



# Analysis of Local Bus Markets

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Susan O'Donnell, NJ TRANSIT

October 7, 2020

## Today's Agenda

- Introduction
- Background and project timeline
- Project objectives
- Methodology
- Accomplishments to date
- Selected results (Demographic, traffic, CO<sub>2</sub>)
- Implementation
- Benefits and uses beyond the project
- Bus usage during the pandemic – an update



## Project Team Members

- **Priscilla Ukpah, NJDOT Project manager**
- **Susan O'Donnell, NJ TRANSIT customer**
- **Deva Deka, Principal investigator**
- **Other key contributors**
  - **Roberto Rivera, NJ TRANSIT**
  - **Stephanie Crozier, Rutgers VTC**
  - **Xiang Liu, Rutgers CAIT**
  - **Other NJ TRANSIT staff (past and present)**
  - **More than 300 Rutgers students**

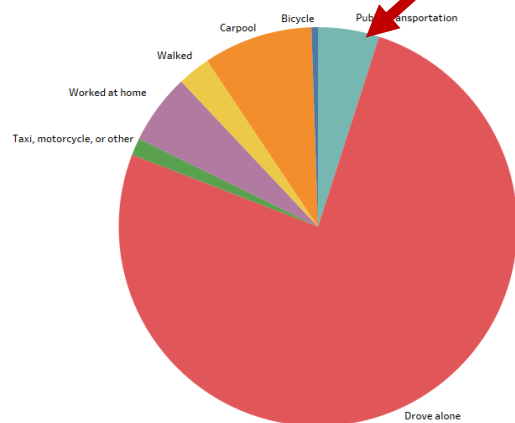
## Transit share (commute trips)

# Background

**NJ bus share= 60%**

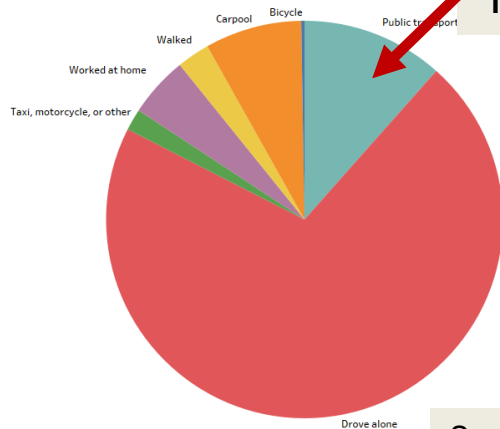
State United States  
Year 2019

**US=4.9%**

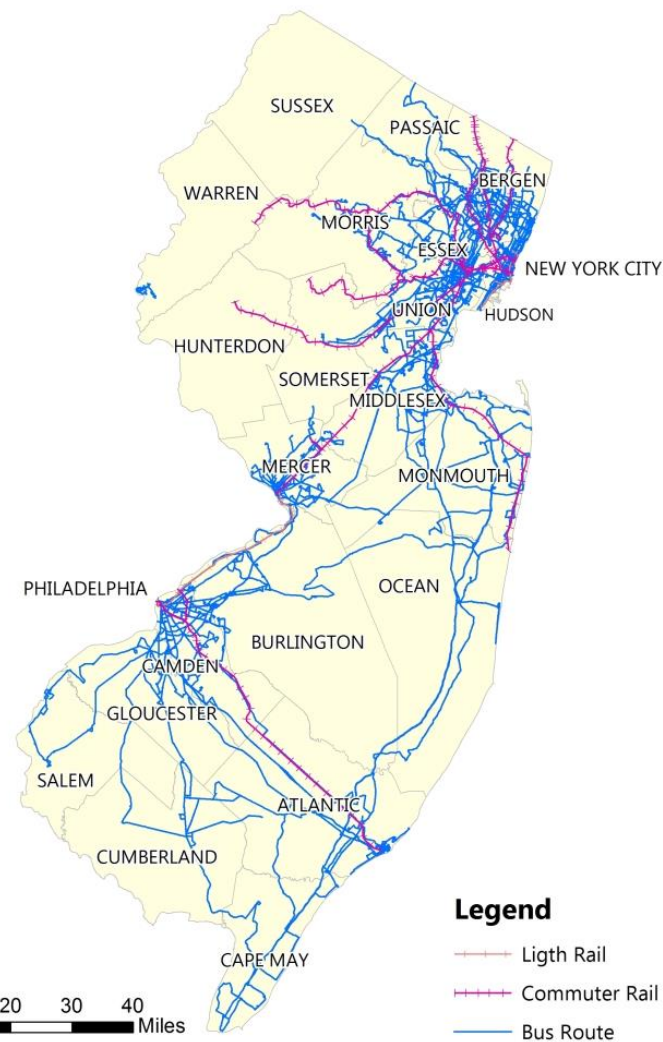


State New Jersey  
Year 2019

**NJ=11.5%**



Source: BTS

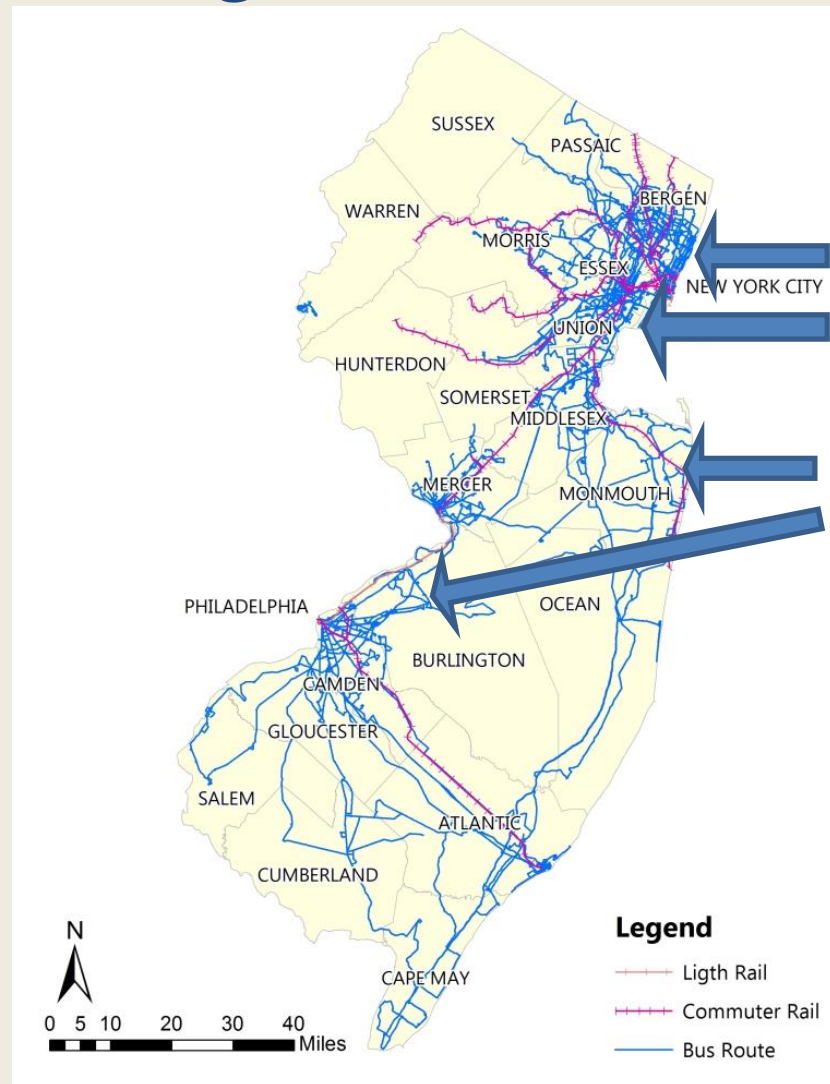




## Background & Timeline

- NJ TRANSIT Bus system & ridership
- NJ TRANSIT's periodic surveys
- Three phases of the project
  - Phase I: Primarily Hudson County (2015-16)
  - Phase II: Primarily Morris, Middlesex, Monmouth, Ocean, Cumberland, Camden Counties (2017-18)
  - Phase III: Newark Bus Market (2019-?)

# Background & Timeline



**Phase I**

**Phase III**

**Phase II**

## Project Objectives

- Assess benefits from local buses
  - Environmental impact
  - Traffic impact (Phase I only)
- Fulfill federal requirements
- Support Title-VI analysis
- Support travel demand modeling
- Support transit service planning

## Broad Methodology

- Conduct survey
  - Prepare for survey
  - Conduct survey
- Clean, weight, and geocode data
- Undertake route-specific data analysis
- Assess environmental/traffic impact





## Survey Preparation

- Develop and print questionnaire
- Obtain IRB approval
- Hire surveyors and supervisors
- Train surveyors
- Convert driver paddles to assignment sheets
- Prepare “master file” to assign surveyors to buses
- Prepare weekly schedules for 30+ surveyors

# Questionnaire

22. Please tell us:  
How many **people (including yourself)** are in your household?  
\_\_\_\_ people  
How many **licensed drivers (including yourself)** are in your household?  
\_\_\_\_ licensed drivers  
How many **vehicles** (cars, motorcycles, trucks, SUVs, vans, etc.) are in your household?  
\_\_\_\_ vehicles
23. Do you have a physical condition that makes it difficult for you to use the bus?  
☐ No ☐ Yes → Do you use a...? ☐ Wheelchair ☐ Other Mobility Device
24. How well do you speak English?  
☐ Very Well ☐ Not Well  
☐ Well ☐ Not at all
25. Do you speak a language **other** than English at home?  
☐ Yes (Please specify) \_\_\_\_\_ ☐ No
26. What is your Annual Household Income?  
☐ Under \$15,000 ☐ \$35,000 - \$49,999 ☐ \$100,000 - \$149,999  
☐ \$15,000 - \$24,999 ☐ \$50,000 - \$74,999 ☐ \$150,000 - \$199,999  
☐ \$25,000 - \$34,999 ☐ \$75,000 - \$99,999 ☐ \$200,000 or over
27. What is your current occupation?  
☐ Management/Professional ☐ Sales/Retail  
☐ Technical/Skilled ☐ Retired  
☐ Clerical/Secretarial ☐ Student  
☐ Not currently employed ☐ Homemaker  
☐ Non-Office Worker ☐ Other (Please specify) \_\_\_\_\_

Please be assured your responses will be kept confidential. To enter our drawing to **WIN ONE OF FIVE \$100 GIFT CARDS**, please provide your...  
Name \_\_\_\_\_  
Street Address \_\_\_\_\_  
City/Town \_\_\_\_\_ State \_\_\_\_\_  
Zip Code \_\_\_\_\_ Phone # \_\_\_\_\_  
Email Address \_\_\_\_\_

Your comments are important to us. If you have specific comments, please...  
Call Customer Service: 1-877-275-5555 or Visit our Website: [www.njtransit.com](http://www.njtransit.com)



Serial # XXXXXX

NJ TRANSIT is conducting this survey to better understand your travel needs. Please help us by filling out and returning your completed survey to the agent onboard the bus or at the terminal, or drop in any US Mailbox (postage-free). Your responses will be kept confidential. To show our appreciation for your help we will enter your name in a drawing to **WIN ONE OF FIVE \$100 GIFT CARDS**.

## For This Bus Trip...

1. On what bus route did you receive this survey? Route #
2. What time did you board this bus?  
 :   AM ☐ PM  
Hour Minute

3. The place you **CAME FROM** is... (CHOOSE ONE)  
☐ Home ☐ Work ☐ Shopping ☐ Personal Business ☐ Medical/Dental ☐ Social/Recreational ☐ School (K-12) ☐ Technical, College or University ☐ Other
4. The place you are **GOING TO** is... (CHOOSE ONE - NOT THE SAME AS QUESTION 3)  
☐ Home ☐ Work ☐ Shopping ☐ Personal Business ☐ Medical/Dental ☐ Social/Recreational ☐ School (K-12) ☐ Technical, College or University ☐ Other

5. What is the address of the place you **CAME FROM**? (NOT YOUR BUS STOP)  
Address or Intersection \_\_\_\_\_  
City/Town \_\_\_\_\_ State \_\_\_\_\_  
Zip Code
6. What is the address of the place you are **GOING TO**? - YOUR FINAL DESTINATION (NOT YOUR BUS STOP OR STARTING ADDRESS)  
Address or Intersection \_\_\_\_\_  
City/Town \_\_\_\_\_ State \_\_\_\_\_  
Zip Code

22. Por favor díganos:  
¿Cuántas personas (incluyendo usted) están en su hogar?  
\_\_\_\_ personas  
¿Cuántos conductores con licencia (incluyendo usted) hay en su hogar?  
\_\_\_\_ conductores con licencia  
¿Cuántos vehículos (automóviles, motocicletas, camiones, camionetas, etc.) hay en su hogar?  
\_\_\_\_ vehículos
23. ¿Tiene alguna condición física u otra condición que le dificulte usar el autobús?  
☐ No ☐ Sí → ¿Usted usa...? ☐ Silla de ruedas ☐ Otro dispositivo para la movilidad
24. ¿Qué tan bien habla inglés?  
☐ Muy bien ☐ Mal ☐ Bien ☐ Nada
25. ¿Habla usted otro idioma que no sea inglés en casa?  
☐ Sí (Especifique) \_\_\_\_\_ ☐ No
26. ¿Cuál es el ingreso anual de su hogar?  
☐ Menos de \$15,000 ☐ \$35,000 - \$49,999 ☐ \$100,000 - \$149,999  
☐ \$15,000 - \$24,999 ☐ \$50,000 - \$74,999 ☐ \$150,000 - \$199,999  
☐ \$25,000 - \$34,999 ☐ \$75,000 - \$99,999 ☐ \$200,000 o más
27. ¿Cuál es su ocupación actual?  
☐ Administración o Profesional ☐ Ventas o Comercios ☐ Técnico o Experto ☐ Retirado(a) ☐ Social o Recreativo ☐ Estudiante ☐ Oficinista o Secretario ☐ Ama(a) de casa ☐ Actualmente desempleado ☐ Otro (Especifique) \_\_\_\_\_

Sus respuestas se mantendrán confidenciales. Para participar en un sorteo para **GANAR UNA DE CINCO TARJETAS DE \$100**, por favor complete los siguientes datos...  
Nombre \_\_\_\_\_  
Dirección \_\_\_\_\_  
Ciudad o Municipio \_\_\_\_\_ Estado \_\_\_\_\_  
Código Postal (ZIP) \_\_\_\_\_ # de Teléfono \_\_\_\_\_  
Correo electrónico \_\_\_\_\_

Sus comentarios son importantes para nosotros. Si tiene algún comentario en particular, por favor...  
Llame Servicio al Cliente: 1-877-275-5555 o Visite nuestro sitio web: [www.njtransit.com](http://www.njtransit.com)



Serial # XXXXXX

NJ TRANSIT está realizando esta encuesta para entender mejor sus necesidades de transporte. Por favor ayúdenos completando y entregando esta encuesta al agente a bordo del autobús o en la terminal, o en cualquier buzón de correo en los Estados Unidos (gastos de envío gratis). Sus respuestas son confidenciales. Para agradecerle por su ayuda, incluiremos su nombre en un sorteo para ganar **UNA DE CINCO TARJETAS DE REGALO DE \$100**.

## Para este viaje en autobús...

1. ¿En qué ruta de autobús recibió esta encuesta? Ruta #
2. ¿A qué hora abordó este autobús?  
 :   AM ☐ PM  
Hora Minuto

3. El lugar de donde **VIENE** es... (SELECCIONE SÓLO UNO)  
☐ Hogar ☐ Trabajo ☐ Compras ☐ Negocio Personal ☐ Médico o Dentista ☐ Social o Recreativo ☐ Escuela (K-12) ☐ Escuela Vocacional, Universidad ☐ Otro
4. El lugar al que **VAS A IR** es... (SELECCIONE SÓLO UNO - NO EL MISMO QUE LA PREGUNTA 3)  
☐ Hogar ☐ Trabajo ☐ Compras ☐ Negocio Personal ☐ Médico o Dentista ☐ Social o Recreativo ☐ Escuela (K-12) ☐ Escuela Vocacional, Universidad ☐ Otro

5. ¿Cuál es la dirección de **DÓNDE VIENE**? (NO SU PARADA DE AUTOBÚS)  
Calle o intersección \_\_\_\_\_  
Ciudad o Municipio \_\_\_\_\_ Estado \_\_\_\_\_  
Código postal
6. ¿Cuál es la dirección de **DÓNDE SE DIRIGE**? - es decir, SU DESTINO FINAL? (QUE NO SEA SU PARADA DE AUTOBÚS O DIRECCIÓN DE PARTIDA)  
Calle o intersección \_\_\_\_\_  
Ciudad o Municipio \_\_\_\_\_ Estado \_\_\_\_\_  
Código postal

Includes trip-related and rider-specific questions

# Paddles and Assignment Sheets

Hilton - N Ctrl Ctr (800) 772-2237

NJ TRANSIT PADDLE

001 001 AM Sstraight	Run # Lines 1 001	Start From 346a Hilton
Block 001HL001 (0-TransRegExact)	Rte: 1 / Sgn:3054 / Ptn:3 Ivy Hill Loop (Mt. Vernon Pl.)..... 16th Ave. at 18th St..... Springfield Ave. at MLK Jr. Blvd..... Market St. at Broad St..... Eastbound Market St. under bridge..... Ferry St. at Waydell St..... River Terminal (Central Ave.)..... Communipaw Ave. at Mallory Ave..... Journal Square Transportation Center.....	Note: R 625a 637a 645a 648a 651a 658a 703a 711a 725a
Logon: 1-1	END TRIP	
DHD / Sgn: - / Ptn:22 Hilton Garage..... Ivy Hill Loop (Mt. Vernon Pl.).....	Rte: 1 / Sgn:3053 / Ptn:52 Ivy Hill Loop (Mt. Vernon Pl.)..... 16th Ave. at 18th St..... Springfield Ave. at MLK Jr. Blvd..... Market St. at Broad St..... Eastbound Market St. under bridge..... Ferry St. at Waydell St..... River Terminal (Central Ave.)..... Communipaw Ave. at Mallory Ave..... Communipaw Ave. at Grand St..... Montgomery St. at Greene St.....	400a 410a 417a 420a 423a 430a 435a 440a 445a 453a
END TRIP	Rte: 1 / Sgn:3056 / Ptn:26 Montgomery St. at Greene St..... Communipaw Ave. at Grand St..... Communipaw Ave. at Mallory Ave..... River Terminal (Central Ave.)..... Chapel St. at Fleming Ave..... Market St. Bus Lane at Raymond Plaza W..... Market St. at Broad St..... Springfield Ave. at MLK Jr. Blvd..... 16th Ave. at 18th St..... Ivy Hill Loop (Mt. Vernon Pl.).....	Note: R 510a 518a 525a 531a 536a 545a 548a 550a 557a 608a
END TRIP	Rte: 1 / Sgn:3054 / Ptn:64 SOUTH 20TH ST LOOP at 16TH AVE..... 16th Ave. at 18th St..... Springfield Ave. at MLK Jr. Blvd..... Market St. at Broad St..... Eastbound Market St. under bridge..... Ferry St. at Waydell St..... River Terminal (Central Ave.)..... Communipaw Ave. at Mallory Ave..... Journal Square Transportation Center.....	835a 837a 849a 850a 859a 903a 906a 915a 920a 927a 939a
END TRIP		

NOTE- R : Trip operates via River Terminal



1 of 3

ROUTE Number: 1		
BUS Number (Painted No.): 6353		
RUN Number: 001	TRIP Number: 2	Ptn. 21
Direction: OUTBOUND	From: JOURNAL SQ TRANSPORT	To: 16TH AVE AT 18TH ST
Date: 27 October 2019	CENTER 7:48 AM	8:35AM
Agent Names:		

ENGLISH Questionnaires	SPANISH Questionnaires
First Serial ID: 100013	First Serial ID: 20001
Last Serial ID:	Last Serial ID:

Bus Stop	Passengers		# of Refusals	Top Survey Serial ID
	ON	OFF		
1 JOURNAL SQUARE TRANSPORTATION CENTER	6		2	
2 SIP AVE AT GARRISON AVE	1		1	
3 SIP AVE AT VAN WAGENEN AVE	1			
4 SIP AVE AT CORBIN AVE				
5 WEST SIDE AVE AT HIGHLAND AVE				
6 WEST SIDE AVE AT FAIRMOUNT AVE				
7 WEST SIDE AVE AT GAUTIER AVE	1		1	
8 WEST SIDE AVE AT KENSINGTON AVE				
9 WEST SIDE AVE AT GIFFORD AVE				
10 WEST SIDE AVE AT HARRISON AVE	8	2		
11 COMMUNIPAW AVE AT WEST SIDE AVE			1	
12 COMMUNIPAW AVE AT MALLORY AVE	2			
13 COMMUNIPAW AVE AT MARCY AVE	2			
14 COMMUNIPAW AVE AT RT-440 #				
15 LINCOLN HIGHWAY AT HACKENSACK AVE		5		
16 RAYMOND BLVD 244' W OF BLANCHARD ST.				
17 RAYMOND BLVD AT LOCKWOOD ST				
18 RAYMOND BLVD AT WAYDELL ST	1			
19 CHAPEL ST AT FLEMING AVE	4			
20 FLEMING AVE AT RICHARDS ST	2			
TOTAL				

Number of Surveys Returned: 22	CONTACT INFO:
Number of Spanish Surveys Distributed:	Myles: 201 400 1618   Stephanie: 732 261 7938

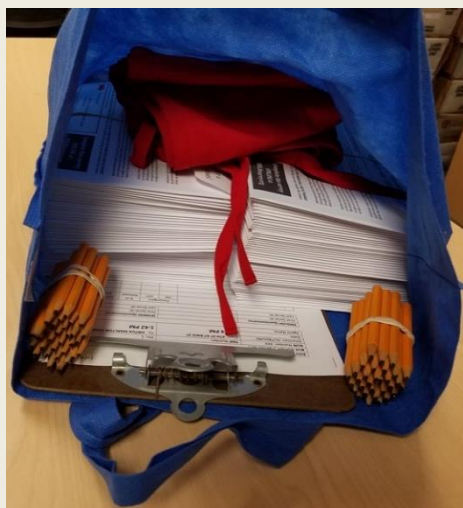
Comments:

6A





# Training



Prepare



Park



Find



Stand



Board



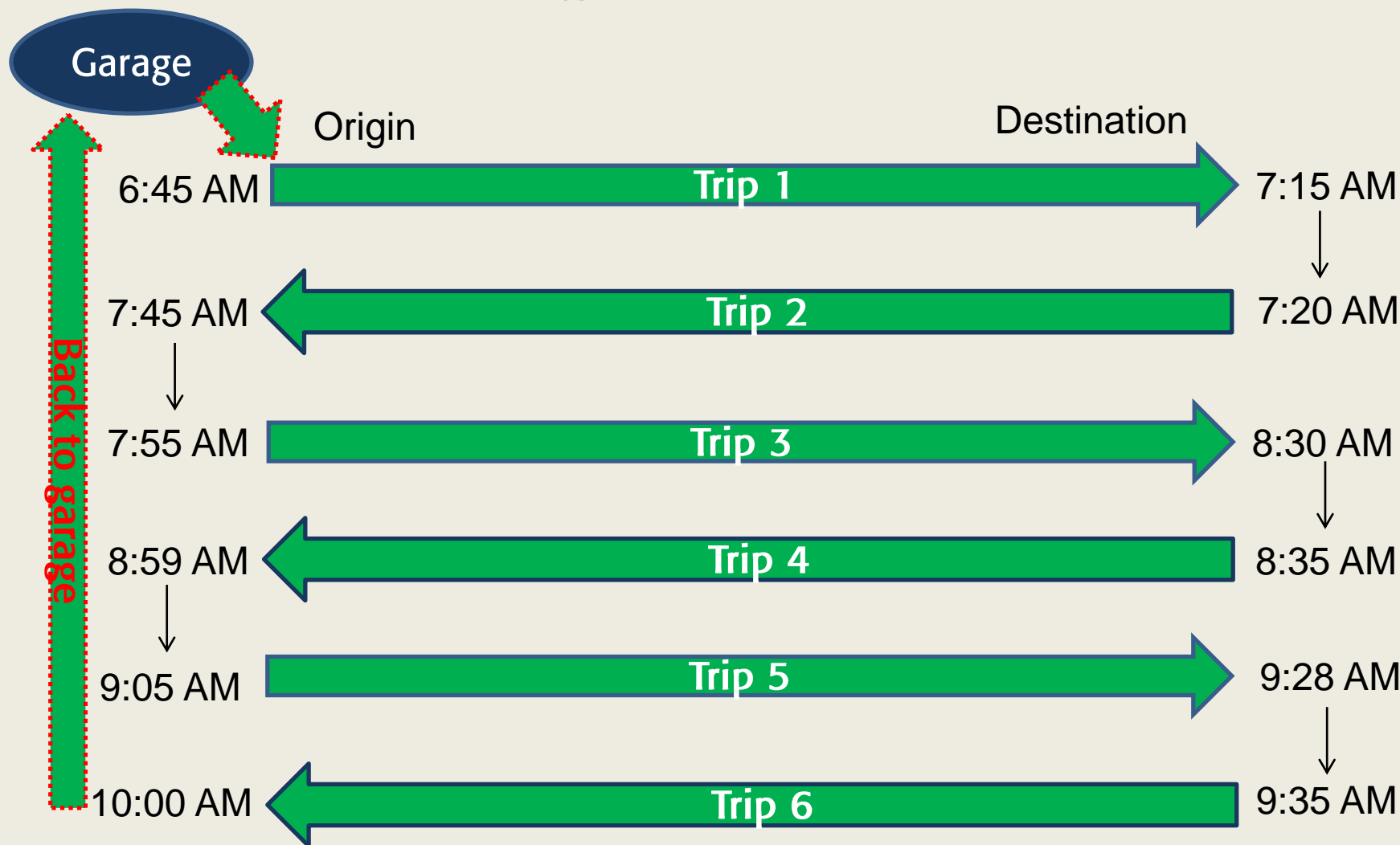
Approach



## Onboard Survey

- Only on Tue, Wed, and Thu in fall and spring
- Between 6 AM and 4 PM
- Always two surveyors
  1. Collector/distributor
  2. Count taker (assignment sheet)
- Stay on the bus for a "Run"
- Bundle collection for each trip
- Bring surveys back at the end of shift

# Trips and Runs



## Post-Survey Work

- Enter surveys (convert to electronic format)
- Clean data
- Develop weight
- Geocode origins and destinations
- Estimate travel distance
- Calculate margin of error
- Analyze



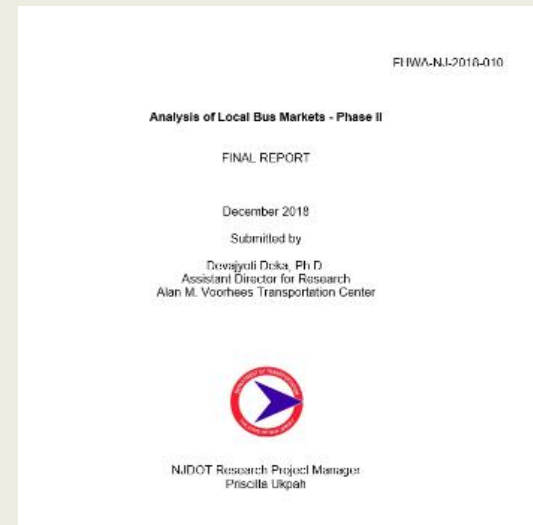
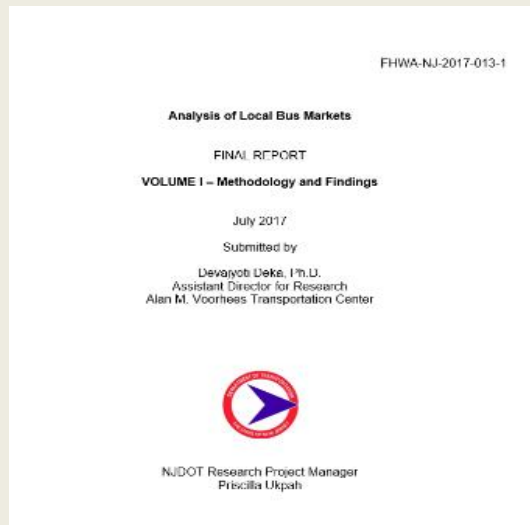
## Learning Experience

- Surveyors can't locate bus stop
- Late bus confuses surveyors
- Riders perceive a trip as round trip
- Riders don't provide clear address
- Highest rider volume does not translate to highest survey collection

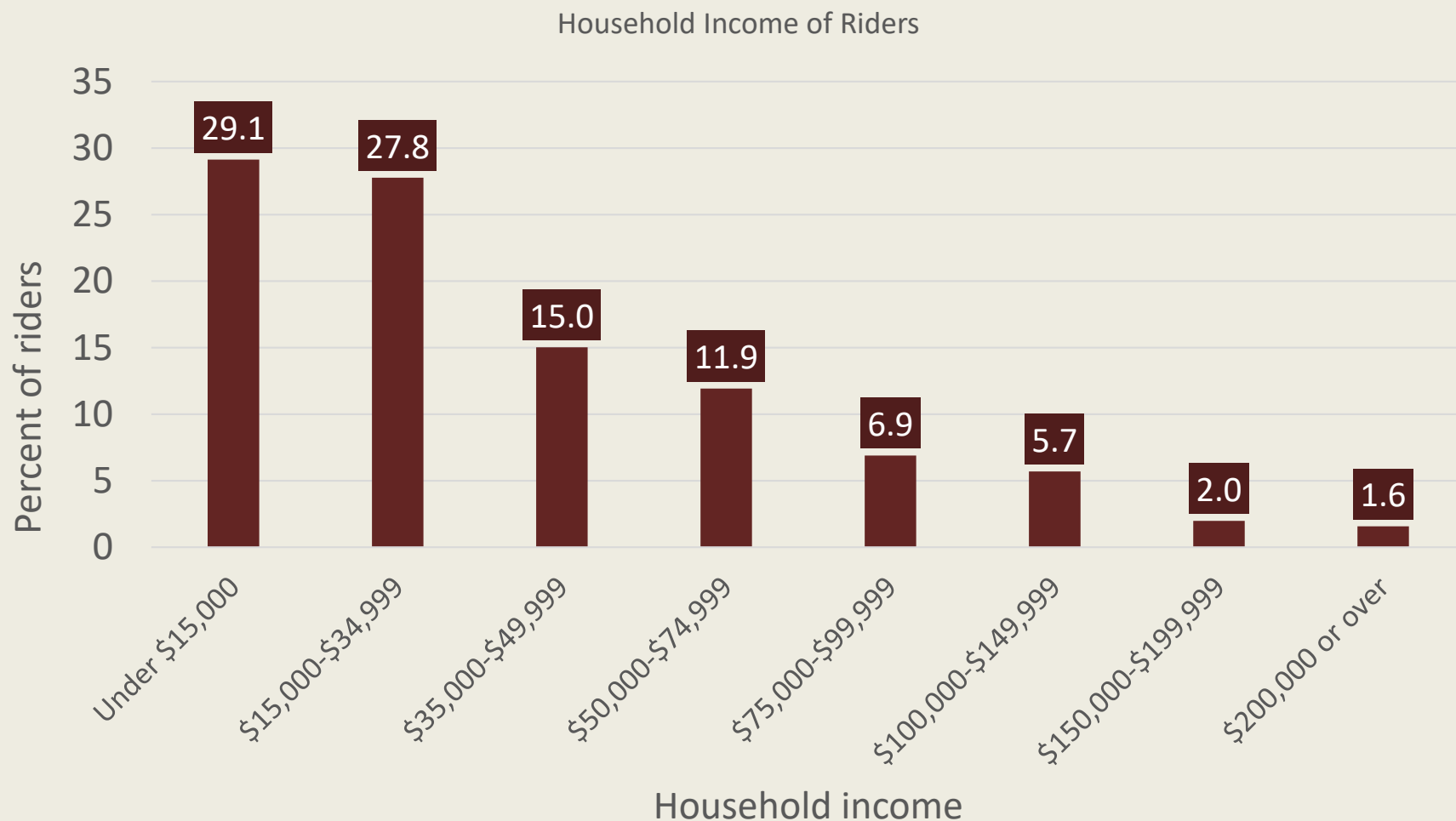


# Accomplishments to Date

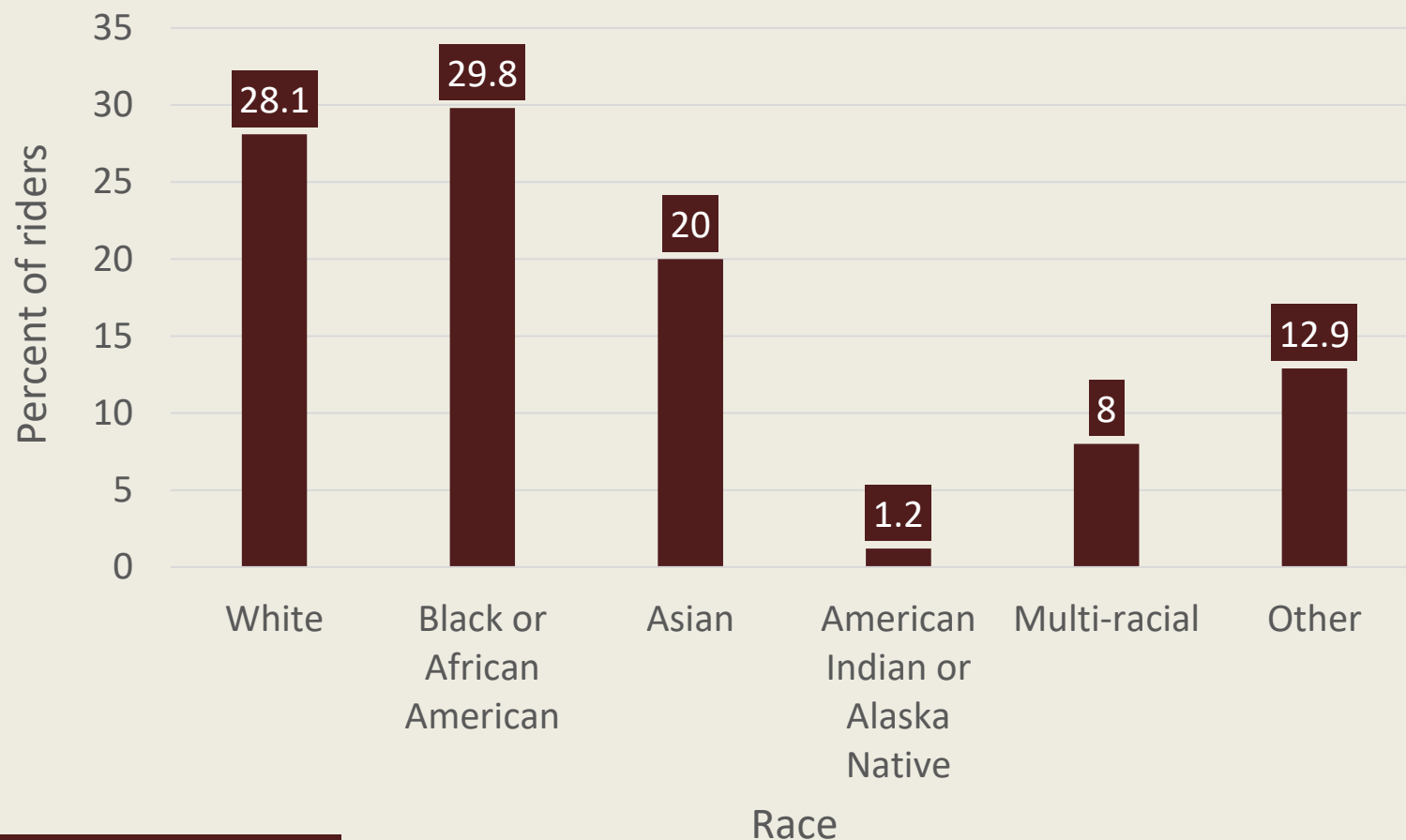
- Phase I and Phase II generated clean data for 10,452 riders
- One season of Phase III generated clean data from 5,127 riders



# Riders' HH Income (from Phase I & II)

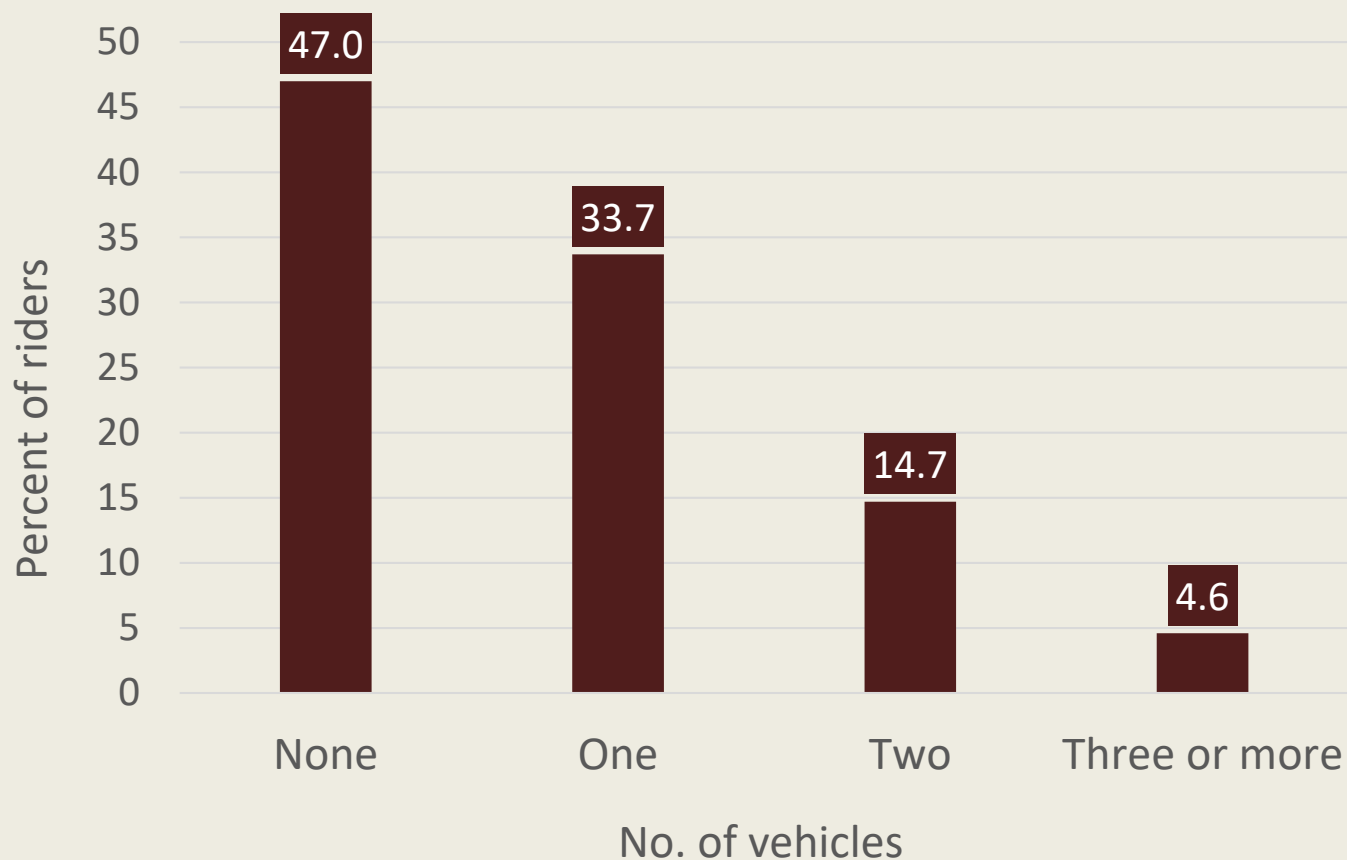


## Riders' Race (from Phase I & II)

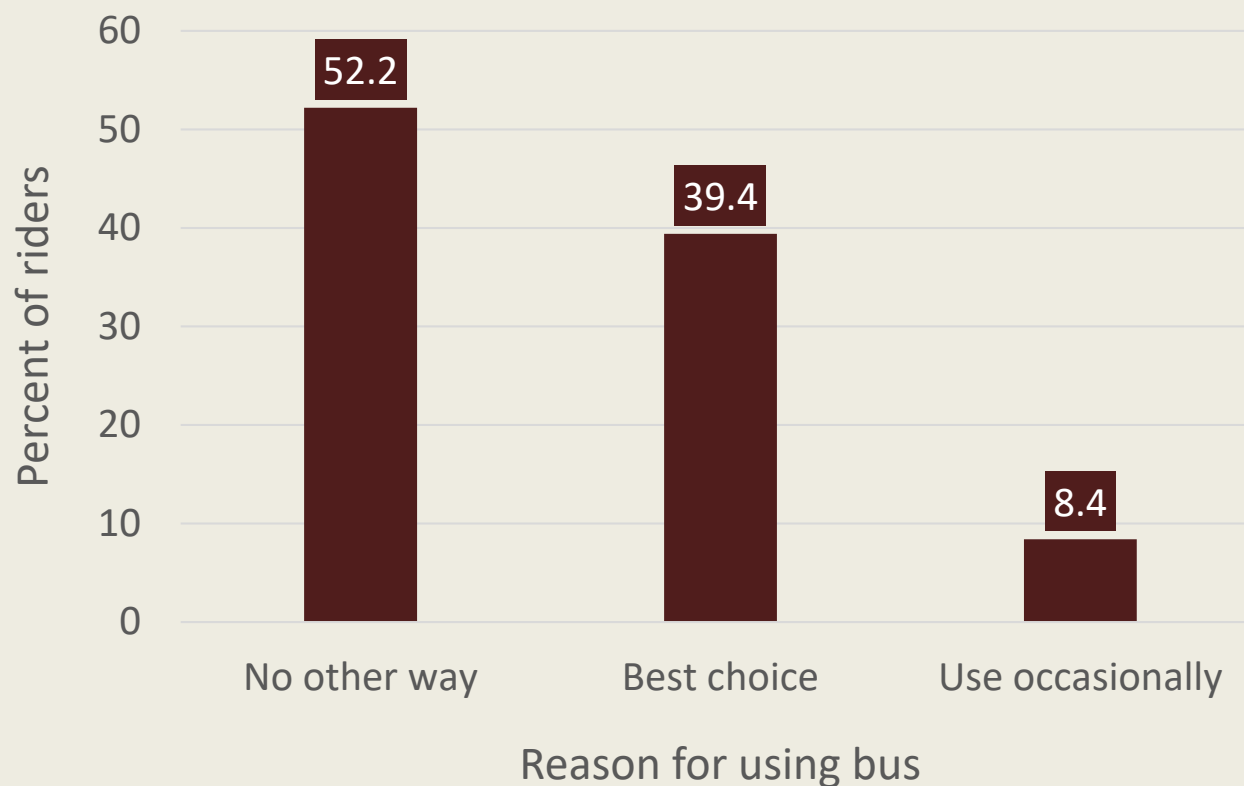


**Hispanic = 40%**

## Riders' HH Vehicles (from Phase I & II)



# Dependence on bus (from Phase I & II)



## Traffic Impact

- Bus Rt. 80 simulation (Jersey City)
- Data collected on traffic volume
- Data collected on signal timing along the route
- Survey data on potential diversion to cars
- VISSIM simulation
- Buses on the route reduces delay by 10% during AM peak



## CO<sub>2</sub> Emission from Diversion to Cars

- Estimate vehicle miles traveled (VMT) based on
  - Potential diversion to cars from survey data
  - Network distance between trip origin and destination
  - Apply carpool rate
- Apply EPA formula to convert VMT to GHG

## Total Annual CO<sub>2</sub> Emission (MT)

- Phase I: (23 bus routes) additional CO<sub>2</sub>=10,260 MT
  - Phase III: (22 bus routes) additional CO<sub>2</sub>=6,170 MT
  - Phase III: (8 bus routes) additional CO<sub>2</sub>=17,380 MT (draft)
- 
- Estimate depends on number of riders, trip length, diversion rate, carpool rate
  - Diversion to app-based service contributes the most

Annual CO<sub>2</sub> from a car is **4.6** MT



## Benefits and Uses beyond the Project

- Travel Demand Modeling
  - Travel survey data is a key component
  - Shared with NJTPA, DVRPC, SJTPO, NYMTC, PANYNJ for use in their models
- Updated travel survey data is required for Capital Improvement Grants like New Starts, Small Starts and Core Capacity
- Title VI of the Civil Rights Act of 1964
  - “No person in the United States shall on the ground of race, color, or national origin, be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any program or activity receiving Federal financial assistance.”

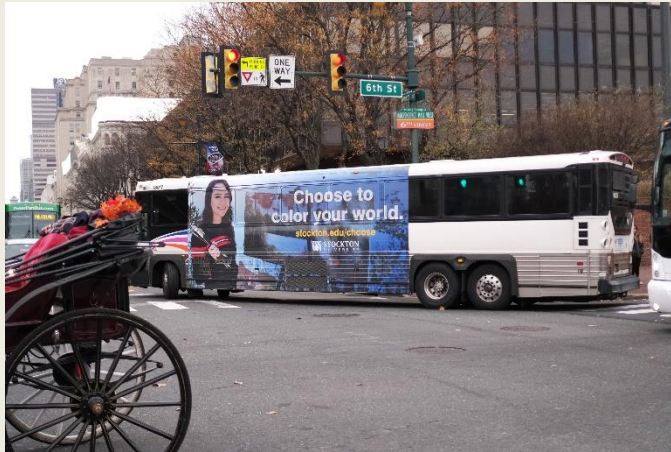


## Benefits and Uses beyond the Project

- Title VI Equity Analysis – evaluates effects on minority and low-income populations
  - Fare Change - any permanent or promotional/temporary fare change lasting longer than six months
  - Service Change – for permanent or temporary major service changes lasting longer than 12 months
- Title VI Four Factor Analysis assessment determines
  - Languages spoken by Limited English Proficient (LEP) individuals
  - Language assistance services for LEP individuals
  - Results are used to develop Language Assistance Plan (LAP)

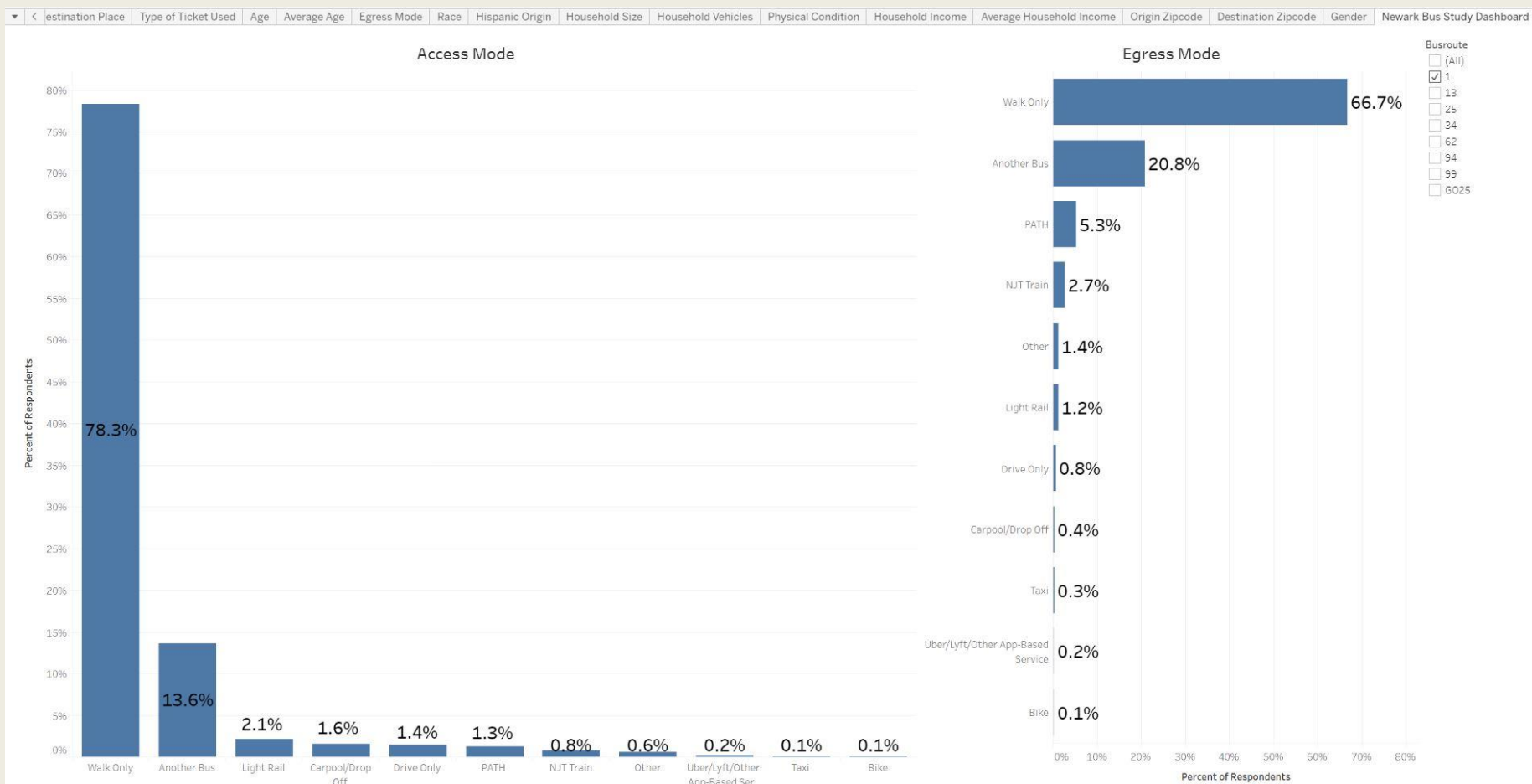
# Benefits and Uses beyond the Project

- Demographic and Travel data for Advertising



# Benefits and Uses beyond the Project

## ▪ Newark Bus System Redesign Project





# Benefits and Uses beyond the Project

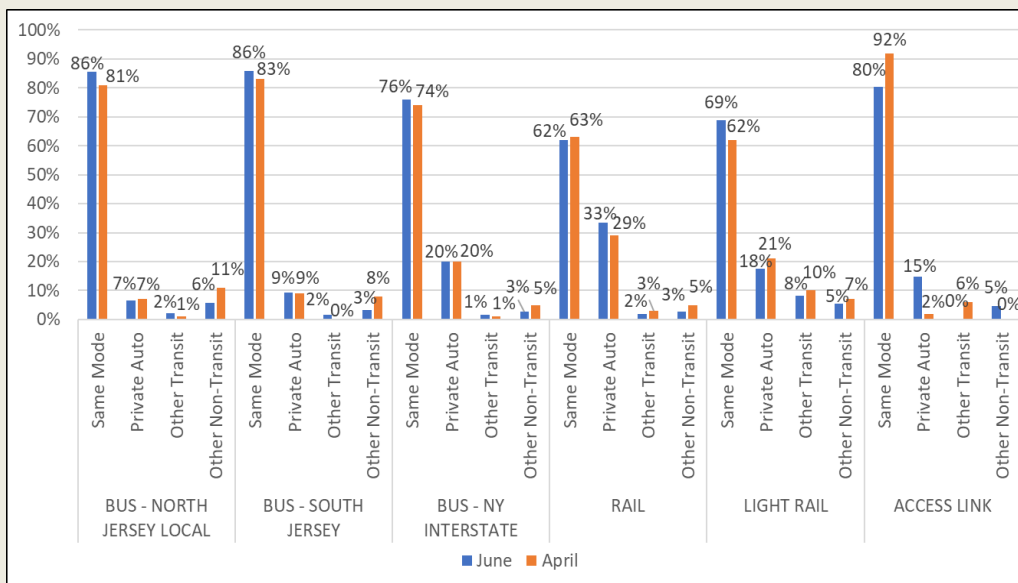
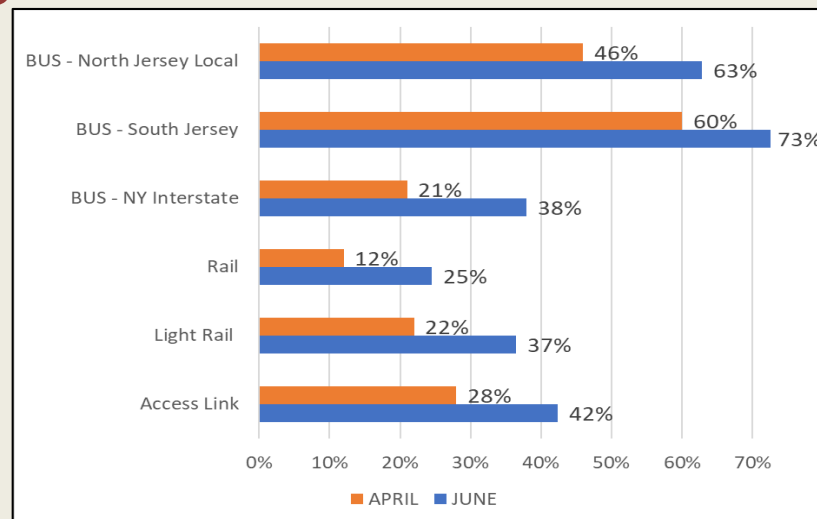
- Additional Uses
  - Station Studies
  - Access to Transit
  - Corridor Studies
  - Fare Policy Studies
  - Transit Oriented Development Studies
  - Grant Applications
  - Intermodal Studies
  - Air Quality Studies
  - Regional Planning
  - Special Events Planning



# Bus usage during the pandemic – an update

## NJ TRANSIT COVID Travel Surveys

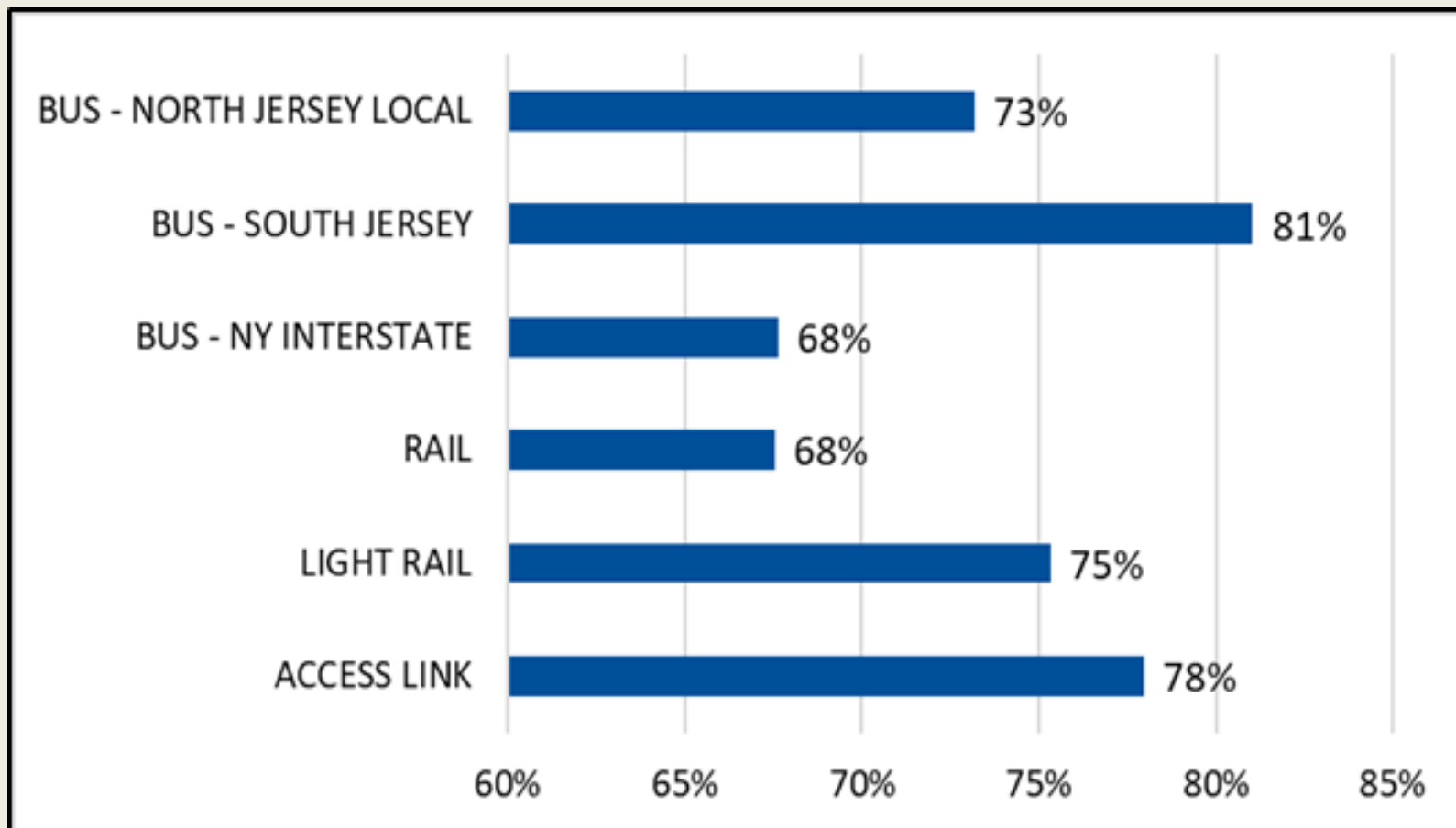
Percent of Customers **Traveling to WORK**  
at least once per week  
*During COVID in April & June 2020*



Modes of Customers  
**Traveling to WORK**  
*During COVID*

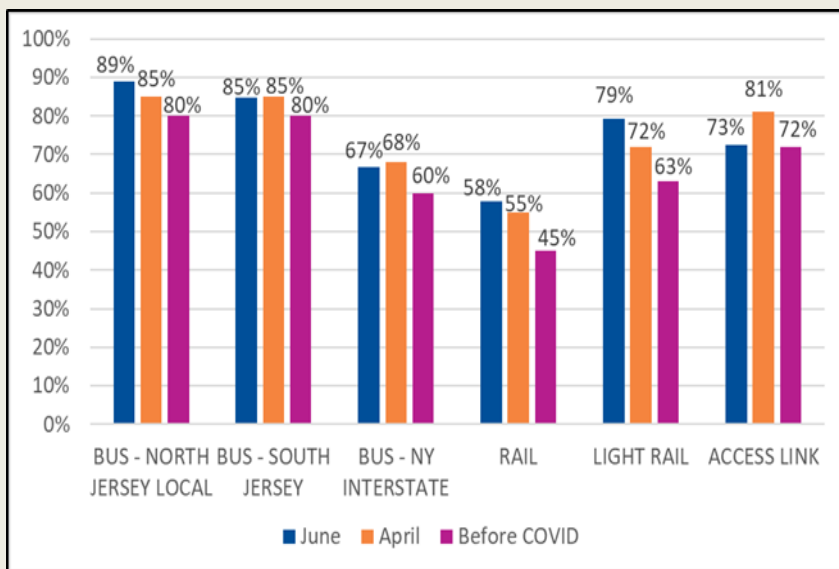
# Bus usage during the pandemic – an update

Percent of Customers Traveling in June that Self-Identified as Essential Workers

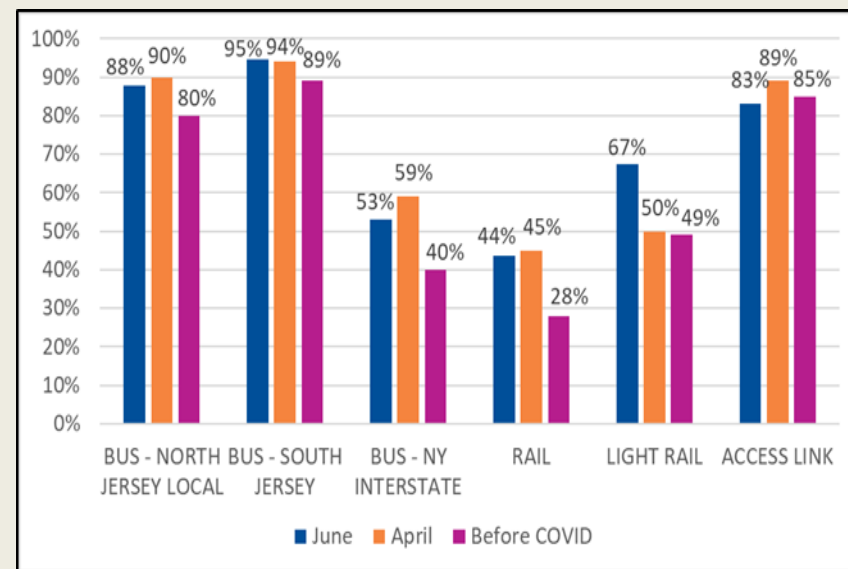


# Bus usage during the pandemic – an update

**Percent of Customers Making a Work Trip that Own 1 or 0 Autos**



**Percent of Customers Making a Work Trip with a Household Income Less than \$75,000**





# Questions