friday, March 6th, with a total of 828,554 vehicles using the MTA crossings. By the following Friday, March 13th, traffic volume was down 9.54%. The first large decrease in traffic volume occurred on Sunday, March 15th, a day before the NYS on PAUSE order; traffic was 44.36% below March 6th levels at 461,031 crossings. By Friday, March 20th, traffic was 41.8% lower than March 6th levels. Volume continued to drop to a low on March 29th of just 166,683 daily crossings—just 20% of the March peak—before climbing slightly by the end of April and into May. By May, total monthly volume was back to half of 2019 levels.

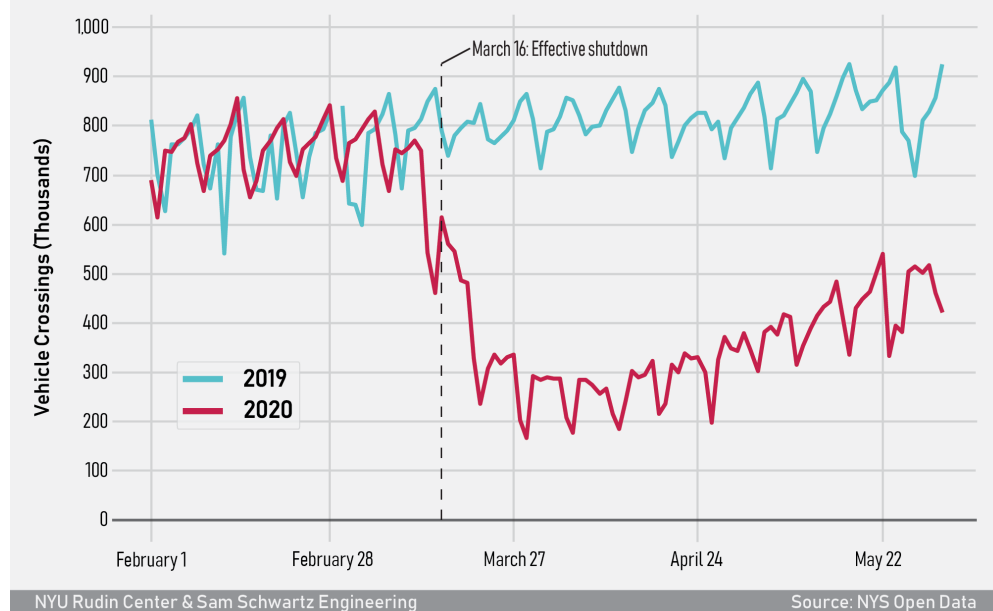
Crossing Specific Changes:

When examining specific crossings, all experienced dramatic decreases in volume as an effect of the pandemic and PAUSE orders, beginning in March. The Henry Hudson Bridge saw the greatest decreases in volume by April, declining 76.7% from February levels. The Queens Midtown Tunnel and Hugh L. Carey Tunnel also saw large decreases in volume, and by April had experienced traffic volume decreases from February of 74.9% and 72.6% respectively.

Compared to the total volume of April of the previous year, bridges experienced decreases in volume rang-

MTA Bridge and Tunnel Crossings Dropped by 65%

Compared to April 2019, April 2020's vehicle traffic was 65% lower while May 2020 was only 50% lower compared to May 2019.



ing from 46.2% to 79.7%. In March and April 2019, the Robert F. Kennedy Bridge carried more travelers than any other MTA bridge at 11.3 million vehicles; the combined total in March and April 2020 was 5.6 million—half of its 2019 capacity. The Henry Hudson Bridge experienced the largest decrease from total April 2019 levels, declining 79.7% by April 2020—falling from 1.9 million vehicles to just over 450,000. By May, the Henry Hudson Bridge and the Hugh L. Carey Tunnel had experienced the greatest increase in vehicular traffic from April lows, with May volume 75.6% and 70.8% greater than April levels. Both the Marine Parkway-Gil Hodges Memorial Bridge and the Cross Bay Veterans Memorial Bridge recovered to almost 70% of May 2019 levels by May 2020.

The three MTA crossings that sit near untolled bridges (Queens Midtown Tunnel, Hugh L. Carey Tunnel, and Henry Hudson Bridge) showed declines 10-20% greater than other crossings where diversions are more roundabout or non-existent. This is likely due to “bridge-shopping,” or opting for the most cost or speed effective route, which is most severe when traffic speeds on the untolled bridges are good.

MTA Crossings, Monthly Traffic Volumes by Crossing 2019–2020

| Crossing Name | Month | 2019 Crossings | 2020 Crossings | YOY % Change |
|--------------------------|------------------|----------------|----------------|--------------|
| Henry Hudson Bridge | February | 1,848,152 | 1,938,536 | 4.9% |
| | March | 2,171,638 | 1,282,187 | -41.0% |
| | April | 2,229,882 | 452,504 | -79.7% |
| | May | 2,371,099 | 794,576 | -66.5% |
| | % Change Feb–May | 28.3% | -59.0% | |
| Queens Midtown Tunnel | February | 2,228,289 | 2,330,268 | 4.6% |
| | March | 2,573,516 | 1,585,781 | -38.4% |
| | April | 2,548,844 | 584,739 | -77.1% |
| | May | 2,716,490 | 905,889 | -66.7% |
| | % Change Feb–May | 21.9% | -61.1% | |
| Hugh L. Carey Tunnel | February | 1,468,632 | 1,515,184 | 3.2% |
| | March | 1,670,672 | 1,076,846 | -35.5% |
| | April | 1,650,924 | 415,466 | -74.8% |
| | May | 1,726,554 | 709,565 | -58.9% |
| | % Change Feb–May | 17.6% | -53.2% | |
| Robert F. Kennedy Bridge | February | 4,829,643 | 4,960,455 | 2.7% |
| | March | 5,655,218 | 3,812,827 | -32.6% |
| | April | 5,655,818 | 1,884,606 | -66.7% |
| | May | 6,038,397 | 2,980,100 | -50.6% |
| | % Change Feb–May | 25.0% | -39.9% | |
| Bronx–Whitestone Bridge | February | 3,459,147 | 3,731,891 | 7.9% |
| | March | 4,064,838 | 2,932,688 | -27.9% |
| | April | 4,130,478 | 1,516,221 | -63.3% |
| | May | 4,388,199 | 2,282,462 | -48.0% |
| | % Change Feb–May | 26.9% | -38.8% | |
| Throgs Neck Bridge | February | 3,179,029 | 3,215,734 | 1.2% |
| | March | 3,673,613 | 2,575,689 | -29.9% |
| | April | 3,676,094 | 1,499,916 | -59.2% |
| | May | 3,946,060 | 2,297,866 | -41.8% |
| | % Change Feb–May | 24.1% | -28.5% | |

| | | | | |
|---|------------------|------------|------------|--------|
| Verrazzano–Narrows Bridge | February | 2,751,542 | 2,890,168 | 5.0% |
| | March | 3,162,863 | 2,374,139 | –24.9% |
| | April | 3,165,538 | 1,383,034 | –56.3% |
| | May | 3,319,270 | 2,027,373 | –38.9% |
| | % Change Feb–May | 20.6% | –29.9% | |
| Marine Parkway–Gil Hodges Memorial Bridge | February | 523,843 | 557,470 | 6.4% |
| | March | 628,812 | 473,472 | –24.7% |
| | April | 616,487 | 305,980 | –50.4% |
| | May | 745,451 | 474,899 | –36.3% |
| | % Change Feb–May | 42.3% | –14.8% | |
| Cross Bay Veterans Memorial Bridge | February | 589,975 | 603,352 | 2.3% |
| | March | 687,530 | 537,933 | –21.8% |
| | April | 682,848 | 367,273 | –46.2% |
| | May | 784,485 | 530,640 | –32.4% |
| | % Change Feb–May | 33.0% | –12.1% | |
| Totals | February | 20,878,252 | 21,743,058 | –4.1% |
| | March | 24,288,700 | 16,651,562 | –31.4% |
| | April | 24,356,913 | 8,409,739 | –65.5% |
| | May | 26,036,005 | 13,003,370 | –50.1% |
| | % Change Feb–May | 24.7% | –40.2% | |

Source: MTA Bridges and Tunnels

2.4.2.2 Port Authority Crossings

Traffic volume was down by 60.7% in April 2020 compared to April 2019

Key Findings:

1. From February to April 2020, Port Authority bridge and tunnel crossings fell 57.3%
2. The Bayonne Bridge declined the least from February 2020 to April 2020, falling by 47.6%, while the Lincoln Tunnel fell the most at 65.7%.
3. Traffic volume began to recover in May, increasing to 42.2% below 2019 levels.

The Port Authority of New York and New Jersey (PANYNJ) tracks New York-bound traffic on six crossings: Bayonne Bridge, George Washington Bridge, Goethals Bridge, Outerbridge Crossing, Holland Tunnel, and Lincoln Tunnel.* The crossings are counted by tolling stations and aggregated on a monthly level.

In 2019, these crossings collectively carried 122,227,676 vehicles into New York City. From February through April 2019, the crossings carried 28,770,801 east-bound vehicles (23.5% of the total 2019 volume). In February 2020, 9.3 million vehicles utilized Port Au-

* Data publicly available: <https://www.panynj.gov/bridges-tunnels/en/traffic---volume-information---b-t.html>. Port Authority of New York and New Jersey. Traffic & Volume, Tunnels And Bridges Eastbound Traffic.

thority crossings; by April, that number had dwindled to just under 4 million—43% of February levels.

In comparison to 2019 levels, February crossings had a slightly higher traffic volume. However, that upward trend took a nosedive beginning in March, with March 2020 numbers 27.7% lower than March 2019. April numbers decreased even further from 2019 levels (60.7%). By May, traffic volume began to increase on all crossings. Systemwide, volume increased from the April lows to 42.2% below 2019 levels. Between April and May, overall crossings increased by 55.3% (See Appendix B, Figure 2.4.2.2).

Crossing-Specific Changes:

The Lincoln Tunnel experienced the greatest initial drop, falling 26.4% below February levels by March, as well as the greatest drop between February and April of

65.7%. The Holland Tunnel was close behind, with an initial drop of 25.6% in March and 63.6% in April from February levels.

Lincoln Tunnel traffic declined the most from 2019 crossings, falling 35.3% in March and 69.5% in April. By May, the Bayonne Bridge was the closest to pre-pandemic volume, falling only 35% from 2019 levels. However, between April and May, the greatest increase in volume occurred over the George Washington Bridge which experienced an increase in traffic from almost 1.8 million to over 2.8 million total vehicles—a 57.9% increase.

Port Authority Crossings, Monthly Eastbound Traffic Volumes by Crossing 2019–2020

| Crossing Name | Month | 2019 Crossings | 2020 Crossings | YOY % Change |
|--------------------------|------------------|----------------|----------------|--------------|
| Bayonne Bridge | February | 191,748 | 266,860 | 39.2% |
| | March | 248,778 | 222,456 | -10.6% |
| | April | 219,997 | 139,765 | -36.5% |
| | May | 295,167 | 192,345 | -34.8% |
| | % Change Feb–May | 53.9% | -28.1% | |
| George Washington Bridge | February | 3,677,566 | 3,939,733 | 7.1% |
| | March | 4,241,762 | 3,121,055 | -26.4% |
| | April | 4,278,887 | 1,788,278 | -58.2% |
| | May | 4,511,523 | 2,822,993 | -37.4% |
| | % Change Feb–May | 22.7% | -28.3% | |
| Goethals Bridge | February | 1,244,714 | 1,338,786 | 7.6% |
| | March | 1,431,155 | 1,061,686 | -25.8% |
| | April | 1,492,767 | 575,424 | -61.5% |
| | May | 1,550,624 | 901,309 | -41.9% |
| | % Change Feb–May | 24.6% | -32.7% | |

| | | | | |
|----------------------|-------------------------|------------|-----------|--------|
| Holland Tunnel | February | 1,128,086 | 1,221,499 | 8.3% |
| | March | 1,266,571 | 909,070 | -28.2% |
| | April | 1,300,323 | 445,082 | -65.8% |
| | May | 1,362,005 | 689,010 | -49.4% |
| | <i>% Change Feb–May</i> | 20.7% | -43.6% | |
| Lincoln Tunnel | February | 1,357,207 | 1,393,271 | 2.7% |
| | March | 1,585,107 | 1,026,043 | -35.3% |
| | April | 1,567,347 | 477,458 | -69.5% |
| | May | 1,628,922 | 726,692 | -55.4% |
| | <i>% Change Feb–May</i> | 20.0% | -47.8% | |
| Outerbridge Crossing | February | 1,069,614 | 1,124,163 | 5.1% |
| | March | 1,229,237 | 894,861 | -27.2% |
| | April | 1,239,935 | 538,947 | -56.5% |
| | May | 1,304,329 | 823,950 | -36.8% |
| | <i>% Change Feb–May</i> | 21.9% | -26.7% | |
| Totals | February | 8,668,935 | 9,284,312 | 7.1% |
| | March | 10,002,610 | 7,235,171 | -27.7% |
| | April | 10,099,256 | 3,964,954 | -60.7% |
| | May | 10,652,570 | 6,156,299 | -42.2% |
| | <i>% Change Feb–May</i> | 22.9% | -33.7% | |

Source: Port Authority of New York and New Jersey



2.4.3 AIR TRAVEL, TOURISM, AND LODGING

As passenger counts across LaGuardia, Newark, and John F. Kennedy airports fell by 96.9% between February and March, demand for hotel rooms fell precipitously

Key Findings:

1. Passenger counts across LaGuardia, Newark, and John F. Kennedy airports fell by 55.2% and 98.4% in March and April, respectively, compared to 2019 levels.
2. Both hotels and short-term rentals (like Airbnb) took serious hits in March and April as tourism ground to a halt.
3. Hotel room demand fell precipitously through March (87.3% lower than the same period of 2019 at its lowest) before increasing modestly by the end of April. This may be due to increasing emergency uses coming into play across the city. Occupancy followed a similar trend, while room rates continued to fall through March and April.
4. Airbnb occupancy fell by 33.3% from February to March, and was down by 63.9% from February levels by April.

2.4.3.1 Airports

At New York City's three major airports, passenger travel fell 98.4% below 2019 levels in April 2020, with 11 million fewer travelers in a single month

Key Findings:

1. Before the pandemic, Newark Airport was the 10th busiest U.S. airport by departures; during the pandemic it fell to as low as the 56th busiest.
2. Taxi and for-hire-vehicle airport dropoffs decreased more than 90%.

Nationally, passenger air traffic severely declined between March 1st and April 30th. Transportation Security Administration (TSA) crossings data show that travelers began to cancel their flights and forgo air travel beginning March 15th. Compared to March and April of 2019, traffic decreased by 73%, or 104 million people.* The initial drop in flights follows President Trump's March 11th travel ban to the Schengen Area

and the March 14th ban to the United Kingdom and Ireland.^{29,30} Throughout much of April, fewer than 100,000 people were flying daily, largely on empty planes as airlines cut service.

In the New York City region, all three major airports (Newark, LaGuardia, and JFK) experienced major decreases in the number of arrivals and departures.[†] Before the pandemic, Newark was the 10th busiest airport in the United States. During the week of April 19th, it became 56th as the number of departures slipped by 90%.³¹ JFK travel declined 86% compared to February. According to the Port Authority, which operates the airports, passenger traffic was down to five percent of its normal operations. United Airlines, which has a hub at Newark, reduced the number of flights from 140 to 15. At LaGuardia, Delta Airlines slashed 135 daily flights, leaving only 15 flights out of the airport.³²

At the three major New York regional airports, passenger travel fell 98.4% below 2019 levels in April 2020.

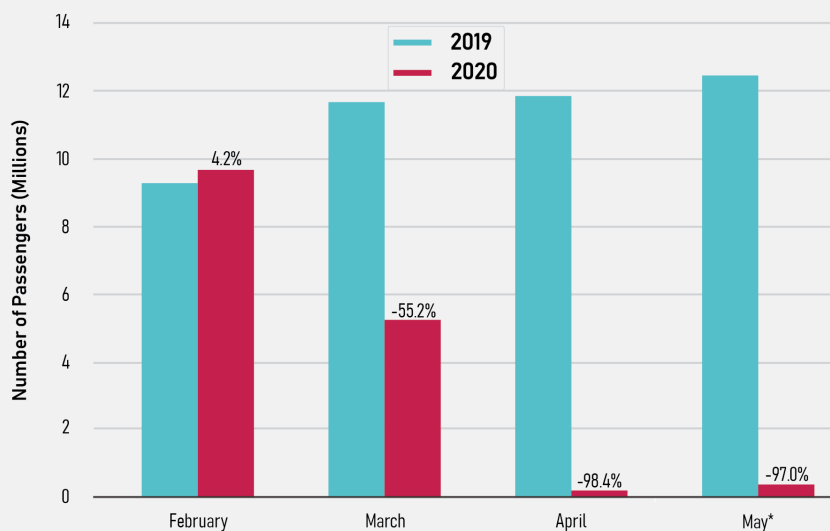
* Data publicly available at: <https://www.tsa.gov/coronavirus/passenger-throughput>. Transportation Safety Administration. TSA checkpoint travel numbers for 2020 and 2019.

† Data publicly available at: <https://www.panynj.gov/airports/en/statistics-general-info.html>. Port Authority of New York and New Jersey. Airport Traffic Statistics.

This translated to 11 million fewer travelers in a single month. By May 2020, passenger traffic doubled from its April lows, reaching 375,008 between the three airports. Newark and LaGuardia more than doubled in May passengers while JFK only increased 40.1%. However, despite the increases between April and May, overall passenger air traffic remained much lower than 2019 levels—down 97%, or 12 million travelers. Taxi and For-Hire Vehicle (FHV) activity near airports reflected this change, with 98.5% and 91.9% fewer dropoffs, respectively, at airports in April compared to March (See Appendix B, Table 2.4.3.1).

Air Passenger Traffic Declined by 98%

Total passengers for Newark, JFK, and LaGuardia airports (with YOY % change).

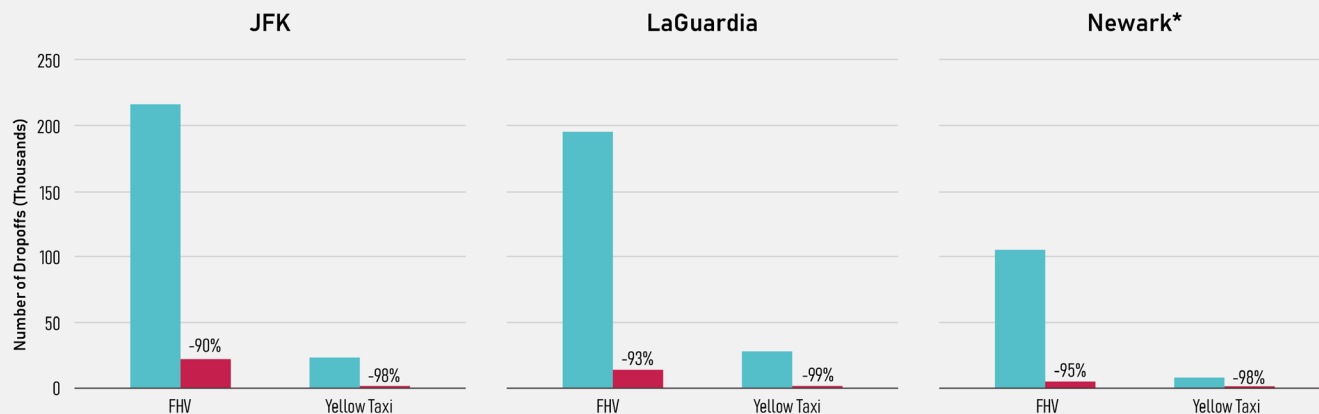


NYU Rudin Center & Sam Schwartz Engineering

Source: PANYNJ Monthly Summaries of Airport Activities

Taxis Declined More Than For-Hire-Vehicles at Airports

Dropoffs for taxis fell 98.5% while FHV experienced a slightly lower drop at 91.9%.



*Minimal dropoffs recorded at Newark Airport because of reporting procedures, not necessarily reduced activity.

NYU Rudin Center & Sam Schwartz Engineering

Source: NYC Taxi & Limousine Commission

2.4.3.2 Hotels

Demand for NYC hotel rooms fell 87.3% from March 2019–2020, but began to rebound in April—although likely not due to a return of tourism

Key Finding:

1. Although March hotel demand fell 87.3%, April rebounded largely due to use by emergency services, leading New York City to have the highest occupancy rate in the country.

New York City attracts almost one-third of all foreign visitors to the United States.³³ In 2018, the city's 65 million visitors spent \$46.4 billion on retail, lodging and transportation—a substantial economic impact.³⁴ The strength of the hospitality industry thus offers insight into the volume of tourists entering the city. Data obtained from New York City & Company provides a detailed look into hotel demand and occupancy from

March to May.* By the last week of March, hotel demand (actual number of room-nights sold) was 87.3% less than the demand in 2019. Although demand began increasing throughout April, this was likely due to additional emergency uses coming into play across the city, including housing for healthcare workers coming from outside the region, rather than the return of tourism. Both occupancy rates (demand divided by supply) and demand began to increase throughout April, and by the end of that month New York City had the highest occupancy rate in the nation. Rates continued to improve in May. However, this again was likely due to the effects of reduced inventory and increased use for emergency needs rather than a return in tourism, since the city remained under the NYS on PAUSE order and almost all attractions remained closed. Beginning mid-May, a growing proportion of the available inventory began to be utilized by the City's Department of Homeless Services (See Appendix B, Table 2.4.3.2).

2.4.3.3 Short-Term Rentals

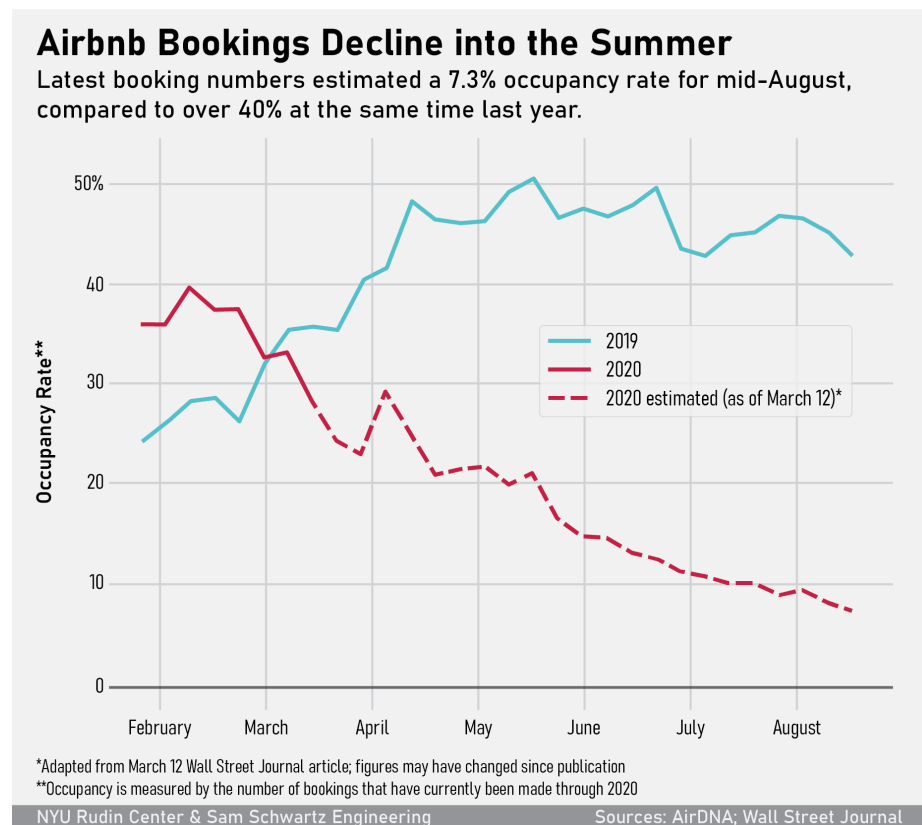
Average host income per stay fell from \$1,221 in February to \$343 in May

Key Finding:

1. The Airbnb occupancy rate in April 2020 was 11%, compared to 56% in April 2019.

Like hotels, the short-term rental market is a gauge on the volume of travel into the city. *The Wall Street Journal* reported that Airbnb bookings in New York between March 1st and March 7th were 21% below levels between January 1st and January 11th.³⁵ Room occupancy in New York City, which is measured by the number of bookings currently made through 2020, predicted a bleak future in mid-March: booking numbers estimated a 7.3% occupancy rate for mid-August, compared to 40% at the same time last year.

AllTheRooms Analytics offered additional insight into the New York City Airbnb rental market.[†] Airbnb rentals, which had offered cancellations with refunds for stays March 14th through May 31st, experienced an occupancy rate of 24% in March and 13% in April. In contrast, April, 2019 had a 56% occupancy rate (March data is unavailable). Occupancy rates continued to fall in May, reaching 11%. The available supply, or rooms available to be booked, also rose steadily from February to April, as more rooms sat vacant. As a result, average host income per stay fell from \$1,221 in February to \$343 in May (See Appendix B, Table 2.4.3.3).



* Data provided directly to the authors of this report.

† Data publicly available at <https://analytics.alltherooms.com/beta/analyze/1076677> AllTheRooms Analytics. Dashboard. Accessed on June 24, 2020.

2.5 TRAVEL IMPACT ON THE CENTRAL BUSINESS DISTRICT

Travel into the CBD faced particularly harsh effects from the pandemic and the cessation of most commuter travel, including major drops in subway use, commuter rail ridership, Citi Bike ridership and pedestrian activity

Manhattan's Central Business District (CBD) comprises the portion of Manhattan below 61st Street. An economic powerhouse of the city, the area drew in 3.8 million people daily on an average workday in Fall of 2018. The subway carried 2.2 million (58%) of these

travelers, while vehicles (including cars, taxis, vans, and trucks) transported 878,000 passengers. A reported 34,000 travelers arrived by bicycle.³⁶ Over the course of the pandemic, the volume of travel into the CBD declined dramatically.



2.5.1 SUBWAYS

Station entries within Manhattan's Central Business District dropped 95.6% from 2019 levels

Key Findings:

1. Travel to the fifty subway stations south of 61st Street fell to 56.7% and 95.6% compared to 2019 levels in March and April 2020, respectively.
 2. Grand Central-42nd Street saw the greatest decline, with April 2020 ridership levels less than 4% of 2019 levels.
 3. Of the five busiest stations in the CBD, Union Square declined the least.
-

Compared to 2019 levels, all fifty stations south of 61st Street that comprise the Central Business District had a total of 61,253,769 riders in April; in 2020, April reached only 2,696,153 total riders—a 95.6% drop. By May, entries had increased slightly to 94.3% of 2019 levels.

The subway system's top five busiest stations are all located in the Manhattan CBD; as identified by the MTA they are Times Square, Grand Central, Herald Square, Union Square, and Fulton Street.³⁷ As an effect of the pandemic, these stations experienced some of the largest declines in ridership. In February 2020, Times Square had the greatest monthly ridership at 4.6 million; by April 2020, ridership had fallen to just over 256,000—a 94.5% drop. Of all the top five stations,

Grand Central experienced the largest declines with ridership reaching just 4.2% of February 2020 levels in April 2020 (3,212,681 to 135,936 riders). This precipitous drop is likely due to a large portion of the area's normal subway riders shifting to work-from-home protocols during the extent of the NYS on PAUSE orders.

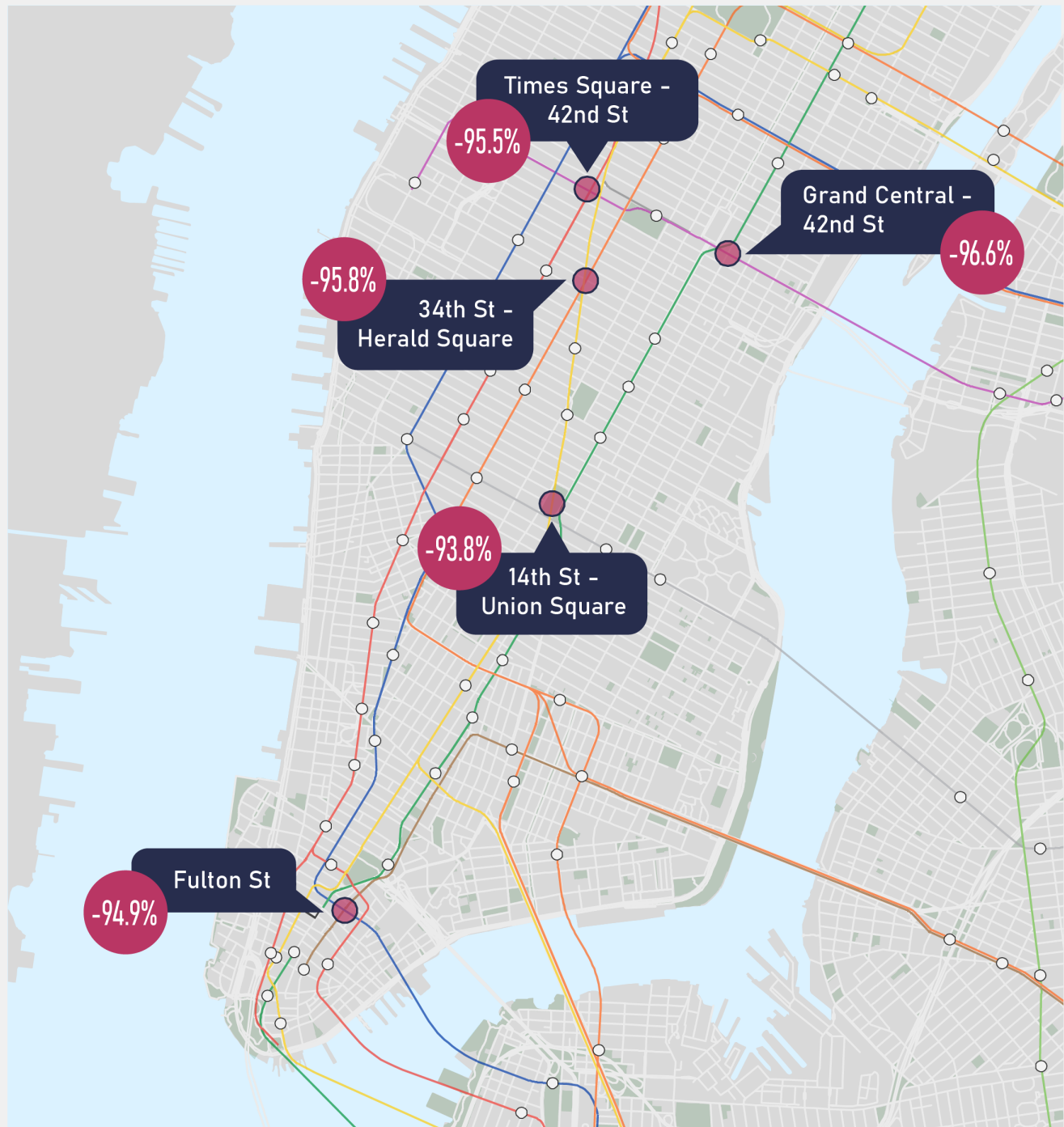
Even as ridership grew through the end of April and May, a survey of New York City residents released in early May found that 44.4% were planning on avoiding public transportation entirely even as restrictions were lifted.³⁸ Another 31.5% planned on using public transit less by walking, biking, or driving. Only 18.5% planned to resume the same patterns of public transit use as before the crisis. If ridership levels into the CBD are reduced

by 44.4% of the approximate 2.242 million daily subway riders, close to one million former riders will have to find

new ways to enter the CBD—or forgo traveling into the CBD at all (See Appendix B, Table 2.5.1).

Subway Ridership Dropped 95% at NYC's 5 Busiest Stations

Before COVID-19, Times Square, Grand Central, Herald Square, Union Square, and Fulton Street were the busiest stations in New York City. In April, turnstile entries plummeted 95.4% on average for these locations as compared to April 2019 levels.



NYU Rudin Center & Sam Schwartz Engineering

Source: New York MTA Turnstile Data



2.5.2 BRIDGES AND TUNNELS

Vehicle traffic on river crossings into Manhattan's CBD fell by a total of 70.2%

Key Findings:

1. Crossings into the CBD fell by a total of 70.2% between February and April 2020.
2. The Lincoln Tunnel fell 65.7% between February and April while the Holland Tunnel fell 63.6%.
3. By May, traffic volume had begun to return: volume in the Hugh L. Carey Tunnel grew by the greatest amount, increasing 70% from the April volume.

Crossings into the CBD also saw some of the largest declines in travelers between February and April 2020, falling by a total of 70.2%. Of the Port Authority managed crossings, the Lincoln and Holland Tunnels connect New Jersey directly to the CBD. By April, the Lincoln Tunnel had suffered the largest decrease in vehicles, falling 65.7% from February levels. This was followed by the Holland Tunnel, with a decline of 63.6%. Compared to 2019, again the Lincoln and Holland Tunnels saw the greatest difference in crossings, down by 35.3% and 28.2% in March and 69.6% and 65.8% in April, respectively. By May, traffic volume had begun to increase. Total crossings through the Holland Tunnel increased from April lows to just under half of 2019 levels; volume increased slightly through the Lincoln Tunnel, reaching 44.6% of 2019 levels.

Of the MTA managed crossings, the Queens-Midtown and the Hugh L. Carey tunnels carry vehicles directly into Manhattan's CBD. In 2019, the tunnels transported 49.5 million people into or out of the CBD—an average of 135,000 people utilizing these crossings per day. In February 2020 alone, 3.8 million vehicles traveled via the tunnels. By the end of April, volume was down to close to 1 million vehicles—just one quarter of the February volume. Specifically, the Queens-Midtown Tunnel April monthly volume was down from February levels by 74.9% and the Hugh L. Carey Tunnel was down by 72.6%. By May, traffic volume had begun to return: volume in the Hugh L. Carey Tunnel grew by the greatest amount, increasing 71% from the April volume (See Appendix B, Table 2.5.2).



2.5.3 CITI BIKE

Trips to the CBD declined 67.7% from April 2019 to April 2020, but began recovering in May

Key Findings:

1. Citi Bike ridership decreased by the largest amount in Midtown Manhattan, with trips ending at stations in the district 70.5% lower in April 2020 than in April 2019.
2. Citi Bike trips in April ending in CBD neighborhoods fell 67.7% from 2019 levels.
3. Trips to Midtown fell most, but overall, ridership increased in the CBD by May.

In March and April of 2019, a total of 875,237 and 1,165,911 trips were made into the neighborhoods of the CBD.* Compared to 2019 levels, total ridership into these areas had fallen by 23.7% in March and 67.7% in April 2020 to 667,870 and 376,040, respectively. Ridership increased overall in May, climbing to 62% of 2019 levels.

Within the specific neighborhoods, the greatest decrease occurred for trips ending in Midtown. By April,

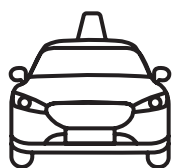
ridership was down 48.2% from March and 70.5% compared to the same month in the previous year. Between 14th Street and the Financial District also saw dramatic changes, experiencing April ridership decreases of 66.9% and 58% below 2019 levels. By May, Midtown remained the greatest amount below 2019 levels, while the Financial District had recovered to 84.2% of 2019 levels.

Citi Bike Destinations in the CBD, 2019 and 2020

| Destination | Month | 2019 Trips | 2020 Trips | YOY % Change |
|---------------------------------------|---------------------------|--------------|--------------|--------------|
| Midtown | March | 469,137 | 344,252 | -26.6% |
| | April | 604,826 | 178,432 | -70.5% |
| | May | 634,541 | 357,736 | -43.6% |
| | <i>% Change March–May</i> | <i>35.3%</i> | <i>3.9%</i> | |
| South of 14th Street (Excluding FiDi) | March | 320,707 | 248,345 | -22.6% |
| | April | 426,574 | 141,092 | -66.9% |
| | May | 470,479 | 291,162 | -38.1% |
| | <i>% Change March–May</i> | <i>46.7%</i> | <i>17.2%</i> | |
| Financial District | March | 85,393 | 75,273 | -11.9% |
| | April | 134,511 | 56,516 | -58.0% |
| | May | 161,495 | 135,959 | -15.8% |
| | <i>% Change March–May</i> | <i>89.1%</i> | <i>80.6%</i> | |
| Totals | March | 875,237 | 667,870 | -23.7% |
| | April | 1,165,911 | 376,040 | -67.7% |
| | May | 1,266,515 | 784,857 | -38.0% |
| | <i>% Change March–May</i> | <i>44.7%</i> | <i>17.5%</i> | |

Sources: Citi Bike; Joanna Simon/Waywiser Spatial

* For the purposes of this analysis, Midtown Manhattan, South of 14th Street, and the Financial District serve as the neighborhood proxies for examining the CBD.



2.2.4 TAXIS AND FOR-HIRE VEHICLES

Pickups in the CBD fell 90.2% in March and April

In the Central Business District, pickups among all providers fell from 4,773,249 in March to 466,206 in April, a 90.2% decrease. This reduction, far greater than

the citywide trip decrease of 73.3% for those months, points to the sheer dropoff of Manhattan's in-office workers.



2.3.1 PEDESTRIANS

Pedestrian counts in four major business improvement districts fell by 80.4% between March and April

Key Finding:

1. Pedestrian movement fell unevenly through the CBD with some areas, such as Flatiron, seeing less of a decline while others, such as Times Square and Grand Central, saw larger declines, largely due to a fall in commuter and tourist traffic.
-

Four business improvement districts (BIDs) in Manhattan (Times Square Alliance, Flatiron/23rd Street Partnership, Garment District Alliance, and Grand Central Partnership) provided pedestrian data; patterns in all four areas were highly similar.*

In all four neighborhoods, April and May foot traffic were consistently lower than recorded in March. Before the city approached lockdown measures, activity increased near certain major centers of transit. Most notably, the data indicated a spike of travel near Grand Central Terminal on March 13th, as residents likely left the city on Metro-North in anticipation of the PAUSE order. From March 1st to March 21st—the day before the NYS on PAUSE—the daily average pedestrian activity ranged from 49,000, in Flatiron, to 233,000 near Grand Central. After the NYS on PAUSE order's im-

plementation, between March 22nd and 31st, an average 15,700 pedestrians walked through Flatiron daily, while 38,000 walked near Grand Central. By April, these daily averages dropped even further in Grand Central, Times Square, and the Garment District, reaching 27,223, 31,552, and 49,279 during the week of April 11th, respectively. Flatiron, in contrast, experienced a slight uptick foot traffic during that week, increasing from 14,239 during the week of April 4th to 15,141 during the week of the 11th.

As residents acclimated to the PAUSE order, pedestrian activity hovered around an 85% decrease in April compared to 2019 counts. Throughout April, Times Square and the Garment District saw a 91% decrease between their 2019 and 2020 counts. Some spikes in activity correlate to good weather, particularly on April

* Data provided directly to the authors of this report. Pedestrian foot traffic was tracked at key intersections and does not reflect the full activity of the area, but does serve as a proxy for pedestrian activity.

19th, 25th, and 28th (See Appendix C). In contrast, the lowest pedestrian counts in two BIDs—Flatiron and Times Square Alliance—occurred on April 13th, when almost two inches of rain prevented residents from outdoor activity.

Through May, Grand Central and Garment District BIDs saw weekly average increases in daily pedestrian activity. Curiously, Times Square and Flatiron saw small decreases between the weeks of May 16th and

May 23rd. Overall, from March to May, Grand Central, Times Square, and Garment District saw greater than 80% decreases in foot traffic while Flatiron only saw a 68.3% decrease. This may reflect that the three BIDs experienced before the pandemic a larger number of tourists and commuters who contributed to foot traffic. Flatiron, meanwhile, has more residents who continued to make the same essential trips both before and during the PAUSE order.

Pedestrian Count Daily Averages by Week in Four Business Improvement Districts (BIDs), 2020*

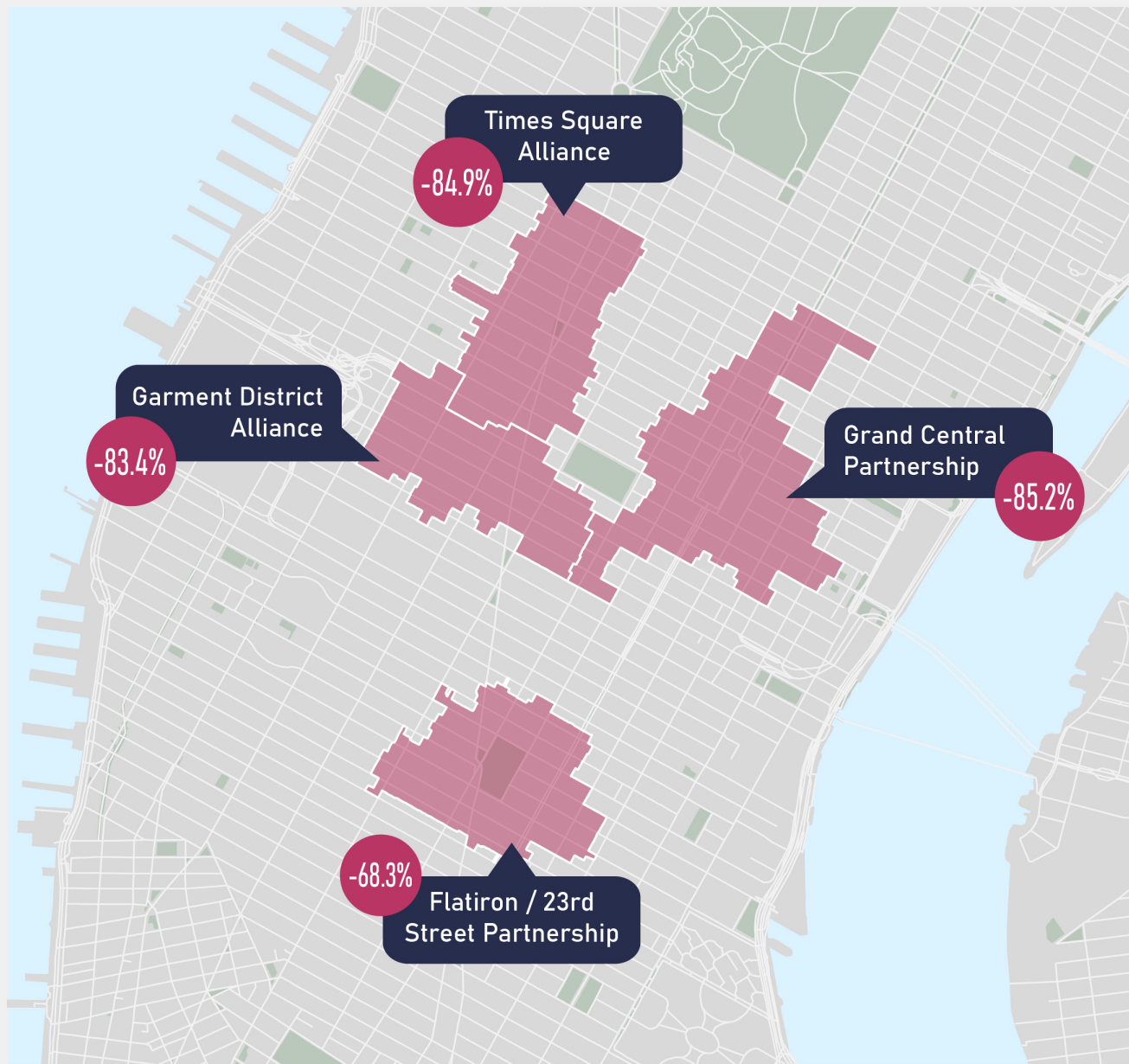
| Week Ending Averages* | Flatiron/23rd Street | Grand Central | Times Square Alliance | Garment District |
|------------------------------|-----------------------------|----------------------|------------------------------|-------------------------|
| March 7 | 65,082 | 326,899 | 324,900 | 534,881 |
| March 14 | 56,826 | 258,044 | 277,118 | 462,741 |
| March 21 | 26,126 | 85,786 | 97,455 | 169,073 |
| March 28 | 15,712 | 37,976 | 39,402 | 64,140 |
| April 4 | 14,239 | 31,817 | 32,653 | 54,158 |
| April 11 | 15,141 | 27,223 | 31,552 | 49,279 |
| April 18 | 15,192 | 29,856 | 32,136 | 50,575 |
| April 25 | 17,227 | 33,169 | 36,675 | 56,036 |
| May 2 | 16,611 | 30,645 | 34,999 | 61,143 |
| May 9 | 18,984 | 39,189 | 38,798 | 69,019 |
| May 16 | 21,916 | 45,846 | 43,055 | 77,120 |
| May 23 | 20,375 | 46,729 | 42,318 | 84,944 |
| May 30 | 20,634 | 48,311 | 49,206 | 88,981 |
| % Change March–May | –68.3% | –85.2% | –84.9% | –83.4% |

Sources: Citi Bike; Joanna Simon/Waywiser Spatial

* Pedestrian counts from the BIDs do not reflect the overall pedestrian activity in each of these districts. Depending on the number and location of counters, the data can vary and create low counts for neighborhoods that would otherwise have much higher volumes of pedestrian activity.

Manhattan's Foot Traffic Came to a Standstill

In four Business Improvement Districts (BIDs), pedestrian counts fell, on average, 83.5% between March and May 2020.



NYU Rudin Center & Sam Schwartz Engineering

Source: BID Pedestrian Data

A photograph of a city street scene. In the background, a large steel truss bridge spans the street. The bridge has a green-painted section. On the left side of the street, there is a wall with colorful graffiti, including the words 'DOMINO PARK'. In the foreground, a black banner with white text is stretched across the street. The banner reads 'ROAD CLOSED TO VEHICLES' and 'DOMINO PARK' with a small logo. Several people are walking on the sidewalk, and a person is riding a bicycle. The sky is blue with some clouds.

HOW NEW YORKERS ADAPTED

ROAD CLOSED
TO VEHICLES

DOMINO PARK

Photo By: Sam Schwartz Engineering

3.1 Essential Workers

Essential workers, estimated at 25% of the workforce, traveled through New York City on subways, buses and in personal vehicles. Many lack travel options in their neighborhoods

Essential workers make up approximately 25% of the New York City workforce, according to the Office of the Comptroller of New York City.* Of these individuals, 60% are women and 75% are people of color.³⁹ On a normal day, essential workers account for 38% of transit commuters.⁴⁰ Eleven Public Use Microdata Areas (PUMAs) were identified with essential worker populations over 20,000 (approximately one-fifth of the total population).† The following table and map illustrate their locations, which are all relatively lower-income areas and are far from the CBD.⁴¹

Neighborhoods with Largest Number of Essential Workers

| Neighborhood | Essential Worker Population |
|---|-----------------------------|
| Canarsie/Flatlands | 34,340 |
| Jamaica/Hollis | 31,697 |
| Queens Village/Cambria Heights | 24,680 |
| Washington Heights/Inwood / Marble Hill | 24,626 |
| Castle Hill/Clason Point/Parkchester | 24,443 |
| East Flatbush/Farragut/Rugby | 24,223 |
| East New York/Starrett City | 22,016 |
| Bensonhurst/Bath Beach | 21,380 |
| Flushing/Murray Hill/Whitestone | 20,742 |
| Belmont/Crotona Park/East Tremont | 20,708 |
| Flatbush/Midwood | 20,191 |

Source: U.S. Census Bureau. ACS 2014-2018 5-Year Estimates. IPUMS USA



3.1.1 HOW ESSENTIAL WORKERS COMMUTED

Essential workers gained new options as micromobility companies expanded service areas and membership programs

Key Findings:

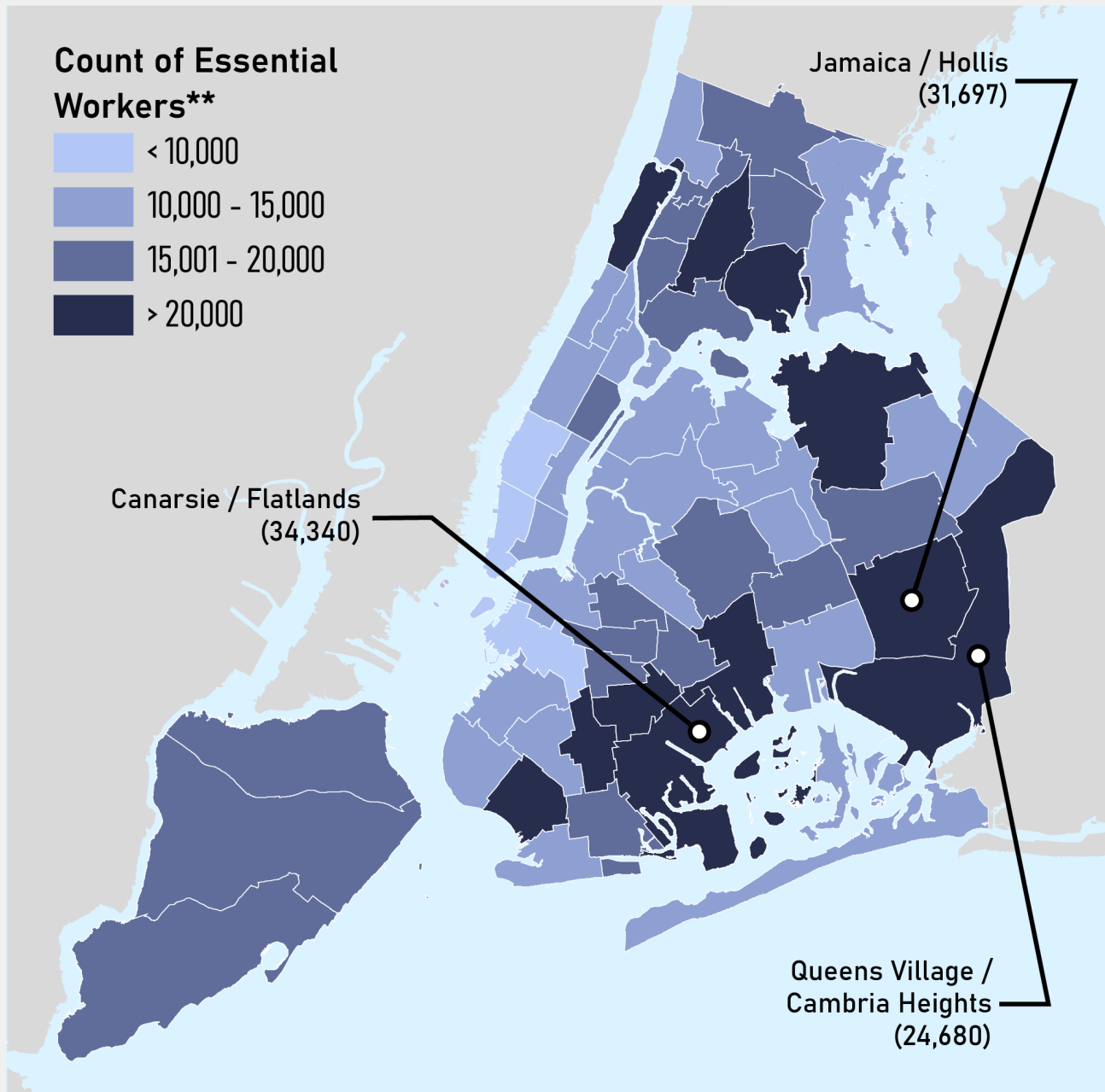
1. Subway ridership declined less in neighborhoods with greater numbers of essential workers.
2. Both Citi Bike and Revel expanded service to assist essential workers, as well as offered free or discounted memberships to essential workers.
3. Citi Bike’s Critical Worker Program saw an uptick in memberships, reaching more than 5,000 total monthly CWP memberships on April 28th, 2020, and nearly 30,000 on July 20th.

* We denote essential workers based on six industry groups, each consisting of several sub-industries that correspond to the following Census Industrial Classification Codes: (1) Grocery, Convenience, and Drug Stores, (2) Public Transit, (3) Trucking, Warehouse, and Postal Service, (4) Building Cleaning Services, (5) Healthcare, and (6) Childcare, Homeless, Food, and Family Services.

† Data publicly available: <https://usa.ipums.org/usa/>. Public Use Microdata Areas (PUMAs) are statistical geographic areas which are defined by their populations—roughly 100,000 people each. These areas are rough approximations of New York City Community Districts (CDs), but not identical.

Essential Workers Generally Live On The City's Outskirts

The largest number of essential workers live in lower-income neighborhoods* far from the Central Business District, such as Canarsie/Flatlands, Jamaica/Hollis, and Queens Village/Cambria Heights.

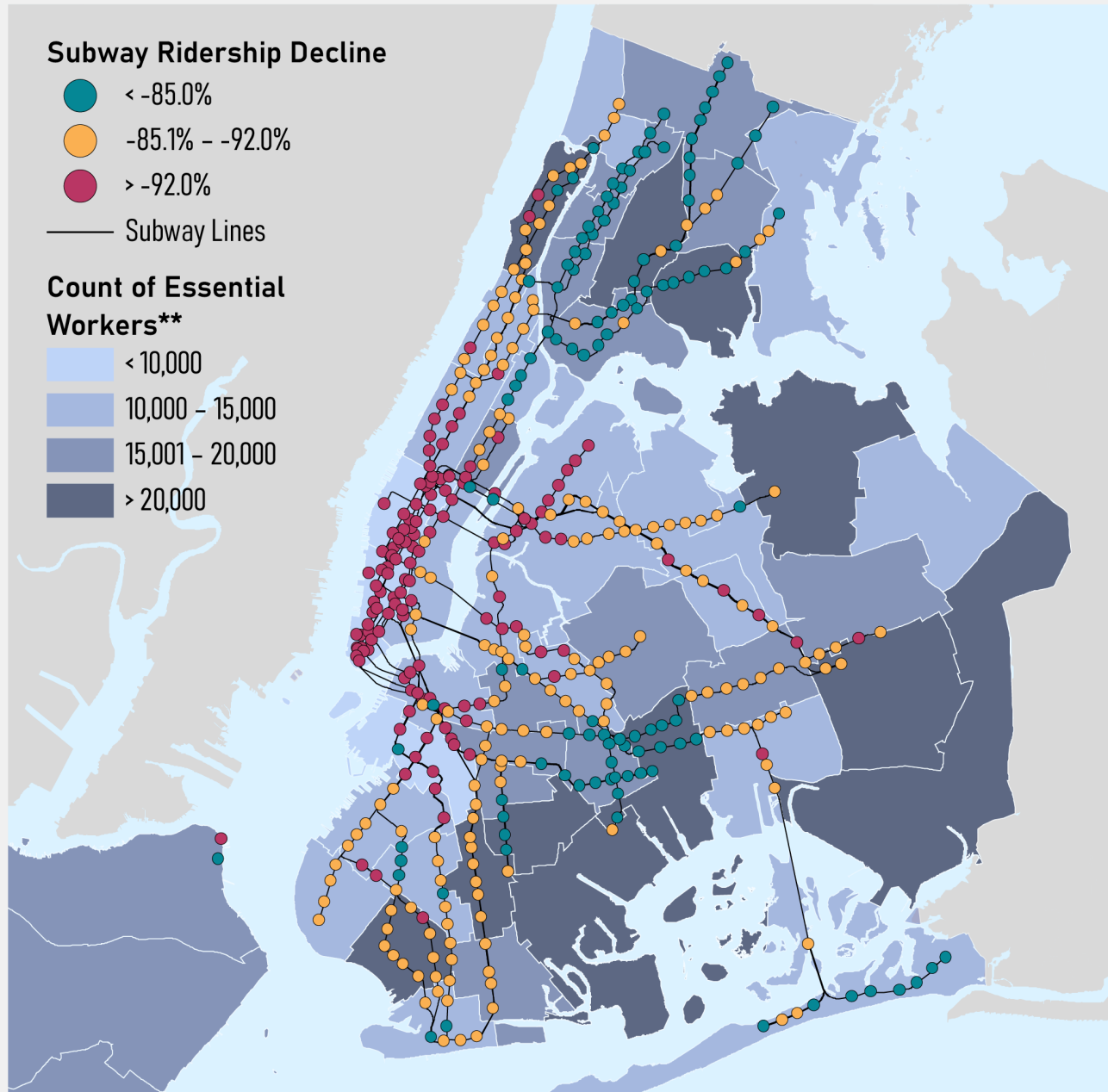


*Public Use Microdata Areas (PUMAs) are statistical geographic areas which are defined by their populations—roughly 100,000 people each. These areas are rough approximations of New York City Community Districts (CDs), but not identical.

**Essential workers were pulled from American Community Survey (ACS) employment data, defined by the Office of the Comptroller as workers in the following industries: (1) grocery, convenience, and drug stores, (2) public transit, (3) trucking, warehouse, and postal services, (4) healthcare, (5) childcare, homeless, food, and family services, and (6) building cleaning services

Subway Ridership Declined Less in Neighborhoods with Larger Number of Essential Workers

Many neighborhoods* with high concentrations of essential workers have minimal to no subway access (Canarsie, Jamaica, Queens Village, Flushing); those with subway access saw lower drops in ridership (Belmont, Castle Hill, East Flatbush, East New York).



*Public Use Microdata Areas (PUMAs) are statistical geographic areas which are defined by their populations—roughly 100,000 people each. These areas are rough approximations of New York City Community Districts (CDs), but not identical.

**Essential workers were pulled from American Community Survey (ACS) employment data, defined by the Office of the Comptroller as workers in the following industries: (1) grocery, convenience, and drug stores, (2) public transit, (3) trucking, warehouse, and postal services, (4) healthcare, (5) childcare, homeless, food, and family services, and (6) building cleaning services

NYU Rudin Center & Sam Schwartz Engineering

Source: New York MTA; NYC Comptroller

Throughout the NYS on PAUSE order, mass transit—the subways, buses, and commuter rail systems—served as vital links for the city’s essential workforce, especially its healthcare sector. However, essential workers’ neighborhoods are mostly underserved by transit, with limited access to the subway system, and essentially no access to micromobility options like Citi Bike or Revel Mopeds. As such, essential workers who commute into Manhattan from these areas must either rely on long public transit commutes—typically involving both a subway and bus—or drive, if they have access to vehicles.

The above map visualizes this reliance. Many neighborhoods with the largest number of essential workers have lower drops in subway ridership as compared to all other areas, especially in the Bronx and East Brooklyn.

In 2009, Garrett et al. surveyed healthcare workers’ primary barriers to reporting to work during a potential pandemic.⁴² Transportation options, along with safety and dependent care concerns, topped the list of reasons for absenteeism. Given healthcare workers’ frontline responsibilities in a pandemic response, it is critical that they are provided with safe and readily available transit alternatives. During the pandemic, healthcare and other frontline workers were given additional mobility options from both private and public organizations.

In late March, Hertz offered free vehicle rentals to NYC health care workers through April 30th, 2020.⁴³ Other car rental companies, such as Avis and Budget, offered discounted rates for essential workers as well.⁴⁴ Citi Bike and Revel expanded their fleets and offered free memberships to frontline workers. Citi Bike expanded to Columbia University Irving Medical Center in Washington Heights, donated bikes to staff at Elmhurst Hospital, and began adding more than 100 additional stations to Upper Manhattan and the Bronx

as part of its Phase Three expansion initiative.⁴⁵ Revel, previously only servicing areas of Brooklyn and Queens, has similarly expanded to Upper Manhattan, parts of Lower Manhattan, the South Bronx, and East Queens to Elmhurst Hospital, working with NYC DOT to make the expansion permanent beyond the pandemic. Both providers also offered free subscriptions to healthcare workers and other essential workers; Citi Bike saw a peak of approximately 5,500 monthly memberships and, as of May 31, approximately 24,500 annual memberships, and Revel served nearly 1,000 daily rides by users under this subscription in May.*

The MTA established the Essential Connector Service in late April in order to provide transportation options to essential workers during the nightly subway shutdown. Qualified workers were connected to for-hire vehicles free of charge.

3.1.1.1 MTA Essential Connector Service

The service provided 18,870 trips in May to essential workers as the subway was shut down overnight

On April 30th, the MTA announced that subways would close between 1 and 5 a.m. each night for cleaning beginning May 6th. To account for this loss in mobility options, the city increased bus service 150% during these hours and created a new “Essential Connector” service. The Essential Connector service was available for commuting essential workers who were either too far from a bus stop (more than a half mile), or whose bus trip would take more than 80 minutes or would require more than two transfers.⁴⁶ These workers were connected with for-hire vehicles at no cost. The service proved extremely popular, providing 18,870 total trips in the month of May. The following maps illustrate the most popular neighborhoods for trip origins and destinations.[†]

* Data provided directly to the authors of this report.

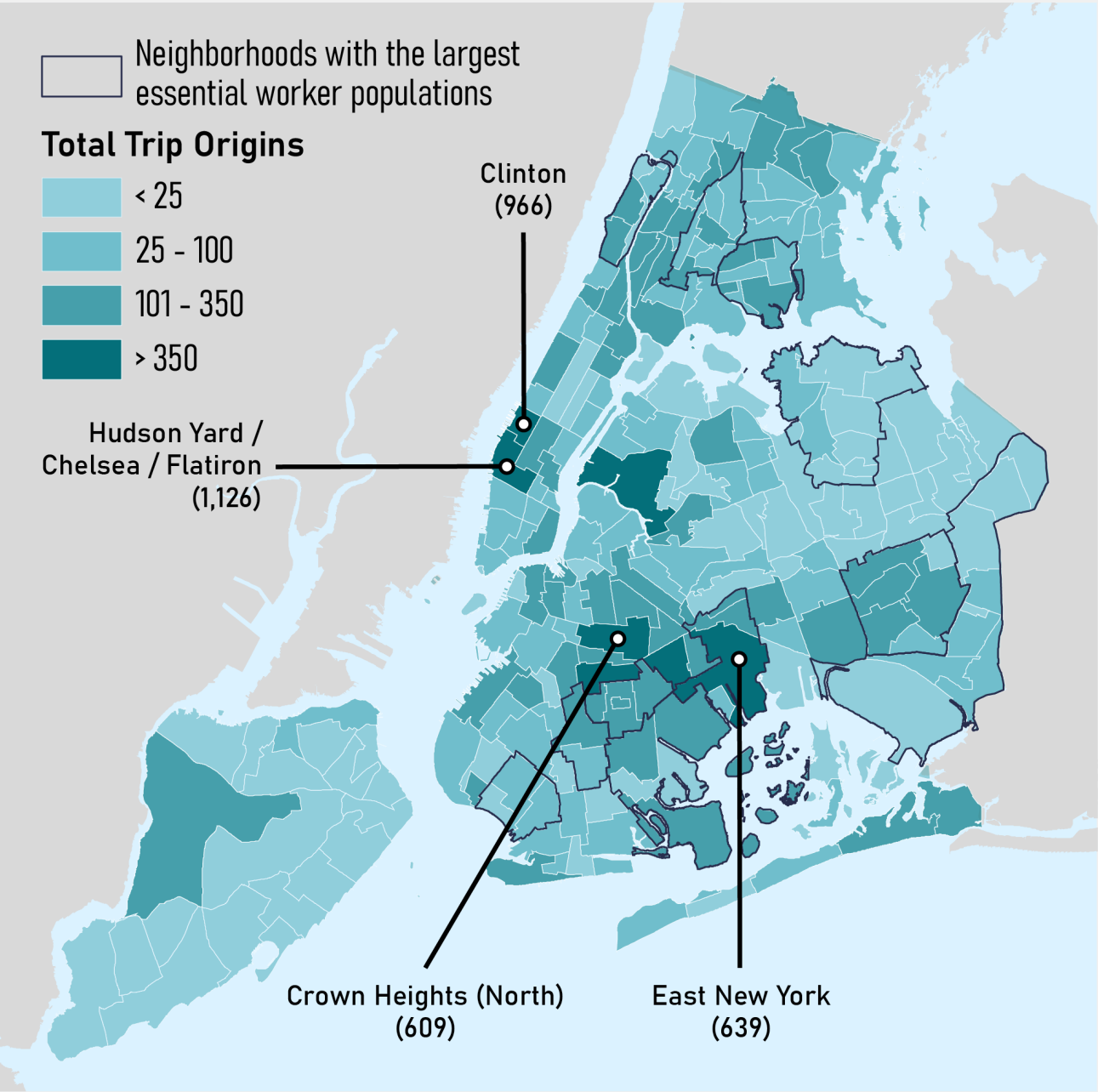
† Data provided directly to the authors of this report.

The top dropoff areas in SoHo/Tribeca, Clinton and Hunter's Point are likely related to the large UPS facilities in these locations. Likewise, the Hudson Yards

area includes a major US Postal Service facility, which likely contributed to the trip locations.

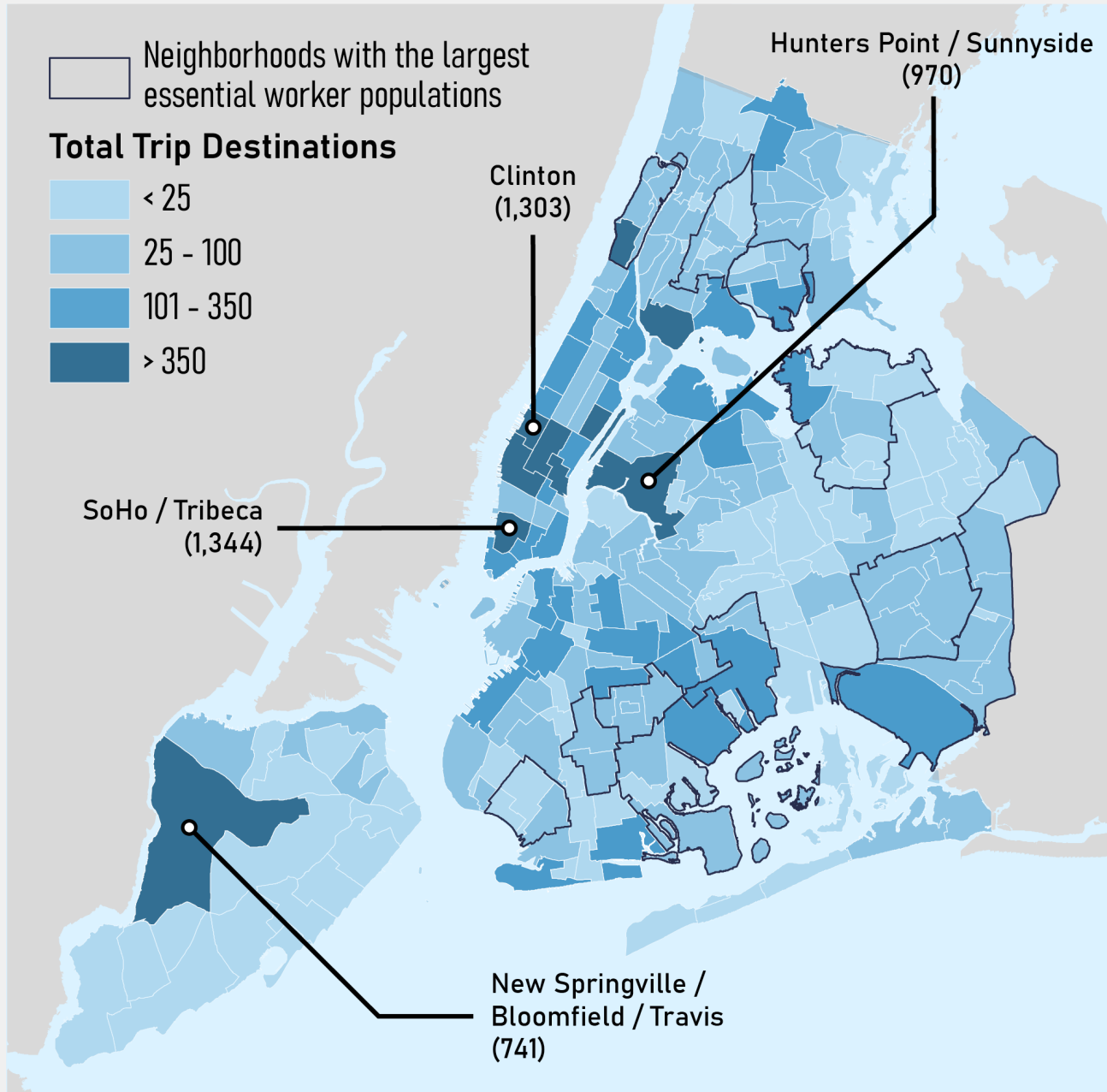
MTA Essential Connector Service Provided Key Mobility

Starting May 6, for-hire-vehicles were made available to essential workers commuting to and from work between 1 and 5 a.m. For the month of May, over 18,000 trips were made, with many originating in Hudson Yards, Clinton, East New York, and Crown Heights.



MTA Essential Connector Service Provided Key Mobility

Starting May 6, for-hire-vehicles were made available to essential workers commuting to and from work between 1 and 5 a.m. For the month of May, over 18,000 trips were made, with many ending in SoHo, Clinton, Hunters Point, and New Springville.



3.1.1.2 Citi Bike Critical Worker Program

Incentives for essential workers increases membership, but service area expansion is necessary for essential workers to fully make use of the system

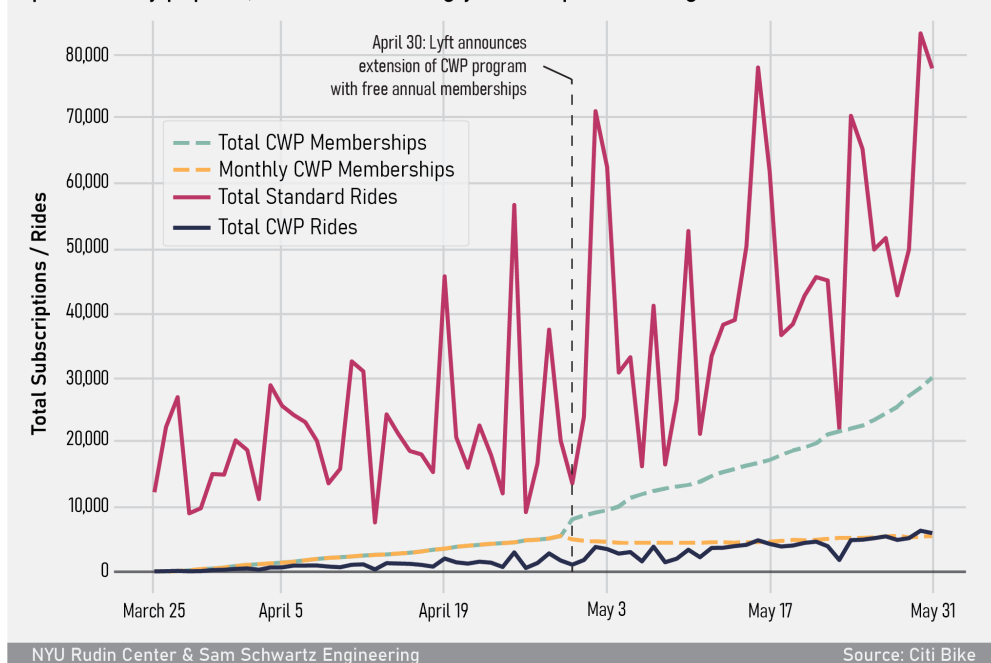
On March 24th, Citi Bike owner Lyft announced the Critical Workforce Program (CWP) which provides free access to the bikeshare program for healthcare workers, transit workers, and first responders for one month.⁴⁷ The number of critical workers signing up to use the service steadily increased through April. The program reached a high of nearly 5,500 total monthly CWP memberships on April 28th before experiencing a 9% decline in the two following days, potentially reflecting the end of the month of free membership for some riders. On April 30th, Mayor Bill de Blasio, NYC DOT Commissioner Polly Trottenberg, and Lyft announced a \$1 million commitment from Citi and Mastercard to extend the program, offering free annual memberships and making the program available to more essential workers, including those working at food banks.⁴⁸ Following this announcement, although monthly memberships slowly leveled off, total CWP memberships spiked with essential workers taking advantage of the new annual memberships. However, the number of critical worker rides throughout this period rose very gradually, disproportionate to the rise in memberships and the rise in total Citi Bike trips.

Between March and June, eighty percent of riders joining with CWP memberships nationwide had nev-

er used the service previously. Within New York City, 61.7% of all critical worker memberships belonged to women. The result was a record high in female bike-share membership, which increased 3.4% between May and June 2020 and was 5.1% greater than June 2019. By June, women comprised 37.8% of all active New York City Citi Bike memberships.⁴⁹ By late July, nearly 30,000 people had joined Citi Bike with CWP memberships.⁵⁰

Citi Bike Critical Worker Program (CWP) Memberships Grew in Popularity but Rides Only Rose Slightly

On March 24, Citi Bike owner Lyft announced a free monthly membership for frontline workers, which was extended to annual memberships on April 30. This program proved very popular, but rides seemingly did not parallel its growth.



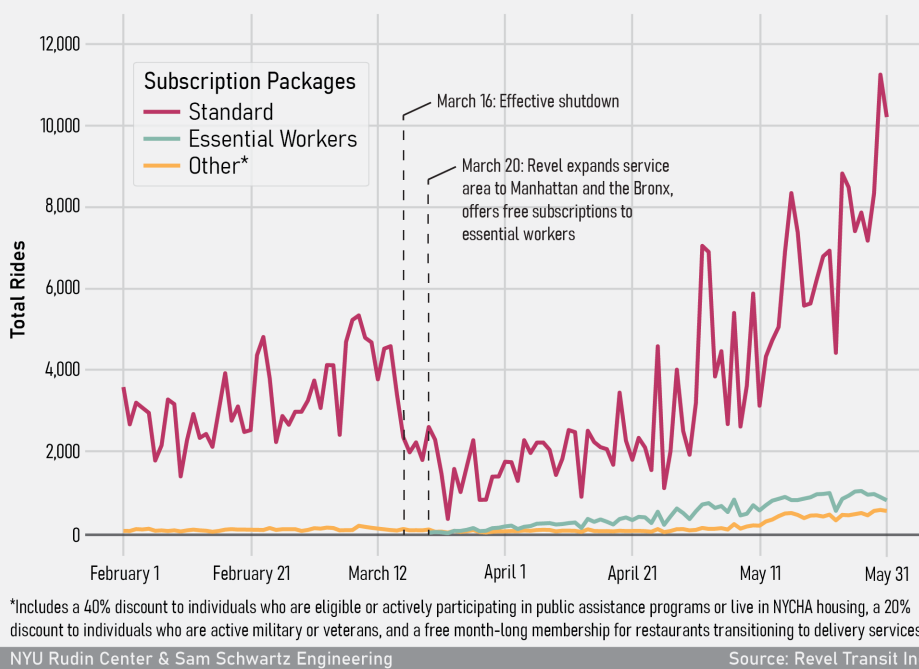
3.1.1.3 Revel Essential Workers

Revel's new membership program for critical workers gained in popularity, growing from 1% of all Revel trips in March to 12% in April

On March 20th, Revel announced they would be expanding their footprint, bringing their fleet of electric mopeds to Upper Manhattan, parts of Lower Manhattan, the South Bronx, and East Queens in an effort to help healthcare workers get to work. They also launched

Revel Mopeds Experienced Significant Growth

Following an initial drop in mid-March, Revel mopeds saw significant growth in their total rides; rides by essential workers have grown but only slightly.



taken by default subscribers. In March, total rides increased slightly, with 96% of trips taken by default subscribers and 1% by essential workers. In April, the essential worker program grew to a larger portion, representing nearly 12% of all trips. In May, as total trips experienced exponential growth, essential worker trips largely stalled, representing approximately 11% of all trips.

These membership programs have proven very popular, but it is unlikely they are reaching some of the largest populations of essential workers in East Queens and Brook-

lyn, although Citi Bike expedited its expansion into Upper Manhattan and South Bronx with 100 new docks beginning in early May.⁵²

an essential workers membership program providing free rides to healthcare workers through June 1 (at which point rides will be discounted 20%) and a partnership with local restaurants, offering a free month-long membership to help them transition to delivery services.⁵¹ These changes have helped the company rebound after a steep drop in rides in early March, now experiencing significant growth in rides across the city and a more gradual increase in essential worker rides. Total ridership for May more than doubled February and March figures and nearly tripled April levels. This should be contributed partly to the nicer weather, but also to the service area expansion and new subscription offerings.

Revel ridership data is categorized by several different subscriber types. These include a default subscription for standard users, a 40% discounted subscription to individuals who are eligible or actively participating in public assistance programs such as SNAP or live in NYCHA housing, a 20% discount to individuals who are active military or veterans, and the aforementioned free subscriptions for essential workers and restaurant delivery. In February, 97% of total Revel trips were

3.2 FOOD AND BEVERAGE DELIVERY SERVICES

As most New Yorkers sheltered in place, they received food and beverages delivered to their homes by essential workers

The NYS on PAUSE order created challenges and opportunities for restaurants and meal delivery. Wholesale and retail groceries, restaurants and alcohol delivery services expanded their offerings and were heavily used by New Yorkers. In addition to healthcare and transit workers, the gig economy's "food transportation" workers continued to work and travel during the pandemic.

Electric bikes, used with a throttle to reach speeds up to 25 miles per hour, are primarily used by food delivery workers. These bikes were deemed illegal and politically vilified in 2018, resulting in impoundment and

fines. However, during the pandemic, e-bikes were not only permitted to operate, but also deemed essential, as food deliveries aided stay-at-home orders.⁵³ Partially as a result of e-bikes' importance during the pandemic for both deliveries and social distanced travel, the mode has now been legalized and will likely embody a larger role in New York City travel going forward.⁵⁴ E-scooters, legalized by the same legislation, have already seen shifting use patterns in other cities as a result of the pandemic, with riders using the mode for longer durations.⁵⁵ This mode may also take on a larger share in the future.



3.2.1 RESTAURANT DELIVERY

As restaurant visits diminished, deliveries, including newly legal to-go cocktails, increased through multiple channels

Key Findings:

1. Restaurant delivery services reported increased volume of delivery orders as delivery workers and their e-bikes were deemed essential.
2. In March, NYC taxi drivers could opt into a program to deliver free meals to New Yorkers.
3. Revel offered a 30-day free trial to delivery drivers.

Restaurants in New York City were ordered to offer only takeout and delivery, with no dine-in option, starting on Monday, March 16th at 8 p.m. Restaurants offered takeout-only service, and many also offered to-go cocktails, an option that was legalized during the pandemic.⁵⁶ Data from third-party apps, such as Seamless, was unavailable for this study.

As Uber ridership fell, the company's restaurant delivery platform, Uber Eats, claimed a 10-fold increase in

deliveries.⁵⁷ Revel offered some restaurants a 30-day free trial to help expedite food delivery without relying on third-party apps.⁵⁸ In late March, New York City taxi drivers started delivering meals to homebound New Yorkers for \$15 per hour plus reimbursement for gas, mileage, and tolls. As of April 20th, 11,000 drivers had signed up to participate in the program.⁵⁹



3.2.2 GROCERY DELIVERY

Demand for household deliveries grew beyond suppliers' capacity

Key Finding:

1. Grocery delivery services experienced large increases in subscribers, and initially faced disruptions in service due to the overwhelming increase in volume.

In 2018, more than half of households below 125th Street in Manhattan received grocery deliveries once a month.⁶⁰ The need for social distancing became clearer as the pandemic progressed, such that grocery stores became less desirable and delivery grew more popular.

In response to increased demand and staff shortages, both FreshDirect and Amazon Fresh limited supplies and delivery windows. The grocery delivery app Insta-

cart reported a 300% increase in order volume during the first week of April.⁶¹ The company experienced a 400% jump in sales between early March and mid-May (a larger increase than other companies, even Amazon or Walmart), and invested over \$20 million into PPE for its shoppers after months of protests and strikes over a lack of protection.⁶²



3.2.3 ALCOHOL DELIVERY

Citywide alcohol sales grew, particularly immediately following the closure of schools and many workplaces

Key Finding:

1. Alcohol delivery services grew in popularity. Drizly, a liquor store delivery app, reported citywide alcohol sales increased 450% within 72 hours of schools and many workplaces closing.

Alcohol delivery services experienced a boom in business. While New York listed liquor stores as essential services allowed to remain open, many residents still chose to have their beverages delivered. According to research by Nielsen, online alcohol sales in the last week of March were up 243% from the same week in 2019.⁶³

According to *New York Magazine* and Drizly, a liquor store delivery app, citywide alcohol sales increased 450% within 72 hours of schools and many workplaces closing. In Brooklyn alone, sales surged 750%. Brooklyn Heights topped the app's list of sales neighborhoods,

alongside areas such as Fort Greene, the Upper West Side, Murray Hill, Chelsea, and Hell's Kitchen.⁶⁴

3.3 OTHER CREATIVE SOLUTIONS

New Yorkers developed creative ways to adapt their businesses and support each other

Key Findings:

1. New York residents and businesses adapted to travel restrictions in a variety of ways. Efforts were made to increase safety and limit revenue decline.
2. Creative solutions include: senior hours and delivery services at grocery stores, companies switching gears to produce PPE, restaurants converting to grocery stores, bars opening “to-go” windows, schools shifting to online learning, and the opening of city streets to pedestrians and bikers.

The pandemic and the NYS on PAUSE order transformed the daily routines for most New York City residents. Small businesses that did not immediately close had to adapt quickly or risk financial failure. Residents and businesses adapted with creative solutions to navigate the new reality, shifting how they shopped, ate, learned and socialized.

Small businesses and restaurants faced severe hardship, but many found new and creative ways to serve their customers and remain afloat. Several examples of small business success stories are:

- Small manufacturing companies, like Brooklyn-based shoe start-up “Atoms” and family-run “Master Tailor” on the Upper West Side, transitioned to making masks.⁶⁵
- Local gyms transitioned to digital platforms, hosting online streaming for their clients to perform workouts at home either in a virtual “group” setting or one-on-one.⁶⁶
- Some liquor distilleries shifted production to hand sanitizer. Half of the profits made on hand sanitizer made by Brooklyn-based distilleries Barrow’s Intense and Standards Wormwood Distillery fund local bars hurt by the pandemic.⁶⁷

Other businesses sought to contribute to the well-being of their fellow New Yorkers, even at a loss of

business income:

- Customers to one Manhattan pizza restaurant could opt to add on an extra pie to send to a hospital for nurses, doctors, and other frontline staff.⁶⁸
- As unemployment began to take its toll of the restaurant industry, with the food and beverage sector accounting for an estimated 60% of the jobs lost in March, some restaurants began daily free-meal services for those in the restaurant industry suffering from unemployment.^{69,70}

Takeout and delivery-only mandates forced many restaurants to reduce staff and hours. However, the lax state liquor laws that allowed for the sale of “to-go” beverages had led to a boom in bar “takeout” windows, where visitors could purchase mixed drinks, wine, and beer. While on-street consumption and loitering was strongly discouraged, and in some cases actively patrolled, the rules were difficult to enforce and many residents enjoyed beverages freely in public spaces.⁷¹ By the end of May, the New York City Council had introduced legislation requiring the Department of Transportation (DOT) to identify open spaces and streets for bars and restaurants to utilize for dining and drinking.⁷² The DOT promoted these restaurants with rapid approvals and a searchable map of outdoor dining.⁷³

Expanding spaces for socially distanced gatherings proved increasingly important and city residents sought

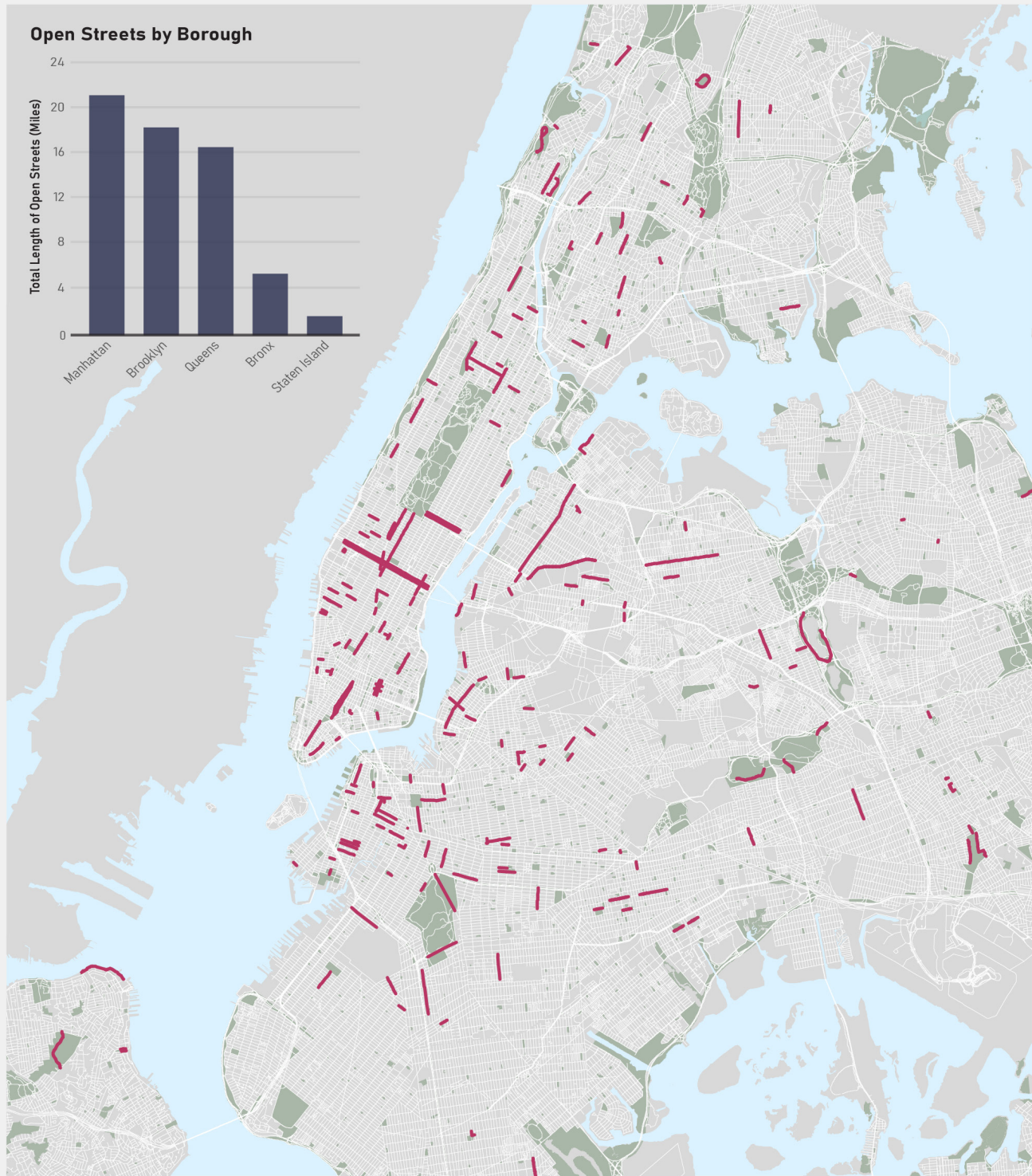
ways to interact safely with friends and loved ones. On March 26th, Mayor de Blasio briefly opened four streets to pedestrians and bikers, prohibiting car traffic, in an effort to give residents space to roam safely. On April 27, the Mayor committed to opening 100 miles of Open Streets, as recommended by NYC DOT Commissioner Polly Trottenberg.⁷⁴ The first seven miles opened on Saturday May 1st, with the remaining miles scheduled to be opened in the weeks and months to follow.⁷⁵ Unfortunately, the open spaces did not align with the communities hardest hit by COVID-19 until the fifth wave of openings, missing an opportunity to create socially distanced recreation in these low-income neighborhood.

To ensure safe distancing after reports of crowding, managers of Brooklyn's Domino Park painted circles on the ground to ensure that visitors kept 6 feet apart (although, as data scientist Chris Whong pointed out, more space could have been obtained with a hexagonal pattern).^{76,77} New Jersey beaches opened under strict socially distancing guidelines even as New York City beaches remained closed for swimming.^{78,79}

Kidault, an app-based ride hail company dedicated to families and their carseat needs, began offering services to families to bring their nannies to their homes without using public transportation in April. As of publication, Kidault's nanny service has 10 families registered primarily on the Upper East and Upper West Sides, and rides cost an average of \$40.⁸⁰ Kidault's development is likely an indicator of microtransit services that will substitute for public transportation until it is considered safe in the mainstream.

Current Distribution of Open Streets

On April 27, Mayor de Blasio committed to opening 100 miles of open streets. 60 miles have been opened so far, distributed across all five boroughs.



NYU Rudin Center & Sam Schwartz Engineering

Source: NYC Department of Transportation



04 LOOKING FORWARD

Photo By: Josh Koh

4.1 CHALLENGES FOR PUBLIC TRANSIT

COVID's impacts on ridership and revenues are significant, and must be overcome to restore New York's lifeline

Key Findings:

1. Public transit is vital to the economic and social life of New York and a key driver of economic and social mobility. The pandemic has led to severely reduced ridership and a loss of revenues that are needed to support the basic operation of the nation's largest mass transit and commuter rail systems.
2. The CARES Act has provided valuable financial assistance during this crisis, but additional federal aid will be necessary while the MTA and other agencies recover from the loss of riders and adopt new safety practices that will allow the systems to continue to be a valuable resource for moving the city's economy.

4.1.1 Ridership Returns

The MTA has taken major steps to ensure system safety

Between March and May, the MTA lost approximately 4.8 million of its daily riders. In order to regain a majority of riders, public transit agencies will need to gain rider confidence in system safety.

Several changes have been floated or implemented in major cities across the nation and globe, such as bus and subway car capacity limits, no talking on transit, shifting business hours, and more direct crowd control measures.⁸¹ In New York City, subway car capacity limits are not possible. Instead, the MTA is requiring riders to wear masks, installing decals on platforms to indicate six-foot distances, releasing informational videos and selling masks and hand sanitizers in vending machines. These steps have been key to New Yorkers' returns to the subway, and the MTA remains ahead of the passengers in preparing for their return.

Although "safe" travel may popularly be considered to be a single-occupant vehicle, it is simply impossible for all New Yorkers to do so. The goal is to ensure a safe environment on train cars and buses to encourage riders to return to the system.⁸² Without regaining ridership, transit will remain underfunded, streets will be congested with personal vehicles, and service will be reduced.

4.1.2 Reduced Service

Transit agencies are reducing subway and bus service due to lower ridership and increased sanitization

By May 28th, the MTA curtailed service to accommodate more rigorous daily cleaning and reduced ridership. In addition to the late night closures, weekday-only lines such as the B, W, and Z stopped running on March 25th and did not return until June 8th, during Phase One. Express services on the 4, 5, 6, 7, and J trains were discontinued as well. The service cuts were not limited to the subway. Metro-North started reducing service on March 27th on its Harlem, Hudson, and New Haven lines, reaching hourly service on April 13th—a near 50% decrease in the number of trains. Two months later, on May 27th, Metro-North returned some service on these lines while also having 14 additional on-call trains to provide capacity when necessary.⁸³ In contrast, LIRR began running 35% fewer trains in late March, and slowly reintroduced service in May.⁸⁴

Beginning March 26th, the MTA announced it would cut bus service by 75%.⁸⁵ For bus riders, reduced service varied by borough. In Brooklyn, buses operated on Sunday schedules daily and some express services such as the X37 and X38 were cut. Queens riders had some routes operating on a Sunday schedule, while all

of the buses that operated between Manhattan and Queens continued with regular service. In the Bronx, most routes operated on a Saturday schedule during the week and a Sunday schedule during the weekend. The Bronx also saw most services connecting to Manhattan be maintained at regular schedules. Both Staten Island and Manhattan had most of their local services unchanged.⁸⁶ In contrast to its local routes, Staten Island went from having 23 express services to Manhattan down to four (SIM1c, SIM3c, SIM4c, and SIM33c), creating crowded conditions on buses.⁸⁷

By the week of June 8th, the MTA reinstated the large majority of its service. Subways went to regular weekday service and express buses fully returned. Local buses returned unevenly: Manhattan buses returned at 75% service capacity while buses in other boroughs reached weekday/holiday levels.⁸⁸ However, buses still use rear-door boarding and will likely continue to do so until August.⁸⁹

The MTA was not alone in cutting service. PATH service was reduced on March 29th with longer headways during rush-hour and weekdays.⁹⁰ On April 11th, New Jersey Governor Phil Murphy placed restrictions on all transit, limiting buses and subway cars to 50% capacity.⁹¹ NJ Transit also cut service down to a weekend schedule on the Newark Light Rail Line and adjusted the River Light Rail Line to a holiday schedule.⁹² NJ Transit restored full weekday service on all bus lines on June 8th, with weekday service restored on commuter rail and light rail lines on July 6th.⁹³

In addition, ferry providers across the region slashed service in response to plummeting ridership. The Staten Island Ferry instituted one hour headways at all times (previously 15 minutes during peak periods) on March 29th, with service partially restored by July 6th.⁹⁴ NYC Ferry cut service by 30% on March 23rd and an additional 20% cut on May 18th.⁹⁵ And NY Waterway (the main provider of trans-Hudson ferry service) suspended service on all but one route by March 24th, with most routes being only partially restored by July 6th.⁹⁶

4.1.3 Protection of Transit Workers

As the city reopens, steps have been taken to protect transit workers who are at increased risk due to continuous contact with the public

Since March, 132 MTA transit workers have died from complications of the coronavirus. At least 10,000 employees have become ill.⁹⁷ To protect their workers, the MTA has distributed 300,000 N95 masks, 160,000 surgical masks, more than 2.5 million gloves, 12,500 gallons of hand sanitizer, and half a million sanitizing wipes to its workers.⁹⁸ Transport Workers Union Local 100, which represents 41,000 of MTA workers, created a *10-Point Transit Plan* to depict a future where operators can maintain their safety as the system reopens to full capacity.⁹⁹ Included in the plan is hazard pay, large-scale testing, protection zones on platforms to prevent interaction between passengers and conductors, as well as other policies to promote a more sanitary transit system. Recently, the union suggested that passengers who do not wear masks be fined, in response to bus driver complaints that few riders abided by MTA policies.¹⁰⁰ While the MTA has yet to respond on whether it will implement these policies, it is clear that as spaces continue to reopen, the transit system will be required to respond to infection control measures and the concerns of employees and passengers.

4.1.4 Budgetary Needs

Transit agencies see significant losses in both fare revenue and tax-supported subsidies

All transportation agencies in the New York region continue to experience financial pressure brought on by the reduced number of fare-paying riders, a drop in tax-supported subsidies (including the loss in tax revenue from real estate transactions, fuel taxes, the personal mobility tax and other sources), and increased operating costs. While the CARES Act appropriated \$5.4 billion to the area, it served as a stopgap measure for short-term losses. The impact of the COVID-19

pandemic on farebox and toll revenues, subsidies, and additional expenses is expected to adversely affect the MTA by \$3.75 billion in 2020, even after accounting for CARES Act funding; in 2021, impact is projected to be \$6.55 billion.¹⁰¹ Other groups, such as the Independent Budget Office of New York City, estimated tax-supported subsidy losses to amount to \$2.7 billion between 2020 and 2022.¹⁰² The Port Authority estimates losing \$3 billion in expected revenue in 2020 and 2021.¹⁰³ Furthermore, through coordinated lobbying efforts, New York region's transit agencies have advocated for a second round of Congressional funds to mitigate losses. The financial impacts of the shutdown warrant detailed analysis in a future study.

Like transit agencies, the New York City Department of Transportation is facing significant COVID-19-related fiscal constraints. Between the April 2020 Financial Plan and June 2020 Adopted Budget, more than \$130 million of budget reductions and savings (PEGs) were introduced into DOT's FY20 and FY21 Expense Budget. This includes more than \$17 million in reductions to Vision Zero and nearly \$8.5 million in reductions to Better Bus Initiatives. In addition, the Council cut 73 positions from the agency.¹⁰⁴ Since March, the City's capital contracts have gone through greater oversight and may be delayed as the City evaluates the economic outlook and cash flow. While there were no cuts to DOT capital funding in the most recent Capital Plan, the City has begun to modify the capital budget to reflect delayed spending. As the City better understands its cash flow constraints due to the fallout from the COVID-19 pandemic, we expect there to be adjustments made to the capital budget to reflect the City's spending abilities.

As these transportation systems have slowly reopened, important sanitary and (where possible) distancing measures have been made to ensure rider safety. By working to gain public confidence in these measures, ridership has the potential of slowly returning and creating fare revenue along the way. However, increased farebox revenue will not make up for losses already

incurred, and given the economic downturn, there remains a chance that farebox revenue may not return to levels projected before the pandemic. The alleviation of transit agencies' fiscal woes will be a reflection of their efforts to make a safe traveling experience.

4.1.5 Restoring Confidence

Transit agencies confront public wariness of the transit system with unprecedented sanitation efforts and campaigns advocating face coverings and social distancing behaviors

New York City's subway system is the primary mode of transportation for many New York City residents, including 56% of all workers and 55% of front-line workers.^{105,106} Seventy-six percent of New Yorkers access Manhattan jobs by transit, and 40% travel to non-Manhattan boroughs by transit.¹⁰⁷ In addition, public transportation is essential for both social and economic mobility—areas of low transit access also have some of the highest rates of unemployment in the city.¹⁰⁸ The transit system is thus foundational to the economic success of the city.

The pandemic brought subway ridership to less than 10% of its normal levels. The massive decline in transit usage was likely due to the decisions of subway riders to avoid crowded subway trains and platforms, as well as the shutdown of all non-essential activities leading New Yorkers to work remotely, stay home, and/or relocate out of the city. The condemnation of city density as a cause of viral spread were seemingly premature; a Johns Hopkins study on 913 metropolitan areas found no causal link between density and viral infection or death rates.¹⁰⁹ Public wariness of the transit system has been confronted in several ways by the MTA in an attempt to restore confidence. Beginning with the overnight closure from 1 to 5 a.m., the MTA initiated an unprecedented sanitization effort. With a new 24/7 cleaning and disinfecting program, 472 subway stations had been cleaned more 71,000 times by mid-June. Subway cars were cleaned 220,000 times, Access-A-Ride

vehicles 111,000 times, and buses 184,000 times. Seventy percent of customers reported that the trains were cleaner. In addition, the MTA explored innovative new options, including using UV light to disinfect surfaces and a 30-day pilot program to test microbe-killing air filters on subways and buses.¹¹⁰ Following Governor Andrew Cuomo's executive order that face masks must be worn in public settings, MTA Chairman Pat Foye announced that face coverings would be mandatory on NYC public transit beginning April 17th.¹¹¹ To encourage mask usage and other health precautions among riders, the MTA launched a media campaign and began distributing masks and hand sanitizer at several stations. In early June, approximately 92% of subway riders were complying with the mask requirement.¹¹²

Other regional transportation authorities took similar steps to restore public confidence. The Port Authority of New York and New Jersey initiated a mask mandate in its airport terminals, PATH and AirTrain stations and trains, and bus terminals.¹¹³ In addition, the agency began 24/7 PATH station cleaning and daily

train disinfection.¹¹⁴ NJ Transit also began mandating face coverings and limiting the number of riders following an executive order from the New Jersey Governor.¹¹⁵

 **Safe Travels**

How to wear a mask:

Cover your nose and mouth.



Nope. **Not quite.** **Try again.** **That's the one!**

Face coverings are required on public transit.



J. P. Chan, MTA

4.2 RETURNING DEMAND

As regions reopen, driving is returning at a faster rate than transit

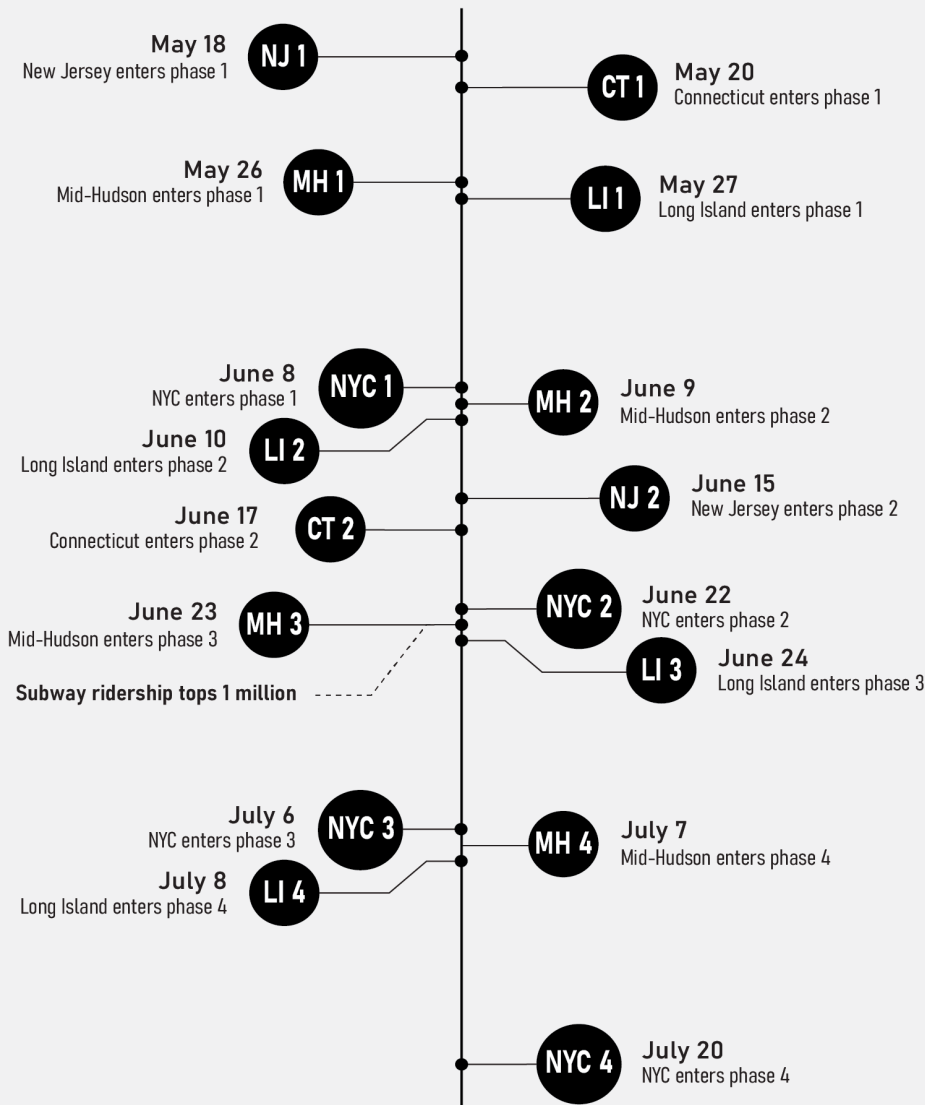
Key Finding:

1. Between April and May, subway ridership increased 28.5% while daily vehicle miles travelled increased 78.9%.
2. Subway ridership reached more than one million riders on June 23rd, for the first time since March.

As the metropolitan region reopens through the appropriate phases, public transit will be expected to accommodate increasing ridership while maintaining

safety protocols. At every new phase, transit will be impacted. For example, after Phase One, the MTA began to experience increases in ridership as workers in

Phased Reopening Timeline in the Tri-State Area



Phase Abbreviated Guidelines (NY)*

- 1 Construction and warehouse traders permitted to reopen with social distancing. Retail reopens for curbside, in-store pick-up, and delivery service.
- 2 Offices permitted to reopen up to 50% capacity. Places of worship may reopen at 25% capacity. Outdoor dining and salons reopen with limited capacity.
- 3 Restaurants may reopen for dine-in service up to 50% capacity.** Gatherings up to 25 people permitted.
- 4 Schools and "low-risk" outdoor arts, entertainment, and recreation permitted at 33% capacity. Indoor arts, entertainment, and recreation permitted at 25% capacity.*** Gatherings permitted up to 50 people.

*These guidelines are New York State specific and do not necessarily reflect the guidelines of New Jersey and Connecticut

**Due to a surge in cases across the U.S., indoor dining was postponed when NYC entered phase 3 reopening on July 6

***Out of abundant caution, indoor activities were similarly postponed when NYC entered phase 4 reopening on July 20

industries such as construction and retail returned to the workplace. However, Phase One arrived at different times through the MTA's operating region. Metro-North and Long Island Rail Road serviced regions that entered Phase One on May 26th and 27th, respectively, while New York City entered on June 8th.^{116,117,118} Thus, the MTA has had to operate under different standards and experience uneven ridership increases as regions enter phases at varying dates.

When Phase One began in New York City, more people returned to the system, including 914,000 daily bus riders, nearly 52,000 riders more than the day before. On Wednesday, June 10th, subway ridership hit the highest levels since the start of the pandemic at 851,241 riders.¹¹⁹

In preparation for Phase Two on June 22nd, the MTA produced informational videos for subway riders that served as public safety announcements.¹²⁰ With Phase Two, offices could reopen, prompting increases in the number of commuters. Subsequently, subway ridership hit another milestone, reaching more than one million riders on June 23rd, for the first time since March.

Compared to the subway's recovery, driving appears to be on track to return quickly to normal levels. Between April and May, the subway's ridership increased 28.5% while daily vehicle miles travelled increased 78.9%. This trend displays the disparity in New York City's transportation recovery.

4.2.1 Risk of Vehicles Overwhelming City Streets

If only ten percent of former transit riders shift to single occupancy vehicles, the city could see congestion return quickly to pre-pandemic levels or greater

The return of travelers has been uneven across different modes, with vehicular traffic returning at a faster rate than public transit. Between April and May, VMT increased from a daily average of 21.4 million to 38.6—a

78.9% increase. Traffic volumes across MTA bridges increased by 54.6%, growing from 8.4 million monthly crossings in April to 13 million in May; similarly, traffic volume increased by 55.3% on Port Authority crossings. Meanwhile, public transit has seen a slower increase in ridership as the city reopens. Between April and May, subway ridership grew by only 28.5%. Bus ridership rates improved slightly faster than subways, but daily weekday ridership still only increased 34% between April and May. Thus, even as the city remained on PAUSE, car traffic rebounded at a troubling rate. The trend continued during the phased reopening: according to data provided by Waze, their users' vehicle miles traveled per day essentially returned to pre-pandemic levels by early July. Daily traffic jams also were nearly back to pre-pandemic amounts, at 92% of mid-February levels.* However, the Department of Transportation found that while East River Bridge traffic volumes increased only 25% while subway ridership increased 75% between early June and mid-July, indicating a less dire distribution across modes.

Growing vehicle traffic presents significant implications for a city with a history of excessive congestion. Pre-pandemic, traffic speeds citywide had declined consistently since 2012, particularly in Manhattan's Central Business District, with the rise in FHV trips. These FHV trips grew by nearly 90% between 2010 and 2019, adding more than 36.9 million trips to city streets between 2016 and 2017 alone. In the CBD, more than half the vehicle traffic was due to taxis and FHV's. Taxi speeds in the CBD fell from 9 miles per hour in 2010 to 7 miles per hour in 2017. Bus speeds citywide had declined 3% since 2010, down 22% since 2010 in the CBD.¹²¹ In non-pandemic conditions, the bridges and tunnels operate at or near capacity.

If this initial trend continues, Manhattan's Central Business District could face intense congestion if large numbers of transit riders rely on taxis and for-hire vehicles while others switch to private vehicles. Even with overall travel lower than typical conditions, just a 10% shift from

* Data provided directly to the authors of this report.

transit to single occupancy vehicles could cause congestion to return to pre-pandemic levels; a greater shift could lead to even greater congestion, particularly on the constrained river crossings into the CBD.

should also make cycling more attractive to New Yorkers. Furthermore, as the NYC Department of Transportation has committed to expanding protected lanes for bicycles, cycling is expected to grow in coming years.

4.2.2 Bike Shop Boom

Bicycle ownership has grown in popularity throughout the pandemic, and is likely to supply socially distant commutes through the fall

Historically, the bicycle has offered a resilient mode during times of crisis: during the 1918 influenza pandemic, bikes were advertised as a way to avoid crowds and move outdoors.

In 2020, biking grew in popularity during the pandemic. On March 22nd, Mayor de Blasio noted that bike shops could stay open, saying “bike repair shops are essential.”¹²²

Data about personal bike ownership rates is unavailable. Anecdotally, local bike shops struggled to keep up with the demand:

- Brooklyn Bicycle Co., a small bike manufacturing company, announced on its website: “Due to the novel coronavirus, demand for bicycles has nearly tripled over the past 2 months - causing a shortage across the industry.”¹²³ In 45 days, the company sold a year’s worth of inventory.
- Charlie McCorkell, the owner of Bicycle Habitat, wrote to his customers: “There is a national bike shortage, unlike anything I have seen before. This is due to increased demand and extensive disruptions to the supply chain.”
- Larry Duffus, owner of Larry’s Freewheeling bike shop, told *The New York Times* that the last time he sold bikes this fast was during the transit strike in April of 1980.¹²⁴

Bicycle riding will likely continue to increase through the fall, as riders see cycling as a socially distant mode of transport. The projected use of electric powered bikes



RECOMMENDATIONS

Photo By: Kelsey McGuinness

These recommendations seek to mitigate the negative outcomes and improve mobility for traveling to and from work, school, recreation and shopping. We recognize the intense financial pressures facing city and

state agencies that constrain current programs and new initiatives. Our goal is that New Yorkers have safe, efficient and flexible mobility in the short- and long-term.

1. ENSURE A SAFE RETURN TO PUBLIC TRANSPORTATION, THE LIFELINE OF NEW YORK CITY'S ECONOMY

The subway and bus systems are fundamental to New York City, and the MTA should continue to invest in public health technologies and programs for public transit riders and employees. Policies are also necessary to add rapid bus transit and improve bike connections to subway stations for the last mile of commuting. The New York City subway, which typically carries 5.5 million passengers every weekday, has been considered as a contributor to the spread of COVID-19, with many claiming that the city's density plays a large and dangerous role. However, a recent study from The Bloomberg School of Public Health at Johns Hopkins University found no causal link between density and COVID-19 death rates and infections. Rather, denser areas like New York City tend to have lower death rates from the virus, likely due to social distancing practices and premium health-care facilities.¹²⁵ NYC's subway must be improved, with public health measures, to resume its role as New Yorkers' primary mode of transportation—millions rely on it for economic opportunity and social mobility. Furthermore, NYC generates five percent of the nation's gross domestic product, and the subway is central to the economic productivity of the city.¹²⁶

The MTA, PATH, and NJ Transit can restore riders' confidence in their subways, buses, and commuter rails through several critical initiatives:

- **Maintain a Hygienic System:** The MTA has already done much to improve the sanitary conditions of its mass transit and commuter rail systems. The MTA should continue to require and distribute masks, make hand sanitizer available,

and clean and disinfect facilities daily.

- Subway riders who rely on elevators and other ADA-compliant features are likely to be otherwise higher-risk for COVID-19; cleaning and disinfection should focus particularly on these stations and elevators.
- **Promote and Communicate the New Norms:** Actions by passengers, including social distancing and avoiding talking indoors, have reduced the spread of COVID-19. However, enforcing these activities will likely be difficult. The MTA should continue to develop and expand campaigns in stations, online and through Transit Wireless connections to foster social distancing and avoid talking on trains and subways.
- **Protect Workers:** The MTA workforce lost 132 transit workers to COVID-19, and at least 10,000 employees became ill during the same time. Their health must be protected through temperature checks at the start of shifts, required masks, encapsulation of bus drivers in plexiglass, and reduced crowding in break rooms.
- **Multimodal Transfers:** Transit providers and the City should collaborate to attract riders by encouraging seamless transfers between modes. Citi Bike docks can be placed at more subway stations for last-mile transfers. New park-and-ride facilities can be developed at unused baseball stadiums, where drivers can leave their cars and take express buses into Manhattan. Ferry tickets can be paired with subway fares to reduce time

underground. The subway and PATH, which already use the same fare collection system, could provide free transfers. Overall, transfers must be

made simpler, both physically and financially, to distribute New Yorkers' across our 28 modes of transportation.

2. MITIGATE TRAFFIC CONGESTION WITH DYNAMIC VEHICLE MANAGEMENT

Vehicle traffic is gradually returning to pre-pandemic levels, with many travelers likely already switching from transit to personal vehicles, assuming it is the safer choice. Even if only 10% of transit riders switched to single-occupancy vehicles, the gridlock on streets and already-strained river crossings would add significantly to regional congestion, individual travel times, and economic costs. To avoid this scenario, especially in the Central Business District, a feasible congestion mitigation strategy is recommended. New York City's Central Business District Tolling Program, slated to launch at the start of 2021 but delayed by the pandemic, should, in fact, move forward to reduce vehicle traffic and increase funding for the Metropolitan Transportation Authority. Specific features to reduce traffic should include:

- **Implementation of Congestion Pricing:** Traffic during the pandemic highlighted the risks created by speeding drivers and, subsequently, more severe crashes. The fee for driving in New York City should reflect the costs the city incurs to maintain streets, the consequences of traffic

crashes, reduced bus speeds, and environmental costs of increased emissions and noise.

- **Synchronize E-Hail Regulations:** Uber, Lyft, Via and other e-hail services are currently subject to a state congestion fee of \$2.75 per trip in the Central Business District, as well as a local monetary penalty system that requires that vehicles are occupied as much as possible with passengers in the Central Business District (the latter has not been implemented due to pending litigation.) The two approaches should be combined for maximum revenue collection and a dynamic mechanism to incentivize vehicle efficiency and reduce congestion.
- **Staggered work hours:** Even if more cars enter Manhattan, but they are spread out (the transit version of "flattening the curve"), traffic flow can be better managed. The city must aggressively work with businesses and delivery companies to spread out worker arrival and departure times as well as encouraging off-hours deliveries.

3. RECONSIDER THE CURB

When curbside lanes consist of free or low-cost private vehicle parking, the city is providing prime real estate to private users. Street curbs should be positioned for dynamic purposes: financial gain, dynamic usage, and reducing reliance on personal vehicles. Moreover, parking forces delivery and other activity into moving

traffic lanes, creating vehicle conflicts and congestion. Curb lanes in New York City should be improved in strategic ways:

- **Parking Premiums:** On-street parking should be priced at a higher rate (and free parking should be reduced) to account for the true cost of vehi-

cle usage and storage. Pricing can be dynamic to incentivize the efficient movement and storage of vehicles, and at a rate that is more aligned with market rate costs of private garages.

- **Placard Enforcement:** City-issued parking placards allow public employees to avoid parking fees and regulations. However, the growth of fraudulent placards takes revenue-generating parking spaces from the public. Furthermore, irresponsible parking by some placard holders prevents the safe and efficient flow of vehicle, pedestrian and bicycle traffic. Parking placards should be reduced in number and enforced for both validity and responsible use.
- **Distribute Pick-Up, Drop-Off Zones More**

Widely: PUDOs are curbside dynamic use zones, areas dedicated to the pick-up and drop-off of taxi passengers and freight deliveries. New York City ran a successful pilot of this concept in 2019; it should be made permanent and expanded into other areas.¹²⁷ By moving dynamic activity to the curb, in commercial areas, residential streets and retail strips, rather than maintaining the static nature of parking, PUDOs benefit both pedestrians and drivers, and will help to keep New York City's heavy traffic moving.

- **Truck Loading/Unloading Management:** New York City should consider new methods to manage truck loading and unloading in order to keep traffic moving and preserve curbspace.

4. CONTINUE THE FLEXIBLE ADAPTATION OF THE TRANSPORTATION SYSTEM

The New York City public transportation system revealed its ability to nimbly adapt to a rapidly changing environment. Programs like the MTA Essential Connector emerged from the need to quickly serve riders. New York City should harness its ability to adjust transportation options and systems to adapt to demand changes in real time.

- **Transit Priority Corridors:** Many essential workers and some of the city's lowest income residents live in areas underserved by public transit. These areas should be the focus of connectivity efforts.
- **Bus Priority Lanes:** Bus rapid transit is essential for expanding transportation networks. The bus-only corridor on 14th Street has increased bus travel speeds and encouraged ridership. The city has developed similar lanes on streets across the boroughs, including through the Better Buses Restart program, announced June 8th, 2020.¹²⁸

Bus Priority lanes should continue to be expanded through the city, with a focus on areas lacking direct access to subway stations.

- **The COVID-19 pandemic has highlighted the need for coordination and communication among key transportation agencies:** The Metropolitan Transportation Authority, Port Authority of New York & New Jersey, New York City Department of Transportation and the Taxi & Limousine Commission. Planning for transportation during disasters and crises will require new transportation and information technologies and innovative policies to improve mobility in New York City.

5. ACCOMMODATE AND ENCOURAGE MICROMOBILITY

As New Yorkers return to work, commutes will encompass numerous modes of travel. Many individuals will seek to maintain social distancing by avoiding public transportation. Cycling is an increasingly popular mode of transportation and is growing rapidly as a commute mode. Although Revel's mopeds have suspended operations amid safety concerns, the service is expected to resume with enhanced safety operations.¹²⁹

Furthermore, the City Council has legalized e-bikes and shared e-scooters, starting in March 2021, and New Yorkers are increasingly riding motorized skateboards, OneWheels, moving ellipticals and hoverboards that will require public policies to assure the safety of all New Yorkers. Micromobility vehicles can reduce crowding on public transit, improve safety on streets with protected lanes, and promote healthy active transport.

New York City should pursue policies that encourage safe micromobility:

- **Expand the protected bike lane network:** The rise of micromobility highlights the need for protective measures for cyclists. During the pandemic (March–May), three cyclists have been killed and 776 injured despite the reduced vehicle traffic.* The City has installed roughly 20 miles of bike lanes per year under NYC DOT Commissioner Polly Trottenberg's leadership, a meaningful number to cyclist safety. However, the newly implemented temporary bike lanes should be contiguous, protected, marked, and enforced.¹³⁰ The City should continue to expand its protected and enforced bike lanes so that New Yorkers can commute safely.
- **Open Streets for Commuters:** New York City's Open Streets program, which closes streets to through traffic, are geared towards recreational use.

However, as New Yorkers start commuting regularly once more, demand patterns for transportation modes will shift and Open Streets should reflect this use.

- **Extend micromobility to essential workers' neighborhoods:** Many of New York City's essential workers during this pandemic reside in Brooklyn, Queens, and the Central Bronx. Workers in these neighborhoods relied on the subway more than others during the pandemic, and did not have local access to micromobility systems, such as Citi Bike or Revel, which could at least serve as first-and last-mile options. Because transit expansion is difficult financially, New York City should continue its current efforts to expand Citi Bike to serve these neighborhoods. As buildout of the Citi Bike network understandably takes time to plan, communicate, and install, consideration should also be given to implementation of dockless bike and scooter share systems in areas of the city farther from the current Citi Bike service area.
- **Lower vehicular speeds in areas with high-density micromobility:** New policies will be necessary to assure the safety of our streets as micromobility grows. The speed of adjacent vehicular traffic as well as new rules for the use of mopeds and scooters should be considered.

* Data publicly available: <https://data.cityofnewyork.us/Public-Safety/Motor-Vehicle-Collisions-Crashes/h9gi-nx95>. Motor Vehicle Collisions - Crashes.

6. MAKE SPACE FOR SOCIAL DISTANCING

Medical experts recommend six feet of space between people to reduce the spread of COVID-19. However, city life does not tend to accommodate the diffusion of people. In order to program social distancing into New York City, these steps can be taken:

- **Expand Sidewalks:** As New Yorkers return to work, school and play, it will be essential to provide additional space for pedestrians to avoid overcrowding of sidewalks, which existed in many areas before the pandemic. New York City should consider creating additional pedestrian space by expanding sidewalks into parking or loading lanes.
- **Expand Permanent Outdoor Dining:** New

York City has encouraged the intelligent use of sidewalks and streets for dining, with more than 9,000 restaurants participating in the Open Restaurants Program.¹³¹ As on-street spaces begin to be utilized for outdoor dining, the city should consider the economic benefit: such uses arguably have the potential to stimulate the city's economy more than private parking. A nominal fee could be charged to restaurants for this space. While the program should be continued and expanded, the relationship between sidewalks and passing pedestrians should be resolved, ensuring distance between diners and passersby. In addition, bike lanes should be pushed out further to avoid conflicts between bikes and restaurants.

7. INFORM DECISION-MAKING WITH DATA

This report draws upon transportation data from approximately 40 sources at different agencies, organizations and companies. Data was provided in nearly as many formats, timeframes and geographies. This lack of interoperability is concerning in terms of transportation planning in the New York region: understanding where, how, and why people move requires comprehensive data on daily movements. If compatible, real-time data is unavailable, building plans and infrastructure to optimize movement through the city and region is nearly impossible. To that end, transportation authorities can take key steps:

- **Collect Data:** Agencies should require relevant, anonymized data to be shared with them, in as real-time format as possible, in a universal format. For the New York Region, a tri-state agreement on open data standards and feed consistency will vastly improve how data from multiple streams can be more quickly and efficiently analyzed.

- **Use Data for Planning:** Transportation planning agencies should use information technologies for collaborative and strategic planning so that current and future crises can be managed among different modes simultaneously. For example, crowding on one mode can be relieved by informing riders about availability on an alternative mode.
- **Open Data:** By providing schedules, real-time and operations data to the public, government agencies are held accountable for their services. And riders have useful information to manage their time and costs.

The improvements outlined above are intended to restore trust in public transit, reduce congestion, encourage new and emerging modes of mobility and allow New Yorkers to move more safely through the city.

ACKNOWLEDGMENTS

This report was made possible through the generous support of the May and Samuel Rudin Family Foundation, Inc.

The following individuals and organizations assisted in the development of this report through data, insights and advisory capacity. Our thanks to:

Mark Burfeind, INRIX
William Carry, New York City Department of Transportation
Kurt Cavanaugh, Flatiron/23rd St Partnership
Rick Cotton, Port Authority of New York and New Jersey
Nick Fasano, MTA LIRR
Adam Forman, Office of the New York City Comptroller
Laura Fox, Lyft/Citi Bike
Pat Foye, MTA
Ellen Goldstein, Times Square Alliance
Jonathan Hawkins, Garment District BID
Aloysee Heredia Jarmoszuk, NYC Taxi & Limousine Commission
Joseph Jarrin, New York City Department of Transportation
Adham Kalila, StreetLight
Donna J. Keren, NYC & Company
Ari Kaputkin, Waywiser Spatial
Janno Lieber, MTA Capital Construction
Kiran Lutfeali, NYU Rudin Center for Transportation
Nicole Mandel, Flatiron/23rd St Partnership
Sarah Meyer, MTA
Juliette Michaelson, MTA
Alec Nadeau, Port Authority of New York and New Jersey
Joe Nowicki, Revel
Sarah Orcutt, Times Square Alliance
Trevor Reed, INRIX
Naomi Renek, MTA
Duane Roggendorff, Grand Central Partnership
Haley Robinson, Revel
Julie Schipper, New York City Department of Transportation
Joanna Simon, Waywiser Spatial
Polly Trottenberg, New York City Department of Transportation
Chris Whong, Qri
Michael Wojnar, MTA
Celine Zakaryan, NYC Taxi & Limousine Commission

Report Design: Nicholas Cowan

Chart Design: Nicholas Cowan, Charles Rudner, and Kelsey McGuinness

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