THE END OF THE LINE

The Relationship between New York City's Subway System and Residential Class Structure

by

Mindy Rhindress

A dissertation submitted to the Graduate Faculty in Sociology in partial fulfillment of the requirements for the degree of Doctor of Philosophy, The City University of New York.

2007

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This manuscript has been read and accepted for the Graduate Faculty in Sociology in satisfaction of the dissertation requirement for the degree of Doctor of Philosophy.

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ABSTRACT

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Public money is necessary to build and maintain this country's vast network of mass transit systems and highways. Thus you would expect class equity in choices of infrastructure location, types of projects and pricing. However, the influence of commercial interests appears to create a contradictory effect, and may negatively influence the settlement patterns where transit serves. New York City and its subway system offered the perfect case study by which to examine the before and after effects of mass transit introduction given the enormous size of the transit system and the grand development of New York City that appeared to occur simultaneous to subway inauguration. The main objective of this study was to determine the relationship between the growth of the New York City subway system and the establishment of class structure in residential patterns. Regional census data covering the first 16-year period of the subway's

development was examined along with geographic statistics on subway line expansion and station openings. GIS (Geographic Information Systems) maps were used to illustrate the development of living spaces as a function of subway introduction into communities, and several Indices were computed to demonstrate the population growth and class disparity. The results revealed that the early years of transit development were entrepreneurial efforts coordinated by business interests. This led to transit first providing significant benefits mostly to the middle and upper classes, giving them a reasonable means by which to escape horrible tenement living conditions while turning a profit at the same time. Thus new settlements were stratified by class almost immediately after introduction. The cycle continued until years later when the automobile was introduced and the once expensive and luxurious, but now more reasonably priced and just functional, public transit system finally befit the population much lower on the socioeconomic scale. Class divisions still existed, but the subway's influence on this stratification decreased. The outcome of this study can provide important direction for new transportation projects that access public money by establishing guidelines to monitor business interests in new transit systems, while ensuring a fair pricing and land use policy.

ACKNOWLEDGEMENTS

This research would not be possible without the team of Dr. Charles Kadushin, Dr. Andrew Beveridge and Dr. David Halle. In particular, I must thank Charles for his encouragement to explore further while also nudging me to finish. Andy gets particular mention for providing me with the datasets, and for being my professional mentor for years. David was so valuable for teaching me how to do use GIS, and introducing me to the importance of geography in my work.

I also thank my special support group and hope we remain intellectual friends for many years. Ann Duffett and Aviva Zeltzer didn't abandon me although I was the last in the group to finish. Their advice and encouragement helped me formulate ideas, gave me confidence to move forward, and helped me keep going when the tasks seemed too overwhelming and life just got in the way.

I would also like to acknowledge Lew Damrauer of Lizardos Engineering and the folks at the Regional Planning Association (RPA). Lew's description of work he was doing with a transit agency helped me formulate my ideas. The RPA permitted me to use their library and supplied me with much-needed data.

Finally, I owe so much to my daughter Megan and my soul-mate Frankie. Their undying love and support allowed me to spend an exorbitant amount of time on this research without feeling the least bit guilty for neglecting them. I love them dearly and share this accomplishment with them.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF PHOTOGRAPHS AND MAPS

INTRODUCTION

I. Introduction to the Research Problem

The title of this dissertation, "The Relationship between New York City's Subway System and Residential Class Structure," suggests that there is a connection between New York's famous rapid transit mode and the economic profile of the communities it services. The purpose of this research was to define the nature of this particular association. More specifically, the goal was to begin the important discussion about how any form of transportation, that is the physical infrastructure along with its policies, contributes to the characteristics of other social systems such as settlements.

We can agree that urban transportation, with its complex of highways and mass transit networks, are an intrinsic part of the urban landscape. An aerial view of a typical metro area will reveal distinct patterns between key auto, rail, bus and shipping routes on one hand and large residential communities, central business districts and major recreational areas on the other. Real estate developers, regional planners, home buyers and chief financial officers examine transportation alternatives carefully as part of the decision-making process on where to invest, where to build, where to live and where to establish a business.[1] An effective and modern highway and mass transportation system contributes

[1] Sam Bass Warner, Streetcar Suburbs: The Process of Growth in Boston (1870-1900), (Cambridge, MA: Harvard University Press, 1962, Second ed. 1978) 23, 49, 122.

greatly to a particular metro area's overall appeal and, as such, is key to a city's survival.[2] Thus the impetus to build new infrastructure and upgrade old networks is enormous.[3] Influences from commerce and public advocates alike, combined with continued government support, keep transportation issues toward the top of regional budget priorities.

Stepping away from the movement of freight and looking more closely at people-moving systems, it appears on the surface that the establishment and maintenance of mass transit is the quintessential civic service. What is not so clear, however, are the ways in which the components of transit -- that is, the location of infrastructure, the prioritization of projects and its fare policy -- may solidify, exacerbate or permit new class stratification, thereby diminishing its model role as a true "public" system. Similar situations may be found in other areas of public concern like education, health care and housing. Yet scholars and community-based organizations continuously debate equity in these areas. In comparison, equity is transportation is scarcely even recognized.

Important clues into mass transit effects on neighborhood class structure are best studied and identified when large-scale transit development created entirely new urban spatial configurations. With this in mind, New York City

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[2] Clifton Hood, 722 Miles (Baltimore: John Hopkins University Press, 1995) 63.

[3] David Harvey, The Urban Experience (Baltimore: John Hopkins University Press, 1985) 33,50.

provided the perfect setting for a case study from which to explore the before and after effects of such a large-scale transit undertaking on living spaces by class.

At the turn of the last century, most of city's population lived in highly dense, unsanitary and dangerous housing in an area known as the *Lower East Side*.[4] Progressives joined with entrepreneurs and government leaders to support plans for the development of New York City's mammoth Subway System,[5] albeit for different reasons. Progressives had human interests in mind and were looking for programs to help end the *Lower East Side* squalor. In contrast, entrepreneurs and government leaders were concerned with business and markets. It was their objective to maintain New York City's top position as the most important city in the United States. With this support from all sides, construction finally began on the massive subway and its doors opened in 1904.

By following the development of the subway system and the changing profile of the various communities once the rail was available, it became evident as to who first profited by the new transit system and the shape of the city expansion created by its development. Analysis of census data during the time the subway was expanding demonstrated that its impact was enormous. First, the development of residential spaces throughout the city indisputably followed the subway's route; the population of neighborhoods grew tremendously once

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[4] Jacob A. Riis, How The Other Half Lives (New York: Penguin Books, 1997 edition) 6+.
[5] Clifton Hood, 722 Miles (Baltimore: John Hopkins University Press, 1995) 127.

the rail was introduced. And its initial benefactors essentially excluded those on the low-end of the economic scale. Residential profiles of newly developed communities with early subway service were skewed toward the higher classes compared with the main population center, the *Lower East Side*, a neighborhood established long before subway initiation. The higher-class profile of these new neighborhoods was also markedly different from the city's low density areas that were still years away from having any subway service at all. This pattern of transit's contribution to class stratification of settlements finally diminished, but it was years later.

A more equitable fare policy, in particular, can be isolated as one important factor for transit's shrinking influence on class segregation. In 1904, the cost of a trip at five cents equaled as much as a third of the earnings of some low-end workers. A decade and a half later, the fare remained constant while earnings almost doubled. It was only then that low-end workers could finally take advantage of a system once reserved only for those with means. However, the seemingly fairer policy had its downside too. The unsubsidized lower fare meant reduced quality of service, just as attention began to shift to a new mode of transportation for the wealthy – the automobile. Thus the cycle of inherent class characteristics of transportation and its influence continued, with the high-end of transit modes later shifting from public transit to personal transportation.

The details of the research begin with a clear statement of purpose. This is followed by a discussion of some of the important theoretical considerations. A full explanation of the methodology is next. Then the findings commence with a look at the summary of New York City's history and the events leading to the inception of the subway service, covering population growth, political issues, and the role of entrepreneurs. Finally, the analytical results from the first two decades of the 21st century are explained, demonstrating the immediate and longer-term impact of subway availability. The dissertation ends with concluding remarks and next steps for further research.

II. Statement of Purpose

The main objective of this study was to determine the relationship between the growth of the New York City subway system and the establishment of class structure in residential patterns.

Specifically, the study used census data from two decades, 1910 and 1920. It also looked at subway line development during that same period and examined:

- the population characteristics of newly developed residential communities in northern Manhattan and the outlying boroughs of Greater New York, specifically literacy which is an indicator of class;
- the changing demographic profile of neighborhoods as subway lines were launched into specific areas; and
- the reduction in densities of older communities as populations dispersed while the wave of heavy immigration into Greater New York City continued.

It was hypothesized that the subway system provided significant benefits only to the middle and upper classes in its early years of operation. That is, it did not become a true “public” transit system until a new form of transportation, the automobile, replaced the subway as the mode of choice for people with means. And, while the lower classes were finally able to take advantage of the subway at that time, it also marked the beginnings of service deterioration. Government

financial support shifted away from the subway and on to new demands for automobile infrastructure.

The outcome of this study will provide important direction for new transportation projects that access public money, and new transportation projects that require civic support in the form of land use rights-of-way.

CHAPTER 1: THEORETICAL FOUNDATION

I. Introduction

Transportation cuts across several sociological disciplines. First, it is associated with economics, given its classification as both an end-product or service and as a labor task. Moreover, it feeds into models on urban development and residential expansion; it has a considerable influence on city landscapes, human travel and settlement patterns. And since travel and settlement are both highly contingent on transit system-types, profiles of individuals living in residential spaces are often associated with the characteristics that describe available transit systems in the area. Finally, transportation is about conquering geographical barriers, and thus its link to geography is clear.

Transportation's connection to each of these sociological disciplines is discussed in detail in this section.

II. Economic Exchange

The relationship of economic exchange to transportation is a significant one. In the economic exchange cycle, transportation is connected to both labor and reproduction.

Transportation and Labor in the Exchange Cycle

Part of the link between transportation and labor revolves around the concept of time. According to David Harvey, time is one measure of labor's value. [6] Therefore, it stands to reason, that the movement of labor between home and employment, that is bringing workers to work, must be managed on a time efficient basis so that the number of hours that one can choose to dedicate to labor in any given day is at its maximum. The quantity of available labor time may be calculated as the remaining hourly balance in a 24-hour period once the time allowance set by an individual for sleep and discretionary use is deducted. If a fourth dimension is added to the equation, a required transportation time allotment, the proportion of time set aside for these other activities must diminish accordingly. In practical terms, for those who need additional labor income, overtime pay or a second job is essentially a "privilege" only if there is affordable time.

Various transit modes often differ by travel time, thus transit availability or transit mode choice can either ease the transportation time burden or intensify it.

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[6] David Harvey, The Urban Experience (Baltimore: John Hopkins University Press, 1985) 19.

New York City, for example, provides a significantly faster transportation alternative in the form of a light rail system for those in a relatively higher socioeconomic class living in suburbia; commuter trip time may average to be same length as for those individuals living 25 to 30 miles outside the city as it is for the individuals who earn less and must use the slower subway or city bus to travel just a few miles to the central business district.[7]

The transportation connection to labor in the exchange cycle extends beyond just being the means to get to work. Transportation also takes on a more direct and fundamental labor role in the exchange process through the creation of its infrastructure. Peter Hall suggests that transportation "carried the industrial revolution forward". It became one of the most important manufactured products in and of itself. The delivery of natural resources, and all other industrial and consumer goods, depended on its widespread availability and reliable operation.[8] Today there is a whole industry surrounding the refurbishing of old train tracks, the continuance of the automobile assembly line, the development of new fare payment technologies, the placement of traffic signage, the design of new transportation hubs, and the promotion of new transit modes. Building, designing, planning, marketing, and maintaining transportation infrastructure produce jobs in the exchange cycle. And like all other employment, these jobs are hierarchical. Superior manual, design or planning skills yield more labor

[7] Estimated commute time from Syosset, New York or Colonia, New Jersey (25-30 miles from city center), is about an hour or so. Estimated commute time from East Flatbush, Brooklyn or Hollis, Queens (10-15 miles from city center) is at least an hour or more.

[8] Peter Hall, Cities in Civilization (New York: Pantheon Books, 1998) 349.

income than assembly line workers or toll collectors can earn. Thus, the mass production of transportation is not only a means to get to work and an outcome of work, it is also very strongly connected to classes of labor.

Transportation and Reproduction in the Exchange Cycle

I just established how on one end of the exchange cycle, transportation is connected to labor. It is also related to the exchange cycle on the other end, in reproduction. This can be especially recognized in residential communities. David Harvey explains that settlement spaces offer the opportunity to unload or spend the labor value earned.[9] And for the exchange cycle to carry on, labor value or income must be unloaded. The act of labor value unloading requires that there must be merchandise and services available to purchase. This is where the role of transportation becomes crucial. It enables the movement – that is, the delivery – of consumer goods and services to settlement spaces. In turn, this provides a never-ending variety from which exchange cycle unloading can never be complete or satisfied.

With this in mind, at least theoretically, people are no longer tied to establishing residential spaces based on the location of natural resources; instead natural resources can move to residential spaces and thus housing can

[9]David Harvey, The Urban Experience (Baltimore: John Hopkins University Press, 1985) 21-23.

be created almost anywhere.[10] In essence, transportation obliterates the obstacles of time, distance and natural impediments to trade such as waterways, mountains and deserts. This is one reason why the United Nations categorizes transportation as a determinant for population dispersion.[11]

To understand this fully I can look at the city of Juneau, Alaska where transportation erases seemingly impossible barriers. Juneau is the capital of Alaska and one of its few cities. As such, it houses important state government agencies and is home to government officials and other residents. The 2000 U.S. Census reports a population of approximately 32,000 individuals.[12] Intuitively, it appears to be an extremely unlikely choice for a small city and especially the state capital location. Other than fishing and forestry, there are no other natural resources in the immediate area that make the location a particularly attractive site for settlement. Its climate is unsuitable for agriculture and it is a far distance from other major urban areas of the U.S.or Canada. Furthermore, it appears isolated from the mainland of North America; ocean inlets on one side and mountains on the other surround Juneau making it an immense engineering challenge to build roads or rail lines into and out of the area, and so there are none. Yet, despite these hurdles, the vicinity grew into a

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[10] "Anywhere" is an overstatement. There are class distinctions in this regard discussed later in this chapter.

[11] United Nations, Department of Social Affairs, Population Division, The Determinants and Consequences of Population Trends (New York: United Nations Publications, 1953) 115.

[12] U.S. Census Bureau, Nov. 2006, <http://quickfacts.census.gov>

small urban area. Business trade is active, retail business represents one of its main areas of commerce,[13] and individuals regularly travel in and out of the region. In Juneau, sea vessels and aircraft provide the transportation service that breaks down time, distance and natural impediment barriers. Without these forms of transportation, Juneau would be inaccessible and secluded.

Transportation not only allows general consumption in the exchange cycle to flow freely, it is also a major part of the consumer product-line. And there are different qualities of transit that can be purchased, each with its own set of benefits and matching cost structure. As such, as with many other consumer goods such as housing, transportation services are an indicator of the socioeconomic status of a particular community. That is, the quality of available transportation services is often highly associated with the quantity of the labor value being unloaded. As an example, one of the first bus companies in New York was Fifth Avenue Coach, which offered an expensive but more comfortable ride via motor coach service as an alternative to New York's subway.[14] It attracted the wealthy leisure set living along Fifth Avenue. In another illustration, the BART rapid transit system in the San Francisco metro area, a modern, fast, and extremely comfortable underground rail system, was built to connect the white-collar suburbs of San Francisco with the center city. It bypassed poor and

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[13] U.S. Census Bureau, Nov. 2006, <http://quickfacts.census.gov>

[14] Brian J. Cuday, Cash, Tokens, and Transfers: A History of Urban Mass Transit in North America (New York: Fordham University Press, 1995) 100.

working-class neighborhoods where its residents must use a slower bus system to enter the central business district.[15] More recently, monorail/dual rail systems were built in New York connecting its airports with the central business district. These monorails operate through, but do not stop in, poorer neighborhoods along the way. They were meant to service the business community. And working class airport employees living in these bypassed areas still commute using older and slower means, like buses. These few examples demonstrate that the theoretical notion mentioned earlier that transportation erases all boundaries is not entirely true. Rather, transportation's benefits are felt more in communities populated by people with means.

There is cost efficiency of transportation for workers who consume it, in the same way that there is time efficiency as discussed earlier in this chapter. Hence, every travel hour spent by commuters must be redeemed at its lowest possible cost value as to not severely impact the total amount of income that could possibly be earned on a given day. Looking closer at travel to employment, the act of commuting becomes the cost of entry into the workforce. The price paid for this service is entirely borne by the worker at no fee to the employer. And without direct reimbursement, the cost of travel essentially converts to personal overhead. Here the absence of a reasonably priced transit system can significantly decrease the value of a day's labor, and significantly affect where workers choose to work and live.

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[15] Peter Hall, Great Planning Disasters, (Berkeley: University of California Press, 1980) 120.

Friedrich Engels' observations of the deplorable living and working conditions surrounding industrial life in Manchester, England in the mid-1800's offers a clear view of how the consumption of transportation and its lack of availability can severely affect working class neighborhood spaces. In "The Great Towns",[16] Engels does not describe the typical urban "community" with an appreciation or romance of urban design, new technologies or architecture. There is no evidence of the beauty of city parks as propagated a half-century later by Frederick Law Olmstead[17] or garden cities as designed shortly thereafter by Ebenezer Howard.[18] Rather, Engels portrays exploited groups of people in isolation and alienation. In this world of the haves and have-nots, Engels describes in detail the invisible but evident boundaries in Manchester, England that are drawn along class lines. Rich and poor residences are separated. Major thoroughfares, essential transportation routes, are financed by the bourgeois and allow easy travel of individuals from rich residential areas to commercial working spaces. They are designed so that the bourgeois never have to enter and be exposed to neighborhoods engulfed in poverty and squalor. The poor cannot afford, both in time and dollars, these thoroughfares. Rather, the locations of

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[16] Friedrich Engels, "The Great Towns" (1845) in The City Reader, Richard T. LeGates and Frederic Stout eds. (New York: Routledge, 1996) 48-49.

[17] Frederick Law Olmsted, "Pubic Parks and the Enlargement of Towns" (1870) in The City Reader, Richard T. LeGates and Frederic Stout eds. (New York: Routledge, 1996) 340.

[18] Ebenezer Howard, "Garden Cities of To-morrow" (1898) in The City Reader, Richard T. LeGates and Frederic Stout eds. (New York: Routledge, 1996) 348-353.

their residential areas are close to industrial sites to minimize wasted non-labor time spent commuting and to avoid its unaffordable cost. Thus, as much time within the 24-hour day as possible is available for labor and there is no overhead. And workers living in these residential locations endure the byproducts of their nearby work stations – industrial sites that yield polluted streams, poor air quality and other waste.[19] This is a stark contrast to the notion that transportation erases boundaries; it only erases boundaries when it is available and accessible.

Even when time efficient and cost efficient commuter transportation is available across neighborhoods, it is often in optional forms that help maintain the class structure in the community it serves, and it also maintains the passenger profile using the mode. Brain Cuday explains that London's subway began its operation offering three classes of service, each priced accordingly and each designed to target different suburban areas.[20] Given that cost of a particular trip is constant regardless of income earned by the traveler, the proportion of personally owned capital that is required to enjoy luxurious forms of transportation decreases as labor income rises.[21] Hence, some commuters can afford relatively large sums of money on the best available transit options because it translates to a smaller share of their budget. In contrast, others must

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[19] Friedrich Engels, "The Great Towns" in The City Reader, Richard T. LeGates and Frederic Stout eds. (New York: Routledge, 1996) 51.

[20] Brian J. Cuday, Cash, Tokens, and Transfers: A History of Urban Mass Transit in North America (New York: Fordham University Press, 1995) 78-82, 231.

[21] David Harvey, Society, the City and the Space-Economy of Urbanism, Resource Paper #18, Commission on College Geography (Washington, D.C.: Association of American Geographers, NSF Grant, 1972) 17.

make more conservative transit mode decisions that better match personal economic conditions. While commuter travel is not generally thought of as manifestly class-based, and it is not obvious that commuter modes offer several classes of service in same way that the London Underground did in its early days of operation, the typical transit choices themselves are, in fact, stratified by class. Today's daily commuter mode choices are analogous to the first, business and coach classes of service we see in air and long distance recreational train travel. In some neighborhoods in New York City, ferries provide the best service to the central business district in terms of speed, comfort and convenience, but are far more expensive than less luxurious bus or rail options.[22] In other areas, commuter rail or express buses offer the best service terms of comfort and convenience, but are far more expensive than intermodal local feeder buses to slower and more crowded subway service.[23] Since the choice options involve the trade-off between price and other desirable benefits, workers with limited transportation budgets are put at a disadvantage. When commuting, they lose more time than they have to, or that they can afford. Or they spend more money in travel costs than they have to, or that they can afford. And in too-often

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[22] The commuting trip using ferry service from Atlantic Highlands along the central New Jersey Coast to Wall Street takes about 40 minutes at a price of about $19.00 one-way. These ferries offer first-class seating, television-news viewing, and upscale coffee, snack service, bar and newspapers service. Comparable much slower commuter train service with one connection takes an hour and 10 minutes at a price of about $10.00 one-way. In addition to time differential, there are no services and passengers may stand depending upon loading conditions.

[23] Very comfortable express bus service within the boroughs of New York City is priced at $5.00, more than double the maximum $2.00 price needed to take a local bus to a feeder subway station, which often requires lots of standing, walking and negotiating of steps in the transfer process.

extreme circumstances it can become impossible for some to take advantage of more lucrative employment or better housing because the travel time, cost of trip, or both time and cost make it unfeasible.

Lastly, in the reproduction phase of the exchange cycle, I cannot ignore how transportation gives birth to whole consumer industries that are related to transportation but not necessarily to transportation infrastructure. It ignites the need to consume other related products.[24] Traveling clothes, suitcases, briefcases, driving gloves, car phones, "walkman" radios, maps, fare pass wallets, steering wheel covers, shaped coffee mugs, etc. are all examples of typical consumer products made to address travel needs.

[24] United Nations, Department of Social Affairs, Population Division, The Determinants and Consequences of Population Trends (New York: United Nations Publications, 1953) 115.

III. City and Suburban Expansion

Keeping in mind the exchange process and the importance of eradicating the distance between production and consumption activity, the expansion of living spaces cannot be accomplished without a simultaneous development of a transportation system that not only enables the shipping of goods and services but also the mass movement of populations.

Transportation's Effect on Settlement in the United States

The United Nations report released in 1953 explains that migration is highly dependent upon the availability of transportation systems. For example, the huge immigration streams to America that helped to create heavily populated cities on the eastern seaboard are, in part, a direct result of the modernization in transportation. This modernization includes an increase in shipping lines; an expansion of trade routes; the convenience of man-made canals; the technological advances toward safer and more comfortable sea vessels; and significantly faster travel times. Similarly, the explorations of the western reaches of North America and the concurrent settlement of new outposts can be attributed to the completion of the US intercontinental railway.[25] While this report refers to heavy migration trends across nations and seas, I can establish on a smaller scale that transportation has a huge effect on settlement spaces within cities as well.

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[25] United Nations, Department of Social Affairs, Population Division, The Determinants and Consequences of Population Trends (New York: United Nations Publications, 1953) 115.

Peter Hall notes that prior to modern transportation systems, people lived where they worked; walking served as the major transportation mode. And town centers usually spanned across a three-mile radius.[26] However, effective transit systems changed the landscape. A study of Chicago by Robert E. Park and Ernest W. Burgess in the early 1920's lays out one formula for the development of a city. The inner circle in a 5-part concentric set of rings is the central business district with a transit system terminal. The next outer circle is a transitional area comprised of both commercial and residential components. The following three circles are predominately living spaces, with each one improving in class; the furthest ring from the center can be considered suburbia. Running like a diameter through the rings is a transportation system feeding into the central business district.[27] This model is typical of urban areas in the east and midwest that began as walking cities – that is, cities that developed before a mature transit system was in place and the center of all activity was within a small central radius. However, the model that describes western cities, Los Angeles for example, is somewhat different. The first strong population growth period for Los Angles occurred in the 1870's, soon after rail transit technology became available. Therefore, the city did not develop as a walking city with a high-density center-core surrounded by concentric rings as did earlier cities.

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[26] Sam Bass Warner, Streetcar Suburbs: The Process of Growth in Boston (1870-1900), (Cambridge, MA: Harvard University Press, 1962, Second Ed. 1978) 16.

[27] Robert E. Park and Ernest W. Burgess, The City: Suggestions for Investigation of Human Behavior in the Urban Environment (Chicago: The University of Chicago Press, 1925, Reprint 1984) 50-52.

Instead, the main city is actually a conglomerate of several, more moderate-density residential and commerce-centered satellite urban areas that were once connected to the main city by rail rapid transit system,[28] most notably the large Pacific Electric Railway system. Martin Wachs suggests that transportation is the one event that specifically led to the expansion of Los Angeles.[29] Other Western cities such as Phoenix, Salt Lake City and San Diego come close to this Los Angeles development model with one exception. Their expansion occurred even later, in the mid 1900's, when the automobile spurned suburban residential development, not rail. Nevertheless, the result was the same; each moderate-density city-center is surrounded by a series of mixed land-use communities with both residential spaces and commerce centers.[30] And whether the model is one from the east coast or the west, transportation played a critical role.

Unlike the issues around the exchange process, this understanding of city/suburban development examines the uses of space but omits the important

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[28]Allen J. Scott and Edward W. Soja, "Introduction to Los Angeles" in Allen J. Scott and Edward W. Soja. eds. The City: Los Angeles and Urban Theory At the End of the Twentieth Century (Berkeley: University of California Press, 1996, Paperback ed. 1998) 6.

[29] Martin Wachs, "The Evolution of Transportation Policy in Los Angeles" in Allen J. Scott and Edward W. Soja. eds. The City: Los Angeles and Urban Theory At the End of the Twentieth Century (Berkeley: University of California Press, 1996, Paperback ed.1998) 108-112.

[30] Peter Hall, Great Planning Disasters, (Berkeley: University of California Press, 1980) 120, 132,133.

role of social relationships.[31] Tying the two together, it first appears as if they are in conflict. The upper classes live the furthest from the central city yet the "time is money" notion suggests that their time is too valuable to waste on the commuting process. However, the explanation sits with the quality of the commuting mode. This is not a conflict at all, but rather a corroboration of the exchange cycle class-structured transit system concept that the faster, more comfortable and more expensive transit modes are reserved as a high-end benefit. There is a pecking order in transit systems just as there is a hierarchy in class residential development, and the two can go hand in hand.

A class-structured transit system is not only the *outcome* of class-structured settlement spaces, it may actively and significantly contribute to the *development* of class-structured residential patterns. Prior to effective transportation, those living on the edge of cities were the underclass,[32] an opposite picture of what we see today. Traveling long distances by foot or horse to center city to buy merchandise or to work was extremely time-consuming and in all probability laborious, thus it was considered very undesirable living space. As illustration, 1820's shantytown housing lined the way in northern Manhattan

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[31] Michael J. Dear, The Postmodern Urban Condition, (Oxford: Blackwell Publishers, 2000) 1-3

[32] Kenneth T. Jackson, Crabgrass Frontier: The Suburbanization of the United States, (New York: Oxford University Press, 1985) 19.

for the very poor.[33] Yet this did not last long. The class structure reversed so that the upper classes moved to be farther from the center city, pointing to the notion that perhaps the introduction of an effective transit system enabled the middle and upper classes to reap the first benefits. In the late 1800's, Jacob Riis went so far as to suggest that New York shouldn't look to establishing a rapid transit system as the answer to tenement conditions on New York's high-density *Lower East Side*, but rather should look more closely at its housing policy to quell the horrendous living conditions. He predicted that the poor population would want to remain close to their places of employment.[34] Brian Cuday noted that the general working population could not afford the early rapid transit systems constructed in the New York region.[35] Reversals of class-structured settlement patterns after the introduction of rapid transit systems were noted in Philadelphia, Chicago[36] and Boston.[37]

Real Estate and Builder Influences on Transportation

It is also hard to overlook the weight of real estate developers in both transit system initiatives and new residential housing space. Usually concurrent

[33] Kenneth T. Jackson, Crabgrass Frontier: The Suburbanization of the United States, (New York: Oxford University Press, 1985) 18.

[34] Jacob A. Riis, How The Other Half Lives (New York: Penguin Books, 1997 ed.) 204.

[35] Brian J. Cuday, Cash, Tokens, and Transfers: A History of Urban Mass Transit in North America (New York: Fordham University Press, 1995) 62.

[36]Kenneth T. Jackson, Crabgrass Frontier: The Suburbanization of the United States, (New York: Oxford University Press, 1985) 25.

[37] Sam Bass Warner, Streetcar Suburbs: The Process of Growth in Boston (1870-1900), (Cambridge, MA: Harvard University Press, 1962, Second Ed. 1978) 84.

with the introduction of a rapid transit system are newly developed residential sites for sale. In many cases, land was sold at soaring costs and was often accompanied by special marketing targeted to high-end populations. Sam Bass Warner describes the not uncommon practice where real estate developers had stock or complete ownership in transit lines to promote their real estate ventures.[38] Real estate interests played a large role in the placement of early elevated steam-powered rail lines in New York City that opened up vast tracts of land outside the downtown center city for residential development.[39] Ironically though, these same real estate interests were just as responsible for the later destruction of these rail systems for a more modern underground subway that extended way beyond the original track boundaries. Hence, land values in the new settlement areas significantly increased once again, and even more tracts of land became available to real estate interests for future development.[40] In Seattle today, commercial property owners are offering transportation benefits into its leasing packages.[41] Presumably, transportation benefits increase the appeal of a property for sale, lease or rent.

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[38] Sam Bass Warner, Streetcar Suburbs: The Process of Growth in Boston (1870-1900), (Cambridge, MA: Harvard University Press, 1962, Second Ed. 1978) 23.

[39] Sarah Bradford Landau, "The Row Houses of New York's West Side," The Journal of the Society of Architectural Historians 1 (1975): 19-36.

[40] Clifton Hood, 722 Miles (Baltimore: John Hopkins University Press, 1995) 106, 138.

[41] "Commercial Landlords Fund Transit Passes as Rental Incentive," The Urban Transportation Monitor 18 (2004): 10.

Real estate interests often went beyond just the building and sales of new homes. It also often meant that conditions needed to be put in place to maintain home values. In Chicago, laws were established to protect property owners from the building of adjacent elevated rail lines that often resulted in reduced land values. Property owners were required to sign-off on any plans prior to implementation; not surprisingly, money-transactions between property owners and rail entrepreneurs took place to acquire that permission.[42] Marketing of early housing sites in Jackson Heights, an area in Queens just outside of Manhattan, guaranteed quick travel to center-city via the brand new subway while also promising non-entrance to "undesirables" including New York's immigrant population of Jews.[43] London's transportation policy in the mid 1880's set a fairly high rapid transit fare between new suburban residential areas and the central business district, assuring that new homes just purchased would remain within in the ownership of high-end families.[44] This is not just an historical phenomenon. Outside New York City today, new upscale ferry service has been introduced as an alternative to a crowded underground rail system that takes commuters from New Jersey to the central business district in Manhattan. Its owner wears two hats — one as the proprietor of the ferry service and the other as the developer of abandoned waterfront property adjacent to upscale ferry terminals. The

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[42] Brian J. Cuday, Cash, Tokens, and Transfers: A History of Urban Mass Transit in North America (New York: Fordham University Press, 1995) 71.

[43] Clifton Hood, 722 Miles (Baltimore: John Hopkins University Press, 1995) 177.

[44] Peter Hall, Cities in Civilization (New York: Pantheon Books, 1998) 699.

waterfront property is being converted into expensive condominium housing, and the proximity to a new and luxurious ferry mode of commuting is part of the development's marketing and promotion strategy.

Government Support for Transportation – and Real Estate

For real estate developers to truly be effective, they need government support. Early government-established planning commissions in Los Angeles directed their efforts with business interests in mind; real estate agents and land developers were appointed to be part of the planning commissions. As such, there was widespread land development and city expansion with concurrent highway and street additions that resulted in mixed-use residential and business land-use zoning. At the same time, they helped turn the tide away from public transit to an automobile-centered region. So the landscape was dotted with wide boulevards and freeways, encouraging even more automobile use, and government money set-asides for public transit dried up. Without government support, the once effective public rapid transit system was no longer operable. In turn, this opened the door for a host of auto-related or auto-impacted building contracts and sales agreements between government agencies and the same business interests that held planning commission posts.[45]

[45] Martin Wachs, "The Evolution of Transportation Policy in Los Angeles" (1996) in Allen J. Scott and Edward W. Soja. eds. The City: Los Angeles and Urban Theory At the End of the Twentieth Century (Berkeley: University of California Press, 1996, Paperback ed.1998) 118-119.

Louis K. Loewenstein and Dorn C. McGrath, Jr. make the case that the connection between city and state planning agencies and transportation firms strengthened after the federal government required that they work together before the release of federal support dollars for operation and capital improvements. To fulfill this requirement and to do so quickly, the Department of commerce, which represents business interests, often got involved. And their involvement ensured that construction and real estate interests were top priority in the selection of individuals to hold positions in the planning agencies.[46] Thus government intervention in both real estate development and transportation landscape go hand-in-hand with their links to builders and developers.

With that in mind, it is possible to question government's role in supporting different qualities and classes of transportation service and the extent to which that support permitted class structure in residential patterns. Just as the auto was becoming the mode of choice for the middle and upper classes, the highway system was infused with public money. Mass transit, on the contrary, began its slide downhill, despite its continuing use among the middle and lower classes.[47] Stan Fischler refers to Robert Moses as the man of influence who single handedly managed to convince politicians and money-men that government funds need to move from public transit to highway and bridge expansion. Part of

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[46] Louis K. Loewenstein and Dorn C. McGrath, Jr., "The Planning Imperative in America's Future," The Annals of the American Academy of Political and Social Science 405 (1973):15-24.

[47] Clifton Hood, 722 Miles (Baltimore: John Hopkins University Press, 1995) 221-223.

his genius-vision of the modern city included an absolute disregard for the lower classes and minorities, many of whom were displaced and later dispersed to housing projects, also his brainchild, because of his massive highway building.[48] His impact included the dissolving of plans for a wide expansion of subway coverage within New York City during the 1930's. He contributed to the bankruptcy of the essentially abandoned, privately owned New York City subway system.[49]

On the opposite end, Michael Dear makes the case that planners and business interests often find themselves on opposing sides of a particular land-use vision with the final outcome becoming a compromise in favor of one or the other depending upon other circumstances.[50] In England, permission for new development in open suburban and rural areas is often stifled because pressure from conservation groups and others set the current policy of looking to redevelop existing residential spaces first. Now, in current times, the pendulum is beginning to swing the other way. Policies are being reviewed with business interests in mind once again, what Paul Syms refers to as "masterplanning."[51]

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[48] Robert A. Caro, The Power Broker (New York: Vintage Books, 1974) 797.

[49] Stan Fischler, The Subway: A Trip Through Time On New York's Rapid Transit (New York: H&M Productions II Inc., 1997) 90.

[50] Michael Dear, "In the City, Time Becomes Visible" (1998) in Allen J. Scott and Edward W. Soja. eds. The City: Los Angeles and Urban Theory At the End of the Twentieth Century (Berkeley: University of California Press, 1996, Paperback ed.1998) 76.

[51] Paul Syms, Land, Development and Design (Oxford: Blackwell Publishing, 2002) 256.

Competition of Cities

The real estate trade is not the only industry that plays a role in city size. According to Sam Bass Warner, the rate of urban development and the accompanying city's importance in the national landscape often depends upon the success of businesses located there.[52] As small firms specialize in particular industries and begin to grow into larger corporations, the industries geographically-centralize where these corporations are located. First, smaller firms located elsewhere that specialize in that same industry find it hard to compete and often go out of business. Then the region where the large corporations reside gain in importance and eventually draw in a host of other firms; these firms provide secondary services and products that continually support and feed the corporations and that specialized industry. Finally, the region becomes an area known for this industry specialization.[53] Typical examples might include New York for finance, Pittsburgh for steel and Los Angeles for film. The federal government impacts this structure by providing support for national transportation and shipping service into these areas, further enabling industry and corporation dominance.

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[52] Sam Bass Warner, The Urban Wilderness: A History of the American City (Berkeley: University of California Press, 1995, Paperback ed. 1995) 91.

[53] Sam Bass Warner, The Urban Wilderness: A History of the American City (Berkeley: University of California Press, 1995, Paperback ed. 1995) 25.

Prior to the full development of New York's subways, the major cities of Chicago, Boston and Philadelphia were competing with New York for the number one position in terms of population and land mass. The reward was the concentration of a specific set of industries that could control resources, pricing, and output of that industry's products and services.[54] While the Erie Canal and the resulting trade ease pushed New York to the front spot, government and commerce leaders felt that continued action was required to ensure its position. The annexation of parts of Westchester (later known as the Bronx), Brooklyn, Queens and Staten Island was arranged by the New York City forefathers as one way to ensure New York's top position.[55] However, in the late 1800's through the turn of the following century, New York City found itself falling behind the technological improvements enjoyed by other cities around the world. Advanced underground railway technology was already in place in London, Glasgow, Budapest, and Berlin.[56] Here in the United States, fierce competition existed between the cities of New York, Boston and Philadelphia – and Boston beat New York to the mass transit punch.[57] Later the infamous Cross Bronx Expressway was built, despite its tremendously negative impact to nearby working class

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[54] David Harvey, The Urban Experience (Baltimore: John Hopkins University Press, 1985) 25.

[55] Ira Rosenwaike, Population History of New York City (Syracuse: Syracuse University Press, 1972) 56-57.

[56] Stan Fischler, The Subway. A Trip Through Time On New York's Rapid Transit (New York: H&M Productions II Inc., 1997) 43-44.

[57] Clifton Hood, 722 Miles (Baltimore: John Hopkins University Press, 1995) 84.

neighborhoods. It sliced neighborhoods in half to dedicate the space for the highway, destroying the social fabric, economic strength and physical appeal of communities in its wake. However, the notion of city competition propelled the project forward, keeping New York's modern appeal by allowing automobile and trucking accessibility.[58]

[58] Robert A. Caro, The Power Broker (New York: Vintage Books, 1974) 839-843.

IV. Concentration of Poverty

Transportation Provides Escape

Transportation makes it possible for the upwardly mobile to flee from highly congested neighborhoods, with all its socioeconomic and environmental drawbacks, into more attractive communities. Launches of new transportation systems into virgin areas have the potential to create a mass exit of people with means from older areas. Brooklyn Heights, a neighborhood just across the east river from Manhattan's horribly congested *Lower East Side*, was first settled by Manhattan's most wealthy merchants in the early 1800's. Land tracts in western Brooklyn were positioned as having easy access to the Manhattan's commerce areas via the efficient ferry, a mode of transit that was only within the economic price and time reach of New York's affluent.[59] Essentially, to move up the economic ladder or to remain at the top is to move out. Under such circumstances, the remaining poor become increasingly isolated. The character of a neighborhood undergoes negative changes and a cycle of poverty-geography begins.[60] Buying demand is cut significantly, some businesses are forced to close, crime escalates, housing deteriorates and mortality rises. An underclass is created and reinforced given its isolation.[61]

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[59] Kenneth T. Jackson, Crabgrass Frontier: The Suburbanization of the United States, (New York: Oxford University Press, 1985) 27-31.

[60] Douglas S. Massey, "American Apartheid: Segregation and the Making of the Underclass". American Journal of Sociology 96 (1990):329-357.

[61] Douglas S. Massey, "American Apartheid: Segregation and the Making of the Underclass". American Journal of Sociology 96 (1990):329-357.

Concurrent with the concentration of poverty in older communities is the settlement of predominately wealthier individuals into new neighborhood developments. Expensive and effective ferry transportation during its heyday in the 1700's and early 1800's, before the introduction of rail, was partially responsible for the formation of wealthy communities as escapes from nearby low-end, high-density urban areas. Contrast the development of Brooklyn, Hoboken, and Jersey City vs. Manhattan; Oakland and Alameda vs. San Francisco; Camden vs. Philadelphia; and Allegheny City vs. Pittsburgh[62]. Later the ferry was replaced by steam railroads that served the same purpose cross land. Electric rail followed and became the next means of escape. The affluent suburban communities of Westchester are examples are how expensively-priced steam and electric rail modes can shape the economic status of neighborhoods. And then finally the automobile became the mode of choice for people with means to escape. Robert Moses infamously built his magnificent parkways with overpasses too low for public bus use. Thus the government-funded parkways that led to the beautiful and new government-funded recreation areas out of center city were out-of-reach for those middle and lower classes who had no access to the automobile.[63] These middle and lower classes remained living and playing in the less desirable city.[64] Today, ferries are making a comeback in

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[62] Kenneth T. Jackson, Crabgrass Frontier: The Suburbanization of the United States, (New York: Oxford University Press, 1985) 33.

[63] Robert A. Caro, The Power Broker (New York: Vintage Books, 1974) 482-483.

[64] Peter Hall, Cities of Tomorrow, (Malden, MA: Blackwell Publishing, 3rd Ed., 2002) 298.

Seattle, San Francisco, New York, Boston and other major cities overseas. And again, high-end pricing of this comeback mode and its routing into new or redeveloped areas are designed to attract only the wealthy. Thus we have the development of a wide geographic gap in class residential patterns.[65] Of course, racial and elderly discrimination in new housing markets established by new transit systems also contributes significantly to the formula for a concentration in poverty.[66] Nonetheless, by creating transportation systems that cannot be economically accessed by low-end or middle classes, and with no other effective transportation alternatives serving the same areas, some neighborhoods remain out-of-reach of the masses. Moreover, instead of public funds earmarked to subsidize travel costs, government money was drawn to produce low-end, high-density housing projects in the most congested and poorest center of town. The cycle of living space development by class continues as long as new transit systems are built to provide escape for some from old residential communities and these escapees fit the profile that are welcome into new communities.

Transportation as Settlement Space Barriers

Martin Wachs makes the point that transportation policy in Los Angeles inadvertently set up a series of "fences" that essentially locked-in mostly minority and poorer communities. With public and private interests working toward

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[65] Nathan Kantrowitz, Ethnic and Racial Segregation in the New York Metropolis (New York: Praeger Publishers, 1973) 23-28.

[66] Richard D. Alba, "Variations of Two Themes: Racial and Ethnic Patterns in the Attainment of Suburban Residence," Demography 28 (1991): 431-453.

improving automobile access between the area's decentralized satellite communities, the building of freeways and minimal cross-traffic boulevards were expanded. While this design allowed the automobile-using population more convenient and more timely travel around the region, it also cordoned off many urban neighborhoods, leaving them with few access and egress points in and out of neighborhoods, particularly when it comes to travel by foot.[67] Assignment of school districts was, in part, determined by access points. So are individual choices in where to shop and how to spend recreational time. In an extreme sense, the interaction between populations in different neighborhoods is severely minimized when roads prevent easy transport from one to the other.

[67] Martin Wachs, "The Evolution of Transportation Policy in Los Angeles" in Allen J. Scott and Edward W. Soja. eds. The City: Los Angeles and Urban Theory At the End of the Twentieth Century (Berkeley: University of California Press, 1996, Paperback ed.1998) 131.

V. Association With Geography

With the understanding that the process of economic exchange, city development, and concentration of poverty is highly geographically-dependent, we can agree that it is appropriate, rather it is mandatory, that we consider geography in any expanded discussion that brings together economic exchange, city development and transportation's impact on a region.

Defining Geography

The science of geography examines characteristics of human social existence within the framework of the earth's features – that is, the social link to the natural and man-made environment. John I. Clark asserts that the "spatial variations in the distribution, composition, migrations and growth of populations are related to spatial variations in the nature of places".[68] It is different from the hard science of geology that focuses entirely on just the physical aspects of the earth's surface; geography does not seek to understand the creation, evolution, current fabric or impending shape of the earth's attributes. Instead, it incorporates *locations* – that is, the physical positions of natural phenomena, political boundaries, man-made objects etc. – as important variables in the sociological subject being studied.

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[68] John I. Clarke, Population Geography (London: Pergamon Press, 1965, Reprinted 1968) 2.

Using Geography to Enhance Sociological Study

Geographic determinism, one extreme example, leads to the conclusion that the physical traits of a society, such as population size, age distribution, gender division, etc., are a direct reflection of the quantity, description and location of available environmental and man-made resources. With this thinking, the argument can expand to suggest that society's economic structure, such as the exchange cycle archetype, prime industry, etc., is also an outcome of geographic determinism. However, it is not necessary to take the extremist point of view. The geographic deterministic perspective can be softened enough to agree that the understanding of social relationships is enhanced when both social structure and the earth's features, in particular the location and spatial arrangement of these features, is taken into consideration.

According to David Harvey, you can study an endless array of variables in space.[69] Thus we can go beyond John I. Clark's reference that associates demographic variables and spatial variations. Within the domain of geographic science, geographers can pull together demographic, behavioral and attitudinal profiles of the population; use analytic methods that involve the calculation of ratios and indices to demonstrate their relationship to each other; include man-made, natural and physical features in space; and then use maps that overlays all of these factors to display and explain their associations to each other.

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[69] David Harvey, Explanation in Geography, (London: Edward Arnold Publishers, 1969, Paperback ed. 1979) 70.

The key word here is connected to the use of *maps,* the visual display of outcomes. Narrative communication about spatial relationships as a stand-alone is inadequate. Mark Monmonier declares that "prose has a sequential linear structure that can be painfully insufficient for discussion of places, regions and spatial relationships."[70] It's *the picture, or in this case the map, that is worth a thousand words.*

Examples of its Use

Engels used hand drawn maps to demonstrate the housing design of the working poor and its relationship to polluted water and other comparable industrial waste sites.[71] Thus he was able to demonstrate the inequity and exploitation of early capitalism in Manchester. Anne Kelly Knowles compiled several articles written by historians and sociologists that both illustrate and promote the use of maps in social science.[72] Her work featured maps that are created using the newest computerized mapping technology, GIS.[73] Andrew A. Beveridge used GIS to create a set of maps explaining the shift in immigration,

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[70] Mark Monmonier, Mapping It Out: Expository Cartography for he Humanities and Social Sciences (Chicago: University of Chicago Press, 1993) ix

[71] Friedrich Engels, "The Great Towns" (1845) in The City Reader, Richard T. LeGates and Frederic Stout eds. (New York: Routledge, 1996) 50.

[72] Anne Kelly Knowles, ed. Past Time, Past Place: GIS For History (Redlands, California: ESRI Press, 2002) vii-xx.

[73] GIS, or Geographic Information System, is a computerized method of analyzing and displaying data with geographic variables. More information on this method may be found in *Chapter 2: Research Methods.*

ethnicity and race spanning the 20th century in New York City neighborhoods.[74] Amy Hiller used this same mapping technology to prove the systematic discrimination of mortgage lending in Philadelphia.[75] In both these instances, without mapping, the ability to explain these findings and prove these hypotheses would have been significantly curtailed. Moreover, in today's climate, it would be impossible to conduct any reasonable urban planning or land-use research without the use of maps. Within urban planning and land-use research falls transportation planning. Beyond the obvious, which is to show travelers how to get from one point to another, transportation planning utilizes maps to demonstrate current and projected traffic and pedestrian flows, and as blueprints that illustrate the relationship between current and new transportation systems to business centers, residential communities, and recreational areas.

[74] Andrew A. Beveridge, "Immigration, Ethnicity and Race in Metropolitan New York, 1900-2000" in Anne Kelly Knowles, ed. Past Time, Past Place: GIS For History (Redlands, California: ESRI Press, 2002) 65-78.

[75] Amy Hiller, "Redlining in Philadelphia" in Anne Kelly Knowles, ed. Past Time, Past Place: GIS For History (Redlands, California: ESRI Press, 2002) 65-78.

VI. Summary

It is impossible to think about transportation without taking into consideration economics, urban development, settlement patterns and dependency on geography. Yet the social forces that play a role in launching, growing and directing transportation (i.e., community activists, business leaders, politicians, and entrepreneurs) often examine only a very narrow side of transportation's effect. Worse, the influence of each of these forces goes well beyond just the shape of the transit service. Their participation in the development of transportation ultimately plays a role in the larger urban landscape from housing to recreation.

The main objective of this study is to determine the relationship between transit and settlement patterns by class using the New York City subway system as the case study. The first chapter of the findings discusses New York's history from the seventeenth century up until subway introduction. This includes population growth, political importance, commercial influence and specific events leading up to subway construction. The second chapter looks at the immediate impact of subway introduction. Several neighborhoods are examined closely for population growth and class stratification. The third chapter continues the examination, shifting the focus to longer-term impact. Finally, the last chapter outlines the conclusions and implications, and presents some ideas for further study.

CHAPTER 2: RESEARCH METHODS

I. Using GIS

Spatial configurations of landmass, population densities, subway lines, and subway station locations are all variables with a geographic component and are critical to understanding the relationship between subway development and class stratification in residence choice. Thus, geography is clearly at the center of this sociological research. Given that, statistical tables accompanying narrative communication about spatial relationships, as I said earlier, is inadequate as a stand-alone. Rather, I utilized geographical tools in the analysis and, in particular, the use of GIS or Geographic Information Systems.

GIS is a collection of computer hardware, software and geographic data for capturing, storing, updating, manipulating, analyzing and displaying all forms of geographically-referenced information. Cloropleth maps are one of its tools. They are thematic maps in which areas are colored or shaded to reflect the concentration of the mapped phenomenon. In this research, I have prepared population densities and subway accessibility to be visually displayed and overlaid on to a series of cloropleth maps.[76]

[76] Anne Kelly Knowles, ed. Past Time, Past Place: GIS For History (Redlands, California: ESRI Press, 2002) 181.

II. Unit of Analysis

The unit of analysis is the aggregate Greater New York City area and selected individual communities or clusters of neighborhoods within. Greater New York City is straightforwardly defined as the five boroughs or counties – Manhattan (New York County), Bronx (Bronx County), Brooklyn (Kings County), Queens (Queens County) and Staten Island (Richmond County). The selected communities or clusters of neighborhoods included groups of contiguous counties and/or census tracts based upon subway line availability and population figures. In almost all cases, areas without subway service were combined for analysis while individual locations with subway service were divided into subsections and examined separately. And districts with relatively small populations compared to surrounding areas were combined for analysis while those with relatively high populations were often examined separately. When possible, to help the reader, area boundaries were chosen to closely coincide with how communities and neighborhoods are defined today, although this was not always done systematically and perfectly. And they were also labeled with the same names that are generally associated with these communities and neighborhoods today (i.e., *Lower East Side*).

The full process of cluster identification and selection is described in more detail later in this chapter.

III. Data Sources

To accurately measure the impact of mass transit on residential settlement, and display it in a geographical visual representation, three types of data sources were required. The first contained population and household characteristics. The second included the locations for all subway track line expansions and timelines for subway station openings. The third involved the use of digital geographic maps. Assembling these sources was a very complex and time consuming task.

Population and Household Characteristics

The U.S. Census was the basis for population and household characteristics. The decennial years chosen were 1910 and 1920 to correspond with the early years of New York City subway system development. Subway service began in 1904, therefore, using census data from 1910 and 1920 sufficiently covered the first 16 years of service, plus the few immediate years prior to 1904 when it was known that service was imminent and residential shifts could have begun in preparation. Census data from 1930 on is not part of this scope; the beginnings of the proliferation of the automobile by then would have masked the findings that residential shifts were caused by subway development.

Note that these census data were released almost a century ago and the tabular results only existed in either hard-to-read microfilm (for 1910 and 1920) or in very fragile, hard paper copies that could only be handled while wearing

protective gloves (for 1920 only).[77] Thus, considerable time and energy was required to manually convert it into a usable electronic form to allow for efficient and accurate statistical analysis. To that end, Dr. Andrew A. Beveridge at Queens College established a team of data entry personnel and developed a key-in protocol to conduct the conversion as part of larger studies about New York City and corresponding demographic interactive tools he was developing, i.e., Social Explorer.[78] Through his larger projects, grants were awarded and these grants paid for the expense of:

- entering the available tabular information from the microfilm and fragile, paper tabular charts into electronic datasets;
- aligning all tracts and tract labels across census decennial years so that comparisons can be made over time, particularly 1910 and 1920 which was an enormous undertaking (between 1910 to 1920, many tract boundaries were given different numeric labels and shifted location as older tracts were divided into additional tracts and new tracts were added); and
- matching twentieth century census tract numeric labels and locations with recent boundaries (year 2000 Computerized Census Maps) to allow for the use of other geographic data and statistical packages that use current year 2000 definitions.

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[77] Not all results from 1910 and 1920 were tabulated. Variables related to nativity, parentage, education, race, and ethnicity were included. Others were not, such as employment, occupation and home ownership that were related to class. A more robust discussion about available census variables may be found later in this section.

[78] Social Explorer, May 2007, <http://www.socialexplorer.com>

The final electronic census data set for 1910 and 1920, although manually constructed, was audited by me to ensure reasonably few errors. While there were some discrepancies, the incidence of such was minimal and the basic population statistics matched almost exactly with aggregate numbers by county as reported by the Census Bureau,[79] and by Ira Rosenwaike in his record of population growth of New York.[80]

Subway Line and Subway Station Development Timelines

Also available for this research were electronic data files with timelines for each subway line extension and subway station opening. This complex electronic dataset was assembled with the assistance of the local Regional Planning Association[81] and ComCarto,[82] supplemented by subway station opening dates provided by Stan Fischler in his book The Subway.[83]

The Regional Planning Association describes itself as "an independent, not-for-profit regional planning organization that improves the quality of life and

[79] U.S. Census Bureau, Mar. 2003, <http://quickfacts.census.gov>

[80] Ira Rosenwaike, Population History of New York City (Syracuse: Syracuse University Press, 1972) 133-134.

[81] Regional Plan Association, Feb. 2000, <http://www.rpa.org>

[82] ComCarto, May 2007, <http://www.comcarto.com>

[83] Stan Fischler, The Subway: A Trip Through Time On New York's Rapid Transit (New York: H&M Productions II Inc., 1997) 239-244.

the economic competitiveness of the 31-county New York-New Jersey-Connecticut region through research, planning, and advocacy. For more than 80 years, RPA has been shaping transportation systems, protecting open spaces, and promoting better community design for the region's continued growth."[84] I contacted them for information and learned that they maintained a current, state-of-the-art geographic file, with latitude and longitude markers coinciding with all subway line segments and subway station locations. They graciously provided this file to me. The latitude and longitude markers were critical to the ability to examine subway development along side other data tied to geographic location (i.e., population of a particular census tract).

ComCarto is a private firm specializing in for-purchase databases used in GIS and in providing ready-to-use maps that already display particular variables. Their databases helped clarify the subway routes specified in the RPA files. For example, RPA files tended to show all routes as straight lines despite geological and other geographic barriers. The ComCarto files indicated the exact route around these barriers.

In addition to the importance of a map of subway line and subway station locations is the timelines of subway development. In this study, the date of each subway station opening was used as the timeline stamp, since I believed that it is the station availability and subway access, more than the subway line

[84] Regional Plan Association, Feb. 2000, http://www.rpa.org

construction dates per se, that most affects residential choice of city dwellers. This information was not available through the RPA, and so was added to the data file by manually keying-in the dates from a source I found, the appendix of Stan Fischler's book, The Subway.[85]

For both sets of data, subway station/subway line locations and the opening dates, Dr. Andrew Beveridge and his research team provided the data entry service.

The Subway vs, Other Transit Modesl

New York City had a variety of transit modes prior to the inception of the subway (i.e., horse drawn omnibus, ferries, long-distance rail, and intra-city steam-run elevated rails). And it is arguable that each of these systems had some impact on the shape of the city prior to subway inception (albeit a small one in comparison the large scale subway system that came later). However, I have specifically chosen only to examine the effect of the large-scale electrified rapid transit system that began in 1904, the system that we currently refer to now as the subway. Most of the older steam rail lines were later electrified and absorbed into this larger subway system. These routes are included in the analysis at the point at which infrastructure upgrades qualified the line to be

[85] Stan Fischler, The Subway: A Trip Through Time On New York's Rapid Transit (New York: H&M Productions II Inc., 1997) 239-244.

considered part of the more modern subway mode.[86] Older steam rail lines that were not upgraded and absorbed into the subway system are omitted from the analysis.

In addition, the term "subway" does not necessarily mean an underground system. Although most of what we call the subway is, in fact, underground, some sections are above ground utilizing older elevated structures or built with newer more modern structures. The term "El" is derived from the elevated trains first introduced as steam-run trains in the later half of the 19th century. Today the term "El" is still commonly used among longer-term residents to describe the subway where it operates above ground.

Digital Maps

The last data source involved digital maps. These are visual maps in electronic form that allow for the creation of a visual representation of a region and its characteristics through the use of GIS specialized computer software. Longitude and latitude variables are the key. Digital maps contain these longitude and latitude coordinates for every possible point along with other map shapes and other geological characteristics associated with a particular area (i.e., water and landmass). Longitudes and latitudes are universally defined. Thus any new variable corresponding to a particular place can be included with the digital map data and visually displayed, as long as the information on

[86] Stan Fischler, The Subway: A Trip Through Time On New York's Rapid Transit (New York: H&M Productions II Inc., 1997) 239-244.

longitudes and latitudes is available for the particular variable of interest. A good example of this is the treatment of the date of subway station openings. The data on each station opening is linked to its particular longitude and latitude coordinate. That allows this set of station data to be linked to any other information connected to the same coordinate. Thus I can merge station data together with other data that includes longitude and latitude variables. Then this new merged data set can be displayed on a digital map that contains the same universal longitude and latitude coordinate statistics for every point on the map.

Acquisition of digital maps is fairly simple these days; maps can be purchased from a variety of suppliers. The maps that were used in this study were provided to me by Dr. Andrew Beveridge at Queens College, given that they were proven to work with the census data he transferred to electronic form, and the statistical programs I chose to use, discussed later in this section.

IV. Census Variables

The choice of variables to use in this research was extremely limited to availability. There were five criteria that a variable needed to meet to be considered for inclusion. That is, to be included in the analysis:

- the variable must be part of the Census administered in the years 1910 or 1920;
- the variable must relate to the issues of adult residence location and class;
- the results on the variable must have been tabulated;
- the tabular results must be available today in microfilm form or in the fragile, paper copies; and
- the results on the variable must have been keyed-in electronically.

Specifically, Table 1 on the following page lists the questions that were asked as part of the Census administered in the two years 1910 and 1920.

Table 1: Variables asked in 1910 and 1920 Census

Variables	*1910 Census*	*1920 Census*
Census Tract	✓	✓
Landmass Size	✓	
Sex	✓	✓
Race	✓	✓
Age	✓	✓
Marital Status	✓ *(and Years Married)*	✓
Children Born and Living	✓	
Birthplace of Person and Parents	✓	✓
Year of Immigration and Citizenship	✓	✓
English-Speaking	✓	✓ *(and "Mother" Tongue for Person and Parents)*
Occupation and Employment	✓	✓
Literacy and School Enrollment	✓	✓
Home Ownership	✓ *(and Farm Designation)*	✓
Survivor of Civil War Military Personal	✓	
Blind, Deaf and/or Dumb	✓	

Yet only these variables in Table 2 were considered to be related to the issues of adult residence location, density and class:

Table 2: Variables Related to Location, Density and Class

Variables	*1910 Census*	*1920 Census*
Census Tract	✓	✓
Landmass Size	✓	
Sex		
Race		
Age	✓	✓
Marital Status		
Children Born and Living		
Nativity of Person, Father and Mother		
Year of Immigration and Citizenship		
English-Speaking		
Occupation and Employment	✓	✓
Literacy and School Enrollment	✓	✓
Home Ownership	✓ ***(and Farm Designation)***	✓
Survivor of Civil War Military Personal		
Blind, Deaf and/or Dumb		

Ideally, a "class" index would be created that would utilize occupation/employment, literacy and home ownership. However, only one class-related variable was tabulated back in 1910 and 1920 – literacy. Data on the remaining variables – occupation/employment and home ownership was collected but omitted from any available tabular census source. Thus these omitted "class" variables were not available for analysis for this research. And

literacy, the only variable available, was used as an indicator for class for this research.

This final, small subset of class and location variables noted on Table 3 represents the final applicable class and geographic variables that were transferred from the microfilm and fragile, paper copies of the Census into an electronic dataset:

Table 3: Keyed Variables Related to Location, Density and Class

Variables	*1910 Census*	*1920 Census*
Census Tract	✓	✓
Landmass Size	✓	
Age	✓	✓
Occupation and Employment		
Literacy and School Enrollment	✓	✓
Home Ownership		

It is important to note here that income earned was not asked on the Census until 1940; it was added as a response to the 1930's Depression as a monitor of the economic health of the country.[87] The initial purpose of the instating the Census was only to count persons by location to properly proportion the House of Representatives based on population statistics.[88] However, in each

[87]Margo J. Anderson, The American Census: A Social History, (New Haven: Yale University Press, 1988) 188

[88] The definition of eligible persons to be counted in the proportion formulas differed from census to census based upon current laws.

decade the Census expanded to include other questions of interest. Today, it is used to both count and classify persons living here. It gives politicians, social activists and business executives considerable information to restructure Congress, develop policies, and market products and services. It is therefore not unexpected that this research would have to select a suitable substitute for what I am used to using as the variable for class.

It is also important to note that the literacy variable was available only among the adult population, those aged 21 and older. So profiles of residents in the specific sub-areas were limited to analysis only among adults.

And finally, with regards to landmass size, acreage was included in the dataset for the 1910 census, but not 1920. However, I was able to estimate the size of the areas and sub-areas included in the 1920 analysis from 1910 information given that, in most cases, the neighborhood boundaries examined in the 1920 analysis went virtually unchanged from 1910.

V. Analysis

Identification of Key Sub-Areas

In order to properly investigate the relationship between New York's changing residential class structure and subway line development, I first grouped census tracts into large contiguous clusters based upon subway presence and current population figures. The identification of sub-areas for individual analysis was a laborious, complex, and multi-step process that involved the use of several statistical packages and a visual inspection of draft GIS maps.

The first step involved the creation of a workable data set. The data files were delivered in SPSS format, Statistical Package for the Social Sciences,[89] with separate datasets for 1910 and 1920. The SPSS application allowed for a tabular view of individual variables by location and decade. I was able to run cross-tabs of population statistics by county; audit the files to be sure the numbers coincided with known statistics in each decade; preview the available variables to select those that would be used in this research; and create new files by decade with a smaller subset of pre-selected variables. The next step was to reformat the files into spreadsheet format, one per decade, to more easily allow for sorting, summing and combining. In this format, extraneous entries were deleted (i.e., minor populations in parks, swamps, and other uninhabitable areas were adjusted) and the database was used to produce draft GIS maps with

[89] SPSS, Mar. 2007, <http://www.spss.com>

Maptitude[90] to visually inspect the current population statistics of the entire Greater New York City area. These early draft GIS maps clearly indicated six areas to study in 1910 and seven areas in 1920. But to confirm that the right choice was made, actual density figures were computed (population/acreage) for each proposed key area. To be considered for inclusion, these residential corridors must have indicated higher-than-average densities. One final note, areas selected did not have to meet any special criteria in regards to actual size of the landmass, however, every effort was mode to keep the individual units as small as possible. The areas used in the final design are as follows:

1910

- Lower East Side
- Other Lower Manhattan
- Midtown Manhattan
- Uptown Manhattan
- Concourse/Fordham, Bronx
- Other Bronx, Queens, Brooklyn, Staten Island

1920

- Lower East Side
- Other Lower Manhattan
- Midtown Manhattan

[90] Maptitude, Mar. 2007, <http://www.caliper.com/maptovu.htm>

- Uptown Manhattan
- Concourse/Fordham, Bronx
- Williamsburg/Bushwick, Brooklyn and Ridgewood, Queens (Combination)
- Other Bronx, Brooklyn, Queens, Staten Island

Each of these selected communities or clusters of neighborhoods involve contiguous spaces and are homogeneous; the combined area either had subway service or not during most of the decade leading up to the when census was taken. The area label is associated with the names of communities and neighborhoods today. And the specific boundaries, i.e., streets names outlining each district, use today's common street names. This makes for easier reading.

Creation of Workable Subway Data Files

Concurrently with area identification, subway station data files were finalized by visually inspecting the data and flagging those subway stations and its matching subway routes with opening dates that fell within each of the two decades under study. Then two separate data files were created, one for each decade to correspond to each census, with each containing only the data corresponding to station openings and subway route development that occurred during that time period. All other data were deleted.

GIS Map Development

Using the new data files on census figures; station openings and route development by decade; demographic statistical analysis; and digital maps of the Greater New York City area, a set of thematic maps were developed, adjusted and finalized. These maps illustrate population growth and subway access. In total, there are six maps for 1910 and seven maps for 1920, as follows:

1910

- Greater New York City
- Lower East Side
- Other Lower Manhattan
- Midtown Manhattan
- Uptown Manhattan
- Concourse/Fordham, Bronx

1920

- Greater New York City
- Lower East Side
- Other Lower Manhattan
- Midtown Manhattan
- Uptown Manhattan
- Concourse/Fordham, Bronx
- Williamsburg/Bushwick, Brooklyn and Ridgewood, Queens

Statistical Formulas

A series of demographic statistical procedures were conducted within each decade to determine the extent to which residential communities were segregated by class in each time period. These procedures involve the use of a Dissimilarity Index, Isolation Index and Exposure Index.[91] Note that I have substituted sub-area for tract within the formulas. Given that I am examining population dispersal by region, not by tract, using sub-area in the formula was a better approach.

Dissimilarity Index ranges from 0 to 100 and refers to the percentage of one group that would have to change residence in order to produce an even distribution:

$$D=0.5*\sum \left| \frac{x_i}{x} - \frac{y_i}{y} \right|$$ where:

x_i = population of lower class in sub-area ***i***

x = population of lower class in aggregate metropolitan area

y_i = population of middle/upper class in sub-area ***i***

y = population of middle/upper class in aggregate metropolitan area

[91] Population Studies Center, University of Michigan. <http://enceladus.icpsr.umich.edu/race/calculate.html>

Isolation Index also ranges from 0 to 100 and measures the probability that a randomly chosen member of one group will next meet another member of the same group:

$$P = \sum \left(\frac{x_i}{x} \right) \left(\frac{x_i}{t} \right)$$ where:

x_i = population of lower class in sub-area ***i***

x = population of lower class in aggregate metropolitan area

t = total population of aggregate metropolitan area

Exposure Index ranges from 0 up to the proportion a group equals in the total population. It measures the probability of a member of one group meeting a member of the other group, taking into consideration the size of the other group:

$$P = \sum \left(\frac{x_i}{x} \right) \left(\frac{y_i}{t} \right)$$ where:

x_i = population of lower class in sub-area ***i***

x = population of lower class in aggregate metropolitan area

y_i = population of middle/upper class in sub-area ***i***

t = total population of aggregate metropolitan area

Limitations to this Research

This study only focuses on the profile of living spaces as a function of subway development. Other issues related to urban development (i.e., housing, racial discrimination and employment) are also important. Yet it is beyond the scope of this research to also incorporate a full examination of the influence of these other variables. Thus, with the exception of some basic details uncovered while researching transit impact, no specific investigation was undertaken with regards to these other issues.

CHAPTER 3: NEW YORK CITY BEFORE 1910

I. Highlights of New York City's History Leading to Subway Development

Research on the impact of the subway on New York City settlement patterns starts with a quick overview of the city's history, and playback of the important events surrounding the subway's inauguration. This summary is critical to better understand some of the salient and lesser-known reasons for subway development, thereby enabling a more accurate assessment as to whether the subway was an appropriate step for New York City; whether it succeeded or failed with meeting its intended goals; and its relationship to settlement patterns.

The chronicle can be traced back three centuries. Between the early 1600's and 1904 when the subway was introduced, the population of New York grew at an astounding rate. Starting with very small numbers of settlers and increasing to about 3.4 million, the area went from an average sea town to a huge metropolis competing for top position with other U.S eastern seaboard cities. In its history, it transferred from Dutch hands to the British before emerging as the most important city in the new United States and later the world. Technological advances, social forces and geographical location all contributed to its growth and importance, but at the same time, it laid the groundwork for some serious issues and problems. Table 4 summarizes the critical events, followed by a narrative description.

Table 4: Key Highlights of New York City's History

Time Period	***Census Count***	***Geographic Boundaries***	***Political Control***	***Important Markers***
Early 1600's	270	Southern Tip of Manhattan	First settlers were from the Netherlands; named area "New Amsterdam"	Started as a small trading post
1698/1703	4 to 5 thousand	Mostly southern end of Manhattan	Unchanged	Third or fourth populous city behind Boston, Philadelphia and Salem
Early 1700's	Exact number not known	Unchanged	Taken by English in war and renamed "New York"	Disease, wars and fires kept population stable
Late 1700's	60 thousand	Unchanged	The United States after the War of Independence	Designated as the first capital of the United States
1850	515 thousand	Annexed the Bronx to form New York City	Unchanged	Top U.S. city in population due to Erie Canal in 1825 and continuous immigration that settled on the Lower East Side
1900	3.4 million	Annexed Brooklyn, Queens and Staten Island into Greater New York	Unchanged	The Lower East Side remained the most densely populated area despite other available territory to establish settlements
1904	3.4 million plus	Unchanged	Unchanged	Subway service began

II. The Seventeenth Century

New York City's western development essentially began in the early 1600's with Henry Hudson's voyages; settlements were established quickly and it became one of many European trading colonies during the time of heavy New World exploration and subsequent colonization.[92] Owned first by the Dutch, specifically the entrepreneurial Dutch West India Trading Company, and christened *New Amsterdam*, the area's greatest appeal rested on its shoreline. Keeping in mind that the transportation of the time was marine-based, the natural harbors in New Amsterdam gave easy access to ships carrying goods and people between the European Continent, the Caribbean and North America. Points north of New Amsterdam, and the wealth of natural resources found there, were accessible from New Amsterdam via the Hudson River that directly fed into New York City's surrounding harbor waters.

Throughout the 17th century, population growth of New Amsterdam steadily climbed. The first reported census by the Dutch in 1628 claimed that 270 persons lived along near the harbor of New Amsterdam, what is now known as the southern border of the Borough of Manhattan.[93] By the end of the same century, the number of residents had increased 15 to 20 fold. The census count taken by the Dutch in 1698 and again in 1703 indicated that persons residing in

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[92] Paul Soifer and Abraham Hoffman, Cliffs Quick Review: U.S. History I (New York: Hungry Minds, 1998) 19

[93] Franklin Jameson, ed., Reissued, Narratives of New Netherland 1609-1664 (New York: Barnes and Noble, 1959) 75.

the area numbered between four and five thousand. However, relative to the population counts of other newly colonized areas along the eastern seaboard of North America, the number of persons living in New Amsterdam was not outstanding. The city was placed either third or fourth position for most of the century. Boston, Philadelphia and even Salem, Massachusetts (a port town just north of Boston) had each reported higher population figures than New Amsterdam.[94] And all of these locations offered similar advantages – satisfactory harbors and quick access to much needed natural resources in surrounding areas.

[94] Ira Rosenwaike, Population History of New York City (Syracuse: Syracuse University Press, 1972) 7.

III. The Eighteenth Century

In the early 1700's, the area changed hands from Dutch control to English control, and concurrently changed its name from New Amsterdam to *New York*. The early city boundaries were modest – about 15 square miles. And after a century of steady population increases, major obstacles plagued the region so that population growth stagnated or even declined for most of the 1700's. Devastating fires, fatal diseases, and on-going wars, first between the Dutch and the British and later between the Colonists and the British, were among the most significant events.

New York City's real importance began to materialize after the U.S. won its independence from England. Most notably, the city was chosen to be the new country's first federal capital. Then, concurrent with the birth of a more modern steamship industry, mass flight from overseas economic and political hardships became possible and exploded. European immigrants, in particular, were among the first to be drawn to America's shores with the promise of financial success and liberty. By the end of the 1700's, the population of Manhattan reached 60 thousand. It now lagged behind only one other more populous city, Philadelphia, and was catching up fast.

IV. The Nineteenth Century

The next 50 years saw unprecedented growth and staggering change in New York City, especially after 1825 with the opening of the man-made Erie Canal. Keeping in mind that waterways essentially represented the only efficient avenues for shipment of people and goods, the significance of the Erie Canal cannot be overstated. Considered an astounding engineering achievement, the Erie Canal connected two important waterways to the north and west of New York City, the Hudson River and Lake Erie. It provided the only connection for shipping goods and transporting people between the U.S. mainland and the rest of the world. As a result, New York City became the only east coast port with ties to the vast North American continent.[95]

As the city's importance soared as a shipping port, so did its appeal to business and labor. The city easily overtook Philadelphia in population and continued to grow exponentially throughout the rest of the century. Large immigration streams from overseas nations headed straight for New York's harbors. By 1850, the population inched past one-half million, increasing almost 9 fold in 50 years.[96] The southern tip of Manhattan, particularly the eastern side known as the *Lower East Side*, became the main depository of the massive numbers of new immigrants. With no inexpensive, effective or quick transit systems to shuttle workers from other, more distant, living spaces, new arrivals

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[95] Franklin Jameson, ed., Reissued, Narratives of New Netherland 1609-1664 (New York: Barnes and Noble, 1959) 93.

[96] Ira Rosenwaike, Population History of New York City (Syracuse: Syracuse University Press, 1972) 42.

continued to squeeze into a very small area living side-by-side with older arrivals. This massive upsurge in New York City's population was good news to business and political interests engaged in a race for the lead with other eastern seaboard cities. However, the consequences of the fast explosion in population growth could no longer be ignored.

It was most evident in the city's living conditions. The *Lower East Side* was afflicted with inadequate housing, insufficient food availability, widespread disease, little financial stability, severe unrest, and poor sanitary situations. The environment was described by Jacob Riis as horrendous,[97] prompting social-welfare advocates to take action. Business leaders were equally concerned; the area's volatility was undermining the city's status as the ideal business center. And all of this was made worse by a massive snowstorm that paralyzed the city and its business operations for days. Moreover, politicians were fearful that publicity about New York might begin to focus on its inadequate living conditions, crime and business risk, putting the city in jeopardy of losing its leading position among the growing list of competitive markets. Competitors now included the old-standby, eastern-seaboard cities and also newly formed cities in the Midwest such as Chicago, the central hub of the bourgeoning national railway system and westward expansion across the continent.[98] The converging agendas and objectives among these three factions – social-welfare advocates, business

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[97] Jacob A. Riis, How The Other Half Lives (New York: Penguin Books, 1997 ed.) 6+.

[98] Ira Rosenwaike, Population History of New York City (Syracuse: Syracuse University Press, 1972) 57.

leaders, and politicians – gave them cause to join together in the search for solutions.

The most promising option was the development of a transportation system. But not the minimal, inefficient and relatively expensive transit systems that currently existed, such as horse-drawn rails, trolleys, elevated steam-run rails, ferries to Brooklyn, or intermittent surface rail to distant locations in Long Island and Westchester.[99] These produced only a sprinkling of settlements beyond the borders of the *Lower East Side*.

For example, there were elevated steam-run rails that had been operating north to south across most of Manhattan since the second half of the nineteenth century;[100] this was an early attempt to introduce "rapid" transit to the city[101]. One branch in particular, the Ninth Avenue El, extended into portions of upper Manhattan by the early 1890's.[102] Real estate developers' preparations for opening up northern Manhattan to housing options ensued once the Ninth

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[99] Clifton Hood, 722 Miles (Baltimore: John Hopkins University Press, 1995) 55,101.

[100] James Blaine Walker, Fifty Years of Rapid Transit 1864-1917 (New York: Arno Press and The New York Times, 1917, Reissued, 1970) 71-73.

[101] Government backing for this venture emerged as a compromise to pro and con subway lobbyists; at the time, government was persuaded to support an elevated system fearful that an underground subway would be potentially dangerous to the prized, recently built water main system.

[102] James Blaine Walker, Fifty Years of Rapid Transit 1864-1917 (New York: Arno Press and The New York Times, 1917, Reissued, 1970) 71-73.

Avenue El got the green light. Blocks and blocks of very expensive and architecturally magnificent row houses were built along Manhattan's west side along with some higher rise but similarly upscale apartment houses.[103] Yet in the end, the El did not nearly impact the shape of the region as expected[104]. The rail service was very slow (traveling about a third the speed of what the subway later could deliver.)[105] Moreover, it was noisy and dirty; steam was the fuel source compared to electricity used for the later subway.[106] And despite several rounds of fare reductions to entice ridership,[107] many homes went unsold for years and some construction went uncompleted. Business did finally pick up again as the turn of the century neared, but only after plans for the underground subway was finally revealed.[108] Then the El was sold to the same company who operated the subway, the IRT, and its fuel was converted to electricity. Soon after, the El was

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[103] Sarah Bradford Landau, "The Row Houses of New York's West Side," The Journal of the Society of Architectural Historians 1 (1975): 19-36.

[104] Peter Derrick, Tunneling to the Future: The Story of the Great Subway Expansion That Saved New York (New York: New York University Press, 2001) 32.

[105] Clifton Hood, 722 Miles (Baltimore: John Hopkins University Press, 1995) 55, 101.

[106] James Blaine Walker, Fifty Years of Rapid Transit 1864-1917 (New York: Arno Press and The New York Times, 1917, Reissued, 1970) 121.

[107] Stan Fischler, The Subway: A Trip Through Time On New York's Rapid Transit (New York: H&M Productions II Inc., 1997) 245-249.

[108] Sarah Bradford Landau, "The Row Houses of New York's West Side," The Journal of the Society of Architectural Historians 1 (1975): 19-36.

converted once more, operating part of the time as a freight line after attempts to increase ridership were unsuccessful.[109]

With the failure of the elevated lines and other modes to meet expectations, leaders looked to an underground, rapid moving and weather-resistant rail, technologically similar to those systems already being successfully developed across Europe, and in U.S. cities like Boston. Note that discussions about an effective underground system ensued on and off for decades,[110] but it wasn't until almost the turn of the century that the argument for moving forward finally became indisputable. Yet despite this transportation option's clear benefits, city politicians and business leaders were quite aware that it could also ricochet. Thus, they were devising steps and working quickly to derail any potential negative impacts an underground rapid transit system could bring before moving further.[111] Most importantly, the question about strategic population dispersal needed an answer. It was important to scatter the population but not to facilitate new settlements in competitive cities, particularly to the city of Brooklyn located directly to the east from across the East River.

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[109] Stan Fischler, The Subway: A Trip Through Time On New York's Rapid Transit (New York: H&M Productions II Inc., 1997) 245-249.

[110] James Blaine Walker, Fifty Years of Rapid Transit 1864-1917 (New York: Arno Press and The New York Times, 1917, Reissued, 1970) 1-161.

[111] Clifton Hood, 722 Miles (Baltimore: John Hopkins University Press, 1995) 25.

So as a first step, the top city leaders set plans to grow the city by acquiring adjacent spaces and incorporating the residents of these areas into the official New York City population count.[112] In 1897, the city expanded into the Greater New York Metro Area through the acquisition of Kings County (Brooklyn), Queens County and Richmond County (Staten Island). This move made the city the largest in the United States, and second to only London on the global scale. The population of New York City was now in the millions.[113] And within this newly formed city limit came the added advantage of considerable under-populated spaces, ideal spaces to re-settle former *Lower East Side* residents by way of a new, underground rapid transit system.

[112] Clifton Hood, 722 Miles (Baltimore: John Hopkins University Press, 1995) 63.

[113] Ira Rosenwaike, Population History of New York City (Syracuse: Syracuse University Press, 1972) 57.

V. The Twentieth Century Until 1904

The incorporation of residents living within the newly acquired Greater New York region, plus the non-stop immigration streams from the old world, resulted in a 1900 census figure for New York City of 3.4 million people.[114] This was almost 7 times the number of people 50 years earlier, worsening the conditions on the *Lower East Side*. However, now that the risk of losing population to the adjacent city of Brooklyn was no longer an issue, the time was right to move forward with modern transportation solutions.

Underground rapid transit service was already operational in parts of London, Budapest, Glasgow, Paris, and Berlin.[115] Even within the U.S., Boston's Green Line was already in service for several years.[116] Thus the technology existed and just needed to be modified where necessary to match New York City's unique topography of rivers and rocks; and scattering of high-rise development. Elevated and surface train service was already available in portions of Manhattan and Brooklyn and still operating.[117] However, as explained earlier in this chapter, this service was slow, dirty and not classified as

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[114] Ira Rosenwaike, Population History of New York City (Syracuse: Syracuse University Press, 1972) 67.

[115] Stan Fischler, The Subway: A Trip Through Time On New York's Rapid Transit (New York: H&M Productions II Inc., 1997) 43-44.

[116] Brian J. Cuday, Cash, Tokens, and Transfers: A History of Urban Mass Transit in North America (New York: Fordham University Press, 1995) 86-87.

[117] James Blaine Walker, Fifty Years of Rapid Transit 1864-1917 (New York: Arno Press and The New York Times, 1917, Reissued, 1970) 71-73.

“rapid” transit. And expectations for major population shifts as a result of these rail lines never emerged.

VI. Subway Service Introduction

The Finance Connection

In 1891, the first municipal commission overseeing subway development was comprised of politicians and bureaucrats, and ended in disgrace because of kickbacks and corruption. In 1894, a new commission was formed, this time they were predominately members of a more "trustworthy" group – the Chamber of Commerce.[118] The contract for the first subway, known as Contract #1 and currently referred to as the number 1 train, called for private building and operation thereby giving business interests a large role in its initial development. Moreover, public interest appeared on the surface to be very much represented through municipal ownership, funding, and inspection of all construction. However, this civic role was, in fact, performed by leaders from the Chamber of Commerce who were also the members of the overseeing commission.[119] This is an important fact not to be overlooked. With top business leaders taking charge on both sides of the table, the direction of subway development could have easily swayed to satisfy business interests, and only worked toward the public good when business goals and aspirations were simultaneously met.

To support this fact further, let's look at subway fare. The cost of a one-way ride on the subway was 5 cents at its opening in 1904. Thus a round trip was 10 cents and a weekly commute, 2 trips per day for a minimum of 6 days,

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[118] Clifton Hood, 722 Miles (Baltimore: John Hopkins University Press, 1995) 63.

[119] James Blaine Walker, Fifty Years of Rapid Transit 1864-1917 (New York: Arno Press and The New York Times, 1917, Reissued, 1970) 141.

cost 60 cents. This was a considerable sum to pay for some labor classes. Statistics about the famous Triangle Shirtwaist Factory, for example, reported that employees earned about $3.00 per week.[120] This would suggest that low-end workers would need to contribute about 20% of their earnings for transit if they chose to live in a more appealing environment far from the *Lower East Side*. Contrast this to low-end earnings in today's dollars. If individuals today bring home a poverty wage of $8.00 an hour for a 40-hour a week, a total of $320 per week, and spends $24 a week on an unlimited fare card for New York City's subway, they would essentially be spending about 7.5% of their gross salary on commuter costs. A 7.5% ratio today compared to 20% ratio in the early 1900's suggests that subway fares then cost about 4 times what it does today in real dollars. While this pricing structure in 1904 may have contributed to a profit margin for subway entrepreneurs, it can hardly be classified as a "worker-friendly" fare.

Finally, it is worth mentioning that some of the architectural features that adorned station trestles and platforms included a carved, colorful sculpture resembling the horn of plenty, intended to symbolize the continued commercial success of New York City.[121]

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[120] The Story of the Triangle Fire, <http://www.ilr.cornell.edu/trianglefire>

[121] New York Transit Museum, Subway Style: 100 Years of Architecture and Design in the New York City Subway (New York: Stewart, Tabori and Chang, 2004) 52

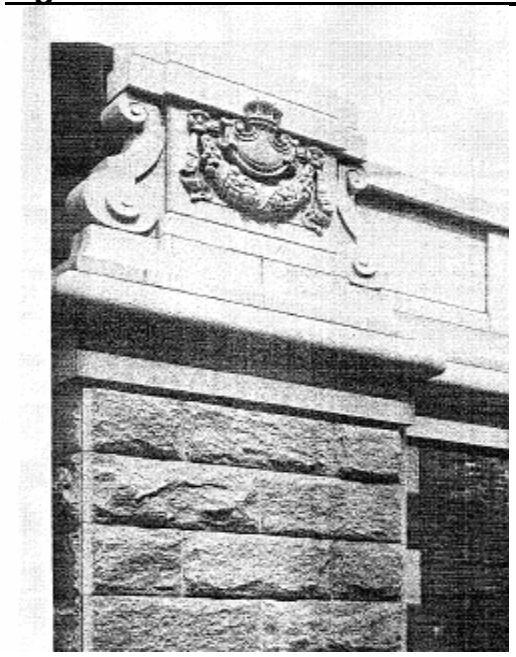
Opulent Amenities

Elaborate symbols of commercial success were not the only features worth noting of the earliest stations and platforms. City Hall, given the most attention, was meant to provide the waiting passenger with the ambiance of luxury. The interior walls were adorned with an artistic tile design. Vaulted ceilings accompanied beautifully crafted, leaded skylights to deter the feeling of being underground. Electric lighting was also provided using ornate pendants. Ticket booths were made of solid oak appointed with bronze accessories. Other stations along the earliest route were marked with unique mosaic signs, each with a unique theme that sometimes mirrored the neighborhood characteristics. Plaster columns and ceilings were embellished with crown moldings and ornamental designs. Cast iron shelters served as entrances.[122] Clearly, these upscale, decorative amenities were not designed to woo the average wage-earner. This was likely a deliberate, expensive strategy to portray the transit system as a suitable option for first class passengers. The photographs on the next two pages illustrate various elements of the subway's upscale architectural and decorative designs.[123]

[122] New York Transit Museum, Subway Style: 100 Years of Architecture and Design in the New York City Subway (New York: Stewart, Tabori and Chang, 2004) 55

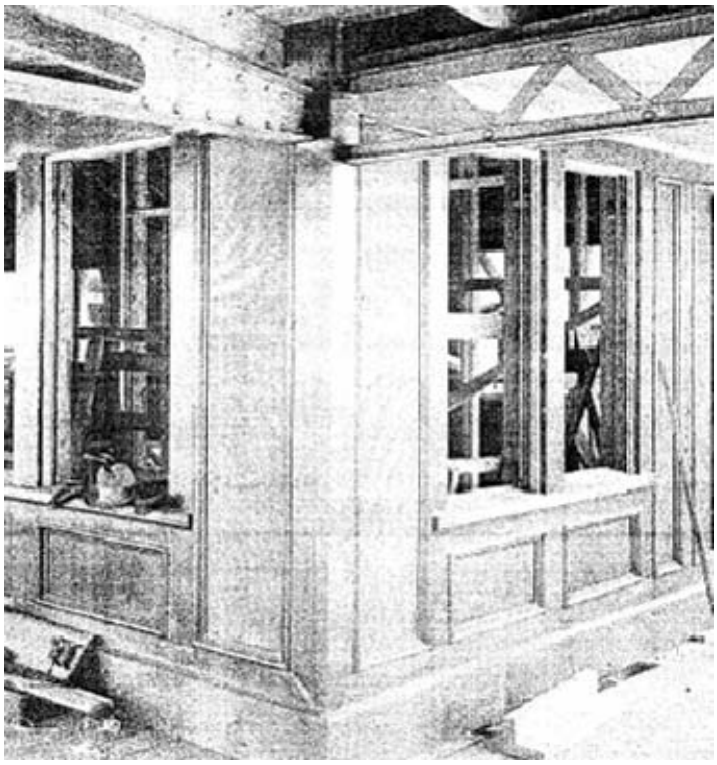
[123] Collection of the New-York Historical Society. The negative number appears next to each photo.

Figure 1: 1904 "Commercial Success" Photo



This photo illustrates the intricate "horn of plenty" adorning the viaduct tracks near 134th Street in Upper Manhattan. The "horn of plenty" symbolized the dream of commercial success (Box 10, PR069, 5101-5200.)

Figure 2: 1904 "Distinctive Wood" Photo

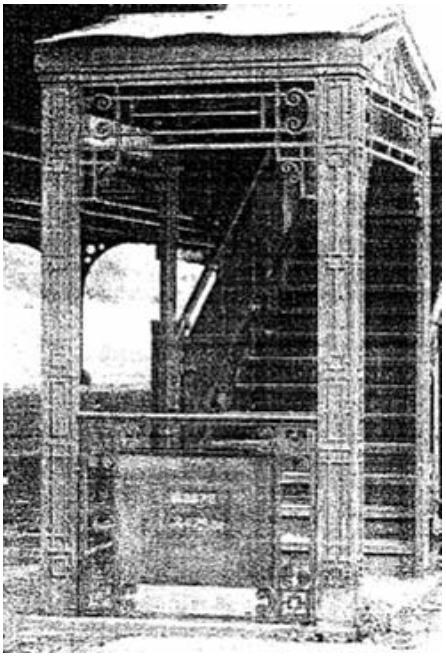


In this photo, distinctive wood molding was integrated in the design of an entrance to a Bronx station (#66347).

Figure 3: 1906 "Skylights" Photo

Looking up toward the ceiling, glass tiles are like skylights to let in light from the outside minimizing that "down under" feeling. Contrast this with tenement dwellings and factories that had no windows at all (#66418).

Figure 4: 1906 "Ironwork Motif" Photo



This street entrance greets passengers with an upscale, elaborate ironwork motif (#66517).

Tremendous care was also taken with subway car design. Fancy architectural details were included, such as mahogany walls and handrails, bronze hardware, window blinds, rattan seats, and wood carvings.[124]

Contrast this with single-room tenement living, lacking in light. Or contrast this with factory employment, lacking in ventilation. The difference seems alarming, confirming that these well appointed interior designs furnishings were not created to appeal to the public at large.

Opening Day

The subway finally opened its doors in October of 1904, amazingly only four years after work was authorized. This first route traveled from the most southern tip of Manhattan to about ¾ of the way to northern end, expanding to the absolute northern most section within the first couple of years. By the end of the decade, the system added several extensions to existing routes and added new routes, particularly into parts of western southern sections of the Bronx.

By 1910, the subway was operating for about six years. Six years is a reasonable timeframe for real estate developers to create new residential spaces and for considerable numbers of individuals to move to new homes.

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[124] The New York Subway: Its Construction and Equipment (Interboro Rapid Transit, 1904) <www.nycsubway.org/articles/irtbook_ch8.html>

VII. Summary

The earliest records of settlers through the U.S census figures from the beginnings of the twentieth century showed that the population of Greater New York exploded over time. By the end of the 1800's, population totals and other geographic benefits allowed the city to earn the competitive edge that commercial interests and politicians craved. Yet with too many persons crowding into a small area, the deteriorating social and health conditions put the city's leading position at risk. Other transit modes were developed, but none succeeded in favorably changing the shape of the city, and its problems continued to grow. This set of circumstances finally paved the way for the development of an underground, rapid subway.

While social progressives joined with entrepreneurs and bureaucrats to push for its introduction, all for their unique reasons, it was really the business interests that ran the show. They took the largest role in developing, coordinating, monitoring and directing the process. As such, the system was built to have a special appeal to people with means. Both the features and pricing had a luxurious feel, and proved to be a possible barrier to those who could not afford its service.

Moreover, early housing in upper Manhattan was designed specifically for the affluent. The region was filled with lavish row houses and apartments.

In the next chapter, I will look more closely at the effect of subway introduction on settlement spaces. In particular, I will trace the areas that grew and declined in population reasonably soon after subway access into an area. I will also examine who the early riders were, and finally profile the developing new communities by class.

CHAPTER 4: 1910 — IMMEDIATE IMPACT OF EARLY SUBWAY DEVELOPMENT

I. Introduction

This chapter examines the settlement patterns of New York City about a decade after the subway contract was awarded, and five years after subway inauguration.

If subway introduction into New York City satisfied social progressives lobbying for its inception, the *Lower East Side* would house fewer people and density scores would be reduced. Concurrently, new settlements would sprout in better environments located in outlying Greater New York locations that could now be accessed by the subway. Given that most of the ills associated with the *Lower East Side* were connected to overcrowding and its byproducts, it is presumed that quality-of-life for most individuals would improve with the progress of residential diffusion.

Second, politicians and bureaucrats would also be satisfied given that the premier position of the city as the population center and business headquarters of the U.S. would be safeguarded. The subway would provide an escape from the *Lower East Side* for some individuals, but at the same time it would make resettlement to other areas within Greater New York City's boarders attractive. This would deter population loss to surrounding east coast cities and to other locations out west. The city would also remain appealing to commercial

interests, key to retaining a top political position, given that the conditions on the *Lower East Side* would no longer create the perception that business activities could be severely threatened. Moreover, the city would more easily conquer any hurdles presented when bad weather conditions (i.e., snow) would otherwise make it impossible to continue normal operations.

Lastly, the goals of business interests would be met. Besides providing a safe environment, subway ownership would be profitable, possibly encouraging further expansion. Moreover, real estate purchase and sales, settlement development, construction and ancillary services would exhibit huge growth. With this, the city would keep its appeal as the U.S. hub of business activity.

II. An Overall Look at New York City

The census of 1910 indicated that 4.8 million persons lived in the Greater New York area. That was an increase of more than 1.4 million or 41% compared to a decade ago when the population figure was at 3.4 million. I've already reported that the rise in Greater New York City's population was enormous since 1850 when the population stood at about half million. This suggested that the upward trend had continued into the twentieth century. Average density was about 28 persons per acre. However, the average score was misleading. Densities were very different across sub-areas within Greater New York City, staggeringly high in some areas and very low in others. Section III within this chapter delves more specifically into regional differences.

Early subway development consisted of two lines, what is known today as a partial segment of the number 1 and 2 Lines. By 1910, these two routes shared tracks and stations through most of Manhattan starting at the most southern point and heading due north on the west side of Manhattan. Note that the western path of the subway meant that it did not run directly through the *Lower East Side*. In some instances, stations were almost a mile west from the *Lower East Side* population center. The subway continued north until it reached the southwestern corner of Central Park, where it began to veer slightly more west to avoid the park. Then the routes paralleled the western side of the park until it reached 96th street, where it divided into two directions. The number 1 route headed straight north to the tip of Manhattan on the west side of the

borough. The number 2 route headed northeast, traveling on the eastern side of upper Manhattan and then through the mid-western Bronx communities of Concourse/Fordham. Later in the decade, Brooklyn connected to Manhattan on the southern edge. Along with these two routes, other transit operations were concurrently operating in Brooklyn. These were generally surface and elevated lines that were slow and unconnected with Manhattan.

The first of several maps follow (Figure 5.) This first map shows the proportion of adults aged 21+ for all census tracts within the Greater New York City area. Also on this map is subway service as of the year 1910. The following features are worth noting:

- The *Lower East Side* is marked with a cluster of dark grey and black tracts, signifying that it was most crowded of areas.
- The immediate surrounding areas in the lower portion of Manhattan were far less congested as demonstrated by a lighter grey color.
- Other areas in Manhattan are also a lighter grey, with fewer adults.
- The mid-western and southern sections of the Bronx had considerable numbers of residents. Some clusters in this area are dark grey and black. This suggests that former *Lower East Side* inhabitants and new immigrants may have targeted this area for residency.
- The rest of the Bronx was scarcely populated along with Queens, Brooklyn and Staten Island.

- All areas with high densities had subway service, suggesting a correlation between subway service and population.
- Brooklyn's subway was introduced too late in the decade to have a real population effect. Other available routes were not connected with the main lines from Manhattan yet. Thus, the population density was similar to areas with no subway service.
- Populations shown include only adults age 21+; an explanation for this approach follows in the next section.

1910: GREATER NEW YORK
POPULATION OF ADULTS AGE 21+
AND EXISTING SUBWAY LINES

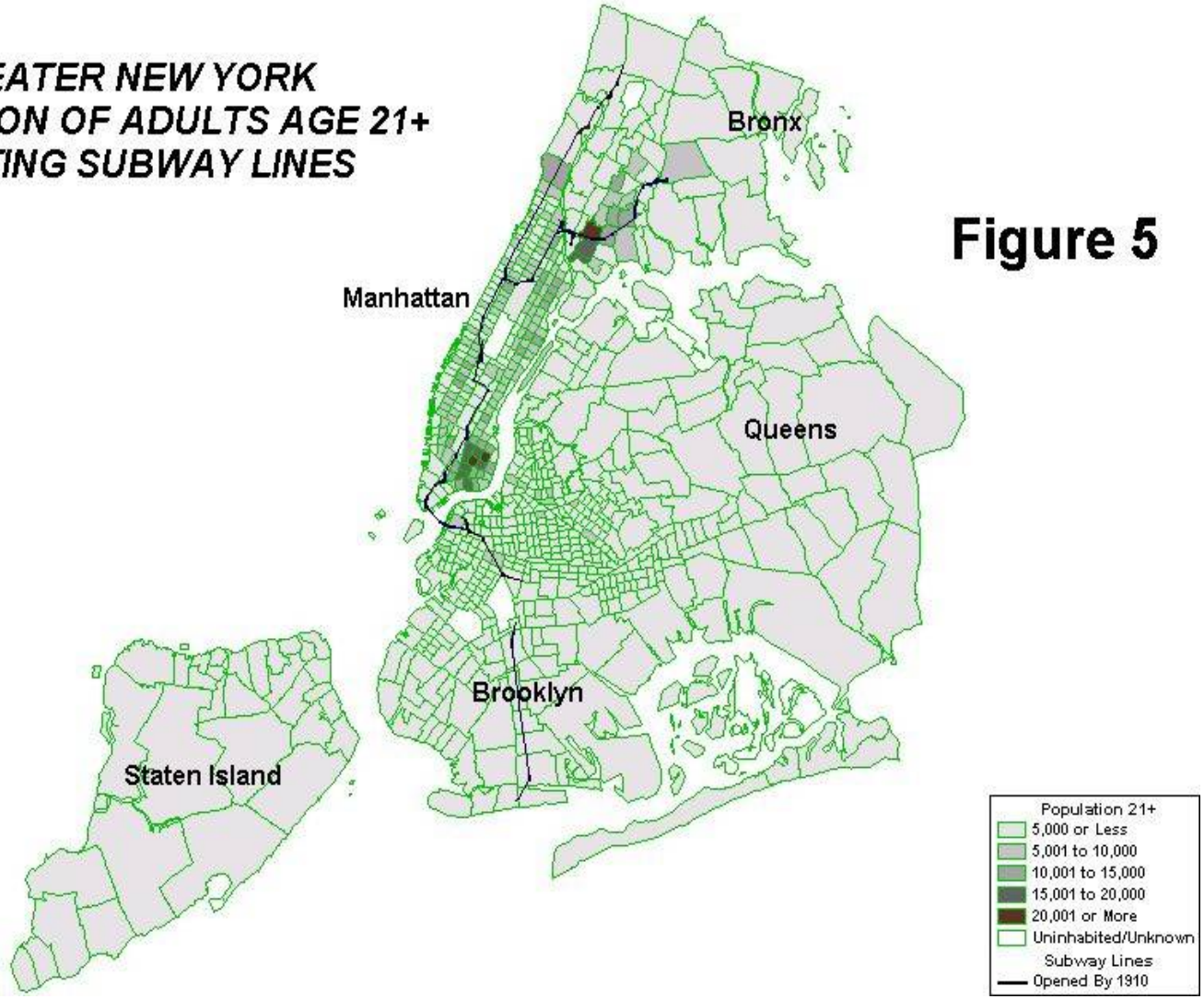


Figure 5

III. Sub-Area Population and Density

To examine the early impact of the subway, I visually inspected tract population figures side by side with subway availability (see Figure 5). In that evaluation, I identified populous and contiguous combinations of tracts with subway service that I labeled as one large community for further analysis. Based on that inspection, and taking into consideration known neighborhood boundaries and today's street names, the city was divided into 6 areas. The *Lower East Side* was Manhattan's most southeastern area. It was boarded to the east by the East River, to the north by 14th Street, to the west by the Bowery, and to the south by the East River. Directly to the east of this area was the community of *Other Lower Manhattan.* This area was boarded to the east by the Bowery and to the north by 14th Street. On its western edge was the Hudson River, and directly to the south was the East River and New York Bay. *Midtown Manhattan* is directly north of the *Lower East Side* and *Other Lower Manhattan* area. It sat between the East River to the east and the Hudson River to the west. On the north side was Central Park and to the south was 14th Street. *Uptown Manhattan* included the balance of Manhattan. It was boarded to the east by the East and Harlem Rivers, to the North by the Harlem River, to the west by the Hudson River, and to the south by Central Park. C*oncourse/Fordham* area of the Bronx was oddly shaped. It was boarded to the east by Third Avenue and Bruckner Boulevard, to the North by Fordham Road, to the west by the Grand Concourse, and to the south by a combination of Bruckner Boulevard, Third Avenue, West 149th Street, Willis Avenue, and the East River. Finally, other areas in Bronx,

Brooklyn, Queens and Staten Island covers all remaining locations and was labeled *Other Greater New York City.*

Table 5 shows how the city population was divided. A considerable portion of the city's population, 2.2 million of the 4.8 million or 46%, was living in Bronx areas outside the *Concourse/Fordham* neighborhood, or in Queens, Brooklyn and Staten Island. These were spaces without subway service. Note, however, that this region was quite large given the city consolidation in 1897, equaling more than 155 thousand acres, or 91% of the entire city's landmass. With the large landmass, the density averaged only 14.04 persons per acre, quite low compared to density figures in the other communities where the figures ranged from over 100 to more than 500 individuals per acre. This was as expected; people who live in the most outlying regions without subway service must be essentially self-contained. There were no effective transit options for shuttling people efficiently to the inner city for work or other daily needs.

Of the remaining population in Greater New York, the *Lower East Side* deserves first mention. While only 11% of the population lived in this neighborhood, these individuals occupied an area just under one thousand acres, yielding a very high density of 542.6 per acre. The remaining neighborhoods had more modest densities. With 23% percent living in *Upper Manhattan* and the second largest area spanning between 7 and 8 thousand acres, this area had a modest density score of 142.41. *Midtown Manhattan*

contained 10% of the population in almost 3 thousand acres for a density score of 160.52 per acre. And *Other Lower Manhattan* held about 5% of the population in about a little more than thousand and a half acres, a density of 136.16 per acre. By 1910, all of these five communities had subway service for some time. Thus it is not unreasonable to expect that density figures for these five would fall closer to the especially crowded *Lower East Side* than to the isolated areas in *Other Greater New York City* beyond subway reach. In fact, the *Lower East Side* density rate was only 4 times that of most of Manhattan and the Bronx where there was subway access, but was 40 times as great as the locations within the other newly-expanded, non-subway spaces of Greater New York City.

Based upon these figures we can agree that the city had significant spaces from which to expand settlement areas.

Table 5: 1910 Sub-Area Population and Density

Sub-Areas	***Population***		***Acreage***		***Density***
	#	***%***	***#***	***%***	***Avg.***
Lower East Side	542,061	11.4	999	.6	542.60
Other Lower Manhattan	226,299	4.7	1,662	1.0	136.16
Midtown Manhattan	460,520	9.7	2,869	1.7	160.52
Uptown Manhattan	1,102,662	23.1	7,743	4.5	142.41
Concourse/Fordham, Bronx	256,788	5.4	2,132	1.2	120.44
Other Greater New York City	2,178,553	45.7	155,175	91.0	14.04
Total Greater New York City	***4,766,883***	***100.***	***170,580***	***100.***	***27.95***

To profile the “class” of those living in each sub-area, the census variable “literacy” was used as the indicator. Literate persons were considered of middle or upper class. Illiterate persons were considered of lower class. This restricted the examination of population statistics to only adults 21 and older; information regarding literacy was available only for this adult group. To move forward using this definition, I first needed to demonstrate that population proportions by sub-area were similar for adults aged 21 and older as they were for all persons

regardless of age. As shown in Table 6, the adult proportions essentially equaled proportions among the total.

Table 6: 1910 Population Aged 21+ vs. Total Population

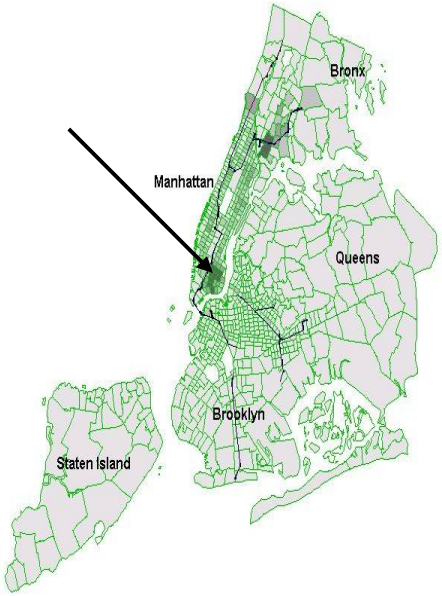
Sub-Areas	***Total Population***		***Population Aged 21+***		***Difference***
	#	***%***	***#***	***%***	***+/- %.***
Lower East Side	542,061	11.4	280,857	9.9	-1.5
Other Lower Manhattan	226,299	4.7	136,262	4.8	+.1
Midtown Manhattan	460,520	9.7	309,983	10.9	+1.2
Uptown Manhattan	1,102,662	23.1	701,254	24.8	+1.7
Concourse/Fordham, Bronx	256,788	5.4	150,991	5.3	-.1
Other Greater New York City	2,178,553	45.7	1,255,442	44.3	-1.4
Total Greater New York City	***4,766,883***	***100.***	***2,834,789***	***100.***	

Thus using adults aged 21 and older for further examination did not introduce any bias. With that in mind, Figures 6 through 10 on the next few pages are close-up maps of each of the first five sub-areas for analysis. They show the proportion of adults aged 21+ for all census tracts within each areas

side by side with subway service as of the year 1910. With these close-up maps, the following features are more clearly seen:

- In Figure 6, the subway skirted the very dense *Lower East Side*. It was to the west of the Bowery and quite a distance from the center and eastern portions of this sub-area.
- In contrast, in Figure 7, subway service was within striking distance of some residents of the far less congestion tracts in *Other Lower Manhattan.*
- Figure 8 shows that the subway route led up the least populated areas of *Midtown Manhattan*.
- Considerable areas of *Upper Manhattan*, the southeastern areas, had no subway access at all. Yet Figure 9 showed they were as populated, or even more so, than the *Upper Manhattan* areas with subway service.
- In Figure 10, the existing subway route appeared to almost coincide perfectly with the tracts that are the densest in this Bronx sub-area. However, the tail-end of the subway route ventured into another area just beyond the sub-areas I am examining for this analysis.

1910: LOWER EAST SIDE POPULATION OF ADULTS 21+ (tracts marked with "x")



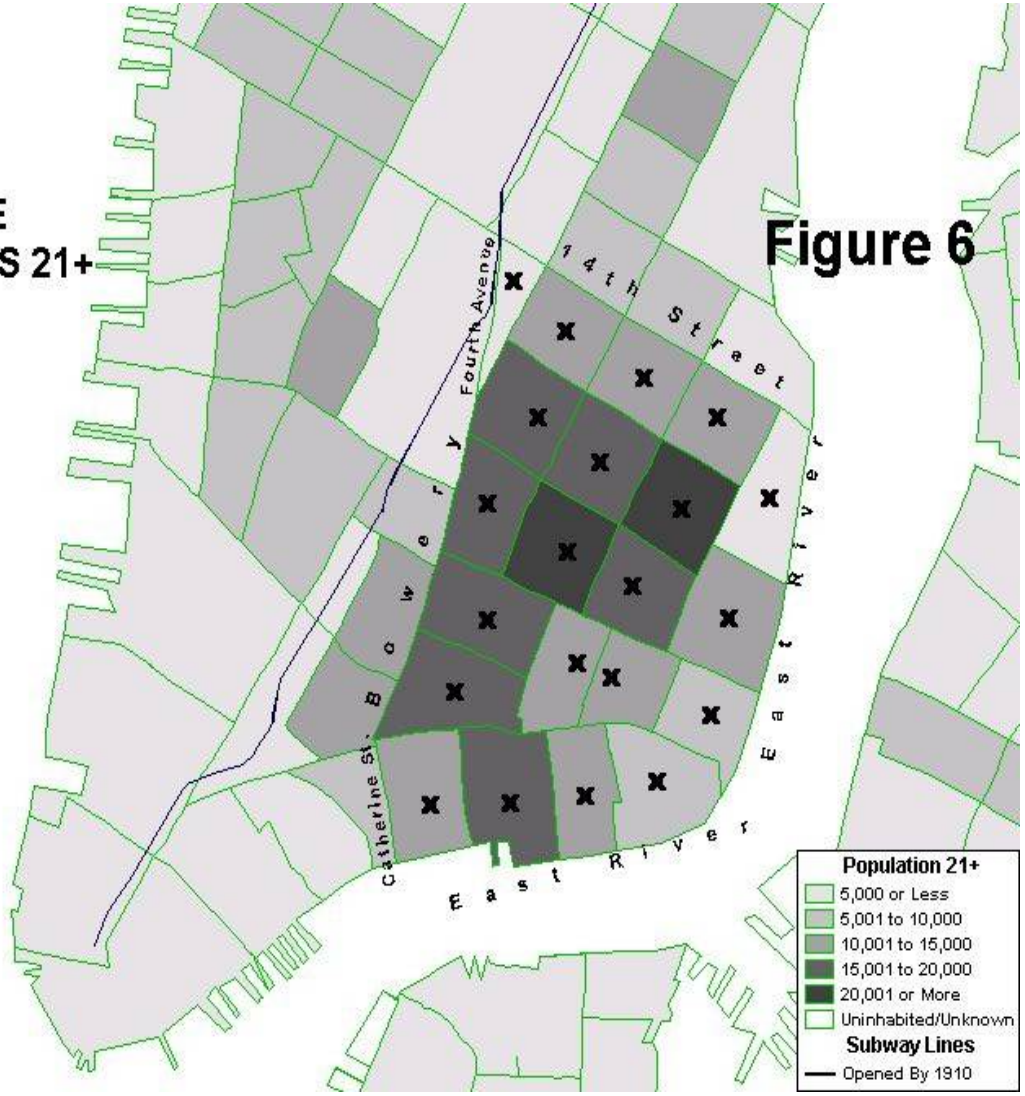
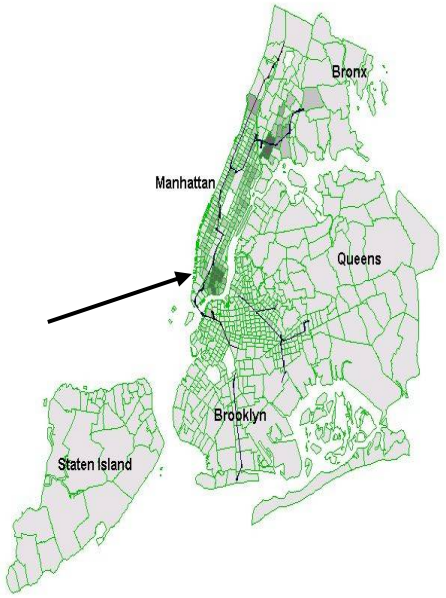
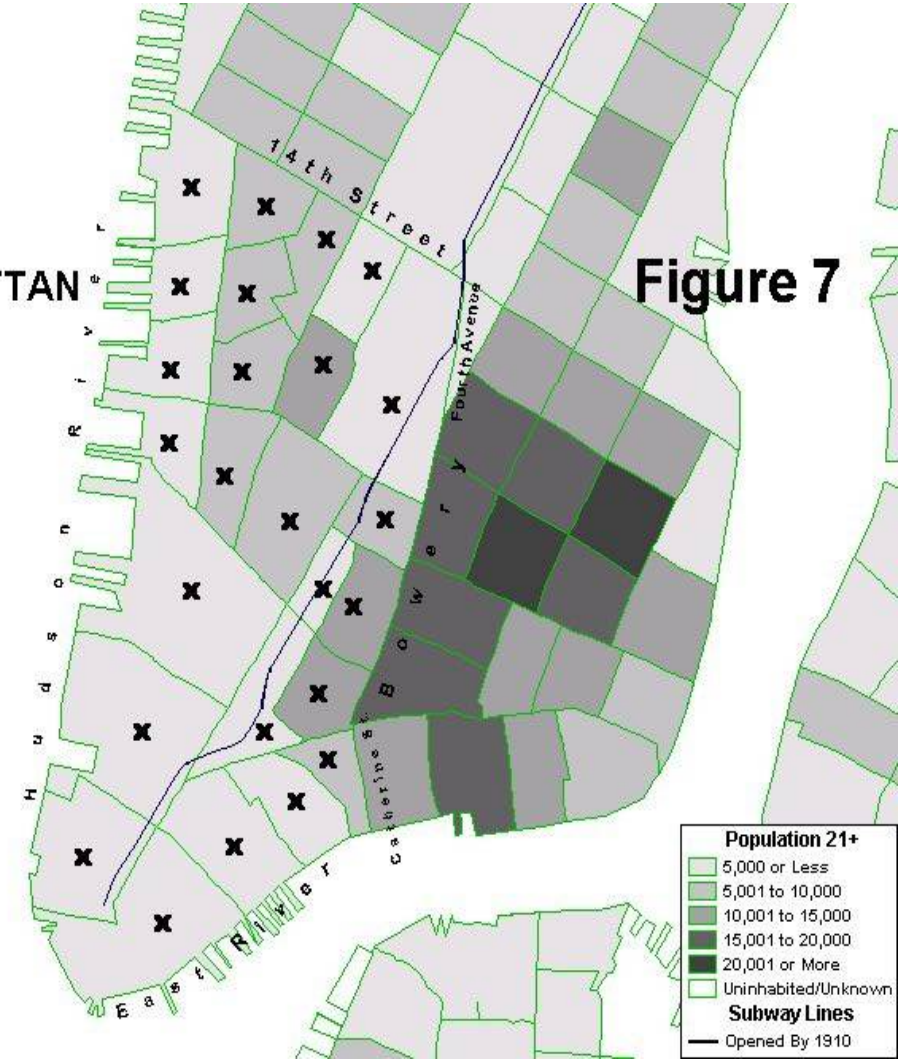


Figure 6

1910: OTHER LOWER MANHATTAN POPULATION OF ADULTS 21+ (tracts marked with "x")

Figure 7





1910: MIDTOWN MANHATTAN POPULATION OF ADULTS 21+ (tracts marked with "x")

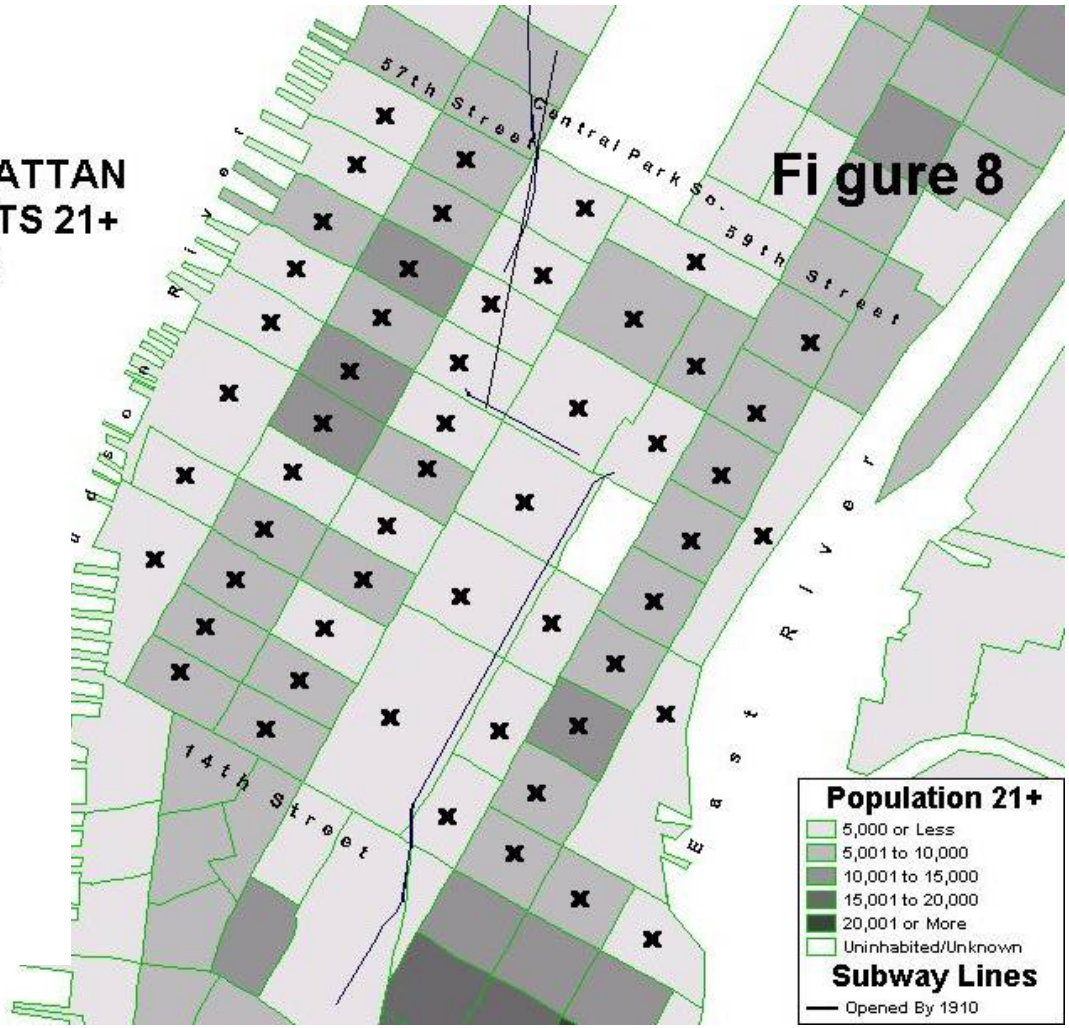
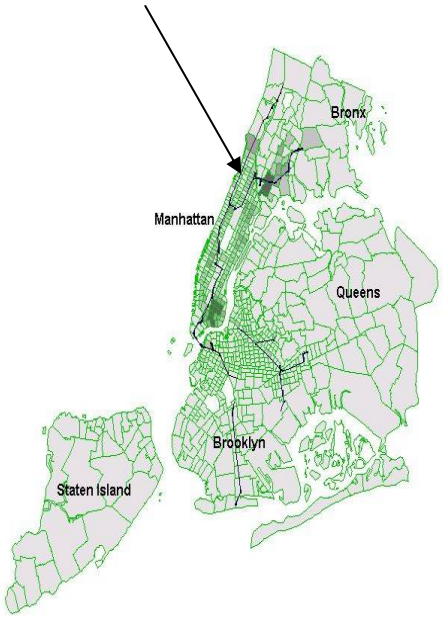


Figure 8

1910: UPTOWN MANHATTAN POPULATION OF ADULTS 21+ (tracts marked with "x")



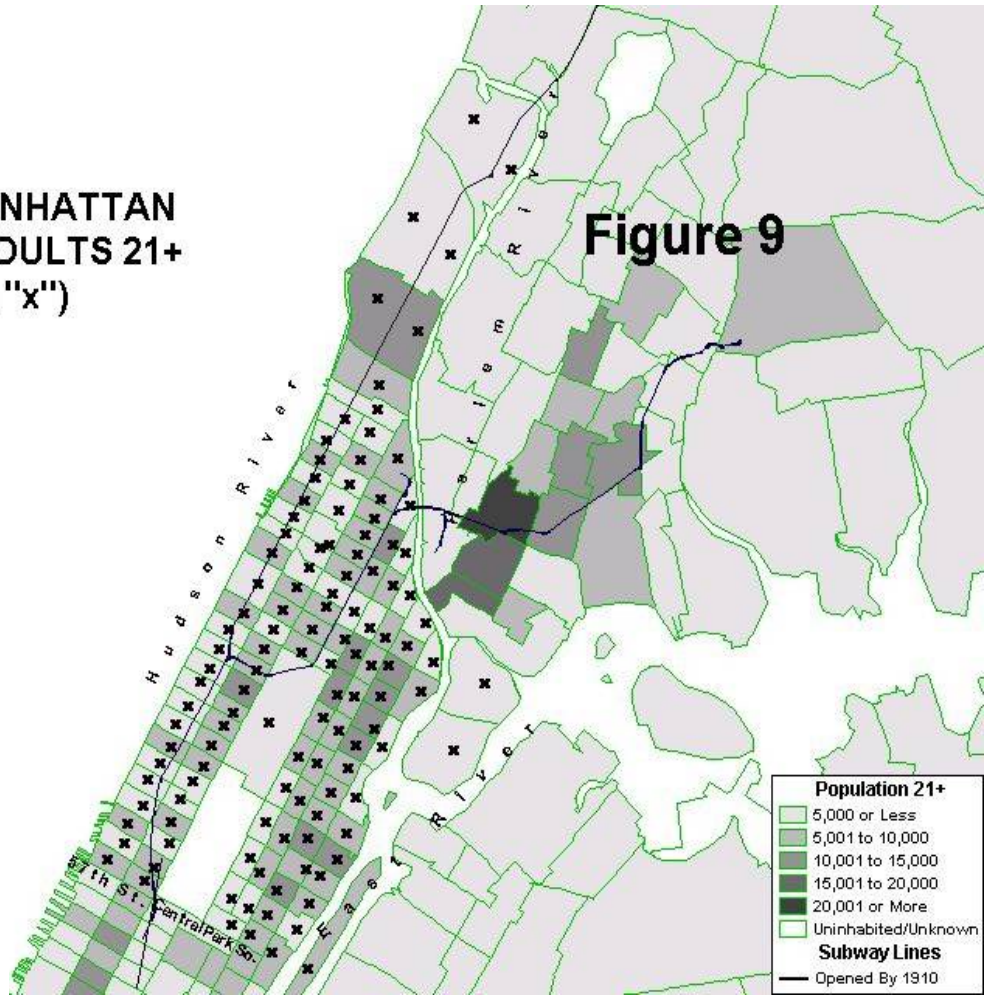
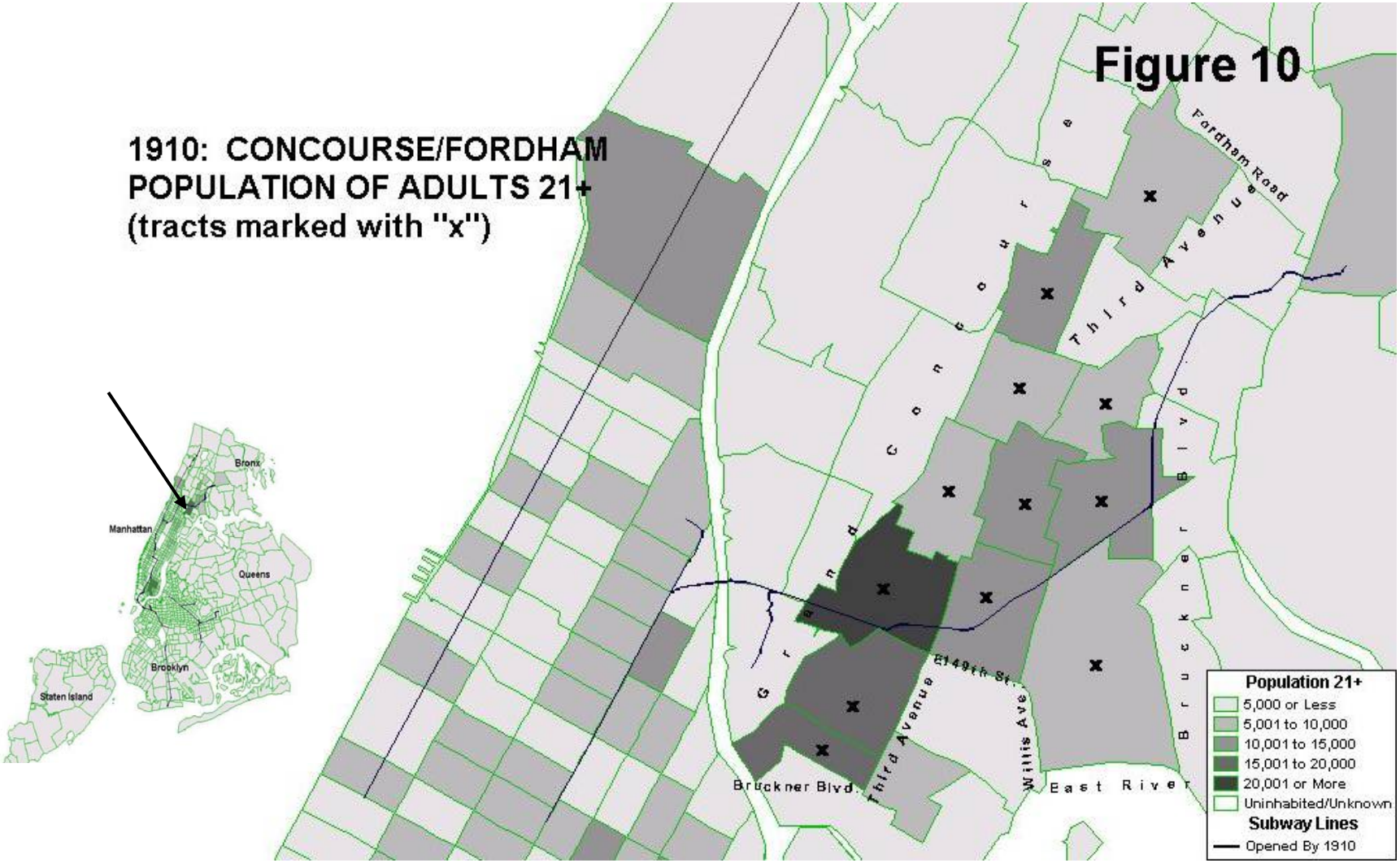


Figure 10


1910: CONCOURSE/FORDHAM
POPULATION OF ADULTS 21+
(tracts marked with "x")
Bronx
Manhattan
Queens
Brooklyn
Staten Island
Concourse
Grand
Third Avenue
Fordham Road
Third Avenue
E149th St.
Willis Ave.
Bruckner Blvd.
Bruckner Blvd
East River
Population 21+
5,000 or Less
5,001 to 10,000
10,001 to 15,000
15,001 to 20,000
20,001 or More
Uninhabited/Unknown
Subway Lines
Opened By 1910

The remaining *Other Greater New York City* locations that are not shown on these close-up maps can be used as a “pseudo-benchmark” or “control group” with the additional analysis that follows. I call this larger region a “pseudo-benchmark” or “control group” given that it had essentially no subway access, and thus this transit mode could not have impacted class configuration of its residential patterns. Although an argument can be made that the *lack* of efficient transportation may have had an influence on settlement structure by class, it is still fair to say that the five communities with subway access would show similar class segmentation as the “pseudo-benchmark” or “control group” if the subway had not been available in their neighborhoods. With this in mind, comparisons will be made on class profiles between each of the different communities with subway service and the larger “pseudo-benchmark” or “control group” region without service.

IV. Class Segmentation

I have divided the concept of class into two categories based on the census variable on "literacy". The combination of middle and upper class adults is examined as one group and is demonstrated by the indicator variable "Literate". The second group of lower class adults is demonstrated by the inverse of that variable, "Illiterate".

To first set the stage, comparisons by class across the aggregate Greater New York area revealed that most residents living in Greater New York were Literate. Of the 2.8 million adults aged 21 and older, 2.6 million or about 91.4% were Literate. With that level of difference, it would not be surprising to see that the scales were tipped in favor of Literate residents in each sub-area as well. However, the operative task is to identify any communities that may lean toward Literacy to a much greater degree than expected. I can then examine the patterns between these skewed areas and availability of subway service. From those observations, I can draw conclusions as to the impact of subway service on settlement patterns by class.

In Table 7 which follows, the proportions of each sub-area were calculated within each of the two class profiles, and there were some stark differences. First I started with the "pseudo-benchmark" or "control group", *Other Greater New York.* In this area, the proportions of Illiterate and Literate adults were very comparable; 44.9% of all Literates in Greater New York City lived in these

outlying areas versus 37.5% of the Greater New York City Illiterate population. This is a ratio of 1.2 Literate to 1.00 Illiterate, very close. Then I reviewed each sub-area with subway service one by one, staring with the very dense *Lower East Side* that was targeted for population dispersal with subway introduction. A much larger proportion of Greater New York City's Illiterate adults lived on the *Lower East Side*, 26.6%, compared with the proportion of Literates at 8.4%. The ratio of 0.3 Literate to 1.0 Illiterate underscores the disparity in this crowded region with regards to class. The *Other Lower Manhattan* community also showed uneven proportions by class, but the gap was narrower. The ratio was 0.5 to 1.0; that is 8.9% of Greater New York City's Illiterate adults resided there compared with 4.4% of Literates. As we get even further away from the *Lower East Side* into other communities that also have subway access, the ratio does an "about-face", turning considerably in favor of Literates. In *Midtown Manhattan*, the ratio was 1.5 to 1.0; 11.3% of Greater New York City's Literate adults settled there compared with only 7.4% of the Illiterate population. The same is true for the *Upper Manhattan* region. In this region, 25.4% of Greater New York City's Literate adults are inhabitants compared with only 17.2% of the Illiterate population, also ratio of 1.5 to 1. Finally, the furthest developing community with new subway service, *Concourse/Fordham,* has the highest degree of inequality, albeit the proportions are small. There it showed a ratio of 2.3 to 1.0, with 5.6% of the Greater New York City's Literate adults compared with only 2.4% of the Greater New York City Illiterate population.

Table 7: 1910 Proportion of Sub-Areas by Class Categories

Sub-Areas	***Total Population Aged 21+***		***Literate Population Aged 21+***		***Illiterate Population Aged 21+***		***Literate to Illiterate***
	#	***%***	***#***	***%***	***#***	***%***	***Ratio***
Lower East Side	280,857	9.9	216,153	8.4	64,704	26.6	0.3 to 1
Other Lower Manhattan	136,262	4.8	114,518	4.4	21,744	8.9	0.5 to 1
Midtown Manhattan	309,983	10.9	291,993	11.3	17,990	7.4	1.5 to 1
Uptown Manhattan	701,254	24.8	659,580	25.4	41,674	17.2	1.5 to 1
Concourse/ Fordham, Bronx	150,991	5.3	145,150	5.6	5,841	2.4	2.3 to 1
Other Greater New York (Control)	1,255,442	44.3	1,164,424	44.9	91,018	37.5	1.2 to 1
Total Greater New York	***2,834,789***	***100.***	***2,591,818***	***100.***	***242,971***	***100.***	

V. Dissimilarity Index

Segregation by class is even more evident when looking at the Dissimilarity Index. The Dissimilarity Index refers to the percentage of one group that would have to change residence in order to produce an even distribution. The figure can range from 0 to 100. The *higher* the number, the more segregated the area is.

For the purposes of developing this Index, I removed the "pseudo-benchmark" or "control group", *Other Greater New York* for the following two reasons: First, the choice of residence location for these inhabitants essentially did not depend on subway availability or lack thereof. Second, for adults who were both living and working in these outlying areas, a not unreasonable conclusion since there is no effective transit system to regularly shuttle them elsewhere, residence change would have been difficult without some sort of transportation infrastructure in place. Table 8, therefore, shows the recalculated proportions of these two class profiles across only those primary areas in Greater New York that had subway service in 1910, and the resulting Index.

Using this method, the Dissimilarity Index was .34, an enormous figure suggesting that a third of one group would have to change residence to produce an even class segmentation across the areas with subway accessibility.

Table 8: 1910 Dissimilarity Index (All Primary Sub-Areas with Subway Access)

Sub-Areas	***Literate Population Aged 21+***		***Illiterate Population Aged 21+***		***Dissimi-larity***
	#	***%***	***#***	***%***	***Index Calculation***
Lower East Side	216,153	15.1	64,704	42.6	.28
Other Lower Manhattan	114,518	8.0	21,744	14.3	.06
Midtown Manhattan	291,993	20.5	17,990	11.8	.09
Uptown Manhattan	659,580	46.2	41,674	27.4	.19
Concourse/ Fordham, Bronx	145,150	10.2	5,841	3.9	.06
Total Sub-Areas with Subway Service	***1,427,394***	***100.***	***151,953***	***100.***	***Index: Sum = .68/2=.34***

I also developed a Dissimilarity Index removing the *Lower East Side* district from the equation. That is, this Index concentrates only on the newly-developed regions with subway service where, if there is equity in transportation

mode development and operation, the settlement patterns should reflect a more equal class profile. The settlement patterns of the *Lower East Side* were established long before subway construction began and so the argument can be made that it was not predominately instigated by subway development. However, even using this new algorithm, the general direction of the Index remained the same.

Table 9 shows the Index to be .16. Thus in this more limited, newly-developed region alone, 16% of one group would have to change residence to yield an even distribution. Although considerably smaller than the .34 figure in the analysis that included the *Lower East Side*, this figure still demonstrated class segregation for upcoming communities.

Table 9: 1910 Dissimilarity Index (Without Lower East Side)

Sub-Areas	***Literate Population Aged 21+***		***Illiterate Population Aged 21+***		***Dissimi-larity***
	#	***%***	***#***	***%***	***Index Calculation***
Other Lower Manhattan	114,518	9.4	21,744	24.9	.16
Midtown Manhattan	291,993	24.1	17,990	20.6	.04
Uptown Manhattan	659,580	54.5	41,674	47.8	.07
Concourse/ Fordham, Bronx	145,150	12.0	5,841	6.7	.05
Total of Newly-Developed Sub-Areas with Subway Service	***1,211,241***	***100.***	***87,249***	***100.***	***Index: Sum = .32/2=.16***

VI. Isolation Index

The Isolation Index is also an important measure of segregation. This Index measures the probability that a randomly chosen member of one group, the Illiterates for example, will next meet another member of this same group. The Index ranges from 0 to 100. The *lower* the number, the more unbalanced the area is. As with the Dissimilarity Index, I first removed the "pseudo-benchmark" or "control group", *Other Greater New York*. And then I recomputed the Index once again removing the pre-transit settled *Lower East Side*.

In Table 10 when the "pseudo-benchmark" or "control group" *Other Greater New York* is deleted from the computation, the Isolation Index was .027, meaning that there was 3% probability that a randomly chosen member of the Illiterate group will next meet another member of the same group. This figure was driven by the unbalance between Literates and Illiterates across the entire city rather than class segmentation within specific sub-areas. And, in this case, this low figure was not necessarily a negative characteristic. While it did show that Illiterates were very much a minority, it also suggested that the "concentration of poverty" would likely not occur despite the skewed figures. In Table 11 when the more limited, newly developed area was examined without the *Lower East Side*, the Index dropped just a bit to .022. This meant that in this limited region, there was a 2% probability that a randomly chosen member of the Illiterate group will next meet another member of the same group. Again, this is not necessarily a negative characteristic of the area.

Table 10: 1910 Isolation Index (All Primary Sub-Areas with Subway Access)

Sub-Areas	***Total Population Aged 21+***	***Illiterate Population Aged 21+***			***Isola-tion***
	#	***Total***	***% of Illiterate***	***% of Total Population***	***Index Calcu-lation***
Lower East Side	280,857	64,704	42.6	4.1	.017
Other Lower Manhattan	136,262	21,744	14.3	1.4	.002
Midtown Manhattan	309,983	17,990	11.8	1.1	.001
Uptown Manhattan	701,254	41,674	27.4	2.6	.007
Concourse/ Fordham, Bronx	150,991	5,841	3.9	0.4	.000
Total of Sub-Areas with Subway Service	***1,579,347***	***151,953***	***100.***		***Index: Sum = .027***

Table 11: 1910 Isolation Index (Without Lower East Side)

Sub-Areas	***Total Population Aged 21+***	***Illiterate Population Aged 21+***			***Isola-tion***
	#	***Total***	***% of Illiterate***	***% of Total Population***	***Index Calcu-lation***
Other Lower Manhattan	136,262	21,744	24.9	1.7	.004
Midtown Manhattan	309,983	17,990	20.6	1.4	.003
Uptown Manhattan	701,254	41,674	47.8	3.2	.015
Concourse/ Fordham, Bronx	150,991	5,841	6.7	0.4	.000
Total of Newly-Developed Sub-Areas with Subway Service	***1,298,490***	***87,249***	***100.***		***Index: Sum = .022***

VII. Exposure Index

The final determination of class segmentation is the Exposure Index which measures the probability that a member of one group, i.e., Illiterates, next meets a member, or interacts with the other class group, taking into consideration the overall size of the other class group across the entire city. The Exposure Index ranges from 0 to the proportion the other class group represents in the larger region. In this case the other group, Literates, was equal to about 91% or more depending upon whether the *Lower East Side* was included in the computation or not. As with the other Indexes, I computed this one twice, once removing the "pseudo-benchmark" or "control group", and then once also removing the *Lower East Side* area.

In Table 12 when the "pseudo-benchmark" or "control group" is deleted from the computation, the Exposure Index was .209, meaning that there was 21% probability that a member of the Illiterate group will next meet a member of the Literates, taking into consideration the size of the group. This figure is rather low given that Literates represent the overwhelming lion's share of the population. In Table 13 with the more limited, region definition, the Index was .319, meaning that there was 32% probability that a member of the Illiterate group will next meet a member of the Literates, taking into consideration the size of the group. This figure is higher confirming the larger proportion of Literates living outside the *Lower East Side*. Yet the figure is still low given the possible range of the Index.

Table 12: 1910 Exposure Index (All Primary Sub-Areas with Subway Access)

Sub-Areas	***Total Population Aged 21+***	***Literate Population Aged 21+***		***Illiterate Population Aged 21+***		***Expo-sure***
	#	***#***	***% of Total Popu-lation***	***#***	***% of Illiterate***	***Index Calcu-lation***
Lower East Side	280,857	216,153	13.7	64,704	42.6	.058
Other Lower Manhattan	136,262	114,518	7.2	21,744	14.3	.010
Midtown Manhattan	309,983	291,993	18.5	17,990	11.8	.022
Uptown Manhattan	701,254	659,580	41.8	41,674	27.4	.115
Concourse/ Fordham, Bronx	150,991	145,150	9.2	5,841	3.9	.004
Total Sub-Areas with Subway Service	***1,579,347***	***1,427,394***	***90.4***	***151,953***	***100.***	***Index: Sum = .209***

Table 13: 1910 Exposure Index (Without Lower East Side)

Sub-Areas	***Total Population Aged 21+***	***Literate Population Aged 21+***		***Illiterate Population Aged 21+***		***Expo-sure***
	#	***#***	***% of Total Popu-lation***	***#***	***% of Illiterate***	***Index Calcu-lation***
Other Lower Manhattan	136,262	114,518	8.8	21,744	24.9	.022
Midtown Manhattan	309,983	291,993	22.5	17,990	20.6	.046
Uptown Manhattan	701,254	659,580	50.8	41,674	47.8	.243
Concourse/ Fordham, Bronx	150,991	145,150	11.2	5,841	6.7	.008
Total of Newly Developed Sub-Areas with Subway Service	***1,298,490***	***1,211,241***	***93.3***	***87,249***	***100.***	***Index: Sum = .319***

VIII. Summary

Data from 1910 indicated that there was a strong relationship between residential development and subway expansion, in terms of both population growth and class profile of the newly developed communities.

First, six years after subway introduction and a decade since its award, there appeared to be considerable migration from the *Lower East Side* to other sections of Greater New York and this migration was essentially limited to where there was subway access. However, crowding on the *Lower East Side* was still evident given that density figures were 4 times higher than other areas with subway service and 40 times higher than areas without service.

There was also evidence of class segmentation in new settlements, and the gap widened the further the distance from the *Lower East Side*. Of the 2.8 million adults aged 21 and older living in the Greater New York City area, about 91.4% were Literate, and this proportion of Literates to Illiterates almost held steady in the “pseudo-benchmark” or “control group”, the region without subway service. However, the class profile of the *Lower East Side* was hugely disproportionate in favor of Illiterates. And on the other side of the continuum, new settlement areas in Manhattan and the Bronx marked a complete reversal in favor of Literates. Using the areas without long-introduced subway service as the “pseudo-benchmark” or “control group”, I demonstrated that the subway was one factor contributing to class divisions in residential patterns. The Dissimilarity

Index of .34 meant that 34% of each group would have had to change residence to produce an even class segmentation, a huge figure. The Dissimilarity Index was also re-computed removing the *Lower East Side* district from the equations to concentrate only on the newly-developed regions with subway service, not regions where the settlement patterns were established long before subway construction began. Even without the highly skewed *Lower East Side*, 16% of each group would have had to change residence. The Exposure Index was .209, meaning that there was 21% probability that a member of the Illiterate group will next meet a member of the Literates, taking into consideration the size of the group. This figure was low given that the Literates represent the vast majority of residents. When excluding the *Lower East Side*, the Index was .319, and higher figure but still confirming the inequitable structure in new communities. The Isolation Index was also low, .027 with the *Lower East Side* in the computation and .022 without, suggesting that Illiterates were alone in some communities. However, the low Isolation Index figure was a reflection of the disparity of class across the entire Greater New York area rather than class segmentation of certain districts. And this low figure had an upside. The “concentration of poverty” appeared unlikely.

CHAPTER 5: LATER IMPACT OF SUBWAY DEVELOPMENT — NEW YORK CITY IN 1920

I. Introduction

I demonstrated in the prior chapter that by 1910, six years after the introduction of the subway and about a decade since its major planning, settlements grew in outlying areas of Greater New York City concomitant with subway expansion. Yet new dwellings along subway routes in outlying areas tended to be filled with a disproportionate number of middle and upper class adults.

In this chapter, I looked at the continuing impact of transit on residential development by class during the next decade. It was now 15 years after the subway was first operational and two decades since the subway contract was awarded and planning began. By 1920, the subway expanded with several new routes, saturating some communities and entering into others for the first time. The automobile and its infrastructure (i.e., roads) also started to make its presence known in the region.

Settlement pattern comparisons between 1910 and 1920 were conducted an illustrated in the chapter. In addition, one new community was added for a closer look in this decade given its rise in population and recent subway introduction.

II. An Overall Look at New York City

The census of 1920 indicated that 5.6 million persons lived in the Greater New York area. That was an increase of about .8 million or 17% compared to a decade ago when the population figure was at 4.8 million. This growth in one decade was enormous, albeit less than the 41% growth seen during the preceding decade. However, population growth was not equal across all the specific sub-areas within Greater New York City, as discussed in detail in Section III in this chapter.

The subway was introduced into new communities between 1910 and 1920, with the award of several new contracts to competing companies. Yet by legal contract, fare policy was established by the municipality, not by the individual commercial operator. And this contract stipulated that the five cent fare was to remain in tact.[125] Profit margins were lower in 1920, and best capitalized by increasing ridership, a marketing shift from the initial strategy that featured upscale amenities designed to attract only a subset of individuals. With this in mind, expansion of subway penetration continued. In Manhattan, subway routes ran parallel on the east and west sides of the island, running from the most southern tip and up past the northern boarder into the western sections of the Bronx. Also in the Bronx, the 1910 *Concourse/Fordham* route was extended several miles further north, and two additional routes were added connecting Manhattan with sections in the more eastern side of Bronx County. Moreover,

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[125]Clifton Hood, 722 Miles (Baltimore: John Hopkins University Press, 1995) 73.

Queens became accessible by subway during this decade. In Queens, two routes heading east from Midtown Manhattan shared an underground tunnel just across the East River to Long Island City. One leg of the route then veered north into the community of Astoria and the other one continued to head east through the center of the borough past Jackson Heights and into Corona. In Brooklyn, a new route now connected the borough to Manhattan that ran along Brooklyn's northern boarder into Williamsburg and Bushwick, and then continuing all the way into the southwestern Ridgewood section of Queens. Thus, with the exception of Staten Island, all of the boroughs had some direct subway service coming in and out of Manhattan by the end of the decade.

This decade also marks the start of a significant proliferation of the automobile. In particular, ownership of the Model T was growing as the assembly line form of manufacturing took off.[126] In the region, roads constructed by entrepreneurs such as Vanderbilt, were introduced first for the fun and games of the very rich and later as a for-profit enterprise.[127]

The first of several maps follow that show the proportion of adults aged 21+ for all census tracts within the Greater New York City area. Also on this map is subway service as of the year 1920. The following features are worth noting:

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[126] Peter Hall, Cities in Civilization (New York: Pantheon Books, 1998) 407.

[127] Long Island Motor Parkway <www.nycroads.com/history>

- The *Lower East Side* is again marked with a cluster of dark grey and black tracts, signifying that it was still the most crowded region.
- The medium grey colors of clusters in *Midtown* and *Uptown Manhattan* heading north out of the *Lower East Side* suggest continued population growth in these areas.
- Population densities in the Bronx appeared to be the highest among all the sub-areas that had early subway access. New subway service in the Bronx, added toward the later half of this decade, had not impacted those service locations as strongly by the 1920 census.
- Population growth in Brooklyn and Queens appeared to be correlated highest with the one route leading directly east from the *Lower East Side* past Williamsburg and Bushwick. Note though that some clusters in Ridgewood, Queens also showed density increases although these areas are beyond the furthest reaches of that subway line. I can speculate that there was some public awareness of soon-to-exist subway extensions into this area.
- Other subway routes through Queens and Brooklyn appeared to have little or no impact as of 1920, yet note that these lines were added late in the decade or, in the case in south Brooklyn, were a mix of slower surface and elevated lines that connect with rapid subway routes.

- Areas without subway service in the Bronx, Queens, Brooklyn and Staten Island were considerably under-populated compared with the rest of the city, confirming the impact of transit access on residential choice.

1920: GREATER NEW YORK
POPULATION OF ADULTS AGE 21+
AND EXISTING SUBWAY LINES

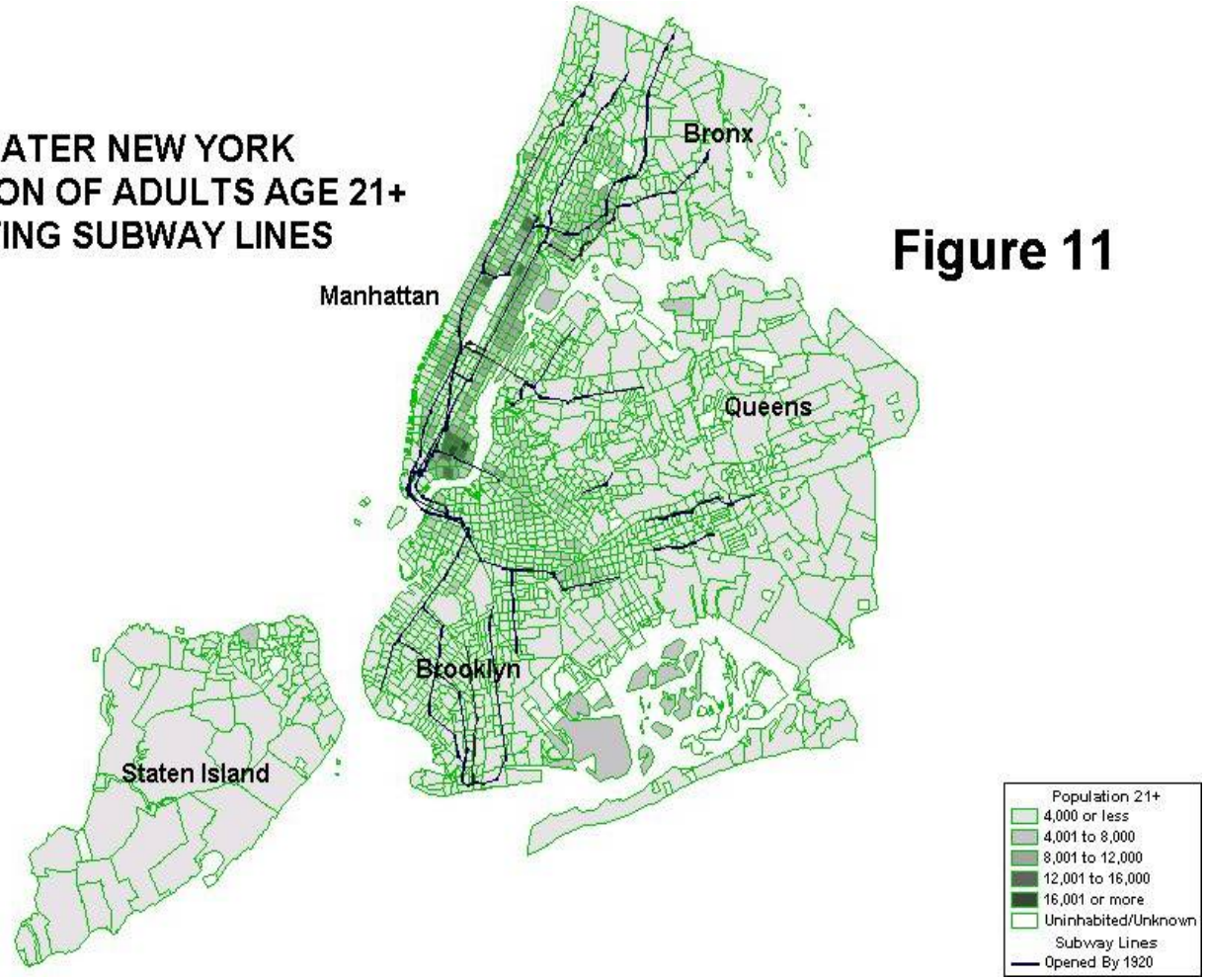


Figure 11

III. Sub-Area Population and Density

Table 14 shows how the city adult population was segmented in 1920 using the same community definitions I established when examining 1910 data. Again, a considerable portion of the city's population, 2.8 million of the 5.6 million or 50%, was living in Bronx areas outside the *Concourse/Fordham* neighborhood, or in Queens, Brooklyn and Staten Island. This region was predominately without subway service. Nevertheless, with an acreage equaling more than 155 thousand acres, 91% of the entire city's landmass, the density was still very low, averaging only 18.05 persons per acre. Compared to density figures in the other communities that ranged from 111.25 to 416.52, this figure was miniscule. As I found with 1910 figures, this confirmed that the most outlying regions were less desirable as living spaces given that there were virtually no options for traveling to work or to shop in the inner city on a daily basis.

Of the remaining population in Greater New York, the *Lower East Side* retained the highest density at 416.52 with 8% of the population. The *Other Lower Manhattan* density was far lower, at 111.25 with 3% of the population. The remaining regions were more crowded, albeit not nearly as crowded as the *Lower East Side*. *Midtown Manhattan* held 8% of the population with a density figure of 149.66. With 22% percent living in *Upper Manhattan,* this area had a density score of 159.80. The *Concourse/Fordham* section of the Bronx grew to be occupied by 9% of the population with a density score of 239.73.

Table 14: 1920 Sub-Area Population and Density

Sub-Areas	***Population***		***Acreage***		***Density***
	#	***%***	***#***	***%***	***Avg.***
Lower East Side	416,108	7.5	999	.6	416.52
Other Lower Manhattan	184,898	3.3	1,662	1.0	111.25
Midtown Manhattan	429,365	7.7	2,869	1.7	149.66
Uptown Manhattan	1,237,362	22.2	7,743	4.5	159.80
Concourse/Fordham, Bronx	511,097	9.2	2,132	1.2	239.73
Other Greater New York City (Control)	2.801,383	50.2	155,175	91.0	18.05
Total Greater New York City	***5,580,213***	***100.***	***170,580***	***100.***	***32.71***

Tables 15 and 16 illustrate the differences in population between 1920 and the census taken in 1910. Most importantly, population figures on the *Lower East Side* dropped by about 126,000 persons or 4 proportional percentage points. This reduced the density to a large extent, from 542.60 persons per acre to 416.52. Given that Greater New York City grew by almost a million persons since 1910, this suggested that older settlement patterns have begun to shift. *Other Lower Manhattan* and *Midtown Manhattan* locations also show fewer residents, roughly 41 thousand and 31 thousand, respectively. And each of these areas shows a slightly reduced proportion of the city's population by one

and two percentage points, respectively. Density scores also decreased in these two areas, -24.91 and -10.86 respectively. *Uptown Manhattan* gained in population, about 135,000, and in density, +17.39 persons per acre, but this gain was not enough to hold on to its proportion of the city's population; the region lost about 1 percentage point.

The big gainers were the outlying regions. Population in the *Concourse/Fordham* section of the Bronx just about doubled and now represented about 9% of Greater New York's residents, an increase of about 4 percentage points. Thus, the density score at 239.73 also doubled, making it the second most congested community after the *Lower East Side*. While *Other Greater New York City*, the "pseudo-benchmark" or "control group", gained about 622,000 persons, the impacts was small given the size of the area; the density score just crawled up a bit from 14.04 to 18.05.

Table 15: Comparison of 1910 and 1920 Sub-Area Population

Sub-Areas	***Population 1910***		***Population 1920***		***Difference +/-***	
	#	***%***	***#***	***%***	***#***	***%***
Lower East Side	542,061	11.4	416,108	7.4	-125,953	-4.0
Other Lower Manhattan	226,299	4.7	184,898	3.3	-41,401	-1.4
Midtown Manhattan	460,520	9.7	429,365	7.7	-31,155	-2.0
Uptown Manhattan	1,102,662	23.1	1,237,362	22.2	+134,700	-0.9
Concourse/Fordham, Bronx	256,788	5.4	511,097	9.2	+254,309	+3.8
Other Greater New York City (Control)	2,178,553	45.7	2,801,383	50.2	+622,830	+4.5
Total Greater New York City	***4,766,883***	***100.***	***5,580,213***	***100.***	***+813,330***	

Table 16: Comparison of 1910 and 1920 Sub-Area Density

Sub-Areas	***1910***	***1920***	***Difference +/-***
	Avg.	***Avg.***	***Avg.***
Lower East Side	542.60	416.52	-126.08
Other Lower Manhattan	136.16	111.25	-24.91
Midtown Manhattan	160.52	149.66	-10.86
Uptown Manhattan	142.41	159.80	+17.39
Concourse/Fordham, Bronx	120.44	239.73	+119.29
Other Greater New York City	14.04	18.05	+4.01
Total Greater New York City	***27.95***	***32.71***	***+4.76***

Analysis from this point forward is based upon adults aged 21+. As in 1910, Table 17 demonstrates that proportional figures in 1920 were roughly the same by area when using adults 21+ as with the total population. Differences do not vary more than 2%.

Table 17: 1920 Population Aged 21+ vs. Total Population

Sub-Areas	***Total Population***		***Population Aged 21+***		***Difference***
	#	***%***	***#***	***%***	***+/-%.***
Lower East Side	416,108	7.4	228,918	6.6	-0.8
Other Lower Manhattan	184,898	3.3	109,777	3.2	-0.1
Midtown Manhattan	429,365	7.7	295,194	8.6	+0.9
Uptown Manhattan	1,237,362	22.2	833,472	24.2	+2.0
Concourse/Fordham, Bronx	511,097	9.2	304,737	8.8	-0.4
Other Greater New York City (Control)	2.801,383	50.2	1,674,544	48.6	-1.6
Total Greater New York City	***5,580,213***	***100.***	***3,446,642***	***100.***	

To examine the later impact of the subway, I again visually inspected the region's density figures side by side with subway access based on the map in Figure 11, shown earlier in this chapter. Based on that observation, and taking into consideration known neighborhood boundaries and today's street names, I added one Brooklyn and Queens contiguous community for separate sub-area analysis. *Williamsburg/Bushwick/Ridgewood* included parts of northern Brooklyn and southwest Queens. It was boarded to the north by Metropolitan Avenue and

Wyckoff Avenue, to the east by Myrtle Avenue, to the south by a combination of Kent Street, Flushing Avenue, Marcy Avenue and Lafayette Street, and to the West by the East River directly across from the *Lower East Side*. It was an unusual area given that subway service intruded only part way, yet population development there suggests a closer look. All the other sub-areas were kept constant. Thus *Other Greater New York City* covered all remaining areas in Greater New York City excluding the newly added region in Brooklyn and Queens – *Williamsburg/Bushwick/Ridgewood*. Note that I did not break out the more northern sections of Astoria, Jackson Heights and Corona in Queens; transit was available very late in the decade there, and a preview of the maps indicated little population impact to date.

With that in mind, the maps on the next few pages correspond to each of the six sub-areas for analysis. On each map, the proportion of adults aged 21+ for all census tracts are layered with subway service as of the year 1920. These maps feature the following noteworthy items:

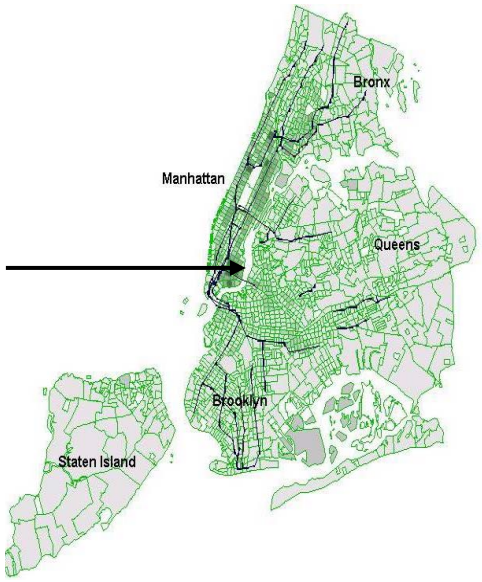
- In Figure 12, the *Lower East Side* had nearby subway service. In 1910, subway access was quite a distance away, to the west of this area. This new subway service extended from the southern tip of Manhattan up a few miles where it made a sharp right across the center of the *Lower East Side* heading directly east into Brooklyn.
- The less crowded *Other Lower Manhattan* region also had additional service by 1920, as indicated by Figure 13. Both the

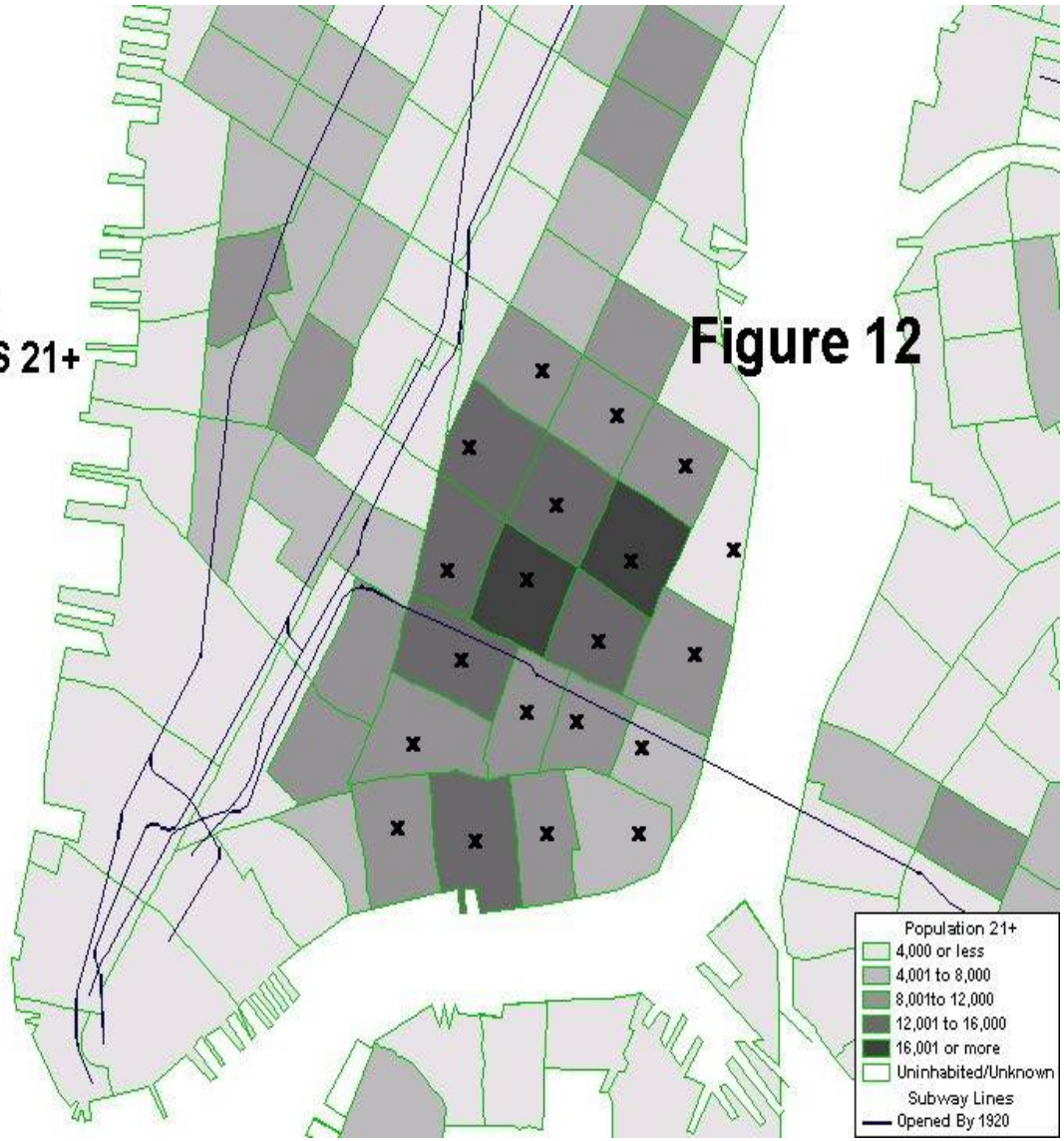
eastern and western boundaries of this region had service heading both north and east out of the area.

- Figure 14 features *Midtown Manhattan* which was less crowded than in 1910. Yet it had several new subway routes going north-south and east-west. Note that the most crowded tracts were not exactly adjacent to the actual subway route. This was in contrast to both the *Lower East Side* and *Other Lower Manhattan* where subway service ran right through the most congested tracts.
- In Figure 15, the most southern end of *Uptown Manhattan* was more congested than the northern tracts. It also showed considerable subway coverage on both the east and western flanks, suggesting that residents living in any tracts within this area were within striking distance of a subway route.
- The Bronx in Figure 16 showed a widespread area of settlements encircled by subway service. Surprisingly, some of the more tracts were both congested and quite a distance from the closest station.
- In Figure 17 showing Brooklyn and Queens, development appeared to be gravitating around a straight line from the East River and heading east. Subway service only went part-way, yet residential developments extended well beyond the last stop, indicating that settlements may have been planned in anticipation of further subway developments.

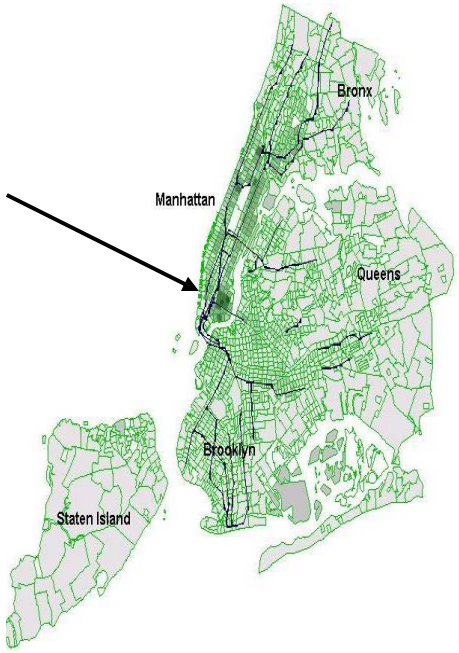
Figure 12

1920: LOWER EAST SIDE POPULATION OF ADULTS 21+ (tracts marked with "x")





1920: OTHER LOWER MANHATTAN
POPULATION OF ADULTS 21+
(tracts marked with "x")



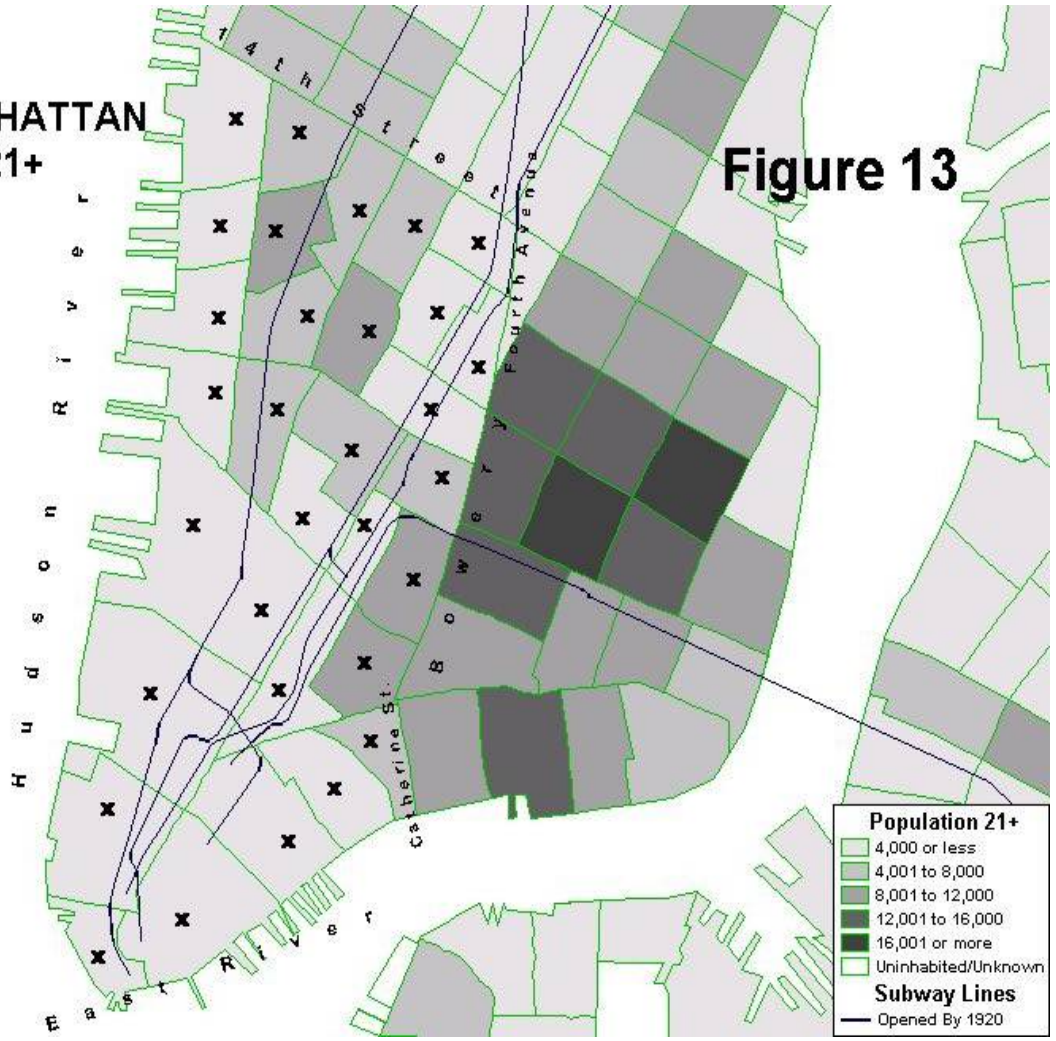


Figure 13

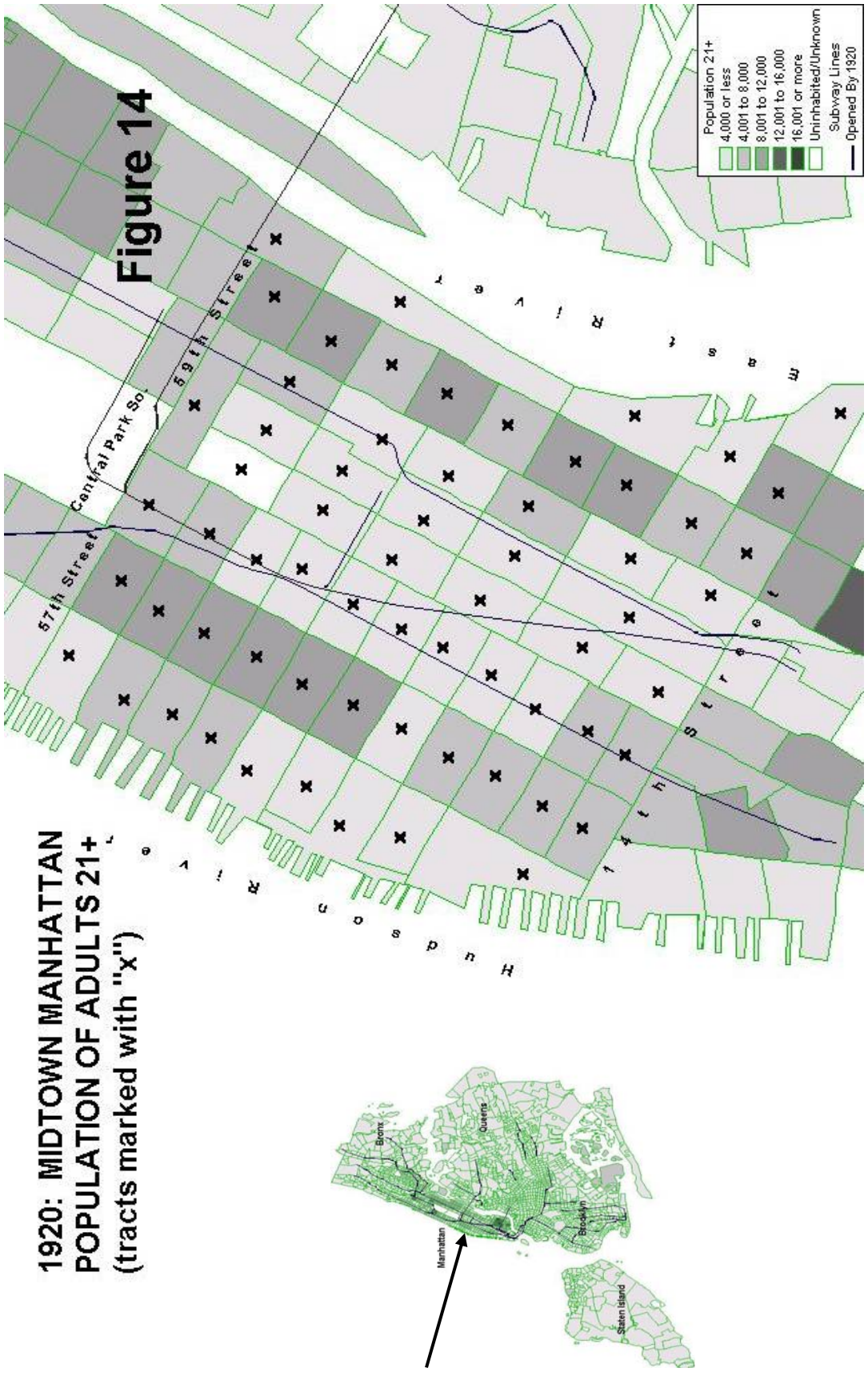
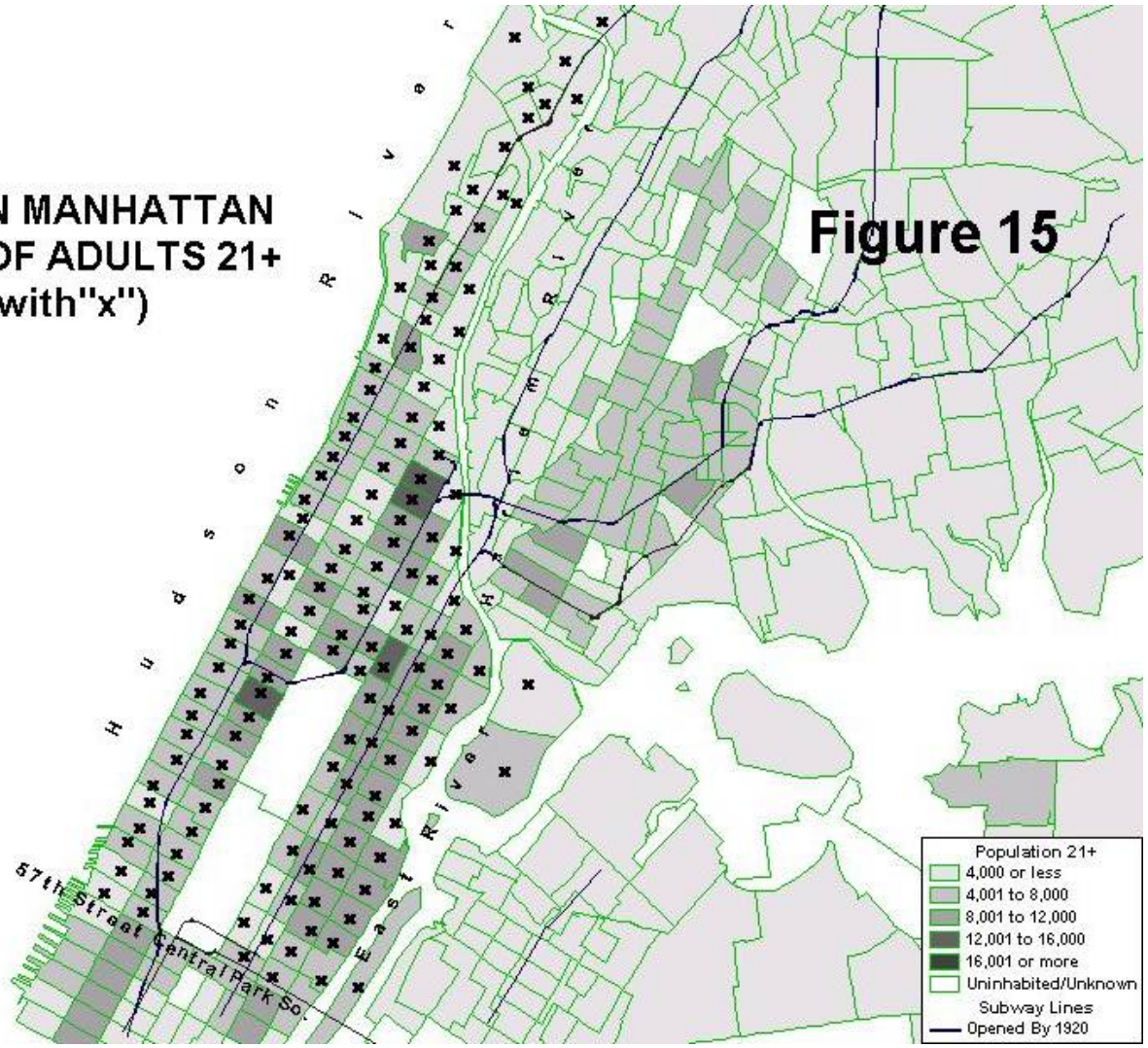


Figure 14
1920: MIDTOWN MANHATTAN
POPULATION OF ADULTS 21+
(tracts marked with "x")
Population 21+
4,000 or less
4,001 to 8,000
8,001 to 12,000
12,001 to 16,000
16,001 or more
Uninhabited/Unknown
Subway Lines
Opened By 1920
Central Park So
59th Street
57th Street
11th Street
Hudson River
East River
Bronx
Queens
Brooklyn
Manhattan
Staten Island

1920: UPTOWN MANHATTAN POPULATION OF ADULTS 21+ (tracts marked with"x")

Figure 15



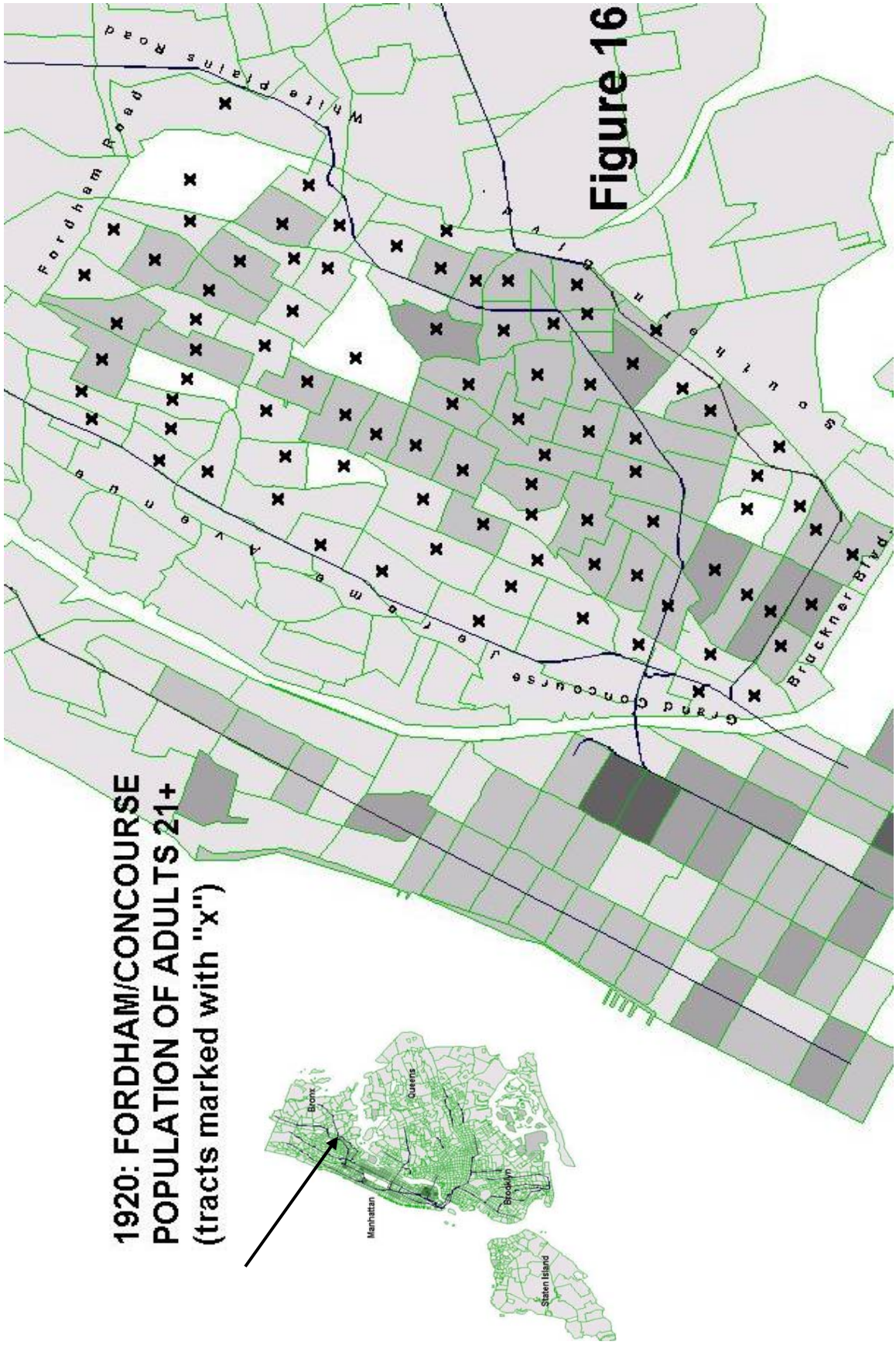
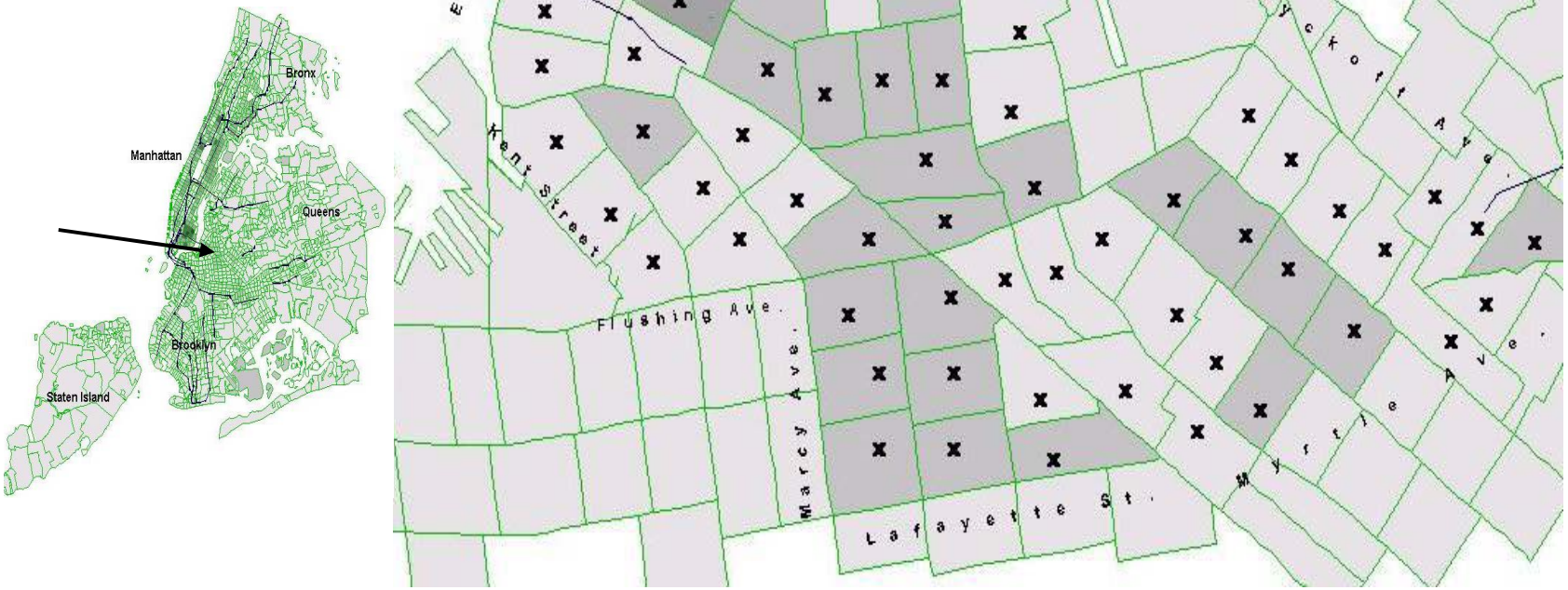


Figure 16
1920: FORDHAM/CONCOURSE
POPULATION OF ADULTS 21+
(tracts marked with "x")
Fordham Road
White Plains Road
Grand Concourse
Jerome Avenue
Bruckner Blvd
Bronx
Queens
Manhattan
Brooklyn
Staten Island


1920: WILLIAMSBURG/BUSHWICK/RIDGEWOOD
POPULATION OF ADULTS 21+
(tracts marked with an "x")
Figure 17
Bronx
Manhattan
Queens
Brooklyn
Staten Island
Metropolitan Ave.
Flushing Ave.
Lafayette St.
Myrtle Ave.
Wyckoff Ave.
Marcy Ave.
Kent Street

Remaining Greater New York City locations that are not shown on these close-up maps can still be used as a “pseudo-benchmark” or “control group” with the additional analysis that follows. These were areas with no subway service, or where subway access was introduced late in the decade. Thus, by 1920, it was too early to say that transit would have impacted residential patterns there.

IV. Class Segmentation

Using the same two categories to indicate the concept of class, middle and upper class described by the variable “Literate” and lower class described by the variable “Illiterate”, Table 18 still reveals a considerable disparity in settlement patterns across individual neighborhoods within Greater New York in 1920.

As in 1910, most residents living in Greater New York were Literate. Of the more than 3.4 million adults aged 21 and older, 3.2 million or about 92.1% were Literate, virtually no change since 1910 when 91.4% were classified as Literate. However, the share of class within each sub-area is glaringly different. First let’s start with *Other Greater New York* region as defined in 1910. These were tracts that were considered as the “pseudo-benchmark” or “control group” in 1910. In this area, the proportions of Illiterate and Literate adults were very comparable; 49.1% of all Literates in Greater New York City lived in these outlying areas versus 42.2% of the Greater New York City Illiterate population. This was a ratio of 1.2 Literate to 1.0 Illiterate, very close, and unchanged from 1910. However, looking closer at this area, the new community for analysis, *Williamsburg/Bushwick/Ridgewood,* was skewed a bit toward the Illiterate group with a ratio of 0.7 to 1, while the rest of the area was skewed in the other direction at a ratio of 1.3 to1. This is contrary to the pattern we saw in 1910 when newly developed communities with subway service attracted more Literates than Illiterates. Next the congested *Lower East Side* continued to

house a much larger proportion of Greater New York City's Illiterate adults compared with other districts, 20.3%, vs. the proportion of Literates at 5.5%. The ratio of 0.3 Literate to 1.0 also remained unchanged since 1910 suggesting that Illiterates and Literates may have migrated out of the area at the same rate during the second decade of subway service. The *Other Lower Manhattan* community showed a very slight change toward more uneven proportions by class, 2.9% of the Literates and 6.9% of the Illiterates resided there in 1920. The ratio was 0.5 to 1.0 in 1910 and shifted every so slightly to 0.4 to 1.0. *Midtown Manhattan* exhibited the same trend. In 1920, 8.8% of the Literate population resided here vs. 6.2% of the Illiterate population, a ratio of 1.4 to 1 which was a very slight improvement over 1910's ratio of 1.5 to 1.0. *Uptown Manhattan*, however, showed no change. In 1920, 24.8% of the Literate population resided there vs. 16.9% of the Illiterate. This was a ratio of 1.5 to 1.0 and was unchanged over the decade. The *Concourse/Fordham* section of the Bronx was the only region with a substantial difference. Class distribution essentially equalized, moving from a ratio of 2.3 to 1.0 to a much closer 1.2 to 1.0. In 1920, 8.9% of the Literate population and 7.5% of the Illiterate population settled in this area.

Table 18: 1920 Proportion of Sub-Areas by Class Categories

Sub-Areas	***Total Population Aged 21+***		***Literate Population Aged 21+***		***Illiterate Population Aged 21+***		***Literate to Illiterate***
	#	***%***	***#***	***%***	***#***	***%***	***Ratio***
Lower East Side	228,918	6.6	173,530	5.5	55,388	20.3	0.3 to 1
Other Lower Manhattan	109,777	3.2	91,027	2.9	18,750	6.9	0.4 to 1
Midtown Manhattan	295,194	8.6	278,224	8.8	16,970	6.2	1.4 to 1
Uptown Manhattan	833,472	24.2	787,290	24.8	46,182	16.9	1.5 to 1
Concourse/ Fordham, Bronx	304,737	8.8	284,100	8.9	20,637	7.5	1.2 to 1
Williamsburg /Bushwick /Ridgewood	227,132	6.6	200,982	6.3	26,150	9.6	0.7 to 1.0
Other Greater New York City (Control)	1,447,412	42.0	1,358,256	42.8	89,156	32.6	1.3 to 1
Total Greater New York City	***3,446,642***	***100.***	***3,173,409***	***100.***	***273,233***	***100.***	

48.6 *49.1* *42.2* *1.2to 1*

Table 19: Comparison of 1910 and 1920 Ratios

Sub-Areas	***1910***	***1920***	***Ratio Change***
	Ratio	***Ratio***	***Direction***
Lower East Side	0.3 to 1	0.3 to 1	No change
Other Lower Manhattan	0.5 to 1	0.4 to 1	Very slight move to less equality
Midtown Manhattan	1.5 to 1	1.4 to 1	Very slight move to more equality
Uptown Manhattan	1.5 to 1	1.5 to 1	No change
Concourse/ Fordham, Bronx	2.3 to 1	1.2 to 1	Major change to more equality
Williamsburg /Bushwick /Ridgewood			
Other Greater New York City (Control)	1.2 to 1	1.2 to 1	No change

V. Dissimilarity Index

The Dissimilarity Index refers to the percentage of one group that would have to change residence in order to produce an even distribution. The Index can range from 0 to 100; the *higher* the number the more segregated the area is. As in 1910, for the purposes of developing this Index, I removed the "pseudo-benchmark" or "control group", *Other Greater New York*. In these locations without subway service, the residence choice did not depend on subway availability.

The computations yielded a Dissimilarity Index of .29, suggesting that about one in four of one class would have to move to produce an even class segmentation. While this number was an improvement over the .34 computed based on 1910 data, it still stood as a large number, 10 years later.

Table 20: 1920 Dissimilarity Index (All Primary Sub-Areas with Subway Access)

Sub-Areas	***Literate Population Aged 21+***		***Illiterate Population Aged 21+***		***Dissimilarity Index Calculation***	
	#	***%***	***#***	***%***	***1920***	***1910***
Lower East Side	173,530	9.5	55,388	30.1	.21	.28
Other Lower Manhattan	91,027	5.0	18,750	10.2	.05	.06
Midtown Manhattan	278,224	15.3	16,970	9.2	.06	.09
Uptown Manhattan	787,290	43.4	46,182	25.1	.18	.19
Concourse/ Fordham, Bronx	284,100	15.7	20,637	11.2	.05	.06
Williamsburg /Bushwick /Ridgewood	200,982	11.1	26,150	14.2	.03	na
Total of Sub-Areas with Subway Service	***1,815,153***	***100.***	***184,077***	***100.***	***Index: Sum = .58/2=.29***	***Index: Sum = .68/2=.34***

na= not available

And by removing the *Lower East Side* from the equations, concentration was placed on newly-developed regions with subway access where transit was

expected to have its largest impact. This perspective showed that conditions had begun to stabilize. The Index in Table 21 is .17, almost equal to the .16 from 1910 data, and shows that 17% of one group must have changed residence for class balance. Thus class stratification in the aggregate newly-developed settlements had remained the same, as all classes migrated out of the *Lower East Side* at about the same rate.

Table 21: 1920 Dissimilarity Index (Without Lower East Side)

Sub-Areas	***Literate Population Aged 21+***		***Illiterate Population Aged 21+***		***Dissimilarity Index Calculation***	
	#	***%***	***#***	***%***	***1920***	***1910***
Other Lower Manhattan	91,027	5.5	18,750	14.6	.09	.15
Midtown Manhattan	278,224	17.0	16,970	13.2	.04	.03
Uptown Manhattan	787,290	48.0	46,182	35.9	.12	.07
Concourse/ Fordham, Bronx	284,100	17.3	20,637	16.0	.01	.05
Williamsburg /Bushwick /Ridgewood	200,982	12.2	26,150	20.3	.08	na
Total of Newly-Developed Sub-Areas with Subway Service	***1,641,623***	***100.***	***128,689***	***100.***	***Index: Sum = .34/2=.17***	***Index: Sum = .32/2=.16***

na= not available

VI. Isolation Index

The Isolation Index measures the probability that a randomly chosen member of one group will next meet another member of the same group. The *lower* the number, the more disparity there is. As with 1910 data, the Index was

computed twice, once removing *Other Greater New York* and once also removing the *Lower East Side*.

In Table 22 the Isolation Index was .019, meaning that there is 2% probability that a randomly chosen member of the Illiterate group will next meet another member of the same group, slightly less than the 3% obtained using 1910 data. This figure was entirely driven by the disparity by class in the entire Greater New York City region and does not change measurably, at .016, even when computed without the *Lower East Side*. Again, the low figure indicated that the “concentration of poverty” cycle was not an issue.

Table 22: 1920 Isolation Index (All Primary Sub-Areas with Subway Access)

Sub-Areas	***Total Population Aged 21+***	***Illiterate Population Aged 21+***			***Isolation Index Calculation***	
	#	***#***	***% of Illiterate***	***% of Total Population***	***1920***	***1910***
Lower East Side	228,918	55,388	30.1	2.8	.008	.017
Other Lower Manhattan	109,777	18,750	10.2	0.9	.001	.002
Midtown Manhattan	295,194	16,970	9.2	0.9	.001	.001
Uptown Manhattan	833,472	46,182	25.1	2.3	.006	.007
Concourse/ Fordham, Bronx	304,737	20,637	11.2	1.0	.001	.000
Williamsburg /Bushwick /Ridgewood	227,132	26,150	14.2	1.3	.002	Na
Total of Sub-Areas with Subway Service	***1,999,230***	***184,077***	***100.***	***9.2***	***Index: Sum = .019***	***Index: Sum = .027***

na= not available

Table 23: 1920 Isolation Index (Without Lower East Side)

Sub-Areas	***Total Population Aged 21+***	***Illiterate Population Aged 21+***			***Isolation Index Calculation***	
	#	***#***	***% of Illiterate***	***% of Total Population***	***1920***	***1910***
Other Lower Manhattan	109,777	18,750	14.6	1.0	.001	.004
Midtown Manhattan	295,194	16,970	13.2	1.0	.001	.003
Uptown Manhattan	833,472	46,182	35.9	2.6	.009	.015
Concourse/ Fordham, Bronx	304,737	20,637	16.0	1.2	.002	.000
Williamsburg /Bushwick /Ridgewood	227,132	26,150	20.3	1.5	.003	na
Total of Newly Developed Sub-Areas with Subway Service	***1,770,312***	***128,689***	***100.***	***7.3***	***Index: Sum = .016***	***Index: Sum = .022***

na= not available

VII. Exposure Index

The final measure of class segmentation is the Exposure Index which measures the probability of a member of one group, Illiterates, meeting or interacting with a member of the other class group, taking into consideration the size of the other group. The Exposure Index ranges from 0 to the proportion the other class group represents in the larger region. Again, as with the other Indices, I computed this Index twice, once removing the "pseudo-benchmark" or "control group", and then also removing the *Lower East Side* area.

In Table 24 when the "pseudo-benchmark" or "control group" was deleted from the computation, the Exposure Index was .173, meaning that there was a 17% probability that a member of the Illiterate group will have next meet a member of the Literates, taking into consideration the size of the group. This presents a slightly worse picture than in 1910 when the Index was .209. In Table 25 with the more limited, region definition, the same is true. The Index is .237, meaning that there is 24% probability that a member of the Illiterate group will have next met a member of the Literates, taking into consideration the size of the group. And this figure is considerably lower than the .319 obtained in 1910.

Table 24: 1920 Exposure Index (All Primary Sub-Areas with Subway Access)

Sub-Areas	***Total Population Aged 21+***	***Literate Population Aged 21+***		***Illiterate Population Aged 21+***		***Exposure Index Calculation***	
	#	***#***	***% of Total Pop***	***#***	***% of Illiterate***	***1920***	***1910***
Lower East Side	228,918	173,530	8.7	55,388	30.1	.026	.058
Other Lower Manhattan	109,777	91,027	4.6	18,750	10.2	.005	.010
Midtown Manhattan	295,194	278,224	13.9	16,970	9.2	.013	.022
Uptown Manhattan	833,472	787,290	39.4	46,182	25.1	.099	.115
Concourse/ Fordham, Bronx	304,737	284,100	14.2	20,637	11.2	.016	.004
Williamsburg /Bushwick /Ridgewood	227,132	200,982	10.0	26,150	14.2	.014	na
Total of Sub-Areas with Subway Service	***1,999,230***	***1,815,153***	***90.8***	***184,077***	***100.***	***Index: Sum = .173***	***Index: Sum = .209***

na=not available

Table 25: 1920 Exposure Index (Without Lower East Side)

Sub-Areas	***Total Population Aged 21+***	***Literate Population Aged 21+***		***Illiterate Population Aged 21+***		***Exposure Index Calculation***	
	#	***#***	***% of Total Pop***	***#***	***% of Illiterate***	***1920***	***1910***
Other Lower Manhattan	109,777	91,027	5.1	18,750	14.6	.007	.022
Midtown Manhattan	295,194	278,224	15.7	16,970	13.2	.021	.046
Uptown Manhattan	833,472	787,290	44.5	46,182	35.9	.160	.243
Concourse/ Fordham, Bronx	304,737	284,100	16.0	20,637	16.0	.026	.008
Williamsburg /Bushwick /Ridgewood	227,132	200,982	11.4	26,150	20.3	.023	na
Total of Newly Developed Sub-Areas with Subway Service	***1,770,312***	***1,641,623***	***92.7***	***128,689***	***100.***	***Index: Sum = .237***	***Index: Sum = .319***

na=not available

VIII. Summary

In 1920, sixteen years after subway introduction and two decades after its award and planning, the Greater New York City area continued to take shape as service expanded.

Populations in regions with subway service for more than a decade continued to grow, while density of the *Lower East Side* lessened but still demonstrated tremendous congestion. In particular, both the *Midtown Manhattan* and *Uptown Manhattan* sections were more crowded. And the populations in *Williamsburg/Bushwick/Ridgwood* sections of Brooklyn and Queens also grew with the introduction of subway service, even beyond the last station stop. Yet it was the Bronx that appeared to show the greatest growth, particularly in those locations where the subway was introduced in 1904.

There was also evidence of continuing class segmentation in new settlements. The *Lower East Side, Other Lower Manhattan,* and *Williamsburg/Bushwick/Ridgwood*, a new area for examination in 1920, were skewed toward Illiterates. However, *Midtown Manhattan* and *Uptown Manhattan* showed higher proportional figures of Literates.

However, despite remaining class divisions in neighborhoods, there were signs that subway appeal and access was starting to spread evenly to both classes. First, additional subway routes made access points more convenient for

individuals. Second, migration out of the *Lower East Side* during the decade appeared to be fairly equal for both Literates and Illiterates. Third, the Bronx *Concourse/Fordham* sub-area showed a shift in settlement patterns. In 1910 the figures were skewed toward Literates. In 1920, the proportions appeared to balance out. Fourth, residents in *Williamsburg/Bushwick/Ridgwood*, a new area for examination in 1920, were proportionally comprised more of Illiterates, a departure from the trend we saw in 1910 when subway introduction first captured the interest of mostly Literates.

Overall, the Dissimilarity Index of .29 meant that 26% of each group would have to change residence to produce an even class segmentation. While this number was still large, it showed an improvement compared to .34 in 1910. Even without the highly skewed *Lower East Side*, the Index was .17, equal to the .16 in 1920. However, the Exposure Index, a measure of interaction, showed a slightly worse picture, 173 this decade and .209 in the prior decade, or .237 this decade without the *Lower East Side* vs. a better figure of .319 in 1910. The Isolation Index in 1920 essentially equaled 1910 figures.

Finally, the automobile started to become a new variable during this time. Roads were starting to take shape, also changing the landscape of the city.

CHAPTER 6: CONCLUSIONS AND IMPLICATIONS

I. Overarching Implications of Subway Introduction

It is evident from the research that the subway system had an immediate and huge influence on the shape of New York City. Most importantly were the general effects related to New York City's competitive position vis-à-vis other U.S. cities. The preparation for subway inception helped contribute to the political decision to acquire large parcels of adjacent spaces. In particular, concerns about likely population loss to new subway access areas in the very late 1800's led to the incorporation of lands in Queens, Brooklyn and Staten Island and its population into the Greater New York City area. The landmass increased almost 5 fold and the population almost doubled, boosting the city to the top position among U.S. cities.

Moreover, the move to finally build the subway helped quell commercial leaders' fears of severe business disruption caused by the weather and hazardous social and health issues emerging from the very congested *Lower East Side*. These threats were so serious that they had put New York's top standing as the country's business center at risk. This confirmed Sam Bass Warner's notion that the position of a city in the on going competitive city race often depends upon successes of the business interests that are headquartered there.[128]

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[128] Sam Bass Warner, The Urban Wilderness: A History of the American City (Berkeley: University of California Press, 1995, Paperback ed. 1995) 91.

II. The Subway's Influence on Migration

Beyond these more general issues, the subway also played an important role in the physical landscape of the city. Development of residential spaces throughout the city closely followed the path of the subway, first north through Manhattan and northwest through the Bronx in areas with subway access, and later into section of Queens and Brooklyn where subway lines expanded. The population spread was so apparently correlated to service that settlements were sprouting in areas where service was planned to be introduced shortly thereafter. This broadened the United Nations' report released in 1953 that explained how migration is highly depended upon the availability of transportation systems.[129] The report focused on migration of large distances country to country and across seas. The data in this research gave a micro view of the same phenomena. While slower elevated and surface transit existed in some of these outlying areas prior to subway inauguration, it was only the cleaner, electrified, quieter, and rapid transit benefits of the subway that finally encouraged considerable numbers of individuals to re-settle in these areas.

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[129] United Nations, Department of Social Affairs, Population Division, The Determinants and Consequences of Population Trends (New York: United Nations Publications, 1953) 115.

III. The Differences in Class Stratification Over Time

The population shift was not the only residential impact that subway introduction brought. Immediately after inception, new neighborhoods were markedly segmented by class, confirming the hypothesis of this research. The Dissimilarity Index across all city areas with subway access just six years after its introduction was .34, suggesting that as many as a third of one class would have to change residence to balance out the class distribution in these neighborhoods. And this high Index was not entirely triggered by the inequity of residents living in the *Lower East Side,* which had been severely tilted toward the lower class Illiterates long before the subway was planned. Rather, the data revealed that newly-developed areas mostly catered to the middle and upper classes, and thus followed a completely different settlement pattern when compared to both those who lived in the older *Lower East Side* community and residents in the outlying areas without subway access yet, what I labeled the "pseudo-benchmark" or "control group". The Dissimilarity Index across these newly-developed areas shortly after subway introduction was .15, suggesting that 15% of one class would have to change residence to equalize the distribution in these new neighborhoods. But even more telling was the gap between the two class profiles of residents in new settlements which were farther away from the *Lower East Side*. *Other Lower Manhattan* exhibited a ratio of Literates to Illiterates that was similar to the *Lower East Side* area next door, 0.5 Literate to 1.0 Illiterate. (The *Lower East Side* ratio was 0.3 to 1.0.) In *Midtown Manhattan*, the ratio completely inverted to 1.5 Literate to 1.0 Illiterate. The same ratio of 1.5 to 1.0

was computed for those in *Upper Manhattan*. *Concourse/Fordham*, farther away in the Bronx, had the highest degree of inequality in favor of the middle and the upper classes, albeit the number of residents there was much smaller. There the ratio was 2.3 to 1.0. Given that the ratio computed for those living in the "pseudo-benchmark" or "control group" was remarkably close to the city average overall, 1.2 Literate to 1.0 Illiterate, and the notable difference between the "pseudo-benchmark" or "control group" and other areas within the city was the absence of the subway, it is highly conceivable that the subway introduction in and of itself contributed considerably to class stratification. This confirmed the model of city development presented by Robert Park,[130] that the living spaces outside of the central business district are made up of three concentric circles, with each one improving in class the farther away you get form the city center and a transit system running like a diameter through it. And it also corroborated Kenneth Jackson's notion that the perceived affluence intrinsic to a neighborhood lifted further once transit was in place. Most importantly though, it verified Kenneth Jackson's point that the upscale will leave a highly congested space once given the transit systems that make it possible to do so.[131]

Unlike initial impact, long-term effects of the subway on settlement patterns by class suggested a moderation of subway's influence on class

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[130] Robert E. Park and Ernest W. Burgess, The City: Suggestions for Investigation of Human Behavior in the Urban Environment (Chicago: The University of Chicago Press, 1925, Reprint 1984) 50-52.

[131] Kenneth T. Jackson, Crabgrass Frontier: The Suburbanization of the United States, (New York: Oxford University Press, 1985) 27-33.

divisions over time. By 1920, it had been 16 years after subway introduction and almost two decades after its initial planning. Also, during this decade, the automobile started to make its presence known, appealing first to the wealthy. Slight moves toward a more equal distribution were detected in *Midtown Manhattan* where the ratio improved from 1.5 to 1.4 Literates to 1.0 Literates. Farther away, a substantial shift toward equity was observed in the *Concourse/Fordham* section of the Bronx where the distribution essentially balanced out to a 1.2 to 1.0 ratio from a ratio of 2.3 to 1.0 indicated ten years earlier. And the *Williamburg/Bushwick/Ridgewood* area, a community new to subway service in 1920, had a ratio of .7 to 1.0 in favor of Illiterates, reversing the 1910 trend that the subway appeal's was more toward Literates. Thus, the Dissimilarity Index for the entire region with subway access improved from .34 to .29, indicating that just more than a quarter of one group would have to change residence to produce an even class profile. Again, this softening trend was detected in areas with subway service for almost two decades, where the differences in figures were followed and measured over time. This leads to the conclusion that rapid transit's contribution to class stratification of new settlements was strongest immediately after introduction, diminishing as the service aged.

IV. The Economic Connection

As the subway service aged, so did its fare structure, making the system more appealing to the lower classes. The five cent fare remained constant during the more than a decade since service began, thus the cost of transit as a proportion of earned salary was reduced considerably. Between 1904 and 1920, average salaries of the typical worker almost doubled.[132] Thus low-end workers that might hypothetically have to contribute almost a third of their earnings to commute regularly using the subway in 1904[133] would only have to contribute 15% in 1920. This improvement made the fare much more "worker-friendly", eliminating the restriction that ridership was a privilege only afforded by those with means.

This helped to explain why Illiterates and Literates migrated out of the *Lower East Side* between 1910 and 1920 at about the same rate. It also shed light on why the gap between the proportion of Literates and Illiterates in 1920 narrowed since 1910 in those early developed communities. Finally, it provided clues as to why settlers between 1910 and 1920 in the new community of *Williamsburg/Bushwick/Ridgewood* that was just introduced to subway service in the latter decade were comprised of an unequal class of residents skewed in favor of Illiterates. This was in contrast to figures computed for *Midtown*

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[132] American Cultural History, Kingwood College Library, <http://kclibrary.nhmccd.edu.decade.10.html>

[133] The Story of the Triangle Fire <http://www.ilr.cornell.edu/trianglefire>

Manhattan, Uptown Manhattan and the Fordham/Concourse section of the Bronx back in 1910 after the subway was introduced and Literates held the edge.

The reduced fare burden on workers allowed the subway service became much more of a "public" or mass transit system only after it had been in operation for some time. However, with operator profit margins cut in light of fare stagnation, increased ridership likely became the only answer to remaining profitable. Thus the subway shifted from a first class service to "coach" class. In agreement with Brian Cuday's findings,[134] this subway form of transportation was like all other general consumption products and services. It carried its own inherent socioeconomic quality, i.e., first class travel vs. second class. To further prove this point, just as the subway in 1920 was accessible to the lower class, the wealthy began to move toward yet another form of transportation, the auto. The Ford Model T was already being produced. And by 1920 an extensive network of roads and highways was already in place around the Metropolitan area, designed and managed with government support[135]. Entrepreneurs, like Vanderbilt, shifted their attention to the commercial toll road,[136] charging exorbitant prices for the use of roads leading out of the city to the lavish playgrounds of eastern Long Island, accessible by only those who could afford a

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[134] Brian J. Cuday, Cash, Tokens, and Transfers: A History of Urban Mass Transit in North America (New York: Fordham University Press, 1995) 180.

[135] Robert A. Caro, The Power Broker (New York: Vintage Books, 1974) 215-226.

[136] New York City Roads <www.nycroads.com/history>

vehicle and pay the tolls. This shows that transportation continued to be divided by class. As one mode declined in affluence, another took its place.

The economic connection was not just limited to fare structure and intrinsic qualities; it also was in relation to the concept of time. With pricing no longer a major barrier in 1920, lower classes were able to migrate without having travel time impinge on work time. Trips to the outlying areas with direct subway access back in 1920 were not too different from today, ranging from about 15 minutes to just above 30 minutes depending upon the destination. Keeping in mind David Harvey's concept of time as one measure of labor's value[137], the time set aside for commuting in 1920 to the central business district in Manhattan from farther away communities in the Bronx, Brooklyn or Queens would not detrimentally reduce the number of hours available to earn income given the speed at which the rapid transit traveled.

Deciding to reside in these further communities was not a decision leading to isolation either. The choice to reside in outlying communities did not inhibit the ability for income to be unloaded, for merchandise and services to be purchased, or for the exchange cycle to carry on[138]. Difficult to transverse terrain or river barriers no longer were natural impediments to the commerce trade.

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[137] David Harvey, The Urban Experience (Baltimore: John Hopkins University Press, 1985) 19.

[138] David Harvey, The Urban Experience (Baltimore: John Hopkins University Press, 1985) 21-23.

V. A Final Word

What we learned from this research was that rapid transit has a huge impact on the shape and profile of cities. If introduced as a civic initiative, municipal control of operations; minimal entrepreneurial influence in design and engineering; the establishment of an equitable pricing policy; the reasonable selection of routes and locations; and fair land use are issues that need to be carefully taken into consideration to prevent a class-structured system leading to a class-structured region.

In that vein, expanding this work to explore the effects of the development of more recent public transit systems on some of the newest American cities may shed more light on the transportation--housing connection, with the added advantage of detailed demographic census data that delineates and focuses in more tightly on socio-economic levels using a variety of variables including income, education, employment and occupation.

The discussion of transportation and economics does not negate the region-wide effects of other events and economic influences that work in tandem with subway introduction. Housing type, costs and availability are some of the most important. While beyond the scope of this research, an exploration of real estate interests, including the ethnic and racial restrictions in housing access in some communities; the influence of housing developers on transit routes; and the laws surrounding eminent domain are just some of the issues that deserve a

more in-depth look in a later project that could complement this research on transit's impact.

Also of particular importance for a future study is the chronological study of the environment inside the *Lower East Side*. This includes an examination of crime statistics; education; health issues; racial and ethnic discrimination; social unrest and living conditions with an eye on the extent to which this environment improved or not with the mass restructuring and re-settling of populations.

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