An aerial photograph of a city grid, likely Manhattan, with various colored lines (green, purple, white) overlaid on the streets to represent different geographic boundaries or census tracts. The grid is dense and regular, with some irregularities in the layout.

Reconciling Small Area ACS Data Across Decennial Geographies

Joel Alvarez, Erica Maurer, and Joseph Salvo
Population Division
NYC Department of City Planning
May 20, 2021

- **The Issue**
- **Reconciling Count Estimates**
- **Reconciling Margins of Error**
- **Conclusion**

- **The Issue**
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New York City Population FactFinder

(popfactfinder.planning.nyc.gov/)

NYC PLANNING Population FactFinder

The screenshot displays the NYC Population FactFinder web application interface. At the top, there is a search bar and navigation tabs for "Census Block", "Census Tract", "Neighborhood (NTA)", and "PUMA". The "Neighborhood (NTA)" tab is currently selected. Below the tabs, a profile view overlay is visible, containing the following elements:

- A search bar with a magnifying glass icon.
- A "Draw" button with a pencil icon.
- A "View Profile 1 Neighborhood" button with a document and arrow icon.
- An "Advanced Options" button with a hamburger menu icon.
- A "Clear Selection" button with a red 'x' icon.

The background is a map of Manhattan showing neighborhood boundaries. Labeled neighborhoods include Union Square, Murray Hill-Kips Bay, Gramercy, Stuyvesant Town-Cooper Village, East Village, Lower East Side, Chinatown, Battery Park City-Lower Manhattan, SoHo-TriBeCa-Civic Center-Little Italy, East Midtown, Greenpoint, Hunters Point-Sunnyside-West Maspeth, North Side-South Side, East Williamsburg, and Williamsburg. A scale bar in the bottom left corner indicates 2000ft. The bottom right corner contains the text "© OpenMapTiles © OpenStreetMap contributors".

New York City Population FactFinder

(popfactfinder.planning.nyc.gov/)

NYC PLANNING Population FactFinder

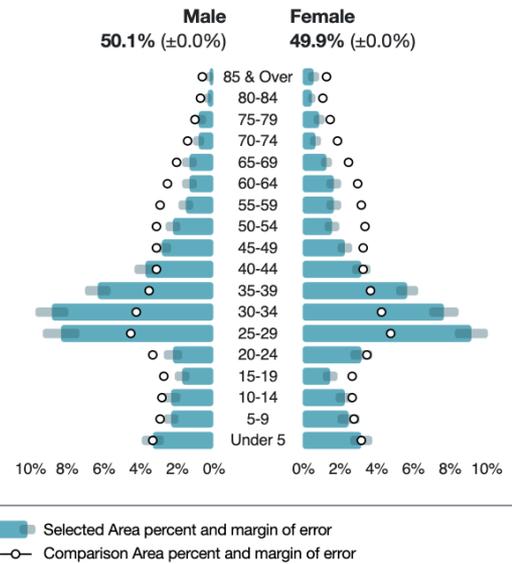
Census
Demographic (ACS)
Social (ACS)
Economic (ACS)
Housing (ACS)

Age and Sex

Copy Table to Clipboard

Show Reliability Data	Selected Area		New York City		Difference	
	Number	Percent	Number	Percent	Number	Pctg. Pt.
Total population	57,036	100.0%	8,443,713	100.0%	-8,386,677	0.0
Male	28,602	50.1%	4,025,097	47.7%	-3,996,495	2.4
Female	28,434	49.9%	4,418,616	52.3%	-4,390,182	-2.4
Under 5 years	3,754	6.6%	551,869	6.5%	-548,115	0.1
5 to 9 years	2,732	4.8%	476,567	5.6%	-473,835	-0.8
10 to 14 years	2,625	4.6%	464,704	5.5%	-462,079	-0.9
15 to 19 years	1,840	3.2%	455,674	5.4%	-453,834	-2.2
20 to 24 years	3,125	5.5%	571,401	6.8%	-568,276	-1.3
25 to 29 years	10,016	17.6%	785,805	9.3%	-775,789	8.3
30 to 34 years	9,410	16.5%	718,474	8.5%	-709,064	8.0
35 to 39 years	6,826	12.0%	610,524	7.2%	-603,698	4.8

Age/Sex Distribution





NYC PLANNING Population FactFinder

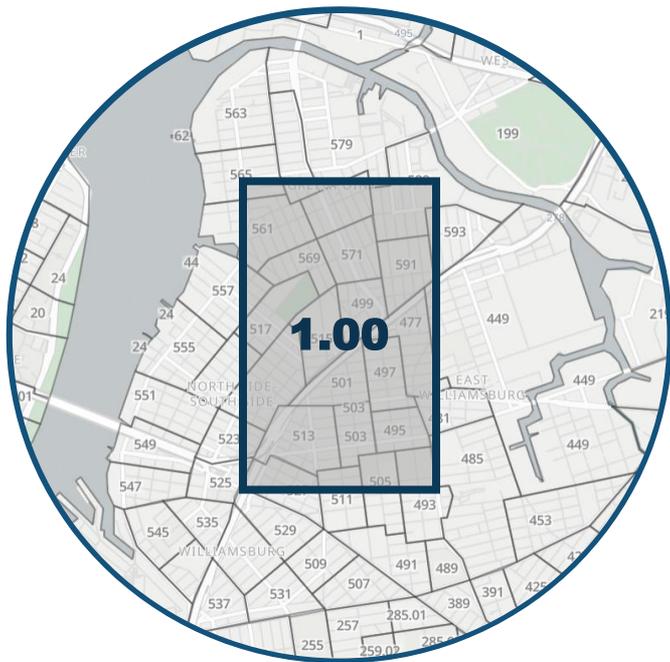
←
Census
Demographic (ACS) ▾
Social (ACS)
Economic (ACS)
Housing (ACS)

Age and Sex

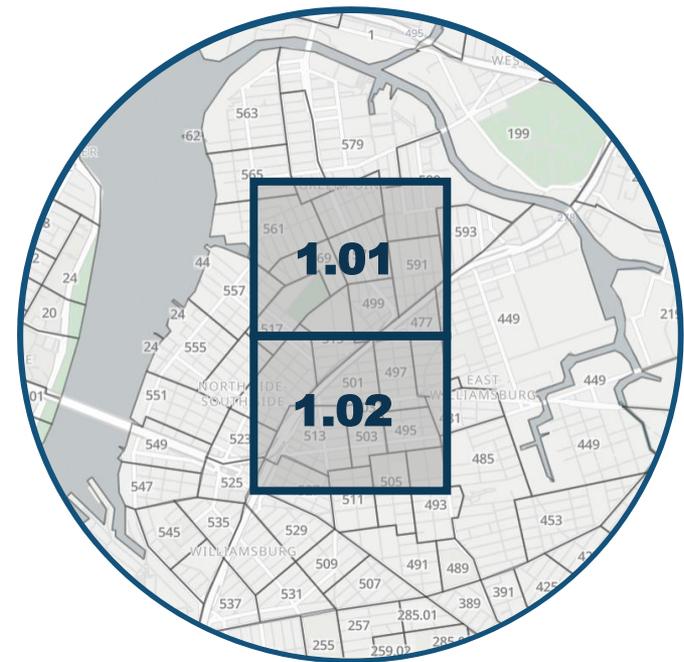
<input type="checkbox"/> Show Reliability Data	2006-2010		2014-2018		Change, 2006-2010 to 2014-2018		
	Number	Percent	Number	Percent	Number	Percent %	Pctg. Pt.
Total population	43,620	100.0%	57,036	100.0%	13,416	30.8%	0.0
Male	20,989	48.1%	28,602	50.1%	7,613	36.3%	2.0
Female	22,631	51.9%	28,434	49.9%	5,803	25.6%	-2.0
Under 5 years	3,007	6.9%	3,754	6.6%	747	24.8%	-0.3
5 to 9 years	2,628	6.0%	2,732	4.8%	104	4.0%	-1.2
10 to 14 years	2,242	5.1%	2,625	4.6%	383	17.1%	-0.5
15 to 19 years	2,564	5.9%	1,840	3.2%	-724	-28.2%	-2.7
20 to 24 years	3,803	8.7%	3,125	5.5%	-678	-17.8%	-3.2
25 to 29 years	7,477	17.1%	10,016	17.6%	2,539	34.0%	0.5
30 to 34 years	5,304	12.2%	9,410	16.5%	4,106	77.4%	4.3
35 to 39 years	3,630	8.3%	6,826	12.0%	3,196	88.0%	3.7

Some 2010 census tracts will be split to create new 2020 census tracts

2010 Census Tracts



2020 Census Tracts



To examine change over time, ACS data in 2010 tracts will need to be converted to 2020 tracts



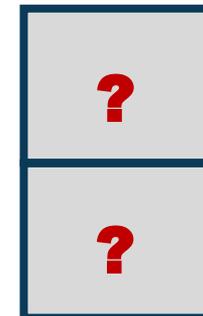
2010 Census Tracts

**Workers 16 years and over
who worked from home
(2006-2010 ACS)**



2020 Census Tracts

**Workers 16 years and over
who worked from home
(2006-2010 ACS)**



- **The Issue**
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To examine change over time, ACS data in 2010 tracts will need to be converted to 2020 tracts



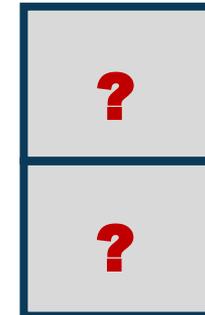
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2020 Census Tracts

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2010 Census Tracts

**Workers 16 years and over
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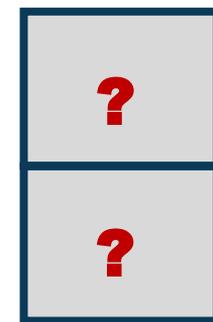
**Total population
(2010 Census)**

1



2020 Census Tracts

**Workers 16 years and over
who worked from home
(2006-2010 ACS)**





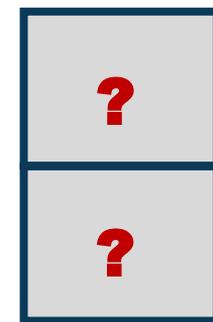
**2010
Census Tracts**

**Workers 16 years and over
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(2006-2010 ACS)**



**2020
Census Tracts**

**Workers 16 years and over
who worked from home
(2006-2010 ACS)**



**Total population
(2010 Census)**

1



**2010
Census Blocks**

2

1,000	500
500	1,000
200	200
500	100



To examine change over time, ACS data in 2010 tracts will need to be converted to 2020 tracts



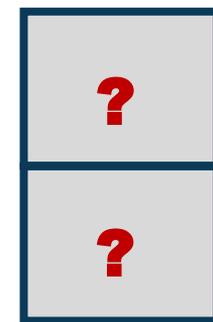
2010 Census Tracts

Workers 16 years and over who worked from home (2006-2010 ACS)



2020 Census Tracts

Workers 16 years and over who worked from home (2006-2010 ACS)



Total population (2010 Census)

1



2010 Census Blocks

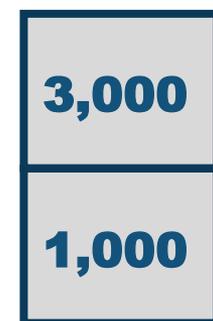
2

1,000	500
500	1,000
200	200
500	100



Total population (2010 Census)

3



75%

25%



To examine change over time, ACS data in 2010 tracts will need to be converted to 2020 tracts



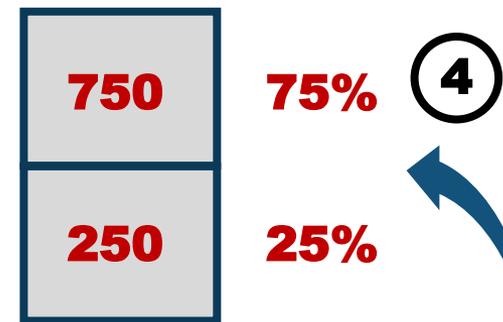
2010 Census Tracts

Workers 16 years and over who worked from home (2006-2010 ACS)

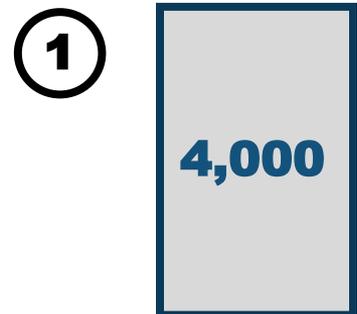


2020 Census Tracts

Workers 16 years and over who worked from home (2006-2010 ACS)



Total population (2010 Census)

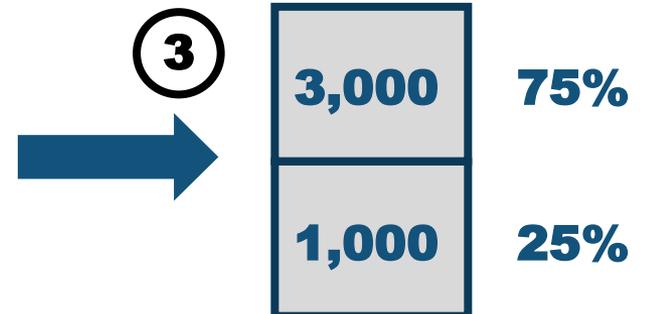


2010 Census Blocks

②

1,000	500
500	1,000
200	200
500	100

Total population (2010 Census)

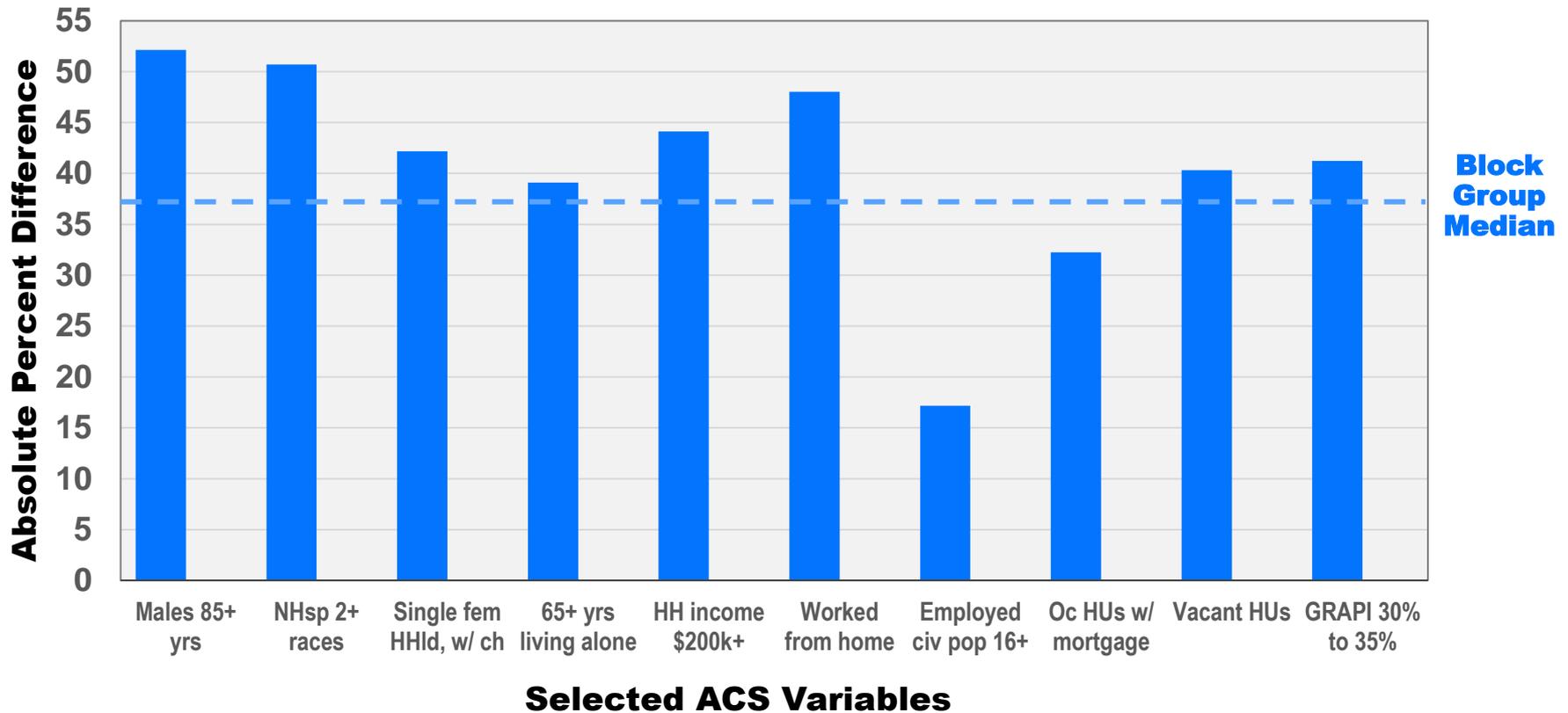


ACS variables selected for evaluation



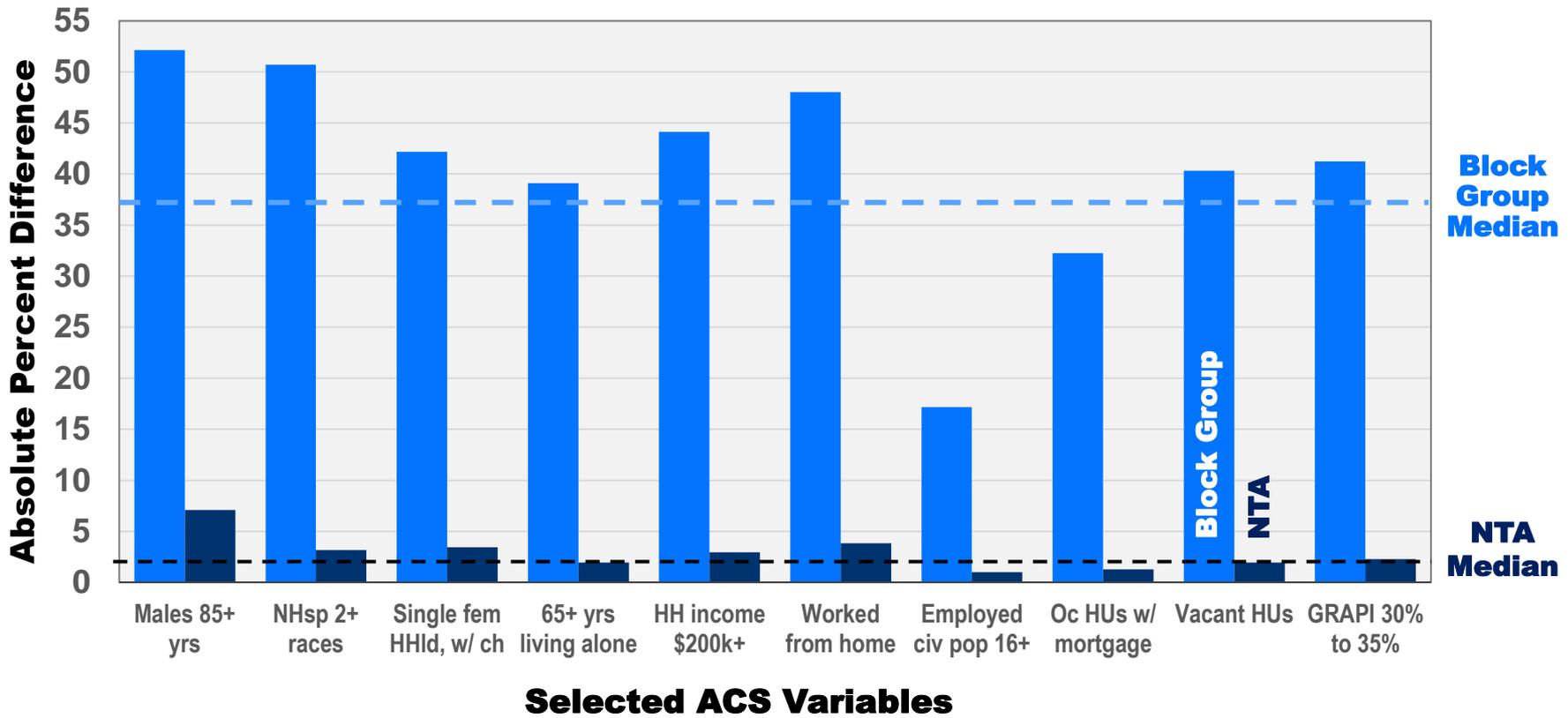
- Demographic
 - 1) **Males 85 years and older**
 - 2) **Nonhispanic of 2 or more races**
- Social
 - 3) **Single female household with children**
 - 4) **65 years and older living alone**
- Economic
 - 5) **Household income \$200,000 or more**
 - 6) **Worked from home**
 - 7) **Employed civilians 16 years and older**
- Housing
 - 8) **Occupied housing with a mortgage**
 - 9) **Vacant housing units**
 - 10) **GRAPI 30% to 34.9%**

Median absolute percent difference between modeled and actual estimates for selected ACS variables, ACS 2006-2010 NYC block groups in split tracts



Median absolute percent difference between modeled and actual estimates for selected ACS variables, ACS 2006-2010

NYC block groups in split tracts & NTAs with boundary-crossing splits



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How can we model new MOEs for ACS data in 2010 tracts that are split into new 2020 tracts?



2010 Census Tracts

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2020 Census Tracts

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2020 Census Tracts

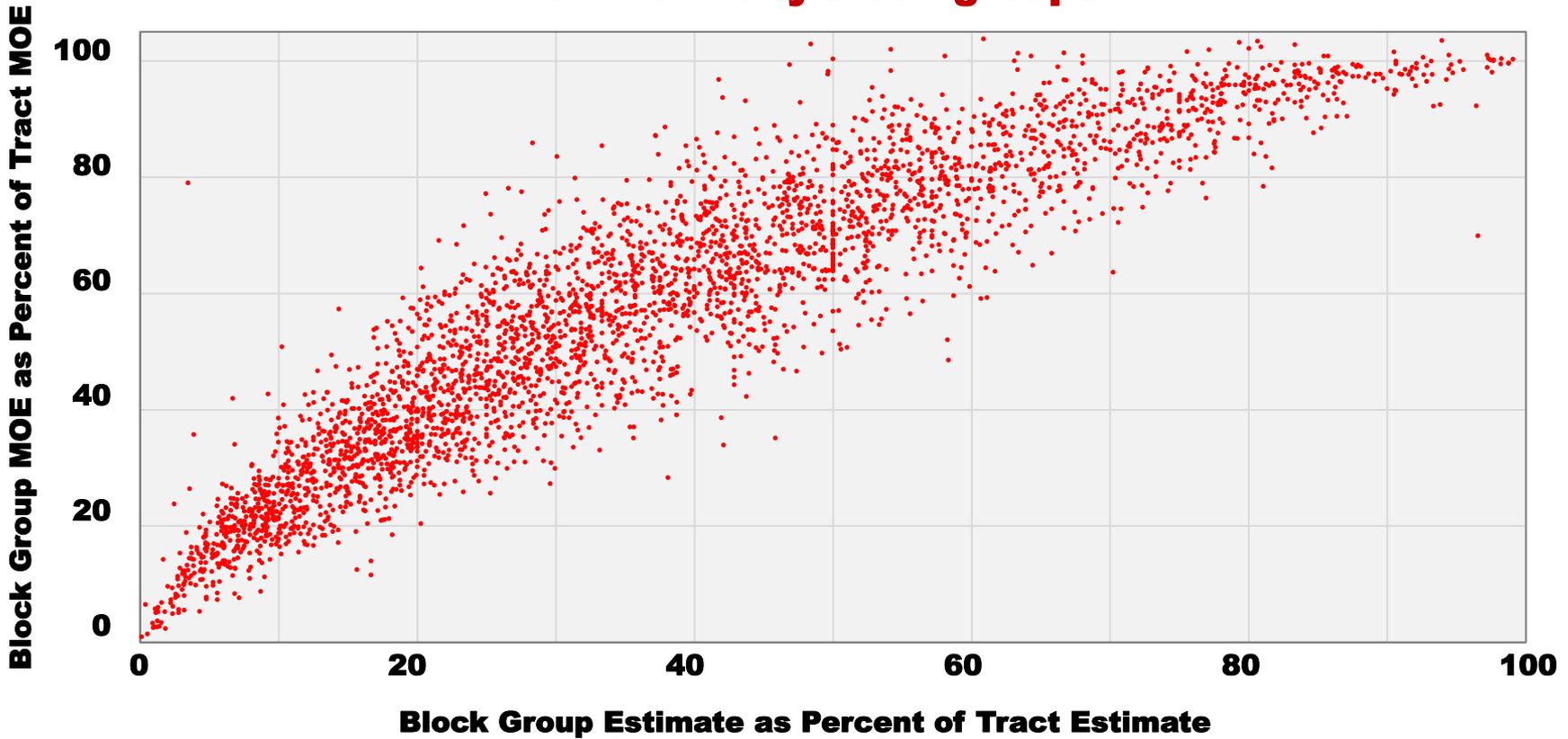
**Workers 16 years and over
who worked from home
(2006-2010 ACS)**



**75%
moe%=?** 1

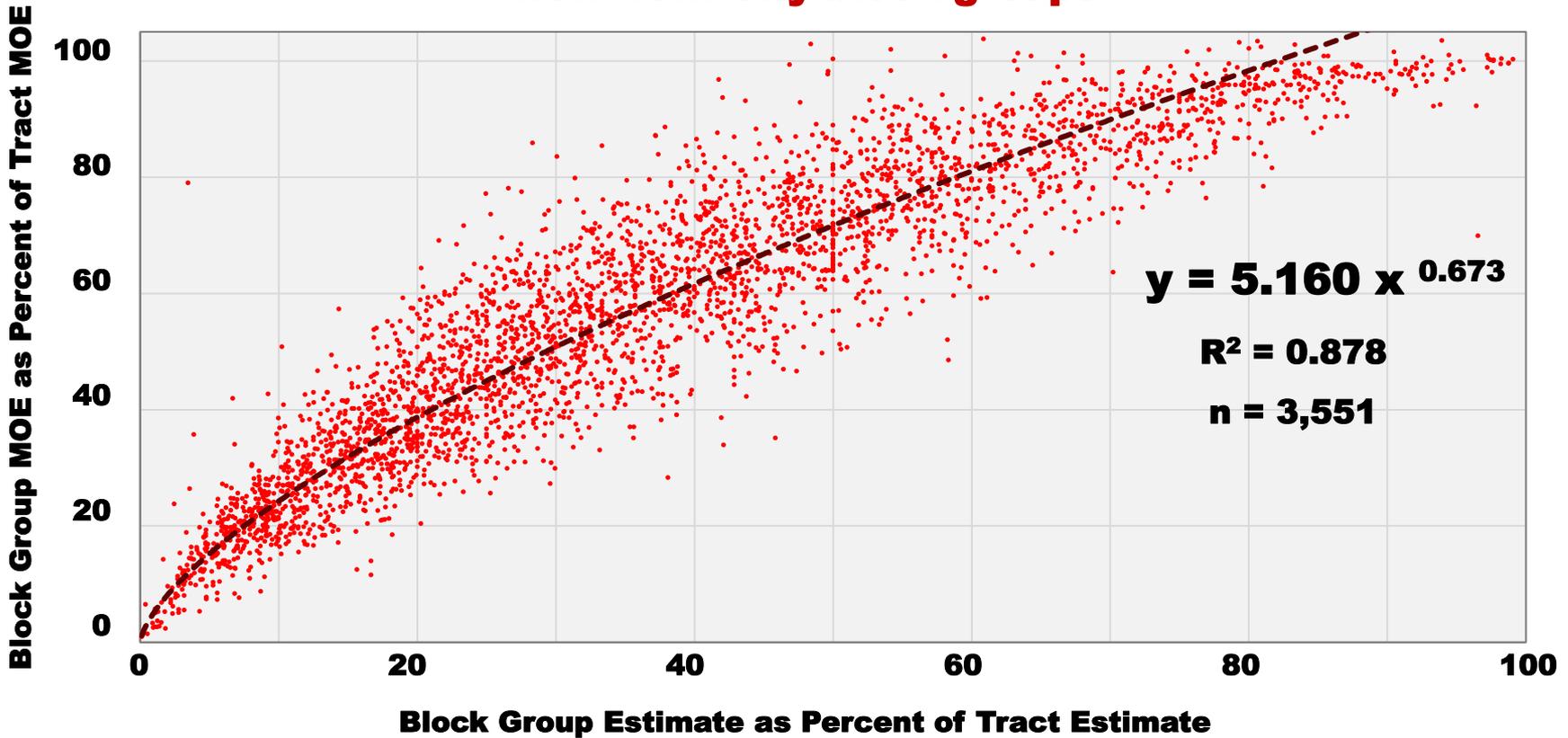


Workers who worked from home New York City block groups



*Estimates constituting 100%, or 0%, of summed estimates omitted from graph

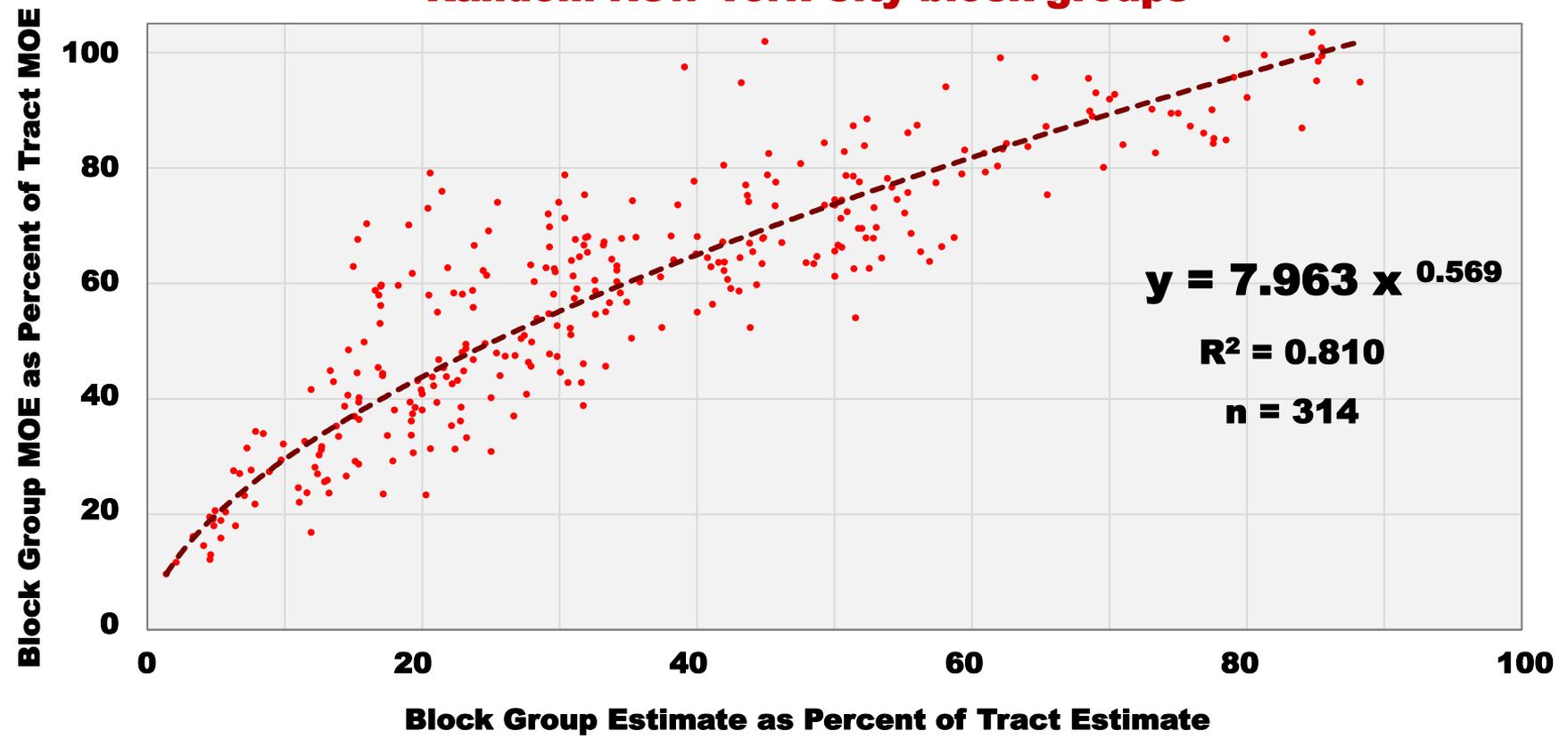
Workers who worked from home New York City block groups



*Estimates s constituting 100%, or 0%, of summed estimates omitted from graph



10 Selected Variables Random New York City block groups



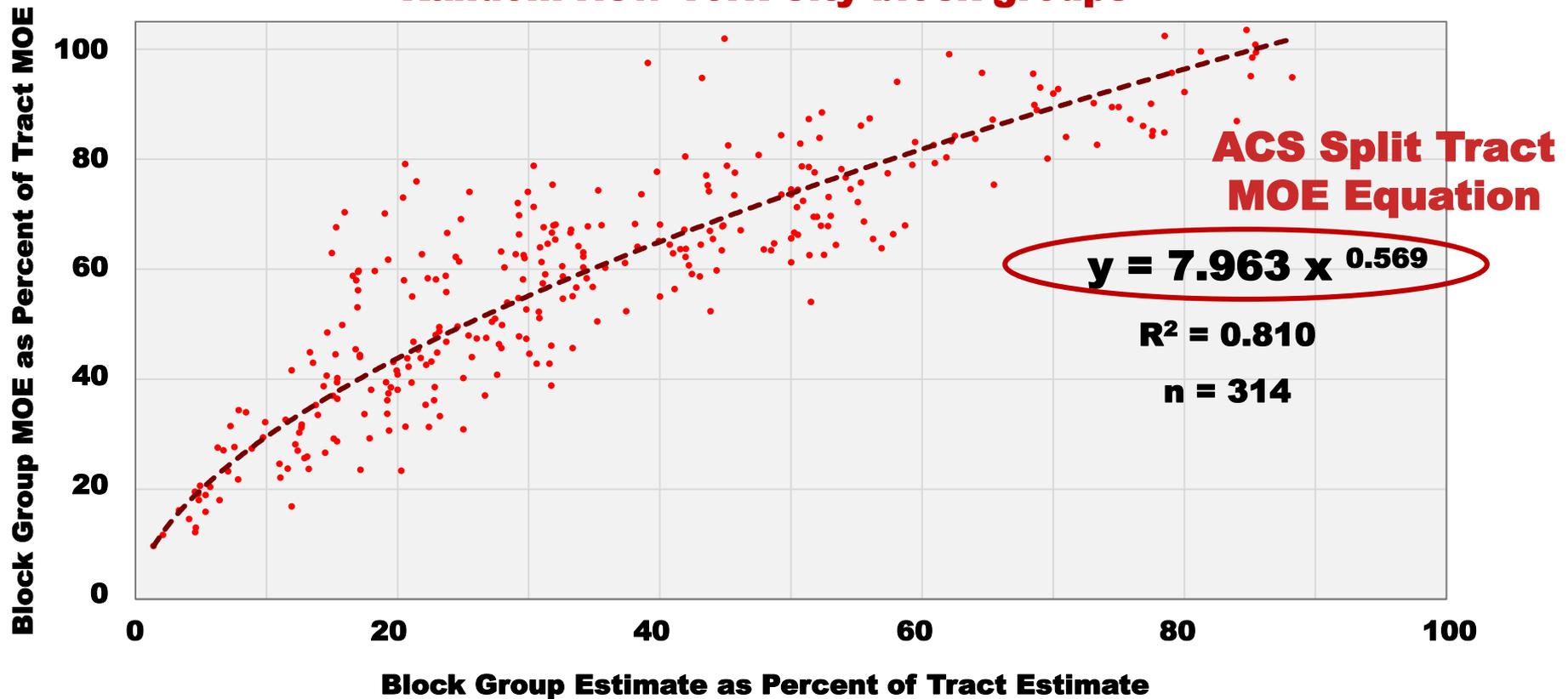
*Estimates s constituting 100%, or 0%, of summed estimates omitted from graph

Relationship between block group estimate as percent of tract estimate and block group MOE as percent of tract MOE for selected variables

Random NYC block groups, 2015-2019 ACS Variance Replicate Tables (VRT)



10 Selected Variables Random New York City block groups



*Estimates s constituting 100%, or 0%, of summed estimates omitted from graph

How can we model new MOEs data in 2010 tracts that are split into new 2020 tracts?



2010 Census Tracts

**Workers 16 years and over
who worked from home
(2006-2010 ACS)**



2020 Census Tracts

**Workers 16 years and over
who worked from home
(2006-2010 ACS)**



**75%
moe%=?** 1

2

$$y = 7.963 * x^{0.569}$$

*ACS Split Tract MOE formula
results are capped at 100%

How can we model new MOEs data in 2010 tracts that are split into new 2020 tracts?



2010 Census Tracts

**Workers 16 years and over
who worked from home
(2006-2010 ACS)**



2020 Census Tracts

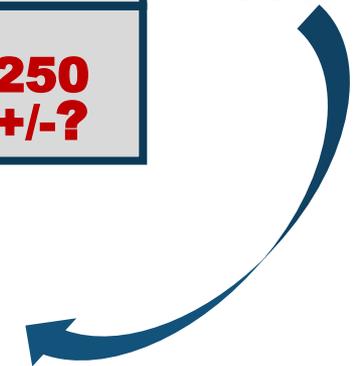
**Workers 16 years and over
who worked from home
(2006-2010 ACS)**



**75%
moe%=?** 1

2

$$y = 7.963 * (75\%)^{0.569} = 93\%$$



How can we model new MOEs data in 2010 tracts that are split into new 2020 tracts?

2010 Census Tracts

Workers 16 years and over who worked from home (2006-2010 ACS)



2020 Census Tracts

Workers 16 years and over who worked from home (2006-2010 ACS)



75% **93%** **1**

2

$$y = 7.963 * (75\%)^{0.569} = 93\%$$

3

$$93\% \text{ of } 100 = 93$$

How can we model new MOEs data in 2010 tracts that are split into new 2020 tracts?



2010 Census Tracts

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(2006-2010 ACS)**



2020 Census Tracts

**Workers 16 years and over
who worked from home
(2006-2010 ACS)**



**75%
93%**

①

②

$$y = 7.963 * (75\%)^{0.569} = 93\%$$

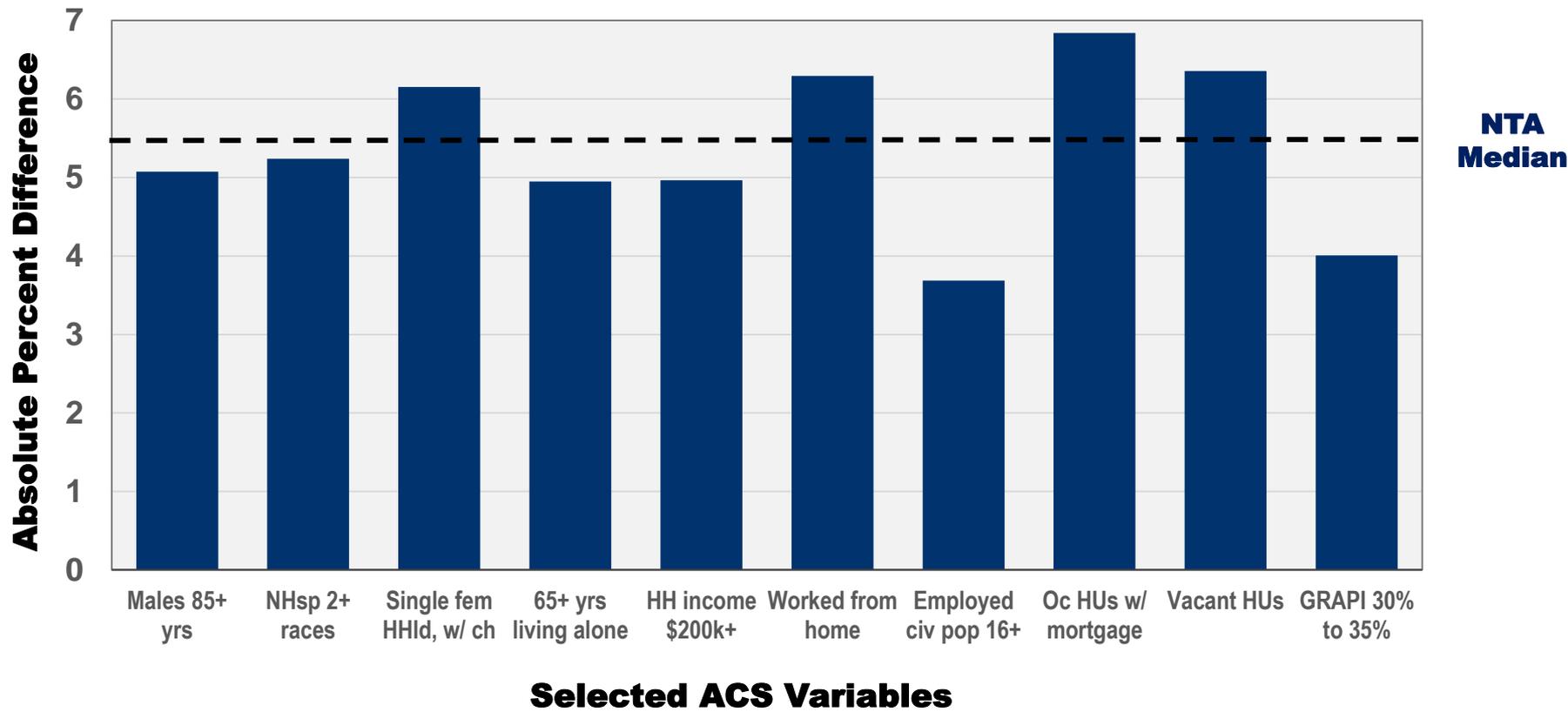
③

$$93\% \text{ of } 100 = 93$$

④

*ACS Split Tract MOE formula results are capped at 100%

Median absolute percent difference between modeled and actual MOEs for selected ACS variables, ACS 2015-2019 (VRT) New York City NTAs with boundary-crossing split tracts



- **The Issue**
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- **Conclusion**

- 1. Sufficient reliability for count estimates**
- 2. Sufficient reliability for Margins of Error**
- 3. Both approaches are simple and easy to use**
- 4. Need further research & to explore alternatives**