



Monmouth
PATHS
Access for All

APPENDIX B

DATA REVIEW AND SUMMARY REPORT

Date: January 26, 2024



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ACKNOWLEDGEMENTS



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Executive Summary

Transportation goes beyond moving goods/people from point A to point B — transportation is opportunity. It is opportunity for jobs, education, recreation, healthcare, and affordable housing. Accordingly, transportation provides the necessary linkages people rely on to access these opportunities. However, transportation does not serve everyone equally. Historically, low-income communities, communities of color, people with disabilities, and younger and older populations have been left out of the equation when planning new transportation improvements. Decades of underfunded public transit, pedestrian, and bicycle infrastructure have hurt groups such as these in ways that are still felt and shown today.

An equitable transportation system is one that serves and works for all users. It means that no matter a person's age, physical abilities, or socioeconomic status, they will enjoy the same level of mobility as any other user. While most Monmouth County residents have access to a vehicle and can access employment, education, healthcare, services, and recreation, those who do not face substantial barriers to their mobility. These barriers can include limited to no transit service, a lack of a sidewalk or bike lane, or a missing curb ramp, among others. Creating a more equitable transportation system means eliminating barriers without needing a personal vehicle.

However, in order to develop strategies to create a more equitable transportation system, specific barriers within Monmouth County and its municipalities must be identified and prioritized. This Data Summary and Review report represents the first step in the process of identifying barriers to mobility in Monmouth County. It combines the existing conditions and public outreach information contained in Appendix A: Experienced Conditions Report with existing mobility data using an ArcGIS Dashboard in combination with the study team's custom tool, the Community Deprivation Audit Tool (CDAT). The CDAT combines transportation data with demographic data to highlight areas where poor connectivity may be contributing to issues such as access to employment, healthcare, education, and recreation.

These tools were utilized to further identify, quantify, and categorize barriers that will be used in the next step of the study process which will be to prioritize barriers in each transect and develop solutions. A transect is a land-use term that describes a location based on its relative density of development or other natural or built environment characteristics.

Dividing the County into transects is a critical step to this study because it helps to define barriers that may be specific to a specific area of the County or those that are common across multiple areas. A more detailed discussion of transects in Monmouth County can be found in Appendix C: Limited Effects and Positive Solutions Report.

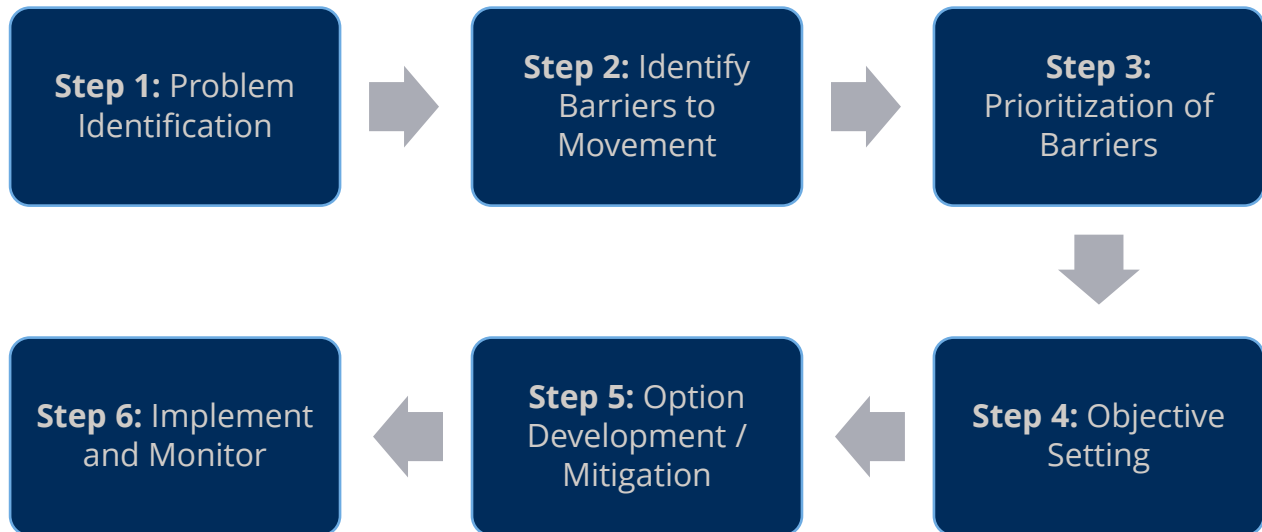
The Data Review and Summary report summarizes the data and tools utilized to compile and analyze mobility in the County and the results in a barriers to mobility framework that will identify and categorize the barriers.

Methodology

As noted in Appendix A: Experienced Conditions Report, a study of this type is relatively unique in the United States, with no identified precedent for a similar study on such a large, county-wide scale. As such, there is no prescribed methodology for conducting this type of study. However, within the United Kingdom, guidance created by the National Department for Transport (DfT) and further adapted by its constituent countries of England, Wales, Scotland, and Northern Ireland, provides a methodological approach to understanding transportation problems (barriers), identification of potential options (mitigation) and evaluation of each option, to ensure the most appropriate solution is sought and implemented.

Therefore, as part of the Monmouth Paths: Access for All Study, the study team has adopted a similar approach to assist in identifying the barriers which residents of Monmouth County face when undertaking a trip and will also use this methodology in the identification of subsequent mitigation to address these barriers. **Figure E-1**, below, highlights the steps involved in this approach.

Figure E-1: Adapted Methodology from the United Kingdom Department for Transport



This report focuses on Steps 1 through 2 above, by first defining what a transportation problem (barrier) is, before presenting a range of identified barriers from the analysis of data and engagement feedback. Steps 3 through 5 will be addressed in Appendix C: Limiting Effects and Positive Solutions Report. Step 6 is the intended outcome after this study is complete. The County, its municipalities, other state agencies, and private developers, among other interested parties, should utilize the information outlined in this study to begin to implement the strategies and monitor their performance.

How are Mobility Barriers Defined?

This analysis primarily focuses on the barriers experienced by a user, or a potential user of the transportation network in Monmouth County. These barriers can be considered as one or more of the following:

- Something that **negatively affects a journey**. This makes a trip less efficient, more expensive, less comfortable or more stressful in terms of safety and / or wellbeing.
- Something that **discourages people or goods travelling by (generally) more sustainable modes**. This primarily leads to more car use and associated negative impacts across a range of policy areas including environment, climate change, equity, and safety.

- Something that **stops people making the trips they would like to make**, or goods being moved. This impacts quality of life, wellbeing, and access to opportunities.

Data Dashboard

The data and analysis that was used to capture the barriers discussed in the following section is available in detail through the ArcGIS dashboard. The dashboard contains the geographical data grouped into pages visualizing information on the transportation network, socio-demographics, active travel, public transit, and car travel. A data log has been provided in **Attachment A**. The dashboard is available at the following link: [Monmouth County - Overview \(arcgis.com\)](#). Additionally, an Excel workbook is available in **Attachment B** which includes further data analysis and insight into specific barriers within the County's municipalities.

Findings

This report summarizes the analysis that was conducted to identify and quantify barriers to mobility within Monmouth County for each mode (active, public transit, and vehicle/driving). The results of the analysis indicate that there are several critical barriers for each mode of transportation, some of which are experienced to the same degree consistently across the County, while others are concentrated in certain areas of the County. **Table E-1** below summarizes the barriers that will be advanced for further analysis by transect in Appendix C: Limiting Effects and Positive Solutions. Barriers in the table are defined as either a County-wide barrier, meaning that the barrier primarily affects mobility across the County, or a localized barrier, meaning that the barrier primarily affects mobility at a local or site-specific level. There are some barriers that are experienced at both scales and are identified as such.

Table E-1: Summary of Critical Barriers and Needs

Mode	Barrier/Need	County-Wide Barrier?	Localized Barrier?
Active (Walking & Biking)	Bicycle network connectivity: There is a very limited amount (<100 miles) of bicycle facilities in the County. Connectivity between communities and services within their own municipality are weak, and there are almost no options to connect between municipalities. Public outreach indicates the need to incorporate higher-quality bicycle facilities into infrastructure projects.	X	X
	Sidewalk connectivity to employment, education, and critical services: Outside of the County's more urbanized municipalities, such as Freehold, Red Bank, and Asbury Park, it is not possible to walk to employment, education, or critical services due to distance or lack of facilities.	X	X
	Major state roadways act as barriers to walking and biking: Major state roadway, such as NJ Routes 18, 33, 35, 36, 79, and US Rt. 9 provide important connections to key services within the County, but also act as barriers to pedestrian and bicycle travel due to lack of sidewalks, low-stress bicycle facilities, and limited crossings.	X	
	Lack of programs, equipment, and facilities to support active mode use by people with disabilities in the County. As pedestrian and bicycle infrastructure is improved, there is a need to consider designing for County residents with disabilities. Special consideration is needed in areas with concentrations of disabled and elderly residents.	X	X
	Safety of pedestrians and cyclists in communities: Pedestrian and bicycle crash hot spots exist in vulnerable communities in municipalities such as Freehold, Asbury Park, Long Branch, and Keyport. Crash hot spots discourage active mode use and result in vulnerable people with few options at greater risk.		X

Mode	Barrier/Need	County-Wide Barrier?	Localized Barrier?
Active (Walking & Biking)	Safety of pedestrians and cyclists along major roadways: There are clusters of pedestrian and bicycle crashes along major roadways such as NJ Rt. 35, 36, and US Rt. 9, indicating a need for improved access along and across these corridors.	X	
	Higher reliance on personal vehicles has created a condition where substantially more investment is made in vehicle infrastructure (wider roads and intersections) to the detriment of pedestrian and bicycle access and safety.	X	
Public Transit	Access to frequent and reliable transit: Only 15 percent of households in the County have access to a public transit stop, and of those 15 percent, only 28 percent have access to a stop with a service frequency of at least once per hour throughout the day.	X	
	Long travel times and multiple seat changes (transfers) to travel around the County and beyond: Only 13 percent of municipality-to-municipality trips can be made without any seat changes (transfers between routes or transit services). In addition, there are few routes within Monmouth County that offer services past 7:00 PM.	X	
	Missing first- and last-mile connections to and from transit stops: Outside of the urban centers within the County, it is difficult to access transit stops due to missing sidewalk connections or crosswalks. Low density land uses typically have buildings set back from the roadway and don't often have sidewalk connections between the street and the building.	X	X
	Limited east-west connections: County residents have several high-frequency options when traveling north to major urban centers such as Newark and New York City. However, east-west travel is limited with few routes with low frequency service.	X	

Mode	Barrier/Need	County-Wide Barrier?	Localized Barrier?
Vehicle (Driving)	High car ownership rates in rural western Monmouth County. Rural areas exhibit higher levels of car ownership due to distances to key services and amenities and lack of transit options.		X
	Higher percentages of zero and one vehicle households in lower-income communities in municipalities like Freehold, Asbury Park, Red Bank, and Long Branch. Low auto-ownership can create substantial barriers to mobility in areas where other mobility options provide limited connectivity. In many of these communities, travel to work, school, shopping, and recreation is constrained by the extent of the public transit network, which has very limited east-west service.		X
	Seasonal congestion creates barriers to travel in many of the County's most vulnerable populations that live east of the Garden State Parkway. Seasonal congestion generated by tourism to the County's shore communities can significantly increase the unreliability of transit, vehicles diverting to local streets, and more vehicle conflicts with pedestrians and bicyclists, among other impacts.	X	X
	Vehicle crash clusters exist in shore municipalities such as Asbury Park and Neptune, which have the highest number of crashes when compared to Annual Average Daily Traffic (AADT), as well as some of the highest densities of crashes based on total roadway mileage.		X
	Travel time and perceived cost benefits of driving versus transit: For most destinations within and outside the County, driving is substantially faster, and is often perceived to be lower cost. Data indicates that travel to major destinations outside of the County can take as much as three times longer than driving. Bus travel time can increase even more if buses are caught in regularly occurring or seasonal congestion. Delays to buses negatively impact schedule reliability and can	X	

Mode	Barrier/Need	County-Wide Barrier?	Localized Barrier?
	lead to missed connections with other bus routes or other transit modes.		
	<p>Limited access to public charging and fueling stations. Electric and other alternative fuel vehicles are becoming more prominent in the market. Overall charging stations numbers are relatively low (78), with over 50 percent of municipalities without a registered public charging station. Furthermore, while electric vehicles are still out of reach for many low-income residents due to high costs, they will likely become more accessible as technology advances. Existing charging stations are primarily located in suburban areas.</p>		X

Introduction

Transportation goes beyond moving goods/people from point A to point B — transportation is opportunity. It is opportunity for jobs, education, recreation, healthcare, and affordable housing. Accordingly, transportation provides the necessary linkages people rely on to access these opportunities. However, transportation does not serve everyone equally. Historically, low-income communities, communities of color, people with disabilities, and younger and older populations have been left out of the equation when planning new transportation improvements. Decades of underfunded public transit, pedestrian, and bicycle infrastructure have hurt groups such as these in ways that are still felt and shown today.

An equitable transportation system is one that serves and works for all users. It means that no matter a person's age, physical abilities, or socioeconomic status, they will enjoy the same level of mobility as any other user. While most Monmouth County residents have access to a vehicle and can access employment, education, healthcare, services, and recreation, those who do not face substantial barriers to their mobility. These barriers can include limited to no transit service, a lack of a sidewalk or bike lane, or a missing curb ramp, among others. Creating a more equitable transportation system means eliminating barriers without needing a personal vehicle.

However, in order to develop strategies to create a more equitable transportation system, specific barriers within Monmouth County and its municipalities must be identified and prioritized. This Data Summary and Review report represents the first step in the process of identifying barriers to mobility in Monmouth County. It combines the existing conditions and public outreach information contained in Appendix A: Experienced Conditions Report with existing mobility data using an ArcGIS Dashboard in combination with the study team's custom tool, the Community Deprivation Audit Tool (CDAT). The CDAT combines transportation data with demographic data to highlight areas where poor connectivity may be contributing to issues such as access to employment, healthcare, education, and recreation.

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The Data Review and Summary report summarizes the data and tools utilized to compile and analyze mobility in the County and the results in a barriers to mobility framework that will identify and categorize the barriers.

Barriers to Mobility Framework

The section of the report presents the methodology and findings of the data analysis and public engagement exercises as part of the Monmouth Paths: Access for All Study, to assist in identifying the barriers that people face when undertaking a trip within Monmouth County. This analysis seeks to capture any issues faced by residents in undertaking any movements either internally within the County or externally from the County. A range of modes were considered: car, public transit (bus, rail) and active modes (walking and biking). Each mode experiences unique barriers that restrict the ability of County residents to access important services and opportunities, such as employment, healthcare, education, shopping and dining, and recreation.

Methodology

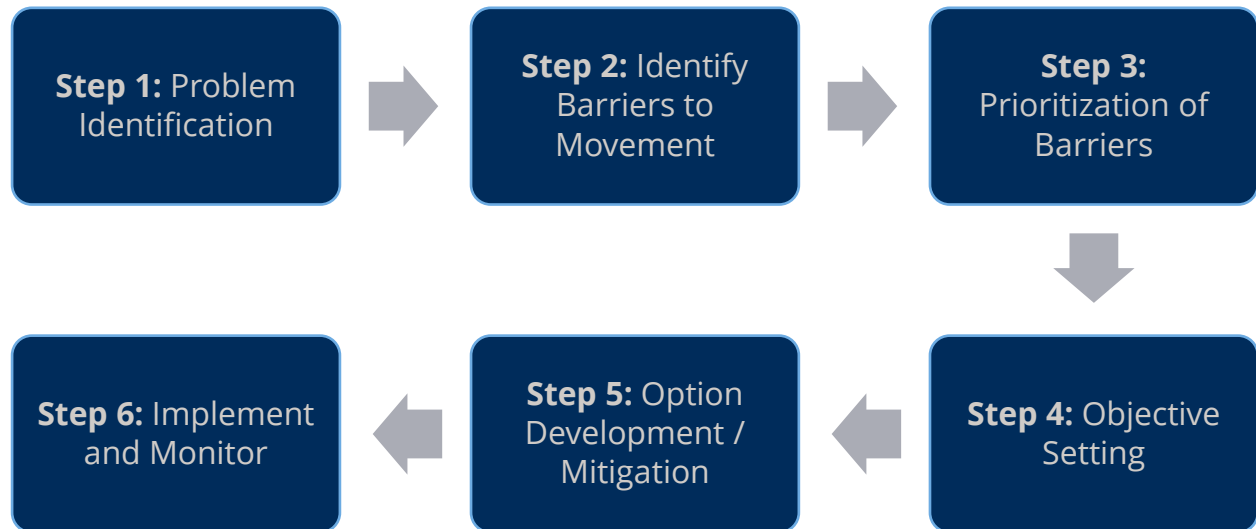
The Process

As noted in Appendix A: Experienced Conditions Report, a study of this type is relatively unique in the United States, with no identified precedent for a similar study on such a large, county-wide scale. As such, there is no prescribed methodology for conducting this type of study. However, within the United Kingdom, guidance created by the national Department for Transport (DfT) and further adapted by its constituent countries of England, Wales, Scotland, and Northern Ireland, provides a methodological approach to understanding transportation problems (barriers), identification of potential options (mitigation) and appraisal of each option, to ensure the most appropriate solution is sought and implemented.

Therefore, as part of the Monmouth Paths: Access for All Study, the study team has adopted a similar approach to assist in identifying the barriers which residents of Monmouth County

face when undertaking a trip and will also use this methodology in the identification of subsequent mitigation to address these barriers. **Figure 1** highlights the steps involved in this approach.

Figure 1: Adapted Methodology from the United Kingdom Department for Transport



To provide further context, each step consists of the following:

- Step 1: Problem Identification:** Collate and undertake data analysis to identify barriers which may be impacting a journey within Monmouth County. This is supported by feedback from the public and stakeholder engagement process to validate and provide further evidence of barriers to movement.
- Step 2: Identify Barriers to Movement:** For each mode, identify potential barriers from the data collated and analyzed in the previous step. This will highlight specific barriers at the County wide-level in addition to highlighting barriers at a much more local / community level.
- Step 3: Prioritization of Barriers:** Identify the barriers that may be impacting the County at an overarching level, which if remedied, could encourage more movement within Monmouth County, stimulating local economies and fostering future growth. This process can assist in prioritizing any specific implementation of mitigation /

options based on outcomes from Steps 1 and 2, which highlight specific problem locations.

- **Step 4: Objective Setting:** Create a set of objectives which state the outcome(s) which any future mitigation / options should seek to assist in delivering. These objectives can be “SMART” – providing targets to inform monitoring and evaluation of any options / mitigation to determine the level of success of its implementation.
- **Step 5: Option Development / Mitigation:** Having set a list of objectives which the County would like to achieve, identify a range of options / mitigation solutions which could be implemented which will address the barriers identified and thus achieve the objectives set.
- **Step 6: Implement and Monitor:** After this study is complete, the County, its municipalities, other state agencies, and private developers, among other interested parties, should utilize the information outlined in this study to begin to implement the strategies. Monitoring is also a critical step to the process to ensure that the implemented strategies are achieving the desired objectives and outcomes. Monitoring can be done quantitatively, for example, measuring the change in pedestrian crashes, or qualitatively, for example, obtaining feedback from the community.

An example of the above process could be as follows:

- **Step 1:** Collation and analysis of bus transit information sourced from the general transit feed specification (GTFS)¹.
- **Step 2:** Analysis of the bus data highlights low levels of services connecting municipalities within the county, with some areas requiring two or more seat changes² (transfers) between modes or services to reach other municipalities.
- **Step 3:** County-wide, only 13 percent of municipality-to-municipality movements can be made without changing services. At the local level, Aberdeen Township, for example, has access to less than five percent of other municipalities within the county using a direct service.
- **Step 4:** Define an objective to improve internal connectivity between municipalities by public transit, reducing the need to change seats, while also delivering journey time

¹ The General Transit Feed Specification is a common format for public transportation schedules and associated geographic information.

² A seat change occurs when a transit rider must transfer to another transit route or service in order to make it to their ultimate destination.

improvements. This can be “smartened” by incorporating target performance measures and timelines.

- **Step 5:** Develop a range of potential mitigation measures, including: (i) introducing new bus routes, (ii) introducing Demand Responsive Transport (DRT) to feed into existing bus routes, (iii) increasing frequency of services, etc. These can then be evaluated to identify options which would deliver the most benefit.
- **Step 6:** Implement the selected mitigation measure(s) and then monitor their performance. In example, monitoring could include comparing before and after transit mode share, measuring the increase in households with access to transit, or calculating the increase in the available direct municipality-to-municipality connections.

This report focuses on Steps 1 through 2 above, by first defining what a transportation problem (barrier) is, before presenting a range of identified barriers from the analysis of data and engagement feedback. Steps 3 through 5 will be addressed in Appendix C: Limiting Effects and Positive Solutions Report. Step 6 would be addressed by the County, its municipalities, other state agencies, and private developers, and/or other interested parties.

How are Mobility Barriers Defined?

This analysis primarily focuses on the barriers experienced by a user, or a potential user of the transportation network in Monmouth County. These barriers can be thought of as one or more of the following:

- Something that **negatively affects a journey**. This makes a trip less efficient, more expensive, less comfortable or more stressful in terms of safety and / or wellbeing.
- Something that **discourages people or goods travelling by (generally) more sustainable modes**. This primarily leads to more car use and associated negative impacts across a range of policy areas including environment, climate change, equity, and safety.
- Something that **stops people making the trips they would like to make**, or goods being moved. This impacts quality of life, wellbeing, and access to opportunities.

As noted above, these barriers are defined as being faced by users of the transportation network and services either now or potentially in the future and are the basic building blocks from which recommendations and mitigation measures can be identified to address these existing and future barriers. Mobility barriers, when defined in this way, are typically associated with a relatively narrow range of parameters which define any trip, defined here as 'barrier themes' and set out in **Table 1**. The list in **Table 1** is used as a 'checklist' to develop a set of mobility barriers for each mode of transportation in the Monmouth County region based on baselining data analysis and engagement/consultation. These barriers have been captured in the following barriers to mobility framework alongside specific evidence of these barriers captured in the data dashboard.

Table 1: Common Barriers By Mode

Theme	Personal Vehicle	Public Transit	Active Modes*
Accessibility	<ul style="list-style-type: none"> • Car ownership due to lack of options • Auto-centric nature of low-density land uses • Ability to purchase and maintain a vehicle 	<ul style="list-style-type: none"> • Connectivity and network coverage (availability of services) • Integration between services (within mode, e.g., bus-to-bus and between modes, e.g., bus-to-rail) including for people with disabilities or other protected characteristics which affect accessibility 	<ul style="list-style-type: none"> • Physical ability to make a journey on foot or by bicycle • Access to electric bikes or scooters • Availability of specially designed bikes or scooters for people with disabilities
Community and/or Environmental Impacts	<ul style="list-style-type: none"> • Concern over environmental impact of travel • Separation of communities/land use types 	<ul style="list-style-type: none"> • Low-density land uses and their negative impact on service type and quality 	<ul style="list-style-type: none"> • Health concerns over the quality of the environment (e.g., air quality)
Cost	<ul style="list-style-type: none"> • Cost of vehicle ownership • Variability in fuel costs 	<ul style="list-style-type: none"> • Fares • Multiple fare structures between different services 	<ul style="list-style-type: none"> • Cost of electric-assisted bikes/scooters and ability to maintain and charge them.
Information	<ul style="list-style-type: none"> • Availability of methods to understand true costs of driving and compare to other modes • Lack of awareness of travel options 	<ul style="list-style-type: none"> • Availability and ease of use of information regarding booking and journey planning (e.g., making connections between services) • Ability to compare different transit service options • Journey information, including for protected groups who may find accessing 	<ul style="list-style-type: none"> • Availability of information regarding availability and quality of walking/biking infrastructure • Ease/ability to access information to plan a journey.

Theme	Personal Vehicle	Public Transit	Active Modes*
		information particularly difficult	
Infrastructure	<ul style="list-style-type: none"> • Availability of EV charging/alternative fuelling sites • Prioritization of vehicular traffic at the expense of infrastructure for other modes 	<ul style="list-style-type: none"> • First- and last-mile connections to/from transit stops (sidewalks, crosswalks, bike facilities, etc.) • Stop amenities (shelters, benches, transit information, lighting, etc.) 	<ul style="list-style-type: none"> • Provision of infrastructure (e.g., routes segregated from traffic, pedestrian crossings, and bicycle parking) • Bike/scooter parking • Charging stations for electric bikes and scooters
Safety	<ul style="list-style-type: none"> • Personal security (fear of crime) • Travel safety (collisions, personal injury) 	<ul style="list-style-type: none"> • Traveling to a stop: condition of sidewalks, lighting, roadway crossings, separation from traffic flow, etc. • At the stop: lighting, proximity to moving traffic, etc. • On-board 	<ul style="list-style-type: none"> • Safety when travelling on or around busy streets • Weather conditions affecting safety or comfort • Security of bike parking
Service		<ul style="list-style-type: none"> • Seating capacity • Comfort, convenience, frequency, and operating hours • Service reliability (cancellations and punctuality) 	
Travel Time	<ul style="list-style-type: none"> • Travel time differences between transit and driving 	<ul style="list-style-type: none"> • Total travel time (including getting to/from transit stop) • Travel time differences between transit and driving 	<ul style="list-style-type: none"> • Travel distance/time required to reach key services or amenities

*Active modes are human-powered modes such as biking, walking, or scooting.

Data Dashboard

The data and analysis that was used to capture the barriers discussed in the following section is available in detail through the ArcGIS dashboard. The dashboard contains the

geographical data grouped into pages for each transportation mode, active travel, public transit, and car travel. A data log has been provided in **Attachment A**. The dashboard is available at the following link: [Monmouth County – Overview \(arcgis.com\)](#). Additionally, an Excel workbook is available in **Attachment B** which includes further data analysis and insight into municipality specific barriers.

Barriers Framework

Active Modes

Active modes are those that are partially or fully powered by humans, such as walking, biking, or riding a scooter. Active modes can directly replace motor vehicle travel, so these modes are effective at reducing fuel consumption and vehicle emissions, bridging first- and last-mile gaps to and from transit, and improving overall individual and public health. An active travel mode assessment was undertaken to identify the potential barriers people face when walking or biking within Monmouth County. The assessment analyzes the local walking and biking network, the local environment, and the underlying needs of the population.

The identified barriers were split into the following categories and their corresponding methodology:

Provision and Quality of Infrastructure

This assesses the available infrastructure to support a person that is travelling by foot or bike. People will be more likely to choose an alternative mode if the quality of infrastructure is not sufficient. For pedestrians, this includes walking infrastructure such as sidewalks, pedestrian crossings, and signage. For cyclists, it includes biking infrastructure such as bike lanes, bike paths / trails, and bicycle racks and parking. Separation from moving vehicular traffic is also a significant decision to a person that is considering walking or biking. For example, depending on experience and ability, a person may feel uncomfortable riding on an unprotected bike lane and may choose to drive instead.

Physical Ability

The ability of a person to use certain modes of transportation will affect their choice of mode, potentially limiting the places and services that they can access. People that are unable to drive a private vehicle may be more reliant on public transportation or walking infrastructure. If a person is unable to walk or bike long distances, this may encourage

additional driving trips or increase reliance on public transportation if key services and amenities are not available within easy access of residential areas. The proportion of people in Monmouth County with a form of disability according to the Census and the Social Deprivation Index were used to obtain a measure of physical ability for active modes.

Distance

The distance that people need to travel to reach key services and amenities influences the travel modes that are available to them. If a supermarket is located within a five-minute walk of a person's home, they are more likely to walk or bike for their weekly shopping. Points of interest were extracted from the Open Street Map (OSM)³ database to represent the key services and amenities that are important to a person, including:

- Local Shops
- Supermarkets
- Public Transportation Stops
- Sports Fields
- Greenspace
- Parks
- Primary Education Facilities
- Healthcare Facilities
- Pharmacies
- Entertainment Venues
- Religious Facilities

These were overlaid on the walking network to assess the distance residents would likely need to travel to reach each category within each Census block. However, it should be noted that while the OSM database generally has a good representation of these categories, it may not be up to date for all categories and additional gaps may exist.

Safety

The safety of active mode users is often driven by the environment. In a car-dominated environment with busy streets, people may feel safer using a car to travel instead of walking

³ <https://www.openstreetmap.org/>. Open Street Map is an open-source mapping system that is built by a community of mappers that contribute and maintain data about roads, trails, cafes, railway stations, and more, all over the world.

or biking. Crash locations and the proportion of collisions that involved a pedestrian or cyclist between 2019 and 2022⁴ were the measures used to assess the safety of active mode users.

Air Quality / Noise

Poor air quality (AQ) within the local environment can discourage walking or biking. The Air Quality Index (AQI) within Monmouth was used to judge the air quality within the County⁵.

Car-Dominant Environment

The car availability and levels of usage will impact the likelihood of a person using an active mode. If users do not have access to a car, they will rely more heavily on public transportation or local transportation services. Census car ownership statistics and mode share data from the Replica platform⁶ for 2022 were used to identify areas that may be car-dominated.

Biking Level of Traffic Stress (LTS)

The confidence of a cyclist impacts the route they may consider suitable. Most riders would consider high traffic streets or streets with a high speed limit as too dangerous. Providing more infrastructure such as bike lanes opens more routes to less confident cyclists, allowing them to access more opportunities than they otherwise would have.

Level of Traffic Stress (LTS) mapping was obtained from the North Jersey Transportation Planning Authority (NJTPA). The LTS assigns the lowest level of stress to travel ways that do not allow cars or are residential streets, and the highest level of stress is assigned to high-speed streets and streets near high stress, unsignalized intersections. For this study, the LTS was used to evaluate the magnitude of low-stress level facilities, as well as connectivity to employment using low-stress and high-stress routes. For the connectivity analysis, LTS data was combined with 2021 longitudinal employer-household dynamics census data to measure how many jobs within the County are accessible using low-stress facilities, as well as how many additional jobs could be accessed using high-stress facilities. The purpose of evaluating high-stress routes as well is to identify where additional bicycle facilities may provide the most value to connecting residents with employment.

⁴ Crash data for all crashes occurring in Monmouth County in 2019 through 2022 was obtained from the New Jersey Department of Transportation's SafetyVoyager database.

⁵ Air Quality Index obtained from <https://www.airnow.gov/>

⁶ Replica is an online platform that provides location-based data from mobile devices to measure travel statistics based on a variety of metrics.

Active Mode Framework

Table 2 presents the types of walking barriers experienced in Monmouth County, a summary of the evidence of the barrier at the County and municipal level, and the dashboard information that was used to obtain that data. **Table 3** presents the same information for biking. Furthermore, while all data can be viewed within the dashboard, the study team has developed a few static maps depicting key topics within the framework.

Table 2: Barriers to Mobility for Walking

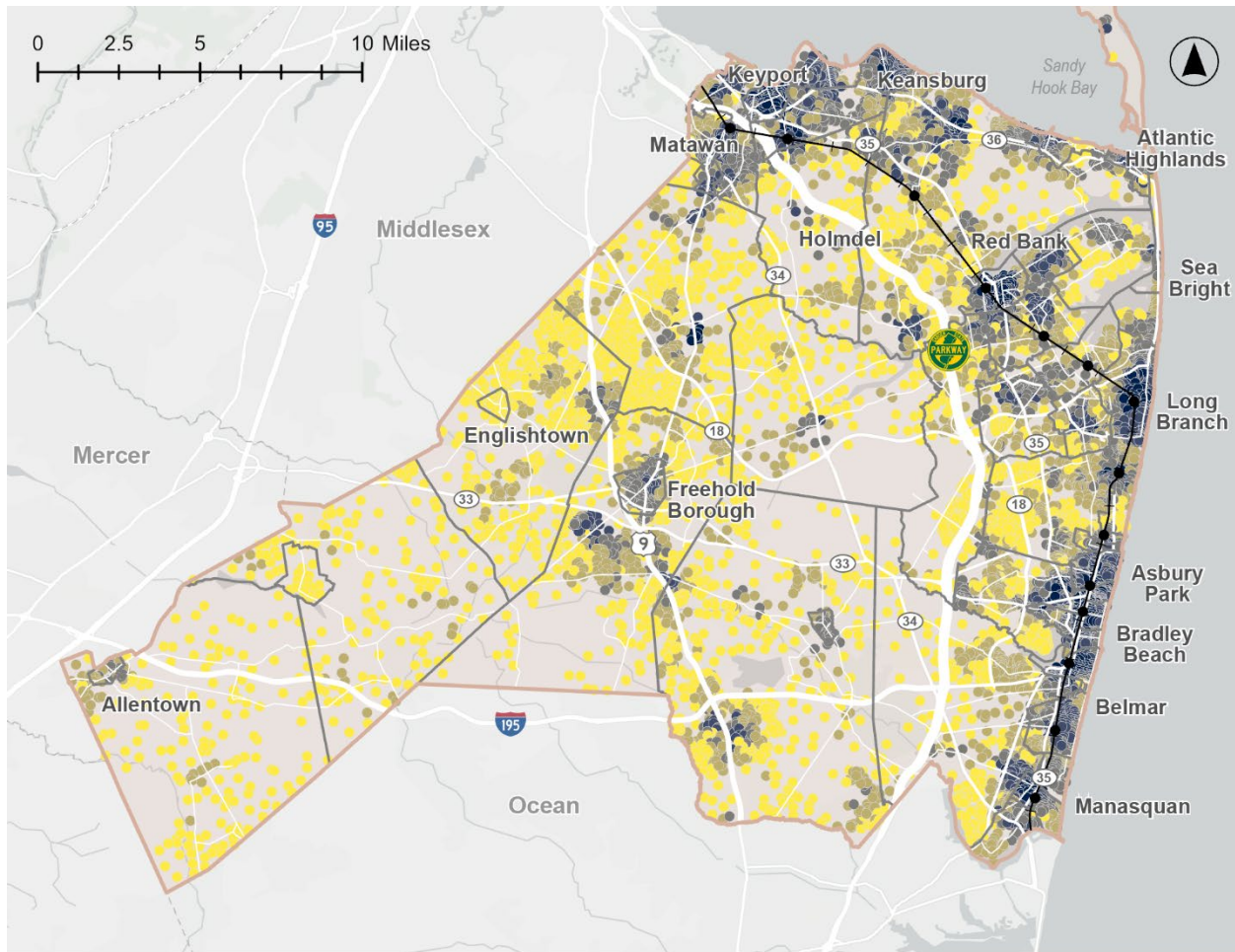
Mobility Barrier	Evidence of Barrier		Dashboard Location
Provision and Quality of Infrastructure	County Level:	<ul style="list-style-type: none"> • 61 percent of public survey mapping tool comments were regarding issues with pedestrian and bicycle infrastructure in the County⁷. • Overall common themes for the entire County include a lack of bicycle facilities connecting the County's municipalities, more pedestrian infrastructure connecting residential areas with shopping centers, and general frustration in the lack of pedestrian and bicycle accommodations being incorporated into roadway and intersections projects. 	Page: Active Travel Layer(s): Pedestrian Infrastructure 2007 Public Survey Mapping Tool
	Municipal Level:	<ul style="list-style-type: none"> • Clusters of comments on the survey mapping tool revealed the need for improved pedestrian and bicycle facilities in municipalities such as Asbury Park, Freehold, Howell, Oceanport, Eatontown, and Atlantic Highlands. • Several corridors such as NJ Routes 33, 79, 35, 71, and US Rt. 9 were also called out as lacking pedestrian and/or bicycle accommodations. 	

⁷ Please refer to Appendix D: Engagement Summary Report for a summary of the outreach that was conducted for this study.

Mobility Barrier	Evidence of Barrier		Dashboard Location
<p>Physical Ability</p> <p>(Refer to Figures B-4 in Attachment B for additional data regarding mode share of disabled populations)</p>	County Level:	<ul style="list-style-type: none"> • 10 percent of the total population of Monmouth County is reported as having some form of disability. • The County overall scores within the 10 percent least disadvantaged within the nation. Within the County, scores vary across municipalities, and one quarter of the County is within the 50 percent most disadvantaged within the nation. 	<p>Page: Active Travel</p> <p>Layer(s): Equity Indicators</p>
	Municipal Level:	<ul style="list-style-type: none"> • Physical ability to travel can impact the choice of transportation modes available to an individual. • Municipalities within Monmouth County with a high proportion of people with a disability, such as Asbury Park and Long Branch, also have a high proportion of trips being made without a car when compared to the County average. 	
<p>Distance</p> <p>(see Figure 2)</p>	County Level:	<ul style="list-style-type: none"> • Households in Monmouth County have access to an average of four out of the 11 point of interest categories assessed. 	<p>Page: Active Travel</p> <p>Layer(s): Walking Accessibility to POI</p>
	Municipal Level:	<ul style="list-style-type: none"> • Englishtown, Farmingdale and Freehold are classified as urban areas in the west of the County, are in the top 50 percent of connectively disadvantaged areas, with convenient access to fewer than half of the key point of interest categories assessed. • Many urban areas in the east of the County have poor walking connectivity to the points of interest analyzed, including: <ul style="list-style-type: none"> ○ The Shark River Hills area in Neptune Township. ○ The area in the west of Ocean Township, around Green Grove Road and Cold Indian Springs Road. ○ The residential area around Asbury Avenue in Tinton Falls • Long Branch has some areas with strong access to the POI locations, but the more disadvantaged census tracts in the north do not, showing high levels of disparity across the municipality. 	

Mobility Barrier	Evidence of Barrier		Dashboard Location
<p>Safety (see Figure 3)</p> <p>(Refer to Figures B-5 through B-7 in Attachment B for a breakdown of pedestrian crashes by municipality and by roadway AADT)</p>	<p>County Level:</p>	<ul style="list-style-type: none"> Between 2019 and 2022, 58,900 collisions were recorded in Monmouth County. 499 of these included a pedestrian, which equates to 0.8 percent of all collisions over this period. The collisions involving pedestrians have decreased from 156 in 2019 to 116 in 2022. The proportion of these collisions occurring on busy roads (>10k vehicle AADT) has increased from 13 percent to 17 percent. 	<p>Page: Active Travel</p> <p>Layer(s): Collisions Involving Pedestrians and Percentage of Collisions Involving Pedestrians</p>
	<p>Municipal Level:</p>	<ul style="list-style-type: none"> Collision hotspots are most visible in and around Asbury Park and Neptune – specifically on Main Street, Springwood Avenue, State Route 35, Corlies Avenue, Munroe Avenue and Memorial Drive. Spring Lake, while recording a lower number of absolute collisions than other areas, records a higher proportion of these collisions involving a pedestrian (3.8 percent). Asbury Park has one of the highest absolute number of collisions (~1,900) and a high proportion of collisions that involve a pedestrian (2.6 percent). Long Branch and Keansburg both have pedestrian involvement close to 2 percent of all crashes. 	

Figure 2: Number of Key Points of Interest within Walking Distance (1/2 mile) by Census Block Group












- | | |
|--|--|
|  Monmouth County | Number of POI Categories in Walking Distance |
|  Municipal Boundaries |  1 - 2 |
|  Passenger Rail |  3 - 4 |
|  Rail Stations |  5 - 6 |
| |  7 - 8 |
| |  9 - 11 |

Figure 3: Pedestrian Crashes 2019-2022 by Severity Compared to Percentage of Households Below Poverty Level

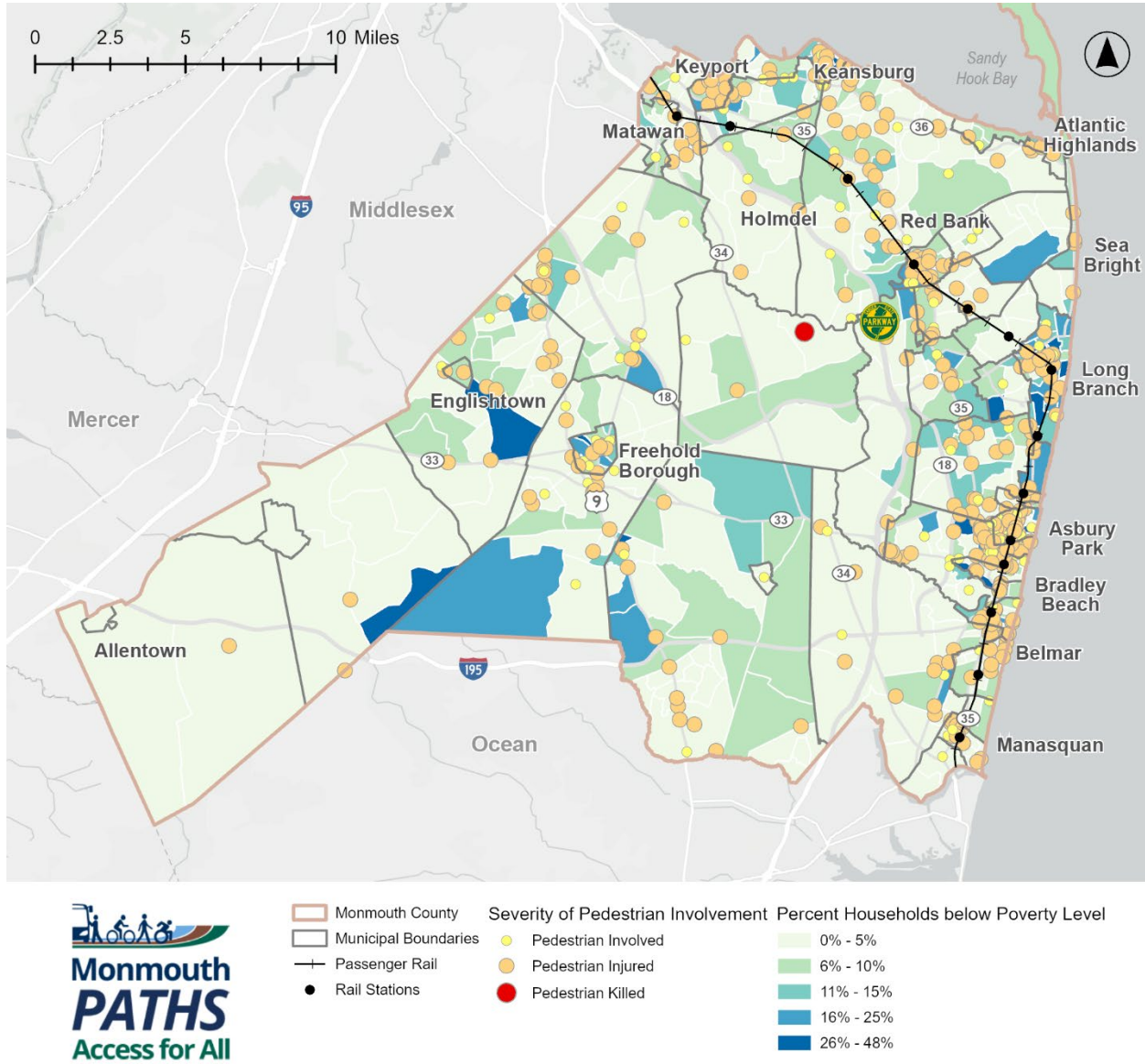


Table 2 Continued: Barriers to Mobility for Walking

Mobility Barrier	Evidence of Barrier		Dashboard Location
Air Quality/ Noise	County Level:	<ul style="list-style-type: none"> Air quality sensors in Red Bank suggest that the air quality in the region is consistently good to moderate for Particulate Matter (PM) 2.5⁸. When the AQ index is “Moderate”, there are health implications for a small number of people and guidance suggests that active children and adults and people with respiratory conditions should limit prolonged outdoors exertion. 	N/A
	Municipal Level:	<ul style="list-style-type: none"> N/A 	
Vehicle Predominant Network (Refer to Figures B-3 in Attachment B for additional data regarding mode share and vehicle ownership)	County Level:	<ul style="list-style-type: none"> Approximately 7 percent of households within Monmouth County do not have access to a vehicle. Across the County, most are made by car drivers (63 percent), with drivers and passengers making up 81 percent of internal trips. 	Page: Active Travel Layer(s): Households with no Car
	Municipal Level:	<ul style="list-style-type: none"> Spring Lake Heights, Freehold Borough, and the area between Red Bank, Tinton Falls and Long Branch show higher car ownership than the County average. Municipalities with lower levels of car ownership typically also show higher levels of walking trips. In Freehold Borough, 26 percent of households have no car available, significantly higher than the County average, and has an average walking trip mode share of 21 percent. Asbury Park, Keyport, and other Shore Town and Town Center transect types also have lower than average car ownership levels and high levels of walking trips indicating a reliance on alternative modes of transportation. 	Page: Car Layer(s): Car Network AADT, Traffic Counts Monmouth

⁸ Particulate matter refers to the mixture of solid particles and liquid droplets found in the air. Some particles, such as dust, dirt, soot, or smoke, are large or dark enough to be seen with the naked eye. Others are so small they can only be detected using an electron microscope. Particle pollution includes:

- PM10 : inhalable particles, with diameters that are generally 10 micrometers and smaller; and
- PM2.5: fine inhalable particles, with diameters that are generally 2.5 micrometers and smaller.

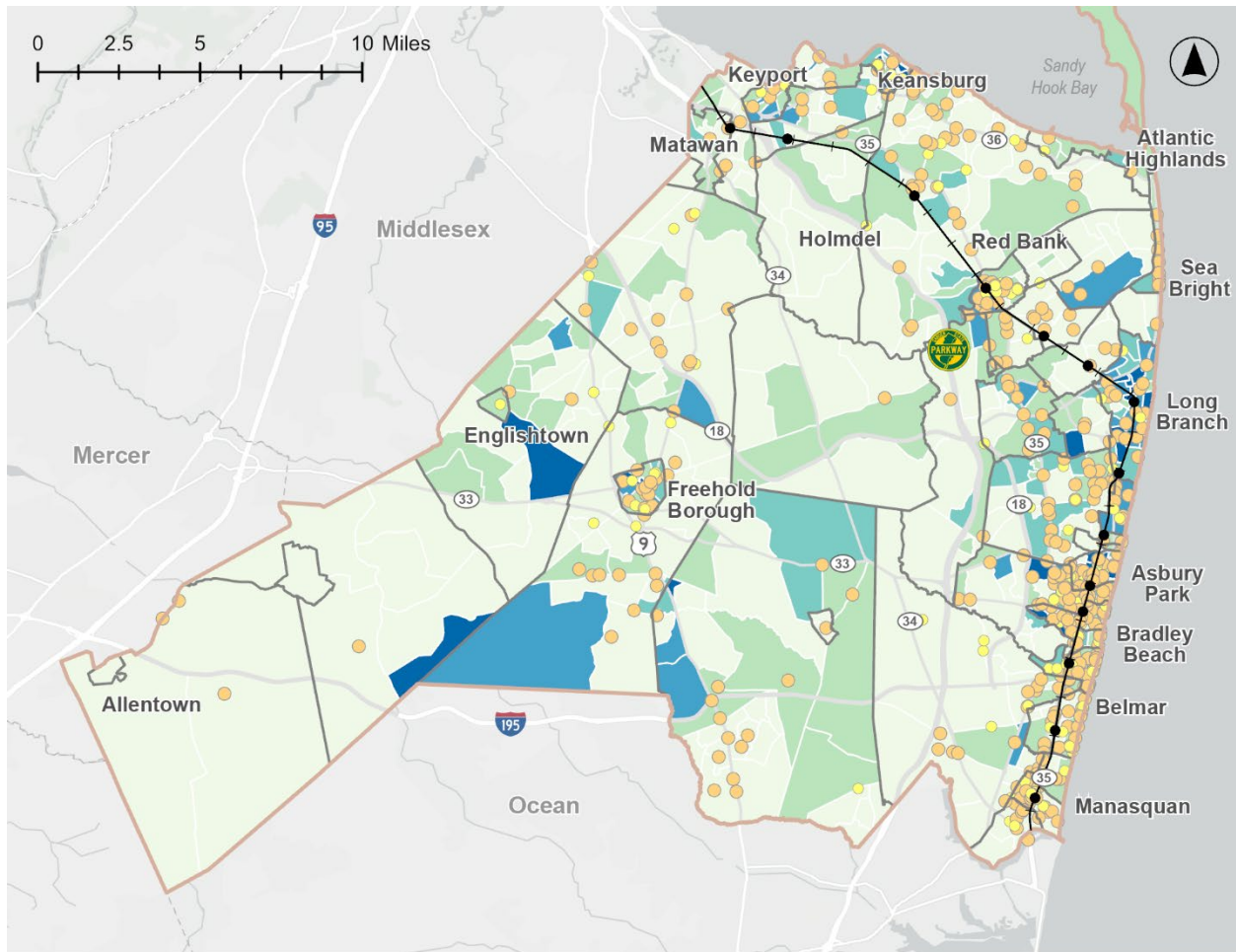
Source: <https://www.epa.gov/pm-pollution/particulate-matter-pm-basics>

Table 3: Barriers to Mobility for Biking

Mobility Barrier	Evidence of Barrier		Dashboard Location
Provision and Quality of Infrastructure	County Level:	<ul style="list-style-type: none"> Monmouth County has approximately 100 miles of bicycle infrastructure, including separated bicycle lanes, on-road bicycle lanes, and bike trails. However, these are scattered across the borough and often not representing practical alternatives to riding on roads. 	Page: Active Travel Layer(s): Bicycle Parking (OSM), Cycling Road AADT, Rural Urban Classification
	Municipal Level:	<ul style="list-style-type: none"> AADT data from Replica suggests high levels of biking within the shore communities, up to an approximate maximum value of 450 riders per day. This is reflected by the bike parking infrastructure within this area, as well as the bikeshare system. Most of the available bicycle parking in the County is located in this area. Municipalities with the highest biking mode share for trips within the county include Allentown, Keyport, Asbury Park, and Manasquan. These municipalities all have a bicycle mode share of approximately 2 percent and often have a high percentage of no car households. Lower levels of bicycle usage are seen in urban areas in the west, alongside lower levels of bike infrastructure. The Henry Hudson trail provides an almost unbroken bike path across the northern municipalities and south to Freehold. The Edgar Felix bike path and other on-road cycle paths provide connectivity within Wall Township, Asbury Park, Bradley Beach, and Avon-by-the-Sea. Many municipalities within the south and west of the County do not have bicycle infrastructure. 	

Mobility Barrier	Evidence of Barrier		Dashboard Location
<p>Physical Ability</p> <p>(Refer to Figures B-4 in Attachment B for additional data regarding mode share of disabled populations)</p>	<p>County Level:</p>	<ul style="list-style-type: none"> • 10 percent of the population of Monmouth County is reported as having some form of disability. • The County overall scores within the 10 percent least deprived within the nation, within the County the scores vary across municipalities, and one quarter of the county is within the 50 percent most deprived within the nation. 	<p>Page: Active Travel</p> <p>Layer(s): Equity Indicators</p>
<p>Municipal Level:</p>	<ul style="list-style-type: none"> • Physical ability to travel can impact the choice of transportation modes available to an individual. • Municipalities within Monmouth County with a high proportion of people with a disability, such as Asbury Park and Long Branch, also have a high proportion of trips being made without a car when compared to the County average. 		
<p>Safety</p> <p>(see Figure 4)</p> <p>(Refer to Figures B-5 through B-7 in Attachment B for a breakdown of bicycle crashes by municipality and by roadway AADT)</p>	<p>County Level:</p>	<ul style="list-style-type: none"> • Between 2019 and 2022, 58,900 collisions were recorded in Monmouth County. • 627 of these included a cyclist, which equates to 1.1 percent of all collisions over this period. 	<p>Page: Active Travel</p> <p>Layer(s): Collisions Involving Cyclists and Percentage of Collisions Involving Cyclists</p>
<p>Municipal Level:</p>	<ul style="list-style-type: none"> • The majority of cyclist involved collisions were recorded in shore towns in the south of the County. • Collision hotspots are most visible between Asbury Park and Manasquan, specifically Main Street in both municipalities, NJ 71, NJ 35, and NJ 33. • Spring Lake and Avon-by-the-Sea, while recording a lower number of absolute collisions than other areas, recorded a higher proportion of collisions involving a cyclist (8 percent). • Manasquan, Bradley Beach, and Belmar all have higher levels of collisions involving cyclists (>4 percent). 		

Figure 4: Cyclist Crashes by Severity Compared to Percentage of Households Below Poverty Level






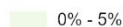







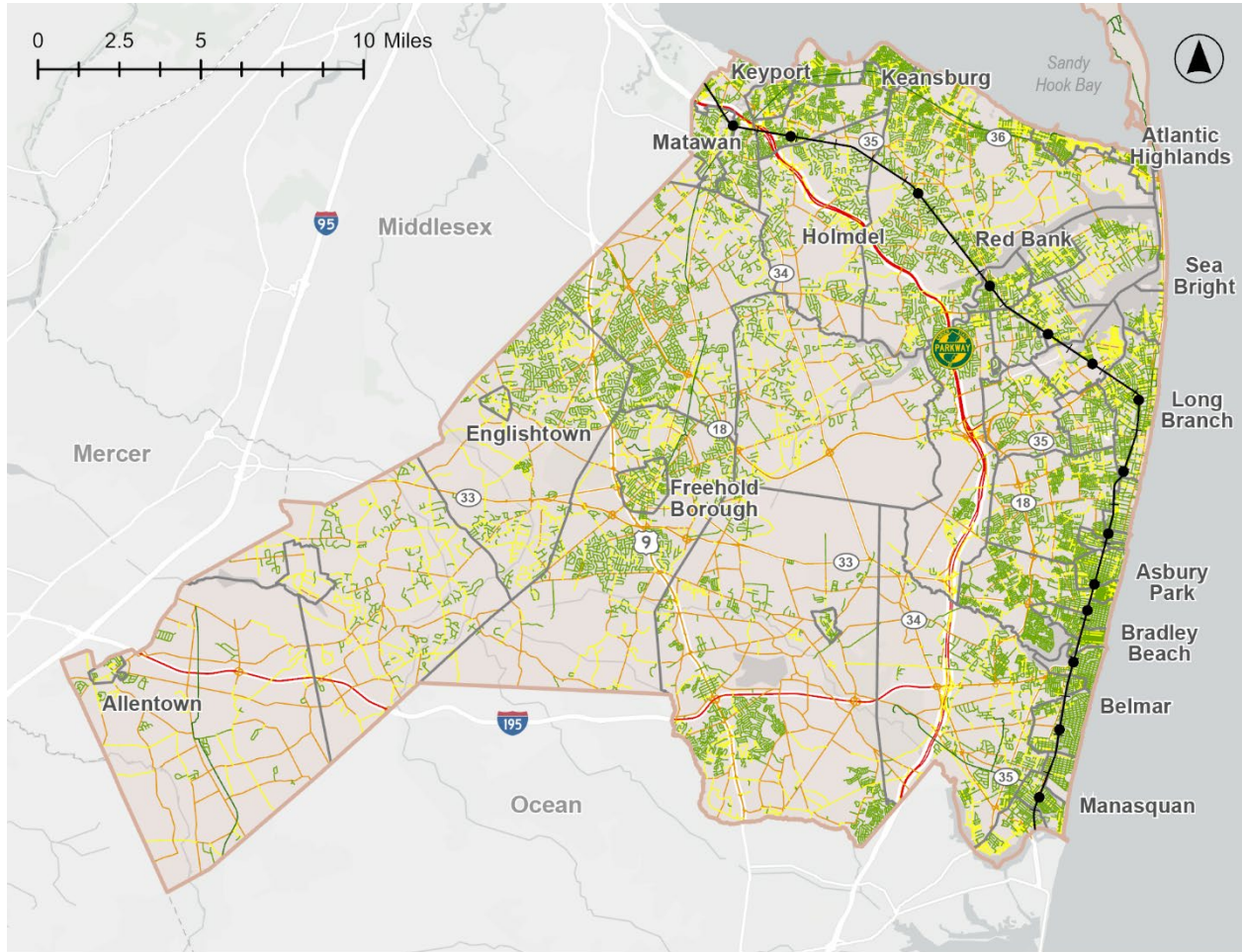
- | | | |
|--|--|---|
|  Monmouth County | Severity of Cyclist Involvement | Percent Households below Poverty Level |
|  Municipal Boundaries |  Cyclist Involved |  0% - 5% |
|  Passenger Rail |  Cyclist Injured |  6% - 10% |
|  Rail Stations | |  11% - 15% |
| | |  16% - 25% |
| | |  26% - 48% |



Table 3 Continued: Barriers to Mobility for Biking

Mobility Barrier	Evidence of Barrier		Dashboard Location
Air Quality/ Noise	County Level:	<ul style="list-style-type: none"> Air quality sensors in Red Bank suggest that the air quality in the region is consistently good to moderate for PM2.5. When the AQ index is “Moderate”, there are health implications for a small number of people and guidance suggests that active children and adults and people with respiratory conditions should limit prolonged outdoors exertion. 	N/A
	Municipal Level:	<ul style="list-style-type: none"> N/A 	
Vehicle Predominant Network (Refer to Figures B-3 in Attachment B for additional data regarding mode share and vehicle ownership)	County Level:	<ul style="list-style-type: none"> Approximately 7 percent of households within Monmouth County do not have access to a vehicle. Across the County, most are made by car drivers (63 percent), with drivers and passengers making up 81 percent of internal trips. Biking mode share is low across the County, at less than 1 percent. 	Page: Active Travel Layer(s): Households with no Car Page: Car
	Municipal Level:	<ul style="list-style-type: none"> Spring Lake Heights, Freehold, and the area between Red Bank, Tinton Falls and Long Branch show higher car ownership and a possible overreliance on personal vehicles. Municipalities with lower levels of car ownership typically also show higher levels of walking trips. In Freehold Borough, 26 percent of households have no car available, significantly higher than the County average, and has an average cycling trip mode share of 2.5 percent. Asbury Park, Keyport, Red Bank, and others also have lower than average car ownership levels and higher than average levels of cycling trips indicating a reliance on alternative modes of transportation. 	Layer(s): Car Network AADT, Traffic Counts Monmouth

Mobility Barrier	Evidence of Barrier		Dashboard Location
Biking Level of Stress (see Figure 5)	County Level:	<ul style="list-style-type: none"> The lack of infrastructure provided for cyclists between municipalities leads to most routes having a moderate to high traffic stress rating. 	Page: Active Travel Layer(s): Cycling LTS
	Municipal Level:	<ul style="list-style-type: none"> The difference between the number of accessible jobs when using only low stress roads against using all available road infrastructure, including high stress roads, indicates the areas where cyclists could be limited by the potential routes available to them. The areas surrounding highly urbanized places, particularly Freehold Township, Little Silver, and Eatontown, stand out as areas that have the least access to low stress roads, gaining connectivity to the most additional jobs per household. The Colts Neck, Marlboro, and Aberdeen show some of the highest relative increases in jobs, when comparing against the number of accessible jobs using low stress roads only. 	

Figure 5: Bicycle Level of Traffic Stress



- | | | |
|---|----------------------|---|
|  | Monmouth County | Level of Stress |
|  | Municipal Boundaries |  1 (None - Bike Only) |
|  | Passenger Rail |  2 (Low - Suitable for Adults) |
|  | Rail Stations |  3 (Moderate - Confident Cyclists) |
| | |  4 (High - Very Skilled Cyclists) |
| | |  5 (Bikes not Permitted) |

Public Transit

Public transit includes public fixed-route bus and rail service that has stops or stations within Monmouth County. These routes may be internal to the County as well as routes that connect to other areas outside of the County. The identified barriers were split into the following categories and their corresponding methodology:

Lack of Convenient Access to Public Transit

An analysis of General Transit Feed Specification (GTFS) timetable data and the OSM network was undertaken to identify locations within the County that have convenient access to a public transit service. If residents only need to walk a short distance to access a public transit stop, they will be more likely to use public transit. Alternatively, long access distances are a barrier to travel using public transit.

Frequency of Public Transit Services

This measure identifies locations that have access to a public transit stop, as above, but the public transit services that serve the stop are infrequent, possibly discouraging travel by public transit.

Journey Time within Monmouth County

An assessment of strategic connectivity within the county was undertaken using the Connectivity and Deprivation Audit Tool (CDAT) which correlates deprivation related data to connectivity of the transportation network and services. This identifies areas where poor connectivity may be contributing to deprivation and highlighting barriers to mobility. Census Block Groups were assigned into one of three tiers for both employment and health, depending on the strength of the relationship between relevant deprivation and connectivity to employment opportunities and health services.

Journey Time to Destinations Outside Monmouth County

Journey times to nearby attractors were assessed using Google Distance Application Programming Interface (API)⁹ for each census block group within Monmouth County,

⁹ Google Distance API is a service that provides travel distance and duration between a specific origin and destination on a specified mode of transportation.

highlighting areas of the County with difficulty reaching key locations for employment, including New York City, Newark, Trenton, New Brunswick, and Philadelphia.

Fares

Differences in the cost of travelling by public transit within Monmouth County could lead to unequal access to opportunities or over-reliance on car travel. Public transit fares were extracted using a morning (8:30am) weekday fare from the NJ TRANSIT website between municipalities within the County and New York, Newark, Trenton, New Brunswick, and Philadelphia as the external locations.

Required Seat Changes

The ability to make a direct trip to your destination, without making transfers between public transit services can make its use more appealing. A lack of direct services can be a barrier to public transit use and contribute to increased reliance on car travel.

The travel times for one seat rides were compared with one transfer, two transfer, and three transfer rides for people traveling between municipalities in Monmouth County. A seat change is classed as a transfer from one transit mode to another (i.e., bus to rail to bus would equate to two seat changes), or from one bus route to another bus route.

Infrastructure

The infrastructure available at bus stops, bus stations, and rail stations can impact a user's experience or ability to travel by public transit. The lack of accessibility options such as wheelchair access and low floors, bicycle racks on buses, or safe bicycle shelters / parking can be a significant barrier to some users.

Hours of Operation

The lack of access to public transit services operating during the evening can be a limiting factor discouraging people from using public transit. Being unable to make a return journey may dissuade users from making the initial journey on public transit. To evaluate hours of operation, an analysis of GTFS data was used to determine the latest service that households in the County can access.

Public Transit Framework

Table 4 presents the types of barriers related to public transit experienced in Monmouth County, a summary of the evidence of the barrier at the County and municipal level, and the dashboard information that was used to obtain that data. Furthermore, while all the data can be viewed within the dashboard, the study team has developed a few static maps depicting key topics within the framework.

Table 4: Barriers to Mobility for Public Transit

Mobility Barrier	Evidence of Barrier		Dashboard Location
Infrastructure	County Level:	<ul style="list-style-type: none"> All rail stations within Monmouth County have access to nearby bike parking facilities, highlighted by OSM data. There is no data regarding the provision of amenities at bus stops, such as shelters, benches, or bike parking. However, public feedback indicates that there is a need for improved amenities at bus stops, as well as better facilities to connect to the bus stops, such as sidewalks and crosswalks. 	Page: Active Travel Layer(s): Bike Parking
	Municipal Level:	<ul style="list-style-type: none"> N/A 	
Lack of Convenient Access (see Figure 6)	County Level:	<ul style="list-style-type: none"> Only about 15 percent of the households in the County have convenient access to public transit stops. There is high variation across the County when considering the proportion of households with convenient access. 	Page: Public Transit Layer(s): Access to a Public Transit Stop
	Municipal Level:	<ul style="list-style-type: none"> Many rural municipalities have little to no access to public transit. Both Upper Freehold and Millstone have no households with access. While some urban areas have good access to public transit stops (over 50 percent of households in Asbury Park and Keansburg have convenient access), many others, such as Little Silver Borough, have under 10 percent. 	

Figure 6: Census Blocks within Walking Distance (800 Feet) of a Transit Stop

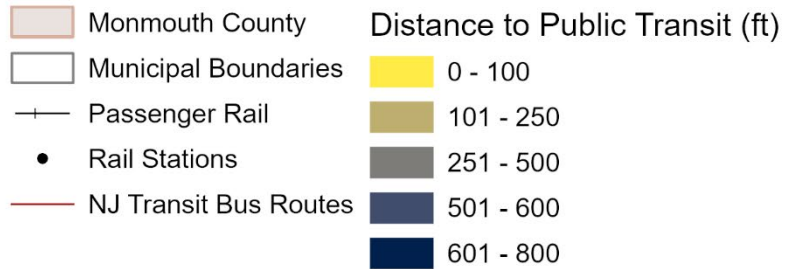
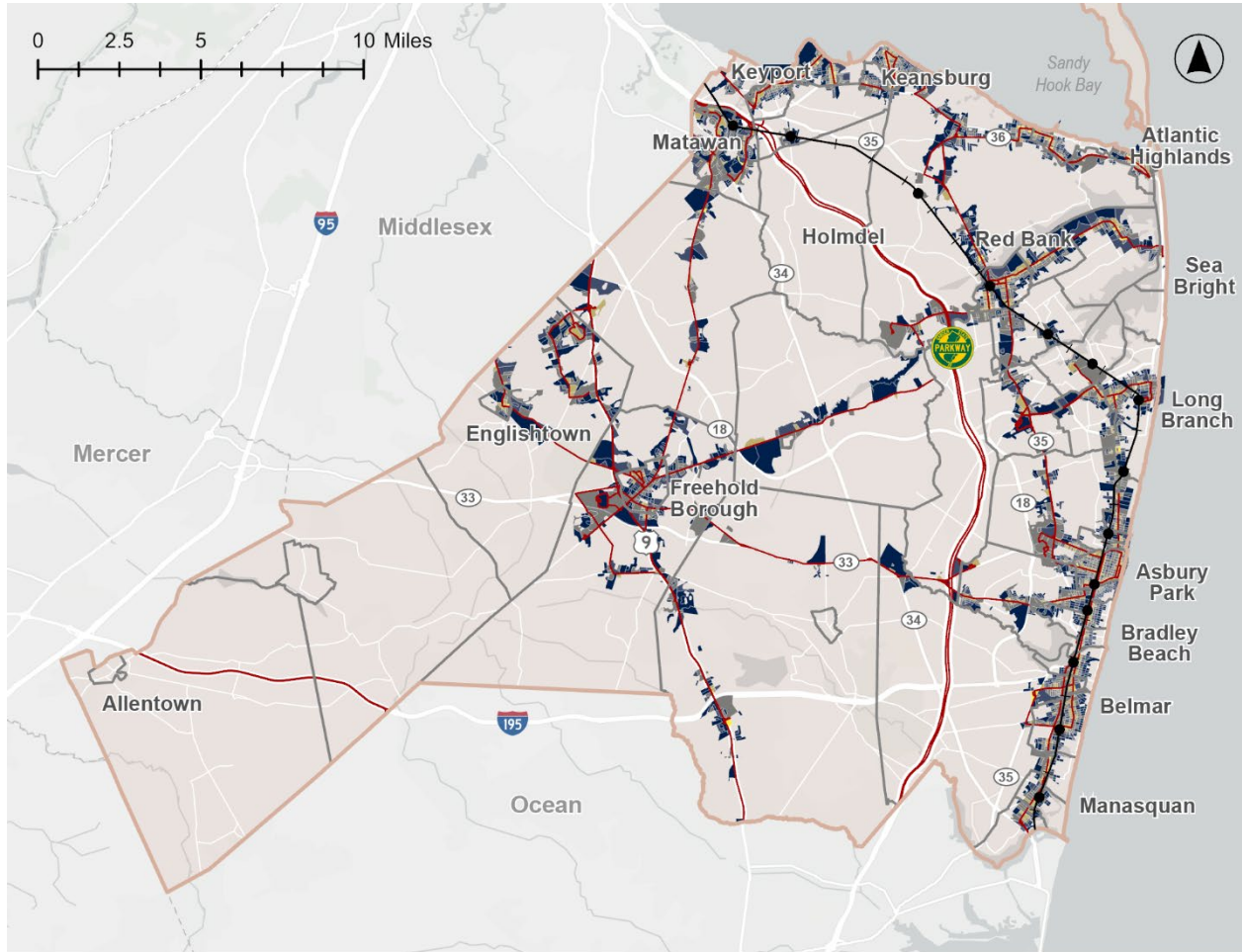
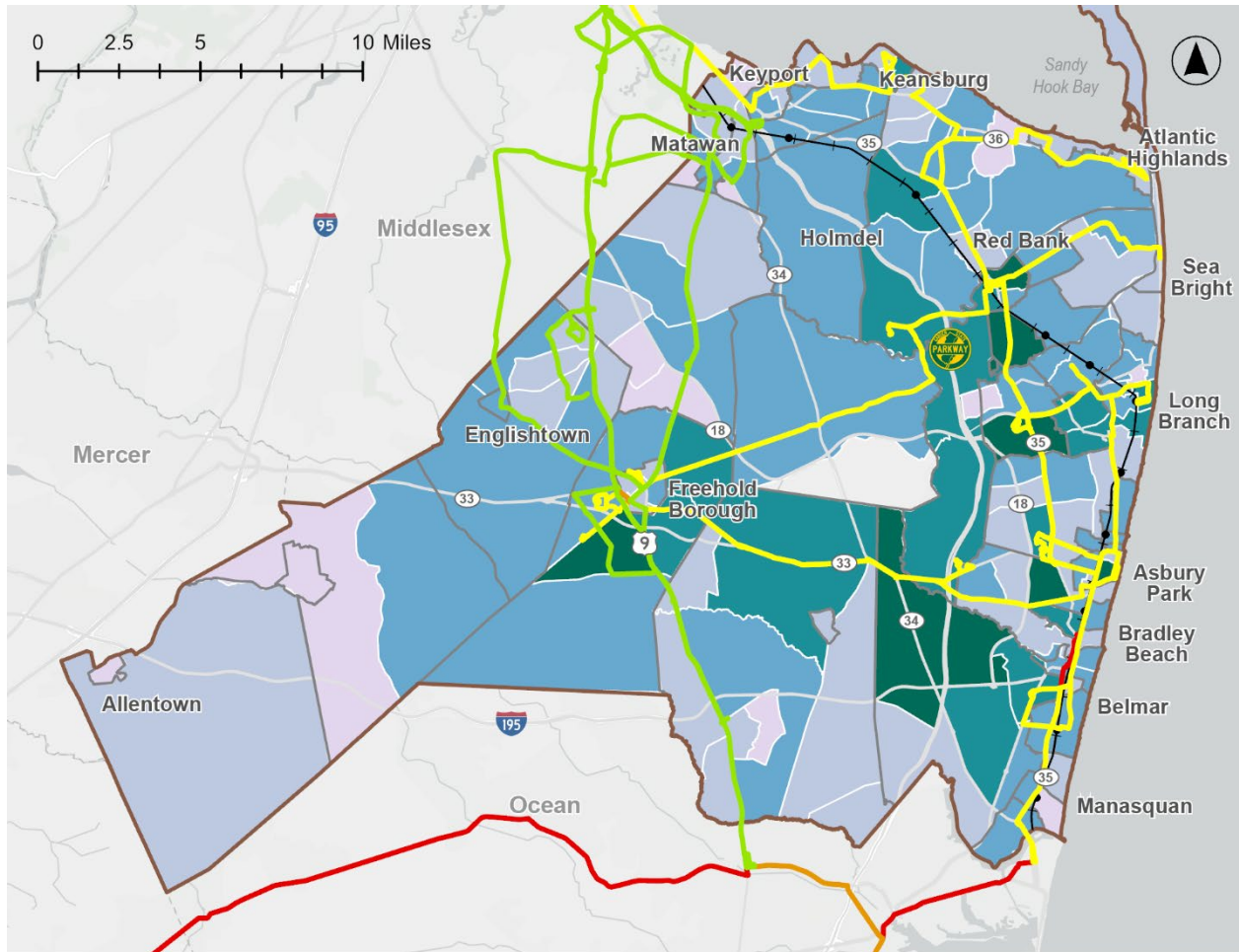


Table 4 Continued: Barriers to Mobility for Public Transit

Mobility Barrier	Evidence of Barrier		Dashboard Location
Frequency of Public Transit Services (see Figure 7, Figure 8, Figure 9, Figure 10)	County Level:	<ul style="list-style-type: none"> • Of the households that can conveniently access a bus stop, only 28 percent have access to a stop with a frequency of service of once per hour throughout the day. • The morning and evening peak periods have better coverage of frequent services (>40 percent of households) however, after 7pm this drops below 10 percent of households. 	Page: Public Transit Layer(s): Frequency at Accessible Stops
	Municipal Level:	<ul style="list-style-type: none"> • Many municipalities (31 out of 44) have a low proportion of households with access to a frequent service. • The following municipalities have less than 10 percent of households with a maximum frequency of <1 service per hour. <ul style="list-style-type: none"> ○ Union Beach ○ West Long Branch ○ Aberdeen ○ Spring Lake Heights ○ Ocean ○ Wall ○ Manasquan 	
Hours of Operation (see Figure 7, Figure 8, Figure 9, Figure 10) (Refer to Figure B-2 in Attachment B for a breakdown of service by municipality)	County Level:	<ul style="list-style-type: none"> • Across the county, 36 percent of public transportation stops have a final service of the day before 7PM. • Long distance rail services towards New York are available regularly throughout the evening. 	Page: Public Transit Layer(s): Last Service at Stops
	Municipal Level:	<ul style="list-style-type: none"> • US 9 through Freehold is served by bus service throughout the day providing a north/south high-frequency route for the area. • Many areas in the County lack access to a public transit service after 7pm, including Keansburg, Fair Haven, Rumson, and Sea Bright. • After 8pm, many municipalities including Long Branch, Union Beach, Englishtown, and Deal lose access to bus services. 	

Figure 7: Weekday Daytime Frequency of Bus Service by Work Trip Destination



-  Monmouth County
-  Municipal Boundaries
-  Passenger Rail
-  Rail Stations

Frequency of Bus Service Work Trip Destinations










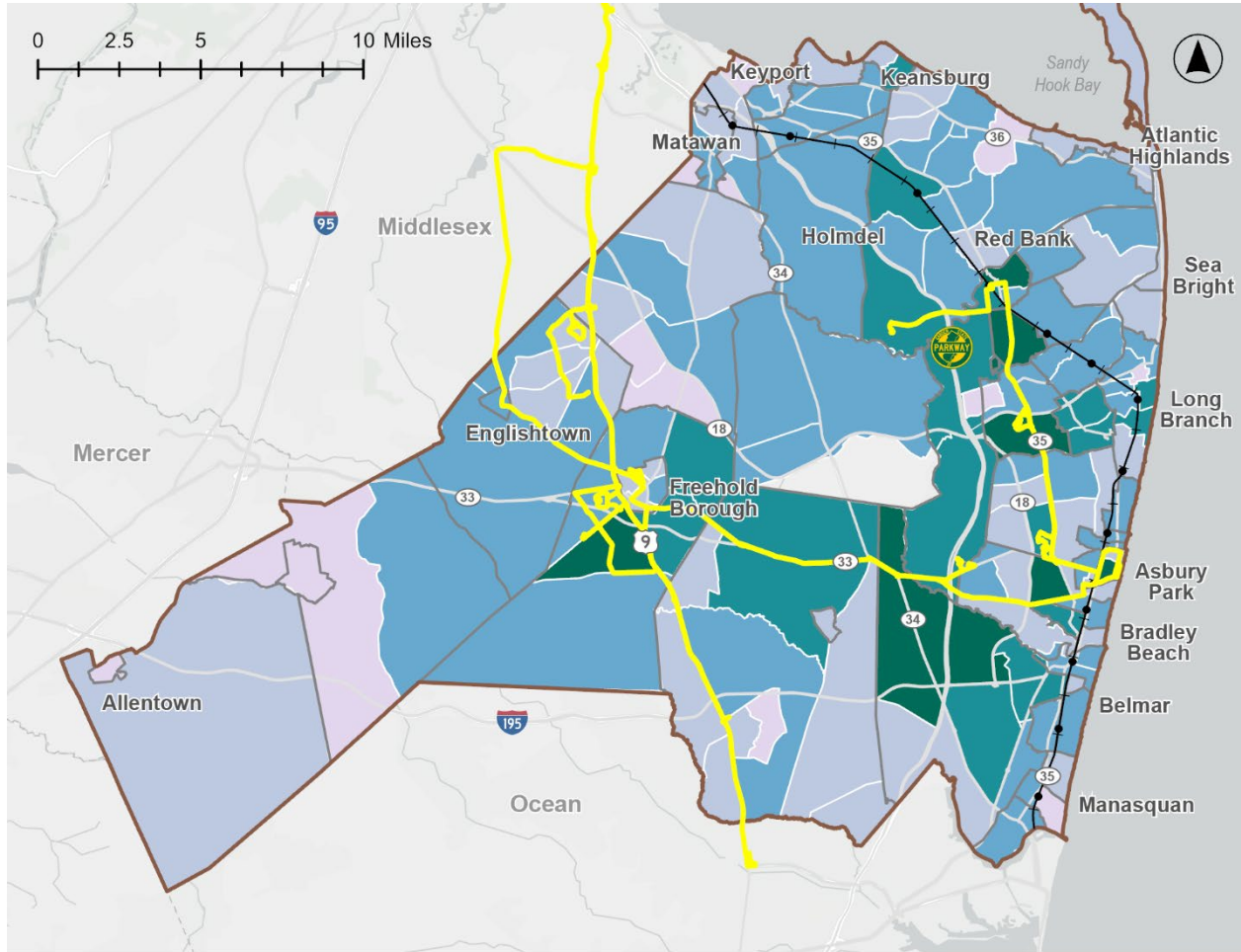
- | | |
|---|---|
|  15 - 30 min |  1 - 15 |
|  1 hr |  16 - 50 |
|  1 - 2 hr |  51 - 100 |
|  2 - 3 hr |  101 - 200 |
| |  201 - 393 |

Figure 8: Weekday Evening (After 7:00 PM) Frequency of Bus Service by Work Trip Destination

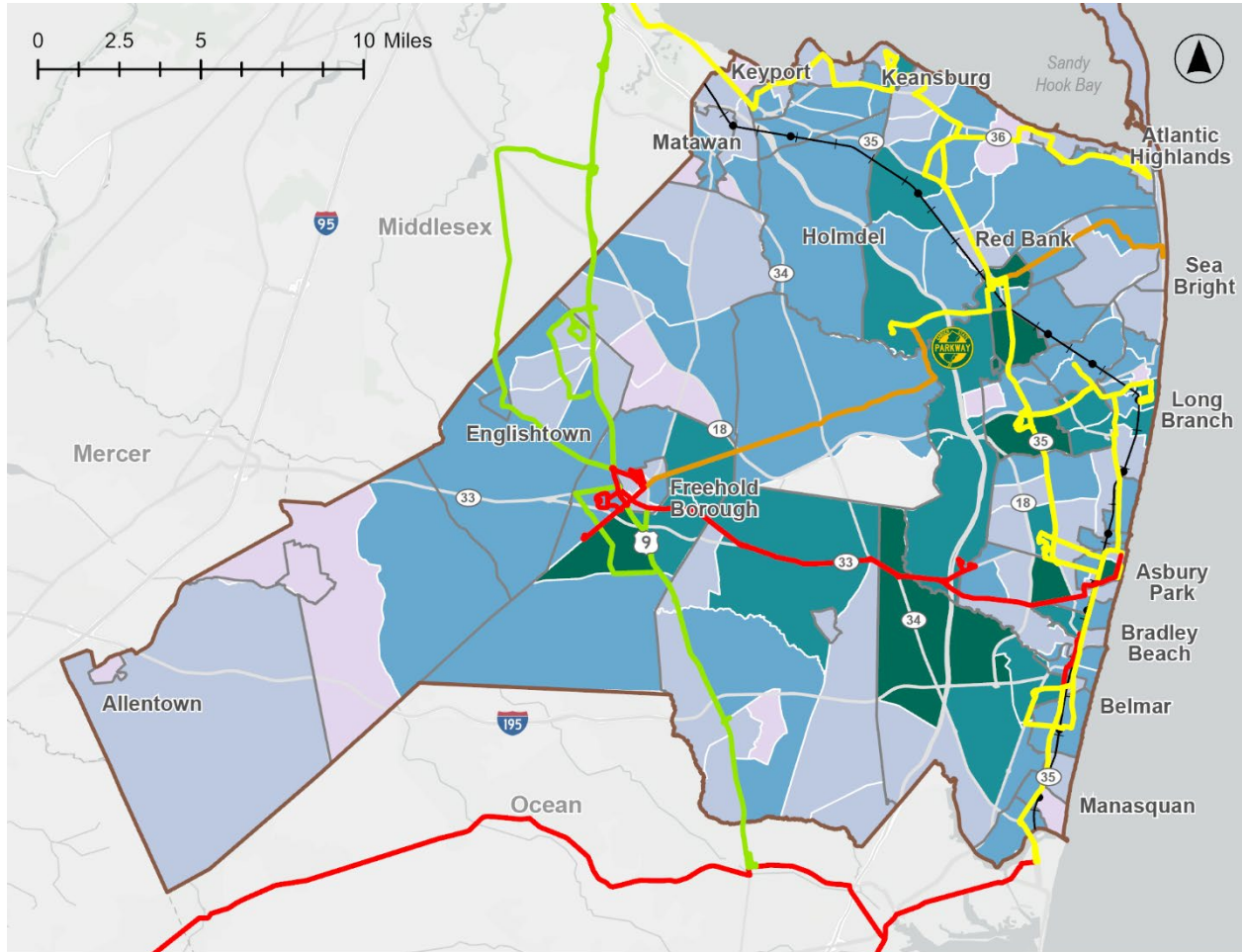



- Monmouth County
- Municipal Boundaries
- Passenger Rail
- Rail Stations

Frequency of Bus Service Work Trip Destinations

- 1 hr
- 1 - 15
- 16 - 50
- 51 - 100
- 101 - 200
- 201 - 393

Figure 9: Saturday Frequency of Bus Service by Work Trip Destination



-  Monmouth County
-  Municipal Boundaries
-  Passenger Rail
-  Rail Stations

Frequency of Bus Service Work Trip Destinations










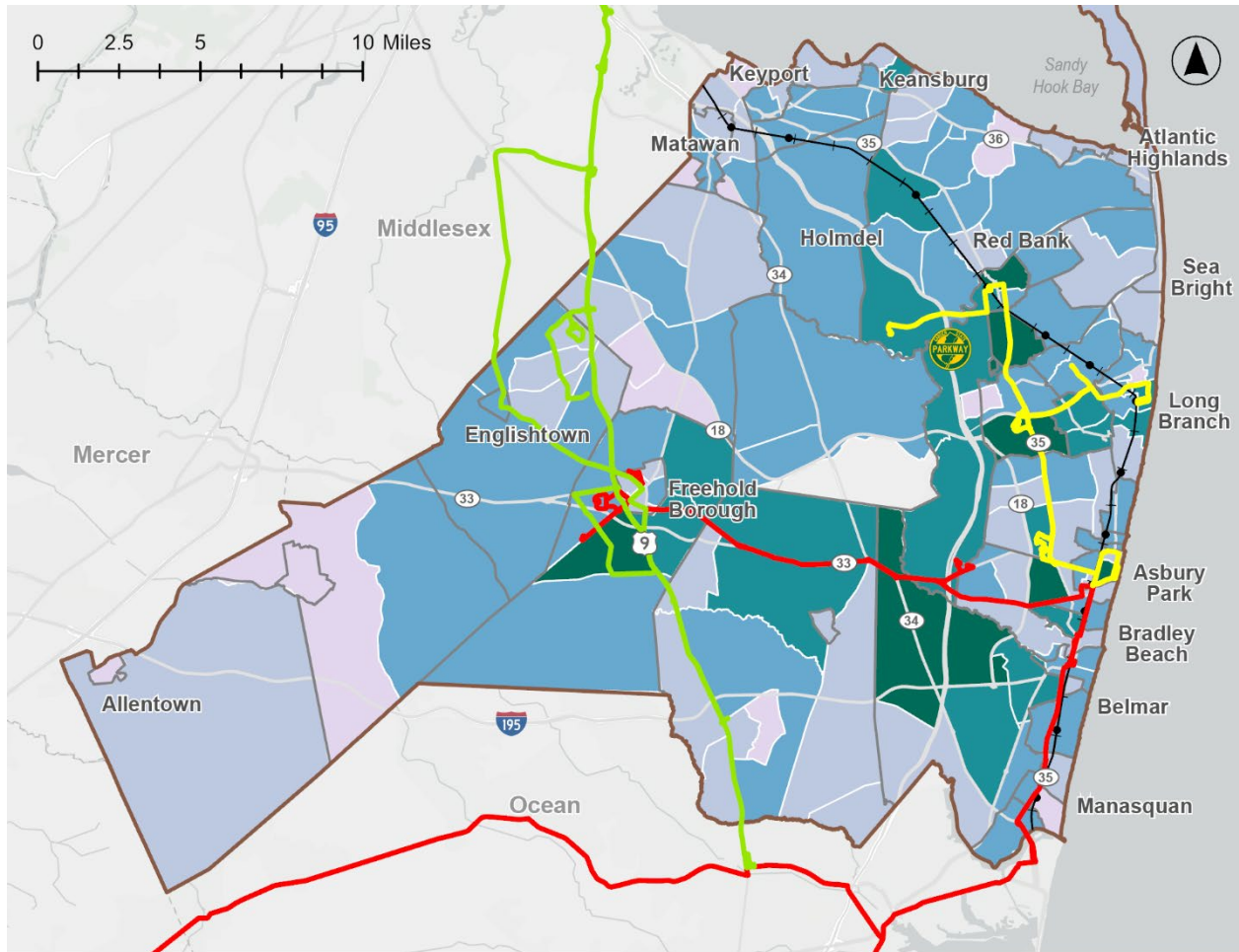



-  15 - 30 min
-  1 hr
-  1 - 2 hr
-  2 - 3 hr
-  1 - 15
-  16 - 50
-  51 - 100
-  101 - 200
-  201 - 393

Figure 10: Sunday Frequency of Bus Service by Work Trip Destination



-  Monmouth County
-  Municipal Boundaries
-  Passenger Rail
-  Rail Stations

Frequency of Bus Service Work Trip Destinations









-  15 - 30 min
-  1 hr
-  2 - 3 hr
-  1 - 15
-  16 - 50
-  51 - 100
-  101 - 200
-  201 - 393

Table 4 Continued: Barriers to Mobility for Public Transit

Mobility Barrier	Evidence of Barrier		Dashboard Location
Long Journey Time within Monmouth County	County Level:	<ul style="list-style-type: none"> • N/A 	Page: Public Transit
	Municipal Level:	<ul style="list-style-type: none"> • The connectivity analysis assessing journey times to employment opportunities (at Census block level) for locations weighted by income deprivation (poverty Social Deprivation Index) highlights various regions with high deprivation and poor connectivity: <ul style="list-style-type: none"> ○ Rural areas in the southwest of the County, including Roosevelt, Upper Freehold, and Millstone. ○ Small areas within the urban areas to the East, such as Eatontown, north Long Branch. • The connectivity analysis assessing journey times to healthcare facilities for locations weighted by the Social Deprivation Index highlights that the region around Belmar, Freehold and Howell have high deprivation and poor connectivity. 	Layer(s): CDAT
Journey Time to Areas Outside Monmouth County	County Level:	<ul style="list-style-type: none"> • N/A 	Page: Public Transit
	Municipal Level:	<ul style="list-style-type: none"> • When travelling to New York via public transit, areas in Middletown and between Long Branch and Tinton Falls Borough experience higher than average travel times (>2 hours). • The US 9 corridor through Freehold experiences higher journey times to Newark than the eastern side of the County (2 – 2.5 hours). • The mean time to travel to Philadelphia is 3 hours, however this varies significantly across the county, from 2 hours to 4.5 hours. 	Layer(s): External Travel

Mobility Barrier	Evidence of Barrier		Dashboard Location
<p>Required Seat Changes</p> <p>(Refer to Figure B-1 in Attachment B for a breakdown of connectivity between municipalities by number of transfers)</p>	<p>County Level:</p>	<ul style="list-style-type: none"> • Approximately 62 percent of movements between municipal centers within the County cannot be made in under 2 hours even when using up to 3 seat changes between public transit services. • Only 13 percent of municipality-to-municipality movements can be made without changing public transit service. 	<p>Page: Public Transit</p> <p>Layer(s): Public Transit Interchanges</p>
	<p>Municipal Level:</p>	<ul style="list-style-type: none"> • An analysis of connectivity compared to number of seat changes shows that residents in many municipalities have significantly greater access to employment opportunities with up to three seat changes. • Keansburg and Port Monmouth benefit the most from allowing additional seat changes, providing access to the most additional opportunities, followed by the area to the north of Red Bank. • Many rural areas are unable to reasonably access other municipalities via public transit (within 2 hours and with few seat changes). • Aberdeen Township has access to less than 5 percent of other municipalities using a direct service. • West Long Branch and Union Beach require at least one transfer to reach most other municipalities. 	

Vehicle (Driving)

Even with improvements to public transit, walking, and biking infrastructure, vehicle travel will likely continue to be how most trips are accomplished. However, there are many barriers that impact driving, and will potentially impact future vehicle-based modes such as autonomous vehicles. Considering how new technology will be implemented in all communities in the County is an important consideration of this study.

The identified driving barriers were split into the following categories and their corresponding methodology:

Involuntary Vehicle Ownership

In some neighborhoods, individuals have effectively no choice but to own a car, either due to the lack of available public transit or active mode options. Likewise, some individuals may not have access to a car due to the cost of ownership.

Safety

Safety can be a factor affecting how a person makes a journey. In some areas, crash rates involving motor vehicles are higher, which can create a general unease for travel by all modes. Collision data from 2019 to 2022 was analyzed to determine hotspots of crashes that may prevent people from regularly travelling through those areas.

Seasonal Congestion

Many County residents, workers, and visitors experience regularly occurring congestion on roadways within the County that can increase travel time for all road users, including those traveling by bus. This type of congestion can often lead to localized negative impacts, such as traffic diverting to local streets to avoid congested areas, worsening air quality, and increased late arrivals on transit, just to name a few. However, regularly occurring congestion is often a result of other infrastructure, service, or land use/urban form barriers that limit the usability of other modes. Therefore, this study does not include an assessment of congestion, rather it focuses on the underlying barriers that lead to that congestion.

However, the many recreational destinations within the County, particularly along the shore, creates seasonal congestion that has different root causes than regularly occurring

congestion. Seasonal congestion is primarily generated by people visiting from outside of the County, and is not greatly impacted by the availability of other modes, such as transit service because of the unique needs of travelers during this time (i.e. transportation of luggage and supplies). Seasonal congestion is a substantial barrier to mobility in many communities, particularly those east of the Garden State Parkway. It is different from recurring congestion because County residents actively avoid traveling during peak times of seasonal congestion.

Monmouth Within Reach, a tourism and event travel demand management study completed by Monmouth County in 2021, identified Asbury Park, Red Bank, Belmar, Downtown Freehold, Sea Bright, the area around Sandy Hook Gateway National Recreation Area, as some of the most impacted areas of the County that are affected by seasonal congestion. This congestion leads to increased travel times, particularly for transit users, traffic diverting through local streets, often negatively impacting some of the County's most disadvantaged populations, limited parking options, and increased conflicts between vehicles, pedestrians, and bicyclists. Although these impacts cannot be easily quantified, it is worth noting that they do occur and can act as a barrier to when people travel.

Cost of Travel

An analysis of the duration and cost to travel to external locations using both private car and public transit was conducted using Google Distance API (morning, weekday) to highlight areas where one mode of travel may be preferred over the other due to the monetary or time cost.

The cost of travel for public transit was extracted from the approximate cost from the County to the external locations from online travel planners. The cost of car travel was estimated using the average US car efficiency¹⁰ and the current month average cost of fuel for Monmouth County, New Jersey, and the nation¹¹. However, these values will vary over time.

Access to Charging Stations or Alternative Fueling Stations

An analysis of the location of electric vehicle charging stations and alternative fueling stations was conducted utilizing OSM. The availability of charging stations, in particular, will become

¹⁰ <https://afdc.energy.gov/data/10310>

¹¹ <https://gasprices.aaa.com/?state=NJ>

an increasing concern in all areas of the County as the price of electric vehicles continues to decrease, making it more accessible to a broader range of County residents.

Vehicle Framework

Table 5 presents the types of barriers related to driving experienced in Monmouth County, a summary of the evidence of the barriers at the County and municipal level, and the dashboard information that was used to obtain that data. Furthermore, while all the data can be viewed within the dashboard, the study team has developed a few static maps depicting key topics within the framework.

Table 5: Barriers to Mobility for Driving

Mobility Barrier	Evidence of Barrier		Dashboard Location
Involuntary Car Ownership	County Level:	<ul style="list-style-type: none"> Rural areas exhibit higher levels of car ownership as the distance to key services and amenities are generally further than their urban equivalent. 	Page: Cars Layer(s): Equity Indicators
	Municipal Level:	<ul style="list-style-type: none"> Areas in the west of the County are most impacted with average car ownership per household at over two in municipalities like Millstone. These areas have no access to transit. Some urban municipalities, including Rumson and Little Silver, also have high car ownership statistics, over two vehicles per household. Areas scoring poorly on the Social Deprivation Index and with a higher proportion of low-income households (Freehold, Keansburg, Asbury Park, and Red Bank) all show low levels of car ownership. These areas are likely more reliant on local pedestrian and bicycle facilities and public transit services. 	

Mobility Barrier	Evidence of Barrier		Dashboard Location
Safety (see Figure 11)	County Level:	<ul style="list-style-type: none"> • Within Monmouth County there were approximately 59,000 collisions recorded between 2019 and 2022. • Since 2019, the proportion of collisions occurring on roads with very low AADT (< 1k vehicles) has increased (from 36 percent to 41 percent), while the number of collisions on high AADT links has decreased. 	Page: Cars Layer(s): Collisions
	Municipal Level:	<ul style="list-style-type: none"> • Asbury Park and Neptune have the highest number of collisions between 2019 and 2022, when compared to the maximum recorded AADT within the municipalities. • Asbury Park (and the surrounding municipalities), Freehold, and Keyport have the highest number of collisions when compared to the total road length within the municipalities. 	
Seasonal Congestion	County Level:	<ul style="list-style-type: none"> • The Monmouth Within Reach study identified 24 sites that generate high-levels tourism and event travel demand across the County. These sites include farms (agritourism), shore towns, urban centers, and concert and sporting venues. Of the sites identified, the County's beaches generate the largest spikes in congestion in the County. • Roadways that are most negatively impacted include NJ Routes 36, 35, 33, 66, 71, and 138, as well as the Garden State Parkway and many east-west County roadways east of the Parkway. 	Page: N/A Layer(s): N/A Refer to Monmouth Within Reach Study
	Municipal Level	<ul style="list-style-type: none"> • Based on the analysis conducted in the Monmouth Within Reach study, Asbury Park, Red Bank, and Belmar ranked as the top three locations in the County regarding peak visitation, as well as communities that have higher concentrations of low income and minority residents that are disproportionately impacted by the seasonal congestion. 	

Mobility Barrier	Evidence of Barrier		Dashboard Location
Cost and Travel Time (see Figure 12)	County Level:	<ul style="list-style-type: none"> The average cost of fuel per gallon within Monmouth County (\$3,207) was higher than both the statewide average (\$3,176) and the national average (\$3,137), as of December 2023. Generally, travelling by personal vehicle is faster for most residents of Monmouth County compared to the available public transit options for most journeys. 	Page: Cars Layer(s): Travel Cost Ratio
	Municipal Level:	<ul style="list-style-type: none"> Travel to New York City highlights wide areas around municipalities that are not along US Rt. 9 or have a stop on the North Jersey Coast Line where public transit travel is both higher cost and has a much higher journey time when compared to car travel. Similar areas are highlighted for travel to Newark. Freehold also exhibits high cost and travel time for public transit. Travel to Philadelphia highlights most areas with much longer journey times, but similar or lower costs when travelling using public transit. This is likely because the public transit network is not oriented for efficient travel to the west. Travel to Trenton shows higher costs and journey times for all areas in the county. In particular, the area around Freehold and the area south of Asbury Park has some of the highest cost and travel times to Trenton in the County. Similarly, higher costs and journey times are experienced for most of the County for trips to New Brunswick. This is likely due to the lack of east-west bus connections external to Monmouth County. 	

Mobility Barrier	Evidence of Barrier		Dashboard Location
Access to Charging/ Alternative Fueling (see Figure 13)	County Level:	<ul style="list-style-type: none"> • Within Monmouth County there are approximately 78 public electric vehicle charging sites, 3 compressed natural gas fueling stations, and one propane fueling station. • Only 23 of the County's 53 municipalities (43 percent) have a registered charging site. 	Page: Cars Layer(s): Collisions
	Municipal Level:	<ul style="list-style-type: none"> • The highest concentrations of charging stations exist in suburban areas including Freehold Township, Middletown, Tinton Falls, Holmdel, Wall, and Eatontown. • Asbury Park, Long Branch, and Neptune City are the only urbanized municipalities in the County that have at least 4 charging sites, with 20 ports available in Asbury Park. • There are only two registered charging sites within the more rural municipalities on the County's western border. 	

Figure 11: Density of All Vehicle Crashes by Maximum AADT of Each Municipality 2019 - 2022

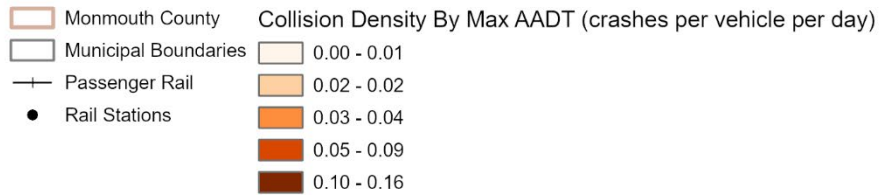
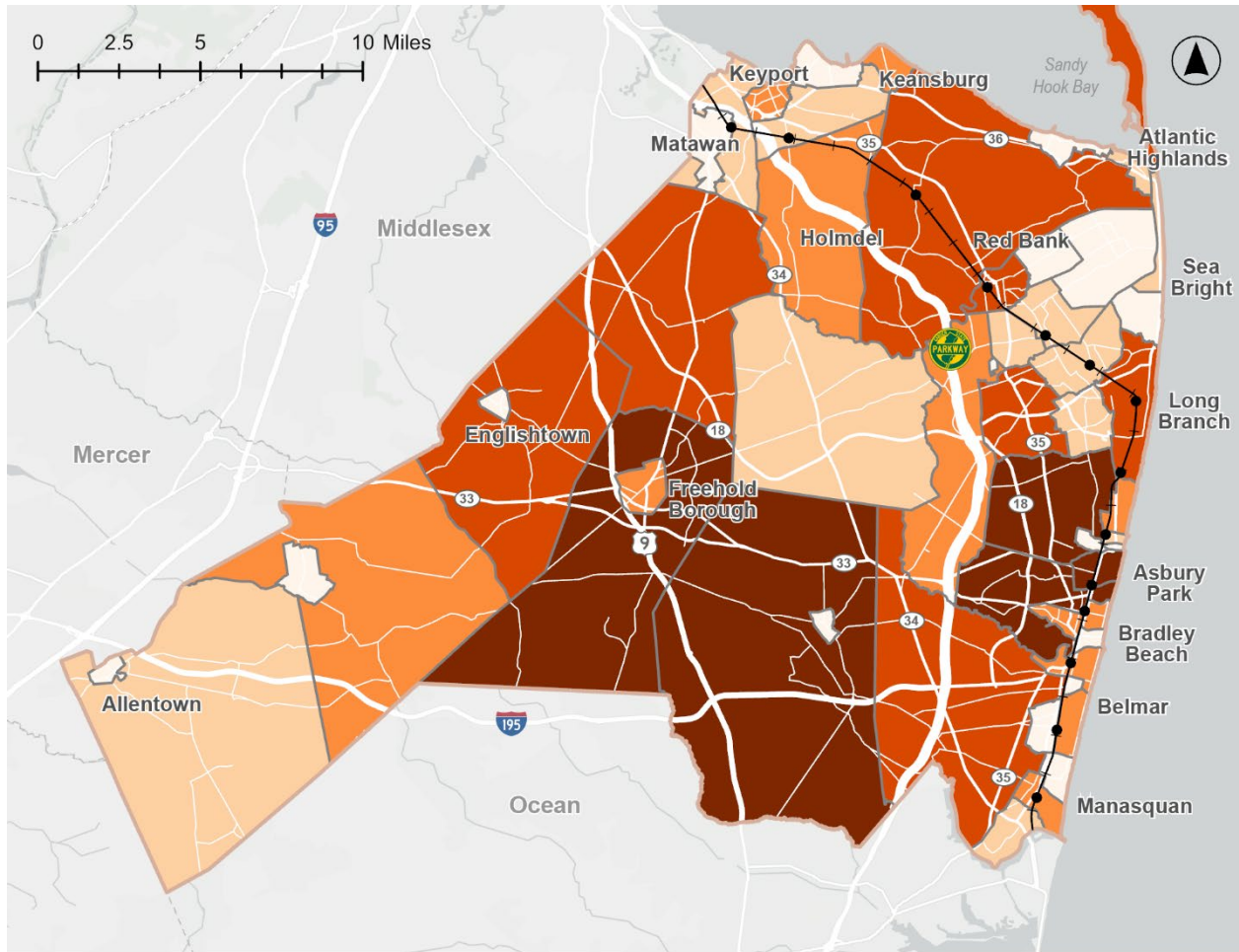
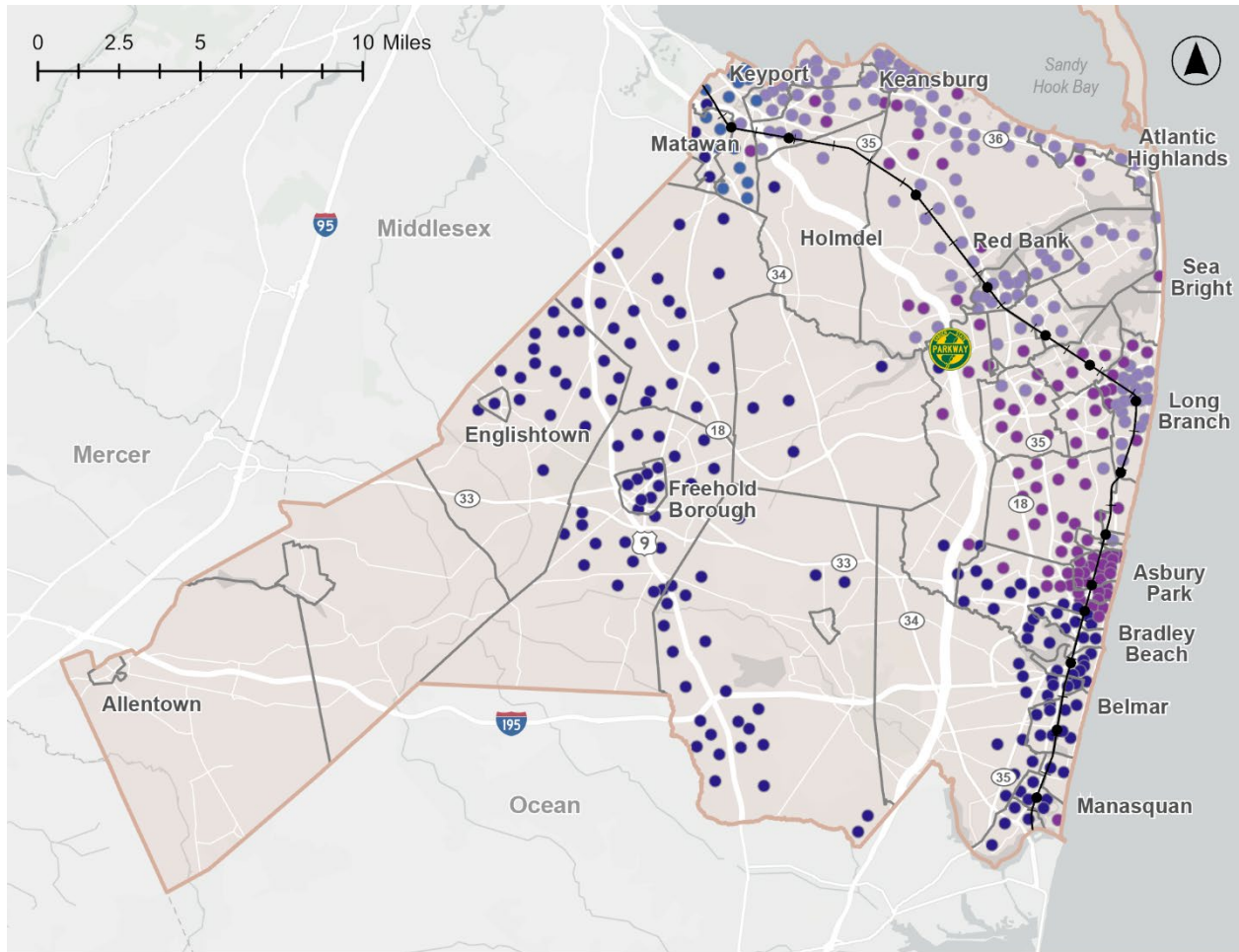


Figure 12: Travel Cost Ratio (Driving vs. Transit) for Census Blocks with Access to Transit



-  Monmouth County
-  Municipal Boundaries
-  Passenger Rail
-  Rail Stations

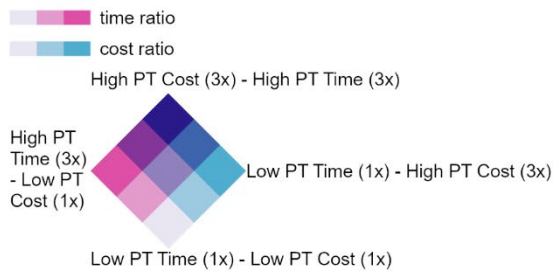
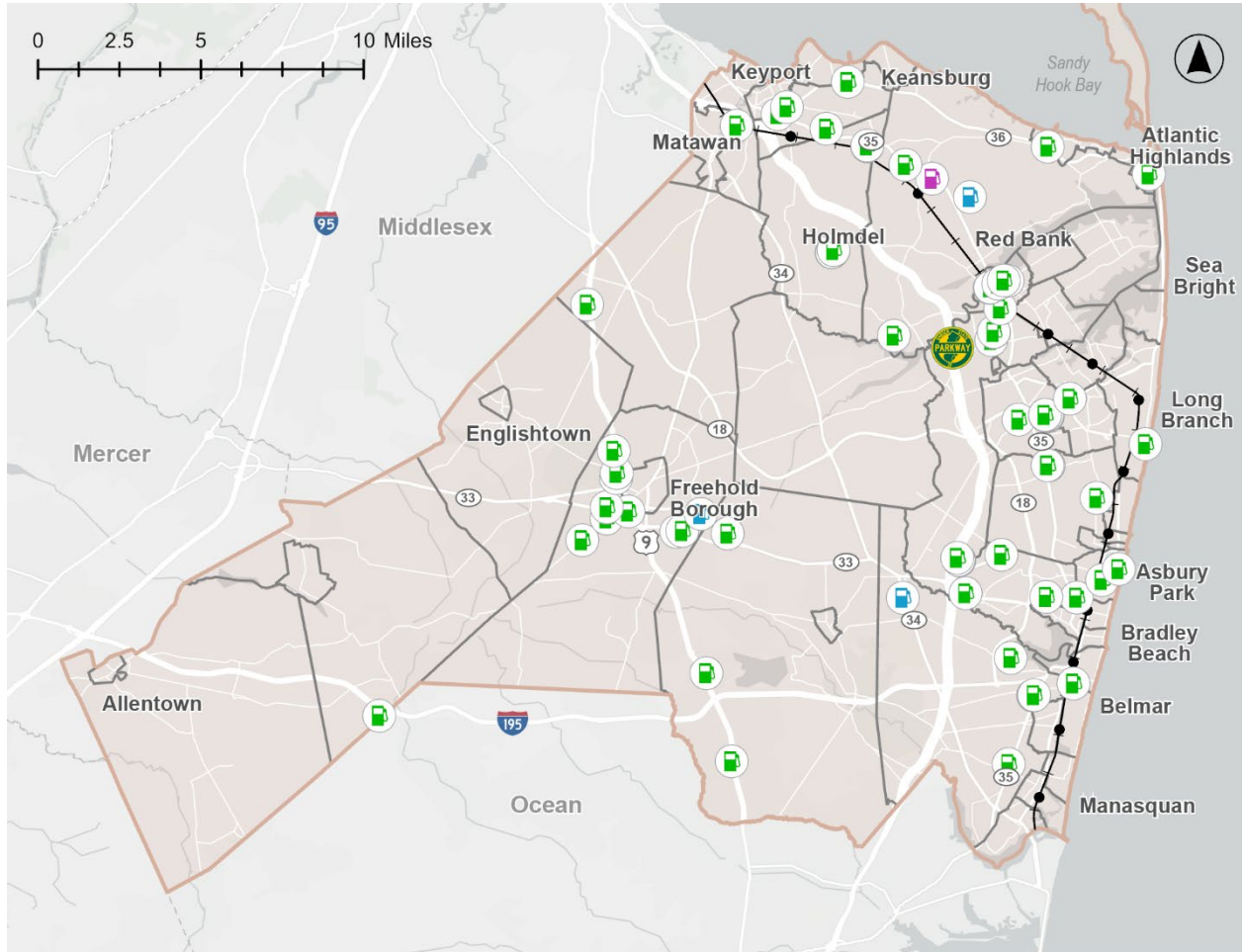


Figure 13: Alternative Fueling Stations in Monmouth County



- Monmouth County
- Municipal Boundaries
- Passenger Rail
- Rail Stations

Alternative Fuelling Stations

- Electric
- CNG
 Compressed Natural Gas
- P
 Propane

Conclusions

This report summarizes the analysis that was conducted to identify and quantify barriers to mobility within Monmouth County for each mode (active, public transit, and vehicle/driving). The results of the analysis indicate that there are several critical barriers for each mode of transportation, some of which are experienced to the same degree consistently across the County, while others are concentrated in certain areas of the County. **Table 6** below summarizes the barriers that will be advanced for further analysis by transect in Appendix C: Limiting Effects and Positive Solutions. Barriers in the table are defined as either a County-wide barrier, meaning that the barrier primarily effects mobility across the County, or a localized barrier, meaning that the barrier primarily effects mobility at a local or site-specific level. There are some barriers that are experienced at both scales and are identified as such.

Table 6: Summary of Critical Barriers and Needs

Mode	Barrier/Need	County-Wide Barrier?	Localized Barrier?
Active (Walking & Biking)	Bicycle network connectivity: There is a very limited amount (<100 miles) of bicycle facilities in the County. Connectivity between communities and services within their own municipality are weak, and there are almost no options to connect between municipalities. Public outreach indicates the need to incorporate higher-quality bicycle facilities into infrastructure projects.	X	X
	Sidewalk connectivity to employment, education, and critical services: Outside of the County's more urbanized municipalities, such as Freehold, Red Bank, and Asbury Park, it is not possible to walk to employment, education, or critical services due to distance or lack of facilities.	X	X
	Major state roadways act as barriers to walking and biking: Major state roadway, such as NJ Routes 18, 33, 35, 36, 79, and US Rt. 9 provide important connections to key services within the County, but also act as barriers to pedestrian and bicycle travel due to lack of sidewalks, low-stress bicycle facilities, and limited crossings.	X	

Mode	Barrier/Need	County-Wide Barrier?	Localized Barrier?
Active (Walking & Biking)	<p>Lack of programs, equipment, and facilities to support active mode use by people with disabilities in the County. As pedestrian and bicycle infrastructure is improved, there is a need to consider designing for County residents with disabilities. Special consideration is needed in areas with concentrations of disabled and elderly residents.</p>	X	X
	<p>Safety of pedestrians and cyclists in communities: Pedestrian and bicycle crash hot spots exist in vulnerable communities in municipalities such as Freehold, Asbury Park, Long Branch, and Keyport. Crash hot spots discourage active mode use and result in vulnerable people with few options at greater risk.</p>		X
	<p>Safety of pedestrians and cyclists along major roadways: There are clusters of pedestrian and bicycle crashes along major roadways such as NJ Rt. 35, 36, and US Rt. 9, indicating a need for improved access along and across these corridors.</p>	X	
	<p>Higher reliance on personal vehicles has created a condition where substantially more investment is made in vehicle infrastructure (wider roads and intersections) to the detriment of pedestrian and bicycle access and safety.</p>	X	
Public Transit	<p>Access to frequent and reliable transit: Only 15 percent of households in the County have access to a public transit stop, and of those 15 percent, only 28 percent have access to a stop with a service frequency of at least once per hour throughout the day.</p>	X	
	<p>Long travel times and multiple seat changes (transfers) to travel around the County and beyond: Only 13 percent of municipality-to-municipality trips can be made without any seat changes (transfers between routes or transit services). In addition, there are few routes within Monmouth County that offer services past 7:00 PM.</p>	X	

Mode	Barrier/Need	County-Wide Barrier?	Localized Barrier?
	<p>Missing first- and last- mile connections to and from transit stops: Outside of the urban centers within the County, it is difficult to access transit stops due to missing sidewalk connections or crosswalks. Low density land uses typically have buildings set back from the roadway and don't often have sidewalk connections between the street and the building.</p>		X
	<p>Limited east-west connections: County residents have several high-frequency options when traveling north to major urban centers such as Newark and New York City. However, east-west travel is limited with few routes with low frequency service.</p>	X	
<p>Vehicle (Driving)</p>	<p>High car ownership rates in rural western Monmouth County. Rural areas exhibit higher levels of car ownership due to distances to key services and amenities and lack of transit options.</p>		X
	<p>Higher percentages of zero and one vehicle households in lower-income communities in municipalities like Freehold, Asbury Park, Red Bank, and Long Branch. Low auto-ownership can create substantial barriers to mobility in areas where other mobility options provide limited connectivity. In many of these communities, travel to work, school, shopping, and recreation is constrained by the extent of the public transit network, which has very limited east-west service.</p>		X
	<p>Seasonal congestion creates barriers to travel in many of the County's most vulnerable populations that live east of the Garden State Parkway. Seasonal congestion generated by tourism to the County's shore communities can significantly increase the unreliability of transit, vehicles diverting to local streets, and more vehicle conflicts with pedestrians and bicyclists, among other impacts.</p>	X	X

Mode	Barrier/Need	County-Wide Barrier?	Localized Barrier?
	<p>Vehicle crash clusters exist in shore municipalities such as Asbury Park and Neptune, which have the highest number of crashes when compared to Annual Average Daily Traffic (AADT), as well as some of the highest densities of crashes based on total roadway mileage.</p>		X
	<p>Travel time and perceived cost benefits of driving versus transit: For most destinations within and outside the County, driving is substantially faster, and is often perceived to be lower cost. Data indicates that travel to major destinations outside of the County can take as much as three times longer than driving. Bus travel time can increase even more if buses are caught in regularly occurring or seasonal congestion. Delays to buses negatively impacts schedule reliability and can lead to missed connections with other bus routes or other transit modes.</p>	X	
	<p>Limited access to public charging and fueling stations. Electric and other alternative fuel vehicles are becoming more prominent in the market. Overall charging stations numbers are relatively low (78), with over 50 percent of municipalities without a registered public charging station. Furthermore, while electric vehicles are still out of reach for many low-income residents due to high costs, they will likely become more accessible as technology advances. Existing charging stations are primarily located in suburban areas.</p>		X

Attachment A:

Data Log

The following matrix describes each data point that was utilized in the analysis and that is included in the ArcGIS Dashboard. The data points are separated into six categories:

- Active Travel: Data related to pedestrian and bicycle travel.
- Vehicle: Data related to vehicular travel and the comparison of vehicular travel to transit travel.
- Public Transit: Data related to traveling by public transit.
- Socio Demographic: Demographic data utilized by this study.
- Boundary: Geographic boundaries that are used in the ArcGIS Dashboard.
- Miscellaneous: Data that is used to support multiple components of the analysis, such as the community outreach survey tool data.

The matrix provides the name of the data type, a brief description of the data, the data source, years that are represented in the data (if applicable), and the location that the data is displayed in the Dashboard. Direct links to the data are provided when available.

Attachment B: Data Analysis Workbook

Attachment B: Data Analysis Workbook

FIGURE B-1: Number of Monmouth County Municipalities that are Accessible from Each Municipality by Number of Transfers (Seat Changes)

This figure presents a metric to assess how well each municipality is connected by transit to other municipalities in the County. It shows the number of municipalities that can be reached with zero, one, two, or three transfers (seat changes), as well as those that require more than three transfers or are not possible to connect to via transit. For example, the figure shows that from West Long Branch Borough, only 3 of the County's other municipalities can be reached with no transfers, 15 are accessible with only one transfer, 3 are accessible with two transfers, and the remaining 32 are not accessible via transit or require more than three transfers. Source: NJ TRANSIT GTFS

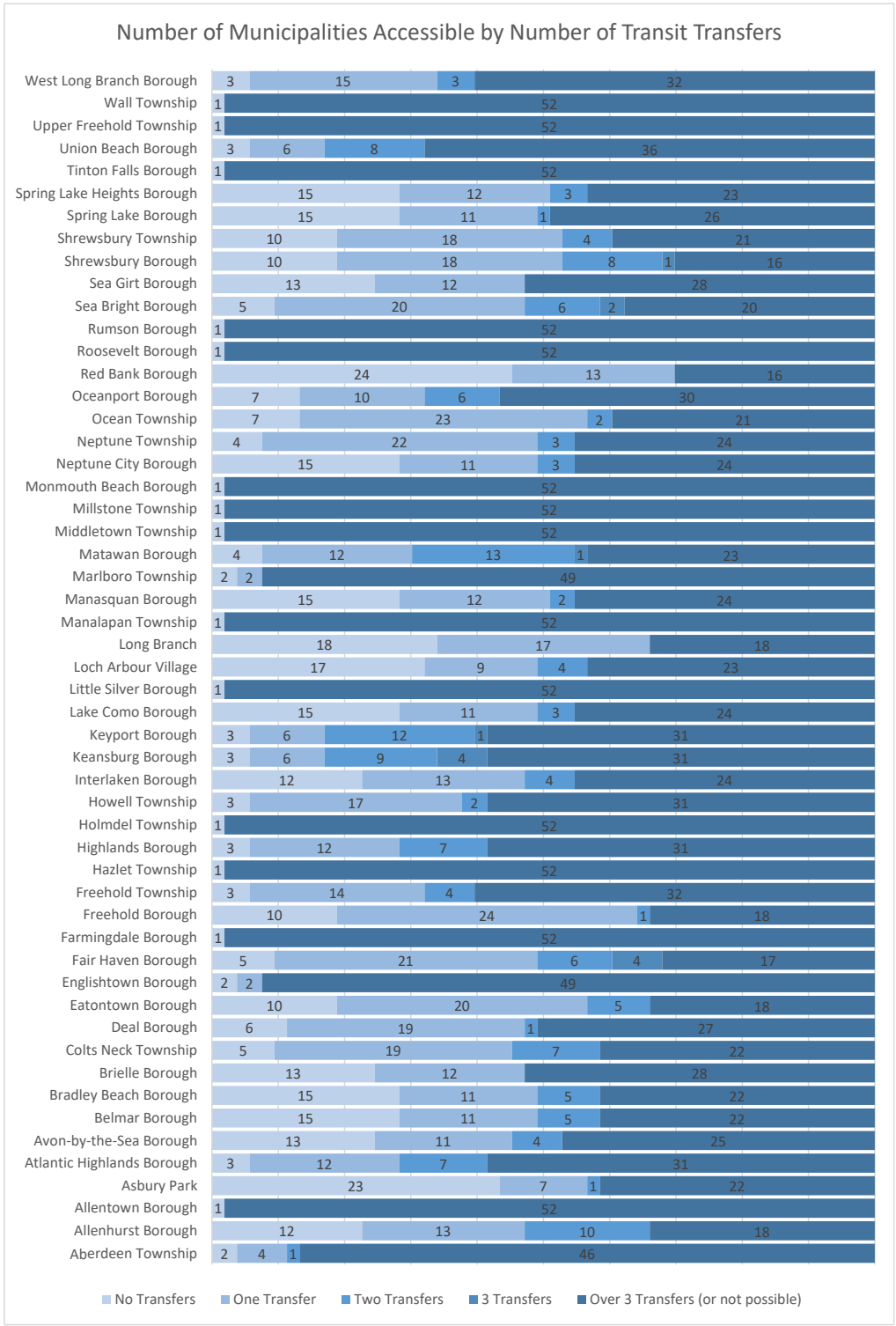


FIGURE B-2: Last Service Available

This figure categorizes the number of stops within each municipality by time of the latest service. For example, in Freehold Township, there are a total of 70 transit stops. Of those 70, service ends before 7:00 PM at 18 stops, between 7:00 PM and 8:00 PM at 5 stops, between 8:00 PM and 9:00 PM at 5 stops, between 9:00 PM and 10:00 PM at 4 stops, between 10:00 PM and 11:00 PM at 4 stops and after 11:00 PM at 24 stops. The larger number of after 11:00 PM stops is likely due to the higher level of service of buses on the US Rt. 9 corridor. Source: NJ TRANSIT GTFS

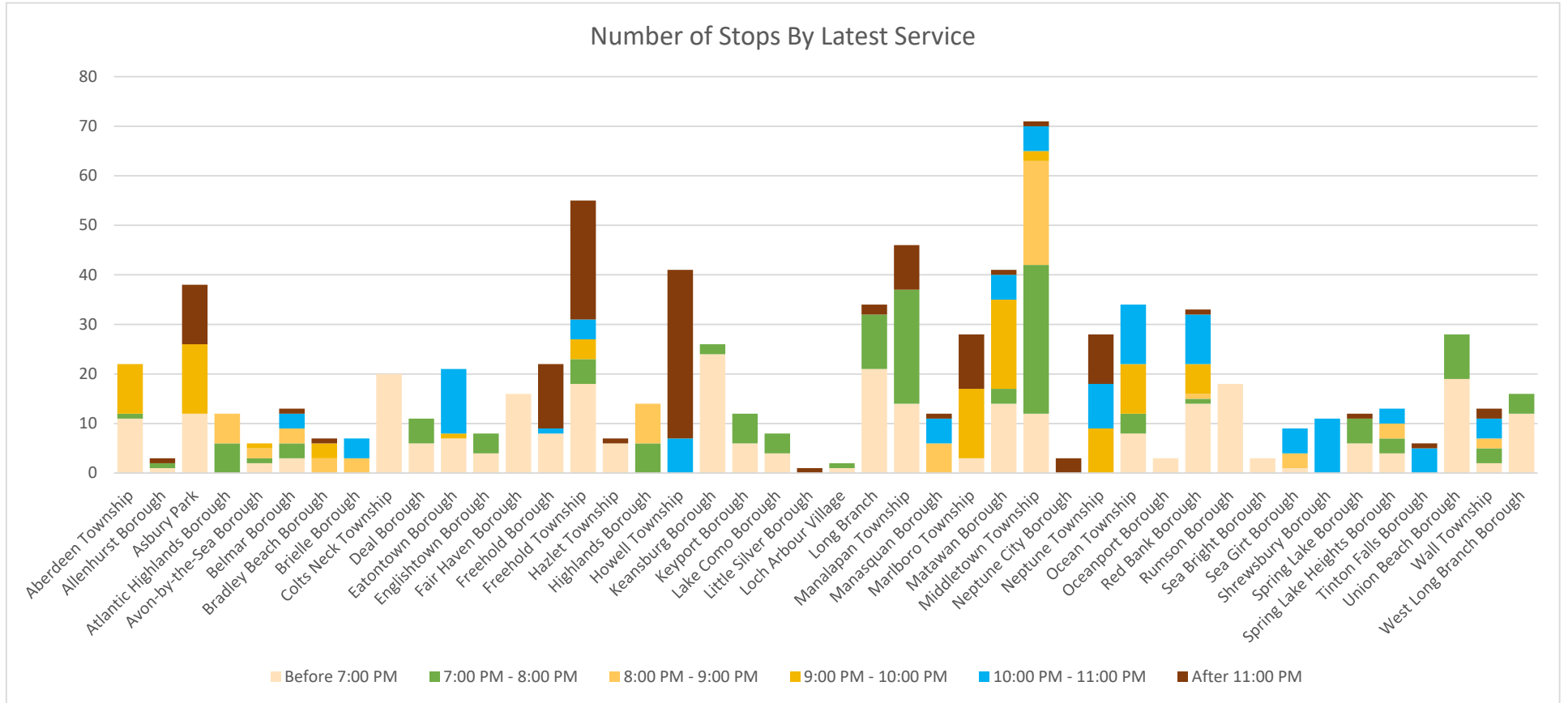


FIGURE B-3: Walking and Biking Mode Share Compared to Zero Vehicle Households (Source: Replica)

The two figures below show the correlation between the percentage of all municipal trips made by walking (top figure) or biking (bottom figure) and the percentage of zero vehicle households in each municipality. For walking trips the data is showing a slight upward trend: as walk mode share increases, so does the percentage of zero vehicle households. However, this correlation is not strong as some municipalities with higher walk mode shares have fewer than 10% of the households with no access to a vehicle. Similar conclusions can be drawn from the bottom figure that compares bicycle mode share to zero vehicle households.

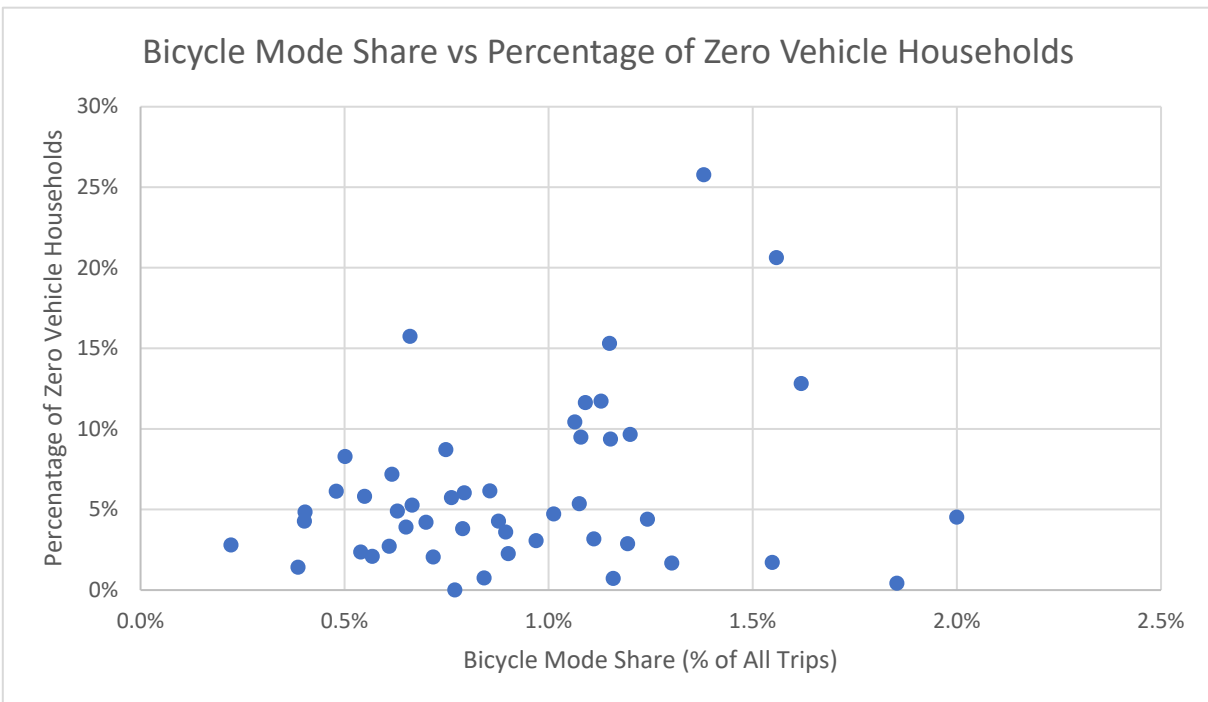
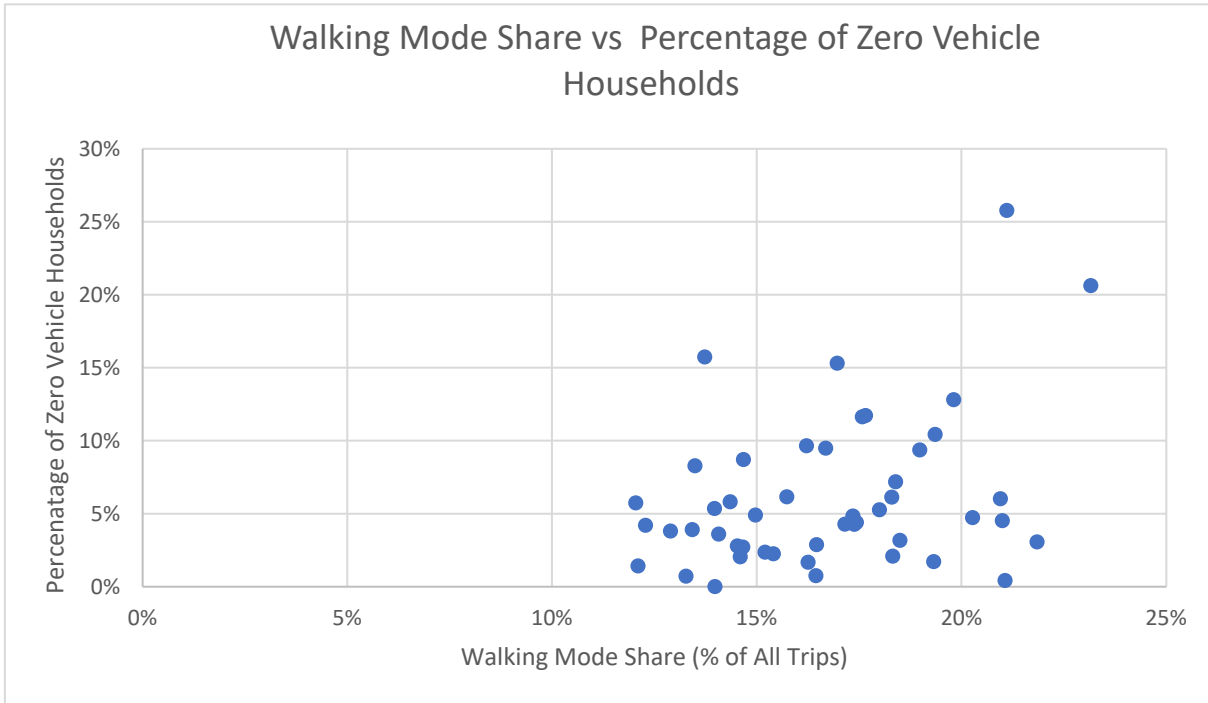


FIGURE B-4: Modes of Transportation for Persons with a Disability (Source: Replica)

The three figures below show the correlation between the percentage of all municipal trips made by vehicle (top figure), walking (middle figure) or transit (bottom figure) and the percentage of the population that identifies as disabled in each municipality. For walking and transit trips, the data is showing a slight upward trend: as walk or transit mode share increases, so does the percentage of the population that identifies as disabled. The vehicular mode share data shows a similar trend in reverse where there is a downward trend in the data: as vehicle mode share trends upward, the percentage of population that identifies as disabled trends downward.

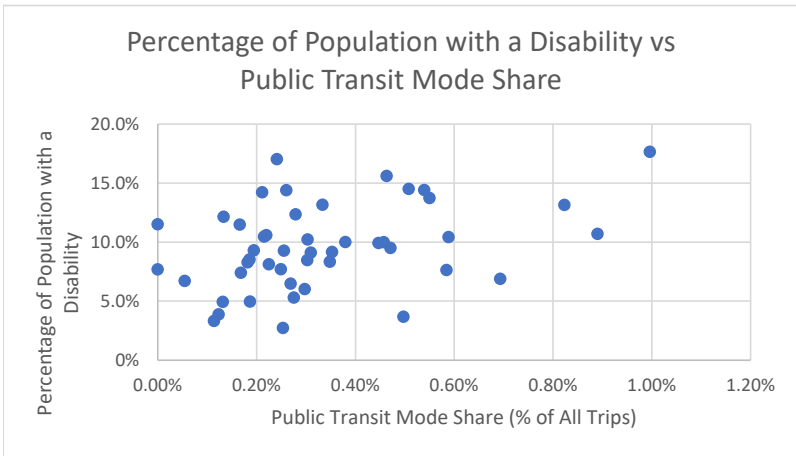
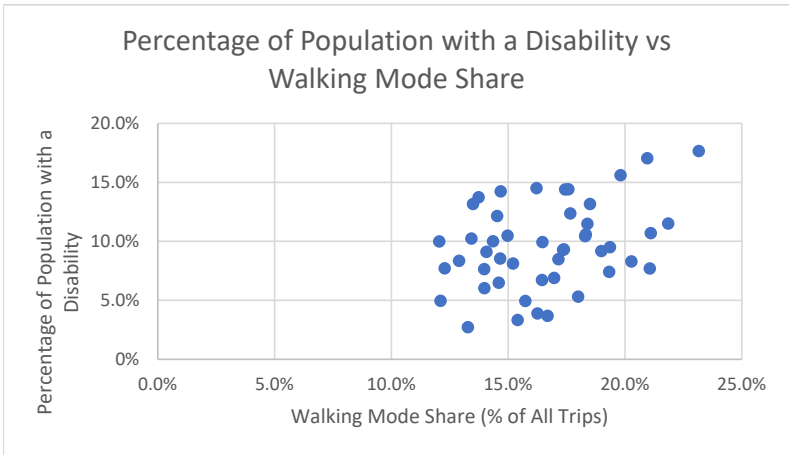
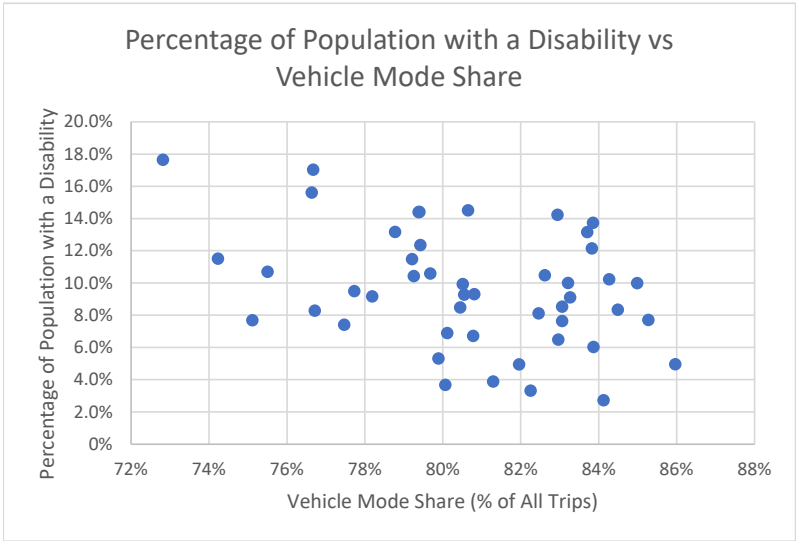


FIGURE B-5: Percentage of Crashes Involving Pedestrian or Bicyclists by Municipality (2019-2022)

The figure below shows the percentage of all crashes occurring in a municipality that involve a pedestrian or cyclist. For example, in Spring Lake Borough, over 3 percent of all crashes occurring in the municipality involve a pedestrian, and over 7 percent involve a cyclist. Source: NJDOT SafetyVoyager

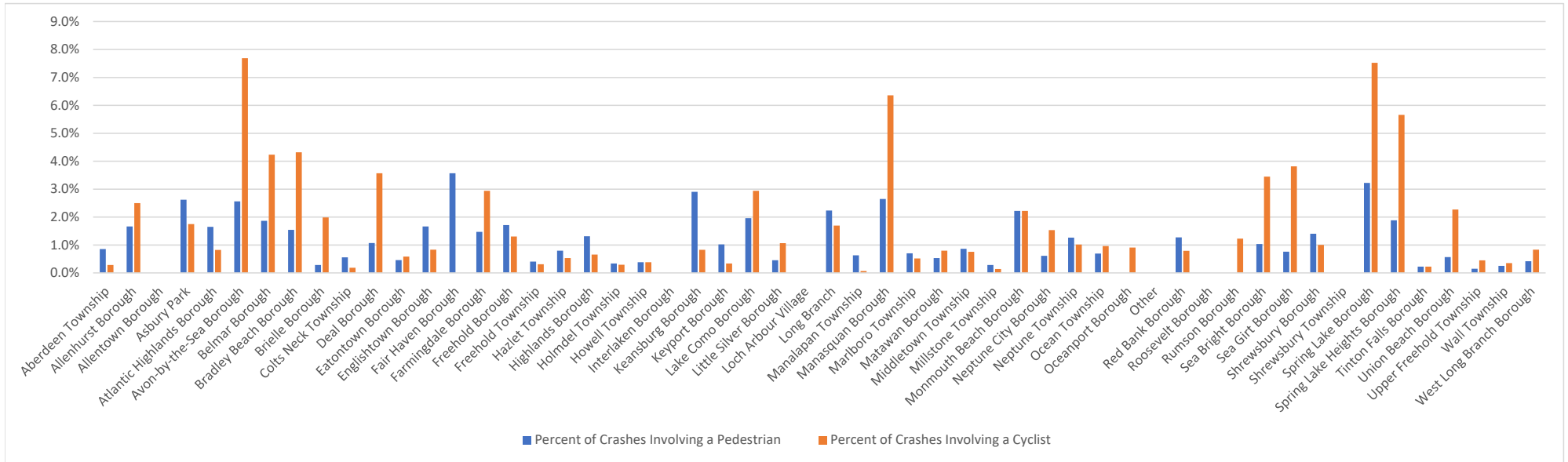


FIGURE B-6: Crashes Distributed by AADT of Nearest Street

The figure below is a box and whisker chart that shows the distribution of crashes in each municipality by the AADT of the roadway segment it occurred on. A box and whisker plot shows how data is distributed and identifies outliers with the box identifying the "middle" of the data between the 25% and 75% percentiles. For example, Holmdel Townships crashes generally occur on roadways between 2,250 vehicles per day to about 22,000 vehicles per day, with fewer crashes occurring outside of that range. (Source: NJDOT SafetyVoyager Data and Replica AADT)

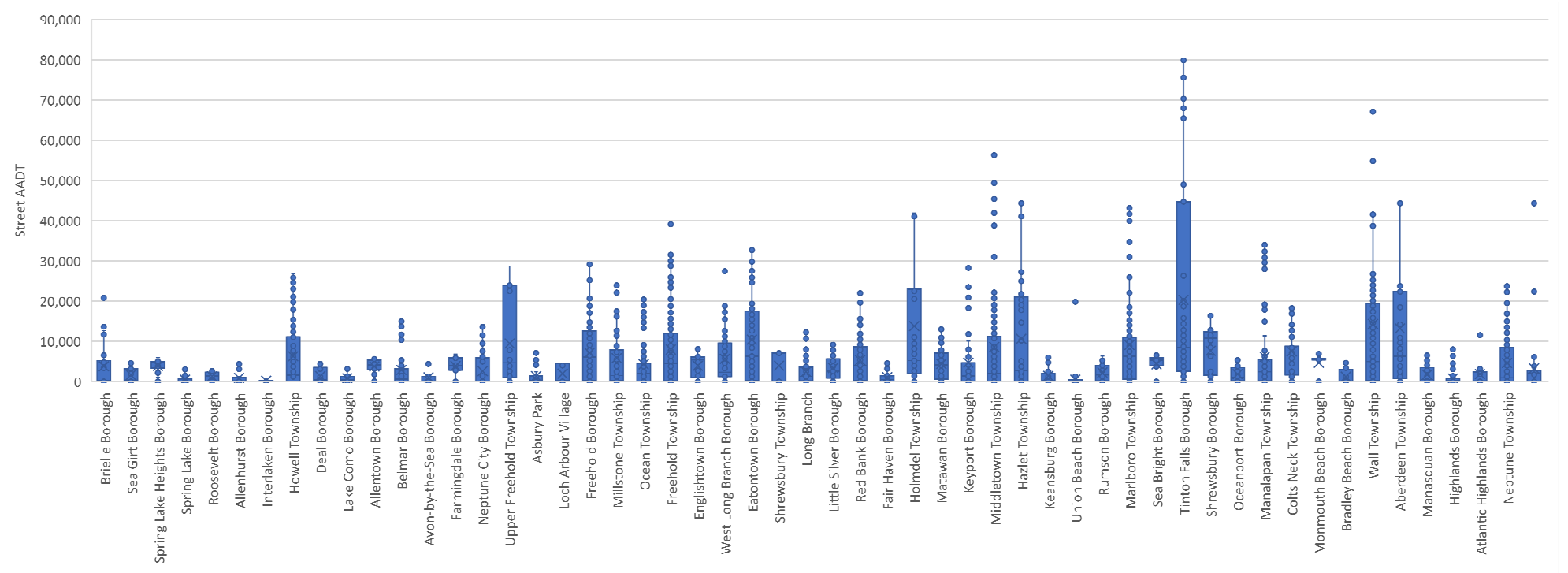


Figure B-7: Proportion of Pedestrian and Bicycle Crashes by Roadway AADT

The figures below show the proportion of pedestrian and bicycle crashes that occurred in the County by the AADT of the roadway. The data shows that most pedestrian and bicycle crashes in the County are occurring on low volume roadways. This is likely because more people walk and bike on these types of roadways. Source: NJDOT SafetyVoyager and Replica AADT

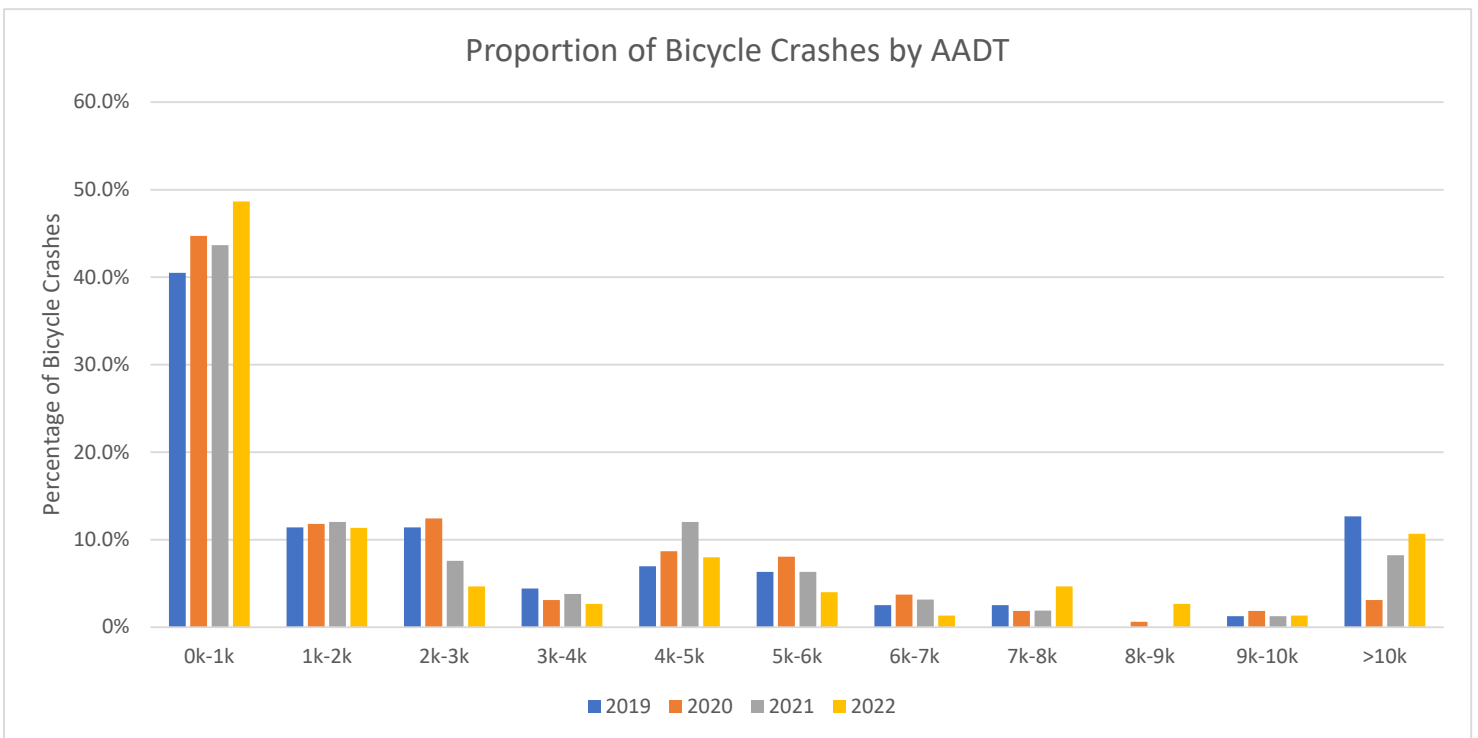
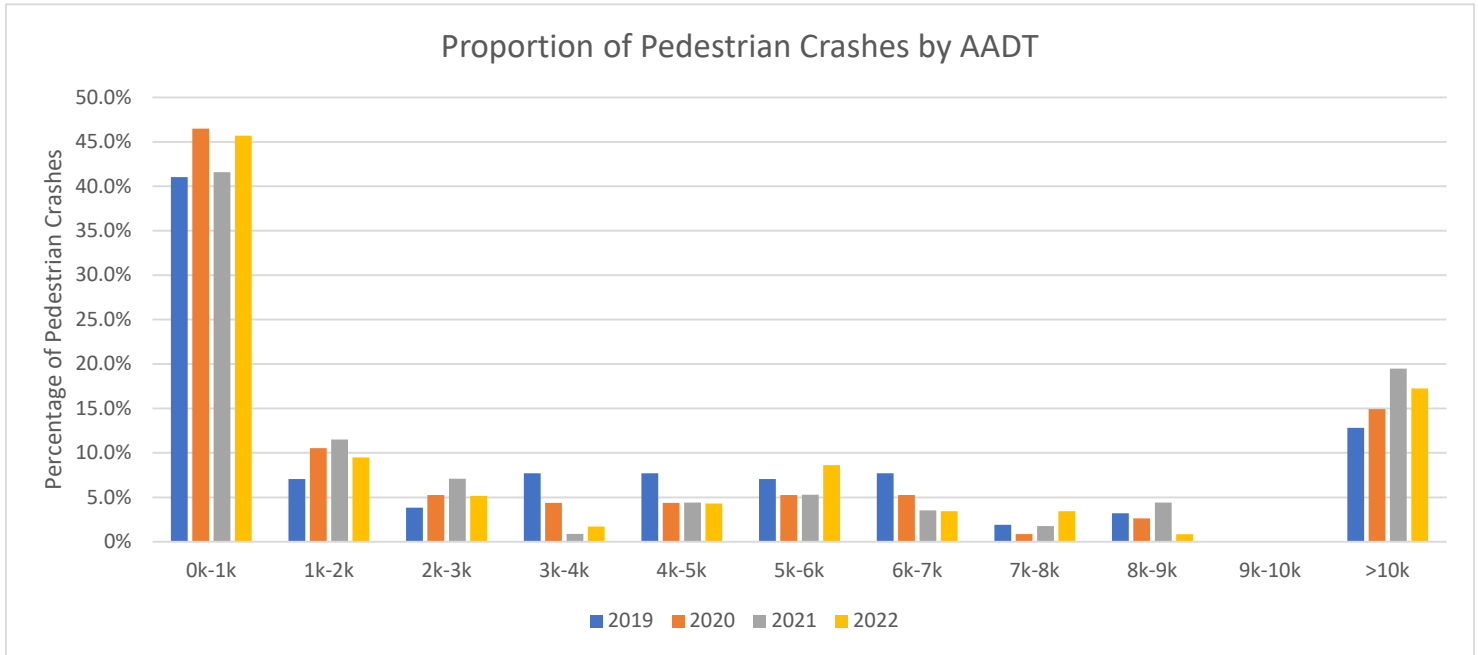


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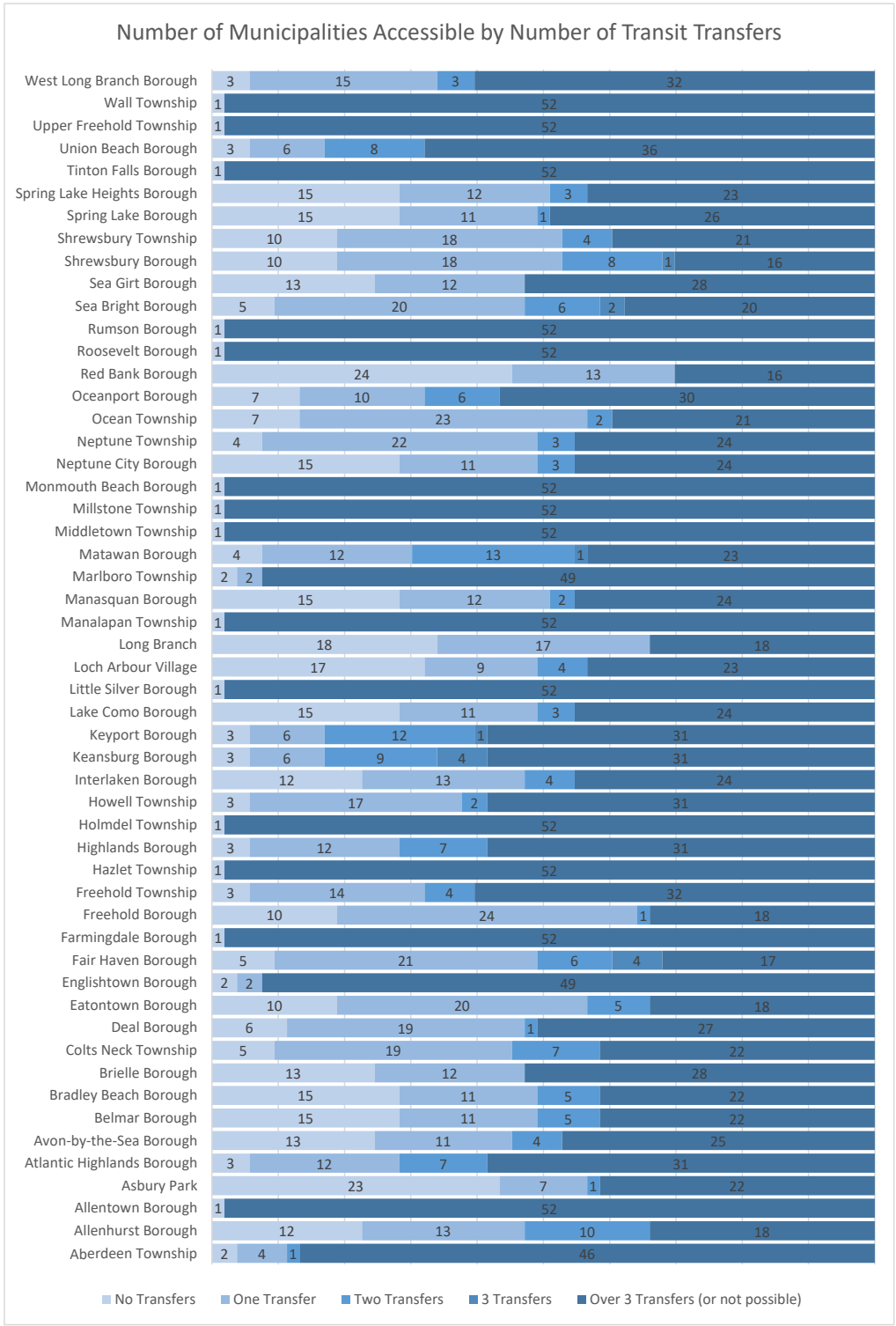


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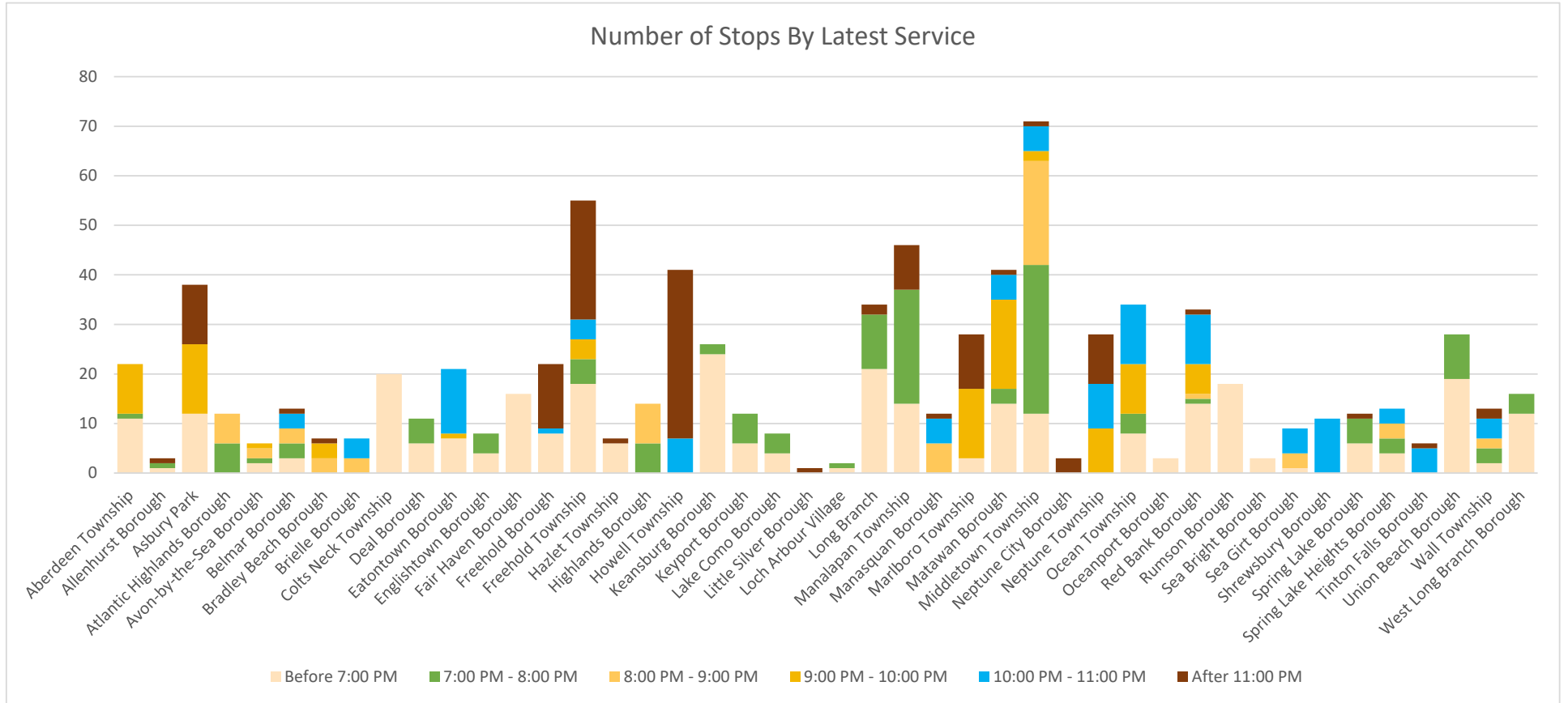


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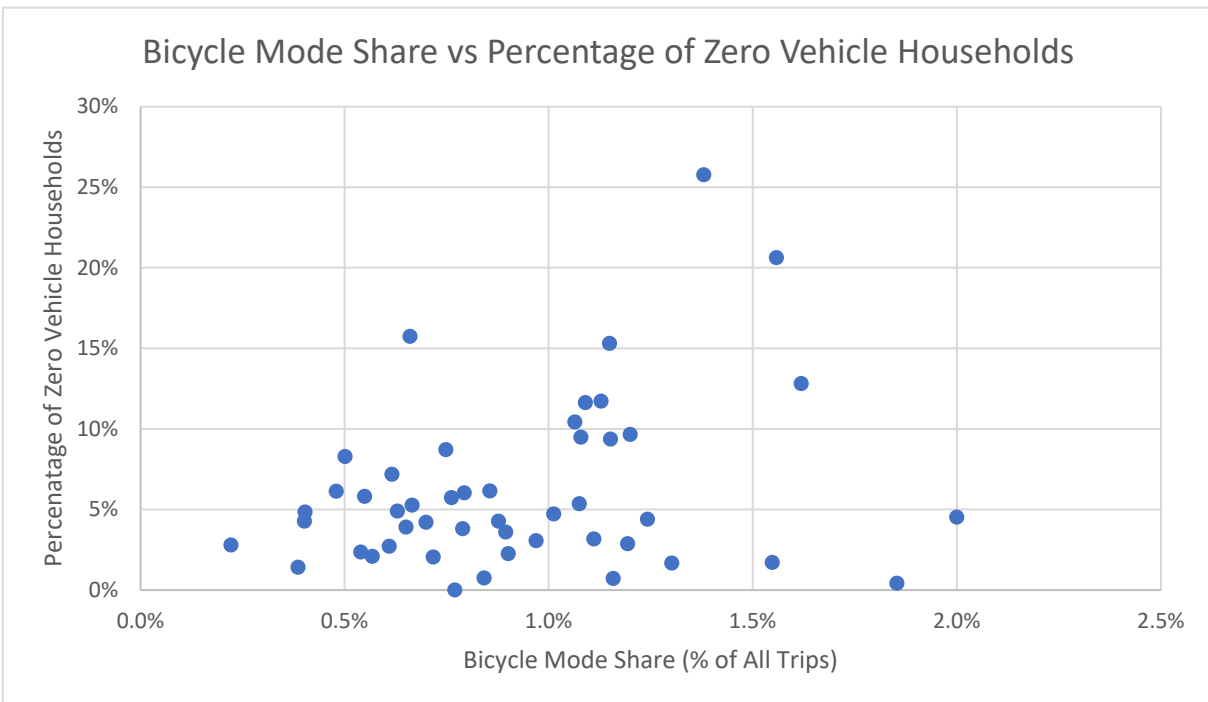
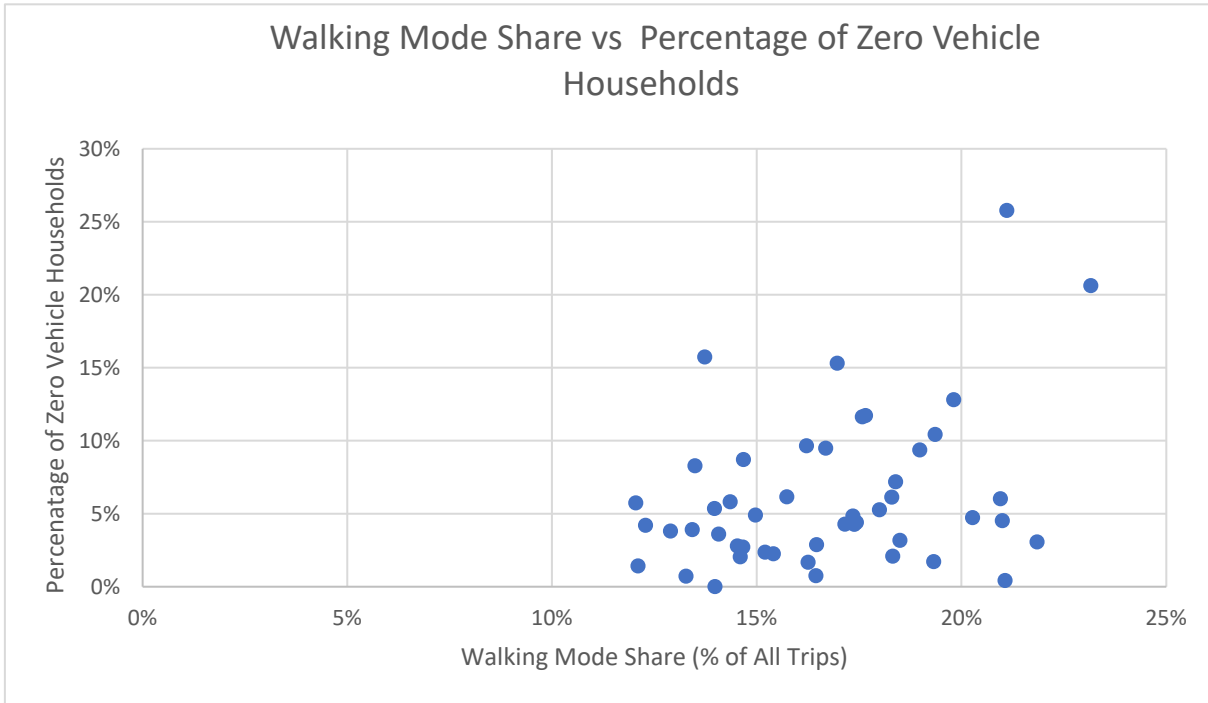


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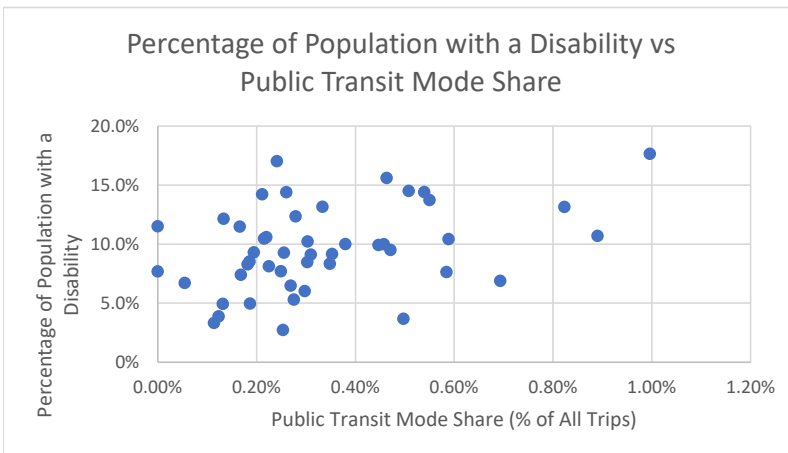
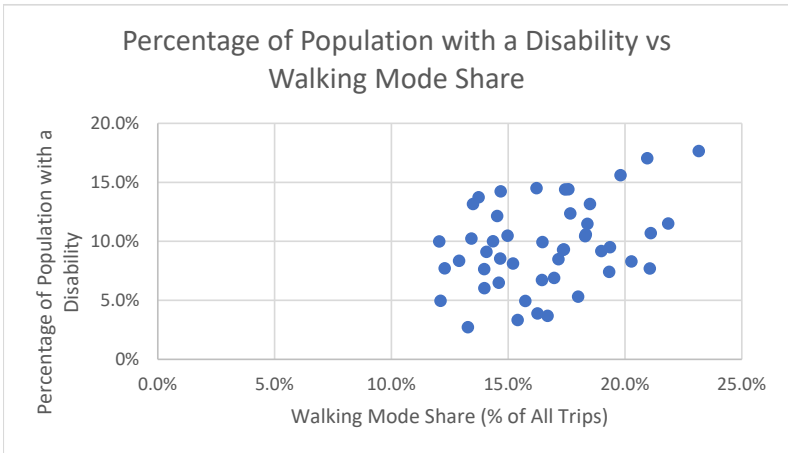
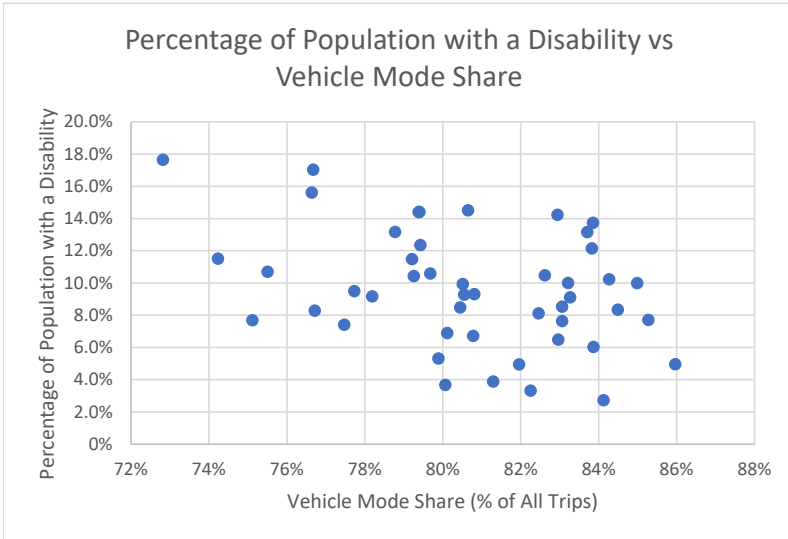


FIGURE B-5: Percentage of Crashes Involving Pedestrian or Bicyclists by Municipality (2019-2022)

The figure below shows the percentage of all crashes occurring in a municipality that involve a pedestrian or cyclist. For example, in Spring Lake Borough, over 3 percent of all crashes occurring in the municipality involve a pedestrian, and over 7 percent involve a cyclist. Source: NJDOT SafetyVoyager

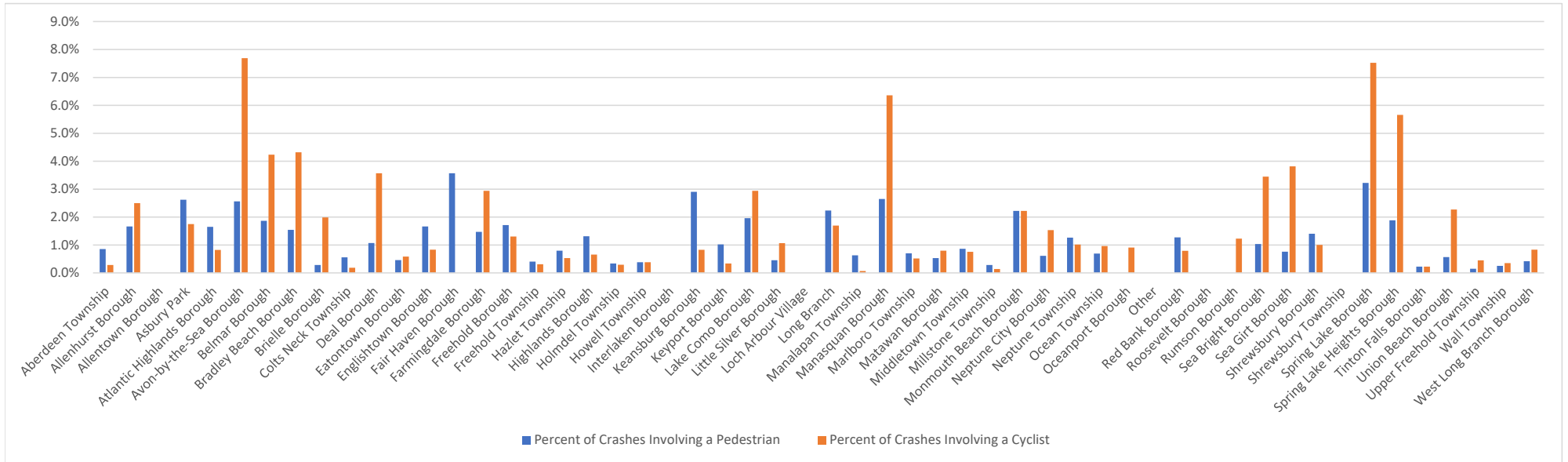


FIGURE B-6: Crashes Distributed by AADT of Nearest Street

The figure below is a box and whisker chart that shows the distribution of crashes in each municipality by the AADT of the roadway segment it occurred on. A box and whisker plot shows how data is distributed and identifies outliers with the box identifying the "middle" of the data between the 25% and 75% percentiles. For example, Holmdel Townships crashes generally occur on roadways between 2,250 vehicles per day to about 22,000 vehicles per day, with fewer crashes occurring outside of that range. (Source: NJDOT SafetyVoyager Data and Replica AADT)

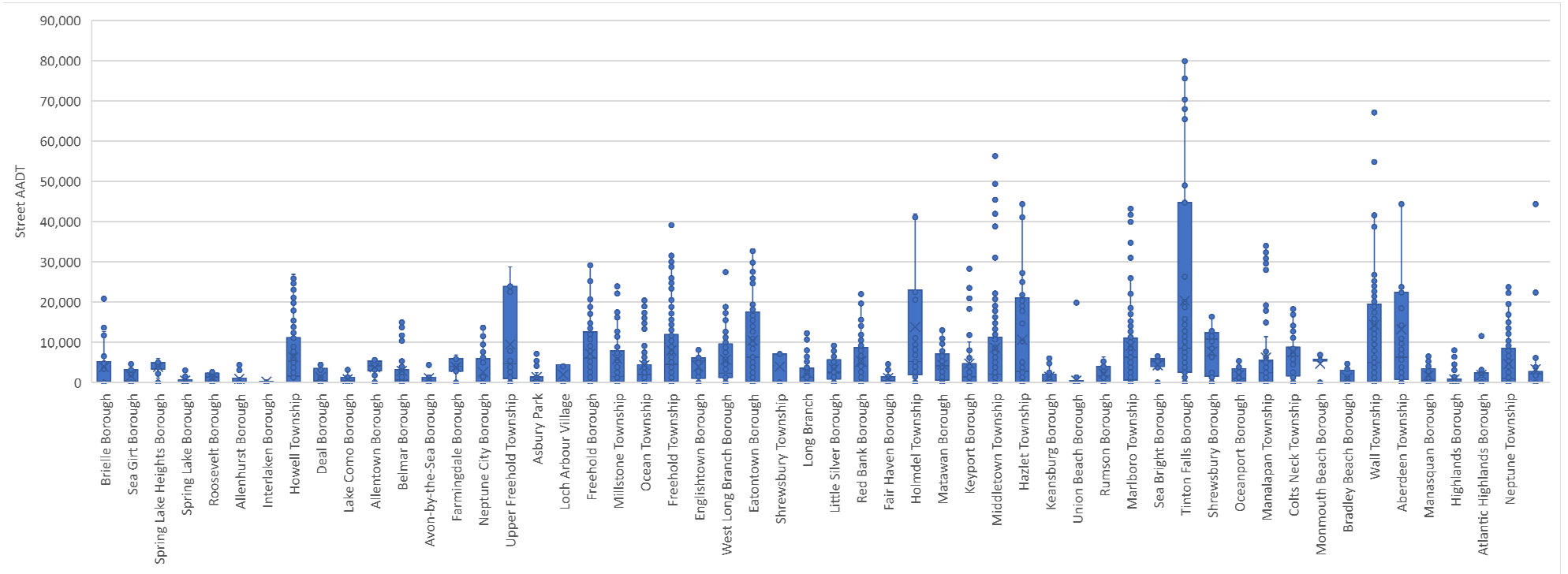


Figure B-7: Proportion of Pedestrian and Bicycle Crashes by Roadway AADT

The figures below show the proportion of pedestrian and bicycle crashes that occurred in the County by the AADT of the roadway. The data shows that most pedestrian and bicycle crashes in the County are occurring on low volume roadways. This is likely because more people walk and bike on these types of roadways. Source: NJDOT SafetyVoyager and Replica AADT

