
Healthcare Accessibility in New York City

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Abstract

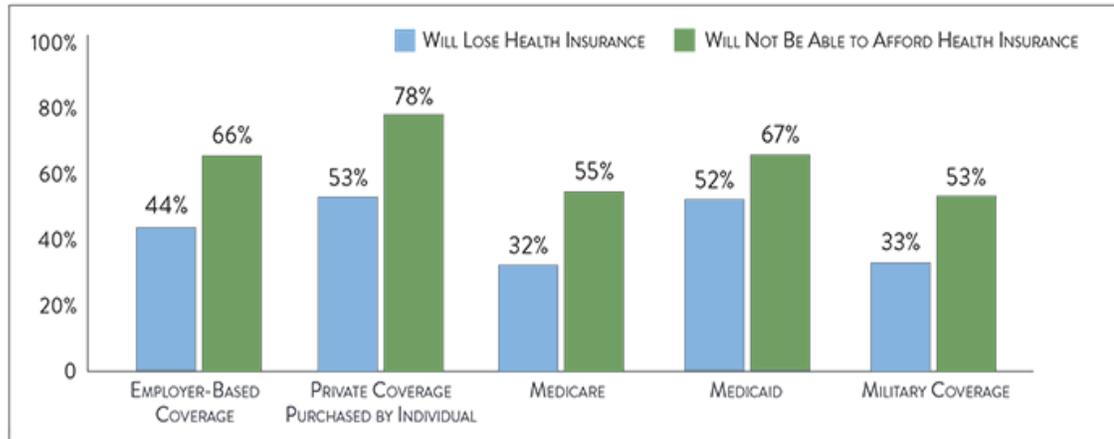
Healthcare and access to medical treatment are vital to the safety and sanctity of community health, yet often there are vast disparities that make it so that healthcare is not equally accessible or of comparable quality. In New York City alone, many such disparities including those in funding and policy -- or a lack thereof -- exist, with research pointing to low-income and minority neighborhoods being disproportionately impacted. To determine the accessibility of healthcare for the citizens of the various boroughs within New York City, we will be examining how income, gender, race, and age correlate healthcare accessibility. There, the conclusion of how healthcare differs for each person in regard to their opportunity to receive healthcare can be viewed and compared to see if there is any statistical significance. After running the analysis for variance test (ANOVA), through the use of collecting data through random surveys shared across a multitude of social media platforms, the conclusion of accessibility to healthcare is not statistically significant for people in regard to their gender, race, and age because there was not enough data to support the original notion of healthcare accessibility depending on those variables. However, the conclusion of healthcare accessibility relying on income did prove true and there was a statistical significance percentage of 99.4%, which was well within the 95% confidence.

Categories: Healthcare, Accessibility, New York City
Keywords: New York City, Medical Care, Healthcare

Background

In New York City, there is a large population of people who come from underserved areas. Communities in medically underserved areas/populations (MUA and MUP) have few primary care providers, high infant mortality, high poverty, and/or high older adult population (HRSA, 2019). Communities like Bed-Stuy and Bedford Park have a lack of medical facilities to support the growing population (Altarum, 2019). Additionally, the income inequality gap has been rising as well as healthcare prices (Altarum, 2019). Most recently, COVID-19 has ravaged these cities leading to a limited access of medical coverage from private and public insurance companies as well as federally funded programs like Medicare and Medicaid. Many people in underserved areas are not insured at all and cannot afford to pay for regular check-ups. As a result, they don't seek medical attention when immediately showing symptoms and their illness worsens until they require government assistance for survival. In 2018, 980 New Yorker adults were surveyed to gauge the accessibility of healthcare in the state (Altarum, 2019). Among all of the adults, 52% experienced a healthcare affordability burden and 76% were worried about affording healthcare in the future. There are multiple reasons why 52% of adults experienced an affordability burden, the most prominent being the high premium cost. Also, 51% of adults stated that it was too expensive. For the table below was used to document the following information gathered during the survey. For individuals that are "Somewhat or Very Worried about Health Insurance", as seen in the table below, the highest percentages came from those with private insurance with 78% reporting not being able to afford health insurance and 53% are about to lose their health insurance (Figure 1). Furthermore, many New Yorkers also had to delay or forego their healthcare due to overwhelming costs. 31% delayed their doctor's appointment or delay a procedure to be done, 29% skipped a recommended medical treatment or test, 26% avoid visiting the doctor or a procedure from occurring altogether, 23% cuts pills in half or skipped doses of medicine, 21% did not fill a prescription and 17% had problems with accessing mental healthcare. Adding on, another issue was struggling to pay medical bills (Altarum, 2019).

Figure 1
Somewhat or Very Worried About Health Insurance



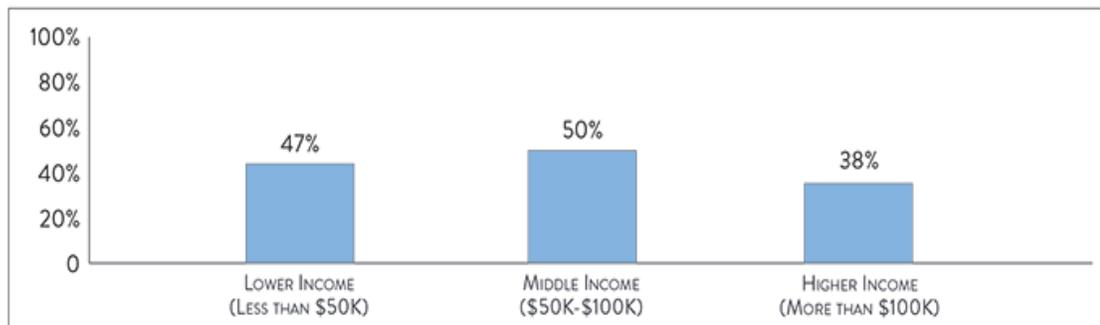
Source: 2018-2019 Poll of New York Adults, Ages 18+, Altarum Healthcare Value Hub's Consumer Healthcare Experience State Survey

Figure 1: From the Alarum Healthcare Value Hub's Consumer Healthcare Experience State Survey, 980 adults - defined as at or above the age of 18 - from New York State which asked about their healthcare status in a variety of manners. Those that identified "somewhat or very worried about health insurance", were then categorized by the type of health policy they receive and whether or not that they will lose healthcare insurance or will not be able to afford health insurance.

The struggle to pay insurance costs and medical bills has been seen with many other demographics. For those New Yorkers who have encountered one or more financial burdens to obtain health insurance, the highest percentage came from incomes of between \$50,000 - \$100,000 in which 50% of respondents said they have a financial obstacle that has made getting health insurance more difficult (Figure 2). This same income bracket is also reported being the highest percentage when considering individuals who have struggled to pay medical insurance, with 42% of respondents between \$50,000 - \$100,000 reporting such struggles (Figure 3). To pay for these high medical bills, 15% of respondents used up all their savings, 13% were unable to pay for necessities like food, heat, or housing, 12% were contacted by a collection agency, 9% borrowed money or got a loan or another mortgage on their home, 7% racked up a large amount of credit card and lastly, 6% placed on a long-term payment plan. By taking money out of their savings or taking out loans, people end more in debt and are forced into poverty. These affordability issues predict the future of how New Yorkers could pay for healthcare. As a result, 76% of people reported being worried about their healthcare costs. Many stated that affording their healthcare in the future comes with a multitude of cost-related issues. For example, 66% said that they would have to pay the cost of nursing homes and home care services, 63% would have to cover medical costs when elderly, 62% would worry about the cost of serious illness or accident and 57% would have to worry about covering prescription drug costs. The majority of these concerns came from individuals who were

worried about private health coverage. Due to the expensive costs associated with healthcare visits, many people go years without seeing a doctor for diseases or health conditions that could be life-threatening. Without any aid to help them with costs, they are forced to suffer in poverty without proper access to take care of themselves or their family members. Part of the survey and understanding adults' worries helped identify and document whether or not adults who are 18+ will either lose health insurance, won't afford it, or both. This is relevant as it provides a visual understanding of the current situation occurring in NYS on healthcare accessibility through cost (Altarum, 2019).

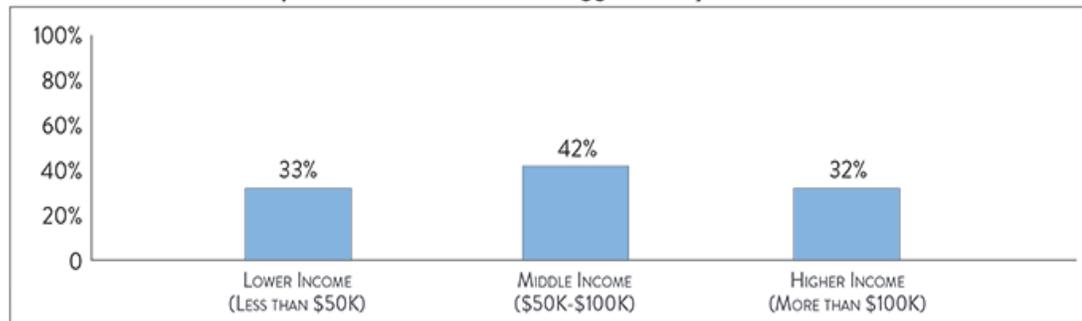
Figure 2
New York Adults Who Needed Healthcare but Encountered One or More Cost-Related Barrier



Source: 2018-2019 Poll of New York Adults, Ages 18+, Altarum Healthcare Value Hub, Altarum's Consumer Healthcare Experience State Survey

Figure 2: From the Alarum Healthcare Value Hub's Consumer Healthcare Experience State Survey, 980 adults - defined as at or above the age of 18 - from New York State which asked about their healthcare status in a variety of manners. Those that needed healthcare, but had one or more cost-related barriers, were then categorized in three basic income brackets: lower than \$50,000 a year, between \$50,000-\$100,000 a year, and those making above \$100,000 a year.

Figure 3
New York Adults Who Experienced One or More Struggles to Pay Medical Bills



Source: 2018-2019 Poll of New York Adults, Ages 18+, Altarum Healthcare Value Hub, Altarum's Consumer Healthcare Experience State Survey

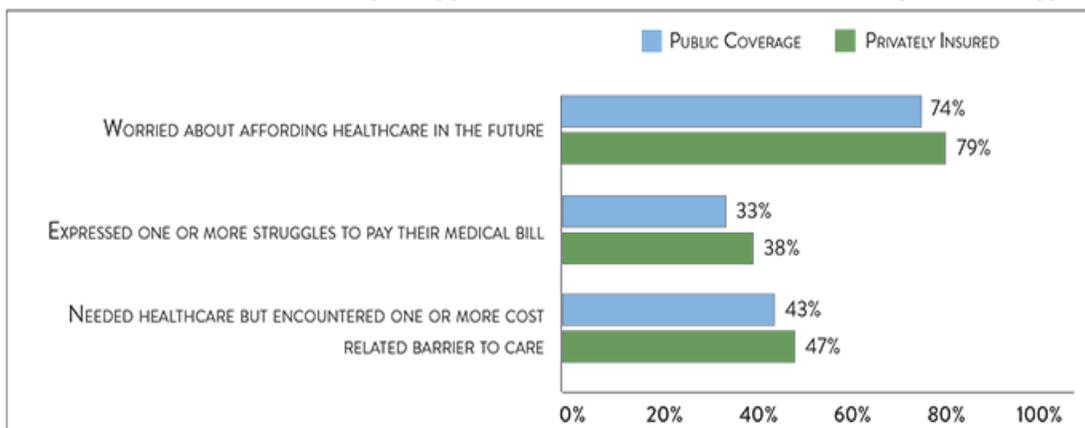
Figure 3: From the Alarum Healthcare Value Hub's Consumer Healthcare Experience State Survey, 980 adults - defined as at or above the age of 18 - from New York State which asked about their healthcare status in a variety of manners. Those individuals that have struggled with paying medical bills one or more, were then categorized into three

basic income brackets: lower than \$50,000 a year, between \$50,000-\$100,000 a year, and those making above \$100,000 a year.

The first table below displays that low-income residents who earn \$50,000 or less a year had the highest level of concern about affording healthcare, and there were two-thirds of high-income households who earn more than \$100,000 have healthcare affordability worries as well. In the second and third table Households with middle incomes that earned \$50,000-\$99,999 a year faced the highest level of healthcare burden within the last 12 months and avoided receiving care along with struggling to pay off their medical payments. In the second and third table Households with middle incomes that earned \$50,000-\$99,999 a year faced the highest level of healthcare burden within the last 12 months and avoided receiving care along with struggling to pay off their medical payments (Altarum, 2019).

Figure 4

Percent of New York Adults Facing Struggles, Barriers and Worries to Healthcare, by Insurance Type



Note: This summary excludes those without insurance.

Source: 2018-2019 Poll of New York Adults, Ages 18+, Altarum Healthcare Value Hub, Altarum's Consumer Healthcare Experience State Survey.

Figure 4: From the Alarum Healthcare Value Hub’s Consumer Healthcare Experience State Survey, 980 adults - defined as at or above the age of 18 - from New York State which asked about their healthcare status in a variety of manners. Those New Yorkers who have faced difficulties with their health insurance were asked three different worries: affording healthcare, one or more struggles with paying medical bills and had cost-related barriers to getting health insurance. From there, they were split into two subgroups: those with public coverage or those that have private insurance. In total, there were six unique groups.

Table 1: In the table, it displays that, among all the regions of NYS, they all had a spike in worry or affordability burden. In NYC, it spiked by 67% of those worried about affording their medical bills as elderly along with a 65% spike in individuals worried about covering a serious illness or accident while Long island has the lowest.

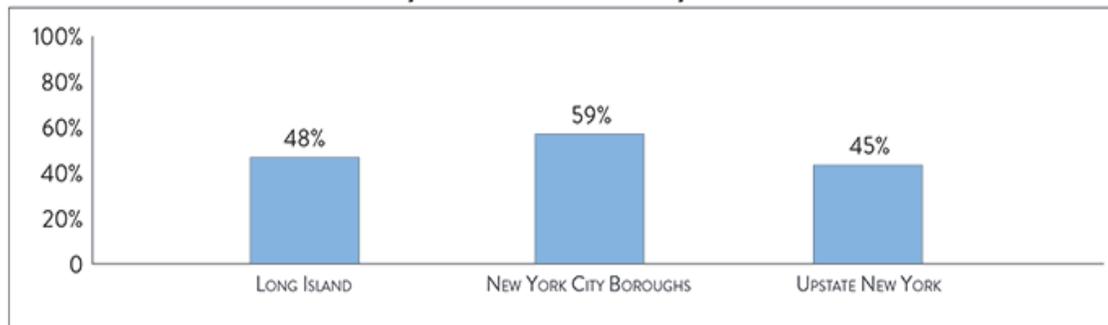
New York Regional Demographics

REGION	PERCENT OF STATE POPULATION	MEDIAN INCOME
NEW YORK CITY BOROUGHS	43%	\$59,071
LONG ISLAND	14%	\$98,988
UPSTATE NEW YORK	42%	\$62,713

Note: New York Boroughs include Bronx, Kings, New York, Queens, and Richmond counties. Long Island includes Nassau and Suffolk counties.
 Source: Population and Income from U.S. Census Bureau; Income is a weighted average of 2017 median income by county.

Figure 5

Percent of New York Adults with Any Healthcare Affordability Burden in the Past Year



Source: 2018-2019 Poll of New York Adults, Ages 18+, Altarum Healthcare Value Hub, Altarum's Consumer Healthcare Experience State Survey

Figure 5: From the Alarum Healthcare Value Hub's Consumer Healthcare Experience State Survey, 980 adults - defined as at or above the age of 18 - from New York State which asked about their healthcare status in a variety of manners. For those adults in NYC that faced a burden when it comes to paying for healthcare, they were split into three groups based on community: Long Island, New York City (NYC) boroughs, and Upstate New York.

Pandemic effects

The healthcare industry hasn't been able to support patients due to the pandemic and its socio-economic effects. Hospitals in New York City have been dramatically understaffed and under-resourced. For example, in 2017 in the New York and Long Island region, there was a 50% shortage of RNs (registered nurses) with 2 or more years of experience (Martiniano R, et. al, 2018). This situation has exacerbated with COVID-19 increasing stress on the healthcare system through the need for more hospital workers and nurses). There are more patients than doctors, and many doctors have been called to help assist in treating patients due to the lack of staff available. Additionally, current programs under Mayor de Blasio's leadership have been designed to target areas in all five boroughs called the "Caring Neighborhoods." Yet, there is a proportion of 109 and 99 per 100,000 residents who identify as American-American or Latino dying from COVID-19 compared to 27 out of 100,000 white residents (Thompson, et al., 2020). A reason that COVID-19 may be higher in these underserved communities is that people are unable to socially distance themselves all the time, and are also not able to see doctors due to

affordability and financial issues. In fact, there was a request for physicians from New Jersey, Vermont, and even across the nation to aid the patients in New York City since there was a shortage of medical staff available. The shortage of physicians worsened during the pandemic because their priority shifted to treating patients that were insured. This included pressure from medical overhead, government officials, pharmaceutical companies, and others who wanted to get everyone treated as quickly as possible. In the spring of 2020, NYC had one of the highest numbers of COVID-19 cases. Before this pandemic even hit NYC, it was reported that there was already uneven access to health insurance among workers in NYC. The pandemic hit hardest in the Bronx and Queens where most of the COVID-19 cases skyrocketed. This led to a massive loss in jobs, affecting millions of New Yorkers' access and maintenance of healthcare coverage. Since healthcare coverage is tied to employment for millions of New Yorkers, a sudden loss of their jobs causes them to lose the only healthcare that they had available. Because of this, many New Yorkers are not able to afford their healthcare insurance and as a result, are unemployed with no ability to see a doctor.

Share of low-income respondents who said that they or member of their household were without health insurance since the start of the pandemic

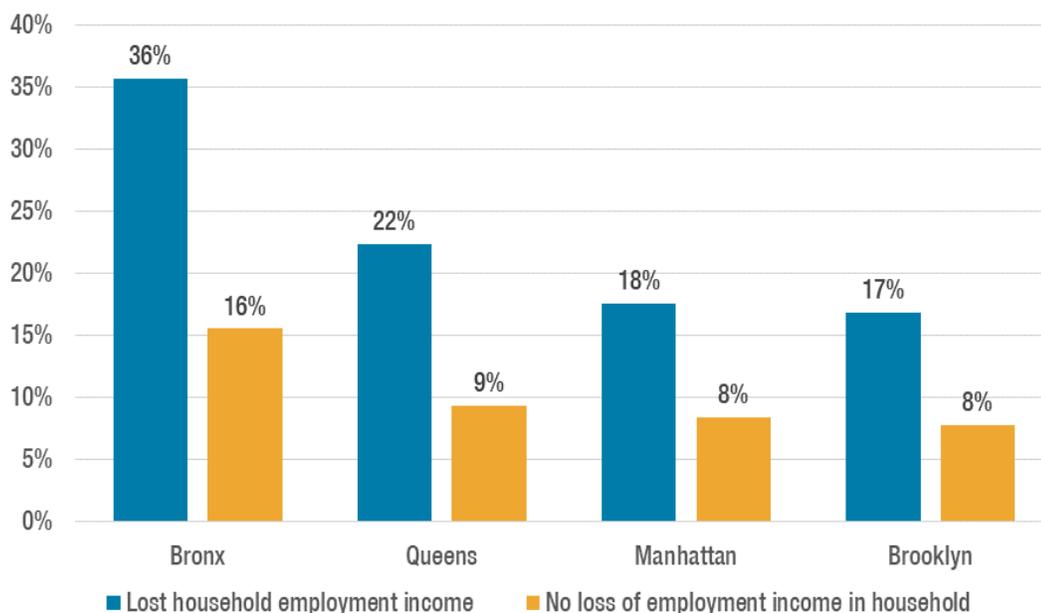


Figure 6: From New York City's (NYC's) Department of Health, surveyors were split into four different communities: Bronx, Queens, Manhattan, and Brooklyn. From there

two subgroups emerged: lost household employment income and no loss of household employment income during the beginning of the pandemic.

Share of low-income respondents with household income loss who said that **they or a member of their household have lacked health insurance since the start of the pandemic**

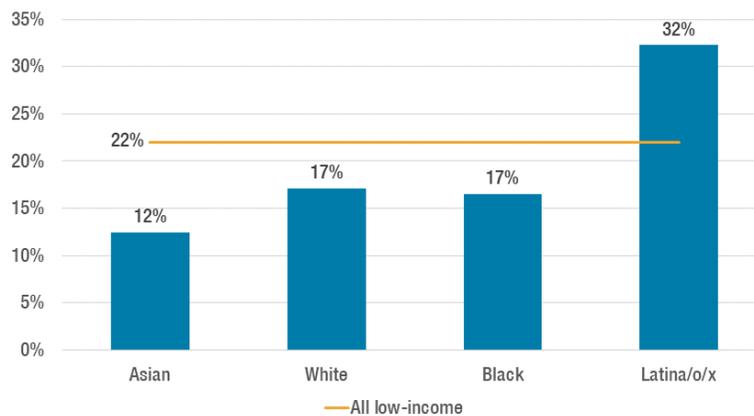


Figure 7: From New York City's (NYC's) Department of Health, surveyors were split into four ethnic groups: Asian, White, Black, and Latina/o/x. In this case, the population that was surveyed all belong to low-income households with income loss and were responding to whether or not they lack health insurance before the onset of the COVID-19 pandemic in NYC

Share of all respondents who said that **they or a family member had been infected with COVID-19**

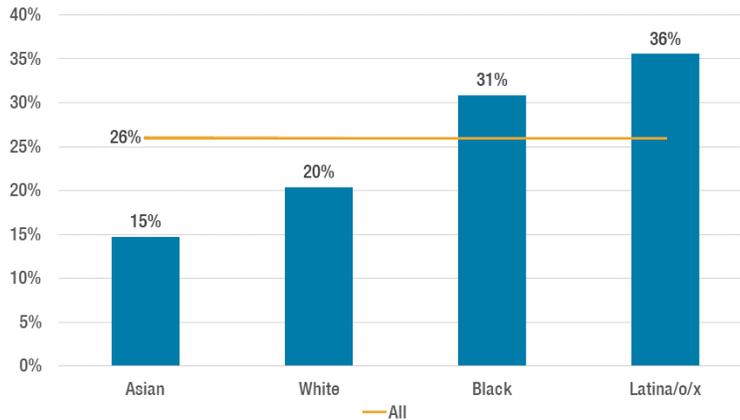


Figure 8: From New York City’s (NYC’s) Department of Health, the responders were asked if they or a family member had been affected by COVID-19. The population recorded was measured in percentage and split into four groups - based on race: Asian, White, Black, and Latina/o/x. The overall average percentage was recorded.

Share of low-income respondents who said that **they or a family member had been infected with COVID-19**

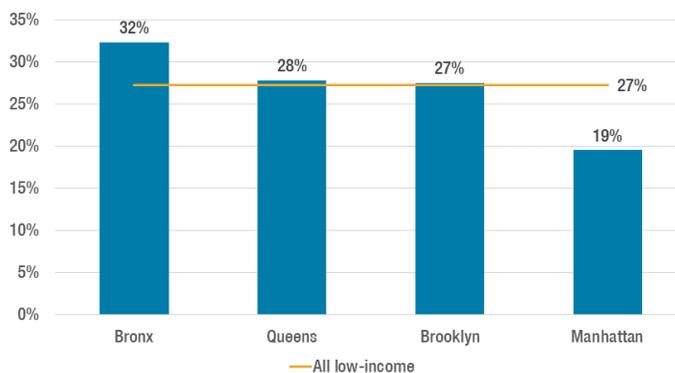


Figure 9: From New York City’s (NYC’s) Department of Health, the responders who were of low-income backgrounds were asked if they or a family member had been affected by COVID-19. The population recorded was measured in percentage and split

into four groups - based on borough: Bronx, Queens, Brooklyn, and Manhattan. The overall average percentage was recorded.

Adding on in the Bronx, many of the COVID-19 cases came from crowded housing, many residents are essential workers, and the borough has the highest rate of pre-existing conditions that put many residents in a high-risk position such as having diabetes. Also, policy actions and decisions brought out many disparities during the pandemic. For example, the hospitals in the Bronx only had 2.7 beds per 1,000 residents, whereas Manhattan hospitals had 6.4 per 1,000 residents. However, it should be noted that affordable care expansion on Medicare and its health plan helped enroll an additional 425,000 New York City residents during February and November as the pandemic took a toll on the healthcare system. Moreover, many residents did not enroll in health-related programs due to their immigrant status; these people were hesitant because they thought doing so would impact their immigration status. In fact, it was reported from the 2020 Unheard Third that more than 52% of low-income New York residents lost their job temporarily or permanently yet they were still able to access Medicare or were enrolled in an essential healthcare plan. Furthermore, before the pandemic, 47% of lower-income (\$50,000 and under) New York residents received healthcare coverage (Lew & Benjamin, 2021). During this pandemic, however, solutions were proposed such as the Equity Action Plan, which was implemented by the NYC Health Department. This plan included increased engagement with healthcare providers to “assess the needs of independent providers in clinics and provide technical assistance to reopen their clinics and continue day-to-day operations, encourage providers to offer telemedicine services and assist them with navigating reimbursement, explore ways to enable in-person primary care visits outside of usual office settings, such as mobile clinics, provide medical supplies, including personal protective equipment, sign up providers to become authorized enrollers in the New York City’s COVID-19 Hotel program, inform providers about City services and resources that can support their patients during and after the COVID-19 public health emergency (health, food, other social services)”. The plan also consists of working with community centers and associations to help ensure additional services, provide advisory for leadership, and assist community-based voices in their advocacy. Lastly, this plan aims to drive communication with community members by conducting outreach activities and spreading awareness about COVID-19 and the precautionary measures everyone should be following. Although there have been several proposed solutions to address the effects of the pandemic, it still leaves NYC in a negative position when it comes to healthcare accessibility. (*Overview of the NYC Department of Health and Mental Hygiene’s COVID-19 Equity Action Plan*, n.d.) (Lew & Benjamin, 2021)

Race in Healthcare

African Americans and Latinos make up a large percentage of the underserved communities and are often mistreated in the US healthcare clinics. The African American

community, specifically, has stated previously that they do not feel safe taking the vaccine due to concerns with getting the wrong dosage or wrong vaccine, which has been done before on purpose. Moreover, many physicians have said that they believe African Americans feel less pain or might not feel pain at all. Some physicians have also stated that they prefer not to treat people of color. Since healthcare professionals are refusing to see people of color, some are outright declining to see a doctor because they know they will be mistreated. Unfortunately, many healthcare workers and doctors are not punished for giving wrong dosages to patients or for making racist statements. These attitudes can make it very difficult for such individuals to access quality healthcare. Considering that people of color tend to make lower incomes on average, they are unable to see physicians for long periods. This causes severe problems in the long run for communities of color, especially the African American community, because if problems aren't detected when they are in their smaller, weaker, and essentially treatable stages, they will eventually develop into diseases that are very hard to treat and will only be found the next time they visit a doctor's office. Something that can compound these issues is that people of color, especially African Americans, are more likely to need access to healthcare. For example, in Brooklyn, African American individuals were twice as likely as Caucasian individuals to be hospitalized due to COVID-19. Furthermore, 46% of COVID-19 related deaths were African Americans, 30% were White, 15% were Hispanic, and 5% were Asian (Renelus et. al., 2020). This need for more access to healthcare as well as it being generally more inaccessible can create drastic problems for people of color.

Funding and Policy History

With healthcare inequality noted, New York State in 1996 created the Indigent Care Pool, a fund dedicated to reimbursing hospitals for the free healthcare they provide to households of low income. While the idea at the time seemed like a good initiative, a 2016 review of the \$1.13 billion budget found a negative correlation between the size of the funding for a hospital and the percentage of low-income patients they were treating (Hammond, 2017). On this point, the report found that four hospitals received grants from the Indigent Care Pool without suffering any net loss in treating patients that could not afford their medical bills, including Memorial Sloan Kettering. This is a major problem for the underserved communities as many of these well-off hospitals are situated mainly in Manhattan and may not be feasible to travel to. In addition, this gap leads to more disparities as the lack of reimbursements leads to even more degradation of local healthcare facilities. By not providing grants to hospitals closer to underserved communities, New York is creating a healthcare inequity where only the affluent people can get access to proper healthcare. The grants must be given to all hospitals so that all patients can be seen by healthcare workers regardless of their socioeconomic background. Over the years, budgeting and public health policies have ignored communities of color. For example, New York invested \$1.13 billion into a program called ICP (Indigent Care Pool) which would result in intense disparities for low-income communities. The establishment of the ICP program was meant to help serve and expand healthcare access

in low-income communities however this plan left out the idea of safety net hospitals that are in these low-income communities. New York policies have not targeted safety net hospitals along with unequally providing money to these hospitals since \$250 million were directed to the top 25 safety-net hospitals in New York while only \$675 million were directed to the bottom 75% of hospitals that do not serve or as many low-income people. In addition, New York health and financing and planning policies have left multiple communities without hospitals or decreasing essential needs such as beds. An example is St. John's Hospital in Flushing, Parkway in Forest Hill, St. Joseph in Fresh Meadow, and, lastly, Mary Immaculate in Jamaica. Overall, funding and public health-related policies have not benefited many low-income communities. A relevant understanding of this is that the top 10 wealthiest, white, and less-impacted communities during the pandemic received just as much funding as the top 10 hardest-hit communities that are populated by both minority and immigrant with funding at \$2,232,459,094 under the CARE ACT (Benjamin, Dunker, 2020).

Communities

People in communities within New York City show great diversity, both in culture and in income. New York City classifies its division in the form of boroughs, which are placed in zones on the five main islands: The Bronx, Manhattan, Brooklyn, Staten Island, and Queens. The boroughs share many similarities in terms of access to healthcare, mean income, and common amenities, but the differences become highlighted within the scope of smaller communities, on a neighborhood scale. Areas like western queens tend to have a lower income, which lends itself to having lower high school graduation rates, decreased investment in health, and a higher overall crime rate when compared to neighboring regions. However, areas such as the Soho community tend to have a higher income, which helps fund its safety and overall cleanliness. Disparities in healthcare found in underserved communities tend to arise in areas that lack the common amenities that more privileged areas get, thus becoming deprived of life-saving functions. The communities facing the highest rate of healthcare disparities are 6 communities in the Bronx (Fordham-Bronx Park, Pelham-Throgs Neck, Crotona-Tremont, HighBridge-Morrisania, Hunts Point-Mott Haven, Northeast Bronx), 8 communities in Brooklyn (Northwest Brooklyn, Bedford Stuyvesant-Crown Heights, East New York, Sunset Park, Borough Park, East Flatbush-Flatbush, Coney Island-Sheepshead Bay, Williamsburg-Bushwick), 4 communities in Manhattan (Washington Heights-Inwood, Central Harlem-Morningside Heights, East Harlem, Union Square-Lower East Side), 4 communities in Queens (Long Island-Astoria, West Queens, Flushing-Clearview, Jamaica), 3 communities in Staten Island (Port Richmond, Stapleton, St. George, and South Shore). To understand why these communities are facing challenges to face healthcare, we need to analyze the economic situations of these communities. The official poverty rate in NYC is 19.1%. The Bronx as a whole falls into this category and has the highest poverty rate. Furthermore, there is a connection between race and healthcare access in these communities that develops the understanding of why there is a huge challenge to access

healthcare. For instance, Latinx has faced the highest rate of poverty of 28.8% in NYC which is one of the most predominant racial demographics in these low-income communities such as Sunset Park a low-income community struggling to access healthcare with a Latinx community of 39.1%. For example, In some of these communities, there had been a few mini successes with expanding access to healthcare. Such as the NYCEDC community health center expansion program. These programs served as a template towards expanding healthcare access through supporting non-profit health care as they were able to improve primary care and expand services as a whole. These programs helped assist with community development and economic development. With this, it helped support the expansion of jobs along with establishing more healthcare centers which helped the sustainability and development growth for these communities. The NYCEDC program was able to bring along more upgraded health technology adoption, payment reform, and more. Along with the NYCEDC health program, the \$20 million investment into an initiative called Caring neighborhoods trying to help improve communities in need in all five boroughs, there was also an establishment of the HHC community health centers. This solution helps expand existing services along with financially stabilizing budgets for the upcoming years. HHC sought to create existing centers to be affiliated with them, which includes 40 primary care centers that would serve more than 120,000 New Yorkers. Furthermore, many of these unserved communities have huge immigrant populations. Overall, there are still existing healthcare challenges in these communities such as Queens which includes Corona the epicenter for

COVID-19 in NYC.

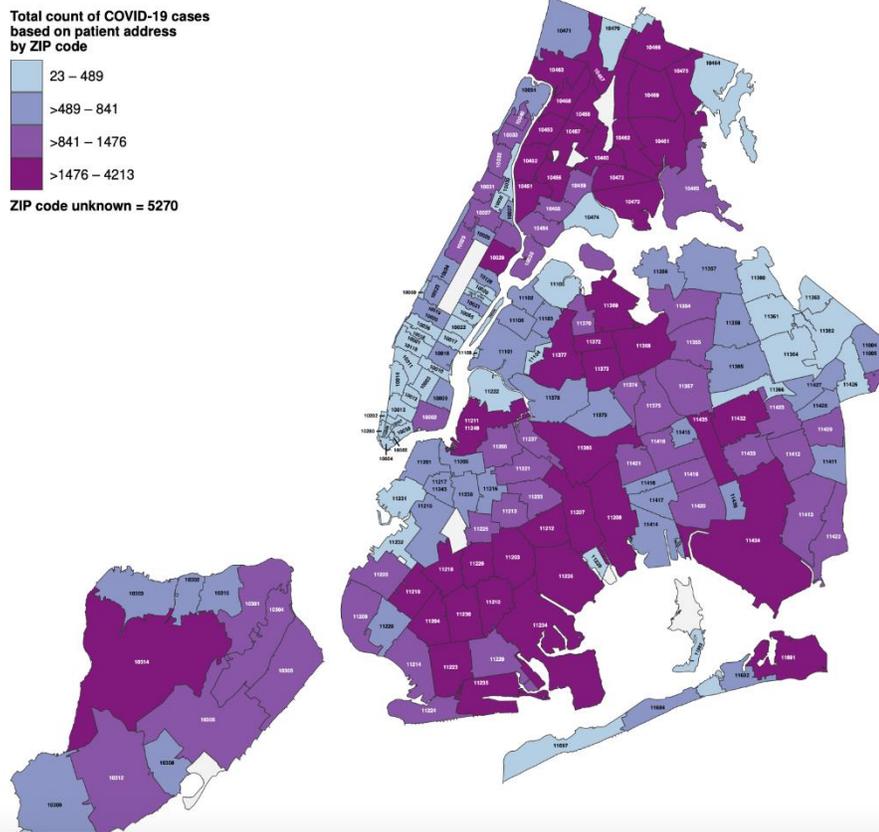
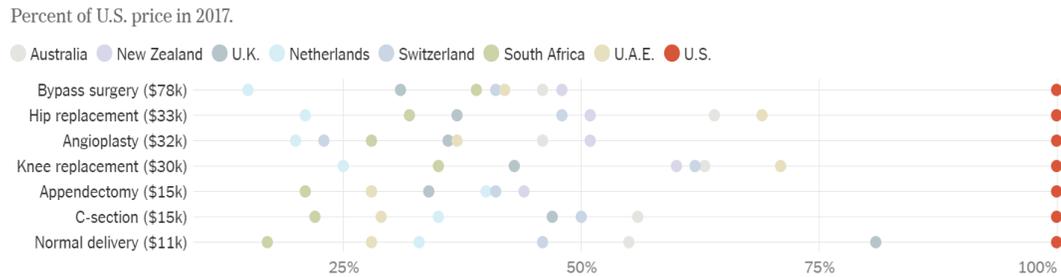


Figure 10: This image helps illustrate the COVID-19 in all the NYC communities from May 17, 2020, reported by the NYC health department.

General Healthcare

Healthcare in New York City is much like any other healthcare system found in the United States of America. Healthcare is contained in the private sector, meaning that costs of healthcare must be paid for by the individual, unless they have insurance. In 2017, a hospital visit, on average, costs \$3949 per day without insurance (Fay, 2021). These costs can be even greater depending on the procedures required. As a result, healthcare without insurance in the U.S. can be the greatest in the entire world.

Health Insurers in U.S. Pay Much More for Hospital Care



Source: International Federation of Health Plans • By The New York Times

Figure 11: From the International Federation of Health Plans, eight countries were analyzed for the average cost for seven different medical procedures based on the average American (U.S) cost. This percentage to the U.S. average was created and displayed as a scatter plot.

This graph illustrates some of these relative costs of healthcare around the world. Even with insurance, the costs are astronomical. Without insurance, the costs are far worse. As such, it is almost imperative that someone has insurance if they need to access healthcare. People who earn a sufficient amount of money can afford to pay the premiums for private health insurance, which can cover them in the case that they become ill with a life-threatening disease. Others can receive insurance fully covered by the federal government under Medicaid and other government or state-provided health insurance. People who qualify for Medicaid tend to have low incomes, but the downside is that many of the government-funded health insurance comes with extremely high deductibles and generally lower quality of health care. Working citizens can qualify for healthcare through their work, but this has steadily declined throughout the twenty-first century due to increasing health treatment costs. Lastly, the final group of people, who tend to be unemployed immigrants, lack health insurance and have to resort to a lack of treatment due to not having enough funds to pay for insurance, and not meeting the criteria for Medicaid. In general, all these scenarios also exist in the New York City healthcare sector, as it is very similar to the system in all of the United States.

Specific Aims

Does healthcare accessibility differ between communities in New York City? Through this research study, we intend to investigate how different demographics have been impacted by certain discrepancies in healthcare funding and policy. To help answer our research question, we conducted a survey that asks participants from various demographics the following questions:

- What ethnicity do you belong to? (seven options were given)

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- What is your income level? (seven categories were given)
 - What is your gender? (four options were given)
 - What is your age? (seven categories were given)
 - How far is your nearest healthcare facility/hospital in miles? (open-ended)
 - How far is your nearest healthcare facility/hospital with the everyday transportation you use in terms of minutes? (open-ended)
 - How long is the wait time to see a doctor in the hospital in minutes? (open-ended)
 - How large is your insurance copayment in U.S. dollars? (open-ended)
 - How often do you visit a facility per year? (open-ended)
 - Any issues with healthcare in your community? If so, please explain below. (open-ended)
 - Does your job put you at higher risk for health issues? Do they cover your health insurance? (open-ended)

Using the data collected from the survey, we conducted several ANOVA and Post-Hoc tests to detect how access to healthcare differs between groups. . This study aims to aid local and state politicians to divert funding into communities that are most in need of it. It also aims to help future city planners, investors, and private companies to allocate valuable resources to develop a safe, secure, and strong medical infrastructure; this may take the form of increased access to PPP, well-funded and developed hospitals, and new medical centers. New medical facilities in communities hardest hit by the lack of healthcare accessibility will not only lead to healthier populations but will also attract potential investors and private companies into the NYC area; thus, catalyzing economic growth and revitalizing the business and culture in the community as well. As this process occurs, politicians will also take notice and would bring forth additional funding for investment from the local and state government level as well.

Materials and Methods

To address the accessibility of healthcare in New York City communities for our experiment, a survey was sent out and data was collected on the demographics and healthcare accessibility of respondents. The independent variables in this study are the demographics of residents (race, income, gender, age, neighborhood) and the dependent variables are the numerical measures of accessibility (distance from the nearest facility in miles, distance from the nearest facility in minutes, number of annual doctor visits, average wait time, insurance copayment). Short answer questions were also asked to survey respondents regarding their job and its relation to their healthcare (higher risk and insurance) and their subjective view of healthcare problems in their community. These responses will not be used for statistical analysis, but to contextualize any data outliers. The survey asks participants to fill out these demographics via a drop-down menu and selected accessibility measures with numerical responses. The responses for each

respondent were compiled into a single dependent variable, called the “Healthcare Accessibility Score,” using the following weighted equation:

- A = distance to the nearest facility (miles)
- B = distance to the nearest facility (minutes)
- C = wait time to see medical professional (minutes)
- D = insurance copayment (dollars)
- E = number of annual doctor visits

$$\text{Healthcare Accessibility Score (HAS)} = A + 2B + C + D - E$$

Of the variables in the equation, Variable B, distance to the nearest facility (minutes), and Variable D, insurance copayment (dollars), were determined to be the most significant factors in healthcare accessibility. As such, since Variable D fell between ranges of 30-100 and was the most influential factor in the HAS, Variable B was weighted by a factor of 2 so it would carry similar weight in the HAS equation. Data were then sorted into various demographics groups: the ones indicated above (independent variables), and ANOVA tests were run to determine if statistically significant disparities in healthcare accessibility exist between demographic groups and healthcare accessibility. The null hypothesis of these tests is that there are no differences between each demographic's healthcare accessibility, whereas the alternative hypothesis is that at least one demographic has different healthcare access than the others does exist. A statistically significant p-value would indicate there is evidence to reject the null hypothesis in favor of the alternative.

Results

Gender and Healthcare Accessibility:

ANOVA - HEALTHCARE ACCESSIBILITY SCORE ▼

Cases	Sum of Squares	df	Mean Square	F	p
Gender	2.089e +6	1	2.089e +6	2.934	0.091
Residuals	5.338e +7	75	711740.336		

Note. Type III Sum of Squares

A one-way ANOVA was conducted to determine if the healthcare accessibility score differed between genders. Participants’ gender was classified into two groups: male (n=32) and female (n=45). With an F statistics of 2.934 and a p-value of 0.091, the

ANOVA test detected no significant differences in HAC between Genders at the 5% level.

Income Level and Healthcare Accessibility:

ANOVA - HEALTHCARE ACCESSIBILITY SCORE

Cases	Sum of Squares	df	Mean Square	F	p
Income Level	7.265e +6	3	2.422e +6	3.667	0.016
Residuals	4.820e +7	73	660331.442		

Note. Type III Sum of Squares

A one-way ANOVA was conducted to determine if the healthcare accessibility score was different across income levels. Participants' income labels were classified into four groups: below poverty (\$0-20,000, n=13), lower class (\$20,000-50,000, n=20), middle class (\$50,000-100,000, n=29), and upper class (\$100,000+, n=15). With an F statistics of 3.667 and a p-value of 0.016, the ANOVA test detected significant differences in HAC between Income at the 5% level.

Race and Healthcare Accessibility:

ANOVA - HEALTHCARE ACCESSIBILITY SCORE ▼

Cases	Sum of Squares	df	Mean Square	F	p
Race	1.257e +6	4	314274.095	0.417	0.796
Residuals	5.421e +7	72	752944.581		

Note. Type III Sum of Squares

A one-way ANOVA was conducted to determine if the healthcare accessibility score was statistically different between respondents' races. Participants' income labels were classified into five groups: White (n=19), Asian (n=39), Black (n=9), Hispanic/Latinx (n=8), and other (n=3). Healthcare accessibility (HAS) differences were not statistically significant between the races since $F(0.417) = 0.796 > 0.05$.

Age and Healthcare Accessibility

ANOVA - HEALTHCARE ACCESSIBILITY SCORE

Cases	Sum of Squares	df	Mean Square	F	p
Age	491571.334	3	163857.111	0.218	0.884
Residuals	5.498e +7	73	753116.916		

Note. Type III Sum of Squares

A one-way ANOVA was conducted to determine if the healthcare accessibility score was statistically different between respondents' ages. Participants' income labels were classified into five groups: minors (0-18, n=20), young adult (21-30, n=9), adult (31-50, n=8), and older adults (51-65, n=2). With an F statistics of 0.218 and a p-value of 0.884, the ANOVA test detected no significant differences in HAC between Age groups.

Discussion

As the data shows, the only demographic with a statistically significant disparity in healthcare accessibility (HAS) among the respondents was income. This means that we have enough evidence to reject the null hypothesis that Healthcare access is the same across income levels; from our analysis, it is plausible to assume differences in Healthcare access across income levels. Past research and literature corroborate these findings, where demographics like gender and age do not have correlations with healthcare accessibility, but ones like income do. In New York City, disparities in access to insurance and government assistance have made medical checkups and facility visits inaccessible to those of lower incomes -- with the COVID-19 pandemic only building upon this gap.

Prior research has concluded healthcare accessibility and income are statistically different. Even within COVID-19, health care costs have risen for most Americans especially due to many hospitals becoming overwhelmed by the overall costs of ordering new respiratory devices to fight the new pandemic. That, coupled with the healthcare system before, has led to healthcare marginalizing people who are of a lower income bracket have felt the increasing costs and seen their overall healthcare accessibility decrease, like the correlation that has been deduced from this experiment which was found to be statistically significant.

In healthcare, there has been a noted need for new policy change. Healthcare accessibility should not be tied to income as noted in the experiment. Change that can improve upon healthcare whether perhaps nationalizing healthcare or expanding resources to improve healthcare accessibility can improve overall happiness and health within the New York City community, helping its citizens and having a side-effect that can be implemented by other cities of like size. Thus, improving healthcare accessibility can transform most

cities and help out the citizens who need to receive the proper level of healthcare without compromising due to their income bracket.

Moving into experimental errors, the differences in healthcare accessibility between races, though statistically insignificant based on respondents' data, has been documented by other literature to constitute a notable disparity. Errors in data collection including a disproportionately large number of responses from Asian respondents (n=39) and comparatively minimal response from Hispanic respondents (n=8) might have skewed data and provided an insufficient basis for the one-way ANOVA to detect statistical differences. Also, though age has not been documented by other research to impact healthcare accessibility, survey responses tended to come from a disproportionate number of minors (0-18) and much smaller numbers of the elderly, potentially providing insufficient data for a one-way ANOVA to prove statistical correlation.

Future improvements to this experiment can be made to ensure a more balanced and diverse respondent pool. Similar questions and survey format can be used with respondents providing numerical responses as opposed to scalar or other measures for the most accurate data analysis. Targeting survey distribution into various diverse communities with residents of various ages, races, incomes, and gender groups can be more heavily emphasized and regulated. Additionally, efforts can be made to have respondents' demographics mirror those of New York City in terms of percentages of the entire population. Regardless, a more balanced and defined survey outreach strategy is necessary for future expansion on this experiment to provide a more comprehensive and representative picture of New York City.

Our study also provides a basis for other researchers to conduct future research into the field of healthcare accessibility. The concept of asking respondents for numerical responses and running one-way ANOVA tests can remain the same; however, a more specific research topic can be adopted such as specific areas of healthcare accessibility such as facility proximity, affordability, or public trust. This research will be useful in identifying and analyzing disparities in healthcare accessibility that exist between demographics in certain aspects rather than from an overall view. Healthcare accessibility is ultimately a wide topic and area of policy concern and our research provides a look into disparities that may exist in New York City and provides future research with a platform to base their experiments on.

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