

Accessibility for Disabled Persons in New York Rail Transit: a comparison of Rail Road stops in Urban and Suburban areas.

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Abstract

This paper analyzes the current accessibility of New York City region train stations for disabled riders. Utilizing GIS and data analysis, this paper finds that high income communities are better served by accessible stations in the suburbs than those in low income urban communities, despite a higher percentage of disabled and elderly population in the urban areas than in the suburbs. Staten Island has the least number of ADA accessible stations out of the four lines. The number of stops on the suburban leg of the LIRR and MNR are more accessible than the on the urban leg or the other two lines. The NYC Subway has the largest disabled population within walking distance but is the least accessible rail line of the four.

1. Introduction

In order to measure how effective a transportation system is we have to examine who has access to it. In this paper the term “access to transit,” has two different meanings. First there is accessibility to transit generally, i.e. the availability of transit coupled with the ability of people to access it. This is particularly crucial in densely populated metropolitan areas with residents that rely on public transportation to reach their job centers, community, educational events, and leisure activities in their neighborhood or city.

Defining general accessibility is not easy. “Accessibility, a concept used in a number of scientific fields such as transport planning, urban planning and geography, plays an important role in policy making. However, accessibility is often a misunderstood, poorly defined and poorly measured construct. Indeed, finding an operational and theoretically sound concept of accessibility is quite difficult and complex” (1).

The primary meaning of accessibility used in this paper is defined as, access to transit for people with disabilities. Thus “accessibility” here generally has a very narrow definition, referring to locations where people with disabilities can access train stations via elevators or escalators.

This type of access has been invested in widely, especially since the passage of the American with Disabilities Act. But there is another wrinkle, namely the shift from creating accessible transit station infrastructure, which makes disabled access possible, towards the maintenance and repairs of elevators and escalators, which ensures that the infrastructure provide actually delivers the access it is meant to. A station may have an elevator, but if it is out of order frequently it is useless to potential riders. This paper examines both dimensions as they exist at transit stations in New York City.

One general note: mobility is not implicitly defined in this paper but is an important background variable. “Mobility” can be thought of as the movement of people between places. Access to a transit system is a precondition to mobility. Mobility is important to everyone, but is especially important to those who are disabled and unable to get around without overcoming physical and social barriers.

Barriers to access thus often exist implicitly through the separate and unequal distribution of transportation services. People with disabilities often never leave their homes due to these limitations; therefore they are denied the opportunity to contribute to society and are constrained to live a more isolated lifestyle. Something as seemingly trivial as the absence or presence of a working train station elevator can have very broad implications for physical and social mobility, the latter referring to an ability to move freely within a society without being held by social, class and other predefined limitations.

2. Current Transit Infrastructure in New York and its implications for general Population

New York City has an impressive rail transit system. When considering both the subway and the commuter rail lines that run in the city, the network is truly impressive and the system is heavily used. However some of the rail lines were built over a century ago. The Long Island Rail Road (LIRR) began its operation in 1836 when it leased the Brooklyn and Jamaica Rail Road and began building its Main Line east of Jamaica. The Staten Island Rail Road (SIRR) system was operated by the Baltimore and Ohio Railroad Company from 1899 to 1971. In 1971 the New York Metropolitan Transit Authority (MTA) took over and currently operates it from St. George Ferry terminal to Tottenville. Metro North started out in lower Manhattan as a horse-car line called New York and Harlem railroad in 1832. Conrail operated commuter rail service until 1983 when MTA took over. The Interborough Rapid Transit (IRT) subway opened in 1904 owned by the city. In 1905 service was established to the Bronx and then extended to Atlantic Avenue, Brooklyn in 1908. The Brooklyn- Manhattan Transit(BMT) was the rapid transit company which built , bought, or assumed control of the Brooklyn elevated lines. Major expansion of the subway ended in the 1940's. (19)

The rail lines examined here include the: NYC Subway, LIRR, SIRR and Metro North Rail Road (MNRR). All of these lines serve the NYC Metro area, providing service for approximately 18 million people (2). As noted above, the present system was built for the purpose of bringing people from the outer boroughs (especially the fringes closest to Manhattan) and the immediate suburbs of NYC into the central business district (CBD).

Since then, settlement patterns have changed and many job centers have been relocated into the suburbs. Most of these areas are not served by rail. System ridership has been growing apace with population (except for severe declines during the City's recession and fiscal crisis in the 1970s), as shown in Figure 1. But transit connections between the outer boroughs are limited, and this is where many of the commuters now need to go. Due to the decentralization of jobs many people rely on automobiles if they live and work in the outer boroughs or suburbs. The number of automobiles per household increases as distance grows from the core (3).

This car-reliance trend in the outer boroughs is illustrated in Table 1. There is a shift in commuting behavior that deviates from Manhattan, towards the outer boroughs or surrounding counties. Given the decentralization of jobs that has occurred since 1960, people no longer need to commute to the CBD in order to acquire a job and in fact need to commute elsewhere to areas far beyond the CBD. There is a significant pattern evident in a data below which shows the increasing disconnect between where people live and where the rail network is best suited to take them. This general pattern is exacerbated, as will be shown below, when it comes to placement of train stations for people with disabilities.

Table 1: Commuter Growth 1990-2006						
	Manhattan	% Change	Own Borough*	% Change	**Surrounding Counties	% Change
Bronx	21,397	12.6%	52,647	29.5%	17,070	38.0%
Brooklyn	44,188	12.9%	90,483	20.1%	18,749	26.9%
Queens	34,369	10.0%	80,937	22.2%	27,998	16.3%
Staten Island	2,393	4.4%	26,347	34.9%	8,815	21.7%

* The "Own Borough" references those who reside and work in the same borough.

** List of Surrounding Counties per Borough: Bronx (Westchester, Queens); Brooklyn (Nassau, Queens, SI); Queens (Brooklyn, Nassau, Suffolk, Bronx, Hudson, Union, Middlesex); SI (Brooklyn).

Data sources: (2, 3, 4)

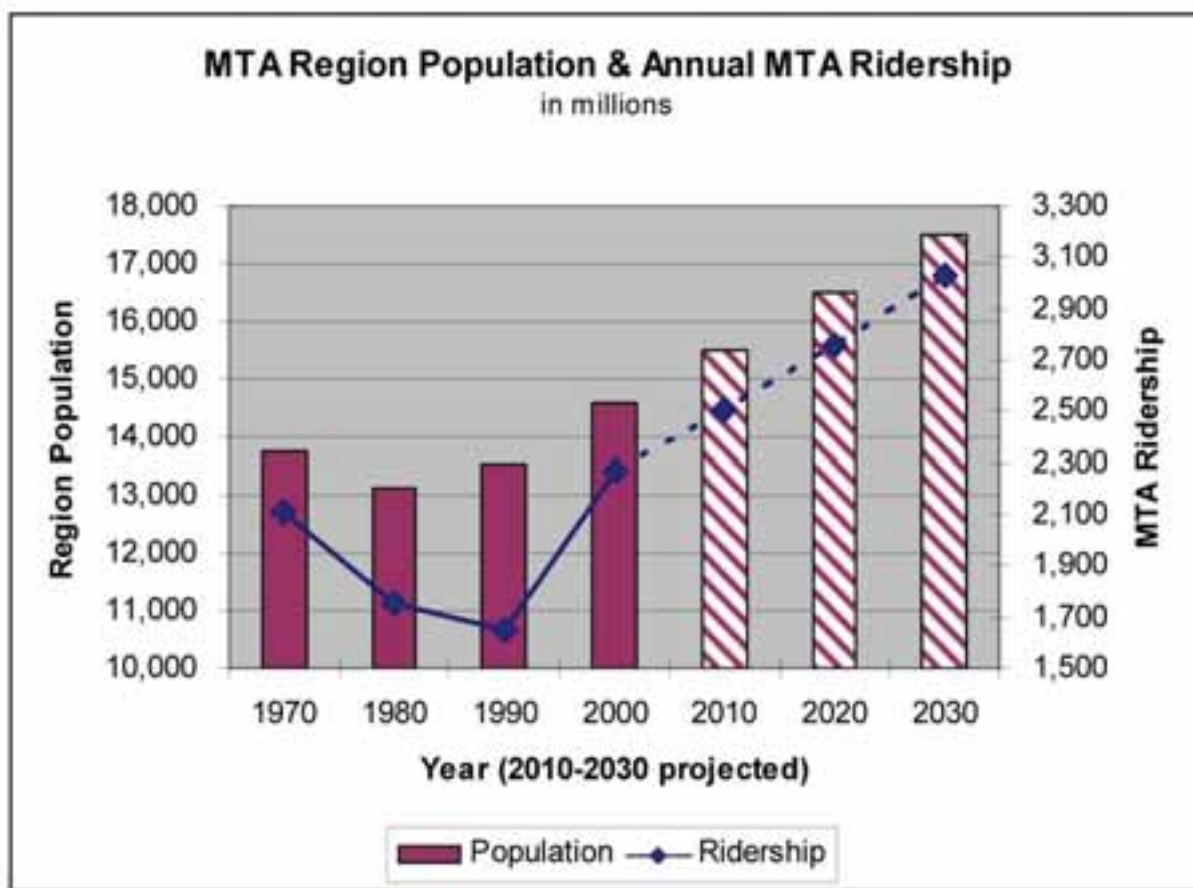


Figure 1. Source: (5) MTA Capital program 2008-2013.

The general accessibility issues surrounding current and future system investment are clear. "Accessibility is determined by attributes of both the activity patterns and the transportation system in the area. The spatial distribution of activities as determined by land development patterns and their qualities and attributes are important components

of accessibility, as are the qualities and attributes of the transportation system that links these activities, such as travel time and monetary costs by mode. ” (6). When it comes to disabled access, the nature and condition of transit infrastructure is especially important, as discussed in more detail next.

3. Current Transit Infrastructure in New York and Persons with Disabilities

For the remainder of this paper we will focus our efforts towards examining access to transit for the disabled. Improving accessibility for all users will help disabled persons but only if the train stations can be easily entered and exited. At a minimum, working, equipped elevators and ramps for the disabled must be available.

How does the city of New York and its immediate suburbs stack up in this regard? Below is a description of each mode of transportation provided with respect to disabled access. All relevant modes (including buses) are thumbnailed though the primary focus here is on rail facilities.

Trains: On the NYC Subway system, 83 stations are currently disabled-accessible out of 468 stations (7). Out of the 83 stops 4 stops belong to the SIRR (which is part of the NYC Subway System). On the LIRR out of 124 stations, 104 are fully accessible, and on the Metro North in New York State 50 stations are accessible out of a 74 stations. All three lines are owned by the MTA. Passengers can access platforms via ramps, elevators, and escalators.

Buses: All MTA NYC buses are accessible because they are equipped with wheelchair lifts and kneeling feature. Kneeling features is when the bus driver can lower the front right corner of the bus to ease the access onto the bus for the elderly or persons with disability. There are over 6,000 MTA buses currently in service. According to New York City Transit (NYCT), in 2006 approximately 71,000 customers per month were boarding the buses using wheelchair lifts (8).

Cabs: There are only about 240 taxicabs out of 13,237 taxicabs in NYC that are accessible to the disabled. These are not clearly marked so one won't know if it is accessible until the vehicle is to be boarded. These mainly provide service in Manhattan. There is a high cost to retrofit vehicles to be accessible (7).

Access-A-Ride: Another alternative option for disabled people is Access-A- Ride created by the MTA in 1980 for people who are unable to use mass transit. This service provides door-to-door transportation to some 20,000 people every week. In 2008 disabled riders made 5.8 million trips using Access-A-Ride (8).

In 2008, the Permanent Citizens Advisory Committee to the MTA reported an enrollment of 630,503 customers in the “Riders with Disabilities” program. Seniors compromise 81% of this enrollment, while disabled persons constitute the remaining 19% (9, p48). According to the 2000 US Census there is an estimated number 1,342,574 disabled persons living within ½ mile of the NYC Subway lines. These data indicate that only a

small fraction of the disabled population are enrolled in the “Riders with Disabilities” program. Those not enrolled in the program may have an alternative mode of private transportation, are unaware of the program or how to enroll in it or perhaps may simply choose not to partake of it for individual reasons. Another reason for non-enrollment could be that the service is not available in their area, or may not fit the user's origin-destination travel need.

Focusing in on the rail network, Figures 2 and 3 show each of the lines mentioned above and the US Census tracts adjoining those lines indicating socio-demographic details of the surrounding areas. The Figures also depicts the stations along each line, and whether or not the station is accessible.

Figure 2. New York City's Commuter and Transit Rail Network

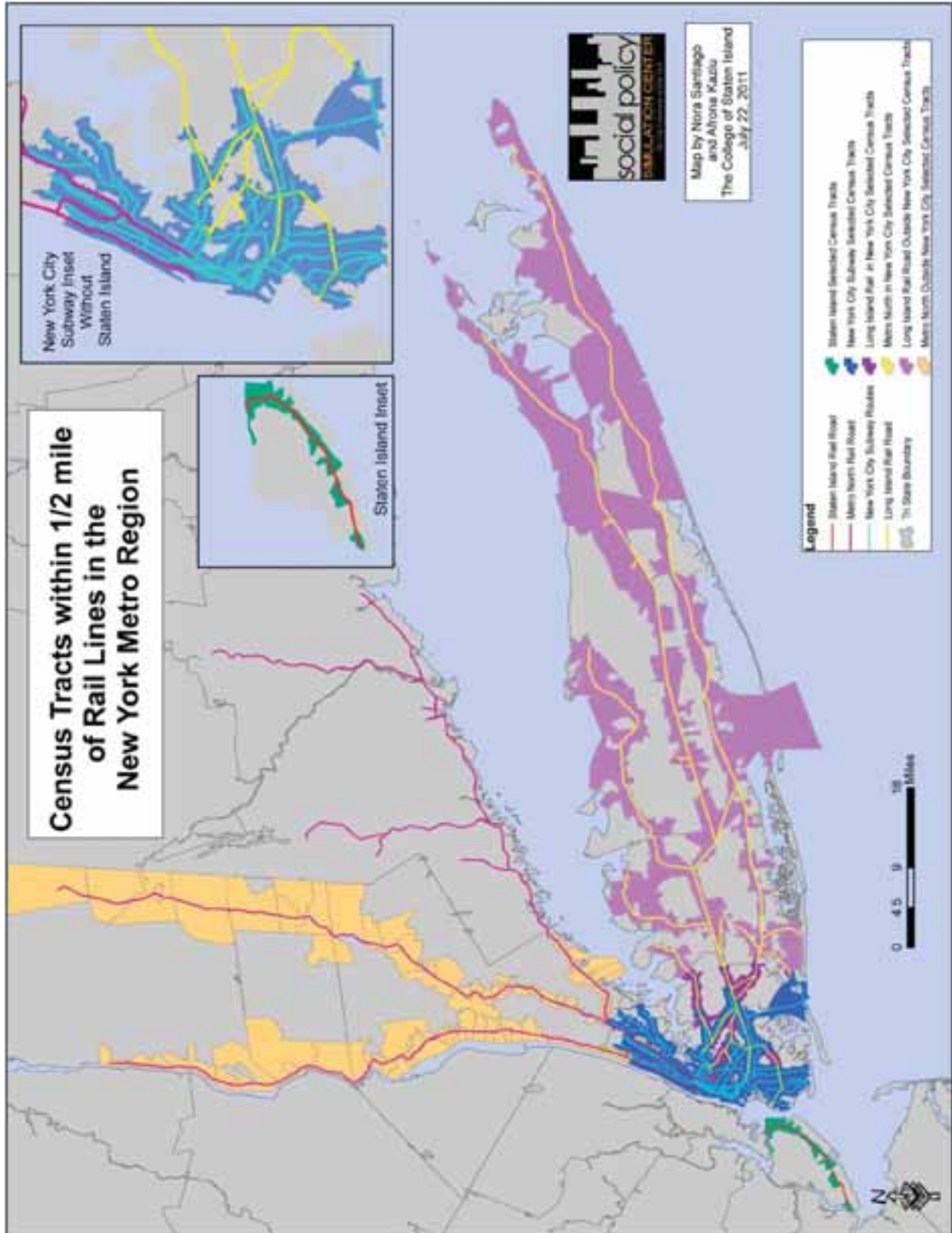
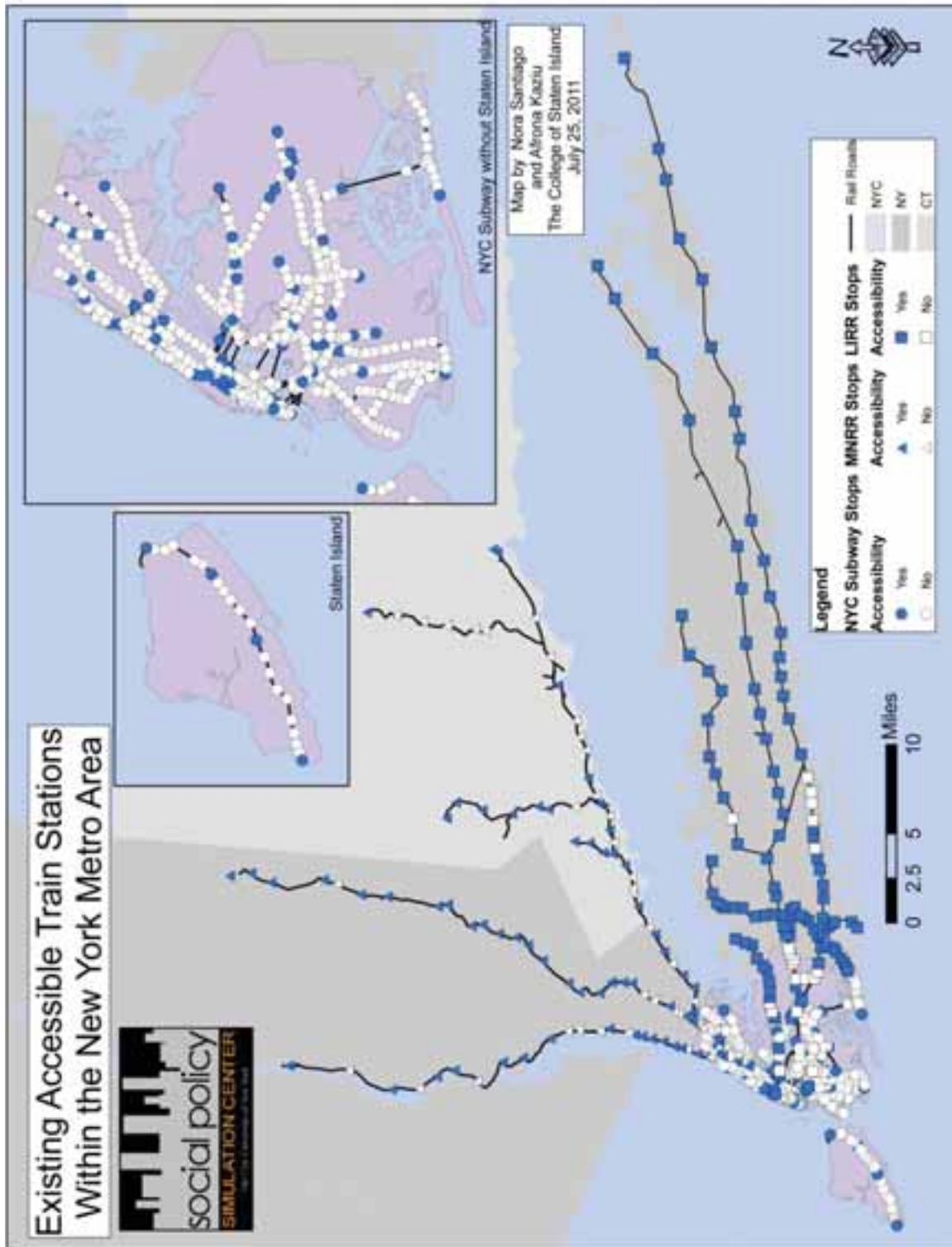


Figure 3. Accessible stops on New York City area commuter and transit lines. (White stops are not accessible. Dark/blue spots are accessible.)



4. Compliance with ADA

The Federal Americans with Disabilities Act (ADA) of 1990 prohibits “discrimination against individuals with disabilities persists in such critical areas as employment, housing, public accommodations, education, transportation, communication, recreation, institutionalization, health services, voting, and access to public services (10).”

The MTA began building accessible stations prior to the 1990 ADA due to lawsuits against the agency. With the passing of the ADA all transit systems had to submit a key stations list to the FTA by July 26, 1992. All key stations were supposed to be accessible by July of 1993 but transit systems were allowed to get an extension up to 30 years to complete construction. By 2010 the MTA had to make 54 of its stations accessible.

In 1994 when the New York Public Buildings Law and Transportation Law were amended it required the MTA to expand its key accessible stations from 67 in 2010 to 100 by 2020. From that point on the MTA was exempt from the accessibility obligations by the Public Building Law requiring all public facilities to be made accessible during any substantial construction, reconstruction of the station. It would have been an ongoing obligation for the MTA until all stations are accessible (9). But they are not exempted from this law for any new subway station and therefore on the new 2nd Avenue Subway all stations will be accessible.

The MTA network has more than 110 accessible subway and commuter rail stations. These stations have features that improve accessibility for customers with visual, hearing, and mobility impairments, as specified by the Americans with Disabilities Act. Their features include: elevators or ramps, handrails on ramps and stairs, large-print and tactile-Braille signs, audio and visual information systems, accessible station booth windows, accessible MetroCard® Vending Machines, accessible service entry gates at subway stations, platform-edge warning strips, platform gap modifications or bridge plates to reduce or eliminate the gap between trains and platforms, telephones at an accessible height with volume control, and text telephones (TTYs), accessible restrooms at commuter rail stations with restrooms (not all station buildings have restrooms).

The MTA network also has more than 120 additional subway and commuter rail stations that have elevators and/or ramps to provide wheelchair access. In some stations, ramps constructed prior to the adoption of the ADA Accessibility Guidelines may not meet current ADA standards for slope, landing and handrail requirements. On commuter rail lines, some ticket offices and restrooms are not accessible by wheelchair (11).

Currently there are 468 stations; 67 of them are key accessible stations. There are an additional 16 stations that are accessible but were not on the key stations list but only five of them fully ADA compliant. The MTA currently has 8 more stations in construction, nine are in design and 16 are in the planning stage. All of these must be completed by 2020 in order to fulfill their obligation (9). Figure 4 maps out these stations.

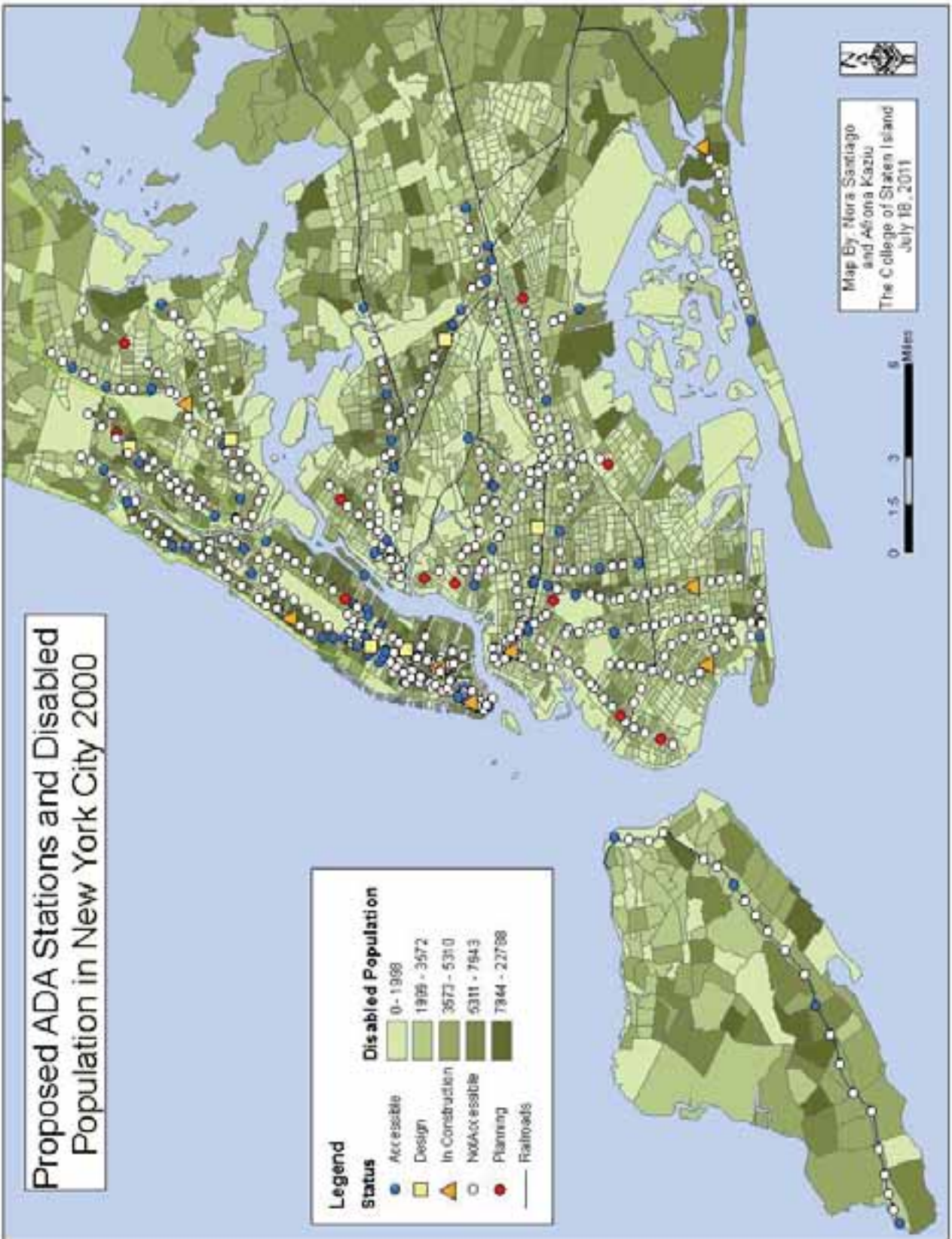


Figure 4: accessible and non-accessible stations and surrounding population

“By the end of 2010, the MTA plans to complete the work at the 96th Street station on the 1, 2 and 3 lines and the Jay Street station on the A, C and F lines. Next year, the MTA plans to finish upgrading the Kings Highway Station on the B and Q lines, the Bleecker Street station on the 6 line, the Broadway-Lafayette station on the B, D, F and V lines and the Mott Avenue station on the A line. Work at the Bay Parkway station on the D and M lines is planned for completion in March 2012. The MTA also plans to achieve accessibility at the Cortlandt Street stop of the R and W trains and the East 180th Street station on the 2 and 5 lines (12).”

5. Achievement of physical and social mobility for the disabled rider

It is clear that physical mobility plays a large role in social mobility. A failure to provide persons with physical disabilities with the proper opportunity to play an active role in society promotes a negative social effect on the individual as well as the community. It divides the social fabric of the community, isolating disabled persons from physically mobile persons. This would limit disabled persons not only by their disability, but also by where they can travel, work, obtain consultation and worship, in addition to hindering accessibility to educational, social, recreational and leisurely events and activities (13). “Population and employment distributions in metropolitan regions create distance barriers maintained through separate and unequal transportation services. (14, p. 184)”

The MTA certainly made significant efforts to comply with ADA once it became effective but there are still some significant gaps to be filled. But while compliance with the law is right and necessary, there is the broader question of whether the facilities being provided by the MTA are efficient and effective at achieving physical and social mobility for the disabled equal to that available to general society.

Although Access-A-Ride service provides millions of people with transportation each year, it is inefficient and a pricey burden that costs the MTA more than \$451 million a year to operate. According to the Gotham Gazette the cost per drive for the disabled individual using Access-A-Ride is \$66 while riders pay \$2.25 per ride (15, 16). The MTA is looking for less expensive alternatives that would still provide people with disabilities mobility at a lower cost. It was originally developed to supplement the existing transportation system that was not accessible at the time. The growth of disabled ridership was underestimated at the time of its creation. Initially, transit officials estimated a \$9 million dollar annual cost; however it quickly grew and is still growing at \$450 million; the cost doubling during 2000-2005. The rising cost is due to the increased number of users and the number of trips they take (17).

Recent service cuts on MTA buses in NYC have eliminated mobility for people whose only transportation option was to use MTA bus service since they live too far from the existing subway lines. Areas away from the transit lines are served by buses, but when

these buses are discontinued their riders are left with limited options. This is especially crucial for disabled residents who might not be able to walk to the next bus route like other residents. A recent lawsuit by Brooklyn disabled residents “charged the MTA with a human rights violation after the agency eliminated the B37 bus” (18). The elimination of this stop severely limited travel for the disabled population in the Bay Ridge area; this lawsuit swayed the MTA to restore previously discontinued bus routes in the near future. Long Island buses were also cut but the counties affected by these cuts are looking into subsidizing a private bus fleet to serve the areas disabled residents. County officials need to understand the need for this service to prioritize appropriately, not leaving out disabled populations.

To get a better sense of how good accessibility is in the New York transit rail system, the authors conducted a detailed analysis using GIS techniques to compare placement of accessible stations with surrounding population characteristics. All data used in the analysis of this paper was derived from 2000 U.S. Census Bureau Census Tracts. Census tract level data provided detailed analytical information on social, demographic and economic data for NYC, Long Island and Westchester County, NY. Due to the isolation of the SIRR to any and all other transportation modes, this line was studied as a separate entity from the NYC Subway system, although it is run by the same organization.

A half-mile buffer was used for each of the lines. Rail line was used rather than rail stops to avoid the over counting of population who have access to services due to close proximity of stops. The LIRR and the MNRR lines were divided into two separate distinct geographies, urban and suburban, based upon the NYC borough boundary border. Rail lines within the city boundary would be renamed MNRR Urban or LIRR Urban and lines outside of the borough boundary would be named MNRR Suburban and LIRR Suburban.

Census tracts then were selected to give us demographic, social and economic characteristics using two different selection methods. Along the urban lines census tracts were selected if their centroid was within $\frac{1}{2}$ a mile of the line, including NYC's borough of Staten Island, due to its small polygons. Along the suburban lines census tracts were selected within a distance of $\frac{1}{2}$ mile of the rail line because census tract polygons are larger in the suburbs due to less dense population.

The disability data used in this report are from the 2000 US Census. Since disability benefits and services are managed and collected by many different agencies a true total number is difficult to come by. It is also hard to compare the increase of population with disabilities between censuses because the questions are asked differently (9). Transit agencies like the MTA don't have much information on the number of disabled riders either. Many of their elderly citizens are using discounted metro cards due to their age and don't bother to fill out the information regarding their disability. Since the same pass is given to the disabled and elderly it is impossible to get a true number on the disabled ridership.

Table 2 provides some framing data on general accessibility. The New York City Subway system, excluding Staten Island, is the most reachable by the general population out of the four rail lines. It has the highest total population of 5,692,115 within a ½ mile than any of the other lines analyzed in this paper. 2,425,758 of which were white, 1,784,788 were Hispanic, 1,453,736 were black, and 556,296 were Asian. Most of this population is located in the borough of Manhattan due to the borough high population density. Manhattan and Staten Island are the two extremes of the NYC subway system. Staten Island total population around its one and only rail line is 131,692 people. The population seems to have more whites (96,243) than any other race. Black population comes in second with 19,136 people, Hispanics with 17,119 people and Asian with 5,749 people.

Rail Lines	TOTAL POP	WHITE	BLACK	ASIAN	OTHER	HISPANIC
NYC Subway	5,692,115	2,425,758	1,453,736	556,296	1,256,325	1,784,788
MNRR (Urban)	1,488,025	601,041	388,611	58,501	439,872	633,643
MNRR (Suburban)	502,959	367,466	71,610	18,920	44,963	74,135
LIRR (Urban)	1,769,877	628,934	542,670	266,282	331,991	454,073
LIRR (Suburban)	1,155,398	928,688	103,730	40,471	82,509	141,126
SIRR	131,692	96,243	19,136	5,749	10,564	17,119
Total	10,740,066	5,048,130	2,579,493	946,219	2,166,224	3,104,884

The total population around the urban section of the Metro North railway to 1,488,025, which is much higher compared to the low number of 502,959 for the suburban portion of the rail. In the urban part only 40% of the population is white, in comparison to 73% in the suburban area. In the urban areas roughly 68% of the population is black or Hispanic verses in the suburban areas only 29%. The total population around the urban leg of the LIRR is denser than around the suburban leg. The suburban leg is 80% white and 12% Hispanic. The urban leg is 56% Hispanic or black and 36% white since it is located within NYC.

Zeroing in on the disabled, 1,342,572 disabled people reside within a ½ mile of the NYC Subway lines. This is the highest number out of the four lines. The urban part of the LIRR and MNRR both served by similar number of disabled population, 342,483 and 416,970. The suburban leg of the LIRR is accessible to almost twice as many disabled people as the suburban leg of the MNRR. The lowest is the SIRR since this is the shortest of the four with only 24,162.

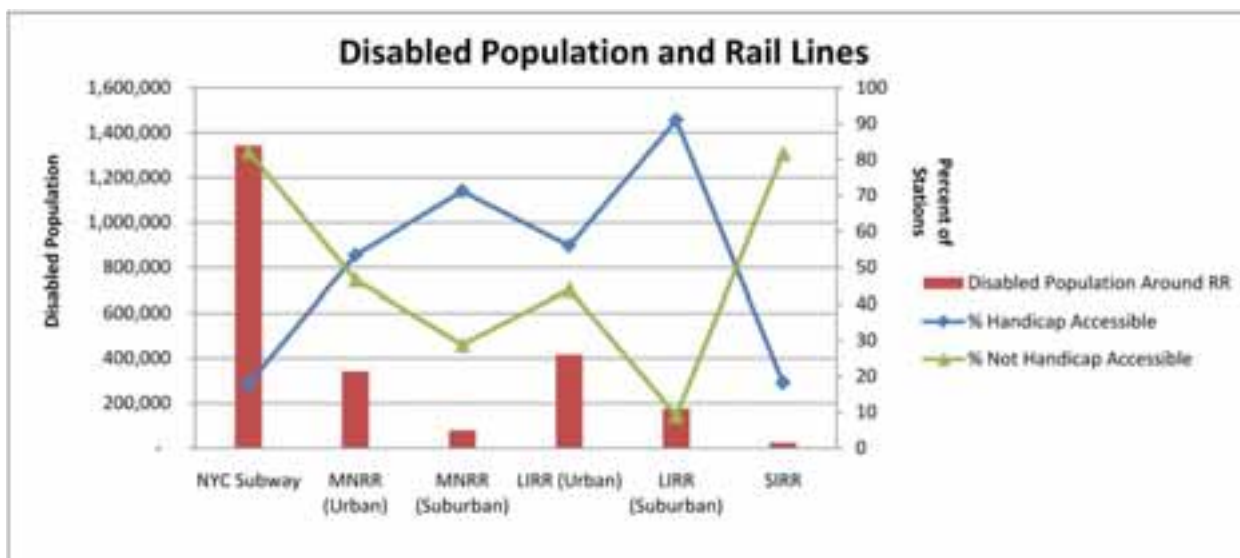


Figure 5. Disabled population by Rail Line and the percentage of disabled individuals with and without access to each line.

The number of those total stations throughout the rail system that are accessible increases as one moves away from the CBD. This is especially evident with the LIRR and MNRR: about 84% of their stations are accessible. There are more accessible stops on the suburban section of these lines than in the urban sections. The SIRR ranks the lowest in this metric: only 18% of its stations are accessible but it is the shortest of the four lines. New York City subway system ranks the lowest proportionately (only 16%) but it has more station than the other three combined. The summary data are shown in Table 3.

Rail Lines in NYS	Accessible	Not Accessible	Total	% Accessible
LIRR	104	20	124	83.87
NYC Subway	83	385	468	17.74
MNRR (NYS only)	50	24	74	67.57
SIRR	4	18	22	18.18
Total	241	447	688	35.03

One final element of the analysis is to look at mean travel time to work and income. Since the US Census doesn't distinguish travel time to work for people with disabilities we used travel time to work for the general population. People with the longest mean travel time to work are living on Staten Island within ½ a mile of the SIRR. The lowest mean travel time is on the suburban leg of the MNRR and LIRR.

Weighted average income within ½ mile of the MNRR is the highest of the four with at over \$80,000. The LIRR ranks second. The lowest is the urban leg of the LIRR with the weighted income of \$42,143. Income and travel time are closely related. Lower income families in the urban section of the LIRR faced with longer commute times than people living along the suburban part of the LIRR. Although systematic analysis has not been done here of the relationship between income and disability, the summary figures shown in Table 4 suggest that the links between travel time, income and disability may be worth exploring in more detail.

Railroads	Weighted Average Income	Mean travel Time	Disabled Population Around RR
NYC Subway	46,348.86	39.37	1,342,574
MNRR (Urban)	54,079.24	36.31	342,483
MNRR (Suburban)	80,970.88	31.74	79,112
LIRR (Urban)	42,143.55	42.25	416,970
LIRR (Suburban)	76,533.74	31.77	176,496
SIRR	57,963.87	43.59	24,162

6. Conclusion

The analysis here shows that Staten Island has the highest mean travel time to work than any of the other areas and it has the least number of ADA accessible stations out of the four lines. The number of stops on the suburban leg of the LIRR and MNRR are more accessible than the on the urban leg or the other two lines. The NYC Subway has the largest disabled population within walking distance but is the least accessible rail line of the four.

The ADA clearly states that “people with disabilities, as a group, occupy an inferior status in our society, and are severely disadvantaged socially, vocationally, economically and educationally” (10, p.5). However the analysis here shows that there is a long way to go in New York City’s rail transit in meeting these goals.

Improving access for disabled and elderly persons will bridge the gap between the currently isolated disabled riders and regular riders in the community, increasing social mobility in the region. The MTA needs to prioritize services in areas that are currently underserved as opposed to areas that already have sufficient access to services.

7. Acknowledgements

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