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Introduction to GIS

10 May 2019

Final Report

1. Title: *Relating Median Income and Median Rental Price with NYCHA Access, Manhattan 2017*
2. Project Summary: This project geographically displays the relationships between New York City Housing Authority (NYCHA) property locations, median incomes, and median rent prices in Manhattan to investigate if NYCHA residents are disadvantaged by being located in overall lower-income, lower-rent census tracts that may prevent their long-term social and economic mobilities.
3. Background & Purpose:

Historically, NYCHA was established in the 1930s as the manager of NYC public housing developments and currently “manages and maintains 346 public housing developments with 181,000 units” across the five boroughs of New York (“Housing”). Recent debate regarding NYCHA residences has been centered about the shift toward the public-private sector to address affordable housing property maintenance and renovations as well as the construction of new affordable housing units to better meet current affordable housing demand (“Problem”). With regard to these debates most recently, Mayor Bill de Blasio has supported leasing NYCHA properties to private landlords, transferring the responsibilities of affordable housing care and development away from the public sector while maintaining public ownership of the properties themselves (Walker).

This project is not intended to answer whether privatization or semi-privatization is an appropriate method for addressing maintenance and future construction of affordable housing units; however, it does raise points of concern that should be addressed when considering the impacts of affordable housing locations on the users of the properties as it relates to current residences and future locations. Specifically, the project calls into question how affordable housing locations may affect residents in both the long and short-terms, especially with regard to social and economic

mobility. Such analysis provides useful information for consideration by NYCHA when prioritizing certain residence locations for maintenance. Secondly, such analysis also suggests future locations where private affordable housing developments, independent of NYCHA, might best be located to benefit tenants and residents. Collectively, then, the purpose of the project is to recommend which of current NYCHA properties be prioritized for longevity as well as how future affordable housing units might be placed to best impact the beneficiaries of affordable housing.

4. Literature Review:

Previous documentation of the conversion of NYCHA housing maintenance and expansion from the public to private sector under de Blasio, as reported by American real-estate blog Curbed, indicates that while the private sector will manage the renovations and construction within the residences, they will remain under public ownership and adhere to “Section 8” regulations such that “rent will be no more than 30 percent of a tenants income” (Walker). While such a regulation provides continued protection of tenants’ rights despite the shift away from the public sector, it does not provide consideration for how much of a tenant’s income spent toward affordable housing compares to the median percent spent by New Yorkers not residing in NYCHA properties. It also does not provide information of how the rent spent on a NYCHA residence compares with typical rent prices already typical of a given census tract in New York, from which the relative advantage gained through continued maintenance or construction of NYCHA housing may be inferred. Thus, more information about the social and economic characteristics of users of affordable housing in relation to other New Yorkers is of interest following the mere statement of the restrictions to be imposed on private NYCHA developers as presented by Curbed.

A source that does provide some insight into the social considerations of affordable housing developments is provided by CityLab; yet, the larger economic implications of affordable housing users in comparison to other New York City residents are still not addressed. In particular, the article points to considerations of “child care, health, light industrial, education, a bank, a grocery store,

[etc.]” as well as aesthetic appeal of buildings as beneficial in achieving better designed affordable housing. These considerations result in greater numbers of opportunities for the people living in affordable housing according to CityLab, but beyond the goods and services that residents of affordable housing can now access, what types of people will they be able to meet and network with according to who else lives in the area? It certainly does seem that more opportunity for affordable housing users is possible if units are located in census tracts where higher rents and higher incomes are expected, where overall wealthier and more professionally-connected neighbors are likely to share goods and services providers within the same neighborhood such that the social mobility and, consequentially, the economic mobility of affordable housing users is increased. Thus, more information about the social and economic characteristics of users of affordable housing specifically in relation to other New Yorkers in their immediate areas, perhaps most easily measured as census tracts, is too of interest when locating future affordable housing locations.

5. Data (Source: data type):

OpenStreetMap: basemap of NYC

NYC Open Data:

- “2010 Census Tracts,” 2010 shapefile
- “Map of NYCHA Developments,” 2016 shapefile

US Census Bureau (American Community Survey 2017):

- “Income in the Past 12 Months” data table
- “Median Gross Rent” data table

6. Methodology:

Initially, all NYCHA residences in NYC were relevant to the questions posed by this project. As such, a map comparing the footprints of NYCHA properties across the five New York Boroughs was produced; however, upon the map’s completion, it became apparent that the NYCHA properties are relatively spread throughout the boroughs of the Bronx, Brooklyn, Queens, and Staten Island

when compared to the NYCHA properties that are comparatively concentrated to only two areas of Manhattan. From this concentration of properties, it seemed that Manhattan is the most likely borough to demonstrate a distinct separation of NYCHA locations from higher-income and higher-rent areas given the large area of the borough essentially absent of NYCHA properties. As such, maps considering median income and median rent were constructed specifically for the borough of Manhattan, which became the only borough of interest for the remainder of the project and its conclusions.

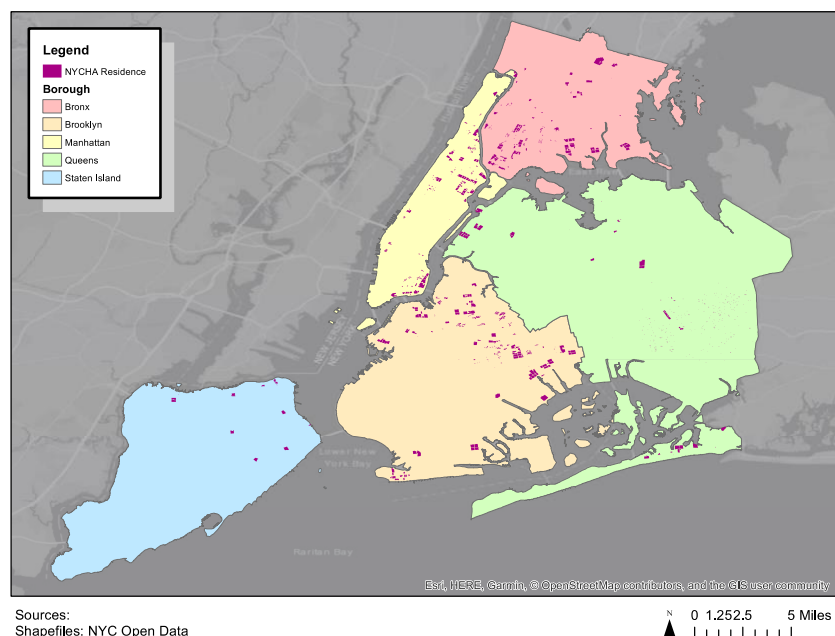
With regard to geoprocessing tools used, the first map was created by dissolving the census tracts according to their borough name attribute, such that a layer on the map only showing the boroughs was produced, over which the shapefile of the NYCHA footprints was layered. The boroughs were colored according to categories under the symbology tab of the layer properties screen. Converting the polygons of the footprints shapefile to a points layer to simplify the data presented across the boroughs was considered; however, it was ultimately decided that the footprints should be preserved because each property was still distinguishable from the others even at the map scale selected and also because the polygons, unlike mere points, demonstrate the area each NYCHA property covers, perhaps providing greater indication to the number of units available in a given residence. Perhaps the points could have been quantified such that the size of each point was indicative of the area covered, but again, this seemed unnecessary given that each footprint was distinguishable even at the smallest map scale relevant to the project. Other processes used for the first map include standard legend, scalebar, north arrow, title, and text features added in layout view as well as the adjustment of transparency of the basemap to increase the visibility of the added shapefiles.

Now with regard to geoprocessing tools used to create the other three following maps, similar processes regarding the layout view features and transparency of the basemap were repeated; however, other processes, especially relating to the attribute tables of the shapefiles were also

employed. With these maps, the census tracts shapefile was not dissolved because the census tracts, not just boroughs were necessary for presenting the data contained in the data tables; however, all census tracts not within the borough of Manhattan were selected and deleted from the attribute table such that the borough of interest was isolated. Likewise, NYCHA footprints not within Manhattan were also deleted from the NYCHA layer to simplify the maps. Appropriate data cleaning methods such as reformatting numbers as text and reformatting the census tract codes in the income data table to match those of the census tracts in the shapefile attribute table were completed within Excel. Within the attribute table of the census tracts, a new field formatted as a string field but calculated to copy the census tract codes from an existing field was created such that a join of both the income data set and the rent data set could be completed with the census tracts shapefile. Resultingly, maps displaying the median annual income, median monthly rent, and median rent burdens (i.e. median monthly rent normalized by median annual income, where the legend labels have been adjusted to account for the discrepancy between monthly and annual costs) were each created, with the variable of interest displayed as a choropleth in colors contrasting with the unchanging NYCHA layer.

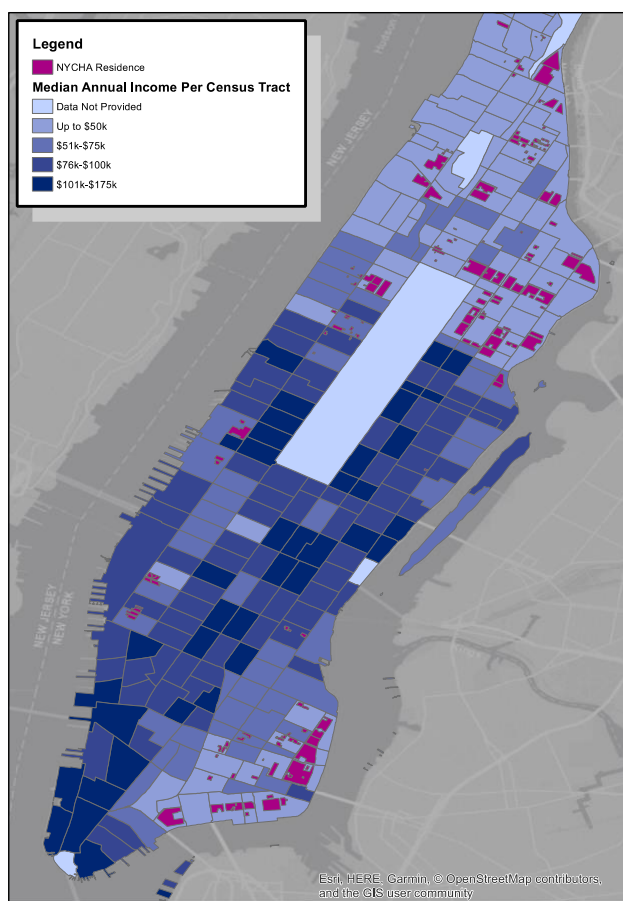
7. Findings:

NYCHA Residences Mapped on New York City Boroughs



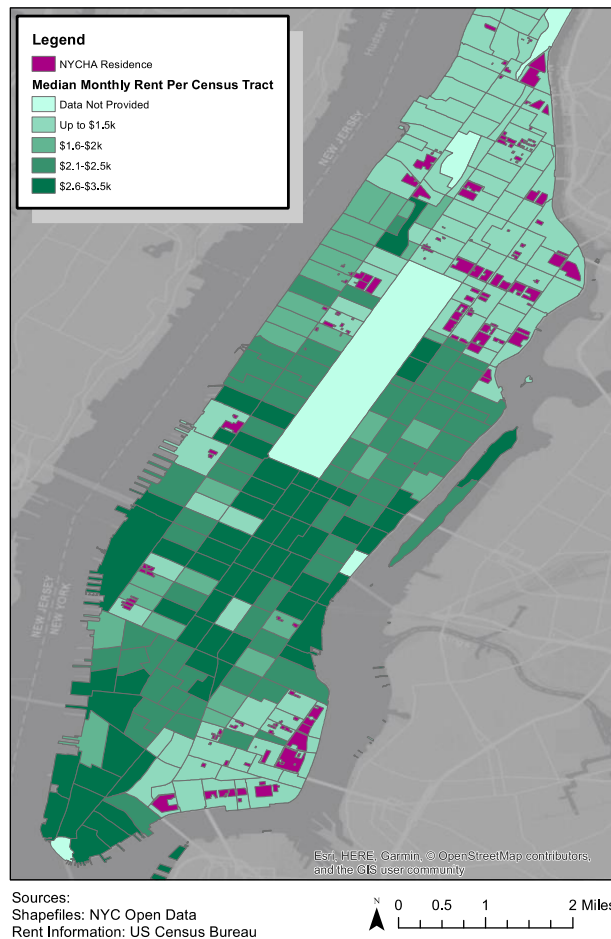
As Manhattan has the highest rent costs of any borough, Manhattan was also of special interest as people needing housing at a low cost would be least likely to find it in this borough without the assistance of NYCHA or other affordable housing providers. This fact, coupled with the demonstration separation of NYCHA properties from a large part of the borough, prompted special investigation into Manhattan itself. To test whether NYCHA properties indeed keep tenants or residents concentrated in lower-income, higher-rent areas for the borough of Manhattan, two new maps were created, demonstrating the footprints of NYCHA residences against median annual income and median monthly rent. Note that income is reported as an annual figure whereas rent is reported as a monthly figure, so these numbers have been mapped accordingly.

NYCHA Residences Compared with Median Annual Income, Manhattan Census Tracts



Sources:
Shapefiles: NYC Open Data
Income Information: US Census Bureau

NYCHA Residences Compared with Median Monthly Rent, Manhattan Census Tracts

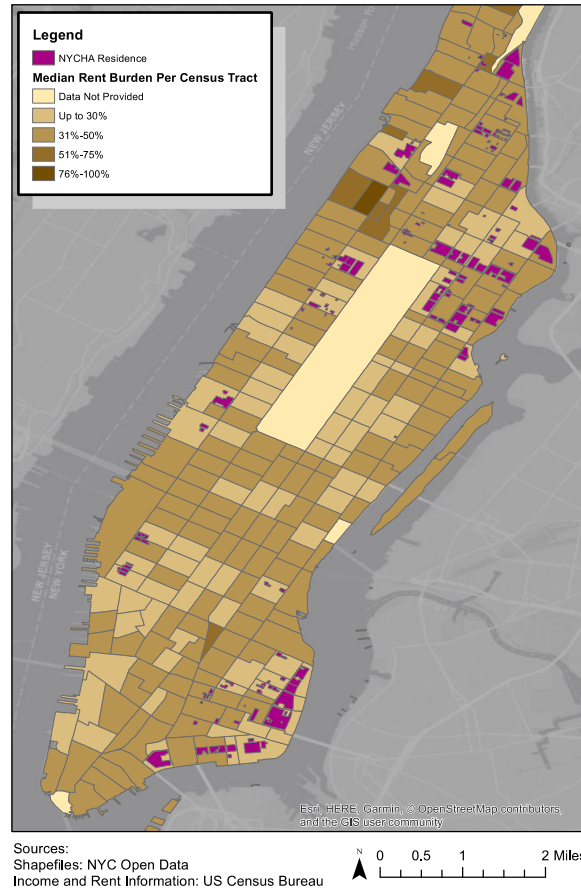


From the map of NYCHA residences against median annual income, it is evident that NYCHA residences are largely located in census tracts within the lowest median income bracket of Manhattan. It should be noted, however, that the median income of the census tracts is naturally lowered by the fact that the residents living in the NYCHA properties there have a lower income than the average household or individual living in Manhattan. Similarly, from the map of NYCHA residences against median monthly rent, it is evident that NYCHA residences are largely located in census tracts within the lowest median rent bracket of Manhattan. As with the median income of the census tracts, the median rent price is naturally lowered by the fact that the residents living in the NYCHA properties there have a lower income than the average household or individual living in Manhattan. Neither median annual income nor median monthly rent is thus independent of NYCHA

residence location, and vice versa, such that a causal relationship cannot be assumed. Rather than a causal relationship, what is then of interest is whether the relationship between median income and median rent differs in areas where NYCHA residences are situated.

A final map is thus created to relate all three factors: median income, median rent, and NYCHA locations; relating median income with median rent is the median rent burden, which is calculated as the median rent multiplied by 12 and divided by the median income of each census tract to demonstrate the median percentage of income spent toward rent, adjusted as an annual cost. This map demonstrates that NYCHA properties tend to be located in the census tracts within the lowest bracket of rent burden; however, there are several census tracts within the lowest rent burden bracket that do not contain NYCHA residences throughout the borough of Manhattan, which was not true of median income and median rent.

NYCHA Residences Compared with Median Rent Burden, Manhattan Census Tracts



8. Limitations:

The limitation of the fact that affordable housing units are located within the census tracts demonstrating lower median incomes and lower median rental prices has been addressed by creating the median rent burden map, another limitation to the project should be noted, which is that it does not provide a method by which to determine whether the short or long-term interests of the users of affordable housing should be given priority when maintaining current and constructing future residences. In the short term, it seems preferable to locate affordable housing in areas with the lowest rents such that households able to increase their income over time can most readily move into regular housing units independent of affordable housing providers to minimize the amount of time spent in affordable housing, especially when the present demand outweighs supply for the units. The effects of necessarily switching children to different school systems, losing valuable neighborly relationships, and changing memberships to recreational centers (e.g. gyms, community clubs) are three results of moving neighborhoods that might disincentivize users from leaving affordable housing units if required to move from the area after raising their income level; thus, it seems necessary that affordable housing be located in lower rent areas. Yet in the long term, it seems preferable to locate affordable housing in areas with higher income areas such that residents gain social and economic access to individuals and business or organizations with larger amounts of money that may enable greater networking and professional opportunities that increase the likelihood that users of affordable housing not only be able to increase their incomes to be able to pay rent at the lowest rent bracket, but to a higher bracket as well. The maps produced by the project themselves do not provide recommendation for whether the short or long-term benefits of affordable housing should be prioritized by affordable housing developers.

9. Conclusion & Recommendations:

Ultimately, the project concludes that NYCHA properties in the borough of Manhattan are concentrated in lower-income, lower-rent census tracts that do not necessarily demonstrate a lower

rent burden compared to other locations in Manhattan. The result is that users of NYCHA properties are contained to the conditions of lower-income, lower-rent areas that may limit their ability to obtain greater networking or professional possibilities that will, in the long-term, inhibit their social and economic mobilities such that class divisions are, in some ways, maintained by the initial locations of NYCHA residences. While in the short-term, NYCHA can provide temporary, short-term solution to families otherwise facing homelessness or eviction, it does not therefore provide a feasible means by which NYCHA users in Manhattan may increase their social and economic mobilities to advance themselves in the long-term.

The current locations of NYCHA do not provide any advantage over other census tracts in Manhattan considering that the 30% rent burden limit as enforced by Section 8 regulations is respected in most tracts throughout Manhattan, not just the ones where NYCHA residences are accessible. Given that the rent burden is not greater in many Manhattan boroughs without NYCHA properties than in the Manhattan boroughs that are occupied by NYCHA, it may be recommended that new affordable housing developments be located in census tracts falling below the 30% rent burden bracket if it is also assumed that affordable housing users in this area would be able to obtain higher paying jobs given the greater social and economic mobility they might achieve by living in there. As a supplement, employment and educational resources might be necessarily imposed through supporting policies as means to assist affordable housing users in attaining such higher paying positions, and the cut-off for income level qualifying for affordable housing might be raised in these areas to account for the higher median rent costs that would be expected to continue living in the same or adjacent census tracts following the use of affordable housing. While this might increase the amount of time that households require continuous use of affordable housing and would potentially benefit households making a greater income than the typical maximum income of affordable housing users, such policies may benefit the long-term social and economic mobilities of affordable housing users and should be considered.

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