



Metropolitan Transportation Authority

# NEW YORK CITY TRAVEL SURVEY

Report | June 30, 2020



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# CONTENTS

<b>EXECUTIVE SUMMARY .....</b>	<b>V</b>
<b>1.0 STUDY OVERVIEW AND OBJECTIVES.....</b>	<b>1</b>
1.1 BACKGROUND .....	1
<b>2.0 RESPONDENT RECRUITMENT .....</b>	<b>2</b>
2.1 ADDRESS-BASED SAMPLE .....	2
2.2 EMAIL LIST.....	5
2.3 POSTCARD HANDOUT .....	5
2.4 SOCIAL MEDIA.....	5
<b>3.0 SAMPLING PLAN .....</b>	<b>6</b>
3.1 ADDRESS-BASED SAMPLING .....	6
3.2 MTA ONLINE PANELS .....	7
3.3 POSTCARD HANDOUT .....	7
<b>4.0 QUESTIONNAIRE .....</b>	<b>11</b>
4.1 RECRUITMENT SURVEY .....	11
4.2 TRAVEL DIARY .....	14
<b>5.0 PRETEST.....</b>	<b>18</b>
5.1 PRETEST RESULTS .....	19
5.2 ADJUSTMENTS MADE AFTER PRETEST .....	20
<b>6.0 RESPONSE RATES .....</b>	<b>22</b>
<b>7.0 DATA CLEANING .....</b>	<b>23</b>
7.1 DATASET OVERVIEW .....	23
7.2 DATASET INCLUSION CRITERIA .....	23
7.3 DATASET STRUCTURE.....	23
7.4 REMOVE DATA PREPARATION.....	25



7.5 TRANSIT PATH CLEANING .....	26
7.6 COMBINE ONLINE DIARY DATA WITH RMOVE DATA .....	28
7.7 RECODED VARIABLES .....	28
<b>8.0 WEIGHTING .....</b>	<b>37</b>
8.1 PERSON AND HOUSEHOLD WEIGHTS .....	37
8.2 TRIP-LEVEL WEIGHTS & ADJUSTMENTS .....	44
8.3 FINAL WEIGHT SUMMARY AND RECOMMENDED USE .....	57
<b>9.0 LESSONS LEARNED .....</b>	<b>59</b>
<b>10.0 SURVEY RESULTS .....</b>	<b>60</b>
10.1 HOUSEHOLD CHARACTERISTICS .....	60
10.2 PERSON CHARACTERISTICS .....	64
10.3 TRIP CHARACTERISTICS .....	74

## LIST OF FIGURES

FIGURE 1. PRENOTICE POSTCARD .....	3
FIGURE 2. INVITATION LETTER AND FAQ .....	4
FIGURE 3. TWITTER POST WITH SURVEY LINK .....	5
FIGURE 4. COMPLETES, BY CENSUS TRACT (DARKER=MORE COMPLETES FROM ABS AND EMAIL SAMPLE) .....	8
FIGURE 5. MAP OF COMPLETED SURVEYS PER POPULATION, BY SUBWAY STATION .....	9
FIGURE 6. FLOW OF SURVEYS .....	11
FIGURE 7. SCREENSHOT OF LANGUAGE SELECTION PAGE .....	12
FIGURE 8. SCREENSHOT OF BASIC PERSON-BASED DEMOGRAPHIC QUESTIONS .....	12
FIGURE 9. SCREENSHOT OF ADDITIONAL PERSON-BASED DETAIL QUESTIONS .....	13
FIGURE 10. SCREENSHOT OF WORK DETAILS QUESTIONS .....	13
FIGURE 11. SCREENSHOT OF TRIP ROSTER QUESTION .....	14
FIGURE 12. SCREENSHOT OF LOCATION GEOCODER .....	15
FIGURE 13. SCREENSHOT OF TRIP DETAILS QUESTION .....	16
FIGURE 14. EXAMPLE RMOVE SCREENSHOTS .....	17
FIGURE 15. NUMBER OF WORKERS PER HOUSEHOLD, BY BOROUGH .....	61
FIGURE 16. NUMBER OF CHILDREN PER HOUSEHOLD, BY BOROUGH .....	62
FIGURE 17. NUMBER OF WORKING MOTOR VEHICLES PER HOUSEHOLD .....	63
FIGURE 18. GENDER, BY BOROUGH .....	64
FIGURE 19. AGE, BY BOROUGH .....	65
FIGURE 20. EMPLOYMENT STATUS, BY BOROUGH .....	66
FIGURE 21. STUDENT STATUS, BY BOROUGH .....	67
FIGURE 22. DRIVERS LICENSE STATUS, BY BOROUGH .....	68
FIGURE 23. ENGLISH PROFICIENCY, BY BOROUGH .....	69
FIGURE 24. BORN IN UNITED STATES, BY BOROUGH .....	71
FIGURE 25. RACE, BY BOROUGH .....	72
FIGURE 26. HISPANIC, BY BOROUGH .....	73
FIGURE 27. NUMBER OF DAILY TRIPS, BY BOROUGH .....	74
FIGURE 28. AVERAGE NUMBER OF WEEKDAY TRIPS PER PERSON .....	75
FIGURE 29. AVERAGE NUMBER OF SATURDAY TRIPS PER PERSON .....	75
FIGURE 30. AVERAGE NUMBER OF SUNDAY TRIPS PER PERSON .....	76
FIGURE 31. BOROUGH-TO-BOROUGH COMMUTER FLOWS TO WORK .....	79
FIGURE 32. NEIGHBORHOOD-TO-NEIGHBORHOOD (BY PUMA) COMMUTER FLOWS TO WORK: TOP 10 ORIGIN-DESTINATION PAIRS .....	82
FIGURE 33. START TIME OF COMMUTE TRIP .....	83
FIGURE 34. COMMUTE FLEXIBILITY .....	84
FIGURE 35. TELECOMMUTE FREQUENCY .....	85
FIGURE 36. SHARE OF TNC (UBER/LYFT) TRIPS, BY ORIGIN BOROUGH .....	89
FIGURE 37. SHARE OF TNC (UBER/LYFT) TRIPS, BY TRIP PURPOSE .....	90
FIGURE 38. SHARE OF TNC (UBER/LYFT) TRIPS, BY AGE .....	91
FIGURE 39. SHARE OF TNC (UBER/LYFT) TRIPS, BY HOUSEHOLD INCOME .....	92
FIGURE 40. SHARE OF TNC (UBER/LYFT) TRIPS), BY DAY OF WEEK .....	93
FIGURE 41. REASONS FOR NOT TAKING TRANSIT* .....	94



## LIST OF TABLES

TABLE 1. ESTIMATED RESPONSE RATES, BY RESPONSE GROUP .....	7
TABLE 2. INVITES AND EXPECTED UNIQUE HOUSEHOLDS, BY BOROUGH .....	7
TABLE 3. SAMPLED SUBWAY STATIONS AND EXPRESS BUS STOPS .....	9
TABLE 4. PRETEST RESPONSE RATES BY RESPONSE GROUP .....	19
TABLE 5. RESPONSE RATES, BY RECRUIT TYPE .....	22
TABLE 6. COMPLETED SURVEYS AND RESULTING NUMBER OF TRIPS (UNWEIGHTED), BY RECRUIT METHOD AND SURVEY TYPE.....	22
TABLE 7. DATASET SUMMARY .....	24
TABLE 8. CODING PROCEDURE FOR “PURPOSE” VARIABLE.....	29
TABLE 9. CODING PROCEDURE FOR THE TOUR PURPOSE VARIABLE .....	30
TABLE 10. TRIP-LEVEL FARE PAYMENT METHOD: NYCT SUBWAY, LOCAL BUS AND EXPRESS BUS, AND ROOSEVELT ISLAND TRAM (NYCT_FARE) .....	32
TABLE 11. TRIP-LEVEL FARE PAYMENT METHOD: LIRR/MNR (RAIL_FARE) .....	33
TABLE 12. OVERVIEW OF MODE VARIABLE SETS INCLUDED IN THE LINKED TRIP FILE .....	34
TABLE 13. CODING DESCRIPTION FOR THE MODE GROUPED VARIABLES .....	35
TABLE 14. HOUSEHOLD AND PERSON VARIABLES USED FOR WEIGHTING .....	37
TABLE 15. WEEKDAY INITIAL PERSON WEIGHTS.....	40
TABLE 16. SUMMARY STATISTICS OF THE FINAL WEEKDAY PERSON WEIGHTS .....	41
TABLE 17. SATURDAY INITIAL PERSON WEIGHTS .....	42
TABLE 18. SUMMARY STATISTICS OF THE FINAL SATURDAY PERSON WEIGHTS .....	43
TABLE 19. SUNDAY INITIAL PERSON WEIGHTS.....	43
TABLE 20. SUMMARY STATISTICS OF THE FINAL SUNDAY PERSON WEIGHTS .....	44
TABLE 21. RSURVEY ADJUSTMENT FACTORS APPLIED TO ADULTS .....	46
TABLE 22: FARE EVASION RATES AND MAY 2018 RIDERSHIP BY BUS SERVICE TYPE .....	47
TABLE 23. WEEKDAY BUS WEIGHT ADJUSTMENT FACTORS.....	48
TABLE 24. WEEKDAY SUBWAY AND SIR WEIGHT ADJUSTMENT FACTORS.....	49
TABLE 25. FINAL WEEKDAY SUBWAY TRIP COUNTS VS. SURVEY TRIPS COMPARISON FOR RESIDENT AND NON-RESIDENT STATIONS .....	50
TABLE 26. FINAL WEEKDAY BUS COUNTS VS. SURVEY TRIPS COMPARISON.....	51
TABLE 27. SATURDAY BUS WEIGHT ADJUSTMENT FACTORS .....	52
TABLE 28. SATURDAY SUBWAY AND SIR WEIGHT ADJUSTMENT FACTORS.....	52
TABLE 29. FINAL SATURDAY SUBWAY TRIP COUNTS VS. SURVEY TRIPS COMPARISON.....	53
TABLE 30. FINAL SATURDAY BUS COUNTS VS. SURVEY TRIPS COMPARISON.....	54
TABLE 31. SUNDAY BUS WEIGHT ADJUSTMENT FACTORS .....	55
TABLE 32. SUNDAY SUBWAY AND SIR WEIGHT ADJUSTMENT FACTORS .....	55
TABLE 33. ADJUSTED SUNDAY SUBWAY TRIP COUNTS VS. SURVEY TRIPS COMPARISON .....	56
TABLE 34. FINAL SUNDAY BUS COUNTS VS. SURVEY TRIPS COMPARISON.....	57
TABLE 35. DATASET OVERVIEW AND WEIGHTS.....	58
TABLE 36. AVERAGE HOUSEHOLD SIZE, BY BOROUGH .....	60
TABLE 37. PERCENTAGE OF HOUSEHOLDS PARTICIPATING IN APP- BASED PROGRAMS.....	63
TABLE 38. DISABILITY, BY TOTAL POPULATION .....	69
TABLE 39. TOP 5 PRIMARY LANGUAGES SPOKEN AT HOME, BY BOROUGH .....	70
TABLE 40. FARE PAYMENT TYPE, BY DAY OF WEEK.....	77
TABLE 41. FARE PAYMENT TYPE, BY HOUSEHOLD INCOME .....	78
TABLE 42. BOROUGH-TO-BOROUGH COMMUTER FLOWS TO WORK .....	80
TABLE 43. MODE SPLIT, BY BOROUGH FOR COMMUTE TRIPS.....	81
TABLE 44. AVERAGE COMMUTE DISTANCE AND TRAVEL TIME.....	83
TABLE 45. PERCENTAGE OF COMMUTERS RECEIVING SUBSIDY* .....	86
TABLE 46. MODE SPLIT, BY BOROUGH FOR NON-COMMUTE TRIPS.....	87
TABLE 47. PASSENGER DEMOGRAPHIC PROFILE .....	88

## LIST OF ABBREVIATIONS

ABS	Address-based sample
ACS	American Community Survey
B&T	Bridges and Tunnels
CBG	Census block group
GPS	Global Positioning System
IPF	Iterative proportional fit
LIRR	Long Island Rail Road
MNR	Metro-North Railroad
MTA	Metropolitan Transportation Authority
NYC	New York City
NYCT	New York City Transit
PUMA	Public Use Microdata Area
PUMS	Public Use Microdata Sample
SIR	Staten Island Railway

## LIST OF TERMS

**Linked trip:** a full trip from start to finish, including all modes (e.g., walk access to bus with a transfer to subway and walk egress).

**Unlinked trip:** a component of a linked trip; a linked trip using more than one mode or route/line can be divided into two or more unlinked trips. A linked trip transferring from one bus route to a subway line would be two unlinked trips (one bus trip and one subway trip).

**Upsampling:** increasing sample rates to account for lower response rates among some segments of the population.

**Resident v. Non-resident Station:** subway stations were categorized as being primarily used by NYC residents v. those stations used by higher proportions of travelers coming from outside the five boroughs.

**rMove:** RSG's smartphone-based travel survey app.

**rSurvey:** RSG's online survey software.

**Weighting:** activity to more accurately represent the demographics and resulting travel behavior of surveyed population.



## EXECUTIVE SUMMARY

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The Metropolitan Transportation Authority (MTA) New York City Travel Survey describes the travel behavior of New York City residents from every borough, irrespective of travel mode. This study collected data by surveying New York City residents on their travel behavior to support three goals:

1. Provide data to be used to recalibrate MTA's Regional Transit Forecasting Model.
2. Satisfy Federal Transit Administration requirements for on-board transit surveys.
3. Fulfill federal Title VI requirements

The survey was comprised of two components: 1) a recruitment survey; and 2) a travel diary. Respondents first took the recruitment survey and provided information about their household, demographics, and general travel information. Then, the household was assigned a travel date(s) and asked to report details of their travel for the assigned date(s).

To analyze origin-destination patterns on New York City Transit Authority subways and buses, the survey team sought completed travel surveys from 12,000 households throughout New York City and 20,000 unlinked transit trips.

The survey was fielded between March 2018 and June 2018 and recruited respondents from approximately 14,500 households to participate, exceeding the target of 12,000 households. The number of unlinked transit trips exceeded the goal of 20,000 trips, with nearly 66,000 trips collected. The survey's overall response rate was approximately 3.5%, which is on par with household travel surveys in other cities.

On average, NYC residents made 3.0 trips per weekday, 3.0 trips on an average Saturday, and 2.7 trips on Sunday. Of these trips, 0.9 were made using transit each weekday, 0.6 on Saturday, and 0.4 on Sunday. In terms of commuting to and from work, the majority of travelers either commuted to Manhattan or stayed within the borough where they live. Residents of Manhattan had the most flexibility in their work schedule and were most likely to be able to telecommute, while those living in the Bronx and Staten Island had the least flexibility or ability to telecommute.

For automobile, For Hire Vehicle (FHV), and taxi trips, respondents were asked why they didn't choose to use transit. Nearly one-third of respondents cited transit taking too long as the reason, with comfort as the second most common reason (15%).

Many in the transportation industry view FHV as a competitor to transit; this study found that FHV made up only 2.3% of mode share in New York City (excluding walk/bike trips). The most common trip purpose for trips using FHV was for commuting to work.

The full survey methodology and key findings are detailed in this report.



## 1.0 STUDY OVERVIEW AND OBJECTIVES

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### 1.1 BACKGROUND

The MTA New York City Travel Survey sought to describe the travel behavior of New York City residents from every borough, irrespective of travel mode. This study collected data by surveying New York City residents on their travel behavior to support three goals:

1. Provide data to be used to recalibrate MTA's Regional Transit Forecasting Model.
2. Satisfy Federal Transit Administration requirements for on-board transit surveys.
3. Fulfill federal Title VI requirements.

To guide this project, MTA assembled a group of key stakeholders from several departments. This group monitored the study progress and provided input to and reviewed the study materials, including the questionnaire, sampling plan, and invitation materials.

Respondents were primarily recruited through an address-based sample (ABS) recruitment strategy—with multiple first-class mailings sent to all invited households. This recruitment method is considered the best practice approach for conducting household travel surveys. Additionally, several supplemental recruitment strategies were used, including MTA's Online Panel, intercept recruitment at targeted transit station/stops, and social media outreach.

Respondents completed the survey in two parts. An online recruit survey gathered general household and person-level information including demographics and general travel related questions. This was followed by a travel diary on an assigned day or days that collected information about all trips taken on those days. The survey offered travel diary data collection through three modes: online (rSurvey™), telephone, and smartphone app (rMove™).

## 2.0 RESPONDENT RECRUITMENT

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The study team surveyed residents of New York City's five boroughs for this effort; the survey effort did not include nonresidents. Respondents were recruited through four methods:

1. ABS.
2. MTA customer email lists.
3. Intercept.
4. Social media.

### 2.1 ADDRESS-BASED SAMPLE

The study team used ABS as the primary recruitment strategy and mailed approximately 235,000 invitations to a random sample of all addresses in the study area, defined as all five boroughs of New York City. Invited households received three or four mailings during the study:

1. A **prenotice postcard** summarizing the study and explaining how to complete the recruit survey (Figure 1).
2. A **formal invitation**, printed on MTA-branded letterhead, explaining the subject in more detail, providing a unique password, and providing answers to frequently asked questions. The formal invitation arrived three to four days after the prenotice postcard (Figure 2).
3. A **reminder postcard**, which encouraged respondents to fill out the recruit survey (after which they could be reminded through other means). The reminder arrived three to four days after the formal invitation.
4. Select households received a **second reminder** postcard. It was sent to half of the respondents, focusing on households that reside in hard-to-reach census block groups (CBGs) (e.g., areas with a high percentage of lower-income households) to boost participation rates. The second reminder arrived six to seven days after the first reminder postcard.

The invitation materials all had a similar design that was also reflected in the web-based survey. This continuity in design meant respondents could identify the materials as all being a part of the same survey, which furthered the legitimacy of the effort.

The recruitment materials mentioned the incentive that a household could receive if the study was completed. The household would receive a \$15 gift card and a chance to win a 30-day unlimited MetroCard if the survey was completed.

Sampling was based on CBGs, the smallest geography for which household data are available from the US Census Bureau’s American Community Survey. The sampling plan is discussed in more detail in the Sampling Plan section of this report.

FIGURE 1. PRENOTICE POSTCARD

**MTA** HELP IMPROVE TRANSPORTATION IN NYC!

NYC Travel Study  
c/o RSG  
55 Railroad Row  
White River Junction, VT  
05001

Your household has been randomly selected to participate in a travel survey for the Metropolitan Transportation Authority (MTA). In a few days, you'll receive an invitation packet for this survey. The MTA needs information on how you travel in order to help provide better transportation options for you and other New Yorkers!

Su hogar ha sido seleccionado aleatoriamente para participar en una encuesta de viaje para la Autoridad de Transporte Metropolitano (MTA, por sus siglas en inglés). En unos pocos días recibirá un paquete de invitación para esta encuesta. ¡La MTA necesita información sobre cómo viaja usted y otros nuyorquinos para poder ofrecer mejores opciones de transporte para usted y otros nuyorquinos!

As one of the few households randomly selected to participate, your input has a large impact on the survey. You'll receive a \$15 gift card and a chance to win a 30-day unlimited MetroCard!

To start the survey now:  
 Visit the survey website [rsgresearch.com/nyc](https://rsgresearch.com/nyc)  
 or, call: 1-844-673-6393

Your password is:

QUESTIONS? [nyc@rsgresearch.com](mailto:nyc@rsgresearch.com) or 1-844-673-6393

**TAKE THE SURVEY! Get a \$15 gift card and a chance to win a 30-day unlimited MetroCard!**

**HELP IMPROVE TRANSPORTATION IN NYC!**

MANHATTAN BRONX  
 QUEENS  
 BROOKLYN  
 STATEN ISLAND  
 ATLANTIC OCEAN

¡AYUDE A MEJORAR EL TRANSPORTE EN NYC!  
 Visite: <https://rsgresearch.com/nyc> o llame al 1-844-673-6393

幫助改善紐約市的交通！  
 請訪問：<https://rsgresearch.com/nyc>

EDE AMELYORE TRANSPÓ NAN VIL NY!  
 뉴욕시 교통 개선에 도움을 주십시오!

¿Habla español?  
 Visite: <https://rsgresearch.com/nyc> o llame al 1-844-673-6393

說中文嗎？  
 請訪問：<https://rsgresearch.com/nyc>

Ou pale Kreyòl Ayisyen? Al gade nan: <https://rsgresearch.com/nyc>

한국어를 하십니까? 다음 웹사이트를 방문하십시오.  
<https://rsgresearch.com/nyc>

ПОМОГИТЕ НАМ УЛУЧШИТЬ ТРАНСПОРТНОЕ СООБЩЕНИЕ В ГОРОДЕ НЬЮ-ЙОРК!  
 Вы говорите по-русски? Посетите сайт: <https://rsgresearch.com/nyc>

Source: RSG

FIGURE 2. INVITATION LETTER AND FAQ



**HELP IMPROVE TRANSPORTATION IN NYC!**

c/o RSG | 55 Railroad Row | White River Junction, VT 05001

**An invitation to participate in the NYC travel survey\***

**\*Get a \$15 gift card and a chance to win a 30-day unlimited MetroCard!**



**HELP IMPROVE TRANSPORTATION IN NYC!**

**FREQUENTLY ASKED QUESTIONS**

**Dear**

Your household has been randomly selected to participate in a survey by the Metropolitan Transportation Authority (MTA). The MTA needs information on how you travel around the city to help improve transportation in the region. This survey is part of the NYC Travel Study.

*Su hogar ha sido seleccionado aleatoriamente para participar en una encuesta de transporte para usted y otros neoyorquinos. La MTA necesita información acerca de cómo viaja su familia y otros habitantes de la ciudad para mejorar el transporte en la región. Este estudio es parte del estudio de viajes de Nueva York.*

The information you provide will remain confidential and will not be used to identify you or your household. We will use the information to help the MTA better understand the travel needs of New Yorkers, improve transportation in the region, and help prioritize transportation improvements in the region. This survey is part of the NYC Travel Study.

To show our appreciation, **your household will receive a \$15 gift card and a chance to win a 30-day unlimited MetroCard as a thanks for completing the travel diary!**

**HERE'S HOW YOU CAN PARTICIPATE IN THREE EASY STEPS:**

**STEP 1: Tell us about your household and your typical travel.**

Go online and use your unique password:

Study website: <https://rsgresearch.com/nyc>

Password:

**STEP 2: Get assigned a specific time period to fill out a "travel diary" during that time.**

**STEP 3: Complete the survey in one of three ways:**

- 1) Return to the survey website to complete the travel diary online
- 2) Call the toll-free number to speak to a trained interviewer who will help you complete the survey
- 3) Use a customized smartphone app that will record all your travel

The back of this letter has more details on this study and answers to Frequently Asked Questions. Visit [rsgresearch.com](https://rsgresearch.com) or call 1-844-673-6393.

**Thank you** for your participation and for helping improve transportation in the region.

Sincerely,



William Wheeler  
MTA Director, Special Projects Development & Planning

**Secure study website: [rsgresearch.com/nyc](https://rsgresearch.com/nyc) Email: [nyc@rsgresearch.com](mailto:nyc@rsgresearch.com) Call toll-free: 1-844-673-6393**

**¿Habla español? Visite: <https://rsgresearch.com/nyc> o llame al 1-844-673-6393 | 普通话? 请访问: <https://rsgresearch.com/nyc> 或致电 1-844-673-6393 | 한국어? 방문하시거나 전화주세요: <https://rsgresearch.com/nyc> | 其他语言? 请访问: <https://rsgresearch.com/nyc>**

**GENERAL INFORMATION**

**How was I chosen to participate?** Your household was randomly selected from all residential addresses in New York City to represent thousands of other people in your community and in the city.

**What's the NYC Travel Study all about?** The survey collects information about where, how, and why people travel around New York City for their daily activities like work, school, leisure, family responsibilities, and community commitments. We are interested in surveying all types of people and all the ways in which they travel—transit, auto, or other means—as well as those who do not travel much at all. The goal is to obtain a complete picture of travel patterns.

**Why should I participate?** The information collected during this survey will help the MTA understand transportation needs and plan for future improvements. By participating, you're helping to make sure that your needs as a New Yorker are accurately represented. Your feedback will have a large impact because your household is one of only a small number of households selected to participate.

**What do I receive for participating?** As our thanks for your time, your household will receive a \$15 gift card and a chance to win a 30-day unlimited MetroCard for completing the travel diary.

**Who is conducting the survey?** MTA has partnered with RSG to conduct this survey. RSG has been in business since 1986 and has conducted many similar surveys across the country to help measure and analyze travel data and help agencies like the MTA improve the quality of life for residents in its service region.

**How will the survey results be used?** This survey will help MTA prioritize transportation improvements. For example, the results of the survey will help answer questions such as "What are the busiest times for traveling and what are the most common reasons for making trips?" or "How can the MTA best improve the mobility of New Yorkers?" or "How can the MTA improve linkages between its services and other modes?"

**What if I don't use transit or travel often?** We are interested in how all New Yorkers get around the city. Your choices as an infrequent traveler who doesn't use transit are just as important as the choices of people who do use transit and travel often. We only request that you report what actually happens on your assigned travel date(s). This means you should report any trips taken regardless of mode (e.g., walk, bike, or transit). And if you don't travel, then you don't report any trips.

**What if my travel on my assigned date isn't "typical?"** Should I still participate in the survey? Yes! This survey seeks an accurate snapshot of how you travel on your assigned travel date(s). The survey will also inquire about how you typically travel around the region.

**How is my personal privacy protected?** Your information is strictly confidential and no personal information will be associated with you. Your information will be grouped with travel data from other households and will not be analyzed individually. The data gathered will not be sold or used for any purpose other than the needs of this project. The privacy policy for this survey is available at <https://rsgresearch.com/nyc>.

**HOW TO PARTICIPATE**

**Why is my household being assigned a specific travel date?** All individuals in your household are being asked to provide information about any trips taken on their specific travel date(s). Assigning specific dates helps us obtain a complete picture of all the travel that happens across the region on each day (even if it is not a "typical" travel day).

**What kinds of questions will I be asked?** You will be asked to recall your trips and all the places you traveled to during your assigned travel date(s). You will also be asked about what means of transportation you used, why you were traveling to those locations, whether you transferred, what choices or alternatives you had when traveling, etc.

**What is a trip?** A trip is defined as traveling from one location to another location. Stopping at any location—such as a coffee shop, gas station, bank, or ATM—counts as a separate trip.

**If you go out and return to the same place without stopping (e.g., jog, bike ride, or leisurely drive), then this counts as two trips.**

**What are some examples of trips?**

- Taking the subway to work
- Driving to a doctor's appointment
- Dropping your child off at school
- Walking your dog
- Walking your child to a neighbor's
- Biking to the grocery store
- Riding the bus to the bank
- Carpooling to a meeting

**Should school-age family members participate?** We think everyone's travel is important and are asking that you keep track of, and report, trips made by any school age members who live in your household. Trips to and from school, sports, play dates, and other activities help reveal how the transportation system is being used and how it can be improved.

**Who should be counted as a member of my household?** Everyone who lives in a dwelling unit and shares a kitchen is a part of the same household, including family and non-family members.

**What if I am invited to participate using the smartphone app?** Some households with compatible smartphones will be invited to participate in the survey using the smartphone app, rMove™ (<https://rmove.rsginc.com/>). Once installed on your phone, rMove will automatically identify and capture your travel patterns using your smartphone's GPS capability. You will be asked a few brief questions about how and why you traveled after you stop traveling and a few questions at the end of each travel day. Answering these end-of-day travel questions will only take a few minutes.

**What if I am an employee of the MTA or any of its agencies?** If you, or someone in your household, are employed by the MTA, then you are not eligible to participate in this survey.

Source: RSG



## 2.2 EMAIL LIST

In addition to recruiting via ABS, the study team also recruited respondents via MTA's email lists and sent out approximately 70,000 email invitations to respondents who lived in the five boroughs. These email lists came from the MTA Headquarters customer panel, Metro-North Railroad (MNR), Long Island Rail Road (LIRR), and Bridges and Tunnels (B&T).

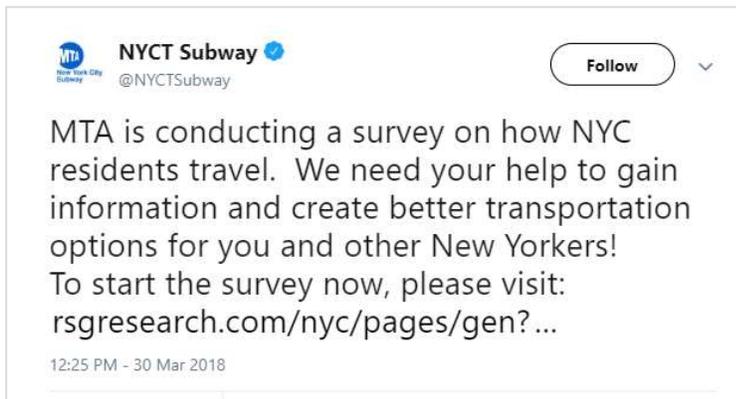
## 2.3 POSTCARD HANDOUT

The study team also recruited respondents via subway station and bus stop intercept. Those intercepted received a postcard that contained information about the study and a link and phone number they could use to take the survey. Approximately 106,000 postcards were handed out.

## 2.4 SOCIAL MEDIA

MTA posted a link to the survey on their Facebook and Twitter accounts (Figure 3).

**FIGURE 3. TWITTER POST WITH SURVEY LINK**



Source: RSG

## 3.0 SAMPLING PLAN

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The primary sampling targets were to collect travel data from respondents in 12,000 households throughout New York City and to collect at least 20,000 unlinked transit trips. The goal was to collect enough information to allow an analysis of origin-destination patterns on New York City Transit Authority subways and buses.

### 3.1 ADDRESS-BASED SAMPLING

New York City residents were sampled in each of the five boroughs using an ABS approach. The ABS sampling plan used a combination of geographic proportional sampling and targeted “upsampling” (increased invitation rates).

Upsampling was done in selected areas where higher proportions of hard-to-reach households (e.g., those typically underrepresented in household travel surveys, including low-income, minority, or non-native-English-speaking households) were identified. Based on the ABS response in the pretest (discussed more in Section 5.0), Census Block Groups (CBGs) with higher numbers of non-native-English-speaking households and low-income households, defined as having an annual household income under \$35,000, were considered “hard-to-reach” and were upsampled.

To identify CBGs with high proportions of non-native-English-speaking and low-income households, the study team used an index based on the percentages of each type of household in the CBG. This way, CBGs with high proportions of low-income or non-native-English-speaking households, as well as households with higher-than-average proportions of *both* types, were included. The study team tested this definition of hard-to-reach households, and determined approximate response rates, using the response data from the pretest.

The study team included the top third of households, as ranked by the index described above, in the hard-to-reach group. New York City has a total of 6,216 CBGs with permanent residents, meaning that 2,072 CBGs had been classified as hard-to-reach. The study team sampled hard-to-reach CBGs at twice the rate of CBGs in the regular group. This sampling rate still resulted in fewer of the hard-to-reach households than there are in the population, but the “upsampling” provided a good base of respondents to be able to weight/expand to be population proportional during analysis.

Table 1 shows the number of households, number of invitations, and estimated, or expected response rates, in both the “hard-to-reach” and “regular” sampling groups. Table 2 shows the number of invitations sent to each of the sampling groups by borough.



**TABLE 1. ESTIMATED RESPONSE RATES, BY RESPONSE GROUP**

GROUP	TOTAL HOUSEHOLDS	NUMBER OF INVITES TO SEND	ESTIMATED RESPONSE RATE	ESTIMATED NUMBER OF UNIQUE HOUSEHOLDS
Hard-to-Reach group	1,017,748	117,500	1.1%	1,331
Regular group	2,095,787	117,500	3.3%	3,928
<b>Overall</b>	<b>3,113,535</b>	<b>235,000</b>	<b>2.2%</b>	<b>5,259</b>

Source: RSG

**TABLE 2. INVITES AND EXPECTED UNIQUE HOUSEHOLDS, BY BOROUGH**

BOROUGH	TOTAL HOUSEHOLDS	APPROX. REGULAR GROUP INVITES	APPROX. HARD-TO-REACH GROUP INVITES	APPROX. TOTAL INVITES	ESTIMATED NUMBER OF HOUSEHOLDS
Bronx	484,902	11,231	40,850	52,081	838
Brooklyn	931,786	39,138	37,105	76,244	1,729
Manhattan	750,419	23,540	13,844	37,383	944
Queens	780,644	35,480	24,566	60,046	1,464
Staten Island	165,784	8,111	1,135	9,246	284
<b>Overall</b>	<b>3,113,535</b>	<b>117,500</b>	<b>117,500</b>	<b>235,000</b>	<b>5,259</b>

Source: RSG

## 3.2 MTA ONLINE PANELS

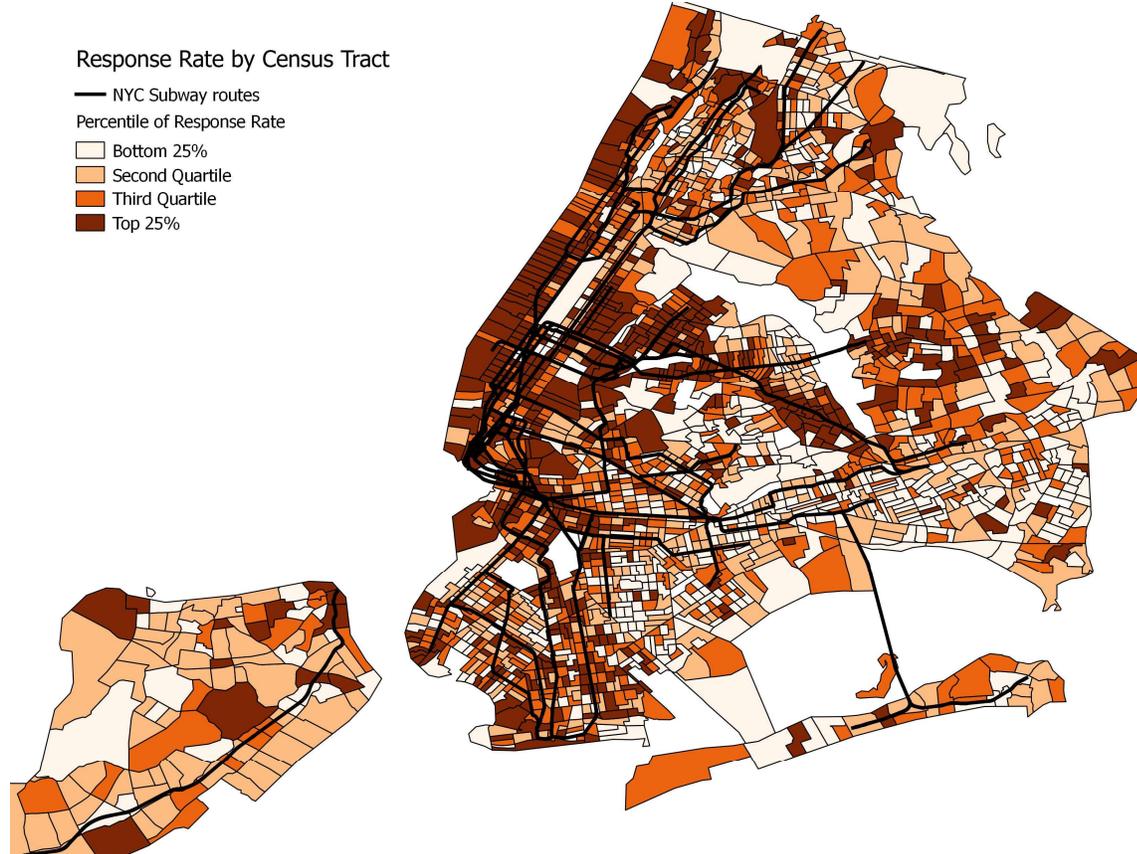
The study team gathered approximately 70,000 customer emails from the MTA. Each of the people on this list had either signed up for MTA Headquarters' customer panel or agreed to participate in future research when taking another MTA survey. The lists were screened for ZIP Codes within the five boroughs so that only New York City residents would be invited.

## 3.3 POSTCARD HANDOUT

In May 2018, the study team distributed postcards to riders at a select group of subway stations and bus stops to gain more respondents from certain underrepresented geographic locations. The study team selected the station/stops by identifying areas in which the ABS and email list samples had fewer completes per person in the population by census tract (Figure 4). The study team conducted this analysis *after* the ABS and email sample had been in the field for approximately two months to identify gaps in the sample. This information was then overlaid with the subway station map to help select stations (Figure 5). The study team sampled 28

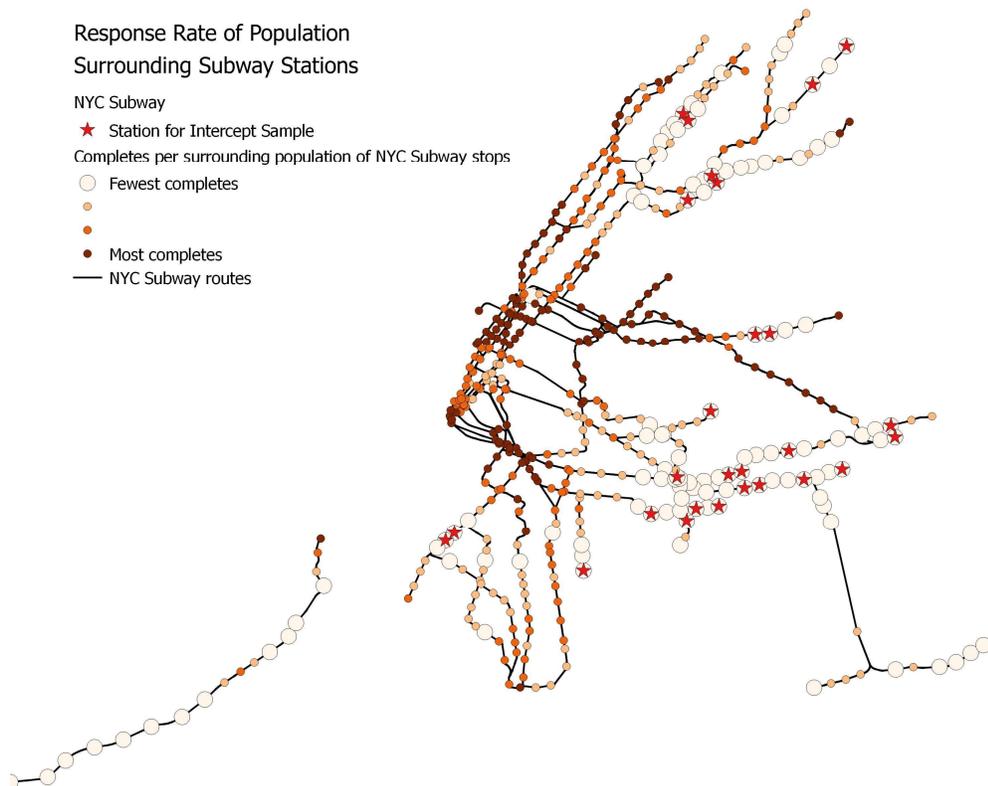
subway stations and 15 express bus stops (Table 3) and distributed approximately 106,000 postcards.

**FIGURE 4. COMPLETES, BY CENSUS TRACT (DARKER=MORE COMPLETES FROM ABS AND EMAIL SAMPLE)**



Source: RSG

**FIGURE 5. MAP OF COMPLETED SURVEYS PER POPULATION, BY SUBWAY STATION**



Source: RSG

**TABLE 3. SAMPLED SUBWAY STATIONS AND EXPRESS BUS STOPS**

STOP NAME	ROUTE/LINE	POSTCARDS DISTRIBUTED
<b>SUBWAY STATIONS</b>		
Eastchester–Dyre Avenue	5	1,700
East 149th Street	6	2,000
Burnside Avenue	4	3,600
Tremont Avenue	B, D	3,700
Gun Hill Road	5	4,700
Simpson Street	2, 5	3,500
Hunts Point Avenue	6	4,400
225 Street	2, 5	2,000
Parkchester	6	4,200
New Lots Avenue	3	3,900
Flatbush Avenue–Brooklyn College	2, 5	4,400
Euclid Avenue	A, C	4,400

STOP NAME	ROUTE/LINE	POSTCARDS DISTRIBUTED
Pennsylvania Avenue	3	3,700
Saratoga Avenue	3	5,100
St. George	SIR	2,700
Myrtle–Wyckoff Avenues	L	4,400
Crescent Street	J, Z	1,400
45th Street	R	4,300
Broadway Junction	J, Z	5,800
Church Avenue	B, Q	4,400
Middle Village–Metropolitan Avenue	M	2,200
Ozone Park–Lefferts Boulevard	A	4,100
103rd Street–Corona Plaza	7	4,400
Rockaway Boulevard	A	3,800
Woodhaven Boulevard	J, Z	1,700
Parsons Boulevard	F	3,300
Junction Boulevard	7	4,400
Jamaica Center–Parsons/Archer	E, J, Z	5,200
<b>BUS STOPS</b>		
East 57th Street/3rd Avenue	QM15, QM16, QM17, QM18, QM21	300
East 57th Street/Lexington Avenue	BM1, BM2, BM5, X63, X64, X68	
Madison Avenue/East 44th Street	BxM6, BxM9	500
Madison Avenue/East 45th Street	BxM10, BxM8	
Madison Avenue/East 46th Street	BxM4	
Madison Avenue/East 44th Street	QM21	
East 34th Street/Park Avenue	BM5, QM1, QM10, QM12, QM15, QM16, QM17, QM18, QM2, QM20, QM24, QM3, QM4, QM5, QM6	50
Broadway/Rector Street (and area)	X1, X10, X11, X12, X15, X17, X17A, X19, X3, X4, X8	400
Madison Avenue/71st Street	BXM10, BXM11, BXM3, BXM4, BXM6, BXM7, BXM8, BXM9	275
Madison Avenue/East 70th Street	BxM4	
East 23rd Street/Broadway	X1, X7, X9, X12, X14, X37, X38	700
Madison Avenue/East 23rd Street	BxM9	700
Madison Avenue/East 24th Street	BxM8	
Madison Avenue/East 24th Street	BxM10	
Madison Avenue/East 24th Street	BxM6, BxM9	
<b>Overall</b>		<b>106,325</b>

Source: RSG



## 4.0 QUESTIONNAIRE

The New York City Travel Survey was a two-part survey:

1. **Recruitment survey:** collected information about the household, demographics, and assigned respondents a travel period.
2. **Travel diary:** collected information about all the trips made for the respondent's travel period.

The recruitment survey could be completed online using RSG's proprietary online survey platform (rSurvey) or via the call center, which used the same survey instrument. The travel diary could be completed via RSG's proprietary smartphone-based GPS survey app (rMove), rSurvey, or via the call center (Figure 6). All surveys were available in English, Spanish, Chinese, Haitian Creole, Korean, and Russian (the phone option was only available in English and Spanish).

**FIGURE 6. FLOW OF SURVEYS**



Source: RSG

### 4.1 RECRUITMENT SURVEY

The recruitment survey collected basic information about the household and the people in it. The respondent was asked to list all the household members and provide information about each member's age, gender, employment status, race/ethnicity, work location (if applicable), school location (if applicable), and several other questions. To ensure respondent privacy and make them feel comfortable providing information about their family, they were only required to provide initials for their family members instead of full names. They also were not required to provide the exact address for schools or work if they did not feel comfortable providing that information; approximate addresses were accepted. Figure 7, Figure 8, Figure 9, and Figure 10 show screenshots of the online recruitment survey.

The recruitment survey was available online and via phone for those who preferred to call and have an operator walk them through the survey. The call center used the same survey instrument that was shown to those completing the survey online and all data were stored in the same database. Appendix A includes the full questionnaire.

**FIGURE 7. SCREENSHOT OF LANGUAGE SELECTION PAGE**

In what language would you prefer to take the survey?

I would like to take the survey in this language: English [en]

Quiero responder la encuesta en este idioma: español (España, alfabetización internacional) [es-es]

다음 언어로 설문조사를 진행하겠습니다. 한국어(대한민국) [ko-kr]

Я хочу пройти опрос на этом языке: русский (Россия) [ru-ru]

我希望使用这种语言参与调查: 中文(中华人民共和国) [zh-cn]

Mwen ta renmen pran sondaj la nan lang sa a: français (Haïti) [fr-ht]

Source: RSG

**FIGURE 8. SCREENSHOT OF BASIC PERSON-BASED DEMOGRAPHIC QUESTIONS**

Please tell us about yourself.

Note: Primary household member must be at least 18 years old

Household member 1 of 1 member(s)

Nickname or initials

Gender

Age

Source: RSG



**FIGURE 9. SCREENSHOT OF ADDITIONAL PERSON-BASED DETAIL QUESTIONS**

We understand the answers to these questions are sensitive. This information will only be used to better understand travel patterns in NYC.  
 Your information is confidential - please [click here](#) to view our privacy policy.

Do **you** have a disability or impairment that affects your mobility?

How well do you speak and understand English?

What is the primary language you speak at home?

Were you born in the U.S.?

Are you of Hispanic, Latino, or Spanish origin?

Which of the following describes your race?  
 Please select all that apply.

- American Indian / Alaska Native
- Asian
- Black / African American
- Native Hawaiian / Pacific Islander
- White
- Other
- Prefer not to answer

Source: RSG

**FIGURE 10. SCREENSHOT OF WORK DETAILS QUESTIONS**

Please tell us about your job, how many hours you work, and how you typically commute to work.  
 If more than one job or more than one workplace, please answer for the primary job (work most hours per week).

Type of workplace location?

Number of hours typically worked per week?

Employer subsidizes or reimburses any of the following methods of commuting?  
 Please select all that apply.

- None
- Free/Subsidized Transit Fare
- Free/Subsidized Parking
- Free/Subsidized Tolls
- Free/Subsidized Vanpool
- Pre-tax contribution to transportation account
- Use of company vehicle
- Cash/incentives for carpooling, walking, or biking to work
- Other
- Don't know

Source: RSG

## 4.2 TRAVEL DIARY

At the end of the recruitment survey, respondents selected between responding to the diary via a free app, online, or by phone. The app (rMove) method and the online/call center method collected the same information from respondents; however, rMove could capture some details about trips automatically so that respondents did not have to enter/provide the details (e.g., trip start/end time, trip start/end location). The travel diary asked questions about all the trips made during the travel period, including the origin/destination locations and types, trip start/end time, trip purpose, mode(s) used, travel party size, and other details.

### rSurvey – Online/Call Center

Respondents who did not own a smartphone or were not willing to download rMove completed the survey online or by phone. They were asked to report one day of travel. The travel diary survey was available beginning the day after the respondent’s assigned travel period to ensure respondents reported end-of-day trips. Respondents had to report all the trips they made on their travel day for the survey to be considered complete. When they were done reporting trips, they were asked to confirm the list of trips and that there were no more to add. Additionally, respondents were asked to report trips for their children and other household members; alternatively, the other adult household members could fill out the diary on their own. Approximately 72% of households chose this method to report their travel. Figure 11 through Figure 13 show example screenshots of the online survey. Appendix B includes the full questionnaire.

**FIGURE 11. SCREENSHOT OF TRIP ROSTER QUESTION**

Please list, in order, all the places you went between 3:00 AM on Sunday, May 27, 2018 and 3:00 AM on Monday, May 28, 2018.

Please give a short name to each unique/different place. When all places are listed, click “Next” to continue.

Later, you will be asked to locate each place on a map.

The screenshot displays a survey interface for reporting travel. It features a list of household locations, a section for starting and ending the day, and an example travel day itinerary.

**Your Household's Locations**

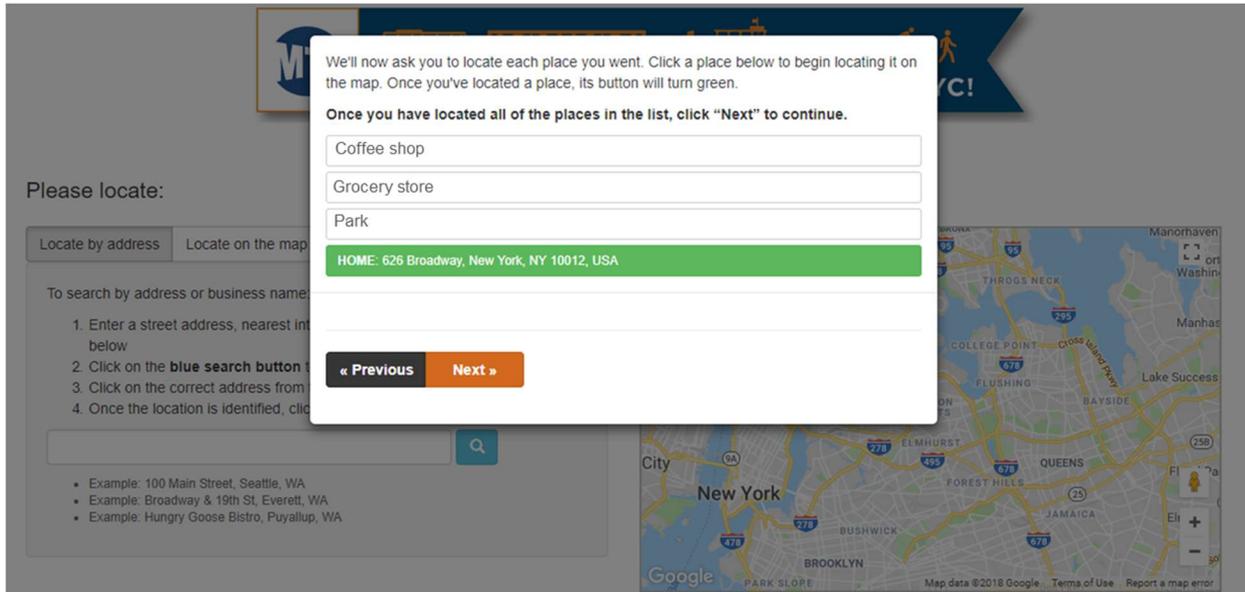
Type **HOME** for your home

**Example Travel Day**

Began the day at:	Home
Then went to:	Elementary school
Then went to:	Work
Then went to:	Bank
Then went to:	Deli
Then went to:	Work
Ended the day at:	Home

Source: RSG

FIGURE 12. SCREENSHOT OF LOCATION GEOCODER



Source: RSG

**FIGURE 13. SCREENSHOT OF TRIP DETAILS QUESTION**

Please tell us about your trip from **HOME** to **WORK**.

Time departed from **HOME**

Time arrived at **WORK**

Number of people (e.g., friends, co-workers) who traveled on trip who are **NOT** members of your household

Types of transportation used on trip  
*Please select all that apply.*

- Household vehicle
- Other vehicle
- Transit (e.g., subway, bus, commuter rail)
- Private bus or shuttle/van
- Paratransit (e.g., Access-a-Ride)
- Ferry
- Walk, jog, or wheelchair
- Bicycle (own bike)
- Citi Bike
- Vanpool
- School bus
- Amtrak
- Taxi (e.g., Yellow Cab)
- Smartphone-based ride-hailing service (e.g., Uber, Lyft)
- Shared ride smartphone-based ride-hailing service (e.g., UberPOOL, Lyft Line, Via)
- Other hired car service (e.g., black car, limo)
- Airplane or helicopter
- Other (e.g., skateboard, kayak, motor home, etc.)

Viewing trip 1 of 3 trip(s).

Your Travel Day

**Trip #1: HOME to WORK**

Trip #2: WORK to GROCERY STORE

Trip #3: GROCERY STORE to HOME

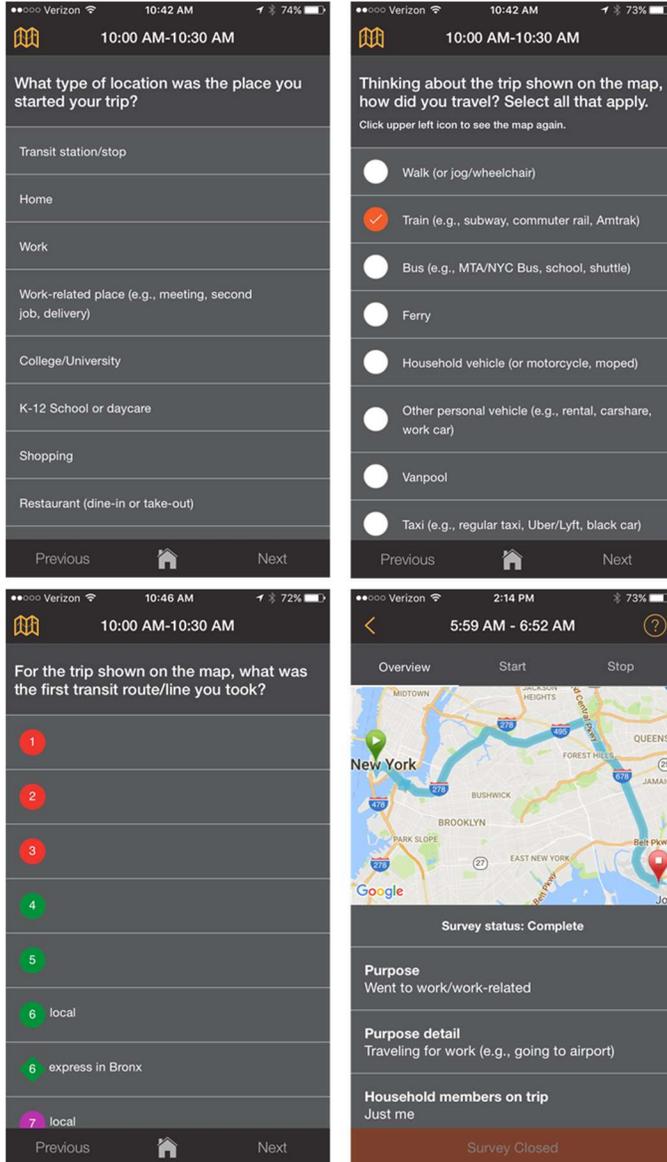
Source: RSG

## rMove - App

Respondents who chose to use the app were required to complete the rMove travel diary for at least one day but were asked to complete it for up to seven days (if they were willing). One person from each household was required to download the app and complete the surveys for one day to be considered complete. Additionally, respondents were asked to report trips for their children and ask that other adult household members also download and use the app. Approximately 28% of households chose this method to report their travel. Figure 14 shows example screenshots from the rMove survey.



FIGURE 14. EXAMPLE REMOVE SCREENSHOTS



Source: RSG

## 5.0 PRETEST

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In October 2017, the study team conducted a pretest to decide whether changes were necessary to the planned methods to successfully complete the full study. The pretest was conducted to assess the following:

- Test response rates and completion rates for the different recruitment methods and travel reporting options.
- Test the sampling plan.
- Test the overall process and materials.
- Test which incentive type provided better response rates: a \$15 gift card offered to each household when all members completed the diary or a lottery-based incentive where each household was entered in a weekly drawing to win a \$500 cash prize.
- Test the surveys to ensure they worked as intended.
- Test rMove to determine if improvements made to the app were enough to provide a good user experience in New York City.
- Test the intercept recruitment method.

The study team targeted obtaining 150 completed travel diary surveys from the ABS. In order to get this target, 3,750 surveys were mailed to New York City households with the assumption that 4% of mailed invites would result in completed diary surveys. A completed diary survey was defined as one person reporting all their travel for one day.

The ABS for the pretest comprised two groups based on likelihood of responding; the goal for each group was to better understand and anticipate response rates. The first group was comprised of CBGs identified as being less likely to respond. CBGs that were less likely to respond include those with the highest percentages of the following:

- Households earning under \$35,000 annually.
- Households in which the head of household was under 35 years old.
- Households in which a language other than English was the primary language spoken.

The second group was comprised of all remaining households. The pretest results helped the study team devise a more efficient sampling plan for the full survey.

The study team also randomly divided recruits into two groups based on incentive type. One group received a direct incentive and the other group received a lottery incentive. Ultimately, this methodology produced four sample groups: low-response lottery, low-response direct incentive, normal-response lottery, and normal-response direct incentive.

Additionally, the study team conducted a small intercept recruit pretest at the Queensboro Plaza (N, Q, 7) subway station in Queens on October 2, 2017 and the East 149th Street (2, 4, 5) subway station in the Bronx on October 3, 2017. At each station, two surveyors recruited riders on the platforms from 6:00 a.m. to 8:00 p.m. For the pretest, surveyors attempted to recruit respondents to download rMove while at the station. The pretest tested the effectiveness of the method and helped the study team prepare more effective training materials for those in field. This effort was separate from the ABS pretest and did not factor into the goal of 150 pretest respondents.

## 5.1 PRETEST RESULTS

### Address-Based Sample

The study team observed that pretest response/completion rates were lower than expected, with just 69 completed diary surveys (1.7%) coming from unique households obtained from the ABS instead of the targeted 150 surveys (4%). A completed diary survey was defined as one person in a unique household reporting their travel for one day; if two people from the same household completed the survey, they were only counted once toward the total. Additionally, the study team found that the households from CBGs that were categorized as “hard-to-reach” due to having members under 35 years of age were more likely to respond to the recruit survey as well as complete the diary survey (Table 4). Meanwhile, the households categorized as “hard-to-reach” due to being in CBGs with more non-native-English speakers and lower-income households were less likely than average to complete the surveys.

**TABLE 4. PRETEST RESPONSE RATES BY RESPONSE GROUP**

RESPONSE GROUP	RECRUIT RESPONSE RATE	DIARY RESPONSE RATE
Overall	4.9%	1.7%
Standard Response Group	4.8%	1.8%
Hard-to-Reach Group	5.0%	1.6%
Limited English Proficiency	3.9%	0.9%
Income < \$35,000	3.8%	1.0%
Under 35 years old	6.3%	2.2%

### Intercept

The intercept effort recruited 370 respondents and obtained completed travel diaries from 28 unique households. Recruitment was relatively successful; however, because a low number of completed households resulted from the effort, it was necessary to alter the method for the full field (as described in Section 5.2).

## Incentives

In terms of the incentive type, the direct \$15 gift card had a better response rate (2.0%) than the lottery-based incentive (1.3% response rate). Section 5.2 describes the adjustments the study team made to the survey methods following the pretest.

## 5.2 ADJUSTMENTS MADE AFTER PRETEST

After analyzing the results of the pretest, several adjustments were made to the survey methodology to improve response rates.

### Recruitment

#### *Address-Based Sample*

During the pretest, the reminder postcard went out two days after the invitation letter. However, after the pretest, the reminder postcard was delayed and went out five days after the invitation letter. This change meant the postcard served as both a reminder to take the recruit survey, if it had not already been completed, and a reminder to take the diary survey closer to the travel dates.

Additionally, after the pretest, the study team noted there was too much time (six days) between the recruitment survey and the travel dates for the online/phone rSurvey respondents. The study team suggested reducing this to three days so respondents did not forget about the study. This change allowed enough time for the entire household to be informed of the travel date and reduced the amount of time between the recruit survey and travel date/diary.

#### *Intercept Recruit*

After the pretest, the study team realized surveyors could maximize their time by handing out postcards rather than asking people to download the rMove app while at a subway station or bus stop. This method was tested in March 2018 to confirm that more completed surveys would result from the postcard handout than having to guide people through downloading rMove at the station/stop. Based on the number of completed surveys that could be obtained per surveyor hour in the field, the revised method was shown to be more effective than the original intercept method and the study team implemented the postcard handout for the full field.

#### *rMove*

After the pretest, the study team concluded that assigning or requiring people with qualifying smartphones to download and use the rMove app for seven days was too onerous. Therefore, the study team changed the recruitment process to allow respondents to choose whether to respond via app, online, or phone (call center). Additionally, the study team relaxed the requirement to complete seven days and modified the recruitment materials accordingly (i.e.,

only one person in a household needed to complete the travel diary for one day to qualify for the incentive). Respondents were still encouraged to have others in their household participate and to complete more than one day.

## Incentives

As noted, the direct gift card incentive in the pretest resulted in a response rate nearly twice as high as the lottery-based incentive. The study team estimated that if the lottery-based incentive were used for the full study, the costs associated with mailing extra recruit invitations (printing, postage, and address purchases), would far outweighed any savings achieved by forgoing the gift card incentives. Therefore, the study team recommended using a \$15 gift card for the full field effort, as it was ultimately less costly and produced better response rates for a higher-quality survey. Additionally, a drawing for a 30-day Unlimited MetroCard (20 were available) was included as an added incentive for the full survey (though this was not tested during the pretest).

## Sampling Plan

Based on the pretest, the study team recommended removing the “under 35 years old” criterion for the hard-to-reach household definition since this group responded at a higher-than-average rate. This change allowed the study team to target invites to non-native-English-speaking and lower-income households, both of which had lower-than-average responses to the survey. Previously, more invites than necessary were targeted for CBGs in Manhattan, which otherwise would not have qualified to receive as many invitations if only based on the low-income and non-native-English-speaking criteria but were included because of the age criteria. As a result of the pretest, fewer invites went to Manhattan households and more went to the households in other boroughs to obtain responses from these harder-to-reach households.

## Questionnaires

Respondents did not contact the study team with questions or problems related to the survey wording or functionality, and the study team reviewed the survey data and found the responses tended to be logical. Therefore, given their performance, the study team recommended that the recruit and travel diary questionnaires remain unchanged after the pretest. The study team did not make any changes to the rMove app after the pretest.

## 6.0 RESPONSE RATES

The survey was fielded between March and June 2018 and recruited respondents from approximately 14,500 households to participate in the New York City Travel Survey, which exceeded the target of 12,000 households. The number of unlinked transit trips also exceeded the goal of 20,000 trips, with nearly 66,000 trips collected. Just over 8,000 households were recruited via ABS, with approximately 4,300 recruited via MTA's email-based customer panel, 1,800 recruited through the intercept postcard handout, and nearly 300 recruited via social media. A complete survey was defined as at least one member of a household completing at least one full day of surveys.

The survey's overall response rate was approximately 3.5%, and the highest response rates were from participants recruited via MTA's email lists. The ABS sample comprised over one-half of the total number of completed households, and the email list sample accounted for approximately 30% of the completed households. The remaining households came from the postcard and social media recruitment efforts. Table 5 shows the response rates by recruit type.

**TABLE 5. RESPONSE RATES, BY RECRUIT TYPE**

RECRUIT TYPE	# INVITATIONS	# COMPLETED HOUSEHOLDS	RESPONSE RATE
Address-based	235,000	8,004	3.4%
Email list	70,464	4,330	6.1%
Postcard	106,000	1,803	1.7%
Social media	n/a	279	--
<b>Overall</b>	<b>411,464</b>	<b>14,416</b>	<b>3.5%</b>

Source: RSG

Table 6 shows the number of completed surveys sorted by recruit type for rSurvey and rMove; the table also shows the number of trips reported by each segment. About 5% of the households completed the survey through the call center.

**TABLE 6. COMPLETED SURVEYS AND RESULTING NUMBER OF TRIPS (UNWEIGHTED), BY RECRUIT METHOD AND SURVEY TYPE**

RECRUIT TYPE	NUMBER OF COMPLETED HOUSEHOLDS			NUMBER OF TRIPS (UNWEIGHTED)		
	RMOVE	RSURVEY	# COMPLETED HOUSEHOLDS	RMOVE	RSURVEY	# COMPLETED HOUSEHOLDS
Address-based	2,245	5,759	8,004	45,779	29,645	75,424
MTA email list	1,362	2,968	4,330	28,749	15,087	43,836
Postcard	430	1,373	1,803	7,975	6,252	14,227
Social media	0	279	279	0	1,416	1,416
<b>Overall</b>	<b>4,037</b>	<b>10,379</b>	<b>14,416</b>	<b>82,503</b>	<b>52,400</b>	<b>134,903</b>

Source: RSG

## 7.0 DATA CLEANING

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### 7.1 DATASET OVERVIEW

Households in the MTA New York City Travel Survey completed the travel diary in one of two ways. These methods included using the rMove app for up to seven days, or completing the survey online or via phone (call center) for one day. The dataset deliverable includes respondents from both data collection methods.

### 7.2 DATASET INCLUSION CRITERIA

To be included in the final dataset, a household needed to have had one person complete at least one day of the travel diary (via rMove or rSurvey). In order for a trip to be included in the dataset, it had to be made on a day in which the person completed all surveys. This is primarily relevant for rMove trips where the app could have recorded trips for a day but the respondent may not have completed the surveys associated with the trips, so they would not be included in the dataset.

### 7.3 DATASET STRUCTURE

Data was collected about individuals, households, and their travel. These data came from one of four possible sources:

- Recruit survey – individual and household characteristics
- Online/call center diary via rSurvey – daily travel for one day
- App via rMove – daily travel for up to seven days
- Derived from recruit or rMove data (e.g., trip distance)

These data were combined to create six datasets:

- Household
- Person
- Vehicle
- Day
- Unlinked trips
- Linked trips

The household-, person-, and vehicle-level datasets are primarily comprised of data from the recruit survey. The household- and person-level datasets include some high-level derived trip totals like total number of trips per person.

The day-level dataset includes answers to the rMove daily survey and other basic information about the travel day, including day of the week and total number of trips.

The linked trip-level dataset includes start and end times and locations of each trip and answers to the trip survey (e.g., mode[s] used, trip purpose). The unlinked trip-level dataset has a separate *row* for each link of transit trip (including access, all routes used, and egress), while the linked trip-level dataset includes *variables* for access and egress mode and all routes used.

All datasets include pertinent ID numbers from higher-level datasets so that the datasets can be easily merged, as needed (e.g., a household ID).

Table 7 summarizes the data in each of the six datasets.

**TABLE 7. DATASET SUMMARY**

DATASET NAME	WHAT DOES DATASET CONTAIN?	WHAT DOES ONE ROW REPRESENT?
<b>Household</b>	All household-level variables from the recruit survey (e.g., hh size, hh income)	A household
<b>Person</b>	All person-level variables from the recruit survey (e.g., age, gender, employment)	A person (a household could have multiple rows – one for each household member)
<b>Vehicle</b>	All vehicle-level variables from the recruit survey (e.g., toll payment method)	A vehicle (a household could have multiple rows – one for each household vehicle)
<b>Day</b>	General information from the day of the diary (e.g., where day started/ended, why respondent did not make any trips)	A day (therefore a household and person would have multiple rows – one for each household member for each day)
<b>Unlinked</b>	All the information from the diary survey related to trips (e.g., mode, start/end time, start/end location, trip purpose)	An unlinked trip (numerous rows per household/person – each row is a link in a trip; a transit trip with a transfer would have two rows – one for each transit route used)
<b>Linked</b>	All the information from the diary survey related to trips (e.g., mode, start/end time, start/end location, trip purpose)	A linked trip (numerous rows per household/person – each row is a trip from start to finish; a transit trip with a transfer would be just one row)

Source: RSG



## 7.4 RMOVE DATA PREPARATION

Since rMove collected up to 7 days of data for a household, it made up a larger proportion of trips in the dataset than rSurvey data (despite having fewer households use the app), as can be seen in Table 6 in previous section. Data collected via rMove and rSurvey required different data processing because they collect data in very different ways. This section provides an overview of the data preparation for the rMove data for completed households. These tasks were all conducted using RSG’s in-house tools, which combine automated processes and analyst review.

Trips collected by rMove were made up of a series of location traces collected every few seconds while a respondent was moving. Each location trace included information about location (latitude and longitude), accuracy (quality of the location information), speed (how fast the respondent was moving), and a timestamp.

### Reviewed and Removed Inaccurate Location Points

The location dataset included inaccurate GPS points that the study team removed from the dataset as a batch using a cleaning tool that has been tested and refined on prior rMove studies and is considered standard practice. These inaccurate GPS data points included points with unrecorded speed data (typically cases where the device briefly lost a consistent GPS signal and recorded errant points based on only cellular service or Wi-Fi towers) and points where the accuracy score recorded by the rMove was below a certain threshold (determined by testing on many previous rMove studies and on the testing period in New York City). When removing these inaccurate location data points, the study team retained the ultimate origin and destination points even if they fit the “deletion criteria” to ensure each trip had some geographic data.

### Reviewed and Removed Spurious Trips

The study team removed spurious trips (i.e., “trips” where no actual travel took place) from the dataset. These “trips” were usually captured when the smartphone was indoors and the GPS sensor was trying to acquire a location fix. Continual rMove enhancements reduced the incidence of these trips, but some spurious trips still occurred. The study team used user error reporting (the first question of each trip survey which asked if the trip appeared correctly) and the geospatial profile of the trip to review and remove spurious trips. These trips were removed through a combination of automated scripts and visual inspection by an analyst.

### Reviewed and Corrected Merged and Split Trips

The study team further checked trips that were split or merged by the respondent in the app. This was done by visual inspection by an analyst. When an analyst noticed that a split trip should not have been split, then the analyst merged the trips together. An example of this is where the speed captured at the location points near the end of the trip did not indicate a stop.

Analysts also reviewed trips that were merged by the respondent. When an analyst noticed that the original two (or more) legs of a merged trip seem to be distinct stops, then the analyst split the merged trip at the respective geographic stops. This includes things like an obvious stop at a gas station or corner store, when the timestamps of adjacent points indicated a stop was made at the location or when the speed recorded at the merged points indicated that the trip had ended.

## **Reviewed and Corrected Trips that Should Have Been Split or Merged**

When an analyst noticed an obvious “stop” on a trip that was not merged by the respondent, the analyst split that trip at the geographic point when the stop appeared to have been made. This includes things like an obvious stop at a gas station or corner store, when the timestamps of adjacent points indicated a stop was made at the location or when the speed recorded at the merged points indicated that the trip had ended. These stopping points can be discovered through visual inspection when many location points are grouped together. The survey answers from the original trip were applied to the two resulting trips.

When an analyst noticed two trips that likely should have been merged, the analyst merged those trips into one trip. In New York City, this frequently happened when subway trips were split because of lost signals underground. The analyst chose the survey answers that best represented the final merged trip.

## **Derived Child/Minor Trips**

When a child was reported as being on a trip with an adult household member using rMove, the study team derived this as a separate trip in the child’s record. This was accomplished using an automated script. In cases where more than one adult reported the same child on a trip at the same time(s), duplicate or overlapping trips were removed so that child trip records had no time inconsistencies.

## **7.5 TRANSIT PATH CLEANING**

The study team ensured that the final dataset included the most complete and correct transit route information possible. This included all transit routes used during a trip, as well as access and egress information, boardings, alightings, and transfer stops. Through automated processes and analyst review, the study team checked the following for each trip that included at least one transit component in the rMove and rSurvey online survey databases:

- Transit trips were grouped with an access and an egress leg.
- Transit route legs started and stopped at a transit station.
- Transit routes were plausible based on rMove location traces (if applicable).
- Transit routes were in the correct order.



- Board, alight, and transfer stops were plausible based on rMove location traces (if applicable) and the transit network.

## rMove Transit Path-Cleaning Process

For rMove, since respondents' location data was collected via an app on their smartphone, the path-cleaning process compared the respondents' rMove survey answers with the location traces and the actual transit network. If the survey answers did not align with the actual trip location and the transit network, the analyst corrected the transit path using a systematic process which included the following steps:

- An algorithm pinged Google directions and returned the top four transit routes between the start and end of each trip indicated by the respondent as a transit trip (excluding trips with automobile access or egress).
- These four options were displayed on a map with the rMove location traces.
- If one of the options aligned with the rMove location traces and the survey answers, an analyst chose that trip.
  - For the unlinked dataset, transit legs were then split at board, transfer, and alight stations, thereby creating a separate leg for each transit route.
- Similarly, if several options aligned with rMove location traces, the analyst chose the trip that lined up with the survey answers.
- If none of the options aligned with the location traces or the survey answers, and the analyst did not split or merge the trip, then these trips were examined in the rSurvey path-cleaning tool (see following section).

## rSurvey Transit Path-Cleaning Process

For the rSurvey data, the path-cleaning process compared respondents' reported origin, destination, board, and alight locations (and the routes they entered in the survey) with the transit network. In case of discrepancies, analysts could change the routes to align with the transit network. If, after review, the transit path was still unclear, the analyst flagged these trips as "Uncertain."

An analyst inspected rSurvey transit trips using a tool that displayed the origin, destination, board, and alight stops on a map as entered in the survey. It also displayed all transit routes entered in the trip survey. Analysts made the following changes to records to make sure that the trip made geographic sense and aligned with the mode details entered in the survey:

- Location of board and alight stops.
- Transit routes used and order of transit routes used.

An analyst might have made changes if any of the following were observed:

- Board and alight stop locations needed to be switched to align with origin and destination locations.
- Board or alight stops were listed as “Other” in the survey.
- Board or alight stops were in locations that did not make sense with the rest of the survey data.
- Board and alight stop locations were in the same place.
- Routes entered in the survey followed the same path (e.g., a person entered two routes that they could have taken).

Transit trips that were not able to be confidently verified after analyst review were flagged as “Uncertain.” These trips had one or more pieces of transit route data (transit line, board, alight or transfer stop) that did not necessarily align with possible transit trips, primarily due to irreconcilable or inconsistent information provided by the respondent. Transit records flagged as “Uncertain” may still be used for aggregate analysis, but should not be used for specific stop-level, route-level or related analyses.

## 7.6 COMBINE ONLINE DIARY DATA WITH RMOVE DATA

The study team combined the rMove app collected data and the rSurvey online/phone data to create the final dataset. This work required some data processing to the online diary data before it could be combined with rMove data. This included aligning variables and ensuring they were consistently coded. Variables in the online diary that did not exist in rMove were NULL for rMove trips, and vice versa.

## 7.7 RECODED VARIABLES

### Trip Purpose Variables

The linked trip file includes several variables related to trip purpose, including:

- Origin type - the type of location a respondent started their trip from (orig\_type).
- Destination type - the type of location a respondent was going to in the trip shown on the map (dest\_type). This is the ultimate trip destination in the linked file.
- Trip Purpose –several home-based (trips starting or ending at home) or non-home based categories (purpose).



- Tour Purpose - recoded from origin/destination types to get the main purpose of each tour, or series of trips starting and ending at home (tour\_purpose).
- The origin and destination location types come directly from the trip surveys and indicate the type of place the respondent was coming from or going to on that specific trip. The purpose variables are derived from these locations and explain the reason for each trip.
- The trip purpose variable is based only on the origin and destination location type of each linked trip. The coding procedure for the trip purpose variable is described in Table 8.

**TABLE 8. CODING PROCEDURE FOR “PURPOSE” VARIABLE**

PURPOSE		CODING	
Home-based work	Origin is Home and destination is Work or Work-related place	or	Destination is Home and origin is Work or Work-related place
Home-based school	Origin is Home and destination is School	or	Destination is Home and origin is School
Home-based shopping	Origin is Home and destination is Shopping or Errands/Personal Business	or	Destination is Home and origin is Shopping or Errands/Personal Business
Home-based social/recreation	Origin is Home and destination is Recreation or Friend/Family member's house	or	Destination is Home and origin is Recreation or Friend/Family member's house
Home-based other	Origin is Home and destination is anything else	or	Destination is Home and origin is anything else
Non-home-based	Both Origin and Destination are not Home		

Source: RSG

The tour purpose variable explains the overarching purpose of travel and is meant to describe the main reason for leaving home on a series of trips. This variable is mainly used to identify commuting trips that have some kind of stop in the middle, for example dropping a child off at daycare on the way to work, or stopping for coffee on the way to work. For example, if a respondent started at home, stopped for coffee, then went to work and then traveled home these would be listed as three trips in the database. The tour purpose variable assigns all three a purpose of work since that was the overarching reason for travel. The variable is based on the purpose of home-based tours (a series of trips starting and ending at home) and work-based tours (a series of trips starting and ending at work). The tour purpose variable coding procedure is described in Table 9.

**TABLE 9. CODING PROCEDURE FOR THE TOUR PURPOSE VARIABLE**

STEP	DESCRIPTION	DETAILS
<b>Step 1</b>	Assign each trip into a "Home-based tour"	Home-based tours are a series of trips that start and end at home, or at the beginning or end of each day if the respondent is not home at that time. All trips are assigned into a home-based tour.
<b>Step 2</b>	Assign a purpose to each Home-Based Tour	<p>Choose tour purpose based on all destination types of trips in the tour with the following hierarchy:</p> <ul style="list-style-type: none"> <li>• Work</li> <li>• Work-related place</li> <li>• College/University</li> <li>• K-12 School or daycare</li> <li>• Shopping</li> <li>• Restaurant</li> <li>• Doctor/Medical</li> <li>• Errands or personal business</li> <li>• Recreation</li> <li>• Friend/Family member's house</li> <li>• Religious</li> <li>• Airport</li> <li>• Other</li> </ul>
<b>Step 3</b>	Identify "Work-based subtours"	"Work-based subtours" are fully contained within a "Home-based tour" and start and end at Work.
<b>Step 4</b>	Assign a purpose to each Work-based Subtour	<p>Choose Work-based subtour purpose based on all destination types of trips in the work-based subtour using the following hierarchy:</p> <ul style="list-style-type: none"> <li>• Work-related place</li> <li>• College/University</li> <li>• K-12 School or daycare</li> <li>• Shopping</li> <li>• Restaurant</li> <li>• Doctor/Medical</li> <li>• Errands or personal business</li> <li>• Recreation</li> <li>• Friend/Family member's house</li> <li>• Religious</li> <li>• Airport</li> <li>• Other</li> </ul>



STEP	DESCRIPTION	DETAILS
Step 5	Assign a "Tour Purpose" to each trip based on the work-based subtour and home-based tour purposes	<ul style="list-style-type: none"> <li>• For trips not in a work-based subtour                             <ul style="list-style-type: none"> <li>○ If home-based tour purpose is not work, then destination type</li> <li>○ If home-based tour purpose is not work and destination type is home or missing, then home-based tour purpose.</li> <li>○ If home-based tour purpose is work, then work.</li> </ul> </li> <li>• For trips within Work-Based Subtours:                             <ul style="list-style-type: none"> <li>○ If destination type is work, then work-based subtour purpose.</li> <li>○ If destination type is not work, then trip tour purpose is the destination type.</li> <li>○ If destination type is home or missing, then work-based subtour purpose</li> </ul> </li> <li>• For all trips                             <ul style="list-style-type: none"> <li>○ If there was more than a 30-minute break between a trip and the following trip and destination is not work or home, then destination type</li> </ul> </li> </ul>

Source: RSG

## Fare Payment Variables

The fare type variables found in the linked file (nyct\_fare and rail\_fare) are imputed at the trip level based on the answers in the recruit survey about the “most frequently used transit fare types.” This was done because it was assumed most riders use the same ticket type for all their trips on a given day or week and therefore asking the question on the survey for every trip throughout the duration of the study would be repetitive and frustrating for respondents.

This question was not asked of people who said they took 1-3 transit trips per month or less, or of people who were under 5 years old; because of this, some trips are missing a fare type. Two separate fare type variables exist: one for New York City Transit (NYCT) trips and one for commuter rail (LIRR/MNR) trips. Each is calculated separately. If a respondent only indicated one of those fares, then that is simply used as the trip fare. If a respondent indicated more than one of those fares, then a hierarchy was used to determine the trip fare (detailed in Table 10 and Table 11). Trips that include both commuter rail and NYCT trips have a value in both of the fare variables. The fare type used on the NYCT mode is stored in the NYCT fare variable and the fare type used on the commuter rail is stored in the commuter rail fare variable.

**TABLE 10. TRIP-LEVEL FARE PAYMENT METHOD: NYCT SUBWAY, LOCAL BUS AND EXPRESS BUS, AND ROOSEVELT ISLAND TRAM (NYCT\_FARE)**

TRIP TYPE	# OF FARES INDICATED AS "TYPICAL" FARES USED	POSSIBLE FARES	RESULT
Subway, Bus, Express Bus, Roosevelt Island Tram	No fare types reported	Pay-per-ride Single Ride Cash 30-day 7-day 7-day express	Missing if missing in person file "Other" if indicated "Don't Know" if indicated "Don't Know," if neither indicated
Subway, Bus, Express Bus, Roosevelt Island Tram	1 fare type reported	Pay-per-ride Single Ride Cash 30-day 7-day 7-day express	Use the (NYCT) fare indicated for this trip
Subway, Bus, Roosevelt Island Tram,	>1 fare type reported	Pay-per-ride Single Ride Cash 30-day 7-day 7-day express	<b>Assign with this hierarchy:</b> 30-day 7-day 7-day express Pay-per-ride Single ride ticket Cash
Express Bus	>1 fare type reported	Pay-per-ride Single Ride Cash 30-day 7-day 7-day express	<b>Assign with this hierarchy:</b> 7-day express Pay-per-ride Cash Single ride ticket 7-day 30-day

Source: RSG



**TABLE 11. TRIP-LEVEL FARE PAYMENT METHOD: LIRR/MNR (RAIL\_FARE)**

NUMBER OF FARES INDICATED	POSSIBLE FARES	THEN
0 fare types reported	Monthly LIRR/MNR Unlimited Ticket Weekly LIRR/MNR Unlimited Ticket Peak 10-Trip LIRR/MNR Ticket Off-Peak 10-Trip LIRR/MNR Ticket Peak One-Way or Round-Trip Ticket Off-Peak One-Way or Round-Trip Ticket Weekly Uniticket Monthly Uniticket CityTicket	Missing if missing in person file "Other" if indicated "Don't Know" if indicated "Don't Know," if neither indicated
1 fare type reported	Monthly LIRR/MNR Unlimited Ticket Weekly LIRR/MNR Unlimited Ticket Peak 10-Trip LIRR/MNR Ticket Off-Peak 10-Trip LIRR/MNR Ticket Peak One-Way or Round-Trip Ticket Off-Peak One-Way or Round-Trip Ticket Weekly Uniticket Monthly Uniticket CityTicket	Use the (MNR/LIRR) fare indicated for this trip
> 1 fare type reported	Monthly LIRR/MNR Unlimited Ticket Weekly LIRR/MNR Unlimited Ticket Peak 10-Trip LIRR/MNR Ticket Off-Peak 10-Trip LIRR/MNR Ticket Peak One-Way or Round-Trip Ticket Off-Peak One-Way or Round-Trip Ticket Weekly Uniticket Monthly Uniticket CityTicket	<b>Assign with this hierarchy:</b> Monthly LIRR/MNR Unlimited Ticket Weekly LIRR/MNR Unlimited Ticket Peak 10-Trip LIRR/MNR Ticket Off-Peak 10-Trip LIRR/MNR Ticket Peak One-Way or Round-Trip Ticket Off-Peak One-Way or Round-Trip Ticket Weekly Uniticket Monthly Uniticket CityTicket

Source: RSG

## Mode Variables

Several sets of variables were coded for the mode or modes used for each trip. Either set of variables can be used depending on the type of analysis. The sets of mode variables in the linked trip file are described in Table 12. The unlinked trip file has only one mode variable “leg\_mode,” upon which all linked trip mode variables are based.

**TABLE 12. OVERVIEW OF MODE VARIABLE SETS INCLUDED IN THE LINKED TRIP FILE**

TYPE	VARIABLE	DESCRIPTION
Mode of each Trip Segment	mode1 through mode10	The mode used for each trip segment Matches the mode for the corresponding leg number in the Unlinked file (“leg_mode”) “leg_mode” is the only mode variable in the Unlinked file
Mode Flag	modeflag_[name]	Each mode had a mode flag variable The variable = 1 if that mode was used for some portion of the linked trip and 0 if it was not used for some portion of the linked trip
Mode Grouped	mode_g2 through mode_g10	An overarching mode or mode category for each linked trip Groups all trips into categories such as NYC Subway Only, NYC Subway and bus, Bus Only Different grouping from two categories up to 10 categories

Source: RSG

### **Mode of Each Trip Segment**

This set of variables exactly matches the “leg\_mode” for each unlinked trip. For example, if a linked trip is made up of three unlinked trips, mode1 would be the mode of the first leg, mode2 would be the mode of the second leg and mode3 would be the mode of the third leg. This variable can be used to see the ordered modes as they were used on a trip.

### **Mode Flag**

This set of variables includes one variable for each mode. If a mode was used for one or more legs of an unlinked trip, then the mode’s “Mode Flag” variable will be equal to one. This is useful for filtering for all trips that included a certain mode, running a table on all trips that included a certain specific mode, or for analyzing specific combinations of modes.

### **Mode Grouped**

These variables are coded to indicate the overarching mode for each linked trip and were coded to be consistent with dataset of the previous NYC travel survey conducted in 2008. The descriptions for the coding of each of these variables are found in Table 13. These variables are useful for running tables or filters on, for example, all trips that use NYC Subway or Bus or any of the other grouping that have been created in this set of variables.



**TABLE 13. CODING DESCRIPTION FOR THE MODE GROUPED VARIABLES**

VARIABLE		LABEL	CODING DESCRIPTION
mode_g2	1	NYC Bus or Subway	If one or more of the legs of the trip is NYC Bus or Subway
	2	Not NYC Transit	If none of the legs of the trip are NYC Bus or Subway
mode_g3	1	All Transit	If one or more legs of the trip are NYC Subway, NYC Bus, Commuter Rail, Other Rail or Other Transit
	2	Other Mode	All other trips
mode_g5	1	NYC Subway	If one or more of the legs of the trip is NYC Subway and none of the legs are NYC Bus
	2	Subway + Bus	If the trip includes both an NYC Subway leg and an NYC Bus leg
	3	NY-MTA Bus (only)	If one or more of the legs of the trip is NYC Bus and none of the legs are NYC Subway
	4	Other Transit	Any trip that includes Commuter Rail, Other Rail, Other Transit but not NYC Subway or NYC Bus
	5	All Nontransit	All other trips
mode_g6	1	NYC Bus or Subway	If one or more of the legs of the trip is NYC Bus or Subway
	2	Other Transit	Any trip that includes Commuter Rail, Other Rail, Other Transit but not NYC Subway or NYC Bus
	3	Taxi, Car/Van Service	Any trip that includes Taxi or Car/Van Service, but not transit or transportation network company (TNC)
	4	TNC (Uber/Lyft)	Any trip that includes TNC, but not transit or Taxi
	5	Auto	Any trip than includes personal Automobile, but no transit
	6	Walk/Bike	Any trip that includes walking or biking but no transit or motorized vehicle
	7	Other Mode	All other trips
mode_g8	1	NYC Subway	If one or more of the legs of the trip is NYC Subway and none of the legs are NYC Bus
	2	Subway + Bus	If the trip includes both an NYC Subway leg and an NYC Bus leg
	3	NY-MTA Bus (only)	If one or more of the legs of the trip is NYC Bus and none of the legs are NYC Subway
	4	Other Transit	Any trip that includes Commuter Rail, Other Rail, Other Transit but not NYC Subway or NYC Bus
	5	Taxi, Car/Van Service	Any trip that includes Taxi or Car/Van Service, but not transit or TNC
	6	TNC (Uber/Lyft)	Any trip that includes TNC, but not transit or Taxi
	7	Auto	Any trip than includes personal Automobile, but no transit
	8	Walk/Bike	Any trip that includes walking or biking but no transit or motorized vehicle
	9	Other Mode	All other trips

VARIABLE	LABEL	CODING DESCRIPTION
mode_g9	1 NYC Subway	Any trip that includes NYC Subway
	2 NY-MTA Bus (no subway)	Any trip that includes NYC Bus, but no Subway
	3 Commuter Rail (no nyct)	Any trip that includes Commuter Rail, but no NYC Bus or NYC Subway
	4 Other Rail (no nyct)	Any trip than includes other Rail, but no Commuter Rail, NYC Bus or NYC Subway
	5 Other Transit (no nyct)	Any trip that includes other transit but no Rail, NYC Bus or Subway
	6 Taxi, Car/Van Service	Any trip that includes Taxi or Car/Van Service, but not transit or TNC
	7 TNC (Uber/Lyft)	Any trip that includes TNC, but not transit or Taxi
	8 Auto Driver/Passenger	Any trip than includes personal Automobile, but no transit
	9 Walk/Bike	Any trip that includes walking or biking but no transit or motorized vehicle
	10 Other Mode	All other trips
mode_g10	1 NYC Subway Only	If one or more of the legs of the trip is NYC Subway and none of the legs are NYC Bus
	2 NYC Subway + Bus	If the trip includes both an NYC Subway leg and an NYC Bus leg
	3 NY or MTA Bus (no subway)	If one or more of the legs of the trip is NYC Bus and none of the legs are NYC Subway
	4 Commuter Rail (no nyct)	Any trip that includes Commuter Rail, but no NYC Bus or NYC Subway
	5 Other Rail (no nyct)	Any trip than includes other Rail, but no Commuter Rail, NYC Bus or NYC Subway
	6 Other Transit (no nyct)	Any trip that includes other transit but no Rail, NYC Bus or Subway
	7 Taxi, Car/Van Service	Any trip that includes Taxi or Car/Van Service, but not transit or TNC
	8 TNC (Uber/Lyft)	Any trip that includes TNC, but not transit or Taxi
	9 Auto Driver/Passenger	Any trip than includes personal Automobile, but no transit
	10 Walk/Bike	Any trip that includes walking or biking but no transit or motorized vehicle
	11 Other Mode	All other trips

Source: RSG



## 8.0 WEIGHTING

The survey dataset was weighted and expanded to more accurately represent the demographics and resulting travel behavior of New York City residents. In most survey efforts, segments of the population respond at different rates and no matter how good the sampling plan, the survey sample may not accurately represent the population. Therefore, survey data are often weighted/expanded to better represent the full population and account for any response rate differences. Each record in the dataset is given a weight that represents the number of people in the population that the record represents, with high weights counting for more and low weights counting for less. Together the weights adjust the sample so that it matches known targets along several key dimensions.

### 8.1 PERSON AND HOUSEHOLD WEIGHTS

For the weighting and expansion, 14 household-level and 14 person-level characteristics (Table 14) were used to expand the New York City Travel Study data to match the 2016 American Community Survey (ACS) PUMS data. The final weighted dataset accurately reflects the study region across these dimensions.

**TABLE 14. HOUSEHOLD AND PERSON VARIABLES USED FOR WEIGHTING**

HOUSEHOLD LEVEL	PERSON LEVEL
1-person HH	Male
2-person HH	Female
3-person HH	
4+-person HH	Age less than 18
	Age between 18 and 24
0-worker HH	Age between 25 and 45
1-worker HH	Age between 45 and 65
2+worker HH	Age greater than 65
HH Income less than \$20k	Worker
HH Income between \$25k and \$50k	Nonworker
HH Income between \$50k and \$75k	
HH Income between \$75k and \$150k	White
HH Income greater than \$150k	Nonwhite
0-car HH	University Student
1+ car HH	Nonuniversity Student
Total People	Hispanic
	Non-Hispanic

Source: RSG

## Weighting Concepts

The data weighting process identifies weights for each survey record to make them, in aggregate, more accurately represent the studied population across several dimensions (listed above). The dimensions used for this study are at the household and person level.

The data weighting process involved two steps. First, an initial set of expansion factors were created based on the probability each household had of being sampled. For example, if a household had a 1 in 250 chance of being sampled, its expansion factor is 250. Each sample segment had a unique expansion factor based on the probability of it being sampled in the population. This study used an address-based sampling frame of residential addresses with two geographic sample segments (hard-to-reach and regular segments). This is discussed in more detail in the sections for Weekday, Saturday and Sunday weights.

Second, after the data was expanded, the expansion factors for each survey record were iteratively adjusted using an Iterative Proportional Fit (IPF) routine until they matched the marginal distributions for the set of “target” data along the selected dimensions. In this project, the target data came from the census ACS PUMS 2016 1-year dataset.

The result of the weighting process is a dataset that can be used to reliably analyze the studied population across several important dimensions.

## Income, Gender, and Race Imputation

The income, gender, and race questions in the survey allowed participants to respond with “prefer not to answer,” so missing values were imputed to facilitate data weighting. Income was imputed using a model-based approach where missing income was predicted based on the income distribution of the block group, the number of working adults in the household, the educational attainment of the household, and the number of children. This model has been tested across many projects and has been found to accurately match the income values that were reported, indicating it is a reliable method to predict the missing income values.

Missing gender was randomly assigned based on the gender distribution within the respondent’s age category.

Race imputation (white and nonwhite categories) was a two-step process and was applied both to children and adults. The first step was to assess whether race was reported for other adult members of the household. If that was the case, the proportion of white household members were used as an estimate of the probability that a respondent was white. If race was not known for the other adult household members, the proportion of white people who reside in the reported block group was used.

## Weekday Person Weights

### *Initial Expansion Factors*

The first step in the weighting process was to assign an initial expansion factor to each record. These factors are based on the probability of each person being sampled and are intended to account for the differences in sampling rates among the different sample types. The initial weights are set so that the survey data is expanded to the population of New York City.

The initial household-level expansion factors for the ABS sample were calculated based on the probability of a person being sampled (i.e., the number of total people in a sample segment, according to the 2016 (single year) ACS PUMS data, divided by the number of sampled people in that sample segment). The weekday initial expansion factors are shown in Table 15.

This sample combines data from several different sources: an ABS, an email list used for MTA market research (MTA), an in-person intercept at Subway and Express Bus stations, and a small sample recruited through various social media channels.

The ABS sample was broken into hard-to-reach and regular response block groups. Expected low-response block groups were upsampled, assuming that the response rate in these block groups would be lower. The initial expansion factors for hard-to-reach and regular response block groups are close, indicating that the hard-to-reach block groups were oversampled at an appropriate rate.

The MTA email list was expected to have differences from the ABS in both demographics and trip patterns. While there were demographic differences, trip patterns (including overall trip rates, transit trip rates, subway rates, bus rates and trip purposes) did not significantly differ between the two sample types, so the MTA email list sample were treated as if they were ABS for the purposes of initial weights. The demographic differences between the samples are not concerning because the data is expanded to match the actual population along demographic variables.

The station intercept respondents were broken into two groups for weighting purposes, one group that had a higher probability of being sampled based on the intercept sampling plan and another group that had a lower probability of being sampled. The high-probability group included people living in block groups near the sampled subway stations (defined as census tracts that touch a 1,500-meter radius around the stop) and Staten Island. This is because it is more likely that people living near these locations would be sampled than people living somewhere else in the city. The station intercept respondents were given an initial weight such that the total station intercept respondents represented 4.8% of the total sample. Initial weights for the high-probability and low-probability segments were calculated using the same process as the ABS/MTA email segments: the ratio of total surveys in each segment to total population in each segment. The high-probability group has a much smaller initial weight, unsurprisingly indicating

that people from those regions were sampled at a greater rate than people from other regions. The result of this process diminishes the effect of a potentially disproportionate amount of sample coming from the immediate vicinity of sampled transit stations.

Social media was given an initial weight so that it would represent 0.2% of the sample but did not further delineate the sample geographically for the initial weight.

**TABLE 15. WEEKDAY INITIAL PERSON WEIGHTS**

SEGMENT NAME	GROUP	SAMPLE SIZE	INITIAL WEIGHT
ABS & MTA	Hard-to-Reach Sample	5,858	498.70
ABS & MTA	Regular Sample	10,239	506.98
Station Intercept	High Probability	1,881	82.04
Station Intercept	Low Probability	746	347.17
Social Media	--	323	52.86

Source: RSG

### **Sample Summary Along Weighting Dimensions**

The survey is weighted at the Public Use Microdata Area (PUMA) geographic level for each of the 30 variables used in the expansion calculations. PUMAs are geographic units used by the US Census for providing statistical and demographic information. Each PUMA contains at least 100,000 people. The Public Use Microdata Sample (PUMS) provides a set of untabulated records about individuals at the PUMA-level weighted to reflect the demographics in each PUMA.

During the calculations of the weights, it was determined that the IPF routine struggled to identify weights that would match the targets closely for some PUMAs. To rectify this, totals for the PUMAs were aggregated together to support more accurate and realistic weights for those regions. The 55 PUMAs in New York City were ultimately grouped into 42 geographies, of which 13 were made of 2 neighboring combined PUMAs. After aggregation, the IPF routine was able to identify acceptable weights.

### **Summary of Calculated Weights**

Table 16 provides a summary analysis of the calculated weekday person weights for the NYC sample. This table includes the minimum, mean, median and maximum weights for each PUMA. A lower mean weight for a PUMA means that that PUMA is represented by more surveys relative to its population while, a higher mean weight for a PUMA means that PUMA was represented by fewer surveys relative to its population.

In this weighting process, the ratio of the final weight to the initial weight was constrained to be in the range of 0.25 to 5 for each person. Allowing the weights to be outside this range would enable the process to match the ACS PUMS targets more exactly, but at the cost of having more extremely high or low weights. Considering that the PUMS targets are estimates based on



census survey data, it is not good practice to try to match the targets too precisely at the expense of allowing the survey weights to vary too widely. In this case, the weighted dataset matches the targets exactly or closely on almost all dimensions.

**TABLE 16. SUMMARY STATISTICS OF THE FINAL WEEKDAY PERSON WEIGHTS**

PUMA	MIN	MEAN	MEDIAN	MAX
3701 & 3706	13.3	448.5	287.0	2534.9
3702 & 3704	20.5	507.6	299.0	2534.9
3703	13.2	519.9	362.9	2534.9
3705	22.0	547.4	409.0	2482.2
3707 & 3708	20.5	590.1	459.3	2534.9
3709 & 3710	13.2	500.7	413.1	2534.9
3801 & 3802	13.2	365.4	126.7	2534.9
3803	14.0	421.9	297.2	2534.9
3804	21.3	427.0	248.0	2493.5
3805	13.2	299.8	263.3	1281.5
3806	14.7	259.9	242.0	1030.3
3807	24.1	272.7	221.0	1536.0
3808	30.7	303.2	185.2	2052.6
3809	13.2	324.8	244.1	1699.2
3810	14.2	367.9	202.0	2534.9
3901 & 3902	20.5	468.6	218.4	2534.9
3903	20.5	571.0	297.8	2534.9
4001	86.8	471.1	255.7	2534.9
4002 & 4003	13.2	629.8	364.1	2534.9
4004	16.6	321.3	264.3	1674.5
4005	13.2	298.6	208.8	2493.3
4006	13.2	423.2	255.7	2493.5
4007 & 4010	19.4	699.7	378.6	2534.9
4008 & 4009	13.2	510.8	299.9	2534.9
4011	13.2	533.8	202.4	2534.9
4012 & 4014	13.2	404.4	177.1	2534.6
4013	13.2	409.2	139.5	2534.9
4015	13.2	360.1	200.0	2531.4
4016	18.1	482.5	404.8	2493.5
4017	13.2	533.8	439.9	2493.5
4018	64.3	446.1	321.7	2400.4
4101	13.2	307.5	180.6	2500.9
4102	13.2	457.2	126.7	2534.9
4103	16.4	426.1	357.3	1540.4
4104	18.3	441.4	391.5	1868.6
4105 & 4112	16.4	875.7	538.5	2534.9
4106	20.5	407.0	328.8	2153.8
4107	20.5	493.3	246.5	2493.5
4108	13.2	229.4	126.7	2145.8
4109 & 4110	13.2	390.0	251.8	2534.9
4111 & 4113	13.2	686.5	127.1	2534.9
4114	13.6	519.3	380.5	2534.9

Source: RSG

## Saturday Person Weights

Weights representing Saturday travel were applied to any person in the dataset that had completed a Saturday travel diary.

### *Initial Expansion Factors*

Initial expansion factors for the Saturday sample were derived in the same process as initial weights for the weekday sample. Table 17 shows the initial weights by segment for the Saturday person weights.

**TABLE 17. SATURDAY INITIAL PERSON WEIGHTS**

SEGMENT NAME	GROUP	SAMPLE PEOPLE	INITIAL WEIGHT
ABS & MTA	Low response	1,917	1523.92
ABS & MTA	Standard	3,716	1397.26
Station Intercept	High Probability	596	258.93
Station Intercept	Low Probability	198	1290.33
Social Media	--	62	275.41

Source: RSG

### *Sample Summary Along Weighting Dimensions*

Because the overall sample size of people who had reported travel on a Saturday was smaller than weekdays, a more aggregate geography was used for weighting purposes. For the Saturday weights, surveys were expanded to match the demographic targets in the census for each of the five boroughs of New York City:

- Bronx (Bronx County).
- Brooklyn (Kings County).
- Manhattan (New York County).
- Queens (Queens County).
- Staten Island (Richmond County).



### Summary of Calculated Weights

Table 18 shows the summary statistics of the Saturday person weights. The same constraints were used as in the weekday weights. The Saturday weights result in a weighted sample that matches the PUMS data exactly on all dimensions in all five geographies.

**TABLE 18. SUMMARY STATISTICS OF THE FINAL SATURDAY PERSON WEIGHTS**

BOROUGH	MIN	MEAN	MEDIAN	MAX
Bronx	64.7	1502.5	943.5	7619.6
Brooklyn	64.7	1363.2	1006.1	7619.6
Manhattan	68.9	907.0	693.9	5838.2
Queens	64.9	1424.6	1113.9	7619.6
Staten Island	101.1	1647.2	1294.7	6698.3

Source: RSG

### Sunday Person Weights

Weights representing Sunday travel were applied to any person in the dataset that had completed a Sunday travel diary.

#### Initial Expansion Factors

Initial expansion factors for the Sunday sample were derived in the same process as initial weights for the weekday sample. Table 19 shows the initial weights by segment for the Sunday person weights.

**TABLE 19. SUNDAY INITIAL PERSON WEIGHTS**

SEGMENT NAME	GROUP	SAMPLE PEOPLE	INITIAL WEIGHT
ABS & MTA	Low Response	2,019	1446.93
ABS & MTA	Standard	3,869	1341.98
Station Intercept	High Probability	587	262.90
Station Intercept	Low Probability	211	1210.83
Social Media	--	75	227.67

Source: RSG

### Sample Summary Along Weighting Dimensions

Similar to Saturdays, as the overall sample size of people who had reported travel on a Sunday was smaller than weekdays, we used a more aggregate geography for weighting purposes. For the Sunday weights surveys are expanded to match the demographic targets in the census for each of the five boroughs of New York City:

- Bronx (Bronx County).

- Brooklyn (Kings County).
- Manhattan (New York County).
- Queens (Queens County).
- Staten Island (Richmond County).

### Summary of Calculated Weights

Table 20 shows the summary statistics of the Sunday person weights. The same constraints were used as in the weekday weights. The Sunday weights result in a weighted sample that matches the PUMS data exactly on all dimensions in all five geographies.

**TABLE 20. SUMMARY STATISTICS OF THE FINAL SUNDAY PERSON WEIGHTS**

PUMA	MIN	MEAN	MEDIAN	MAX
Bronx	65.7	1390.3	1136.5	7234.7
Brooklyn	56.9	1302.2	873.8	7234.7
Manhattan	61.3	872.5	701.1	6201.7
Queens	56.9	1415.0	968.7	7234.7
Staten Island	65.7	1504.7	1015.6	7234.7

Source: RSG

### Household Weights

For purposes of analysis on household-level data, household-level weights were also created for weekday, Saturday and Sunday. The household weight is only available in the household file and sums to the total number of households in New York City. The household weights were not used as a basis for trip-level weights (the person-level weights were). Only households where all persons completed at least one day were included in the household weight. Household weights are weighted to the same geography and the same variables as the person weights. However, household-level variables are calculated in terms of number of households, rather than number of people in households as with the person-level weights.

## 8.2 TRIP-LEVEL WEIGHTS & ADJUSTMENTS

The person-level weights were used as a base for the trip-level weights. The same trip weights are applied to linked trips in the linked trips file and their corresponding unlinked trips in the unlinked trips file.

The base trip weights are equal to the person weight divided by the number of days completed by that person, such that trip weights for a person who completed five weekdays would be one-fifth of their person weight. This adjusts for the fact that people could complete surveys for different numbers of days, normalizing the trip weights to equal one average day of travel of



New York City residents. For weekdays trips weights, person weights were divided by the number of complete weekdays. For Saturday and Sunday trip weights, person weights were unchanged, as a person could not complete more than one Saturday or Sunday.

## **rMove/rSurvey Trips Adjustment**

Following the adjustment for number of completed days, an adjustment was made to account for the differences in the number of trips reported by rMove and rSurvey participants.

Experience with comparing smartphone application trip diaries to online-based trip diaries shows that respondents tend to underreport the number of trips made using the online diary method. This was evident in this data collection effort as well, and a series of factors were applied to all rSurvey trips so that rSurvey trip rates would match rMove trip rates.

The adjustment factor is defined as the trip rate for rMove trips divided by the trip rate for rSurvey trips. These rates were calculated independently for different categories of trips as described below.

Since certain types of trips tend to be under-reported at a greater rate and certain types of respondents are more likely to under-report their trips, the research team tested several different sets of adjustment factors. Demographic variables tested included: age, employment status and income. The resulting scheme divided the population into adults and children, applying a rate of one for children and a set of rates based on day of week, trip length, and purpose for adults shown in Table 21. The greater the adjustment factor, the more likely that trips were under-reported for that segment in rSurvey.

Adjustment factors were broken into transit vs. non-transit trips, discretionary (non-work/non-school) vs. non-discretionary trips, and short distance vs. long distance trips. For the weekend weights, some of these rates were combined when smaller sample sizes or high margins of error caused results that were not intuitive. For example, all long trips on Saturdays are given the same rate.

In general, respondents were less likely to underreport their transit trips. This makes sense in the context of this survey because a transit trip requires a greater level of thought and consideration and may be a bit more memorable than other types of trips.

Trip length was included because respondents are more likely to underreport short trips based on experience from other similar studies. Short trips were defined as any trip shorter than 500 meters.

Finally, trip purpose is included because respondents may be more inclined to report trips that they had to make, or made regularly every day, such as commute trips. Here non-discretionary trips are defined as those with a tour purpose of work or school.

**TABLE 21. RSURVEY ADJUSTMENT FACTORS APPLIED TO ADULTS**

DAY TYPE	TRIP LENGTH	TRANSIT		NONTRANSIT	
		NONDISCRETIONARY	DISCRETIONARY	NONDISCRETIONARY	DISCRETIONARY
Weekday	Short	1.00	1.00	1.78	1.56
Weekday	Long	1.01	1.10	1.07	1.48
Saturday	Short	1.00	1.00	1.74	1.74
Saturday	Long	1.30	1.30	1.30	1.30
Sunday	Short	1.81	1.81	1.81	1.81
Sunday	Long	1.56	1.56	1.56	1.56

Source: RSG

## Transit Trips Adjustment

Following the adjustment made to rSurvey trips, a final adjustment was made because the total number of subway and bus trips was higher than the ridership numbers published by the MTA. The number of subway trips prior to this adjustment was around 11% higher than was expected by the study team and the number of bus trips was around 16% higher. The study team hypothesized that the main reason for this difference was that the study was branded with the MTA logo, causing respondents to think more about their transit trips and less about other trips. However, it should also be noted that the study team did not expect to exactly match the number of transit trips in a dataset that was weighted to demographics only and not transit trips. Since having the number of subway and bus trips in the dataset match existing totals was a priority, an additional transit trip adjustment factor was added. Adjustments were made to bus and subway trips, in order to reduce the total number of transit trips in the database, using the following process.

### ***Weekday Trip Weights Bus Adjustments***

Bus trips were adjusted first using the following assumptions:

- Most bus trips are made by NYC residents and therefore ridership counts from MTA would be a good source of control data.
- Actual ridership on buses is greater than the counted ridership due to fare evasion; bus counts were inflated using factors provided by the MTA. The fare evasion rates were different for each bus service type and can be found in Table 22.



**TABLE 22: FARE EVASION RATES AND MAY 2018 RIDERSHIP BY BUS SERVICE TYPE**

BUS ROUTE TYPE	AVERAGE WEEKDAY RIDERSHIP COUNTS MAY 2018	FARE EVASION RATE	RIDERSHIP TARGET (ADJUSTED FOR FARE EVASION)
Bronx	472,678	20.2%	592,328
Manhattan	402,044	11.9%	456,350
Staten Island	90,147	18.9%	111,155
Brooklyn	596,799	12.1%	678,952
Queens	727,495	8.4%	794,209
X Express	41,777	2.6%	42,892
BM Express	3,752	2.6%	3,852
BxM Express	13,066	2.6%	13,414
QM Express	14,583	2.6%	14,972

The research team then compared bus boardings (grouped by borough and express vs. local routes) to the initial weighted unlinked trip survey results (Table 23) and adjusted all bus trips down by the percentage difference between MTA boarding counts and initial weighted unlinked trip survey results, by borough and express v. local. The MTA boardings counts used in this case had already been adjusted to account for fare evasion. It should be noted that a small subset of trips had an unknown bus route due to the trip details being inconsistent (determined during the data cleaning phase) so the route was coded as “missing” during the cleaning process. These trips were weighted by the average difference.

Using the weights from the unlinked bus trips, the research team computed an average linked trip weight and applied it to both the unlinked and associated linked trips. This was done so that unlinked trips retained the same weight as their parent linked trip in cases where a linked trip included two or more buses from different groups. For example, if a linked trip includes more than one bus from different boroughs or express vs. local, the linked trip and its associated unlinked trips end up with the same weight.

**TABLE 23. WEEKDAY BUS WEIGHT ADJUSTMENT FACTORS**

BUS ROUTE TYPE	SURVEY (INITIAL WEIGHT)	MTA BOARDING COUNTS (ADJUSTED TO ACCOUNT FOR FARE EVASION)	ADJUSTMENT FACTOR FOR SURVEY BUS TRIPS
Queens	810,217	794,209	0.98
Brooklyn	772,424	678,952	0.88
Bronx	693,485	592,328	0.85
Manhattan	534,381	456,350	0.85
Staten Island	142,866	111,155	0.78
X Express	112,863	42,892	0.38
QM Express	50,137	14,972	0.30
BxM Express	44,605	13,414	0.30
BM Express	6,279	3,852	0.61
NA	52,798	--	0.84
<b>Overall</b>	<b>3,220,053</b>	<b>2,708,125</b>	<b>0.84</b>

Source: RSG

### ***Weekday Trip Weights Subway and Staten Island Railway Adjustments***

The subway and Staten Island Railway (SIR) trip weights were adjusted after the bus trip weights were adjusted. The adjustments were done in this order because any trip that included both subway and bus segments would be impacted twice and the study team’s priority was matching the subway totals.

Since local resident and non-resident use of subways varies greatly throughout the system, the MTA defined a list of stations that are primarily used by NYC residents (“resident stations”) vs. stations used by a mix of both residents and non-residents (“nonresident stations”). The research team then compared MTA boarding counts at resident stations (grouped by borough) to the weighted survey results after the bus trip adjustments had been made (Table 24) and then adjusted all subway trips down by the percentage difference between MTA boarding counts at resident stations and weighted survey results (after bus trip adjustments made to weights), by borough. This adjustment was for all subway trips and included trips boarding at nonresident stations.

A small subset of trips had an unknown boarding station due to the trip details being inconsistent so the station was coded as “missing” during the cleaning process. These were weighted by the average difference.

Finally, any trips that used both subway and bus received both adjustment factors.



**TABLE 24. WEEKDAY SUBWAY AND SIR WEIGHT ADJUSTMENT FACTORS**

ORIGIN STATION BOROUGH	SURVEY RESIDENT STATION COUNTS (INITIAL WEIGHT)	SURVEY RESIDENT STATION COUNTS (WEIGHT AFTER BUS ADJUSTMENT)	MTA RESIDENT STATION BOARDING COUNTS	ADJUSTMENT FACTOR FOR SURVEY SUBWAY TRIPS
Manhattan	293,427	288,460	230,398	0.80
Bronx	445,059	431,383	397,846	0.92
Brooklyn	1,013,981	998,597	943,575	0.94
Queens	505,886	501,689	425,624	0.85
Staten Island	31,648	30,036	17,399	0.58
<b>Overall</b>	<b>2,290,001</b>	<b>2,250,165</b>	<b>2,014,842</b>	<b>0.90</b>

Source: RSG

**Summary of Weekday Transit Trips, by Borough**

The tables in this section show the final number of weekday bus, subway, and SIR survey trips after all of the weighting adjustments described above were made.

Table 25 shows the updated number of subway trips by origin station borough, with the overall number of weekday subway trips totaling approximately 5.2 million. Total subway trips were lower than MTA’s subway boarding counts by about 11% overall, with Manhattan non-resident stations being the furthest below MTA’s counts, which makes sense given the number of non-residents using Manhattan stations (and therefore not represented in our survey data). The number of subway trips boarding in the Bronx and Brooklyn at non-resident stations is still somewhat higher than actual counts.

**TABLE 25. FINAL WEEKDAY SUBWAY TRIP COUNTS VS. SURVEY TRIPS COMPARISON FOR RESIDENT AND NON-RESIDENT STATIONS**

ORIGIN STATION BOROUGH	MTA COUNTS			ADJUSTED SURVEY TRIPS			% DIFFERENCE		
	ALL	RESIDENT	NONRESIDENT	ALL	RESIDENT	NONRESIDENT	ALL	RESIDENT	NONRESIDENT
Bronx	503,217	397,846	105,371	528,456	397,846	130,610	5%	0%	24%
Brooklyn	1,298,846	943,575	355,271	1,340,440	943,575	396,865	3%	0%	12%
Manhattan	3,233,079	230,398	3,002,681	2,498,758	230,398	2,268,360	-23%	0%	-24%
Queens	821,946	425,624	396,322	765,346	425,624	339,722	-7%	0%	-14%
Staten Island	17,399	17,399	0	17,399	17,399	0	0%	0%	--
N/A	0	0	0	69,408	0	0	--	--	--
<b>Overall</b>	<b>5,874,487</b>	<b>2,014,842</b>	<b>3,859,645</b>	<b>5,219,806</b>	<b>2,014,842</b>	<b>3,135,557</b>	<b>-11%</b>	<b>0%</b>	<b>-19%</b>

Source: RSG

Table 26 shows the MTA bus counts vs. the surveyed bus trips after the bus and subway weighting adjustments were made. Overall, the number of bus trips with the final survey weights is roughly in line with what would be expected based on MTA's counts. The number of survey bus trips will not precisely match the MTA counts, primarily because unlinked bus trip weights were averaged to create linked trip weights. The final survey trips are also slightly different than MTA counts because combination subway/bus trips received both the bus and subway adjustment factors.

**TABLE 26. FINAL WEEKDAY BUS COUNTS VS. SURVEY TRIPS COMPARISON**

BUS ROUTE TYPE	MTA BUS COUNTS	SURVEY BUS TRIPS (UNLINKED)	% DIFFERENCE
Queens	794,209	741,770	-7%
Brooklyn	678,952	661,753	-3%
Bronx	592,328	572,574	-3%
Manhattan	456,350	435,447	-5%
Staten Island	111,155	105,432	-5%
X Express	42,892	43,804	2%
QM Express	14,972	16,654	11%
BxM Express	13,414	14,681	9%
BM Express	3,852	3,899	1%
N/A	--	42,522	--
<b>Overall</b>	<b>2,708,125</b>	<b>2,596,013</b>	<b>-4%</b>

Source: RSG

### ***Weekday Trip Rates***

Using this updated weighting scheme, overall adult trip rates were reduced from 3.6 trips per person per weekday to 3.4 trips. The number of linked transit trips were reduced from 1.2 trips to 1.0 trips.

The overall trip rates are comparable to the 2008 trip rates, which ranged between 3.0 to 3.16 on weekdays.

### Saturday Transit Trips Adjustment

The same process described for weekdays was applied to Saturdays. Adjustment factors differ because the number of survey trips and MTA counts reflect Saturdays only.

**TABLE 27. SATURDAY BUS WEIGHT ADJUSTMENT FACTORS**

BUS ROUTE TYPE	SURVEY TRIPS	MTA BOARDING COUNTS (ADJUSTED TO ACCOUNT FOR FARE EVASION)	ADJUSTMENT FACTOR FOR SURVEY BUS TRIPS
Queens	557,030	449,855	0.81
Brooklyn	557,733	408,170	0.73
Bronx	589,743	359,135	0.61
Manhattan	431,291	260,352	0.60
Staten Island	125,092	61,490	0.49
X Express	22,314	7,901	0.35
QM Express	6,063	1,274	0.21
BxM Express	18,604	6,894	0.37
BM Express	3,592	579	0.16
NA	107,629	--	0.64
<b>Overall</b>	<b>2,419,090</b>	<b>1,555,649</b>	<b>0.64</b>

Source: RSG

**TABLE 28. SATURDAY SUBWAY AND SIR WEIGHT ADJUSTMENT FACTORS**

ORIGIN STATION BOROUGH	SURVEY RESIDENT STATION TRIPS (INITIAL WEIGHT)	SURVEY RESIDENT STATION COUNTS (WEIGHT AFTER BUS ADJUSTMENT)	MTA RESIDENT STATION BOARDING COUNTS	ADJUSTMENT FACTOR FOR SURVEY SUBWAY TRIPS
Manhattan	217,048	209,186	112,062	0.54
Bronx	315,283	296,869	197,411	0.66
Brooklyn	656,791	634,776	532,739	0.84
Queens	288,737	278,842	216,222	0.78
Staten Island	5,967	5,198	4,861	0.94
<b>Overall</b>	<b>1,483,826</b>	<b>1,424,871</b>	<b>1,063,295</b>	<b>0.75</b>

Source: RSG



### Summary of Saturday Transit Trips, by Borough

The tables in this section show the final number of Saturday bus, subway, and SIR survey trips after all of the weighting adjustments described above were made.

Table 29 shows the updated numbers of subway trips by origin station borough.

**TABLE 29. FINAL SATURDAY SUBWAY TRIP COUNTS VS. SURVEY TRIPS COMPARISON**

ORIGIN STATION BOROUGH	MTA COUNTS			ADJUSTED SURVEY TRIPS			% DIFFERENCE		
	ALL	RESIDENT	NONRESIDENT	ALL	RESIDENT	NONRESIDENT	ALL	RESIDENT	NONRESIDENT
Bronx	260,641	197,411	63,230	264,311	197,411	66,900	1%	0%	6%
Brooklyn	731,803	532,739	199,064	766,843	532,739	234,104	5%	0%	18%
Manhattan	1,620,998	112,062	1,508,936	925,036	112,062	812,974	-43%	0%	-46%
Queens	449,463	216,222	233,241	395,542	216,222	179,320	-12%	0%	-23%
Staten Island	5,171	4,861	310	4,861	4,861	--	-6%	0%	--
N/A	--	--	--	43,603	--	--	--	--	--
<b>Overall</b>	<b>3,068,076</b>	<b>1,063,295</b>	<b>2,004,781</b>	<b>2,400,196</b>	<b>1,063,295</b>	<b>1,293,298</b>	<b>-22%</b>	<b>0%</b>	<b>-35%</b>

Source: RSG

Table 30 shows the MTA bus counts vs. the survey trips after the bus and subway weighting adjustments.

**TABLE 30. FINAL SATURDAY BUS COUNTS VS. SURVEY TRIPS COMPARISON**

BUS ROUTE TYPE	MTA BUS COUNTS	SURVEY BUS TRIPS	% DIFFERENCE
Queens	449,855	425,000	-6%
Brooklyn	408,170	394,661	-3%
Bronx	359,135	336,958	-6%
Manhattan	260,352	245,704	-6%
Staten Island	61,490	56,301	-8%
X Express	7,901	7,811	-1%
QM Express	1,274	2,176	71%
BxM Express	6,894	6,616	-4%
BM Express	579	485	-16%
N/A	--	60,479	--
<b>Overall</b>	<b>1,555,649</b>	<b>1,475,712</b>	<b>-5%</b>

Source: RSG

### ***Saturday Trip Rates***

Using this updated weighting scheme, overall adult trip rates were reduced from 3.6 trips per person on Saturday to 3.3 trips. The number of linked transit trips were reduced from 0.8 trips to 0.5 trips.



### Sunday Transit Trips Adjustment

The same process described for weekdays was applied to Sundays (Table 31). Adjustment factors differ because the number of survey trips and MTA counts reflect Sundays only.

**TABLE 31. SUNDAY BUS WEIGHT ADJUSTMENT FACTORS**

BUS ROUTE TYPE	SURVEY TRIPS	MTA BOARDING COUNTS (ADJUSTED TO ACCOUNT FOR FARE EVASION)	ADJUSTMENT FACTOR FOR SURVEY BUS TRIPS
Queens	410,068	336,967	0.82
Brooklyn	506,576	315,454	0.62
Bronx	283,235	267,408	0.94
Manhattan	390,216	208,681	0.53
Staten Island	49,630	44,525	0.90
X Express	15,787	4,719	0.30
QM Express	3,927	693	0.18
BxM Express	2,736	4,131	1.51
BM Express	872	0	1.00
NA	73,409	--	0.68
<b>Overall</b>	<b>1,736,456</b>	<b>1,182,577</b>	<b>0.68</b>

Source: RSG

**TABLE 32. SUNDAY SUBWAY AND SIR WEIGHT ADJUSTMENT FACTORS**

ORIGIN STATION BOROUGH	SURVEY RESIDENT STATION TRIPS (INITIAL WEIGHT)	SURVEY RESIDENT STATION COUNTS (WEIGHT AFTER BUS ADJUSTMENT)	MTA RESIDENT STATION BOARDING COUNTS	ADJUSTMENT FACTOR FOR SURVEY SUBWAY TRIPS
Manhattan	158,196	153,037	87,933	0.57
Bronx	260,852	255,382	147,703	0.58
Brooklyn	589,796	578,170	414,780	0.72
Queens	184,024	175,741	160,814	0.92
Staten Island	4,209	3,802	3,521	0.93
<b>Overall</b>	<b>1,197,078</b>	<b>1,166,132</b>	<b>814,751</b>	<b>0.70</b>

Source: RSG

**Summary of Sunday Transit Trips, by Borough**

The tables in this section show the final number of Sunday bus, subway, and SIR survey trips after all of the weighting adjustments described above were made. Table 33 shows the updated numbers of subway trips by origin station borough.

**TABLE 33. ADJUSTED SUNDAY SUBWAY TRIP COUNTS VS. SURVEY TRIPS COMPARISON**

ORIGIN STATION BOROUGH	MTA COUNTS			ADJUSTED SURVEY TRIPS			% DIFFERENCE		
	ALL	RESIDENT	NONRESIDENT	ALL	RESIDENT	NONRESIDENT	ALL	RESIDENT	NONRESIDENT
Bronx	195,257	147,703	47,554	226,996	147,703	79,293	16%	0%	67%
Brooklyn	561,934	414,780	147,154	565,524	414,780	150,744	1%	0%	2%
Manhattan	1,291,610	87,933	1,203,677	828,810	87,933	740,877	-36%	0%	-38%
Queens	341,301	160,814	180,487	320,446	160,814	159,632	-6%	0%	-12%
Staten Island	3,791	3,521	3791	3,521	3,521	0	-7%	0%	--
N/A	0	0	0	46,306	0	0	--	--	--
<b>Overall</b>	<b>2,393,893</b>	<b>814,751</b>	<b>1,582,663</b>	<b>1,991,603</b>	<b>814,751</b>	<b>1,130,546</b>	<b>-17%</b>	<b>0%</b>	<b>-29%</b>

Source: RSG

Table 34 shows the MTA bus counts vs. the survey trips after the bus and subway weighting adjustments.

**TABLE 34. FINAL SUNDAY BUS COUNTS VS. SURVEY TRIPS COMPARISON**

BUS ROUTE TYPE	MTA BUS COUNTS	SURVEY BUS TRIPS	% DIFFERENCE
Queens	336,967	317,535	-6%
Brooklyn	315,454	306,557	-3%
Bronx	267,408	230,976	-14%
Manhattan	208,681	192,528	-8%
Staten Island	44,525	41,726	-6%
X Express	4,719	3,602	-24%
QM Express	693	894	29%
BxM Express	4,131	3,936	-5%
BM Express	0	872	--
N/A	--	0	--
<b>Overall</b>	<b>1,182,577</b>	<b>1,098,627</b>	<b>-7%</b>

Source: RSG

### **Sunday Trip Rates**

Using this updated weighting scheme, overall adult trip rates were reduced from 3.2 trips per person per weekday to 2.9 trips. The number of linked transit trips were reduced from 0.6 trips to 0.4 trips.

## **8.3 FINAL WEIGHT SUMMARY AND RECOMMENDED USE**

Each set of weights is attached to the appropriate dataset:

- The household-level dataset includes household weights for weekday, Saturday and Sunday.
- The person-level and day-level datasets include person weights for weekday, Saturday and Sunday.
- The unlinked and linked datasets include the adjusted trip rates for weekday, Saturday and Sunday.

### **Household-Level Weights**

The household-level weights add up to the total number of households in New York City and should be used for any analysis done at the household-level.

## Person-Level Weights

The person-level weights add up to the total number of people in New York City and should be used for any analysis done at the person level.

## Trip-Level Weights

The trip-level weights add up to the total number of trips made by New York City residents on an average weekday, Saturday or Sunday. In the linked file the weights add up to the total number of linked trips while in the unlinked file the weights add up to the total number of unlinked trips. Any trip-level analysis should be done using these weights.

Transit records flagged as “Uncertain” may still be used for aggregate analysis, but should not be used for specific stop-level, route-level or related analyses.

**TABLE 35. DATASET OVERVIEW AND WEIGHTS**

DATASET NAME	WHAT DOES DATASET CONTAIN?	WHAT DOES ONE ROW REPRESENT?	VARIABLES TO LINK TO OTHER DATASETS	WHAT DO WEIGHTS REPRESENT?
Household (HH)	All HH-level variables from the recruit survey (e.g., HH size, HH income)	One HH	HHID	Total NYC HHs
Person	All person-level variables from the recruit survey (e.g., age, gender, employment)	One person (a HH could have multiple rows—one for each HH member)	PersonID	Total NYC residents
Vehicle	All vehicle-level variables from the recruit survey (e.g., toll payment method)	One vehicle (a HH could have zero, one, or multiple rows—one for each HH vehicle)	HHID	-- (unweighted)
Day	General information from the day of the diary (e.g., where day started/ended, why respondent didn't make any trips)	One day (each HH and person may have multiple rows—one for each HH member for each day)	PersonID	Total NYC residents
Unlinked Trips	All the information from the diary survey related to trips (e.g., mode, start/end time, start/end location, trip purpose)	One unlinked trip (many rows per HH/person—each row is one leg in a trip; a transit trip with a transfer would have two rows—one for each transit route used)	PersonID (to person file) HHID (to household file) TripID (to linked file)	Total unlinked trips made by NYC residents on average weekday, Saturday, Sunday
Linked Trips	All the information from the diary survey related to trips (e.g., mode, start/end time, start/end location, trip purpose)	One linked trip (many rows per HH/person—each row is a trip from start to finish; a transit trip with a transfer would be just one row)	PersonID (to person file) HHID (to household file) TripID (to unlinked file)	Total linked trips made by NYC residents on average weekday, Saturday, Sunday

Source: RSG



## 9.0 LESSONS LEARNED

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The NYC Travel Survey collected very detailed data using a hybrid approach, which we believe was key to the success of the project. While some respondents were comfortable downloading an app to record their travel and answer their surveys, others were more likely to respond via a web- or phone-based survey; therefore, it was important to provide all three options to meet the needs and preferences of NYC residents. The app, rMove, recorded highly detailed trip information and made the survey easy to complete, meaning that many respondents completed multiple travel days. While the online and phone version collected just one day of data per respondent, a large amount of data was still collected via these methods and provided an important response option.

### Importance of a Pretest

The importance of a pretest conducted well in advance of the full fielding effort cannot be underscored. The RSG team conducted a pretest several months prior to the full field, which allowed ample time for assessing the pretest response rates and data, and allowed time to thoughtfully adjust materials. By adjusting the materials and our methods, we were able to recover from a pretest that obtained lower than expected response rates and would have resulted in too few completed surveys. As a result of the pretest edits, the study team was able to obtain more completed surveys than planned and ensured a successful study. The changes made are documented in Section 5 of this report.

### Weighting & Visitor Counts

Weighting the survey data was one of the biggest challenges of this study, due partly to the fact that the survey sampled only residents of the five boroughs, but the available transit boarding counts included both residents and visitors/commuters to New York City. In an ideal world, weighting the household data to demographic control totals would yield the correct number of transit boardings by station; however, with such a large population and complex system, getting the transit boarding counts to match exactly to the survey results was extremely challenging.

RSG and MTA created a solution (described in Section 8) to create two categories of subway stations – “resident” and “non-resident” stations to help correct for this issue (list in Appendix D). However, a more precise means of getting the boardings correct would be to collect control data about the proportion of boardings at each station that were from residents of the five boroughs. This could be done by sampling a subset of randomly selected stations across the system, as well as targeting a few key stations known to have high numbers of visitors (e.g., Times Square, Grand Central). A short survey could be administered where riders were asked whether they lived in the five boroughs upon going through the turnstiles. This would provide a better data source for the number of residents and help improve the weighting further.

## 10.0 SURVEY RESULTS

### 10.1 HOUSEHOLD CHARACTERISTICS

#### Household Size and Workers/Children in Households

As shown in Table 36, Staten Island had the largest average household size (2.69), while Manhattan had the smallest (1.95). Manhattan, Queens and Brooklyn had a higher share of households with at least one person working, as compared to the Bronx and Staten Island (Figure 15). Eight in ten households in Manhattan had no children, while that figure was between 61% and 68% in the other four boroughs (Figure 16).

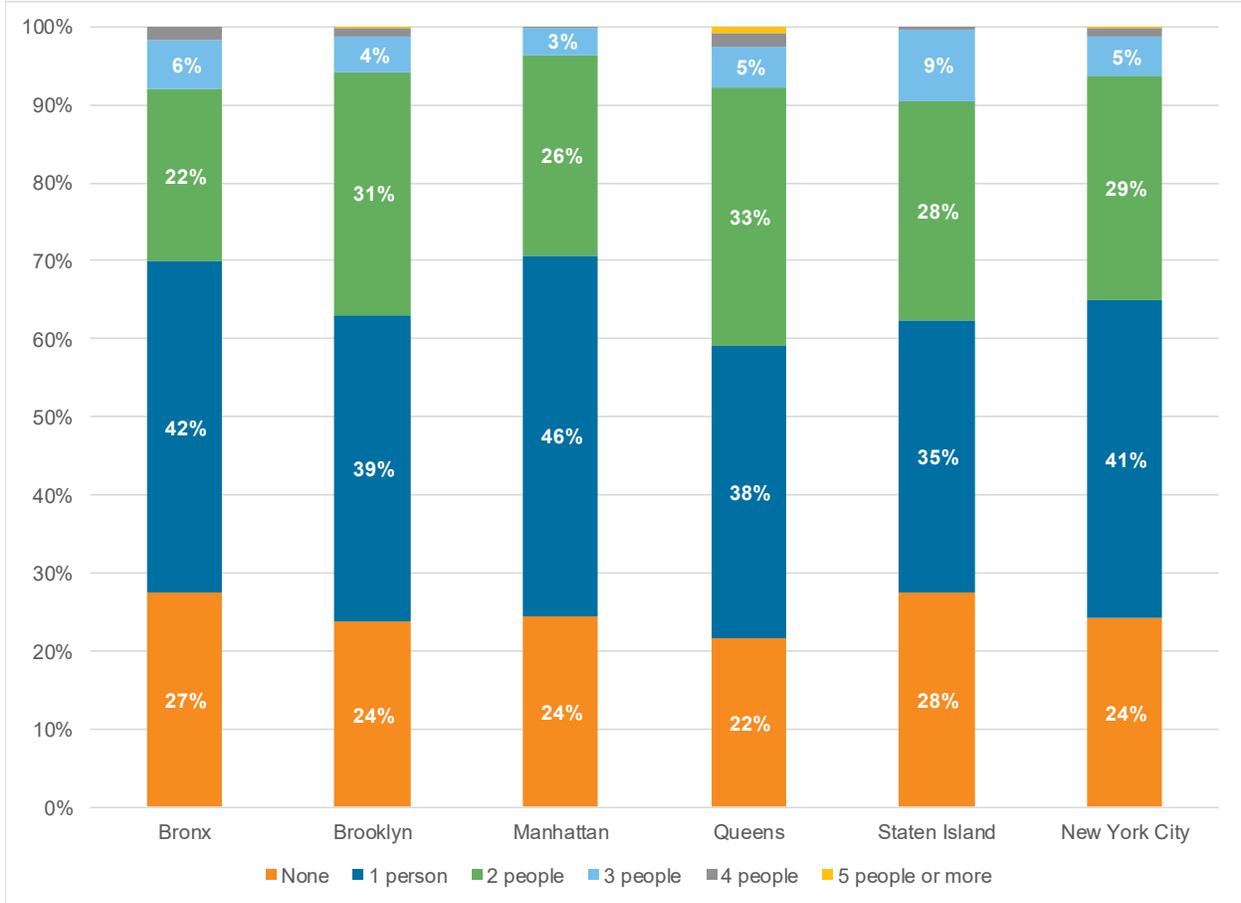
**TABLE 36. AVERAGE HOUSEHOLD SIZE, BY BOROUGH**

GROUP	AVERAGE HOUSEHOLD SIZE
Bronx	2.63
Brooklyn	2.54
Manhattan	1.95
Queens	2.58
Staten Island	2.69
New York City	2.43

Source: RSG

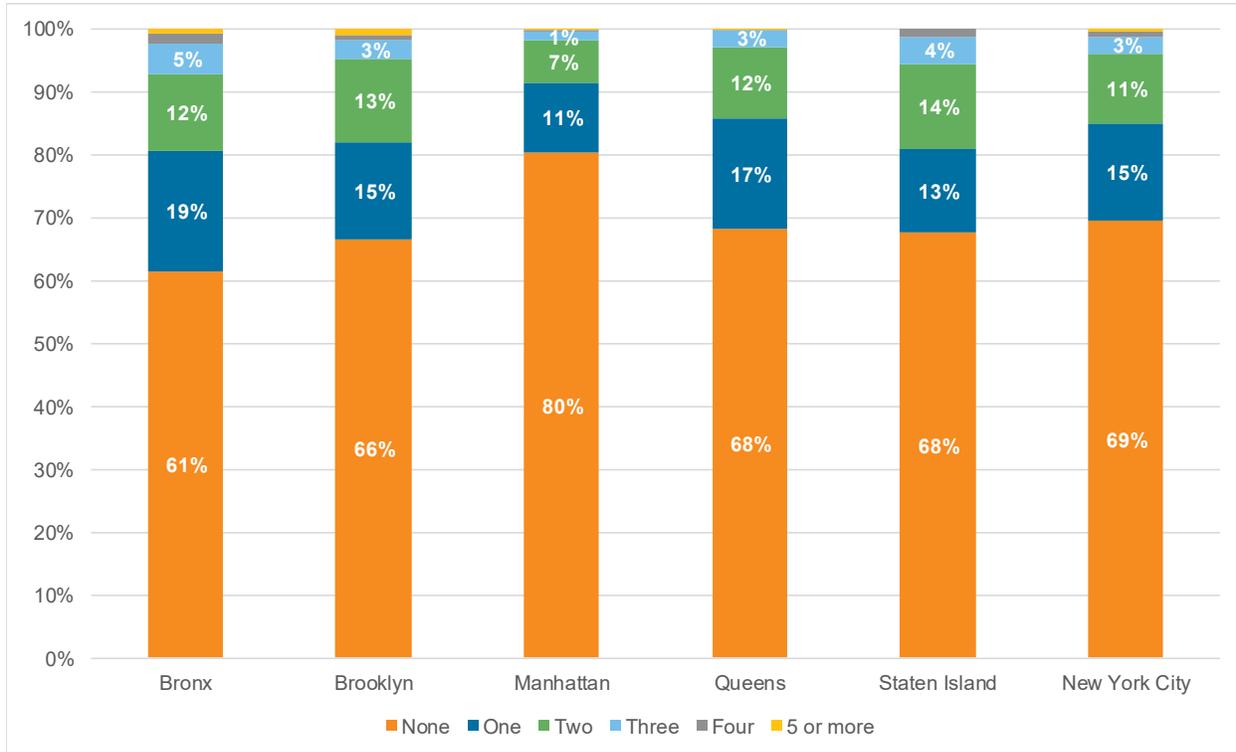


**FIGURE 15. NUMBER OF WORKERS PER HOUSEHOLD, BY BOROUGH**



Source: RSG

**FIGURE 16. NUMBER OF CHILDREN PER HOUSEHOLD, BY BOROUGH**



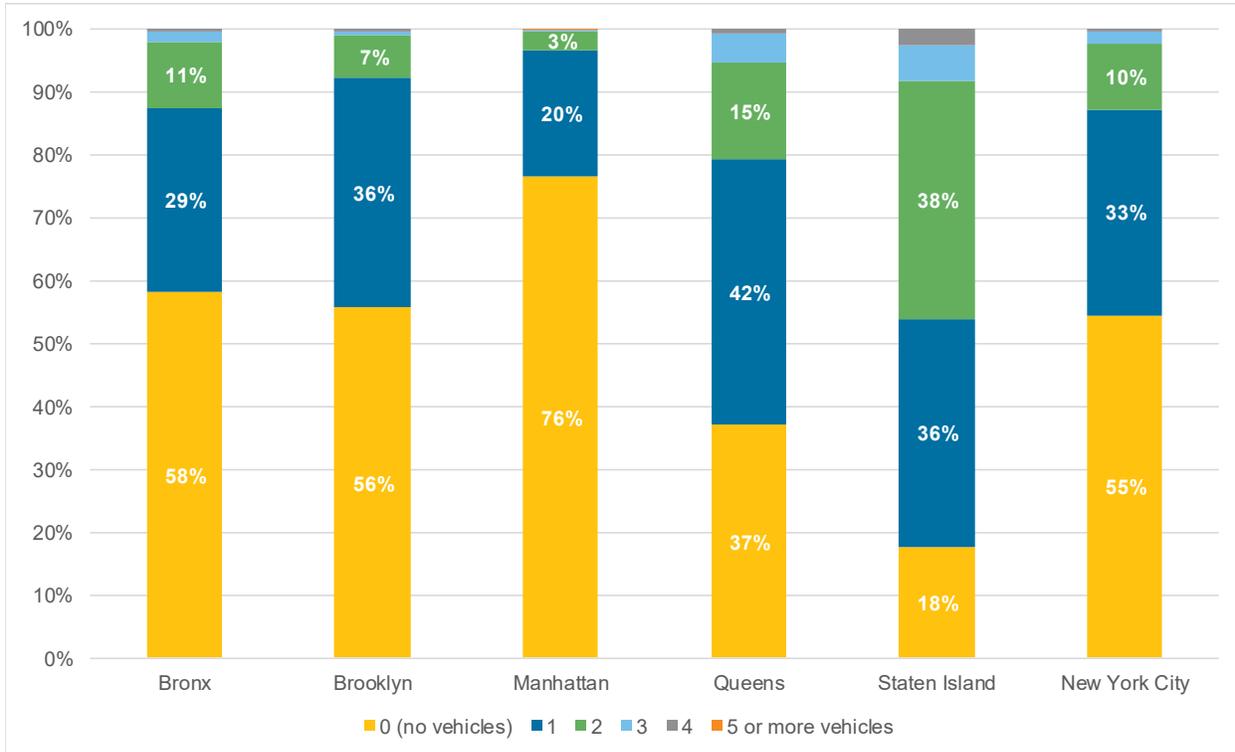
Source: RSG

## Household Vehicles and Participation in App-Based Activities

Vehicle ownership was highest in Staten Island, with 82% of households having at least one working motor vehicle (Figure 17). Just over three-quarters of households in Manhattan did not have a working motor vehicle, while that figure is 58%, 56% and 37% for the Bronx, Brooklyn and Queens, respectively.



**FIGURE 17. NUMBER OF WORKING MOTOR VEHICLES PER HOUSEHOLD**



Source: RSG

Across the boroughs, the most popular app-based programs were for car services (or TNC) such as Uber, Lyft and Via (Table 37). About half of households in Manhattan participated, while 30% to 39% of households from the Bronx, Brooklyn and Queens participated. The lowest use of the popular app-based TNCs are among households in Staten Island (21%). Nine percent (9%) of households in Manhattan participated in bikeshare programs, such as Citi Bike.

**TABLE 37. PERCENTAGE OF HOUSEHOLDS PARTICIPATING IN APP-BASED PROGRAMS**

SHARE PROGRAM	BRONX	BKLYN	MAN	QUEENS	STATEN ISLAND	NEW YORK CITY
Uber, Lyft, Via or other smartphone-based car service	30%	39%	51%	33%	21%	38%
Carshare program (e.g., Enterprise Carshare, Zipcar)	3%	6%	6%	2%	0%	4%
Bikeshare program (e.g., Citi Bike)	1%	4%	9%	2%	1%	4%
Vanpool program	0%	0%	0%	0%	0%	0%
No programs	68%	59%	45%	66%	77%	60%

Source: RSG

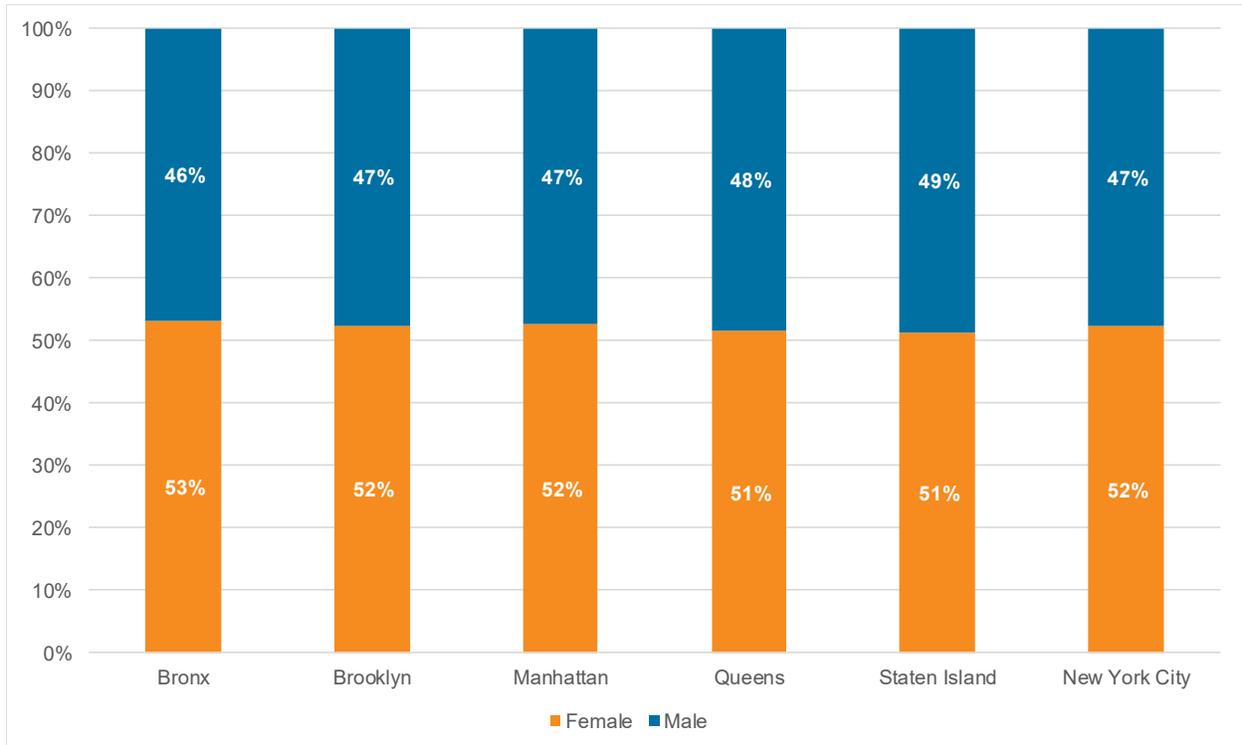
## 10.2 PERSON CHARACTERISTICS

### Gender and Age, by Borough

Across all boroughs and for New York City as a whole, females accounted for just over half of the population (Figure 18). This proportion did not vary substantially across boroughs or for New York City as a whole.

Persons under 18 represented the largest age group in all of the boroughs except for Manhattan (Figure 19), where the largest age group was persons between 25 - 34. The distribution of all other age groups in the boroughs were relatively uniform and showed minor fluctuations when compared borough to borough and for New York City.

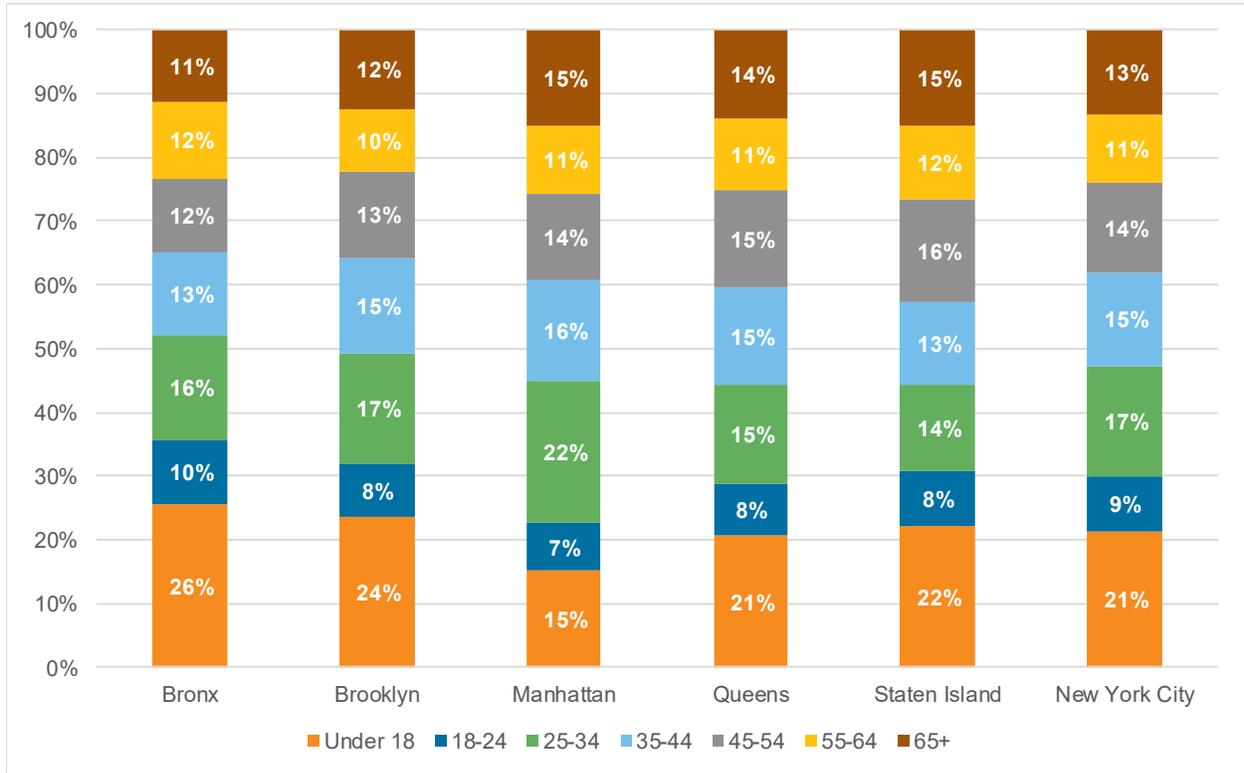
**FIGURE 18. GENDER, BY BOROUGH**



Source: RSG



**FIGURE 19. AGE, BY BOROUGH**

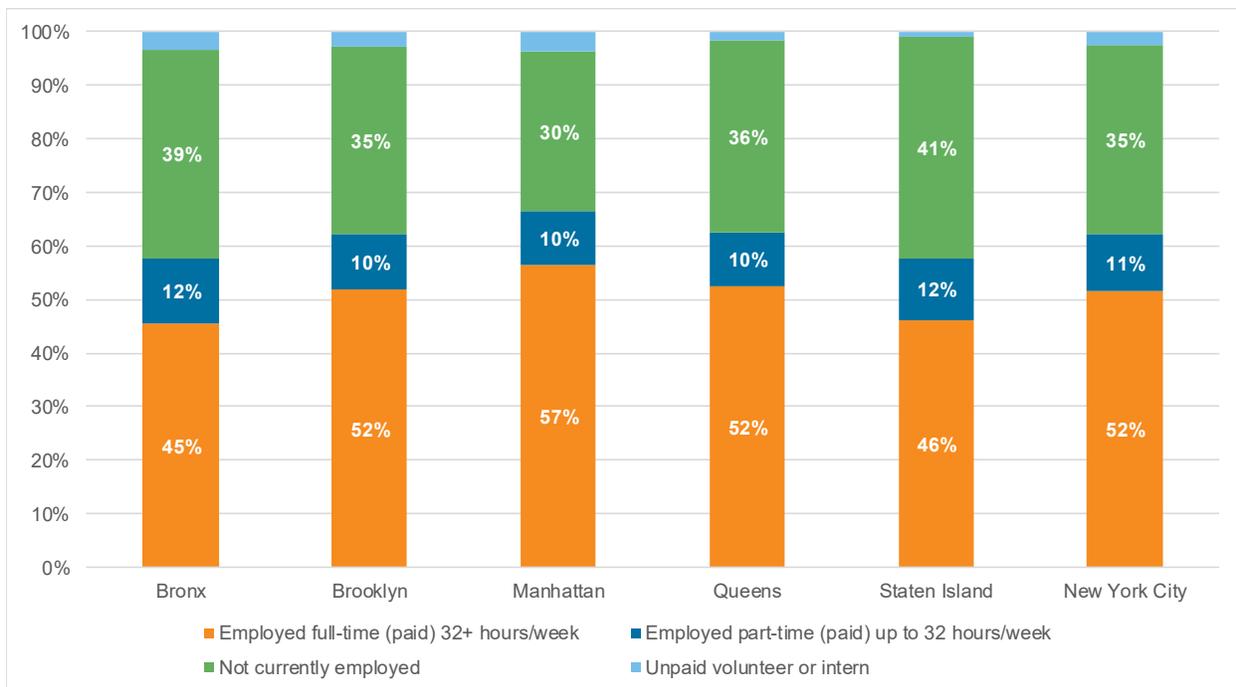


Source: RSG

## Employment Status, by Borough

The percentage of persons employed full time ranged from a low of 45% in the Bronx to a high of 57% in Manhattan (Figure 20). For New York City as a whole, just over 50% of the population was employed full-time. The percentage of part-time employees ranged from 10% to 12% for all boroughs. Staten Island and the Bronx each had higher percentages of persons not currently employed at approximately 40%. Unpaid volunteers or interns comprised a small fraction of employees across all boroughs and for New York City.

**FIGURE 20. EMPLOYMENT STATUS, BY BOROUGH**



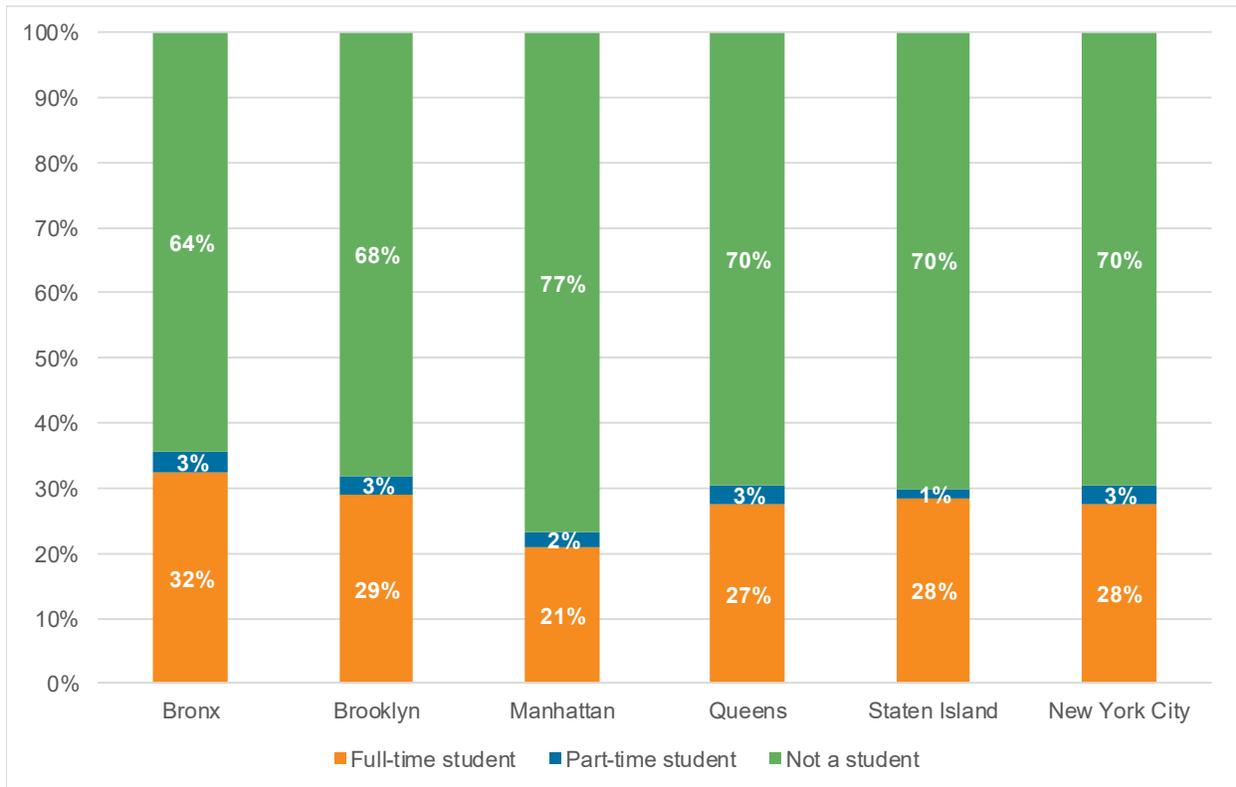
Source: RSG



## Student Status, by Borough

The majority of residents in each borough were not students. In terms of student status, the Bronx had the highest percentage of full-time and part-time students (35%) and Manhattan had the lowest percentage with 23%. For New York City, the proportion of full- and part-time students was 31% (Figure 21).

**FIGURE 21. STUDENT STATUS, BY BOROUGH**

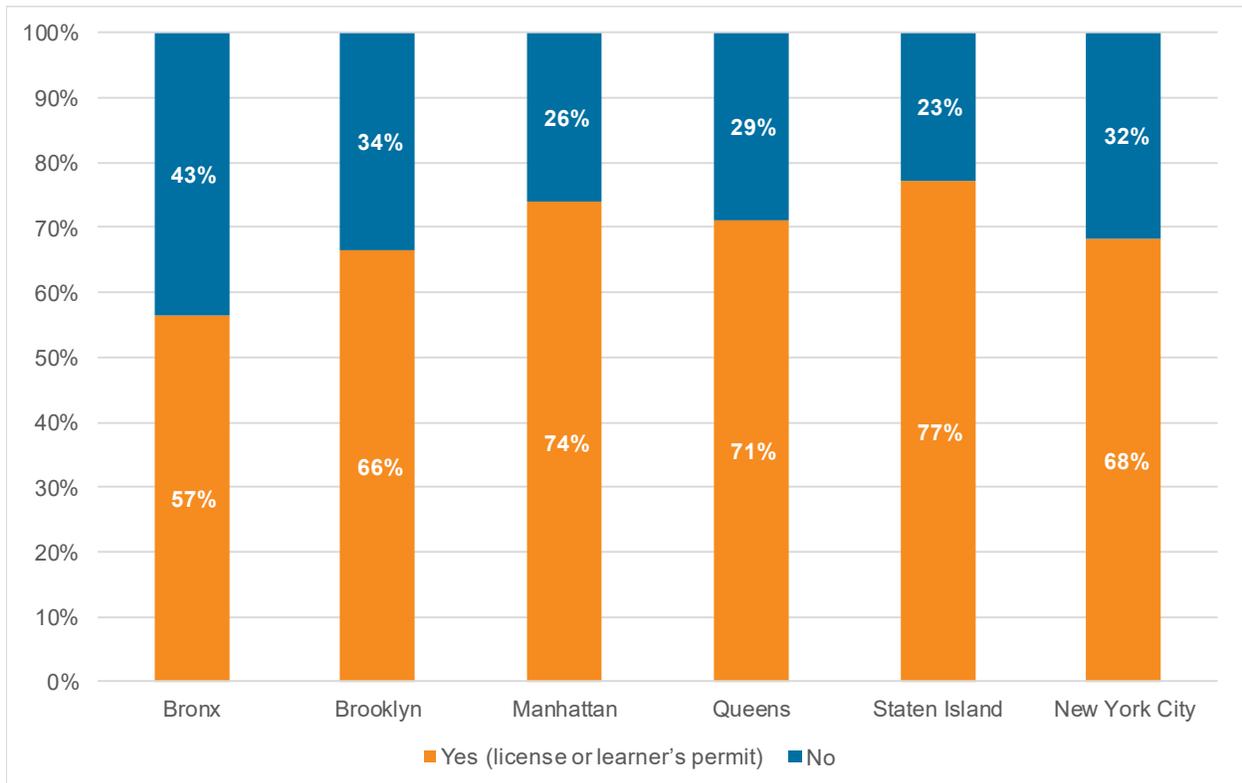


Source: RSG

## Driver License Status, by Borough

Staten Island had the highest number of persons with driver licenses or learner’s permits with 77% of the population. Conversely, the Bronx had the fewest persons with driver licenses or learners permits with only 57% of the population (Figure 22).

**FIGURE 22. DRIVERS LICENSE STATUS, BY BOROUGH**



Source: RSG



## Disability, by Total Population

As shown in Table 38 persons with ambulatory difficulties represented the most common disability across all boroughs. Persons with hearing, vision, cognitive or other difficulties represented smaller percentages across all boroughs.

**TABLE 38. DISABILITY, BY TOTAL POPULATION**

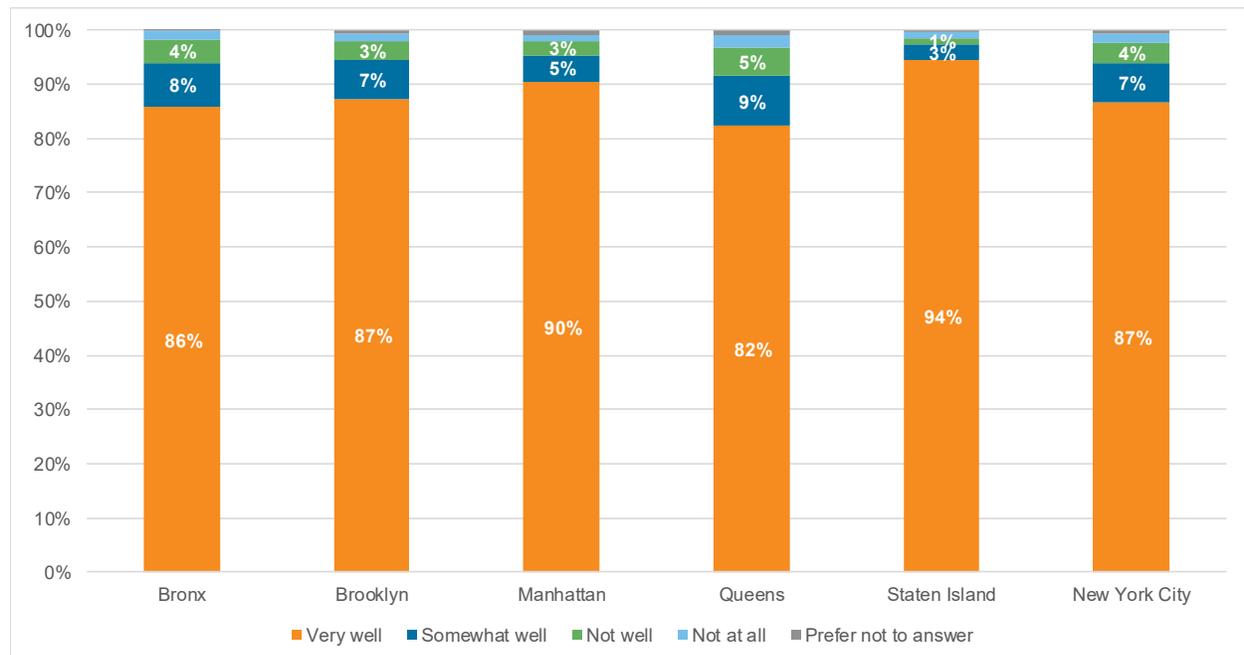
	HEARING DIFFICULTY	VISION DIFFICULTY	COGNITIVE DIFFICULTY	AMBULATORY DIFFICULTY	OTHER
Bronx	1.0%	0.9%	1.6%	5.3%	2.8%
Queens	0.3%	0.6%	0.8%	3.5%	1.2%
Manhattan	0.3%	0.5%	0.4%	4.1%	1.5%
Brooklyn	0.4%	0.5%	0.8%	3.6%	1.2%
Staten Island	0.2%	0.3%	2.2%	5.4%	2.2%
New York City	0.5%	0.6%	1.0%	4.1%	1.5%

Source: RSG

## English Proficiency, by Borough

A majority of persons in all boroughs indicated that they spoke English very well. The highest percentages were in Staten Island (94%) and Manhattan (90%). Queens had the lowest percentage at 82% (Figure 23).

**FIGURE 23. ENGLISH PROFICIENCY, BY BOROUGH**



Source: RSG

## Primary Language Spoken at Home, by Borough

English was the most commonly spoken language at home across all boroughs and for New York City as a whole. Spanish was the second most spoken language in the Bronx, Manhattan, Queens and in New York City, while Spanish and Russian were the second most spoken language in Staten Island (Table 39).

**TABLE 39. TOP 5 PRIMARY LANGUAGES SPOKEN AT HOME, BY BOROUGH**

LANGUAGE	Bronx
English	74%
Spanish	21%
Bengali	2%
Other	0.9%
Afrikaans	0.4%

LANGUAGE	Brooklyn
English	77%
Chinese	7%
Spanish	6%
Russian	3%
Yiddish	1%

LANGUAGE	Staten Island
English	87%
Russian	4%
Spanish	4%
Chinese	2%
Arabic	1%

LANGUAGE	Manhattan
English	81%
Spanish	11%
Chinese	4%
Russian	1%
Japanese	0.5%

LANGUAGE	Queens
English	70%
Spanish	10%
Chinese	9%
Bengali	3%
Korean	1%

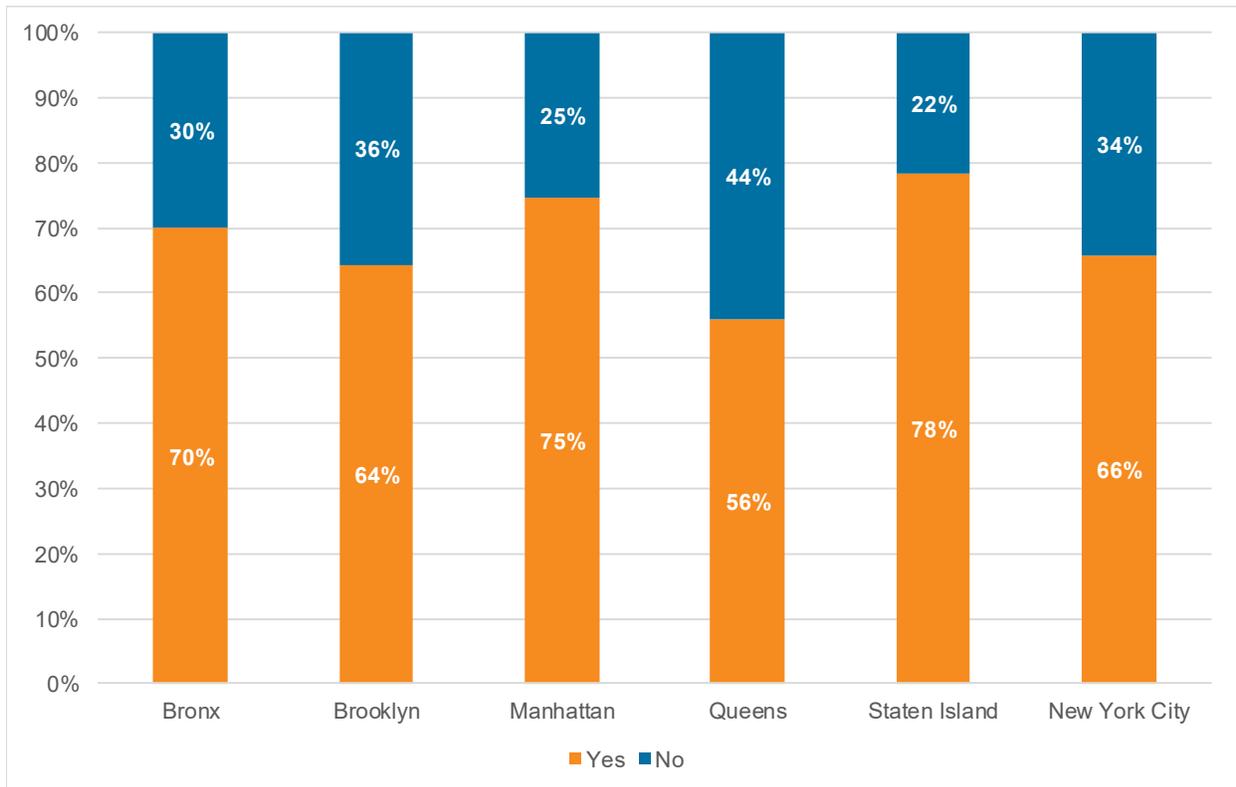
LANGUAGE	New York City
English	76%
Spanish	10%
Chinese	6%
Russian	1%
Bengali	1%

Source: RSG

### Born in United States, by Borough

In Staten Island, Manhattan and the Bronx, 70% or more of the population was born in the United States. In Brooklyn and Queens, while a majority of residents were born in the United States, the share was smaller; 64% in Brooklyn and 56% in Queens (Figure 24).

**FIGURE 24. BORN IN UNITED STATES, BY BOROUGH**



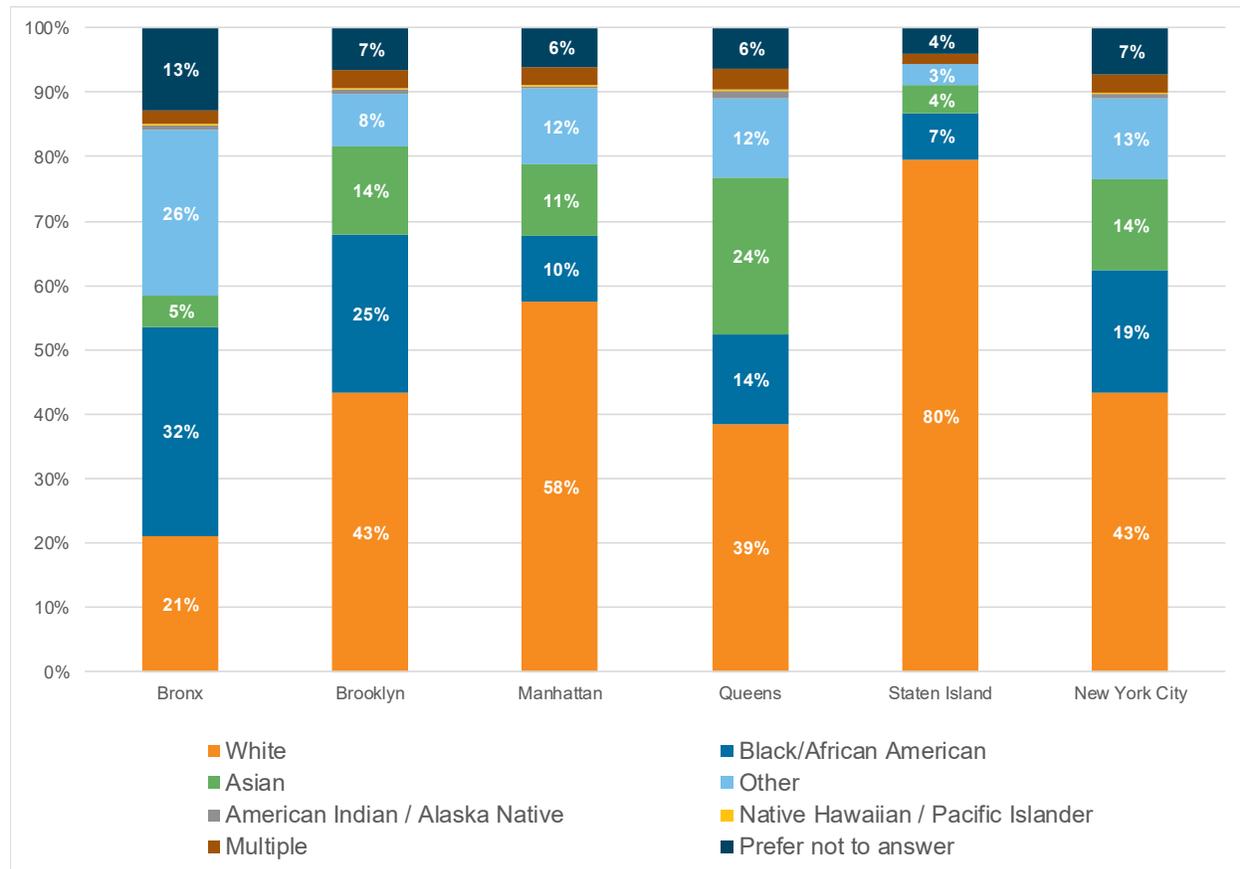
Source: RSG

## Race and Ethnicity, by Borough

Whites made up the largest share of the population by race in all boroughs except for the Bronx, where Black/African Americans made up the largest share (32%). In Staten Island, 8 in 10 residents were White. Black/African Americans were the second highest percentage of the population in Brooklyn (25%). Asians were the second highest percentage of the population in Queens (24%). Distribution by race by borough is shown in Figure 25.

As shown in Figure 26, over half of respondents in the Bronx answered “Yes” to Hispanic ethnicity (57%). A quarter of respondents in Queens and Manhattan responded “Yes” to Hispanic ethnicity as well. Under 20% of respondents in Brooklyn and Staten Island indicated they were of Hispanic ethnicity (Figure 26).

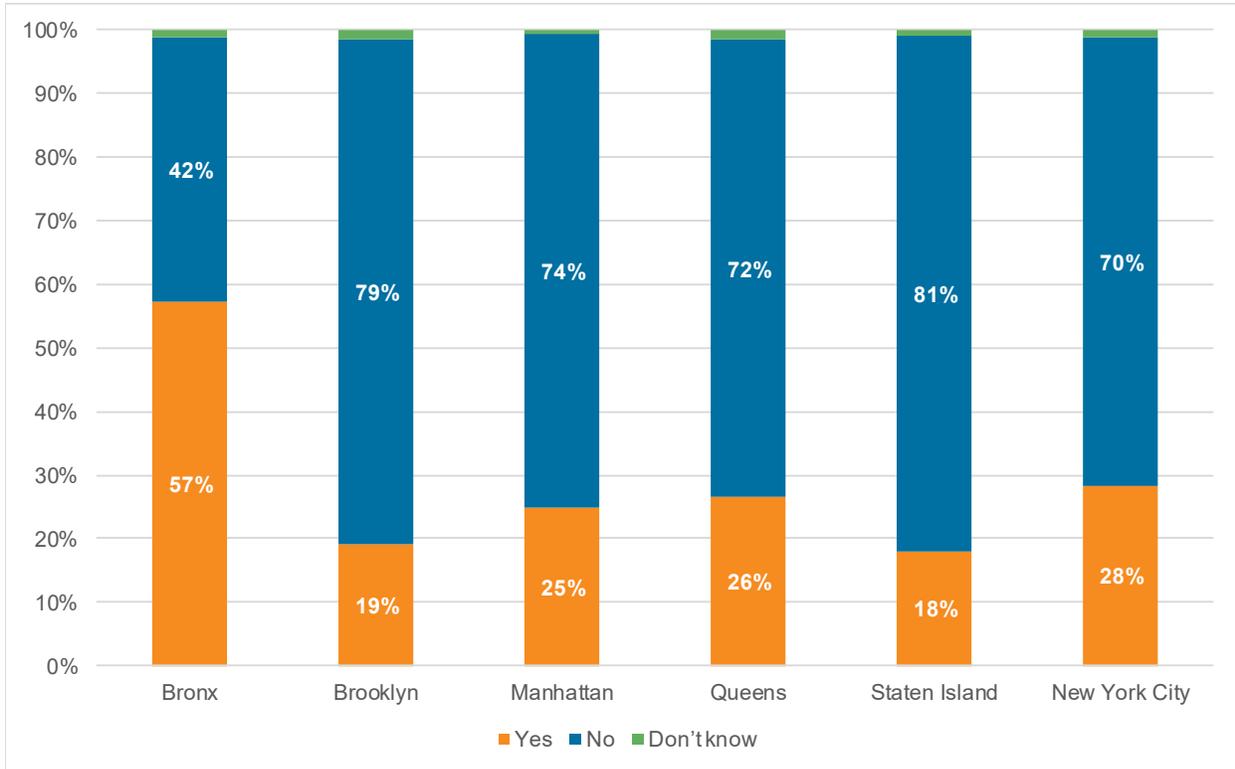
**FIGURE 25. RACE, BY BOROUGH**



Source: RSG



**FIGURE 26. HISPANIC, BY BOROUGH**

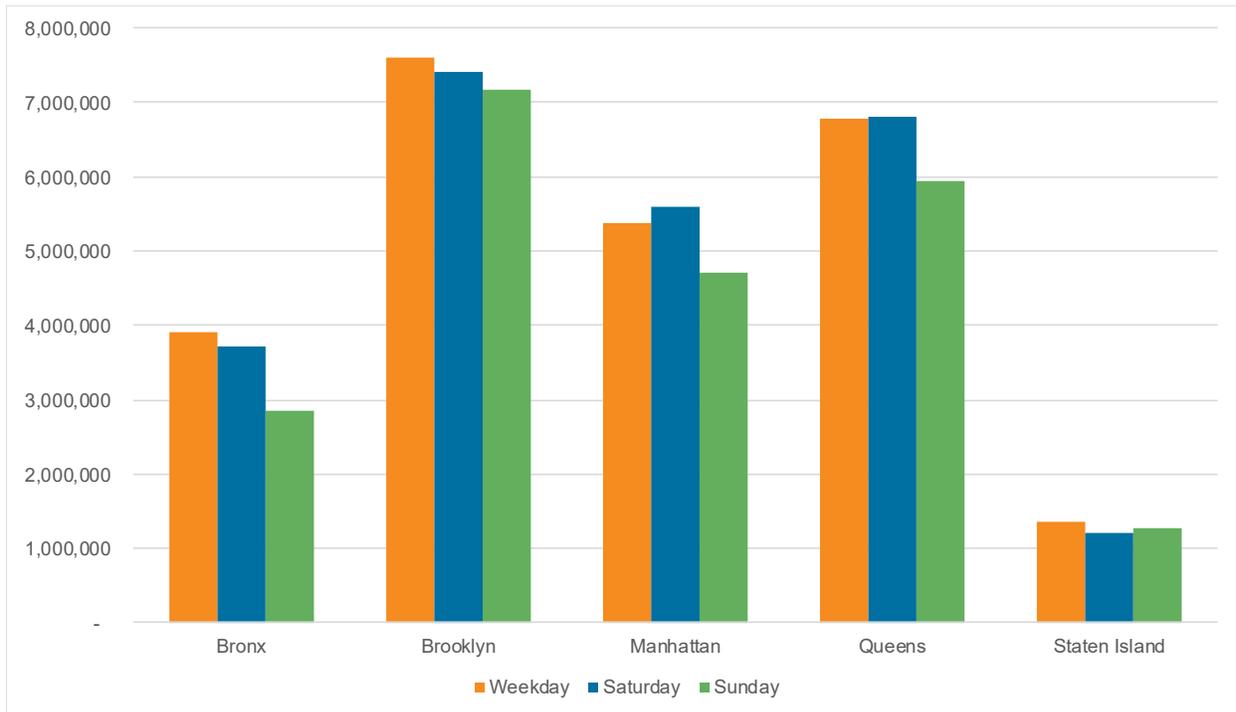


Source: RSG

### 10.3 TRIP CHARACTERISTICS

Residents of Brooklyn made the greatest number of daily trips on a given weekday, Saturday and Sunday, as compared to the other boroughs (Figure 27). While Saturday trips outnumber weekday trips in Manhattan and Queens, weekday trips were highest in Brooklyn, the Bronx and Staten Island.

**FIGURE 27. NUMBER OF DAILY TRIPS, BY BOROUGH**

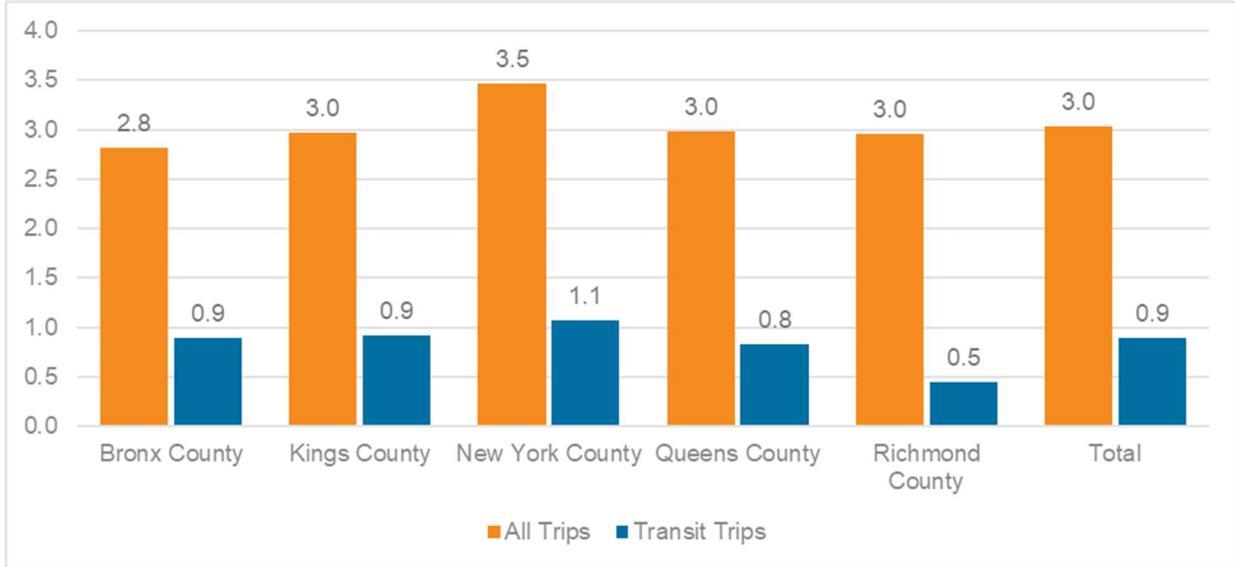


Source: RSG

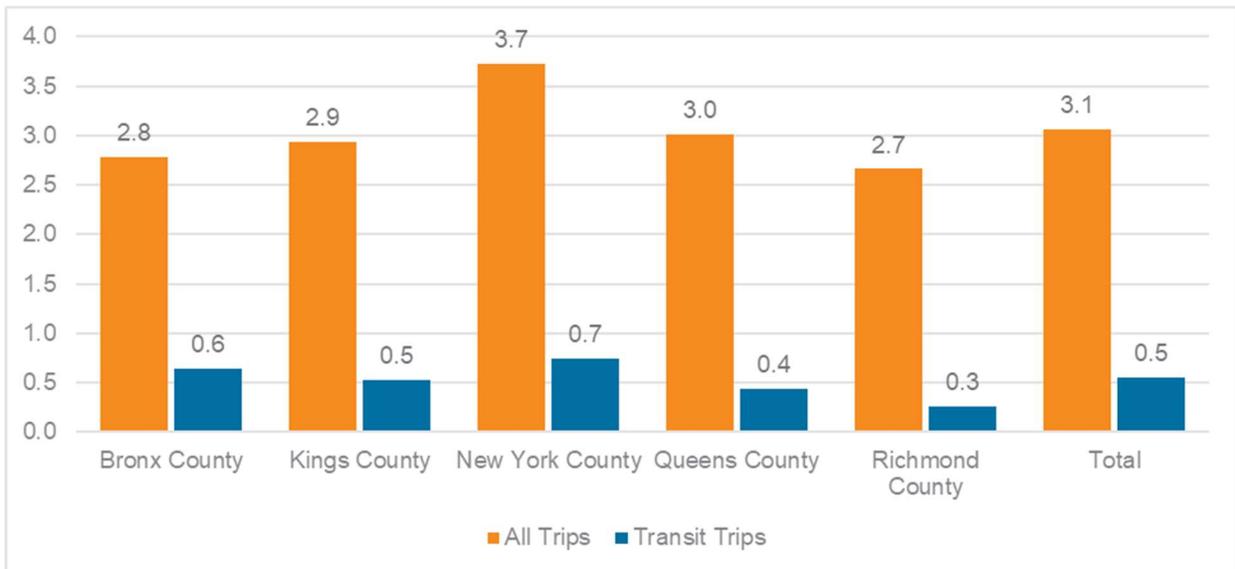
On average, residents made 3.0 trips per weekday (Figure 28), 3.0 trips on an average Saturday (Figure 29), and 2.7 trips on Sunday (Figure 30). Of these trips, 0.9 were made using transit each weekday, 0.6 on Saturday, and 0.4 on Sunday. Manhattan residents made more trips overall and more transit trips on each day of the week than residents of other boroughs.



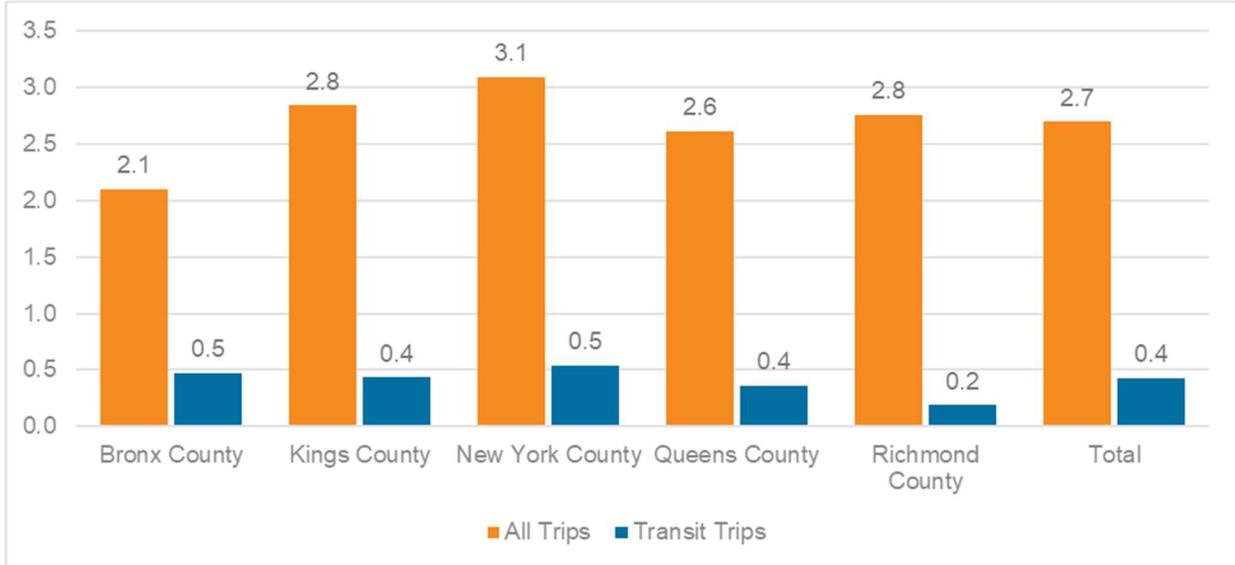
**FIGURE 28. AVERAGE NUMBER OF WEEKDAY TRIPS PER PERSON**



**FIGURE 29. AVERAGE NUMBER OF SATURDAY TRIPS PER PERSON**



**FIGURE 30. AVERAGE NUMBER OF SUNDAY TRIPS PER PERSON**



## Fare Type Profile

Fares types on NYCT subway and bus did not vary across weekday and weekend use (Table 40). Roughly 45% of trips used a 30-day unlimited MetroCard, about a third used a pay-per-ride MetroCard, and 11-13% used a 7-day unlimited MetroCard among both weekday and weekend travel.

**TABLE 40. FARE PAYMENT TYPE, BY DAY OF WEEK**

FARE TYPE	NYCT SUBWAY, LOCAL BUS & EXPRESS BUS		
	WEEKDAY	SATURDAY	SUNDAY
30-day Unlimited MetroCard	46%	46%	47%
Pay-per-ride MetroCard	35%	32%	34%
7-day Unlimited MetroCard	11%	13%	11%
7-day Express Bus Plus	1%	0%	0%
Cash/coins on the bus	1%	1%	1%
Single Ride Ticket	1%	1%	2%
Other	4%	4%	3%
Don't Know	2%	2%	2%

Source: RSG

Looking at fare payment types for NYCT by household income (Table 41), there are differences among household with incomes above and below \$20,000 per year. The 30-day unlimited MetroCard was used for roughly half of all trips among households earning \$50,000 per year or more and 45% of trips among households earning \$20,000-\$49,999. Comparatively, for those households earning less than \$20,000 per year, just 30% used a 30-day unlimited MetroCard. The most common fare type for those households earning less than \$20,000 was the pay-per-ride MetroCard (38%). Residents of households earning between \$20,000-\$49,999 were also more likely to use cash or coins on the bus (5%).

**TABLE 41. FARE PAYMENT TYPE, BY HOUSEHOLD INCOME**

FARE TYPE	NYCT SUBWAY, LOCAL BUS & EXPRESS BUS				
	UNDER \$20,000	\$20,000-\$49,999	\$50,000-\$74,999	\$75,000 - \$149,999	\$150,000 OR MORE
30-day Unlimited MetroCard	30%	45%	50%	51%	50%
Pay-per-ride MetroCard	38%	28%	34%	38%	42%
7-day Unlimited MetroCard	18%	18%	8%	7%	3%
7-day Express Bus Plus	0%	0%	1%	1%	1%
Cash/coins on the bus	5%	1%	0%	0%	0%
Single Ride Ticket	2%	1%	1%	1%	1%
Other	5%	3%	3%	3%	3%
Don't Know	3%	3%	2%	1%	0%

Source: RSG

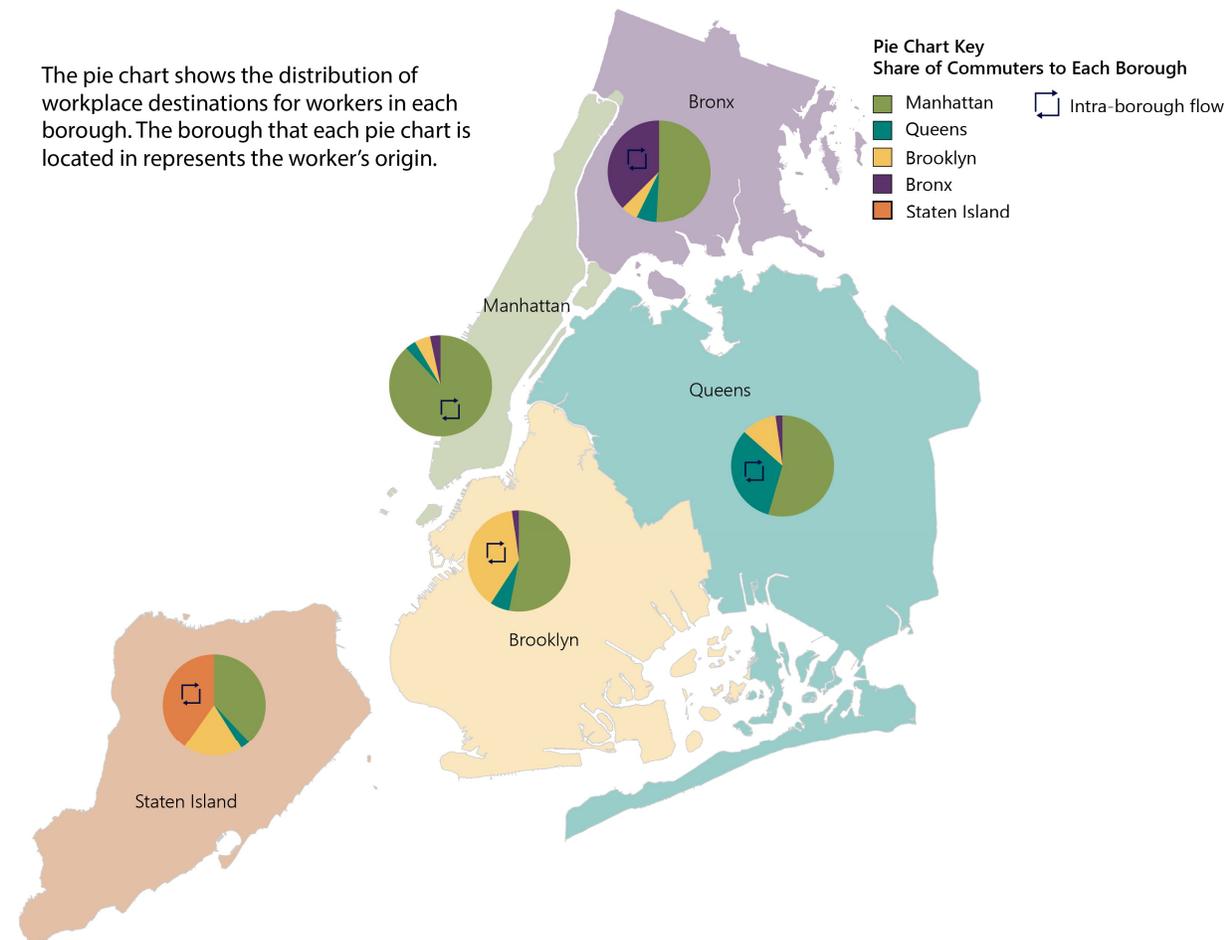


## Commute Trip Profile

A commute trip is defined as a trip where either the destination or origin of the trip is where an individual works. Figure 31 and

Table 42 show the share of commuters from each borough that traveled to a given borough for work. The pie charts in Figure 31 show the share of commuters from the origin boroughs (home) that travel to each destination borough (work). For Bronx, Queens and Brooklyn residents, the largest share of workers commuting to work traveled to Manhattan and the second largest share of commuters traveled intra-borough (i.e. to the same borough). For example, in the Bronx, about 50% of commuters traveled to Manhattan for work and another 37% stay in the borough for work. Manhattan saw the largest share of intra-borough commuters, as 85% of Manhattan residents remained in Manhattan for work. In Staten Island, roughly the same percentage of workers remained in Staten Island as traveled to Manhattan for work.

**FIGURE 31. BOROUGH-TO-BOROUGH COMMUTER FLOWS TO WORK**



Source: RSG

**TABLE 42. BOROUGH-TO-BOROUGH COMMUTER FLOWS TO WORK**

		WORK BOROUGH						
		To Manhattan	To Queens	To Brooklyn	To Bronx	To Staten Island	To outside of New York City	Overall
Home Borough	From Manhattan	85%	3%	5%	3%	0%	5%	100%
	From Queens	49%	29%	10%	2%	0%	10%	100%
	From Brooklyn	51%	6%	37%	2%	3%	3%	100%
	From Bronx	49%	6%	5%	36%	0%	5%	100%
	From Staten Island	37%	3%	18%	0%	39%	3%	100%

Source: RSG

Table 43 shows the modal split by borough for commute trips. The largest share of borough-to-borough commute trips by auto were from the Bronx to Staten Island (100%) and Brooklyn to Staten Island (87%). The largest share on the NYCT subway were from Manhattan to Queens (85%) and Brooklyn to Manhattan (80%). The largest share on the MTA bus was from Staten Island to Manhattan (31%) and Manhattan to Staten Island (28%). The largest share on the NYCT subway and bus combined were from Staten Island to the Bronx (86%) and the Bronx to Brooklyn (32%). Taxis garnered at most 3% of mode share, while TNCs such as Uber and Lyft garnered 7% from Manhattan to Brooklyn and 6% from the Bronx to Queens. Walk/Bike trips were most frequent for intra-borough commutes in Manhattan (32%) and Brooklyn (25%).

TABLE 43. MODE SPLIT, BY BOROUGH FOR COMMUTE TRIPS

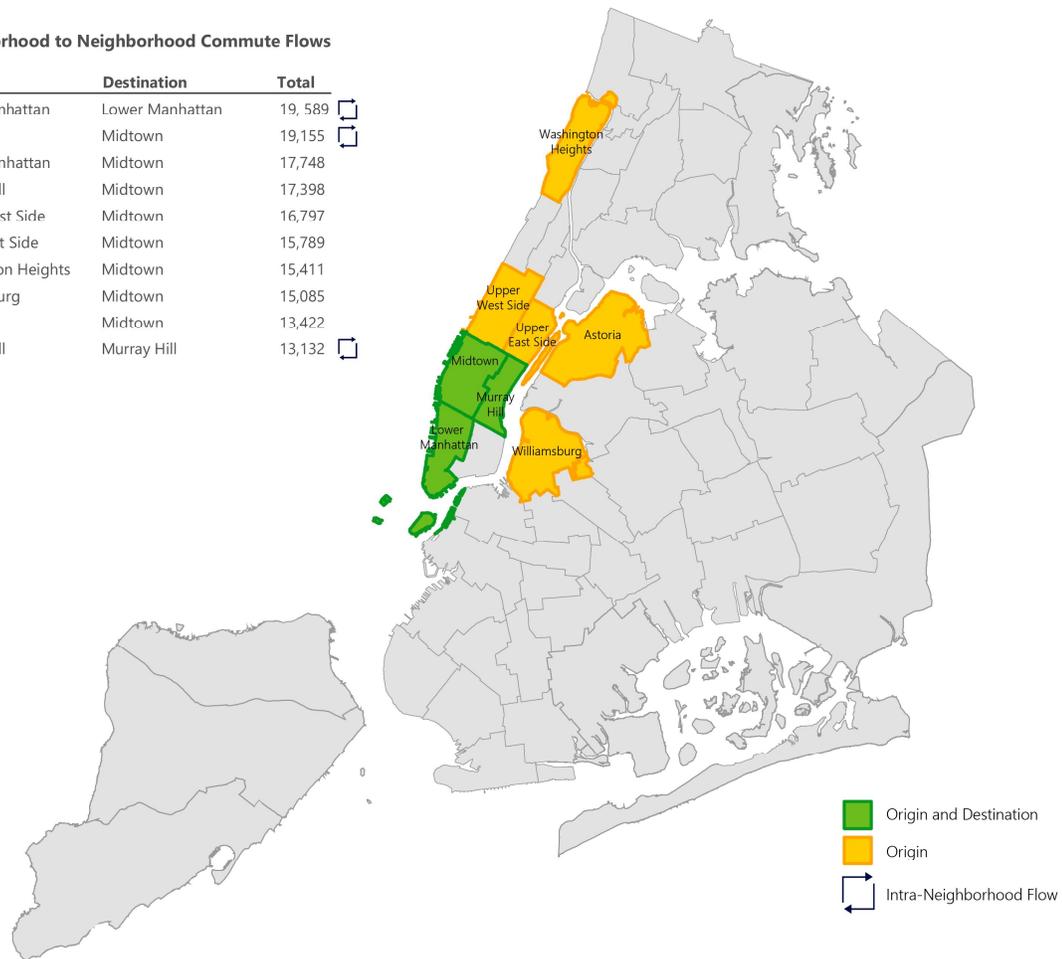
HOME BOROUGH	WORK BOROUGH	AUTO		NYC SUBWAY		NY-MTA BUS (ONLY)		SUBWAY + BUS		TAXI, CAR/VAN SERVICE		TNC (UBER/LYFT)		WALK/BIKE		OTHER	
		TOTAL	%	TOTAL	%	TOTAL	%	TOTAL	%	TOTAL	%	TOTAL	%	TOTAL	%	TOTAL	%
From Bronx	To Bronx	29,022	30%	18,028	19%	21,453	22%	5,401	6%	3,191	3%	2,445	3%	15,426	16%	1,702	2%
	To Brooklyn	585	5%	7,763	60%	7	0%	4,121	32%	436	3%	-	0%	-	0%	-	0%
	To Manhattan	9,721	7%	77,931	58%	5,709	4%	25,163	19%	633	0%	4,408	3%	6,055	5%	4,770	4%
	To Queens	7,012	46%	4,036	27%	1,242	8%	1,738	11%	-	0%	985	6%	-	0%	174	1%
	To Staten Island	138	100%	-	0%	-	0%	-	0%	-	0%	-	0%	-	0%	-	0%
	To Outside NYC	7,646	61%	1,076	9%	665	5%	476	4%	-	0%	-	0%	-	0%	2,757	22%
From Brooklyn	To Bronx	5,619	41%	7,215	53%	35	0%	722	5%	-	0%	-	0%	-	0%	-	0%
	To Brooklyn	50,614	23%	59,474	27%	34,340	15%	13,069	6%	2,886	1%	4,291	2%	56,183	25%	2,662	1%
	To Manhattan	17,559	6%	245,239	80%	5,541	2%	21,718	7%	3,526	1%	1,315	0%	8,385	3%	2,655	1%
	To Queens	8,503	23%	19,803	53%	1,012	3%	4,154	11%	530	1%	325	1%	2,867	8%	136	0%
	To Staten Island	2,460	87%	-	0%	-	0%	184	7%	76	3%	-	0%	103	4%	-	0%
	To Outside NYC	12,830	64%	2,149	11%	116	1%	943	5%	-	0%	136	1%	1,396	7%	2,489	12%
From Manhattan	To Bronx	1,716	13%	7,044	52%	2,757	20%	424	3%	27	0%	241	2%	630	5%	630	5%
	To Brooklyn	1,588	8%	14,926	75%	268	1%	1,256	6%	57	0%	1,382	7%	554	3%	-	0%
	To Manhattan	6,257	2%	188,913	51%	22,603	6%	11,100	3%	7,105	2%	8,735	2%	117,443	32%	6,453	2%
	To Queens	934	8%	10,318	85%	-	0%	500	4%	31	0%	-	0%	283	2%	90	1%
	To Staten Island	29	72%	-	0%	11	28%	-	0%	-	0%	-	0%	-	0%	-	0%
	To Outside NYC	6,632	37%	7,415	41%	109	1%	-	0%	57	0%	-	0%	475	3%	3,460	19%
From Queens	To Bronx	6,705	60%	2,317	21%	404	4%	1,757	16%	-	0%	-	0%	-	0%	-	0%
	To Brooklyn	22,964	43%	22,582	42%	1,282	2%	4,527	8%	-	0%	-	0%	1,812	3%	483	1%
	To Manhattan	14,719	6%	165,177	63%	14,507	6%	45,118	17%	868	0%	1,381	1%	8,575	3%	13,353	5%
	To Queens	54,928	34%	25,597	16%	30,867	19%	12,375	8%	4,064	3%	822	1%	30,592	19%	360	0%
	To Staten Island	-	0%	-	0%	-	0%	-	0%	-	0%	-	0%	-	0%	-	0%
	To Outside NYC	36,202	66%	11,238	20%	3,747	7%	1,068	2%	-	0%	-	0%	908	2%	1,812	3%
From Staten Island	To Bronx	62	14%	-	0%	-	0%	382	86%	-	0%	-	0%	-	0%	-	0%
	To Brooklyn	12,692	80%	174	1%	1,622	10%	1,456	9%	-	0%	-	0%	-	0%	-	0%
	To Manhattan	7,481	23%	9,105	28%	10,351	31%	4,926	15%	-	0%	-	0%	478	1%	541	2%
	To Queens	1,284	53%	781	32%	-	0%	370	15%	-	0%	-	0%	-	0%	-	0%
	To Staten Island	22,539	64%	1,135	3%	7,592	21%	50	0%	101	0%	101	0%	3,840	11%	-	0%
	To Outside NYC	2,462	86%	68	2%	132	5%	-	0%	-	0%	-	0%	-	0%	186	7%

As shown in Figure 32, of the top 10 neighborhood-to-neighborhood flows (by PUMA) for work, Midtown, Lower Manhattan and Murray Hill were the main destinations. The two largest flows were intra-neighborhood, with Lower Manhattan seeing 19,589 commuters traveling to work from within the neighborhood, and Midtown seeing 19,155 commuters traveling to work from within the neighborhood. After that, Lower Manhattan, Murray Hill, the Upper West Side, the Upper East Side, Washington Heights, Williamsburg and Astoria each have between 13,000 and 18,000 commuters traveling to work in Midtown on an average weekday.

**FIGURE 32. NEIGHBORHOOD-TO-NEIGHBORHOOD (BY PUMA) COMMUTER FLOWS TO WORK: TOP 10 ORIGIN-DESTINATION PAIRS**

Neighborhood to Neighborhood Commute Flows

Origin	Destination	Total
Lower Manhattan	Lower Manhattan	19,589
Midtown	Midtown	19,155
Lower Manhattan	Midtown	17,748
Murray Hill	Midtown	17,398
Upper West Side	Midtown	16,797
Upper East Side	Midtown	15,789
Washington Heights	Midtown	15,411
Williamsburg	Midtown	15,085
Astoria	Midtown	13,422
Murray Hill	Murray Hill	13,132

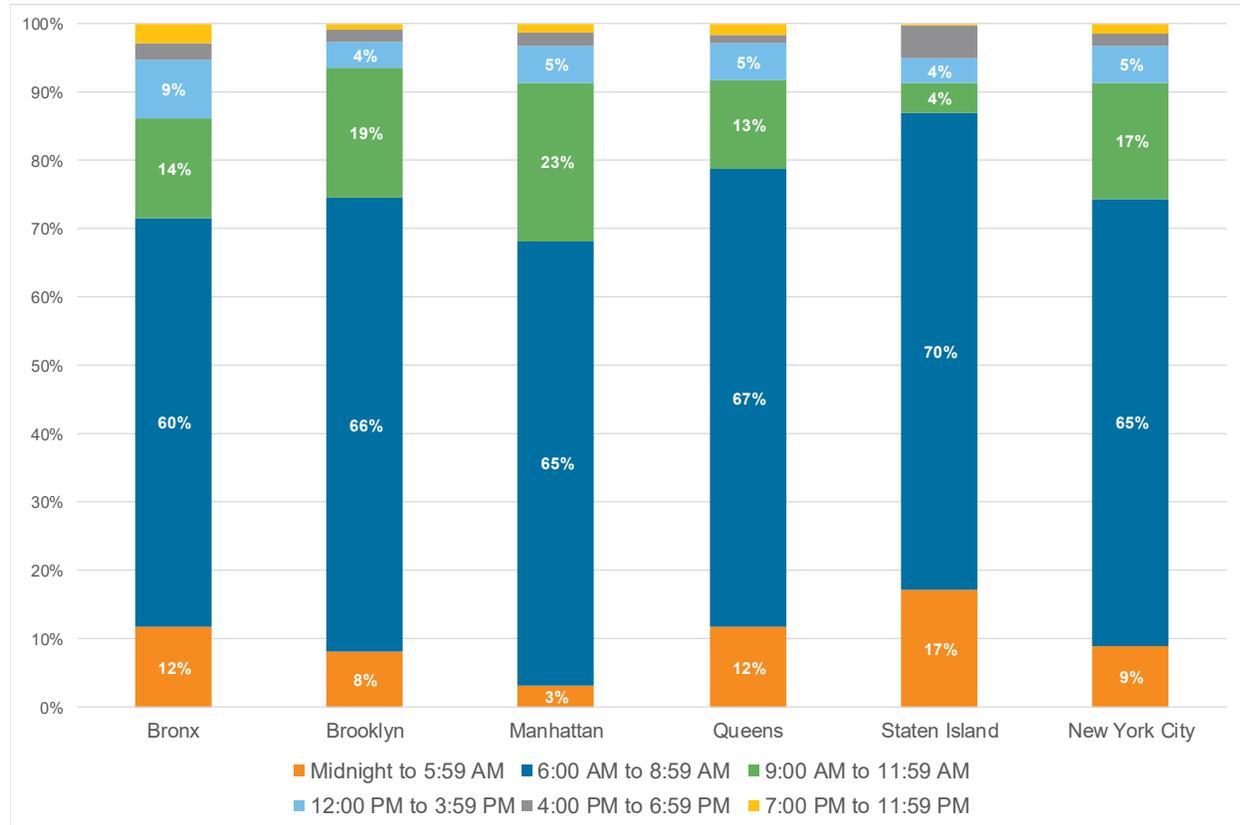


Source: RSG



Figure 33 shows the start time of commute trips by borough. Staten Island had the highest share of commutes beginning before 6:00am (17%), as well as the highest share of commutes beginning between 6:00am – 8:59am (70%). Approximately two-thirds of trips in the other boroughs began between 6:00am – 8:59am.

**FIGURE 33. START TIME OF COMMUTE TRIP**



Source: RSG

As shown in Table 44, residents of Staten Island had the longest average commute distances (13.4 miles) and residents of Queens had the longest average commute travel times (67.4 minutes). Manhattan residents, on the other hand, had the shortest average commute distances (6.0 miles) and travel times (43.0 minutes).

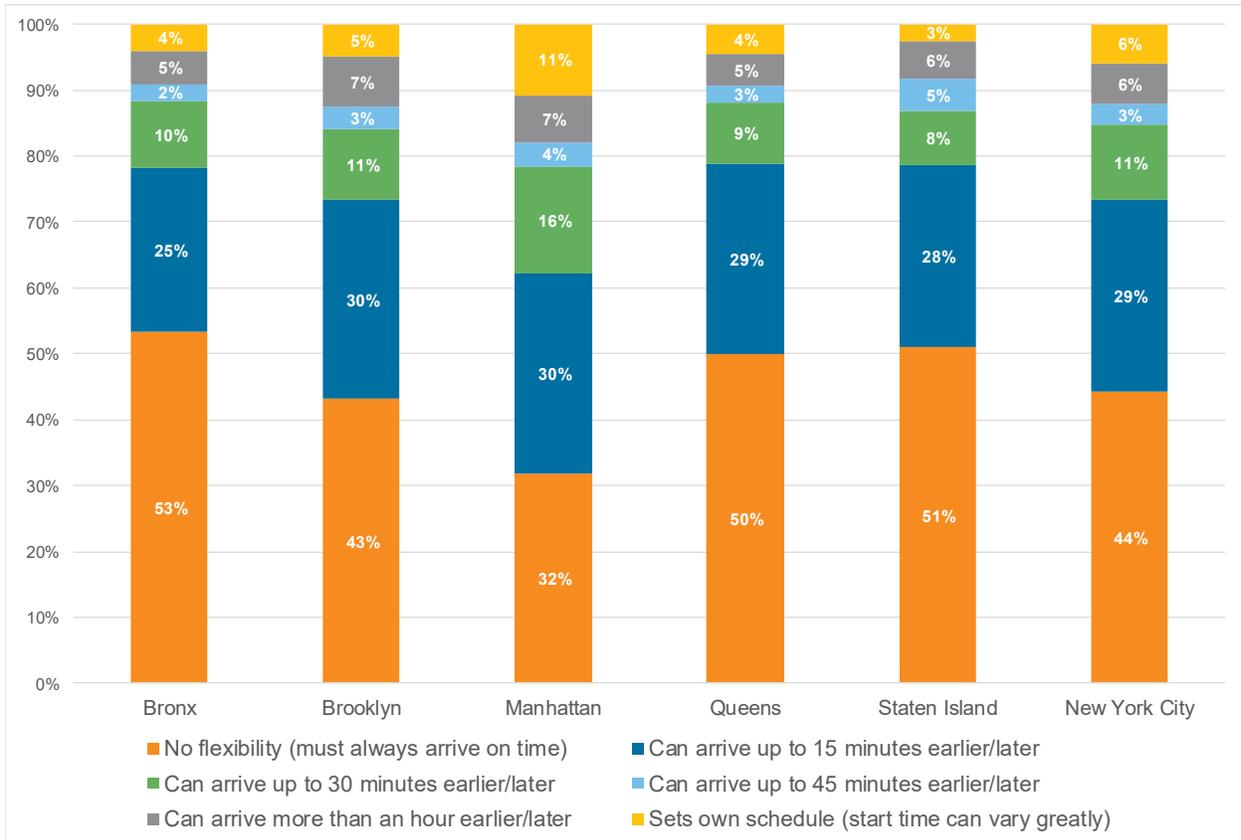
**TABLE 44. AVERAGE COMMUTE DISTANCE AND TRAVEL TIME**

	BRONX	BKLYN	MNHTN	QUEENS	STATEN ISLAND	NEW YORK CITY
Average Commute Distance (Miles)	10.8	9.6	6.0	11.3	13.4	9.6
Average Commute Travel Time (Minutes)	64.6	54.1	43.0	67.4	64.5	57.3

Source: RSG

Manhattan residents had the highest commute flexibility, with 68% of workers having at least some level of flexibility to arrive earlier or later (Figure 34). Over half of Bronx and Staten Island residents had no commute flexibility.

**FIGURE 34. COMMUTE FLEXIBILITY**

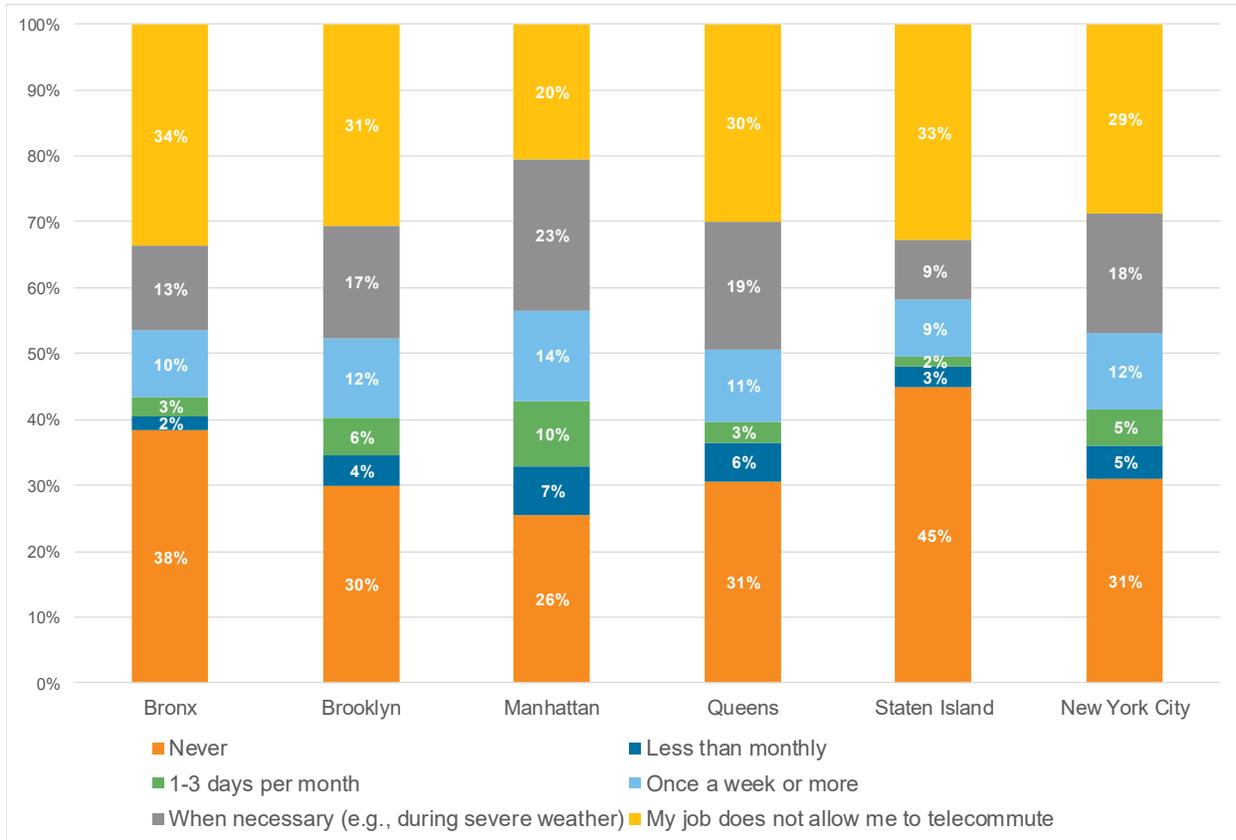


Source: RSG



With regard to telecommuting, Manhattan residents reported a greater ability to telecommute (80% of workers were allowed some amount of telecommuting) as well as a greater frequency of telecommuting compared to other boroughs (Figure 35). The Bronx had the highest share of workers that were not able to telecommute (34%).

**FIGURE 35. TELECOMMUTE FREQUENCY**



Source: RSG

Most commuters reported that they did not receive a subsidy for their transit trip (Table 45). The most common subsidy, a pretax contribution to a transportation account, was used by 12% to 23% of commuters, with the highest share of users in Manhattan (23%).

**TABLE 45. PERCENTAGE OF COMMUTERS RECEIVING SUBSIDY\***

	BRONX	BROOKLYN	MANHATTAN	QUEENS	STATEN ISLAND	NEW YORK CITY
No subsidy	73%	68%	66%	69%	79%	69%
Pretax contribution to transportation account	12%	19%	23%	15%	12%	18%
Free/Subsidized Parking	3%	2%	2%	2%	5%	2%
Free/Subsidized Transit Fare	2%	4%	5%	4%	1%	4%
Free/Subsidized Vanpool	0%	0%	0%	0%	0%	0%
Free/Subsidized Tolls	0%	0%	1%	1%	3%	1%
Use of company vehicle	1%	0%	0%	0%	1%	0%
Cash/incentives for carpooling, walking, or biking to work	0%	0%	0%	0%	0%	0%
Other	1%	1%	1%	1%	0%	1%
Don't know	9%	7%	5%	8%	3%	7%

Source: RSG

\*Respondents can select all that apply

Table 46 shows the modal split by borough for non-commute trips. Of all non-commute trips made between Brooklyn and Staten Island, 83% were auto trips, comprising the largest share of borough-to-borough, non-commute trips made by auto. The largest share on the NYCT subway were from Manhattan to Brooklyn (39%), while the largest share on MTA bus were from Manhattan to the Bronx (16%).



TABLE 46. MODE SPLIT, BY BOROUGH FOR NON-COMMUTE TRIPS

HOME BOROUGH	DESTINATION BOROUGH	AUTO		NYC SUBWAY		NY-MTA BUS (ONLY)		SUBWAY + BUS		TAXI, CAR/VAN SERVICE		TNC (UBER/LYFT)		WALK/BIKE		OTHER	
		TOTAL	%	TOTAL	%	TOTAL	%	TOTAL	%	TOTAL	%	TOTAL	%	TOTAL	%	TOTAL	%
From Bronx	To Bronx	611,551	25%	250,249	10%	279,098	11%	47,662	2%	38,853	2%	44,391	2%	1,077,090	44%	80,440	3%
	To Brooklyn	9,933	15%	22,595	33%	2,431	4%	1,543	2%	504	1%	3,135	5%	27,545	41%	-	0%
	To Manhattan	70,834	11%	154,081	24%	34,719	5%	29,192	5%	11,558	2%	5,468	1%	312,881	50%	12,779	2%
	To Queens	50,512	47%	15,946	15%	5,504	5%	2,736	3%	803	1%	1,624	2%	27,745	26%	2,107	2%
	To Staten Island	428	20%	259	12%	-	0%	93	4%	-	0%	-	0%	1,319	63%	-	0%
	To Outside NYC	138,042	68%	4,584	2%	3,440	2%	352	0%	15,091	7%	1,584	1%	29,103	14%	10,704	5%
From Brooklyn	To Bronx	4,622	14%	6,256	19%	1,751	5%	389	1%	321	1%	4	0%	17,214	54%	1,617	5%
	To Brooklyn	1,021,005	20%	700,674	14%	347,807	7%	72,803	1%	108,948	2%	58,971	1%	2,583,976	52%	122,923	2%
	To Manhattan	54,373	5%	336,939	29%	17,045	1%	26,838	2%	11,817	1%	16,680	1%	687,334	59%	18,923	2%
	To Queens	46,506	28%	29,284	18%	9,993	6%	6,524	4%	3,043	2%	14,789	9%	46,830	28%	10,255	6%
	To Staten Island	8,987	83%	256	2%	432	4%	25	0%	553	5%	-	0%	628	6%	8	0%
	To Outside NYC	74,100	48%	5,592	4%	585	0%	501	0%	11,502	7%	4,671	3%	46,248	30%	11,427	7%
From Manhattan	To Bronx	13,793	14%	25,081	26%	15,366	16%	5,234	5%	1,872	2%	5,350	5%	30,450	31%	1,180	1%
	To Brooklyn	14,374	16%	35,441	39%	2,786	3%	952	1%	1,494	2%	1,527	2%	30,222	34%	3,125	3%
	To Manhattan	127,897	3%	695,657	17%	251,052	6%	40,828	1%	77,370	2%	63,307	2%	2,808,907	68%	75,084	2%
	To Queens	11,470	15%	13,143	17%	6,549	9%	716	1%	7,190	9%	2,732	4%	27,105	36%	7,070	9%
	To Staten Island	1,674	69%	56	2%	138	6%	-	0%	-	0%	-	0%	-	0%	559	23%
From Queens	To Bronx	9,277	37%	4,416	17%	516	2%	1,264	5%	776	3%	-	0%	7,356	29%	1,782	7%
	To Brooklyn	72,183	37%	39,423	20%	9,983	5%	5,762	3%	2,266	1%	521	0%	55,899	28%	10,427	5%
	To Manhattan	33,259	4%	273,416	29%	22,188	2%	37,857	4%	17,954	2%	4,754	1%	527,185	56%	23,073	2%
	To Queens	1,593,766	37%	368,599	9%	312,460	7%	80,286	2%	65,273	2%	25,819	1%	1,760,635	41%	91,213	2%
	To Staten Island	862	77%	135	12%	-	0%	-	0%	127	11%	-	0%	-	0%	-	0%
	To Outside NYC	255,296	74%	4,127	1%	3,483	1%	3,553	1%	6,762	2%	5,213	2%	54,749	16%	11,104	3%
From Staten Island	To Bronx	311	13%	342	15%	8	0%	128	5%	-	0%	139	6%	1,274	54%	139	6%
	To Brooklyn	32,775	61%	1,452	3%	4,087	8%	838	2%	503	1%	-	0%	13,082	24%	1,074	2%
	To Manhattan	11,416	9%	15,541	12%	3,825	3%	3,661	3%	1,915	1%	302	0%	91,075	68%	5,358	4%
	To Queens	6,665	63%	3,032	29%	22	0%	20	0%	-	0%	-	0%	861	8%	-	0%
	To Staten Island	633,047	67%	19,263	2%	54,252	6%	10,799	1%	4,317	0%	3,758	0%	194,970	21%	29,225	3%
	To Outside NYC	37,811	92%	211	1%	10	0%	-	0%	-	0%	-	0%	2,712	7%	182	0%

## Rider Profile

Table 47 shows a demographic profile of three types of transit users: subway only users, bus only users, and subway and bus users. The selections were determined based on a respondent's self-reported "typical commute mode".

Compared to bus only and subway and bus users, subway only users were more likely to be white (47%), with a higher percentage of riders with a bachelor's degree (65%) and a greater share of household incomes in the \$150,000 or more category (23%). Bus only (60%) and bus and subway (59%) users skewed more female as compared to subway only users (52%). While roughly a third of all users tended to be Hispanic, bus only (26%) and subway and bus users (27%) were slightly more likely than subway only users (20%) to be Black/African American.

**TABLE 47. PASSENGER DEMOGRAPHIC PROFILE**

	SUBWAY ONLY	BUS ONLY	SUBWAY + BUS
<b>Hispanic</b>	30%	34%	35%
<b>Ethnicity</b>			
Native American/Alaska Native	1%	1%	1%
Asian	15%	14%	14%
Black/African American	20%	26%	27%
Native Hawaiian/Pacific Islander	0%	0%	0%
White	47%	39%	37%
More than one race	3%	4%	4%
Other	14%	16%	18%
<b>Female</b>	52%	60%	59%
<b>Age</b>			
18-24	8%	8%	9%
25-34	30%	27%	27%
35-44	25%	24%	25%
45-54	21%	22%	22%
55-64	11%	14%	12%
65+	4%	6%	5%
<b>Bachelor's degree or higher</b>	65%	55%	57%
<b>Household Income</b>			
Under \$20,000	7%	10%	9%
\$20,000-\$49,999	21%	26%	26%
\$50,000-74,999	17%	19%	20%
\$75,000 - \$149,999	31%	29%	28%
\$150,000 or more	23%	16%	17%

Source: RSG

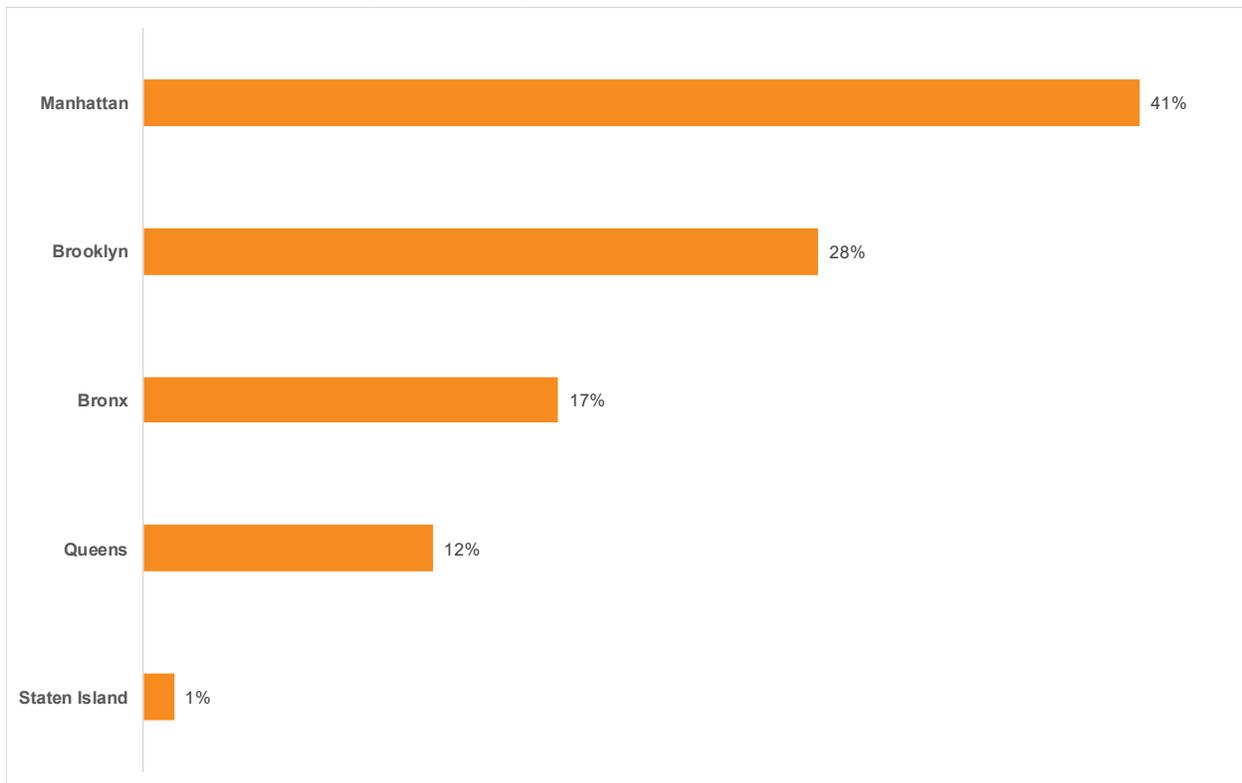


## Transportation Network Company Usage

Figure 36 through Figure 40 provide a snapshot of how TNCs such as Uber and Lyft were being used in New York City by borough, trip purpose, age, income, and day of week. The percentages represent the share of TNC trips for the various categories.

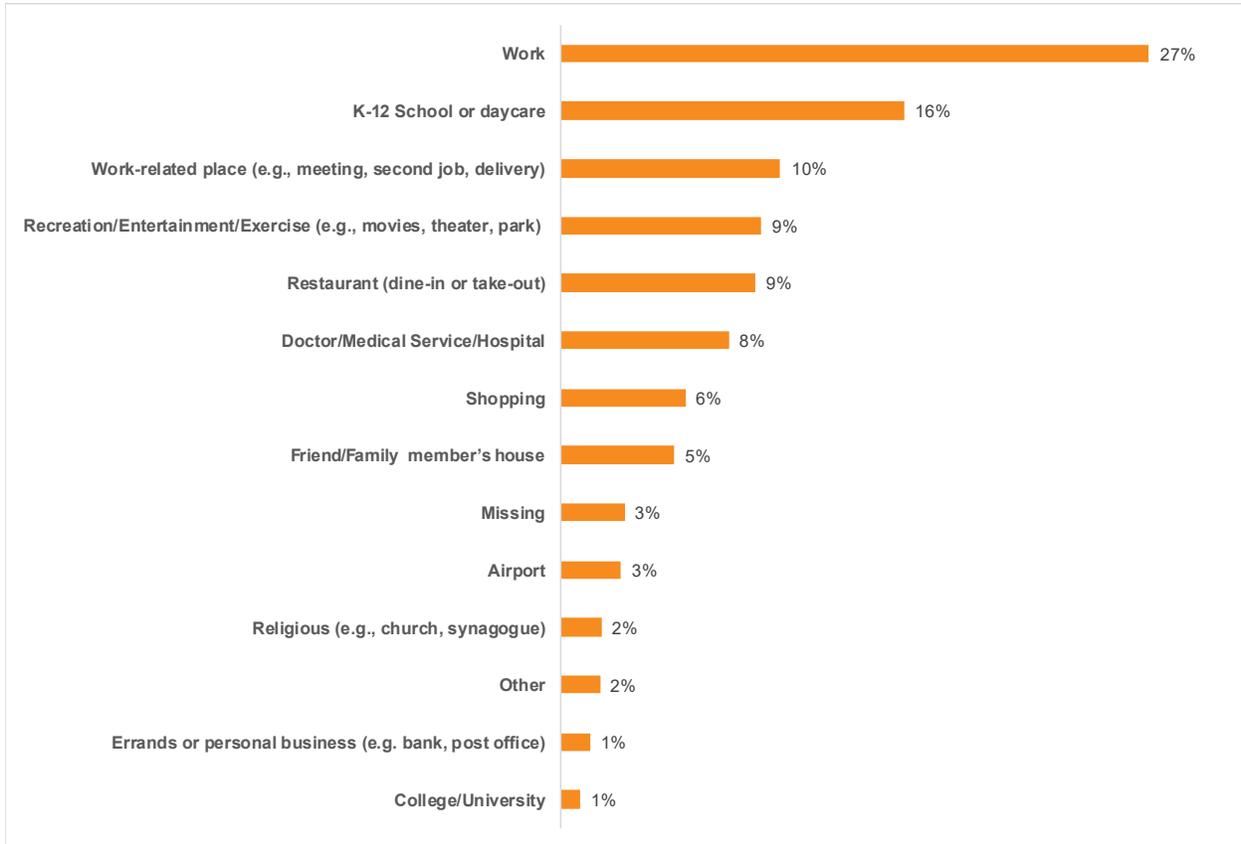
Across New York City (Figure 36), the most common borough for a TNC trip to originate from was Manhattan (41%), followed by Brooklyn (28%). For trip purpose, as a share of all TNC trips (Figure 37), work trips accounted for the greatest percentage (27%) followed by K-12 school or day care (16%).

**FIGURE 36. SHARE OF TNC (UBER/LYFT) TRIPS, BY ORIGIN BOROUGH**



Source: RSG

**FIGURE 37. SHARE OF TNC (UBER/LYFT) TRIPS, BY TRIP PURPOSE**

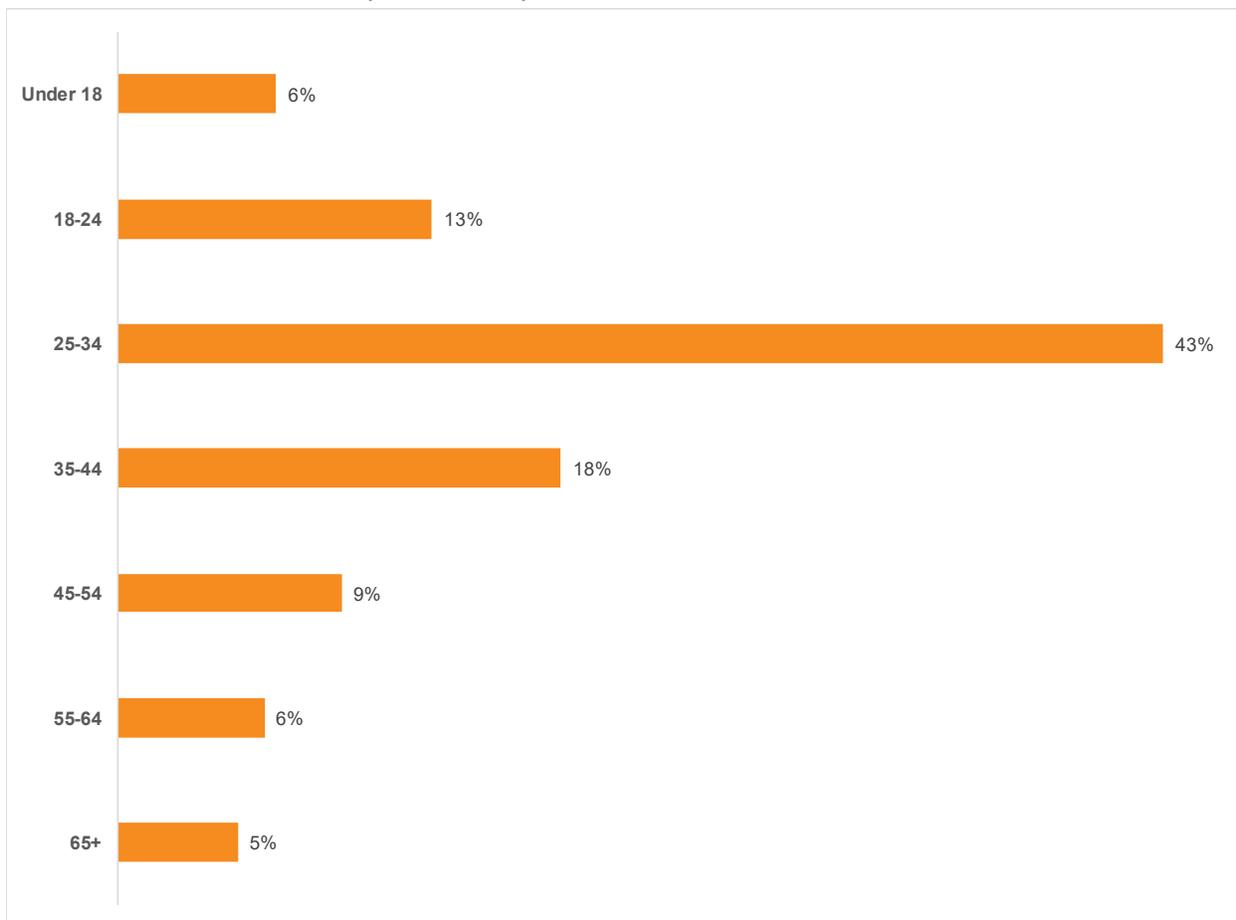


Source: RSG



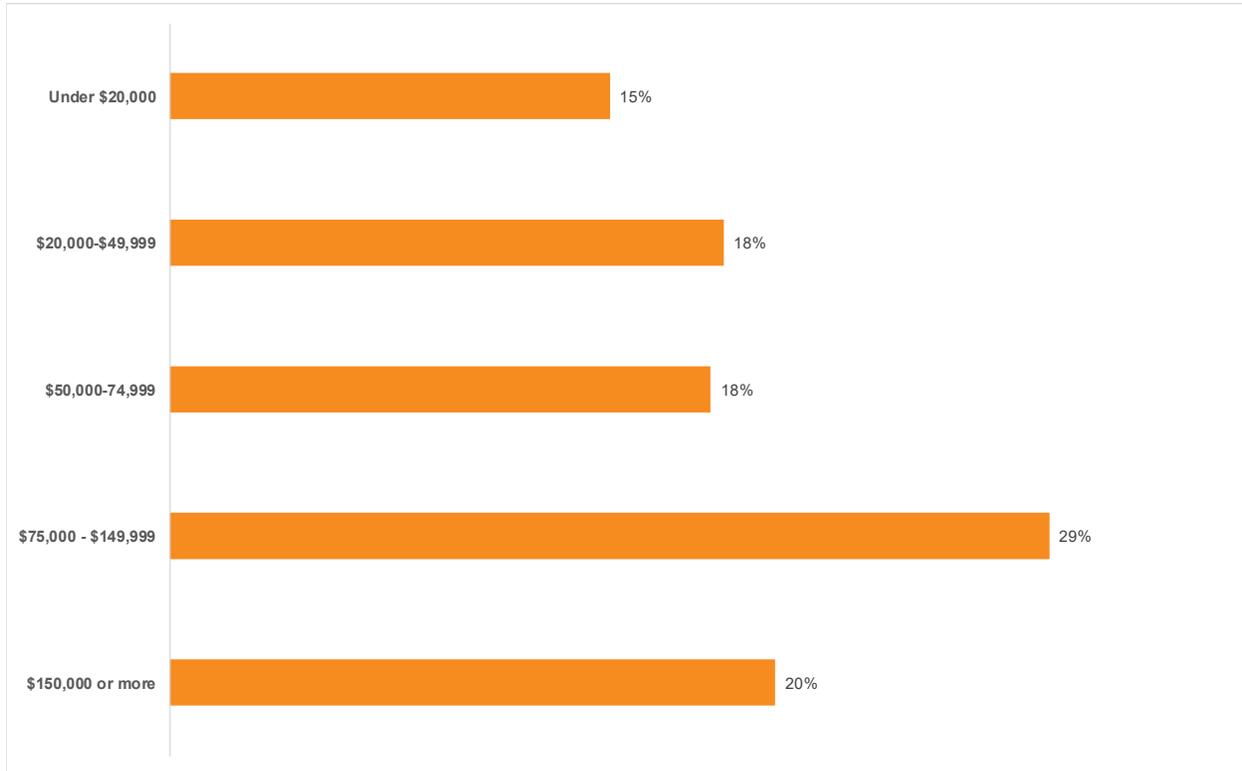
TNCs were most commonly used by those between ages 25-34, with over 40% of the reported trips made by this age cohort (Figure 38). Of note, eight in ten TNC trips were taken by those under age 45. Looking at TNC use by income, approximately 30% of all trips are taken by those from households earning \$75,000-\$149,999 per year, the highest share of all income brackets. Roughly half of TNC trips were taken by those earning less than \$75,000 per year and half by those earning more than \$75,000 per year (Figure 39). TNC use was slightly more likely to occur on Saturdays as compared to weekdays or Sundays (Figure 40).

**FIGURE 38. SHARE OF TNC (UBER/LYFT) TRIPS, BY AGE**



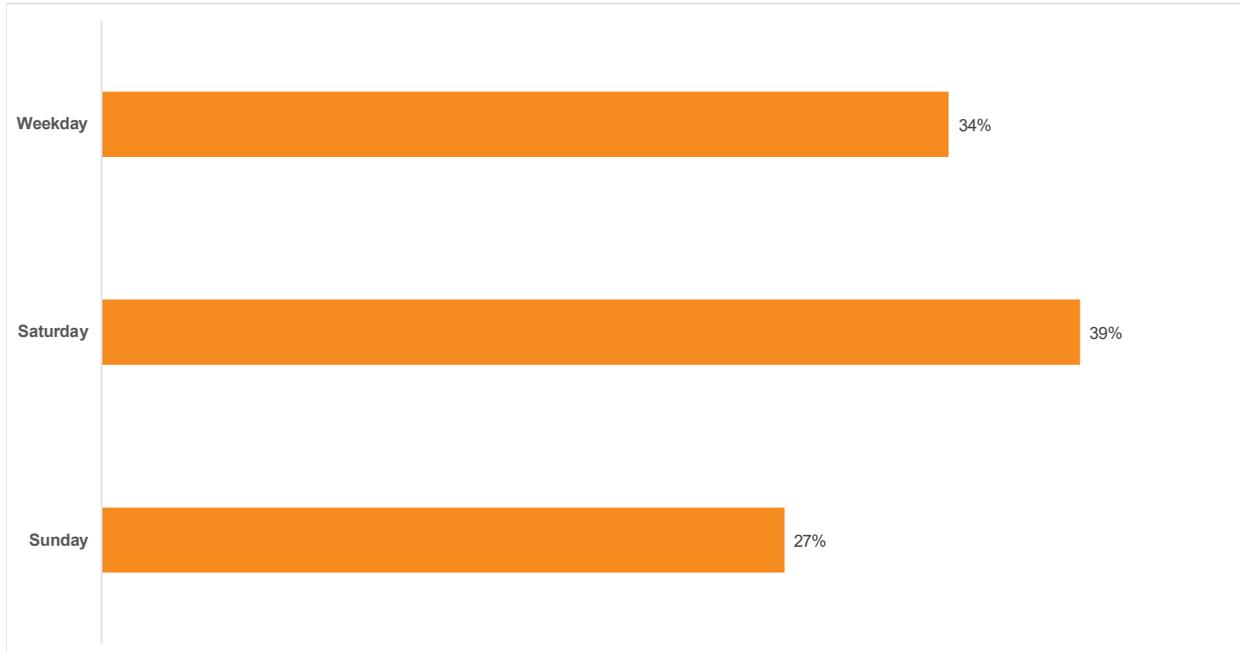
Source: RSG

**FIGURE 39. SHARE OF TNC (UBER/LYFT) TRIPS, BY HOUSEHOLD INCOME**



Source: RSG



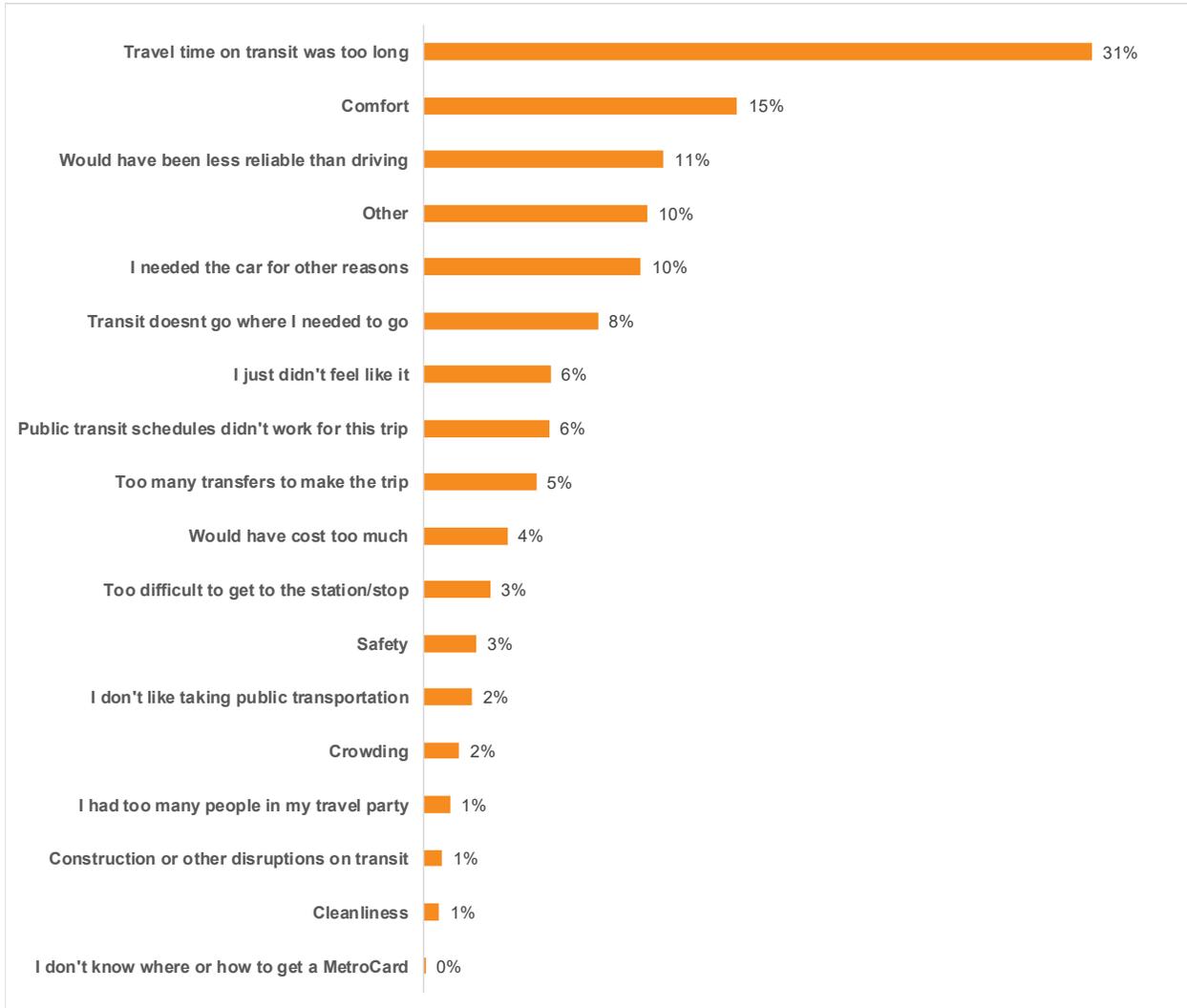
**FIGURE 40. SHARE OF TNC (UBER/LYFT) TRIPS), BY DAY OF WEEK**

Source: RSG

## Reasons for Not Using Transit

By far, the most common reason for not using transit among New York City residents was that the travel time on transit was perceived to be too long (31%). The next most frequently cited reason for not taking transit was comfort (15%). At least 10% cited needing the car for other purposes, and transit not being as reliable as driving as reasons they did not use transit for their trip. The most infrequent responses include not knowing where or how to get a MetroCard, cleanliness, construction or other disruptions and having too many people in a travel party (Figure 41).

FIGURE 41. REASONS FOR NOT TAKING TRANSIT\*



Source: RSG

\*Respondents can select all that apply







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