EFFECT OF HOUSEHOLD Structure ON UPWARD MOBILITY in Queens and Brooklyn (NYC)

By Shuvam Bhowmick

Hypothesis: Differences in household type based on the 2010 Census estimate collected by the ACS over the years spanning 2006-2010 have unique relationships with upward mobility in New York. In Queens and Kings County(aka Brooklyn borough) of NYC, there is abundant variation in family household structure and I will test the effects of this variation on upward mobility while controlling for variables such as incarceration rates, median income(in 2010), population density(in 2010), and rent for a two bedroom apartment (in 2015). I will also compare the relationship between different household types and upward mobility within two different neighborhood categories : 1. High Income Areas ; 2. Low Income Areas

The upward mobility statistic :

The upward mobility measurement that I will be using is Statistic 1: Absolute Mobility at the 25th Percentile included in the Opportunity Atlas by Raj Chetty et al. This statistic {kfr_pooled_pooled_p25} pools together racial/ethnic/gender groups recorded in the opportunity atlas dataset across the U.S and calculates the absolute mobility at the 25th percentile. The absolute mobility at the 25th percentile measures the predicted income of children with parents that income within the lowest quarter of U.S. income ranks. The opportunity atlas can measure these predictions using data of intergenerational income mobility. In this dataset, linked tax records show the income of parents at age 35 (between 1974 - 1978) and their children's incomes at age 35 in 2010 - 2016. Aftering ranking the parents' income, we can then rank the children's income and predict those ranks given the rank of parents income using a linear regression model. Here is an example of what that would look like : $Rank_{Child\ Income} = 33 + 0.4 * Rank_{Parent\ Income}$ .The number of Census Bureau observations within this dataset is 73,199 individuals. I will investigate the average upward mobility for New York as well as Queens and Kings county(counties in New york city). For more information on this statistic please reference the paper written by Raj Chetty et al.
https://opportunityinsights.org/wp-content/uploads/2018/10/atlas_paper.pdf
In order to investigate variations in household type, I merged data onto the original opportunity atlas dataset using Stata.

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Additional Variables Merged to Atlas Dataset (with abbreviations)

1. Average Household size = **AHS**
2. Percent of Households with One or more person 60 years of age or over = **PH60**
3. Percent of households with the householder (m or f) living Alone = **PHLA**
4. Total Number of Married-Couple family Households (with or without children) = **TMCF**
5. Percent of married-couple family households with at least one child under the age of 6 = **PMCFH6**
6. Total Number of Households with at least one grandchild and one grandparent = **THGD**
7. Total number of households with unmarried couples and/or other non-related groups = **TUCNR**
8. Total Households(all types) = **THouseholds**
9. Percent of total married couple family households = **PMCTH**
10. Percent of Households with at least one grandchild = **PHGD**
11. Percent of households with unmarried couples and/or other non-related groups : **PUCNR**

DATA : Household Types Investigated

DIfferent Households have different characteristics. Here are the different types investigated:

1. Households with at least one grandchild and one grandparent
2. Households with one or more 60 year old individual in the house
3. Households with unmarried couples or non-related friends/acquaintances (possible children/ adopted)
4. Married households with at least one child under 6
5. Households where the householder is living alone(male or female combined)

All data is collected through the percent estimates on the Census 2010 (ACS 06-10).

TABLE 1

Mean Upward Mobility kfr_pooled_pooled _p25	Percent of households made up of unmarried couples or non-related friend groups	Percent of Households with at least one grandchild and one grandparent	Percent of households with Householder Living Alone (Male or Female)	Percent of Married households with at least one child under the age of 6	Percent of households with at least one person 60 years or over
NY Mean Upward Mobility : 46.83	CC = -.31	CC = -.43	CC = -0.19	CC = -.37	CC = .37
Queens County Mean Upward Mobility : 48.66	CC = -.31	CC = -.52	CC = .15	CC = -.28	CC = .12
Kings County Mean Upward Mobility : 44.69	CC = -.26	CC = -.45	CC = -.02	CC = -0.28	CC =.45

TABLE 1 : This table shows the correlation coefficients (CC) of different household types and upward mobility in NY, Queens county and Kings county.

Here is the linear regression model used to predict the upward mobility statistic:

$$\mathbf{Y}_i\text{(Upward Mobility Statistic)} = 39.9 + .07\beta_1 + -.033\beta_2 + -.077\beta_3 - .15\beta_4 - .21\beta_5 + .0001\beta_6 - 83.21\beta_7 + .001\beta_8 + .00002\beta_9 + \epsilon$$

β_1 = Percent of Households with at least one 60 year old present
β_2 = Percent of Households where the Householder is living alone
β_3 = Percent of Married Households where there is at least one child under the age of 6 present.
β_4 = Percent of households that are made up of unmarried partners or non-related friends/acquaintances (possible children / adopted children)
β_5 = Percent of Households with at least one grandchild and one grandparent present
β_6 = Median Household income in 2016
β_7 = Fraction incarcerated on April 1st, 2010 for children from families at the 25th percentile (lower income households)
β_8= Median Rent for Two-Bedroom Apartment in 2015(dollars).
β_9= Population density in 2010
ϵ = error term

```
. reg kfr_pooled_pooled_p25 PH60 PHLA PMCFH6 PUCNR PHGD med_hhinc2016 jail_pooled_pooled_p25 rent_twobed2015 popdensity2010
```

Source	SS	df	MS	Number of obs	=	55,630
				F(9, 55620)	=	6218.73
Model	1282809.68	9	142534.408	Prob > F	=	0.0000
Residual	1274820.9	55,620	22.9201888	R-squared	=	0.5016
				Adj R-squared	=	0.5015
Total	2557630.58	55,629	45.9765693	Root MSE	=	4.7875

kfr_pooled_pooled_p25	Coefficient	Std. err.	t	P>|t|	[95% conf.	interval]
PH60	.0704443	.0019089	36.90	0.000	.0667028	.0741857
PHLA	-.0342703	.0023324	-14.69	0.000	-.0388418	-.0296989
PMCFH6	-.0773229	.0020567	-37.60	0.000	-.081354	-.0732917
PUCNR	-.156617	.0086106	-18.19	0.000	-.1734938	-.1397402
PHGD	-.2073956	.0034824	-59.56	0.000	-.2142211	-.2005702
med_hhinc2016	.0000922	1.29e-06	71.34	0.000	.0000896	.0000947
jail_pooled_pooled_p25	-82.30303	1.017622	-80.88	0.000	-84.29758	-80.30849
rent_twobed2015	.000933	.0000779	11.98	0.000	.0007803	.0010858
popdensity2010	.0000215	1.87e-06	11.48	0.000	.0000178	.0000252
_cons	39.85949	.1291947	308.52	0.000	39.60627	40.11272

Reference : Stata

** 50 percent of the response variance is explained by the variables in the linear regression based on the adjusted R-squared.**
All p > |t| values equal 0 meaning there are significant effects of ind. variables on dep. variable.

The relationship between upward mobility and the percent of households with various characteristics will be controlled by median income, fraction incarcerated, rent of a two bedroom apartment, and population density. The average median income in New York State is 72,386. The average fraction incarcerated on April 1st, 2010 is .012. The average rent of a two bedroom apartment in 2015 is 1480, and the average population density in 2010 is 37,531. All of these averages characterize observations in New York State. I chose these socio-economic characteristics to create two groups: 1. high income areas and 2. low income areas. I can then examine the differences in graph direction, slope and correlation strength between high and low income areas. The relationship between different household types and upward mobility when it is controlled by these averages is shown below.

(The following graphs contain descriptions and equations. Conclusions and Caveats with references to data included below the data)

Section 1:
Investigation of low and high income areas at the New York State Level
1. Low Income Areas

(Part A) The relationship between the percent of households with at least one person 60 years or older and upward mobility when the fraction incarcerated is more than the average, the median household income in 2016 is less than the average, the rent for a two bedroom apartment in 2015 is less than the average, and the population density in 2010 is greater than the average at the New York State level.

Yi(Upward Mobility) = 34 + .17(Percent of households with at least one person 60 years or older)
Correlation Coefficient = 0.27

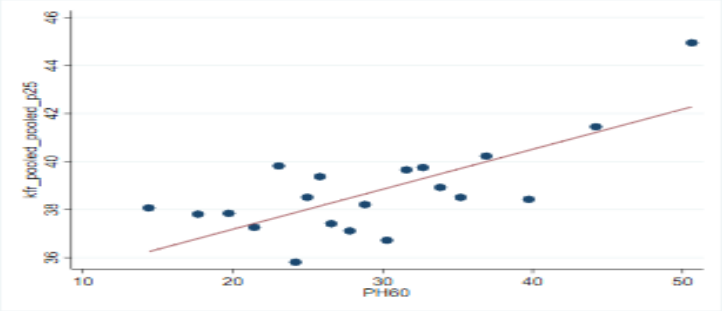


Figure 1.A

(Part B) The relationship between the percent of households where the householder(male or female) is living alone and upward mobility when the fraction incarcerated is more than the average, the median household income in 2016 is less than the average, the rent for a two bedroom apartment in 2015 is less than the average, and the population density in 2010 is greater than the average at the New York State level.

Yi(Upward Mobility) = 41.2 - .08(Percent of households where the householder(male or female) is living alone)
Correlation Coefficient = -0.15

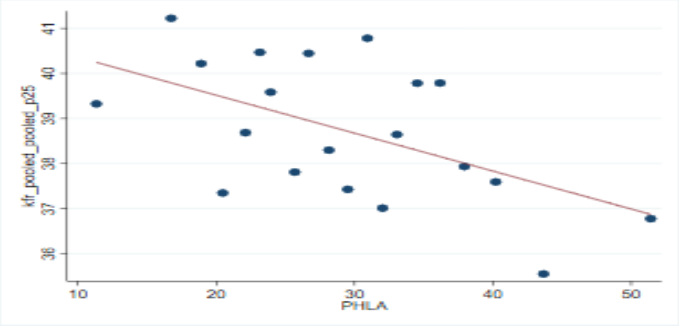


Figure 1.B

(Part C) The relationship between the percent of married households where there is at least one child under the age of 6 present and upward mobility when the fraction incarcerated is more than the average, the median household income in 2016 is less than the average, the rent for a

two bedroom apartment in 2015 is less than the average, and the population density in 2010 is greater than the average at the New York State level.

Yi(Upward Mobility) = 41.9 - .14(Percent of married households where there is at least one child under the age of 6 present)
Correlation Coefficient = -0.26

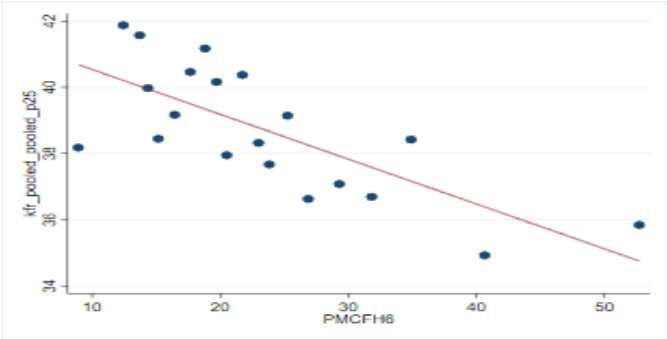


Figure 1.C

(Part D) The relationship between the percent of households that are made up of unmarried partners or non-related friends/acquaintances (possible children / adopted children) and upward mobility when the fraction incarcerated is more than the average, the median household income in 2016 is less than the average, the rent for a two bedroom apartment in 2015 is less than the average, and the population density in 2010 is greater than the average at the New York State level.

Yi(Upward Mobility) = 39 - .07(Percent of married households where the households are made up of unmarried partners or non-related friends/acquaintances(possible children / adopted children)
Correlation Coefficient = -0.04

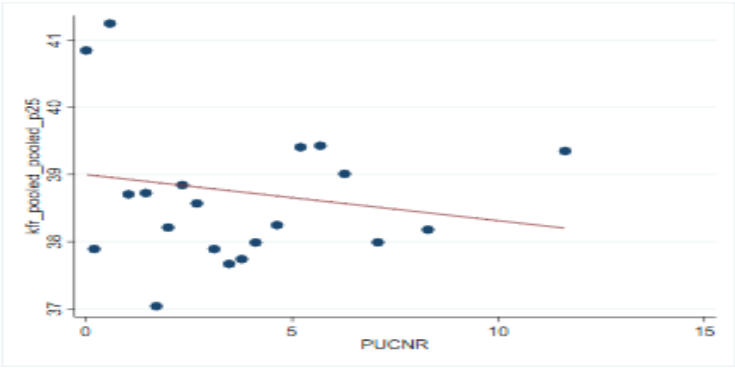


Figure 1.D

(Part E) The relationship between the percent of households with at least one grandchild and one grandparent present and upward mobility when the fraction incarcerated is more than the average, the median household income in 2016 is less than the average, the rent for a two

bedroom apartment in 2015 is less than the average, and the population density in 2010 is greater than the average at the New York State level.

Yi(Upward Mobility) = 42 - .27(Percent of married households where there is at least one grandchild and one grandparent present)
Correlation Coefficient = -0.35

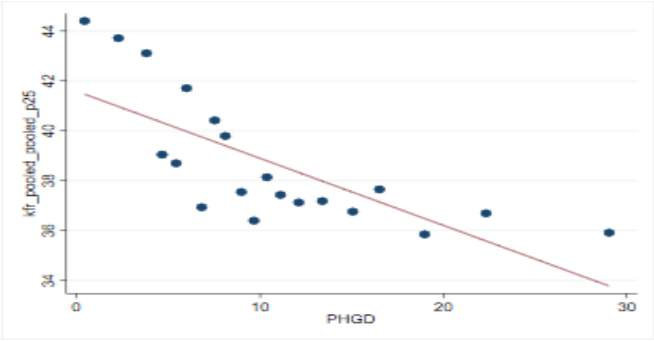


Figure 1.E

2. High Income Areas

(Part A) The relationship between the percent of households with at least one person 60 years or older and upward mobility when the fraction incarcerated is less than the average, the median income in 2016 is more than the average, the rent for a two bedroom apartment in 2015 is more than the average, and the population density is 2010 is less than the average at the New York State level.

Yi(Upward Mobility) = 46 + .21(Percent of households with at least one person 60 years or older)
Correlation Coefficient = 0.31

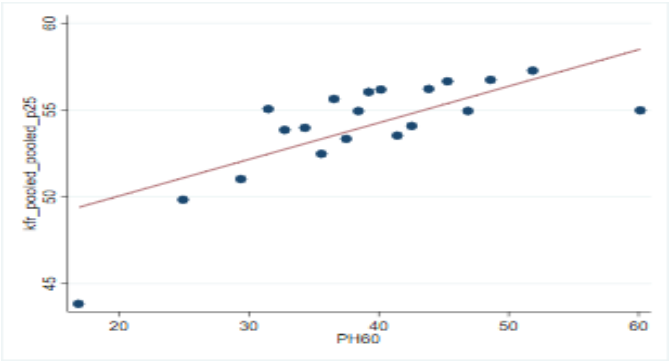


Figure 1.A.1

(Part B) The relationship between the percent of households where the householder(male or female) is living alone and upward mobility when the fraction incarcerated is less than the average, the median income in 2016 is more than the average, the rent for a two bedroom

apartment in 2015 is more than the average, and the population density is 2010 is less than the average at the New York State level.

Yi(Upward Mobility) = 58.39 - .21(Percent of households where the householder(male or female) is living alone)
Correlation Coefficient = -0.35

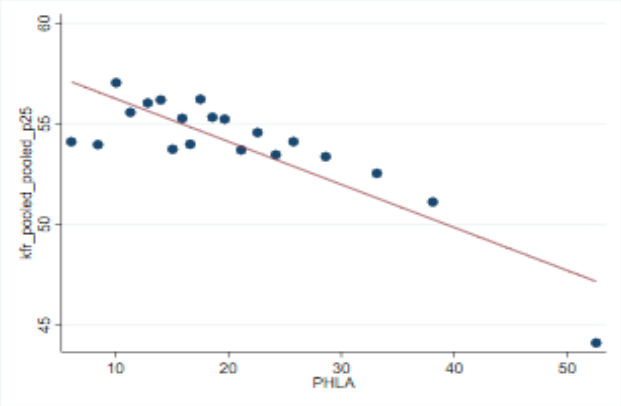


Figure 1.B.1

(Part C) The relationship between the percent of married households where there is at least one child under the age of 6 present and upward mobility when the fraction incarcerated is less than the average, the median income in 2016 is more than the average, the rent for a two bedroom apartment in 2015 is more than the average, and the population density is 2010 is less than the average at the New York State level.

Yi(Upward Mobility) = 58.08 - .28(Percent of married households where there is at least one child under the age of 6 present)
Correlation Coefficient = -0.38

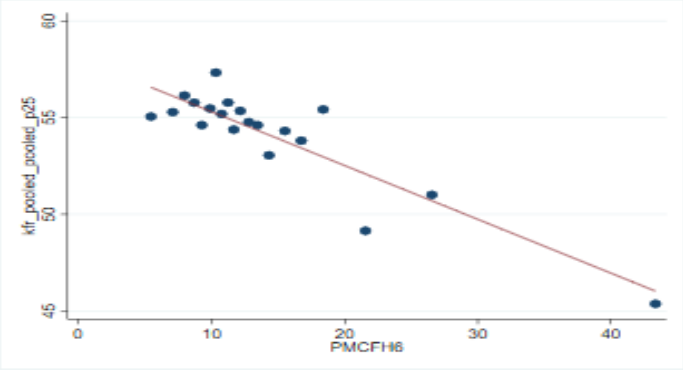


Figure 1.C.1

(Part D) The relationship between the percent of households that are made up of unmarried partners or non-related friends/acquaintances (possible children / adopted children) and upward mobility when the fraction incarcerated is less than the average, the median income in 2016 is

more than the average, the rent for a two bedroom apartment in 2015 is more than the average, and the population density is 2010 is less than the average at the New York State level.

Yi(Upward Mobility) = 54 - .33(Percent of married households where the households are made up of unmarried partners or non-related friends/acquaintances(possible children / adopted children)
Correlation Coefficient = -0.08

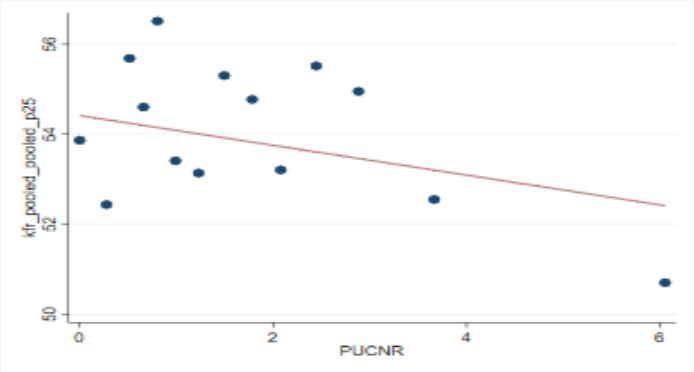


Figure 1.D.1

(Part E) The relationship between the percent of households with at least one grandchild and one grandparent present and upward mobility when the fraction incarcerated is less than the average, the median income in 2016 is more than the average, the rent for a two bedroom apartment in 2015 is more than the average, and the population density is 2010 is less than the average at the New York State level.

Yi(Upward Mobility) = 55 - .29(Percent of married households where there is at least one grandchild and one grandparent present)
Correlation Coefficient = -0.18

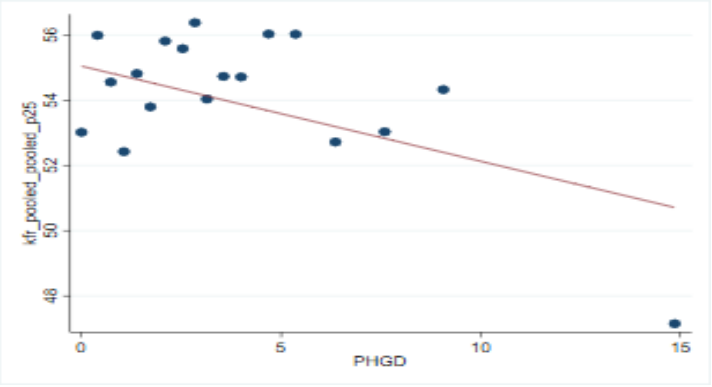


Figure 1.E.1

Section 2 :

The relationship between upward mobility and the percent of households with various characteristics will be controlled by median income, fraction incarcerated, rent of a two bedroom apartment, and population density at the county level. The average median income in Queens County is 64,146. The average fraction incarcerated on April 1st, 2010 is .009. The average rent of a two bedroom apartment in 2015 is $1460, and the average population density in 2010 is 35,666. All of these averages characterize observations in Queens county only. The relationship between different household types and upward mobility when it is controlled by these averages is shown below.

Investigation of low and high income areas at the New York State County Level (Section 2)

1. **Low Income Areas in Queens County**

(Part A) The relationship between the percent of households with at least one person 60 years or older and upward mobility when the fraction incarcerated is more than the average, the median household income in 2016 is less than the average, the rent for a two bedroom apartment in 2015 is less than the average, and the population density in 2010 is greater than the average in Queens County

Yi(Upward Mobility) = 42 + .08(Percent of households with at least one person 60 years or older)
Correlation Coefficient = 0.12

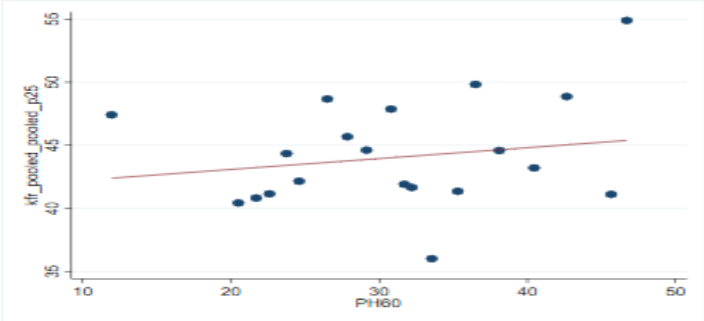


Figure 2.A

(Part B)
The relationship between the percent of households where the householder(male or female) is living alone and upward mobility when the fraction incarcerated is more than the average, the median household income in 2016 is less than the average, the rent for a two bedroom apartment in 2015 is less than the average, and the population density in 2010 is greater than the average in Queens County.
Yi(Upward Mobility) = 46 - .07(Percent of households where the householder(male or female) is living alone)
Correlation Coefficient = -0.11

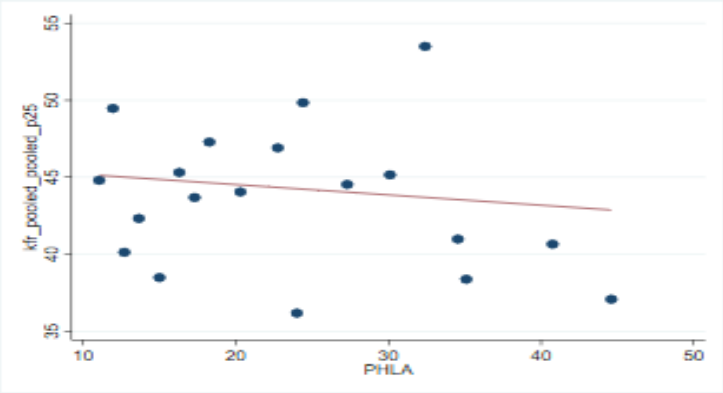


Figure 2.B

(Part C)
The relationship between the percent of married households where there is at least one child under the age of 6 present and upward mobility when the fraction incarcerated is more than the average, the median household income in 2016 is less than the average, the rent for a two bedroom apartment in 2015 is less than the average, and the population density in 2010 is greater than the average in Queens County.

Yi(Upward Mobility) = 50.4 - .33(Percent of married households where there is at least one child under the age of 6 present)
Correlation Coefficient = -.32

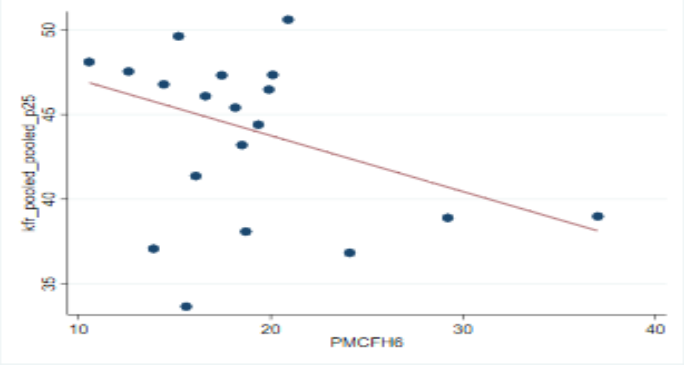


Figure 2.C

(Part D) The relationship between the percent of households that are made up of unmarried partners or non-related friends/acquaintances (possible children / adopted children) and upward mobility when the fraction incarcerated is more than the average, the median household income in 2016 is less than the average, the rent for a two bedroom apartment in 2015 is less than the average, and the population density in 2010 is greater than the average in Queens County.

Yi(Upward Mobility) = 44.7 - .1(Percent of households that are made up of unmarried partners or non-related friends/acquaintances(possible children / adopted children)
Correlation Coefficient = -.08

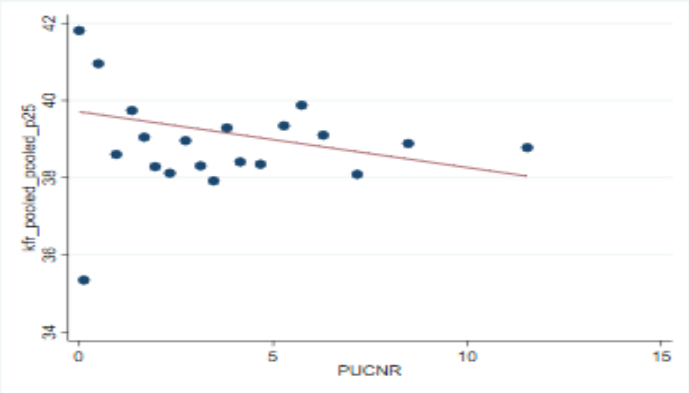


Figure 2.D

(Part E) The relationship between the percent of households with at least one grandchild and one grandparent present and upward mobility when the fraction incarcerated is more than the average, the median household income in 2016 is less than the average, the rent for a two bedroom apartment in 2015 is less than the average, and the population density in 2010 is greater than the average in Queens County.
Yi(Upward Mobility) = 47 - .32(Percent of households that have at least one grandchild and one grandparent present)
Correlation Coefficient = -.46

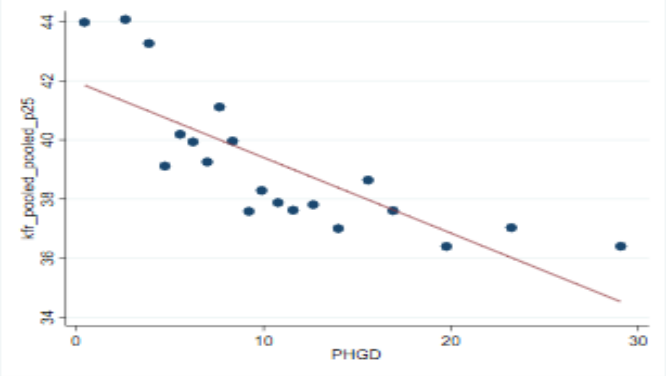


Figure 2.E

2. High Income Areas in Queens County

(Part A) The relationship between the percent of households with at least one person 60 years or older and upward mobility when the fraction incarcerated is less than the average, the median income in 2016 is more than the average, the rent for a two bedroom apartment in 2015 is more than the average, and the population density is 2010 is less than the average in Queens County.

Yi(Upward Mobility) = 47.5 + .17(Percent of households with at least one person 60 years or older)

Correlation Coefficient = 0.25

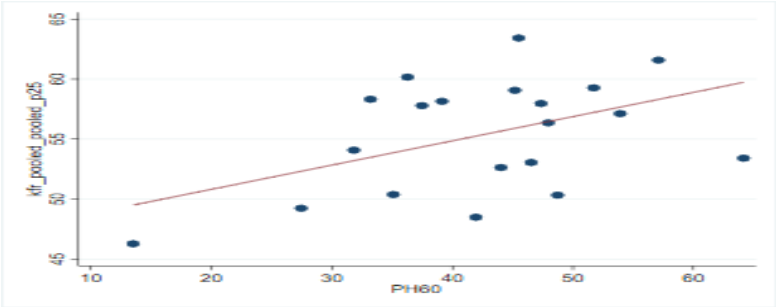


Figure 2.A.1

(Part B)
The relationship between the percent of households where the householder(male or female) is living alone and upward mobility when the fraction incarcerated is less than the average, the median income in 2016 is more than the average, the rent for a two bedroom apartment in 2015 is more than the average, and the population density is 2010 is less than the average in Queens County.

Yi(Upward Mobility) = 54.3 + .02(Percent of households where the householder(male or female) is living alone)
Correlation Coefficient = 0.02

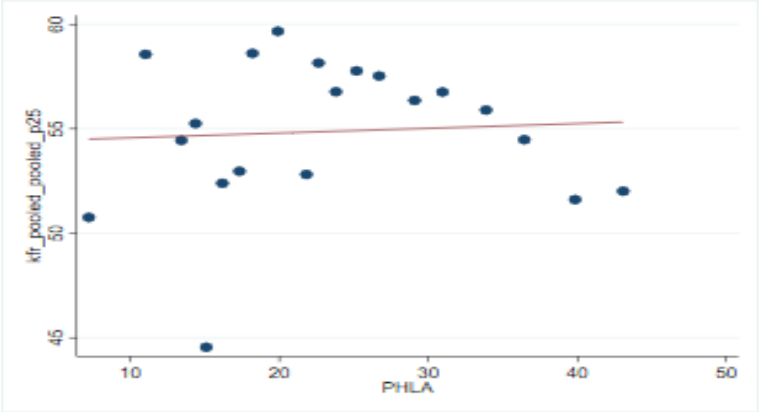


Figure 2.B.1

(Part C) The relationship between the percent of married households where there is at least one child under the age of 6 present and upward mobility when the fraction incarcerated is less than the average, the median income in 2016 is more than the average, the rent for a two bedroom apartment in 2015 is more than the average, and the population density is 2010 is less than the average in Queens County.

Yi(Upward Mobility) = 60.3 - .29(Percent of married households where there is at least one child under the age of 6 present)
Correlation Coefficient = -.33

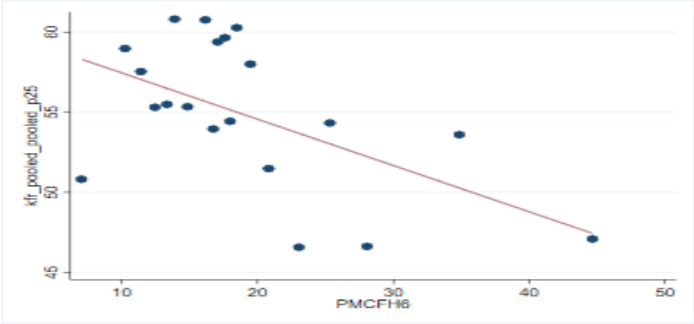


Figure 2.C.1

(Part D) The relationship between the percent of households that are made up of unmarried partners or non-related friends/acquaintances (possible children / adopted children) and upward mobility when the fraction incarcerated is less than the average, the median income in 2016 is more than the average, the rent for a two bedroom apartment in 2015 is more than the average, and the population density is 2010 is less than the average in Queens County.

Yi(Upward Mobility) = 55.8 - .6(Percent of households that are made up of unmarried partners or non-related friends/acquaintances(possible children / adopted children)
Correlation Coefficient = -.15

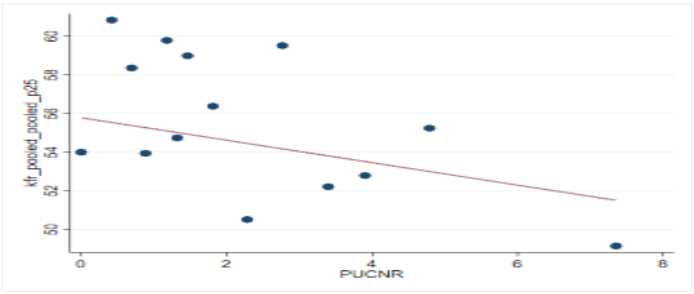


Figure 2.D.1

(Part E) The relationship between the percent of households with at least one grandchild and one grandparent present and upward mobility when the fraction incarcerated is less than the average, the median income in 2016 is more than the average, the rent for a two bedroom apartment in 2015 is more than the average, and the population density is 2010 is less than the average in queens county

Yi(Upward Mobility) = 57 - .47(Percent of households that have at least one grandchild and one grandparent present)
Correlation Coefficient = -.33

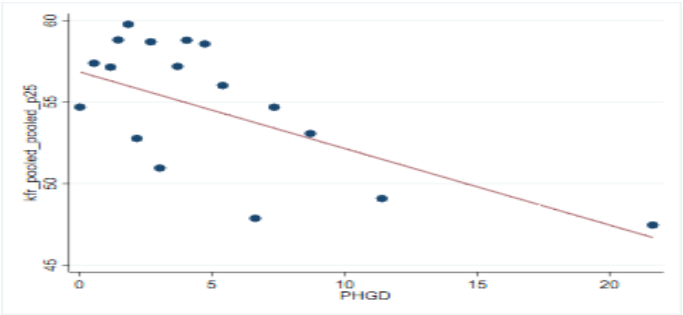


Figure 2.E.1

Section 3:

The relationship between upward mobility and the percent of households with various characteristics will be controlled by median income, fraction incarcerated, rent of a two bedroom apartment, and population density at the Kings county level. The average median income in Kings County is 56,759. The average fraction incarcerated on April 1st, 2010 is .013. The average rent of a two bedroom apartment in 2015 is $1380, and the average population density in 2010 is 48,876. All of these averages characterize observations in Queens county only. The relationship between different household types and upward mobility when it is controlled by these averages is shown below.

Investigation of low and high income areas at the New York State County Level (Section 3)

3. Low Income Areas in Kings County

(Part A) The relationship between the percent of households with at least one person 60 years or older and upward mobility when the fraction incarcerated is more than the average, the median household income in 2016 is less than the average, the rent for a two bedroom apartment in 2015 is less than the average, and the population density in 2010 is greater than the average in Kings County.

Yi(Upward Mobility) = 33.3 - .14(Percent of households that have at least one person 60 years or older)
Correlation Coefficient = .24

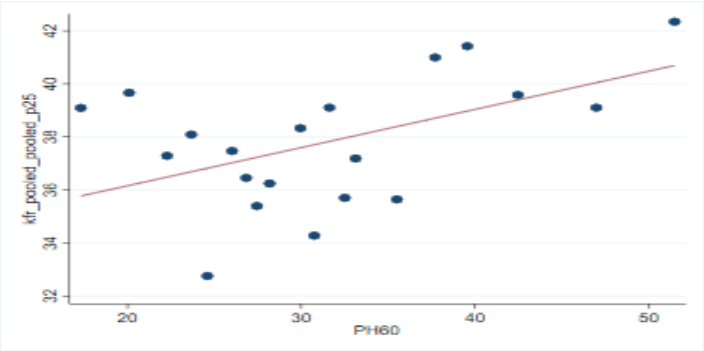


Figure 3.A

(Part B)

The relationship between the percent of households where the householder(male or female) is living alone and upward mobility when the fraction incarcerated is more than the average, the median household income in 2016 is less than the average, the rent for a two bedroom apartment in 2015 is less than the average, and the population density in 2010 is greater than the average in Kings County.

Yi(Upward Mobility) = 33.3 - .14(Percent of households where the householder(male or female) is living alone)
Correlation Coefficient = -.22

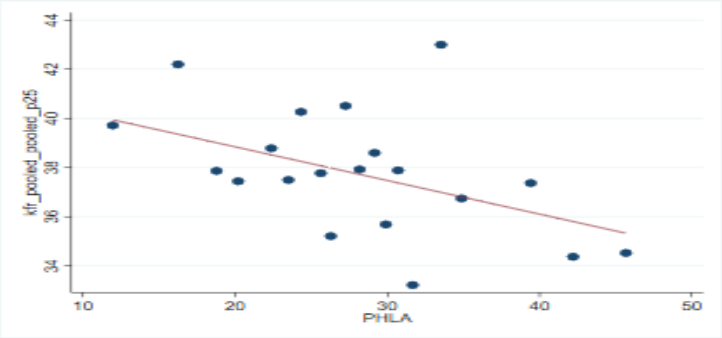


Figure 3.B

(Part C)
The relationship between the percent of married households where there is at least one child under the age of 6 present and upward mobility when the fraction incarcerated is more than the average, the median household income in 2016 is less than the average, the rent for a two bedroom apartment in 2015 is less than the average, and the population density in 2010 is greater than the average in Kings County.
Yi(Upward Mobility) = 42.7 - .19(Percent of married households where there is at least one child under the age of 6 present)
Correlation Coefficient = -.44

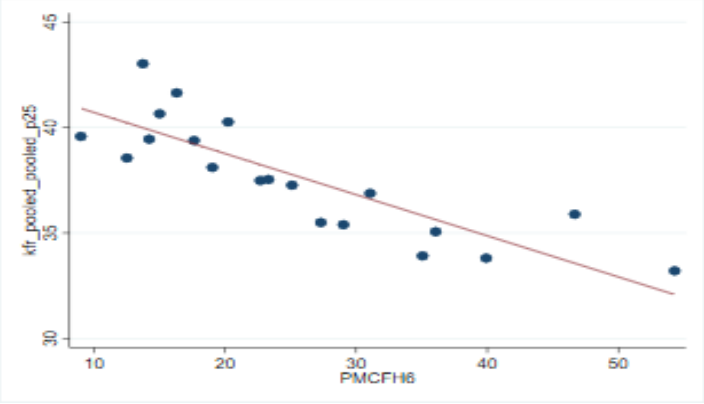
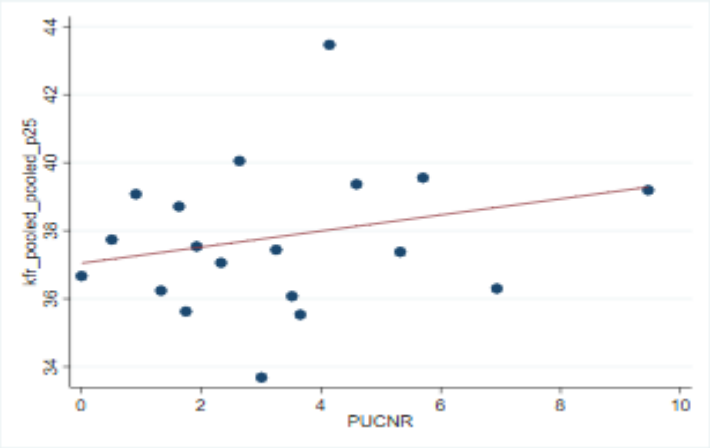


Figure 3.C

(Part D)
The relationship between the percent of households that are made up of unmarried partners or non-related friends/acquaintances (possible children / adopted children) and upward mobility when the fraction incarcerated is more than the average, the median household income in 2016 is less than the average, the rent for a two bedroom apartment in 2015 is less than the average, and the population density in 2010 is greater than the average in Kings County.

Yi(Upward Mobility) = 37 + .24(Percent of households that are made up of unmarried partners or non-related friends/acquaintances(possible children / adopted children)
Correlation Coefficient =.11



3.D

(Part E) The relationship between the percent of households with at least one grandchild and one grandparent present and upward mobility when the fraction incarcerated is more than the average, the median household income in 2016 is less than the average, the rent for a two bedroom apartment in 2015 is less than the average, and the population density in 2010 is greater than the average in Kings County.
Yi(Upward Mobility) = 41 - .26(Percent of households that have at least one grandchild and one grandparent present)
Correlation Coefficient = -.35

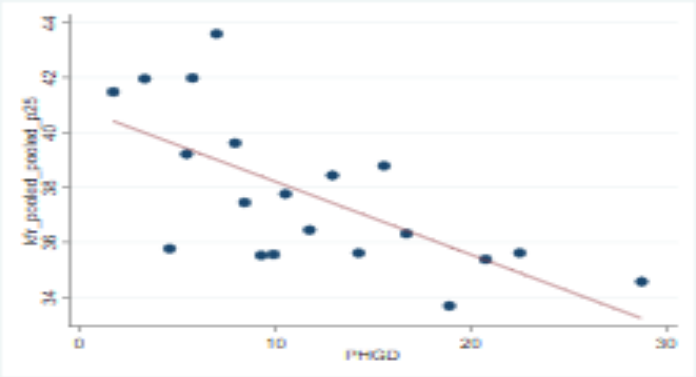


Figure 3.E

3. High Income Areas in Kings County

(Part A) The relationship between the percent of households with at least one person 60 years or older and upward mobility when the fraction incarcerated is less than the average, the median income in 2016 is more than the average, the rent for a two bedroom apartment in 2015 is more than the average, and the population density is 2010 is less than the average in Kings county.

Yi(Upward Mobility) = 37 + .36(Percent of households that have at least one person 60 years or older)

Correlation Coefficient = .54

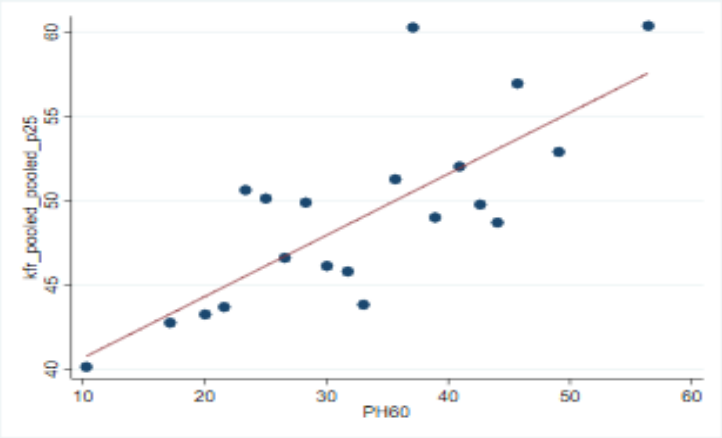


Figure 3.A.1

(Part B)
The relationship between the percent of households where the householder(male or female) is living alone and upward mobility when he fraction incarcerated is less than the average, the median income in 2016 is more than the average, the rent for a two bedroom apartment in 2015 is more than the average, and the population density is 2010 is less than the average in Kings county.

Yi(Upward Mobility) = 50.53 - .06(Percent of households where the householder(male or female) is living alone)
Correlation Coefficient = -.1

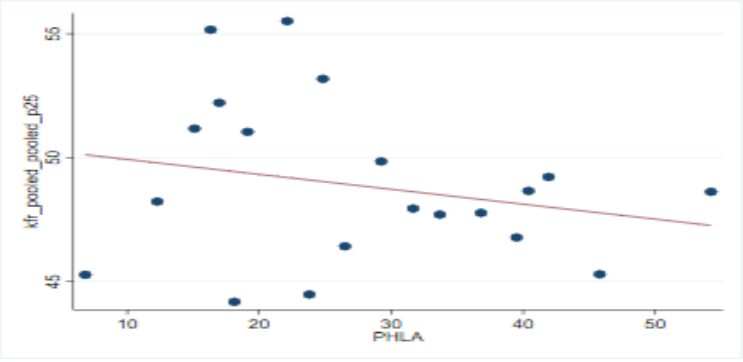


Figure 3.B.1

(Part C)
The relationship between the percent of married households where there is at least one child under the age of 6 present and upward mobility when he fraction incarcerated is less than the average, the median income in 2016 is more than the average, the rent for a two bedroom apartment in 2015 is more than the average, and the population density is 2010 is less than the average in Kings county.

Yi(Upward Mobility) = 51.3 - .1(Percent of married households where there is at least one child under the age of 6 present)
Correlation Coefficient = -.16

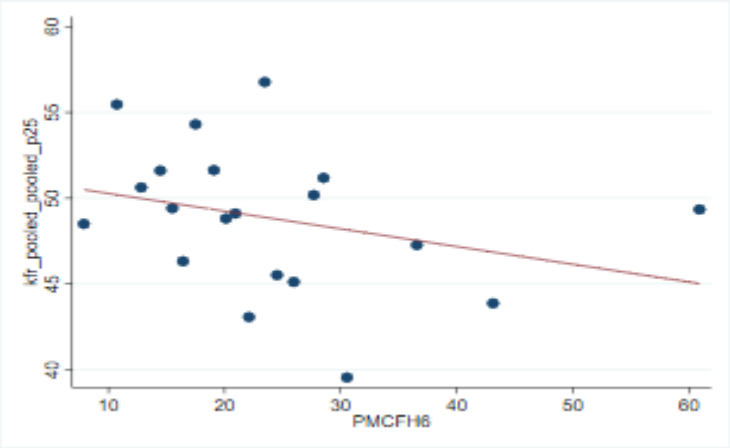


Figure 3.C.1

(Part D)
The relationship between the percent of households that are made up of unmarried partners or non-related friends/acquaintances (possible children / adopted children) and upward mobility when the fraction incarcerated is less than the average, the median income in 2016 is more than the average, the rent for a two bedroom apartment in 2015 is more than the average, and the population density is 2010 is less than the average in Kings county.

Yi(Upward Mobility) = 49.8 - .62(Percent of households that are made up of unmarried partners or non-related friends/acquaintances(possible children / adopted children)
Correlation Coefficient = -.2

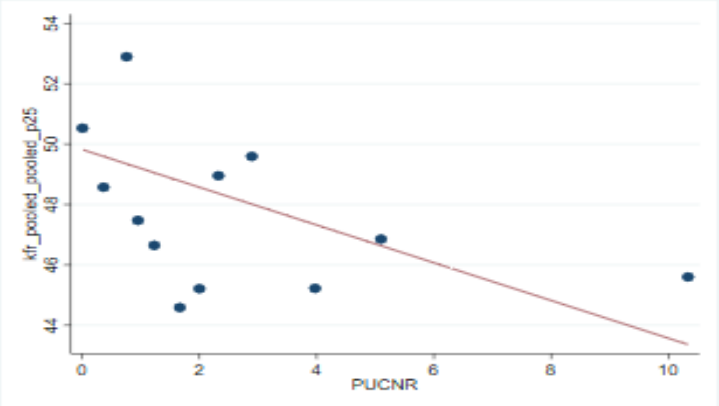


Figure 3.D.1

(Part E) The relationship between the percent of households with at least one grandchild and one grandparent present and upward mobility when the fraction incarcerated is less than the average, the median income in 2016 is more than the average, the rent for a two bedroom

apartment in 2015 is more than the average, and the population density is 2010 is less than the average in Kings county.

Yi(Upward Mobility) = 51 - .43(Percent of households that have at least one grandchild and one grandparent present)

Correlation Coefficient = -.40

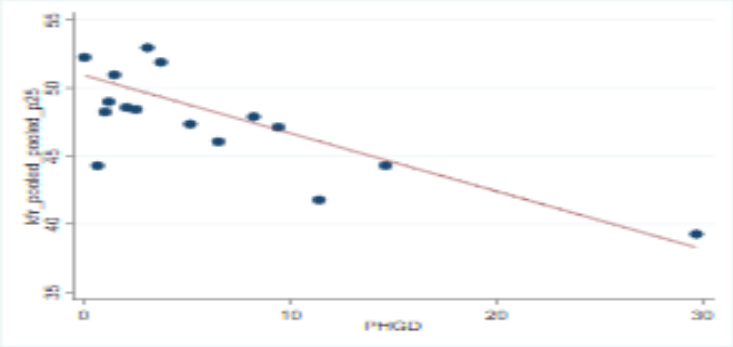


Figure 3.E.1

Observations

New York State Level (Part A)

1. In both high income and low income areas at the New York state level, the percent of households with at least one person 60 years or older is positively correlated with upward mobility. This is interesting given that many of these people could be retired yet there is still higher upward mobility in these areas with a higher percentage of households with at least one person 60 years or older in NYC. (Figure 1.A and 1.A.1)

2. In both high and low income areas at the New York state level, the percent of households where the householder, male or female, is living alone is negatively correlated with upward mobility. However, the correlation is stronger and more negatively linear in high income areas. This could mean high income areas where there are higher percentages of people living alone experience steeper decreasing rates of upward mobility than low income. (Figure 1.B and Figure 1.B.1)

3. In both high and low income areas at the New York state level, there is a negative relationship between the percent of married households where there is at least one child under the age of 6 present and upward mobility. In areas where there is a higher percentage of this household type, there is lower upward mobility. This effect seems to be stronger and more negatively linear in the higher income areas compared to the lower income areas given the correlational difference and distances from the linear regression line. (Figure 1.C and Figure 1.C.1)

4. In both high and low income areas at the New York state level , there is a slight negative relationship between the percent of households that are made up of unmarried partners or non-related groups (e.g. friends or work acquaintances) and upward mobility.

However, given the low correlation coefficients , it is not valid to attribute significance to this relationship.

5. In high income areas in the state of New York, we see a strong negative and linear relationship between the percent of households with at least one grandchild and one grandparent and upward mobility. However, in low income areas we do not see the same strength of correlation but there is a slight negative relationship nevertheless.

Queens County Level (Part B)

1. In both the low and high income areas in Queens county, there is a positive relationship between the percent of households with at least one person 60 years or older and upward mobility. However, the relationship is more positive and linear for high income areas. This means that as the percentage of this household type increases in high income areas, there is a faster increase in upward mobility compared to lower income areas in Queens county. (figure 2.A and 2.A.1)

2. The correlation is too low to accurately depict a relationship between the percent of households where the householder(m or f) is living alone in areas in Queens County(this goes for both high and low income areas). (figure 2.B and 2.B.1)
3. In both the low and high income areas in Queens county, there is a negative relationship between the percent of married households where there is at least one child under the age of 6 present and upward mobility. This means that areas with a higher percentage of this household type have higher ranks of upward mobility in Queens county. This is true regardless of whether you are in a high or low income Queen county area. (figure 2.C and 2.C.1)

4. In both the low and high income areas in Queens county, there is a slight negative relationship between the percent of households that are made up of unmarried partners or non-related friends/acquaintances (possible children / adopted children) and upward mobility. However, this relationship is more strongly correlated in higher income areas. Overall, the correlation coefficient is too low to accurately depict a relationship here. (figure 2.D and 2.D.1)

5. In both the low and high income areas in Queens county, there is a strong negative linear relationship between the percent of households with at least one grandchild and one grandparent present and upward mobility. However, this negative relationship with upward mobility is stronger in low income areas compared to high income areas in Queens county. (figure 2.E and 2.E.1)

Kings County Level (Part C)

1. In both the low and high income areas in Kings county, there is a positive linear relationship between the percent of households with at least one person 60 years or older and upward mobility. However, this relationship is more strongly correlated in high income areas. The rate at which upward mobility increases as the percent of this household type increases is faster in higher income areas in Kings county. (figure 3.A and 3.A.1)

2. In both the low and high income areas in Kings county, there is a negative relationship between the percent of households where the householder(male or female) is living alone and upward mobility. However this negative relationship is stronger in low income areas compared to high income areas. The rate at which upward mobility decreases as the percentage of households where the householder is living alone increases is much faster in low income areas. (figure 3.B and 3.B.1)
3. In both the low and high income areas in Kings county, there is a negative relationship between the percent of married households where there is at least one child under the age of 6 present and upward mobility. This correlation of the relationship is stronger in low income areas in Kings county. The rate at which the upward mobility decreases as the percentage of married households with children under 6 increases is also much faster in low income areas. (figure 3.C and 3.C.1)
4. ☆The relationship between the percent of households that are made up of unmarried partners or non-related friends/acquaintances (possible children / adopted children) and upward mobility is positive in low income areas and negative in high income areas in Kings county. ☆(figure 3.D and 3.D.1)
5. In both the low and high income areas in Kings county, there is a negative relationship between the percent of households with at least one grandchild and one grandparent present and upward mobility. (figure 3.E and 3.E.1)

RELATIONSHIPS OBSERVED :

1. Percent of households with at least one 60 year old present and upward mobility at the New York State, Queens county, and Kings county level.

2. Percent of households where the householder is living alone and upward mobility at the New York State, Queens county, and Kings county level.

3. Percent of married households where there is at least one child under the age of 6 present and upward mobility at the New York State, Queens county, and Kings county level.
4. Percent of households that are made up of unmarried partners or non-related friends/acquaintances (possible children / adopted children) and upward mobility at the New York State, Queens county, and Kings county level.

5. Percent of households with at least one grandchild and one grandparent present and upward mobility at the New York State, Queens county, and Kings county level.

Conclusions/Caveats :

At the New York State level, most of the relationships between the percent of household types and upward mobility are negatively correlated. The relationship between upward mobility and the percentage of households with at least one person 60 years or older seemed to be the only positive linear relationship observed at the New York state level. The relationships of the household types and upward mobility at the Queens County level are similar to the ones observed at the New York State Level. There is obscurity between the relationship of the

percentage of households where the householder lives alone and upward mobility in Queens county due to the correlation coefficient being too low to accurately depict a relationship. The only positive relationship observed in Queens county was the same positive relationship observed at the New York State level. The relationships of the household types and upward mobility in Kings county are similar to the ones observed at the New York State level and at the Queens County level. The relationship between the percent of households that are made up of unmarried partners or non-related friends/acquaintances (possible children / adopted children) and upward mobility is positive in low income areas and negative in high income areas in Kings county. This is the only part of the observations where the low and high income areas observe different directional linear regressions. This means that the effect of this household type is completely different in Kings county depending on whether it's a low or high income area. In most cases in New York, the higher upward mobility areas are the ones where there is a higher percentage of households where there is at least one person 60 years or older. Areas with higher percentages of households with at least one grandparent and one grandchild observe lower levels of upward mobility. This is a bizarre observation that is shown at the New York State, Queens, and Kings County Level.

Part 2 : Causal Effect Quasi Research Experiment

In this experiment, the socio-economic variables are held constant to test the effect of different levels of household type percents on upward mobility in New York. Depending on the category of area (high or low income) the social-economic variables will be held either below or above the mean. For high income areas, variables such as median household income and rent of a two bedroom apartment will be held above the mean while incarceration rates and population density will be held below the mean. For low income areas, variables such as median household income and rent of a two bedroom apartment will be held below the mean while incarceration rates and population density will be held above the mean. The only difference between the control and treatment is that the percent of household type is below the mean for the control group and above the mean for the treatment group within that area. For each part below, the control and treatment reside in the same county or state.

Note:

The data of median household income and incarceration rates were recorded in 2016. Data of two bedroom apartment rents was recorded in 2015 and population density data was recorded in 2010.

At the New York State Level :

(Part A) Percent of households where there is at least one person 60 years or older for low and high income areas in New York.

Figure 4.A

Looking at the high income areas at the New York State level, there is an upward mobility percentile rank difference of 5 between the control and treatment group. In high Income areas, the percent of households where there is at least one person 60 years or older positively impacts upward mobility. It is better to live in a high income area where there is an above average percentage of this household type compared to a below average percentage.

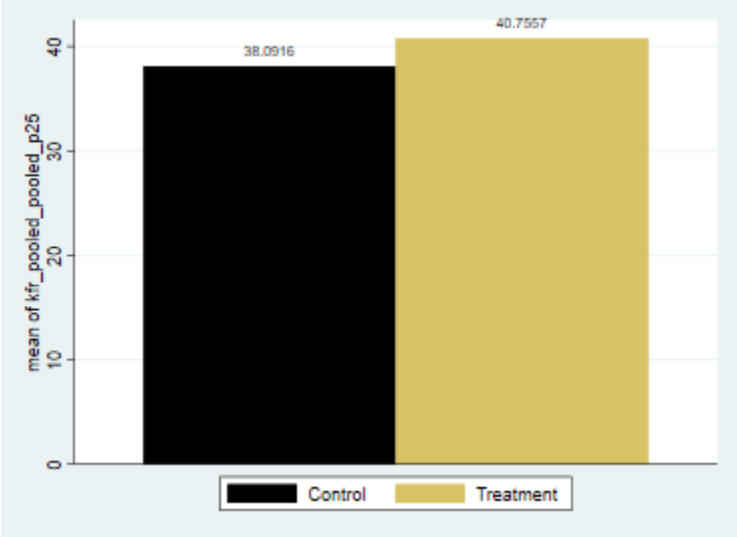


Figure 4.A.1

Looking at low income areas at the New York State level, we see a difference of 2.7 percentile ranks of upward mobility between the control and treatment group. In low income areas in New York, there is better upward mobility in areas with above average percentages of households where there is at least one person 60 years or older compared to areas with below average percentages. However, the difference is larger in high income areas compared to low income areas in New York.

(Part B) Percent of households where the householder (male or female) is living alone for low and high income areas in New York.

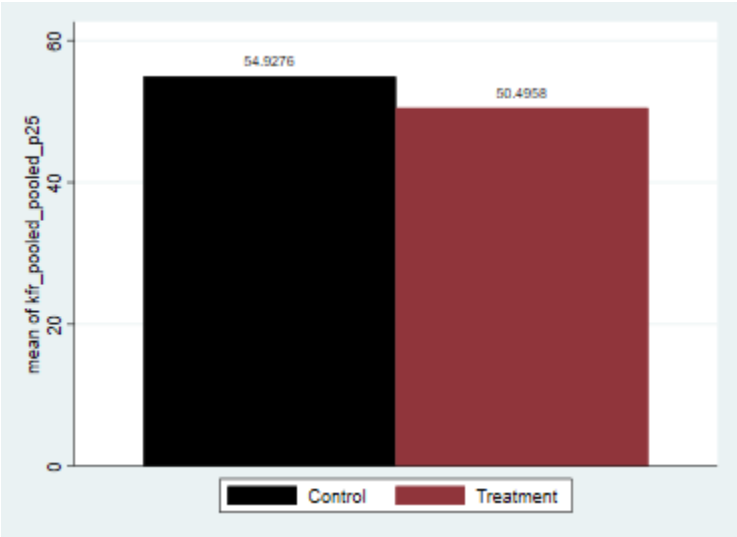


Figure 4.B

Observing high income areas at the New York State level, we see a difference of 4.5 percentile ranks of upward mobility between the control and treatment group. In high income areas, the upward mobility is less in areas with above average percentages of households where the householder (male or female) is living alone. In high income areas at the New York State level, it is better to live in areas where there are lower percentages of households where the householder is living alone.

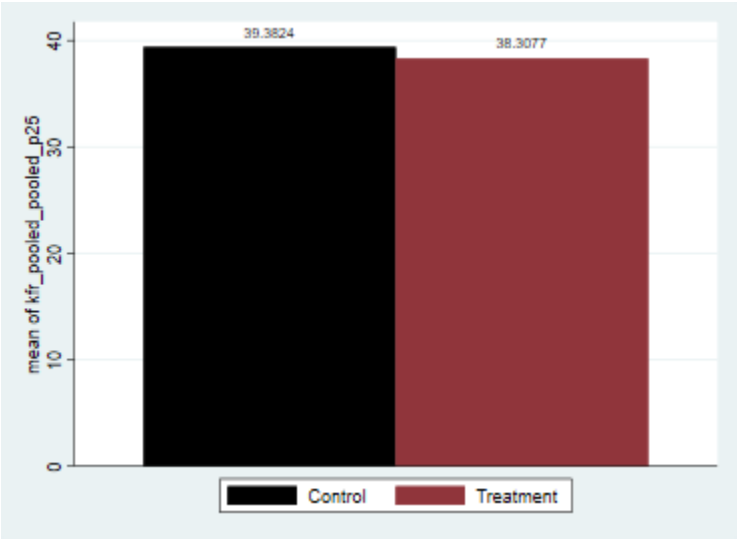


Figure 4.B.1

There is only a one percentile rank difference between the control and treatment groups of low income New York areas. The difference is too small to draw conclusions.

(Part C) Percent of Married Households where there is at least one child under the age of 6 present in New York

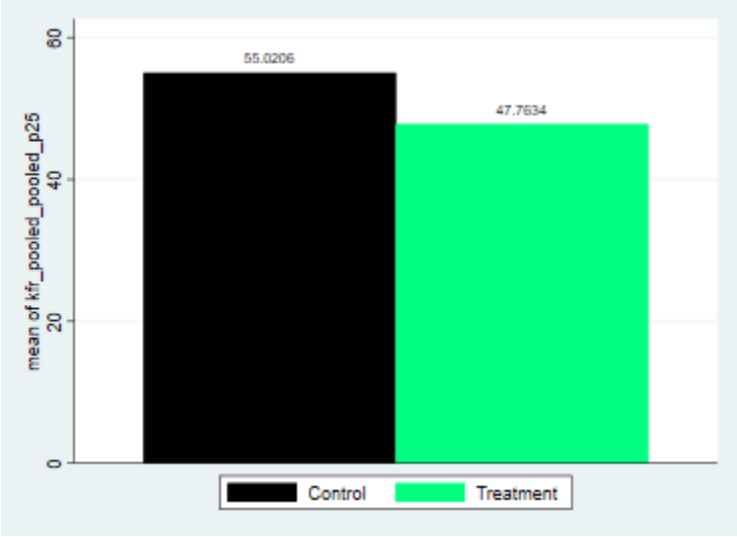


Figure 4.C

Observing the high income areas at the New York state level, we see a 7 percentile rank difference in upward mobility. This means that upward mobility is less in high income areas that are above the average percent of married households with children under the age of 6. This makes sense since newly weds tend to find cheaper housing since they have more expenses and less time to make money than single people or people who have older children.

Figure 4.C.1

Observing the low income areas in New York, we see a 2.5 percentile rank difference in upward mobility between the control and treatment group. This means that upward mobility is less in low

income areas that are above the average percent of married households with children under the age of 6. However, this decrease in upward mobility is much larger in high income areas.

(Part D) Percent of households that are made up of unmarried partners or non-related friends/acquaintances (possible children / adopted children)

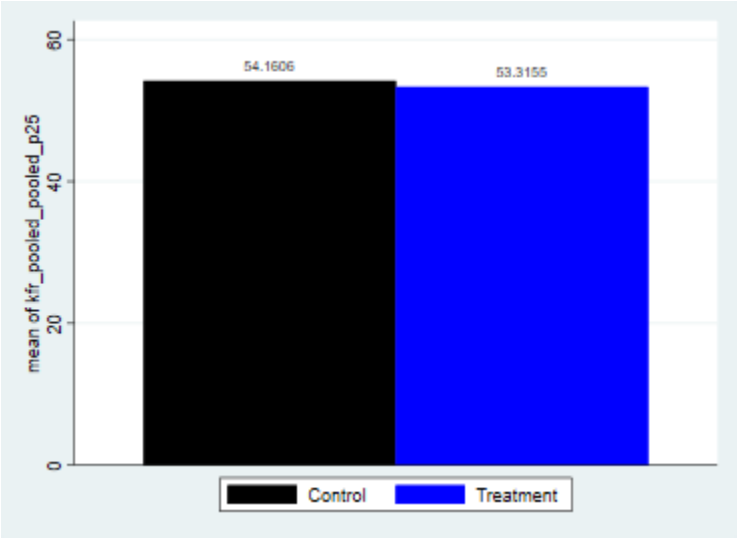


figure 4.D

Observing the high income areas in New York, the difference between the control and treatment is too small to draw any conclusions. There is no effect of the percent of households that are made up of unmarried partners or non-related friends/acquaintances (possible children / adopted children) and upward mobility in high income areas(New York state).

Figure 4.D.1

Observing the low income areas in New York, the difference between the control and treatment is too small to draw any conclusions. There is no effect of the percent of households that are

made up of unmarried partners or non-related friends/acquaintances (possible children / adopted children) and upward mobility in low income areas(New York state).

(Part E) Percent of Households with at least one grandchild and one grandparent present in New York state.

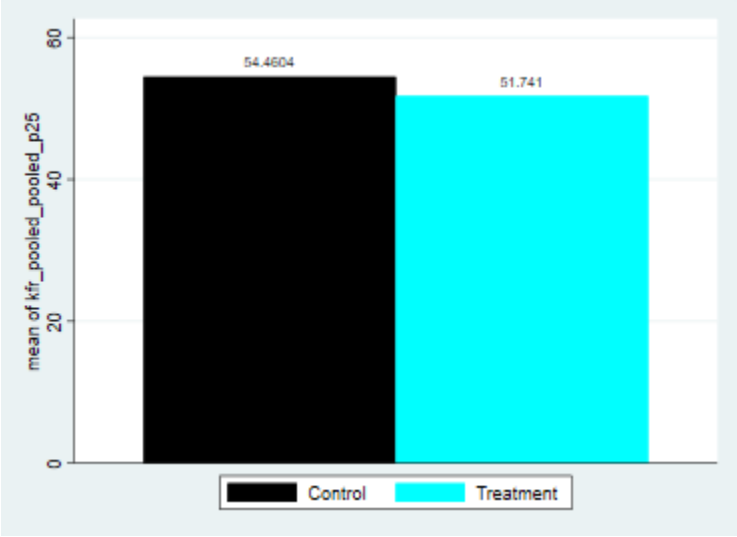


Figure 4.E

Observing the high income areas in New York state, There is a 3 percentile rank difference in upward mobility between the control and treatment group. This means that areas with above average percent of households with at least one grandparent and one grandchild have lower upward mobility in high income areas in New York.

Figure 4.E.1

Observing the low income areas in New York state, there is a 4 percentile rank difference in upward mobility between the control and treatment group. This means that low income areas in New York with above average percentages of households with at least one grandparent and one grandchild experience lower upward mobility.

At the Queens County Level :

(Part A) Percent of Households where there is at least one person 60 years or older for low and high income areas in Queens County (NY).

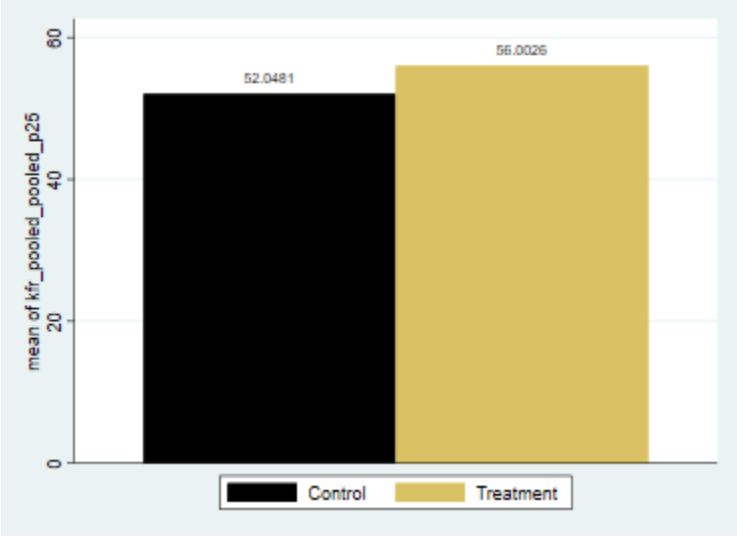


figure 5.A

There is a 4 percentile rank difference in upward mobility between the control and treatment group in high income areas of Queens county (NY). This means that high income areas with above average percentages of households where there is at least one person 60 years or older experience higher upward mobility.

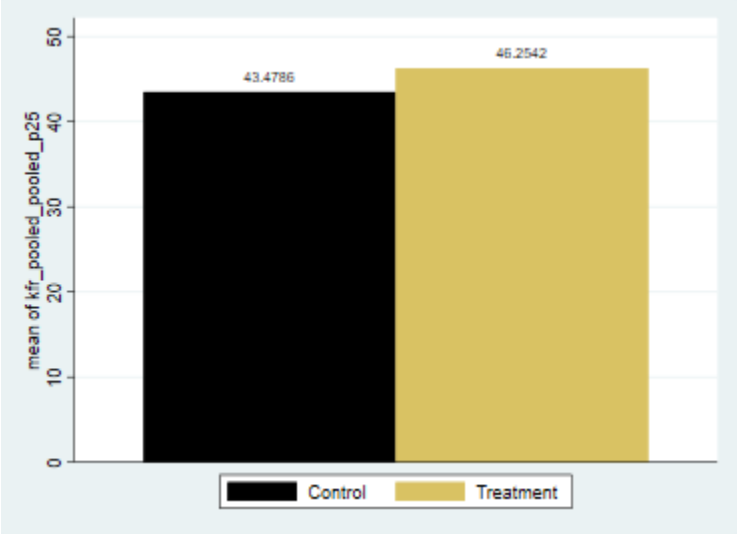


figure 5.A.1

There is about a 2.5 percentile rank difference between the control and treatment group in low income areas of Queens County (NY). This means that low income areas with above average percentages of households where there is at least one person 60 years or older experience higher upward mobility. This difference is less significant compared to the high income areas in Queens county but they observe the same result.

(Part B) Percent of Households where the householder is living alone for high and low income areas in Queens County (NY).

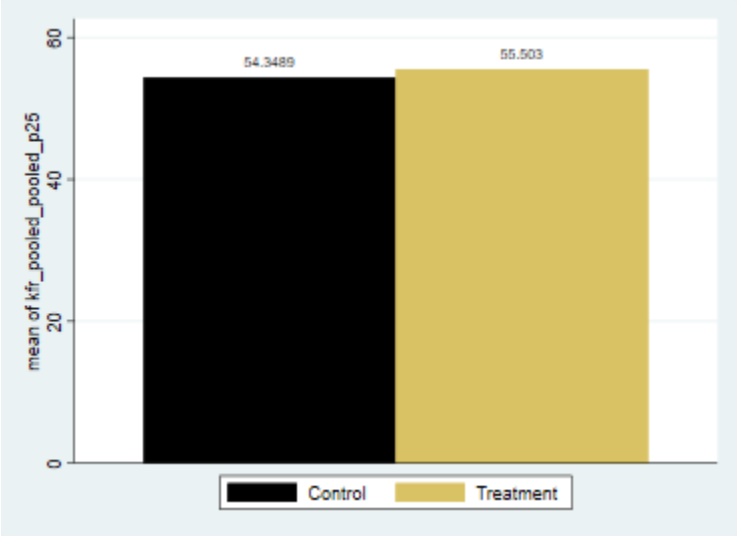


Figure 5.B

There isn't a significant difference in upward mobility in high income areas in Queens County. This means that the percent of households where the householder is living alone does not affect upward mobility in this area.

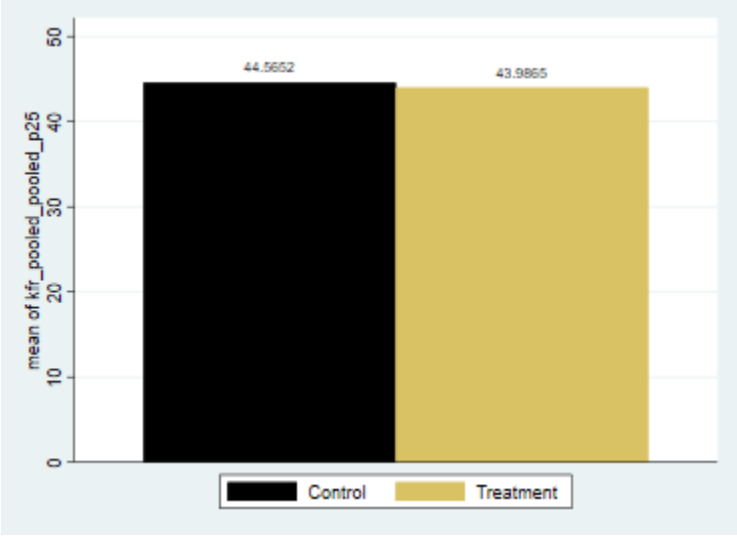


Figure 5.B.1

There isn't a significant difference in upward mobility in low income areas in Queens County. This means that the percent of households where the householder is living alone does not affect upward mobility in Queens county in both high and low income areas.

(Part C) Percent of Married Households where there is at least one child under the age of 6 present in Queens County (NY). High income vs Low income areas.

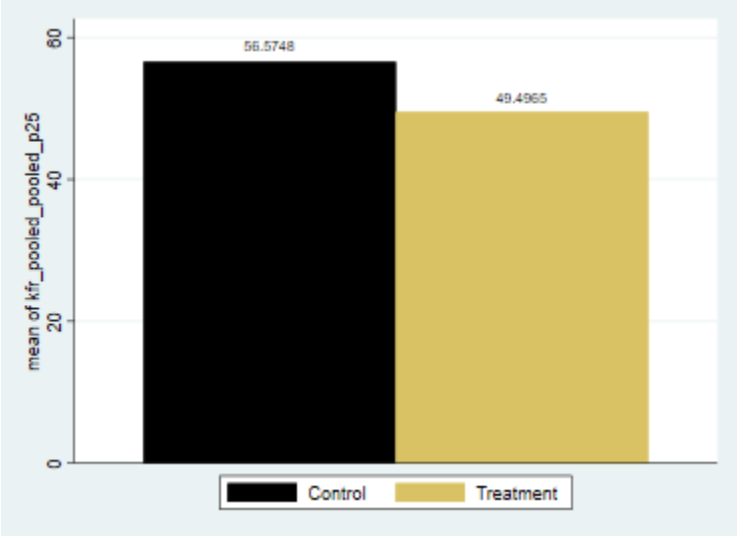


Figure 5.C

In high income areas of Queens County (NY) , there is a significant difference in upward mobility between the control and treatment group(roughly a 6 percentile rank difference). This means that areas with above average percentages of married households with children under the age of 6 experience lower upward mobility in high income queens county areas.

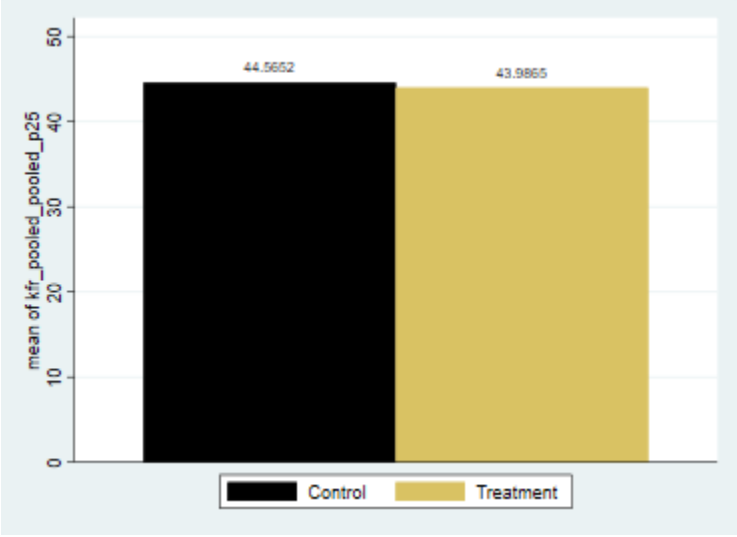


Figure 5.D

There isn't a significant difference in upward mobility between the control and treatment group in low income areas in Queens County. This means that the percentage of Households where there is at least one child under the age of 6 present does not affect upward mobility in low income areas in Queens county.

(Part D) Percent of Percent of households that are made up of unmarried partners or non-related friends/acquaintances (possible children / adopted children) in Queens County (NY). High income vs Low income areas.

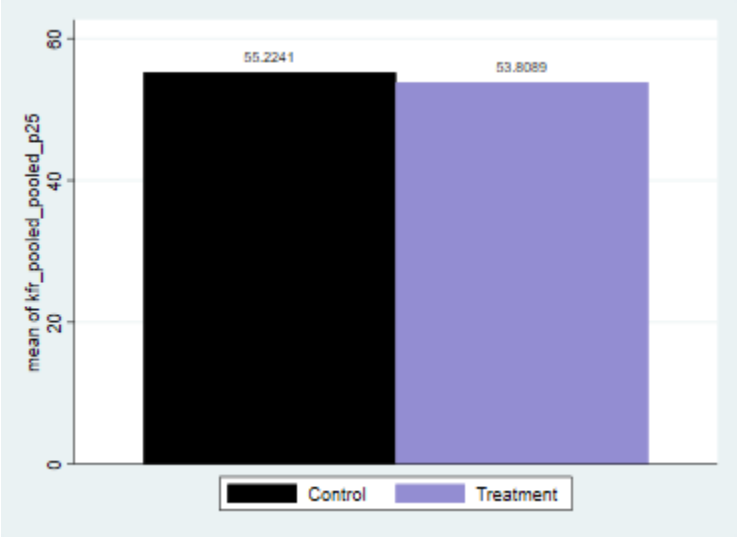


Figure 5.D

In high income areas in Queens County, there isn't a significant difference in upward mobility between the control and treatment group. This means that the percentage of households that are made up of unmarried partners or non-related friends/acquaintances (possible children / adopted children) does not affect upward mobility in this area.

Figure 5.D.1

In low income areas in Queens County, there isn't a significant difference in upward mobility between the control and treatment group. This means that the percentage of households that are made up of unmarried partners or non-related friends/acquaintances (possible children / adopted children) does not affect upward mobility in this area.

(Part E) Percent of Percent of Percent of Households with at least one grandchild and one grandparent present in Queens County (NY). High income vs Low income areas.

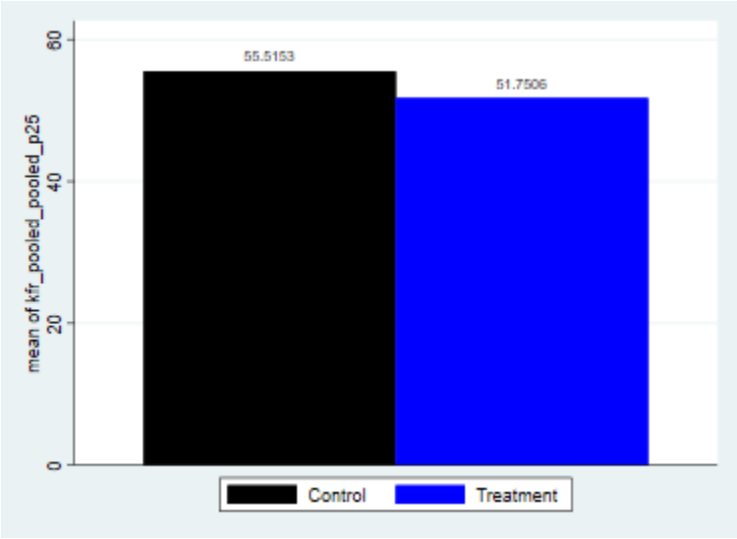


Figure 5.E

In high income areas in Queens county, there is a 4 percentile rank difference between the control and treatment group. This means that areas with above average percentages of Households with at least one grandchild and one grandparent present experience lower levels of upward mobility.

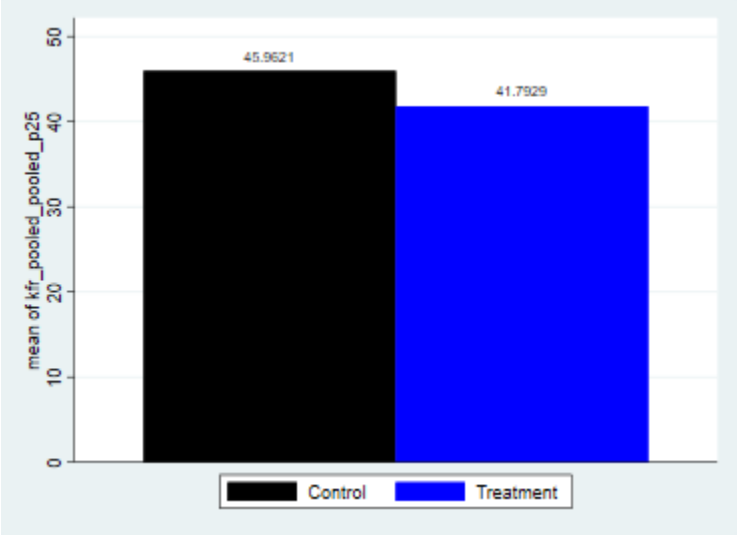


Figure 5.E.1

In low income areas in Queens county, there is a 4 percentile rank difference between the control and treatment group. This means that areas with above average percentages of Households with at least one grandchild and one grandparent present experience lower levels of upward mobility.

At the Kings County Level :

(Part A) Percent of Households where there is at least one person 60 years or older for low and high income areas in Kings County (NY).

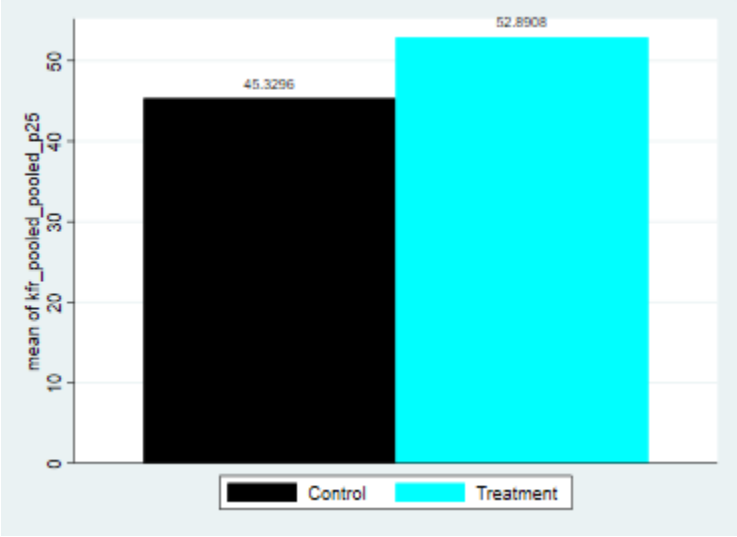


Figure 6.A

In high income areas in Kings County, there is a 7 percentile rank difference between the control and treatment group. This means that high income areas with above average percentages of households where there is at least one person 60 years or older, experience higher upward mobility.

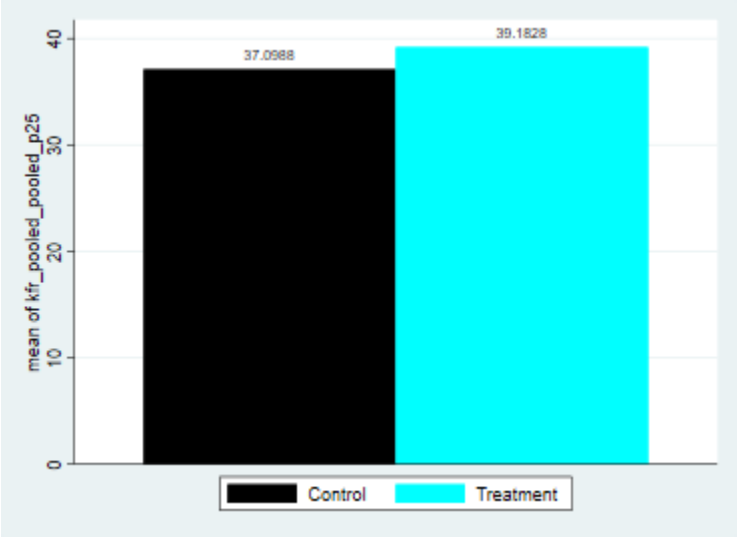


Figure 6.A.1

In low income areas in Kings county, there is a 2 percentile rank difference between the control and treatment group. This means that low income areas with above average percentages of households where there is at least one person 60 years or older, experience higher upward mobility. However, this increase in upward mobility is more drastic in high income areas in Kings county.

(Part B) Percent of Households where the Householder is living alone for low and high income areas in Kings County (NY).

Figure 6.B

In high income areas in Kings county, there is a difference in 2 percentile ranks of upward mobility between the control and treat group. This means that areas with above average percentages of households where the householder is living alone, experience lower upward mobility.

Figure 6.B.1

In low income areas in Kings county, there is a difference in 2 percentile ranks(estimated) of upward mobility between the control and treat group. This means that areas with above average percentages of households where the householder is living alone, experience lower upward mobility.

(Part C) Percent of Married Households where there is at least one child under the age of 6 present in Kings County (NY).

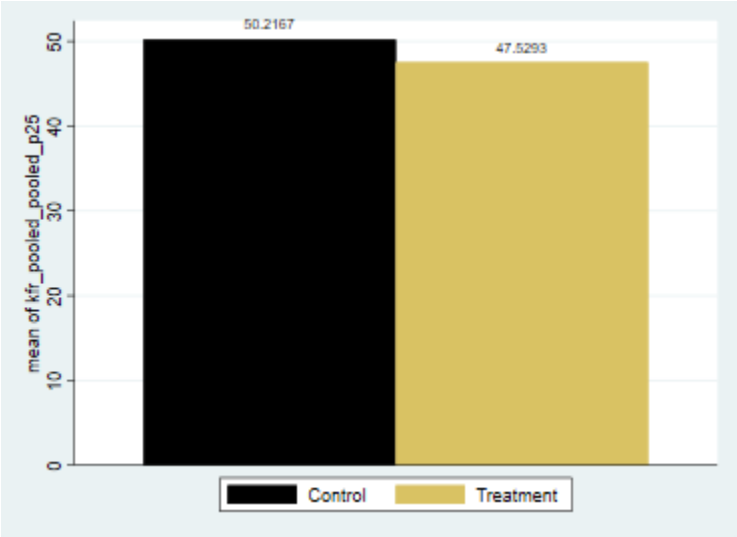


Figure 6.C

In high income areas in Kings county, there is a 2.5 percentile rank difference between the control and treatment group. This means that areas with a higher percentage of Percent of Married Households where there is at least one child under the age of 6 present , experience lower levels of upward mobility.

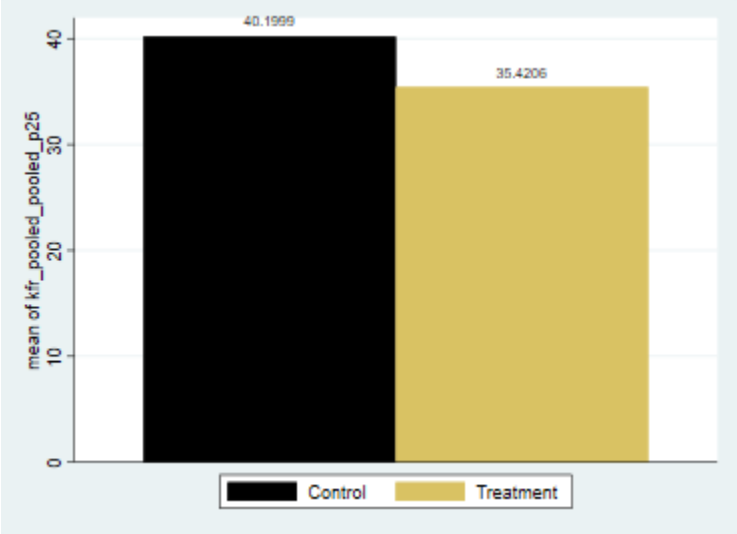


Figure 6.C.1

In low income areas in Kings county there is a 4.5 percentile rank difference between the control and treatment group. This means that low income areas with a higher percentage of Percent of Married Households where there is at least one child under the age of 6 present , experience lower levels of upward mobility.

(Part D) Percent of households that are made up of unmarried partners or non-related friends/acquaintances (possible children / adopted children) in Kings County (NY).

Figure 6.D

In high income areas in Kings county, there isn't a significant difference between the control and treatment group for this household type. This means that the percentage of households that are made up of unmarried partners or non-related friends/acquaintances (possible children / adopted children) does not affect upward mobility in high income areas in Kings county.

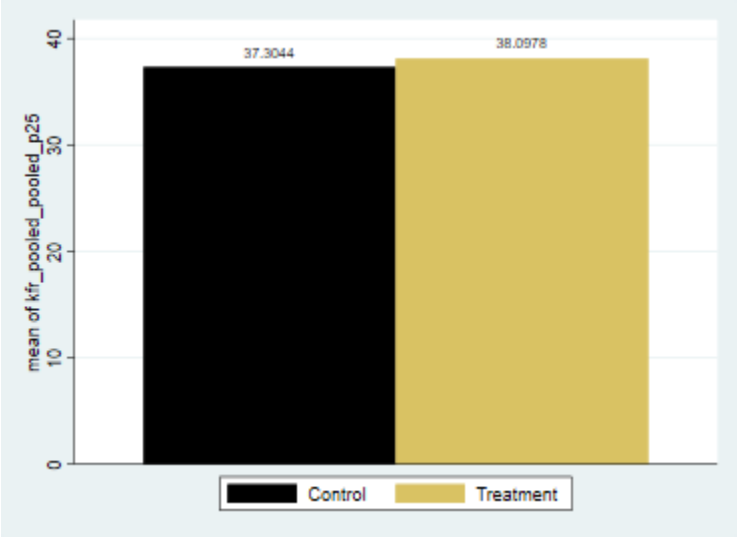


Figure 6.D.1

In low income areas in Kings county, there isn't a significant difference between the control and treatment group for this household type. This means that the percentage of households that are made up of unmarried partners or non-related friends/acquaintances (possible children / adopted children) does not affect upward mobility in low income areas in Kings county.

(Part E) Percent of Households with at least one grandchild and one grandparent present in Kings County (NY).

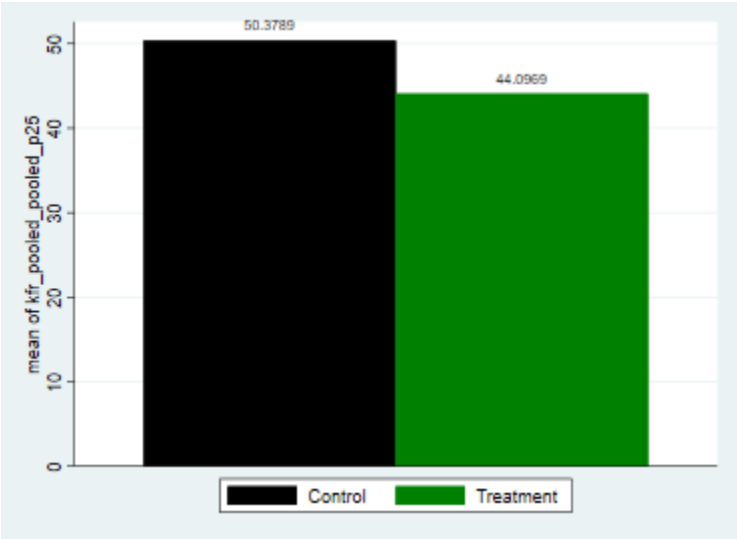


Figure 6.E

In high income areas in Kings county, there is a 6 percentile rank difference in upward mobility. This means that high income areas with above average percentages of Households with at least one grandchild and one grandparent present, experience lower levels of upward mobility.

Figure 6.E.1

In low income areas in Kings county, there is a 2 percentile rank difference in upward mobility. This means that low income areas with above average percentages of Households with at least one grandchild and one grandparent present, experience lower levels of upward mobility. However, this decrease in upward mobility is more drastic in higher income areas.

Conclusion in New York:

1) In New York high income areas, above average percentages of households where there is at least one person 60 years or older creates significant differences in upward mobility between the control group and treatment group. It is fair to assume that high income areas with above average percentages of this household type experience significantly higher levels of upward mobility. What's interesting is that when we look at the percentage of this household type in low income areas in New York, the difference between the control and treatment group isn't nearly as drastic. The difference in treatment and control is 5 percentile ranks of upward mobility for high income areas and 2.7 percentile ranks in upward mobility for low income areas. Nevertheless, in both high and low income areas in NY there is higher upward mobility for areas with above average percentages of households where there is at least one person 60 years or older. (reference 4.A and 4.A.1)

2) In New York high income areas, above average percentages of households where the householder (male or female) is living alone, experience lower levels of upward mobility(roughly 4.5 percentile ranks less of upward mobility). This same relationship isn't observed in the low income areas of New York. The difference is negligible for the low income areas. In many cases, the high income areas experience a greater difference in control and treatment upward mobility compared with low income areas. (reference 4.B and 4.B.1)

3) In New York high income areas, above average percentages of married households where there is at least one child under the age of 6 present experience 7 percentile rank decrease in upward mobility compared to NY high income areas with below average percentages. This is one of the biggest differences observed. In many cases, younger families have more expenses and less time to focus on work. Interestingly, the upward mobility for low income areas in NY only decreases by 2.5 percentile ranks for above average percentages of married households where there is at least one child under the age of 6 present. As stated in #2, the high income area experiences a greater difference in control and treatment upward mobility compared with low income areas. (reference 4.C and 4.C.1)

4) In high and low income areas in New York, there isn't a significant relationship between upward mobility and the percent of households that are made up of unmarried partners or non-related friends/acquaintances (possible children / adopted children). Adjusting for the above average percentage of this household type did not change upward mobility. This is surprising, since areas that are low in upward mobility are the ones that have cheaper costs of living which attracts younger people(e.g. college friends living together). Also, married families that have wealth are not as likely to live in areas where the neighborhood households are made up of friends, college students, and unmarried couples(this isn't always the case for all married families). This would negatively impact upward mobility but in this case there is no difference in upward mobility given fluctuations in the percentage of households that are made up of unmarried partners or non-related friends. (figure 4.D and 4.D.1)

5) In high income areas in New York with above average percentages of households with at least one grandchild and one grandparent present, experience a 3 percentile rank decrease in

upward mobility compared to areas with below average percentages of that household type. This decrease is almost the same for low income areas in New York. This means that high and low income areas in New York with above average percentages of households with at least one grandchild and one grandparent present experience lower levels of upward mobility. This is surprising because earlier we observed a positive relationship between upward mobility and higher percentages of households with at least one person 60 years or older in high and low income areas in New York. However, households with a combination of grandchildren and grandparents seem to have a much different effect in New York

Conclusions in Queens County

1) High income areas in Queens county with above average percentages of households where there is at least one person 60 years or older, experience a 4 percentile rank increase in upward mobility compared to areas with below average percentages of that household type. It's the same situation for the low income areas except the increase is only 2.5 percentile ranks.

2) In high and low income areas in Queens county there isn't a significant difference in upward mobility when we condition on percentages of households where the householder is living alone(male or female). This happens at the New York state level as well.

3) In high income areas in Queens county with above average percentages of married households where there is at least one child under the age of 6, experience a 6 percentile rank decrease in upward mobility compared to areas with below average percentages of that household type. When we look at low income areas, upward mobility does not change between areas with below average percentages of that household type and above average percentages. This means that in Queens county, only the high income areas have lower levels of upward mobility when the percentages of married households where there is at least one child under the age of 6 is above the average.

4) In high and low income areas in Queens county there isn't a significant difference in upward mobility when we condition on percentages of households that are made up of unmarried partners or non-related friends/acquaintances. This happens at the New York state level as well.

5) In high and low income areas in Queens county there is a 4 percentile rank decrease in upward mobility for areas with above average percentages of Households with at least one grandchild and one grandparent present. We see the same situation at the New York state level.

Conclusions in Kings County

1) High income areas in Kings county with above average percentages of households where there is at least one person 60 years or older, experience a 7 percentile rank increase in upward mobility compared to areas with below average percentages of that household type. This is the highest increase in upward mobility observed. However, low income areas in Kings county with above average percentages of households where there is at least one person 60 years or older

experience only a 2 percentile rank increase in upward mobility. The increase is much more drastic in high income kings county areas.

2) High and low income areas in Kings county with above average percentages of households where the Householder is living alone for low and high income areas in Kings County (NY), experience a 2 percentile rank decrease in upward mobility. A 2 percentile rank decrease is pretty low. Also, in Queens county there wasn't any change in upward mobility after conditioning the percentages of this household type.

3) High income areas in Kings county with above average percentages of married households with children under the age of 6, experience a 2.5 percentile rank decrease in upward mobility. In low income areas in Kings county, this decrease is 4.5 percentile ranks. The Queens county and New York state level experience the same decrease in upward mobility given the same condition of this household type.

4) In high and low income areas in Kings county there isn't a significant difference in upward mobility when we condition on percentages of households that are made up of unmarried partners or non-related friends/acquaintances. This happens at the New York state and Queens county level.

5) High income areas in Kings county with above average percentages of households with at least one grandchild and one grandparent present, experience a 6 percentile rank decrease in upward mobility. In low income areas in Kings county, this decrease is 2 percentile ranks. The Queens county and New York state level experience similar decreases in upward mobility given the same condition of this household type.

Caveat : Many of the control and treatment groups have different numbers of observations. However, I kept data collected in control and treatment groups relatively close, meaning each group had at least 200-300 observations each. More observations in each group are required in order to draw definitive conclusions. It is nearly impossible to control for all socio-economic variables given two areas of a city which make comparisons for causal effect difficult. However, we can approximate treatment and control groups that have very similar distributions of significant characteristics to make a probable case for causation.

MAIN TAKEAWAYS

Solely based on the upward mobility statistic, it makes sense to live in a neighborhood with a good variety of household types. Areas skewing to any one particular household type might have unexpected differences in upward mobility than areas that don't. In all areas in New York, it is best to be in an area where there are many households with at least one person 60 years or older. In Kings county, one should be more cautious of living in an area with large numbers of households with young married couples with children under 6 because they have a significantly lower upward mobility rank especially, low income Kings county areas. In most high and low income New York areas, it is better to live in areas with less than average percentages of

households with at least one grandparent and one grandchild regardless of whether it's a Kings or Queens county area.

References:

1. Chetty, Raj. et al.“The Opportunity Atlas: Mapping the Childhood Roots of Social Mobility.” opportunityinsights.org, January 2020. https://opportunityinsights.org/wp-content/uploads/2018/10/atlas_paper.pdf.
2. Stata Code and Graphs