Towards Standards in Mapping ACS Data

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NYC Department of City Planning
Population Division

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American Community Survey

2005-2009 ACS 5-year Estimates: Big News for Small Areas

The American Community Survey 5-year estimates are now available.

Learn more about the 5-year Data Release or access the data directly in American FactFinder.

- These are population and housing characteristics based on data collected from January 1, 2005 to December 31, 2009.
- These are not the Census 2010 population counts.

With this first-ever release of these 5-year estimates and each year's update to come, people will no longer have to wait a decade for the next look at detailed characteristics data for their small areas.

--Dr. Robert Groves, Director of the U.S. Census Bureau

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Data by Geography

city/ town, county, or zip

or state

-- select a state --

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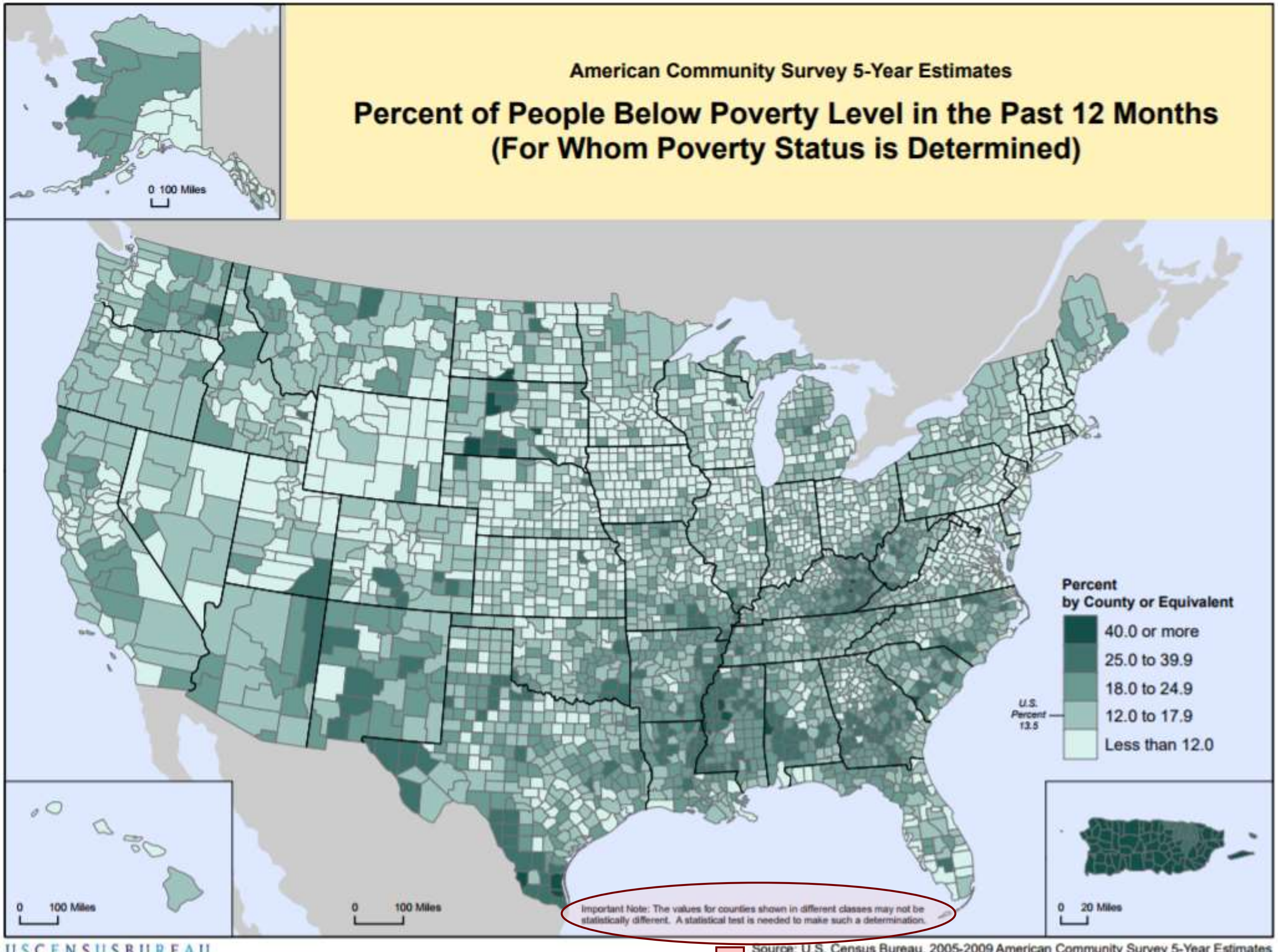
Data by Topic



Important Note: The values for counties shown in different classes may not be statistically different. A statistical test is needed to make such a determination.

The New York Times

Mapping America: Every City, Every Block

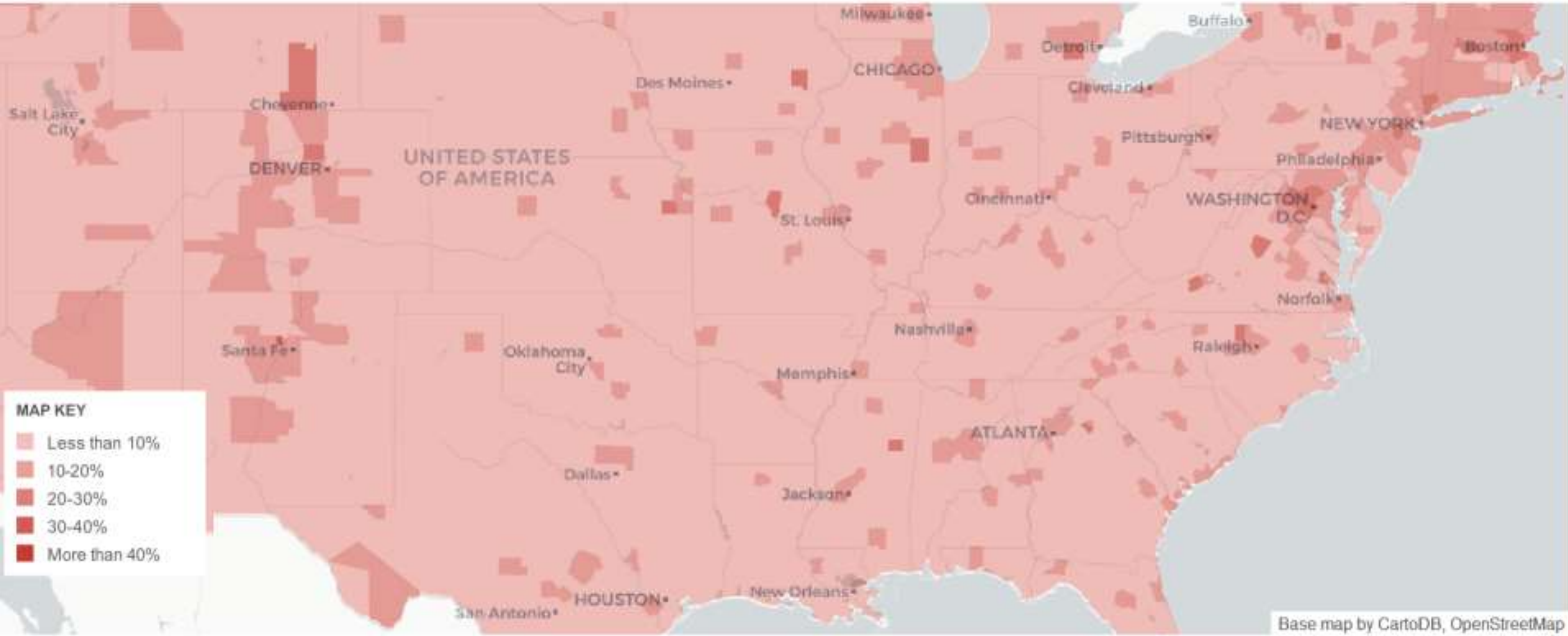
Find something interesting? Share this view on Twitter or Facebook

Browse local data from the Census Bureau's American Community Survey, based on samples from 2005 to 2009. Because these figures are based on samples, they are subject to a margin of error, particularly in places with a low population, and are best regarded as estimates.

View Readers Maps (49)

Master's degree or higher

View More Maps



By MATTHEW BLOCH, SHAN CARTER and ALAN McLEAN | Source: 2005-9 American Community Survey, Census Bureau; socialexplorer.com

Note: Dots are evenly distributed across each Census tract or county.

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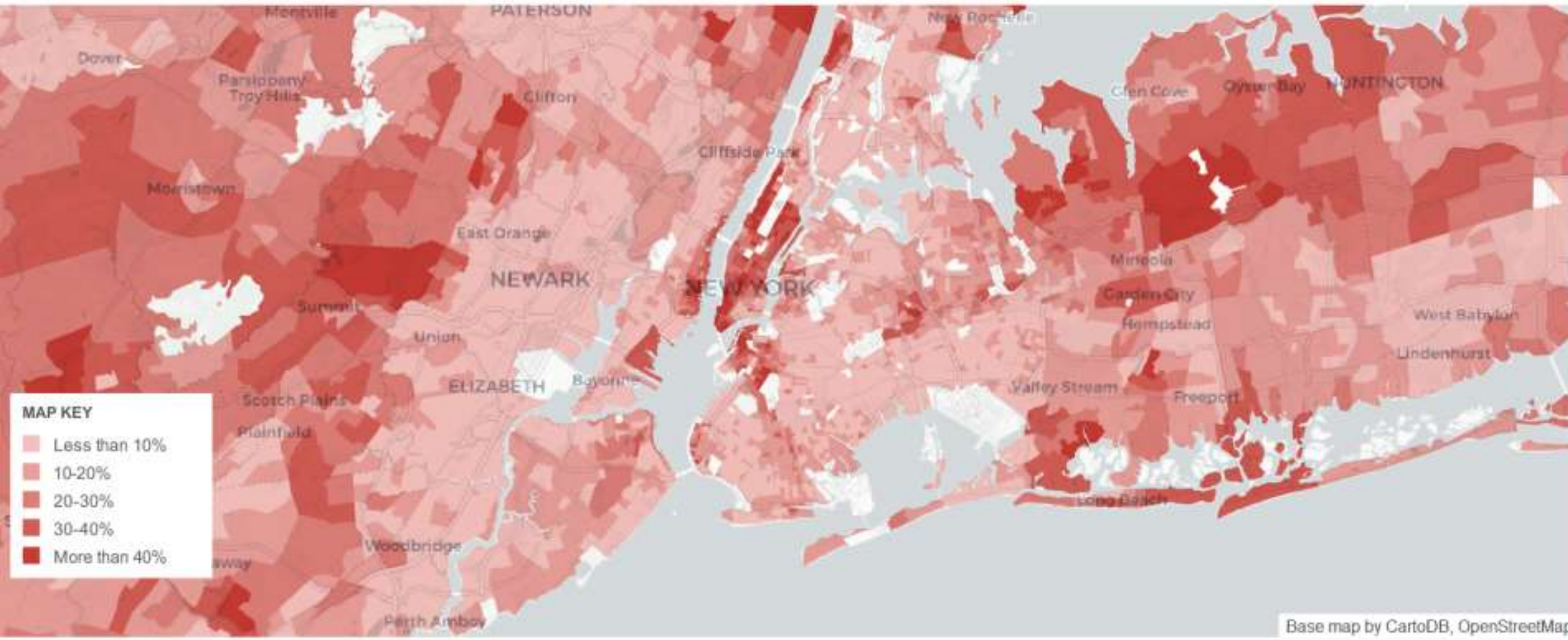

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Overview

1) Acknowledge we have a problem

2) Standardized measure of map reliability
and threshold for general use

3) Evaluation of map reliability of ACS estimates

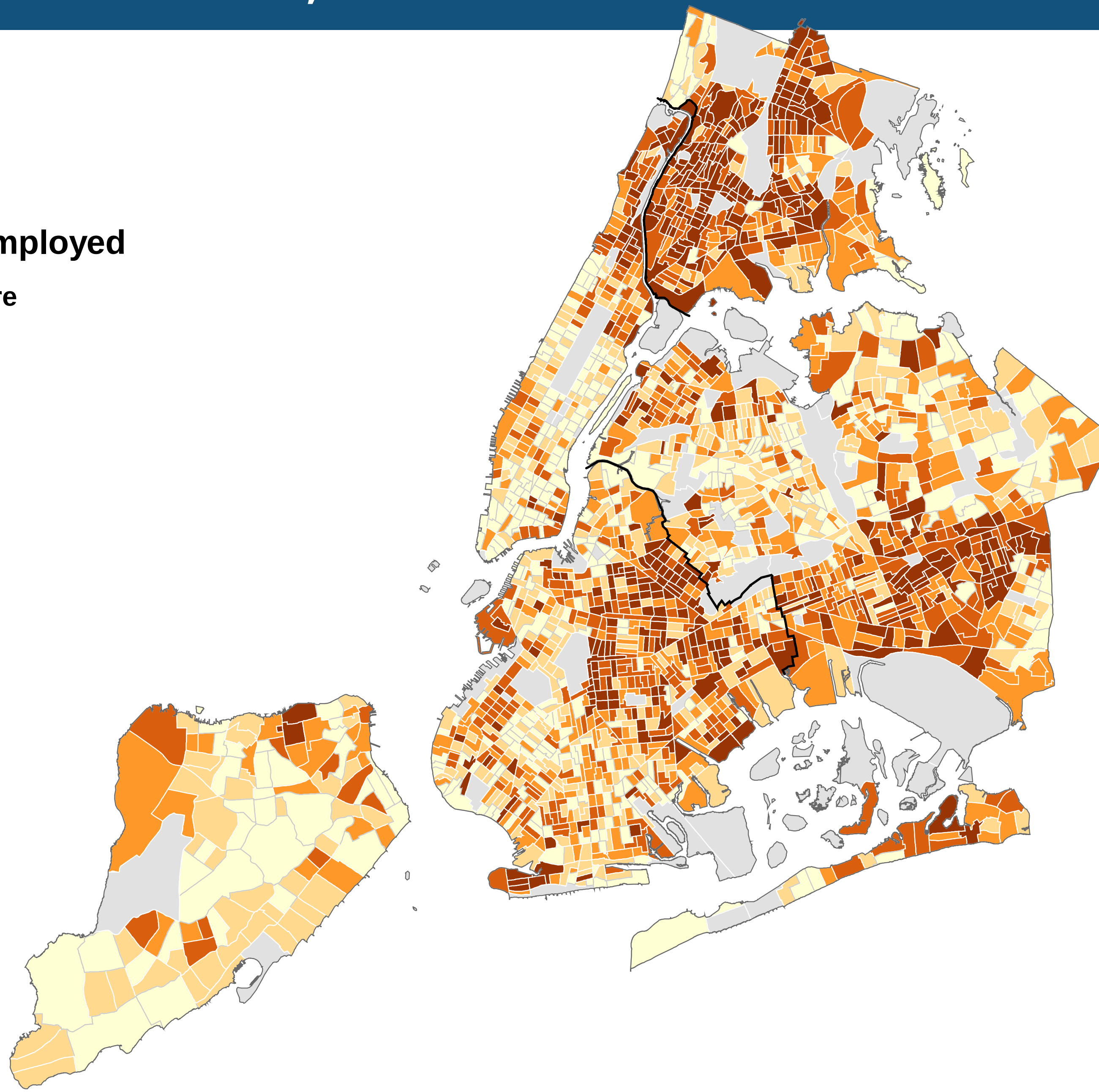
4) Demonstrate Map Reliability Calculator

<u>The Problem:</u>
Unreliable ACS Maps

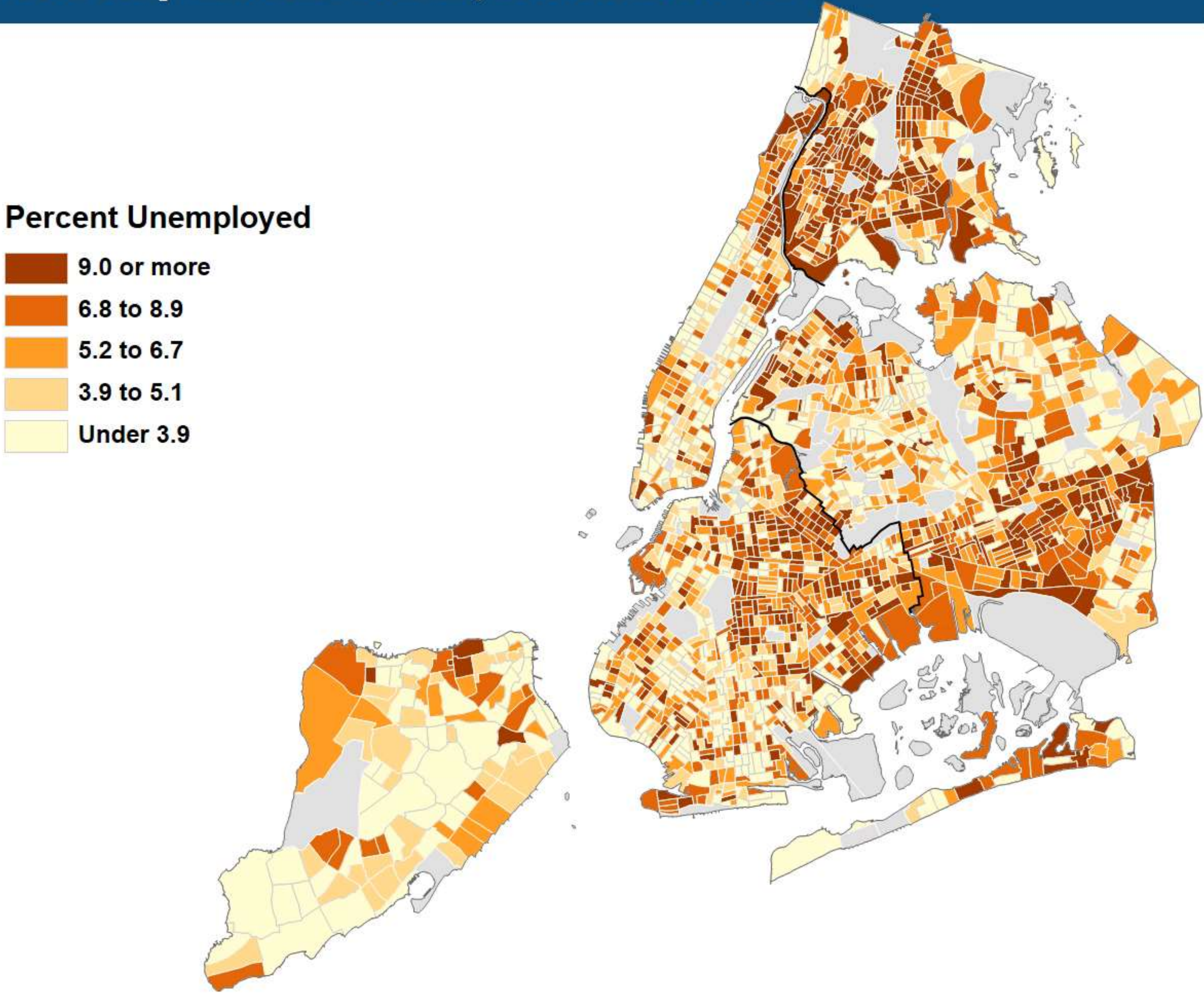
Percent Unemployed
New York City Census Tracts, 2010-2014 ACS

Percent Unemployed

- 9.0 or more
- 6.8 to 8.9
- 5.2 to 6.7
- 3.9 to 5.1
- Under 3.9



Percent Unemployed
New York City Census Tracts, Simulation #1



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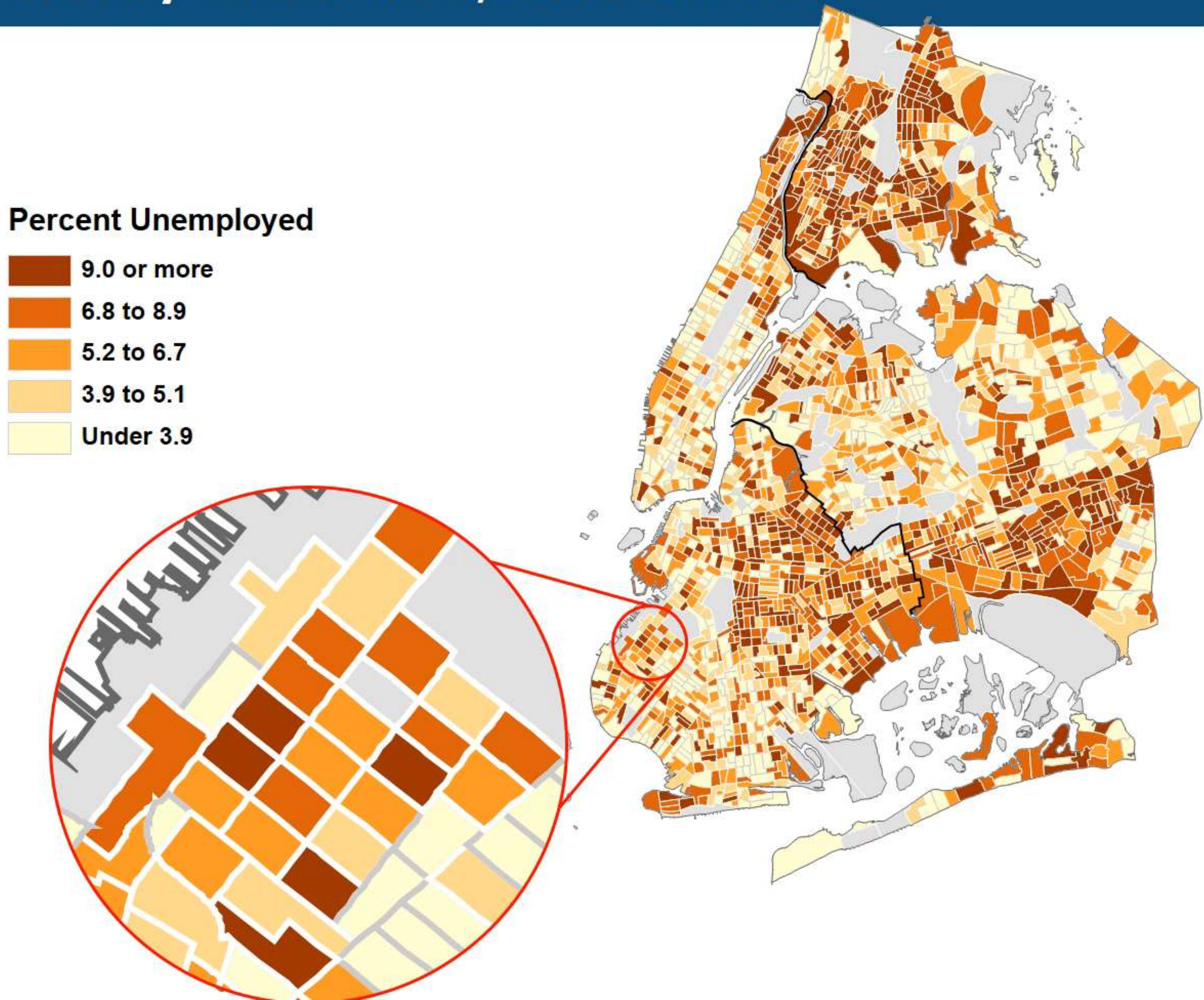
Percent Unemployed
New York City Census Tracts, Simulation #1



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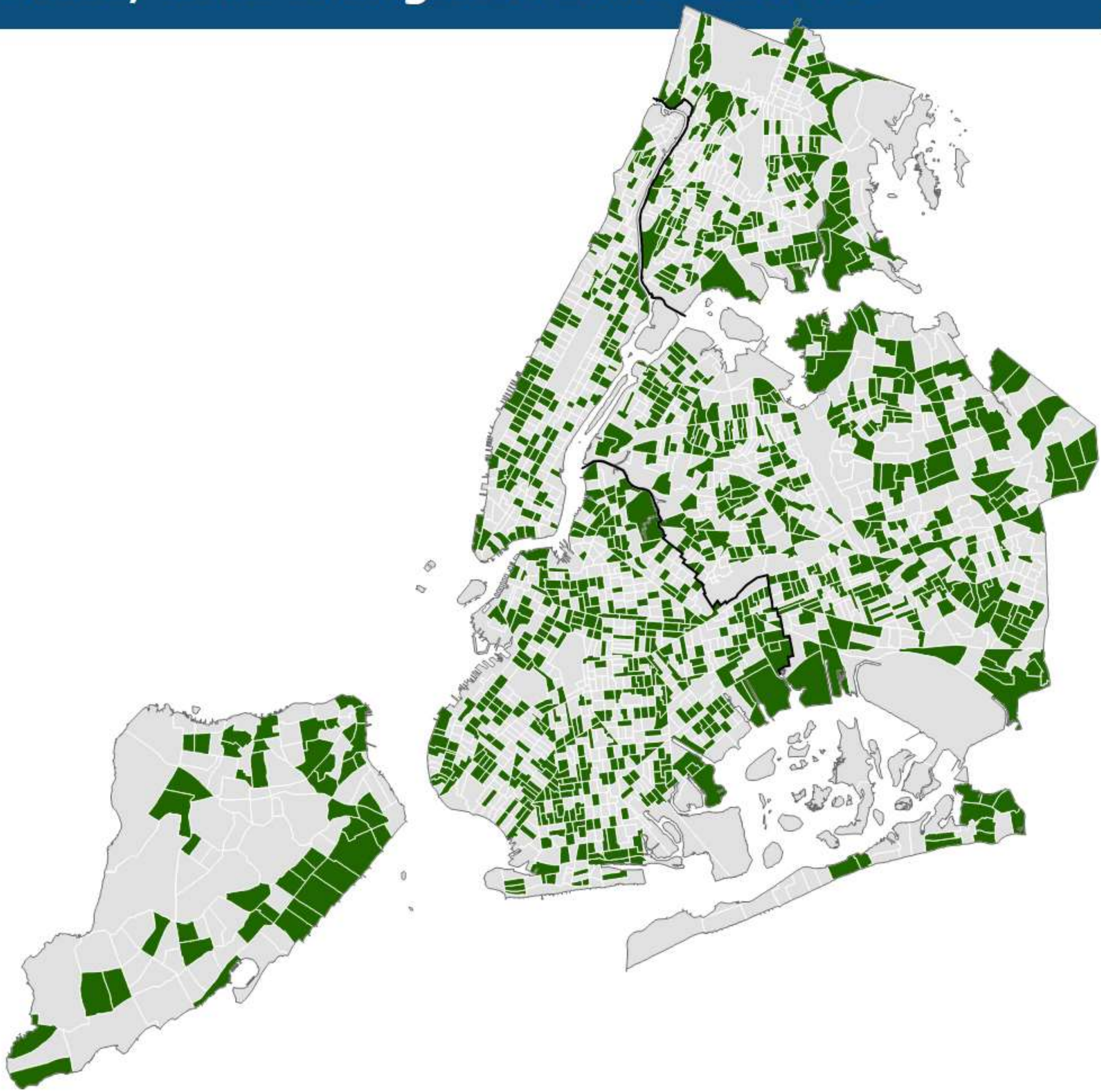
Percent Unemployed
New York City Tracts, Class Changed in Simulation #1



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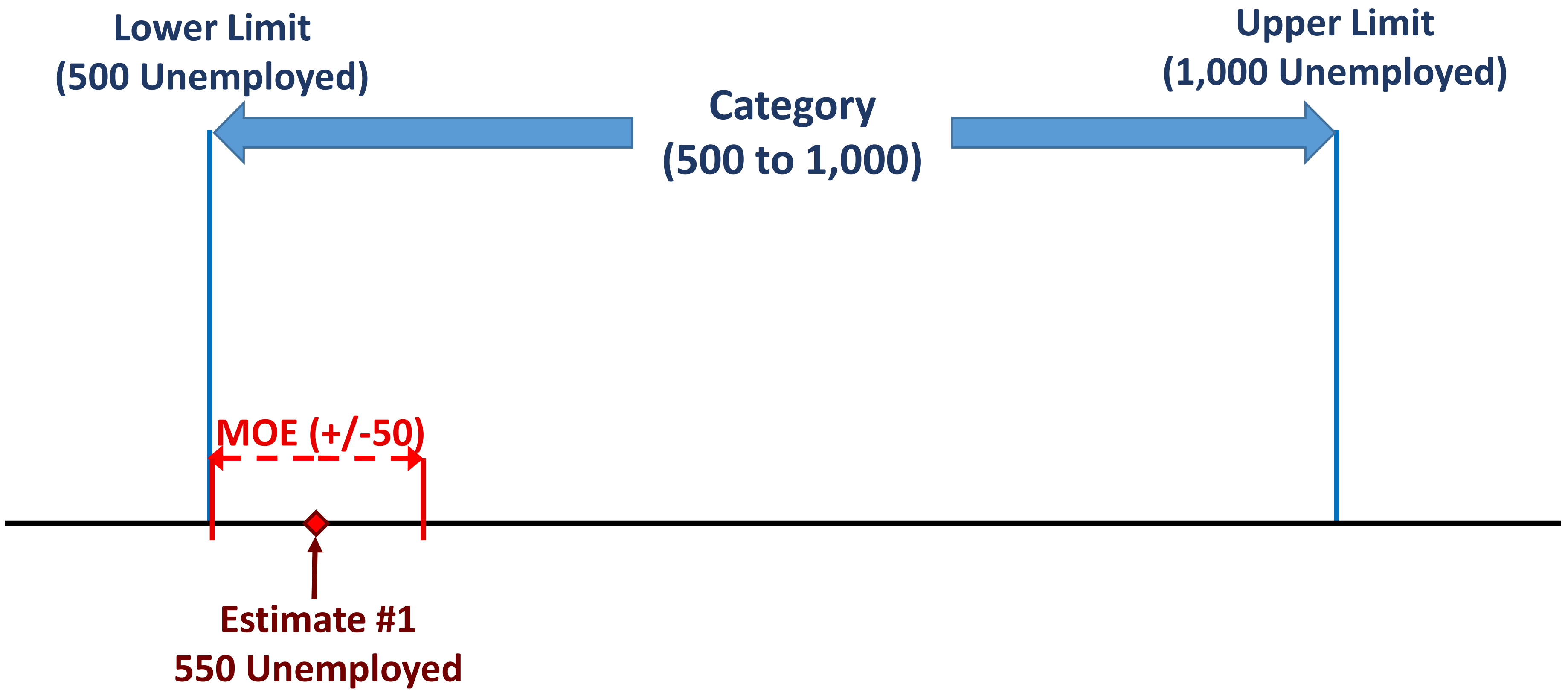
Calculating Map Reliability and Delineating an Acceptable Threshold

Calculating Map Uncertainty
Example – Mapping Unemployment



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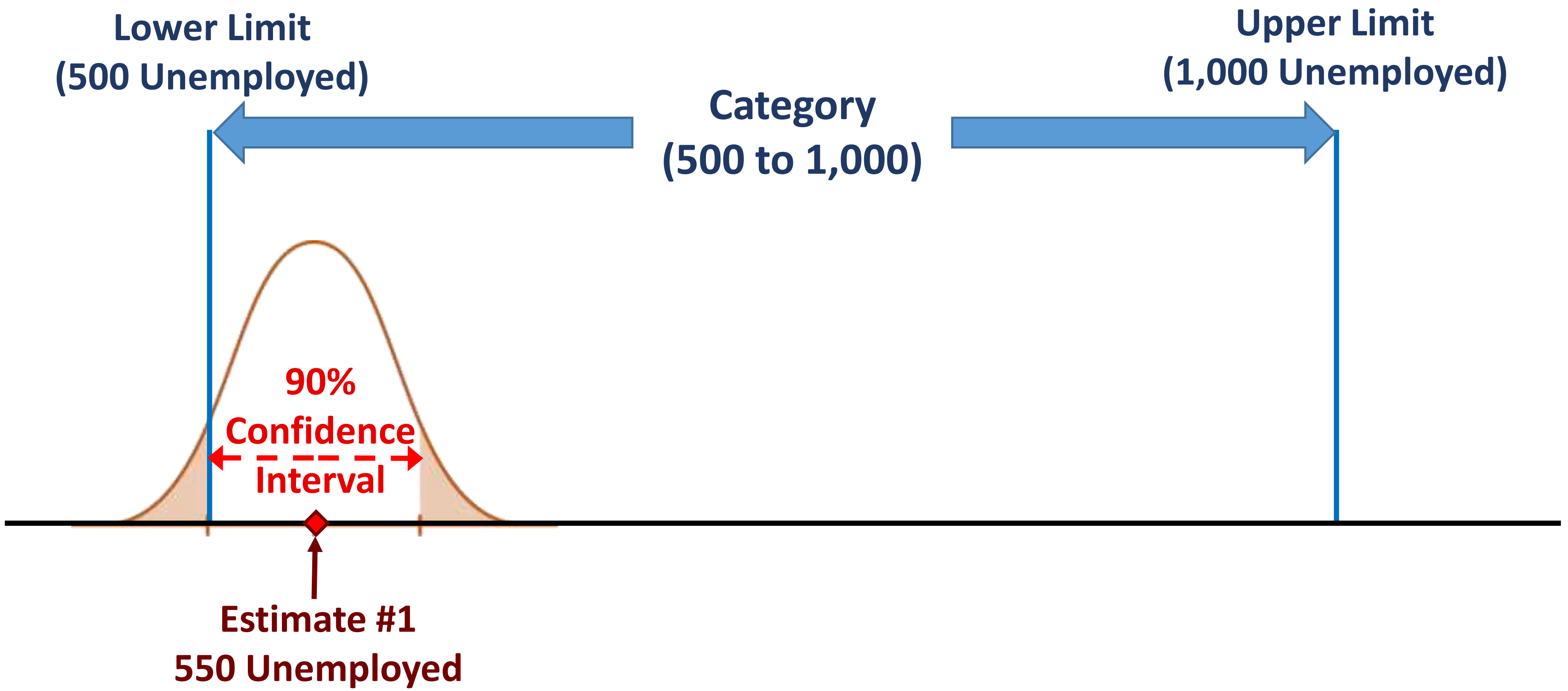
Calculating Map Uncertainty
Example – Mapping Unemployment



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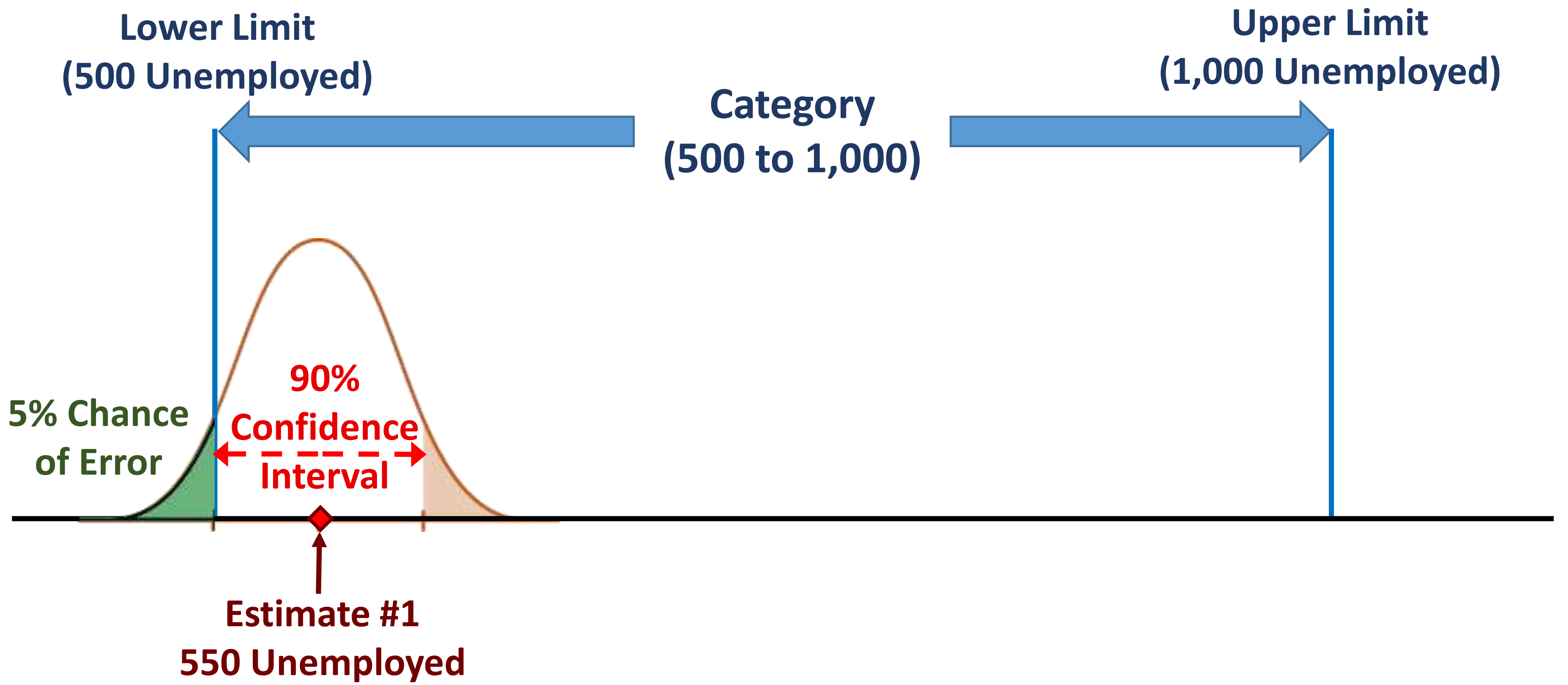
Calculating Map Uncertainty
Example – Mapping Unemployment



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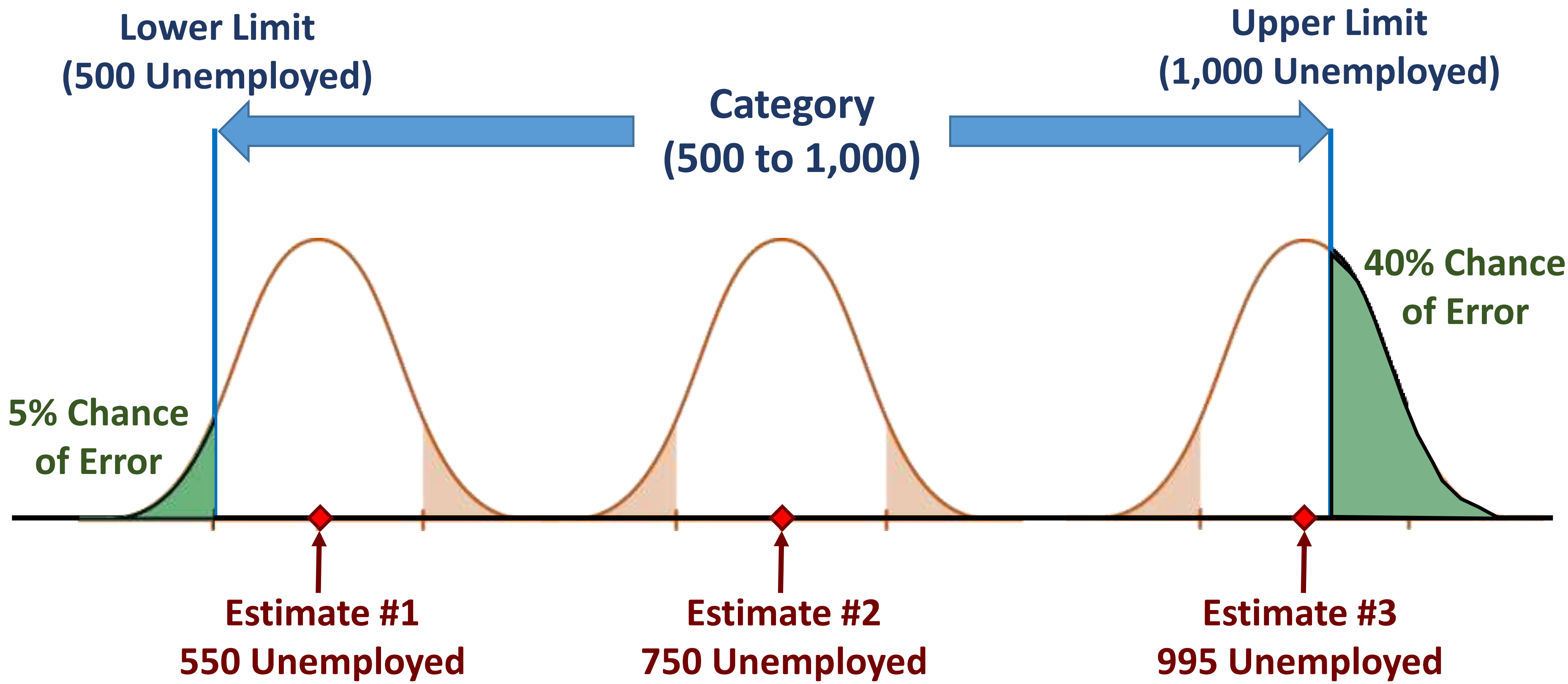
Example – Mapping Unemployment



15% chance
one of the estimates
is erroneously classed

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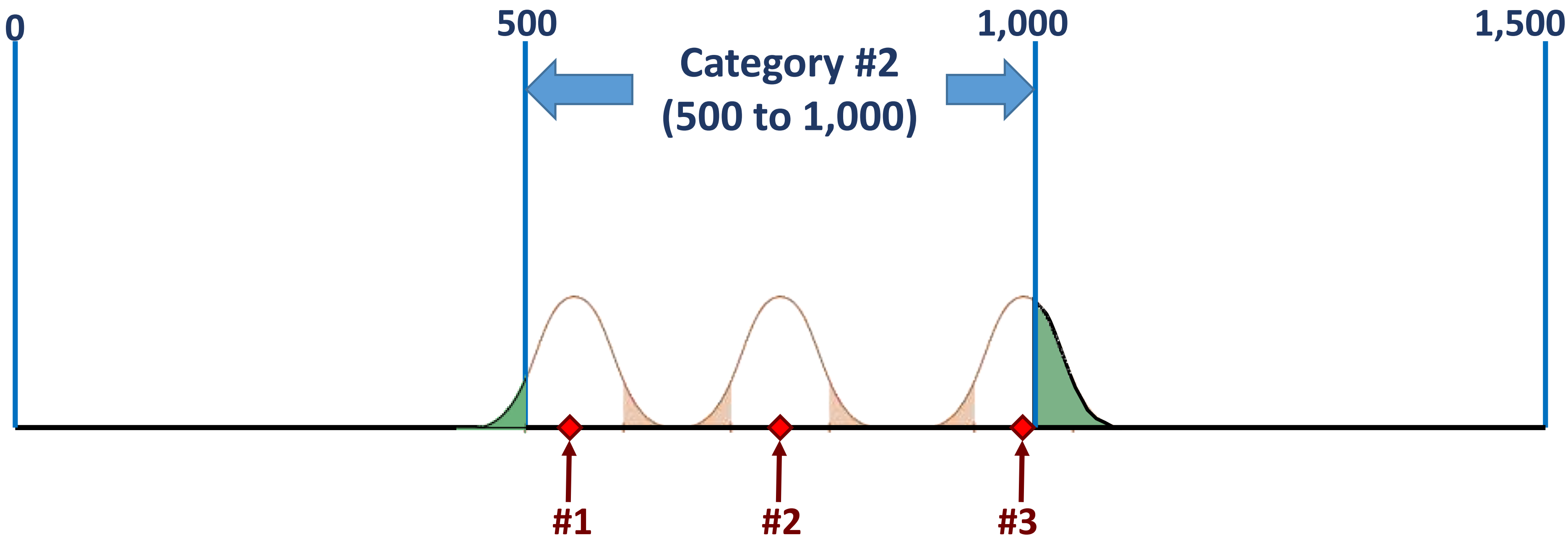
Calculating Map Uncertainty
Example – Mapping Unemployment



15% chance of error

n=3

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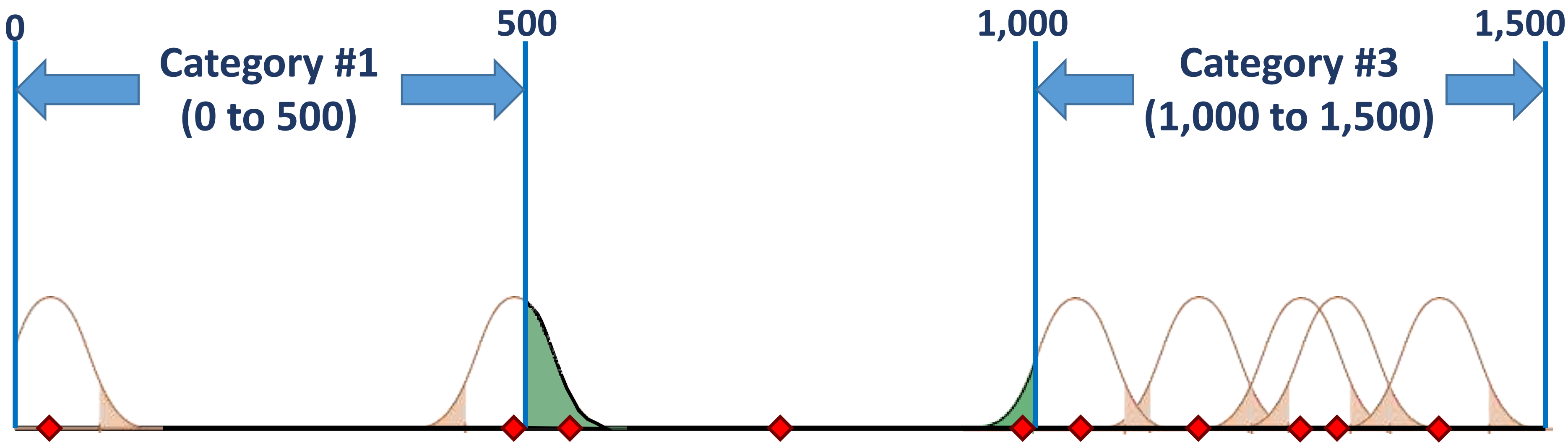
Calculating Map Uncertainty
Example – Mapping Unemployment



20% chance of error

n=2

3% chance of error

n=5

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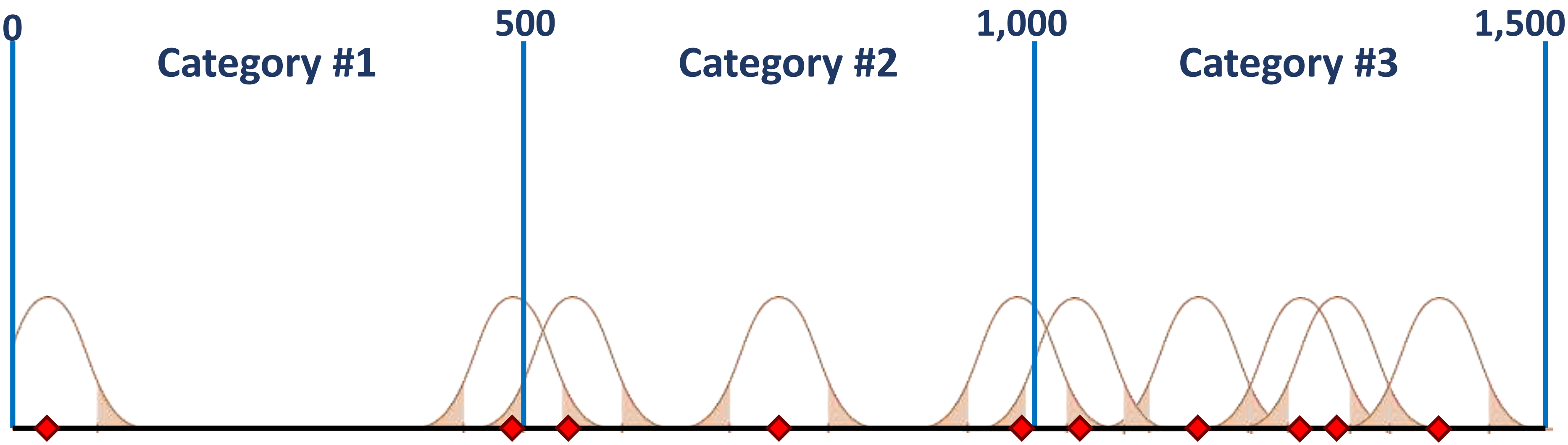
Calculating Map Uncertainty
Example – Mapping Unemployment

10% overall chance of error

n=10



20% chance of error

n=2

15% chance of error

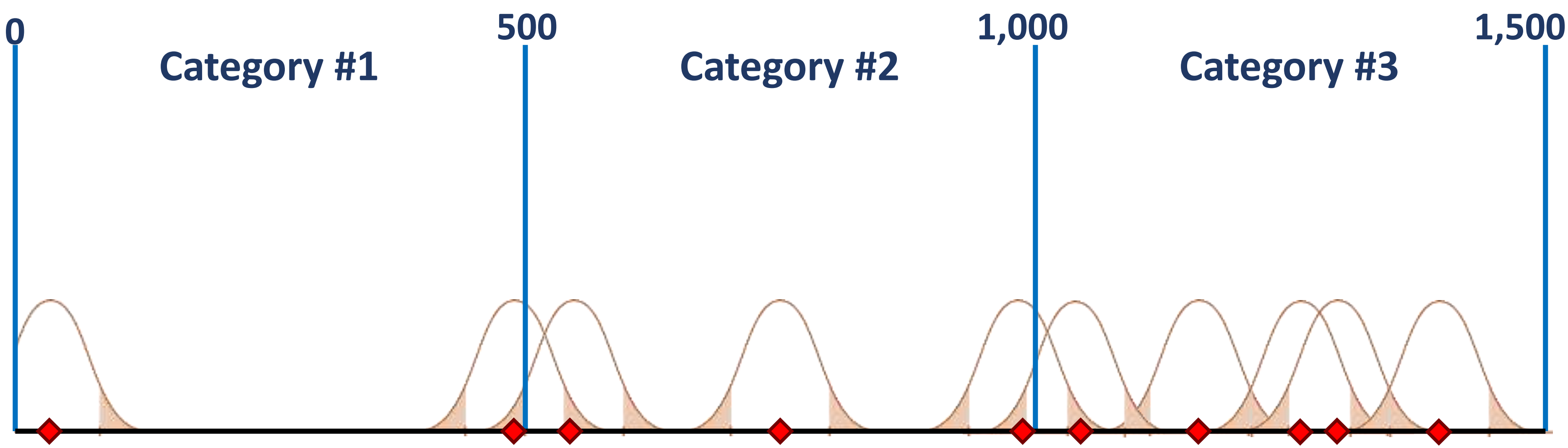
n=3

3% chance of error

n=5

Calculating Map Uncertainty
Example – Mapping Unemployment

Max acceptable map error → **10% overall chance of error**



20% chance of error

15% chance of error

3% chance of error

Max acceptable error for any one class

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Evaluation of Cross-section of ACS Estimates

Assessment of Map Reliability for Selected ACS Estimates

Demographic	Population 85 years and over
	Median Age
	Females 65 and over
	Asian nonhispanic
	Chinese, excluding Taiwanese
	Asian Indian
	Bangladeshi
	Southeast Asian
Social	Single female head, own children under 18
	65 and over living alone
	Less than high school diploma
	Population with ambulatory difficulty
	Born in New York State
	Born in Haiti
	Foreign-born non-citizen
	Speaks Spanish, limited English Proficiency

Economic	Unemployed
	Mean travel time to work
	Workers in professional occupations
	Workers self employed
	Household income $200,000 or more
	Median household income
	Population 65 and over below poverty
	No health insurance coverage
Housing	Vacant housing units
	Rental vacancy rate
	Median number of rooms
	No vehicles available
	1.51 or more occupants per room
	Owner costs 35% or more of income
	Rent 35% or more of income
	Rent 50% or more of income

Dimensions of Analysis

1) 59 ACS counts, percents, means, medians, and rates

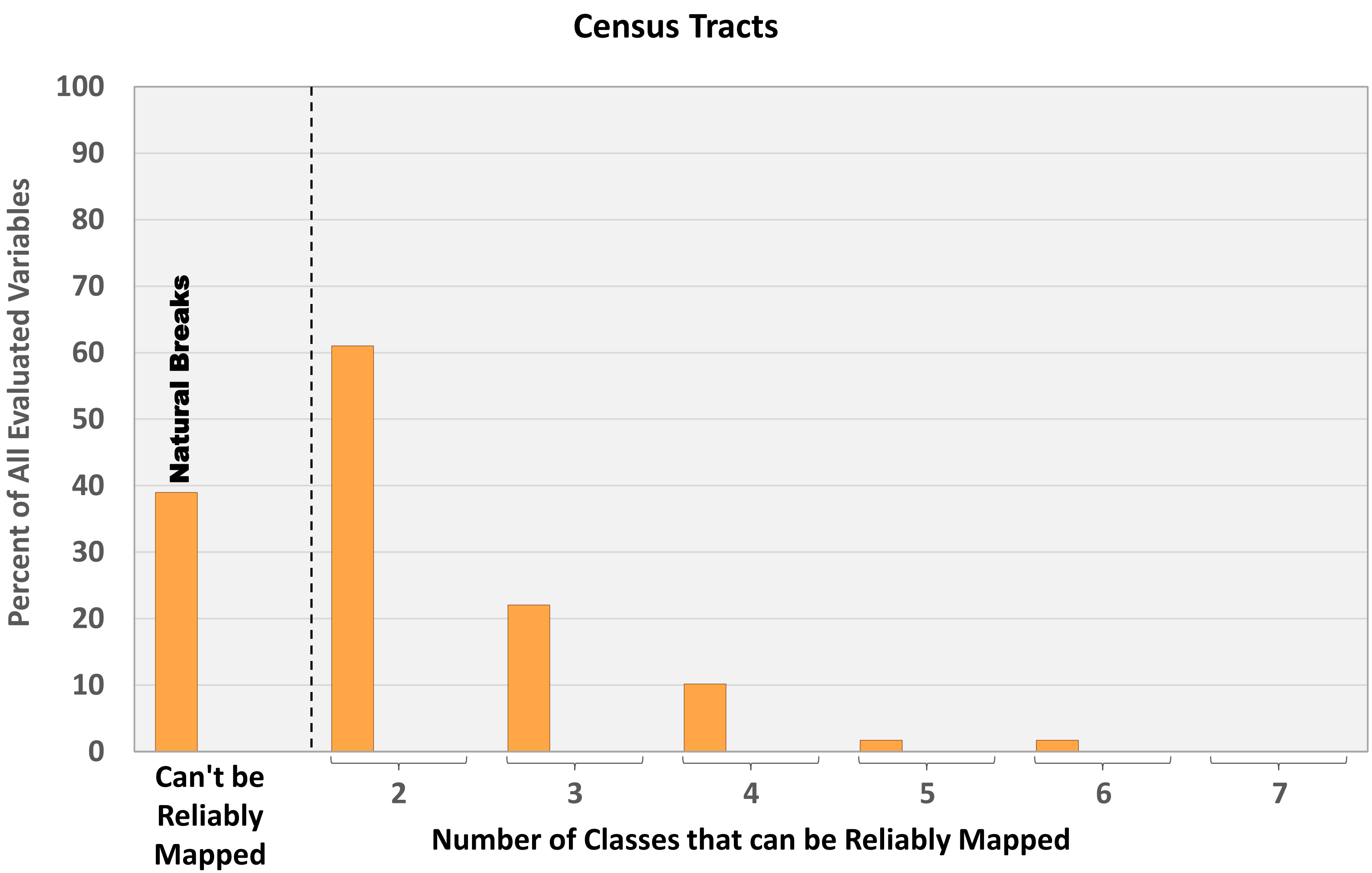
2) 3 map classification schemes (up to 7 classes)

   - Natural Breaks
   - Equal Interval
   - Quantile

3) 3 geographic summary levels

   - Census Tracts
   - Neighborhood Tabulation Areas (NTAs)
   - PUMAs

“Mapability” of Variables for New York City Census Tracts – Number of Classes that can be Reliably Mapped



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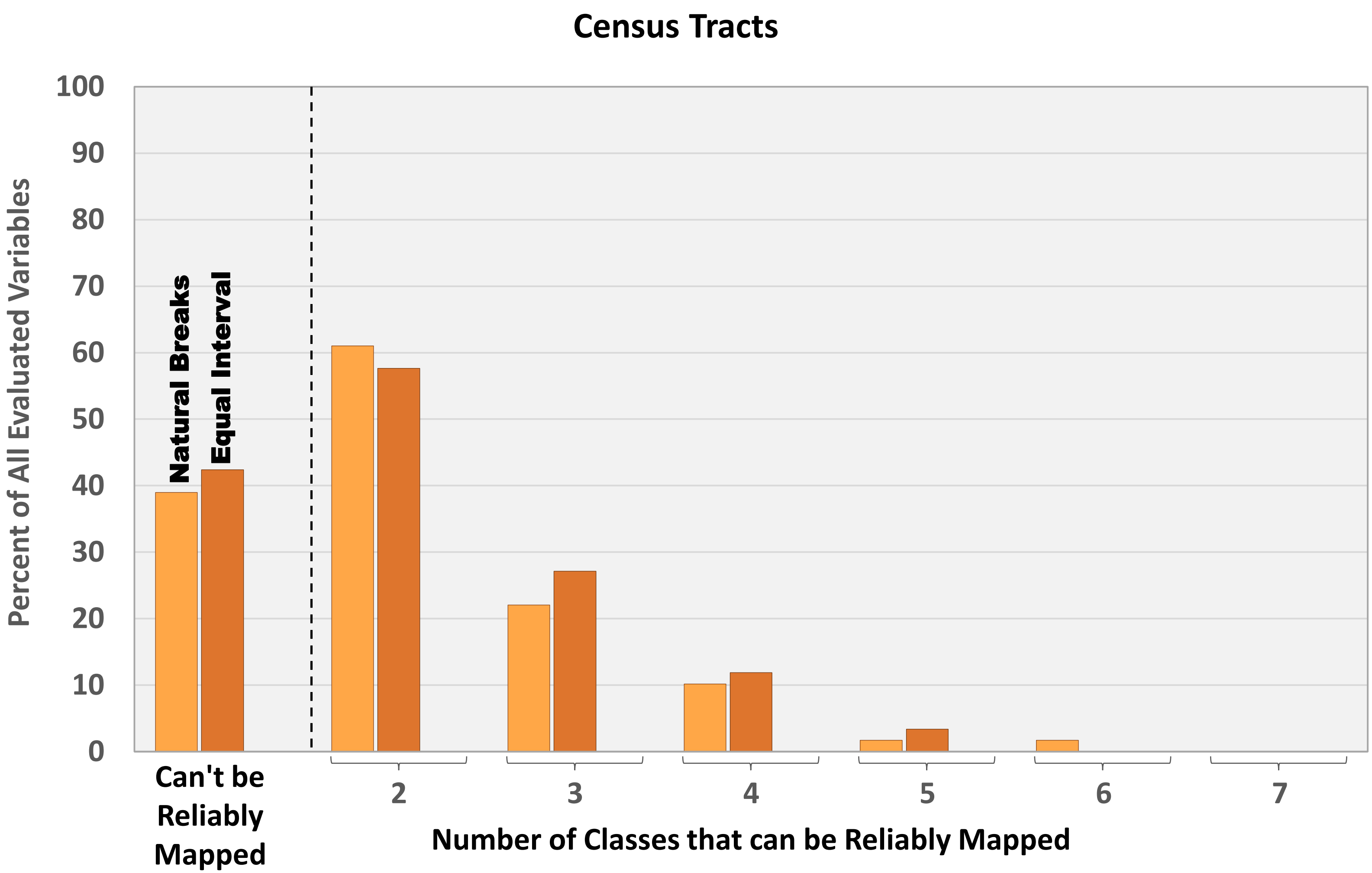

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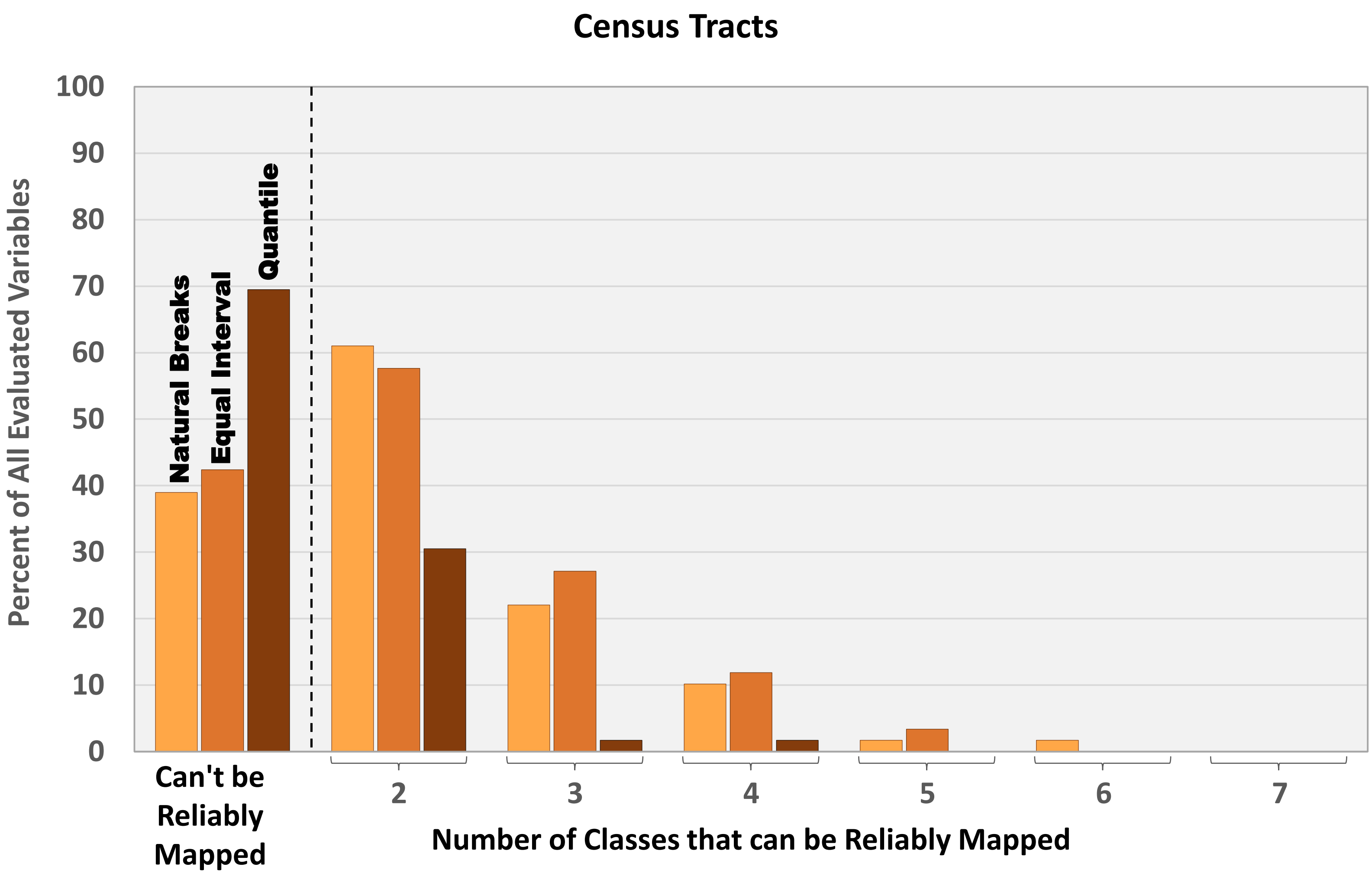

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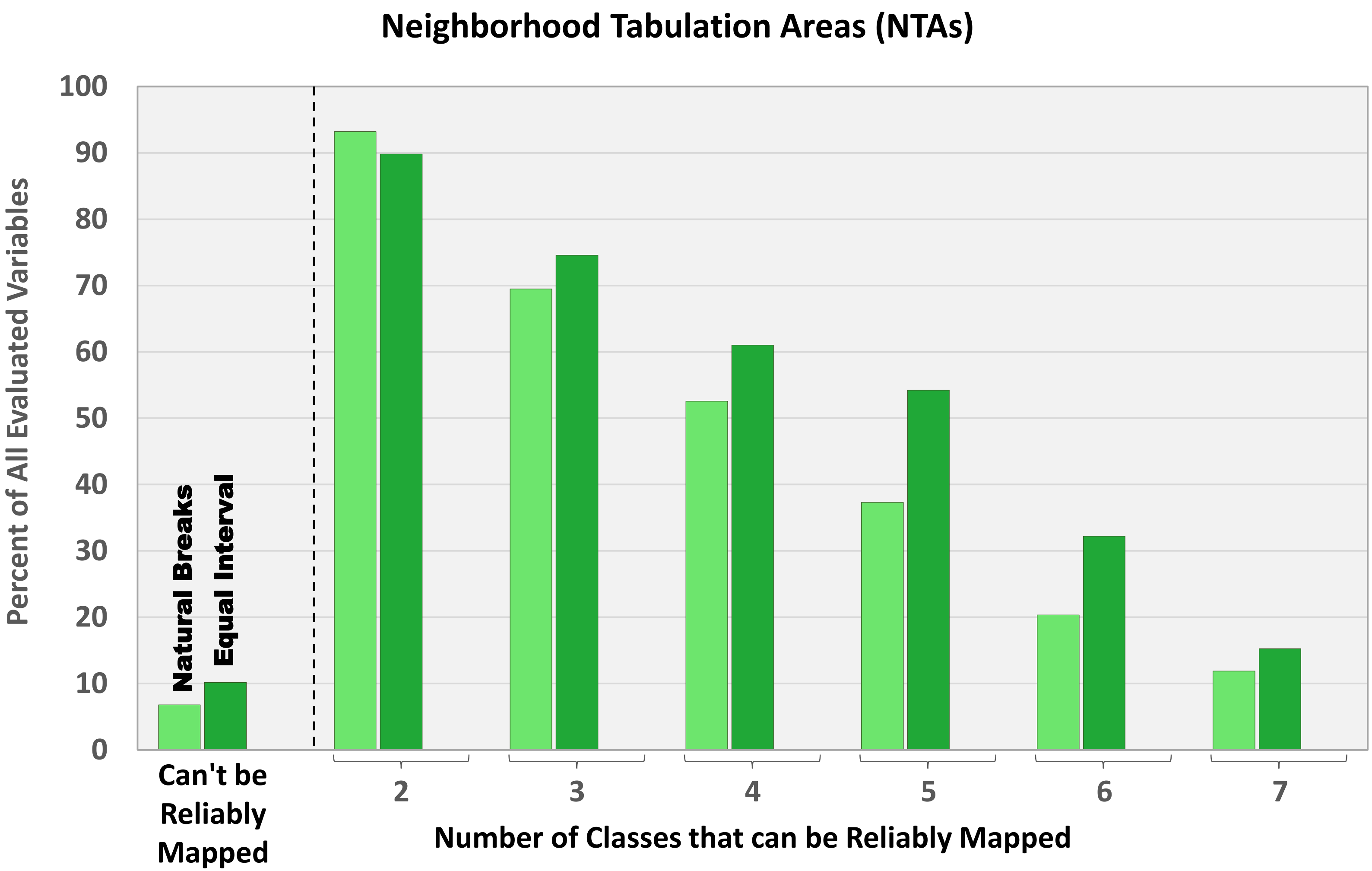
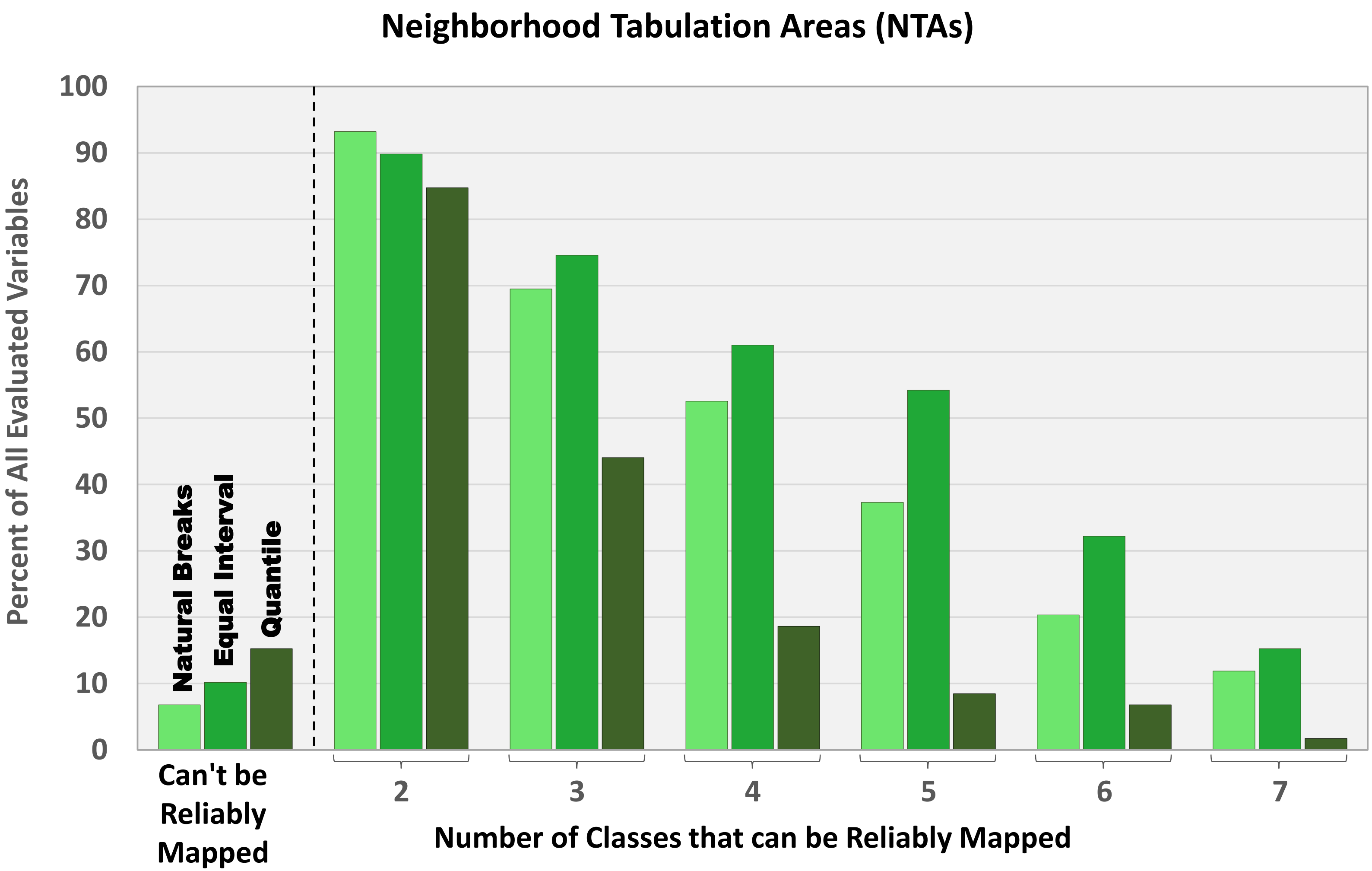
“Mapability” of Variables for New York City NTAs – Number of Classes that can be Reliably Mapped



"Mapability" of Variables for New York City NTAs – Number of Classes that can be Reliably Mapped



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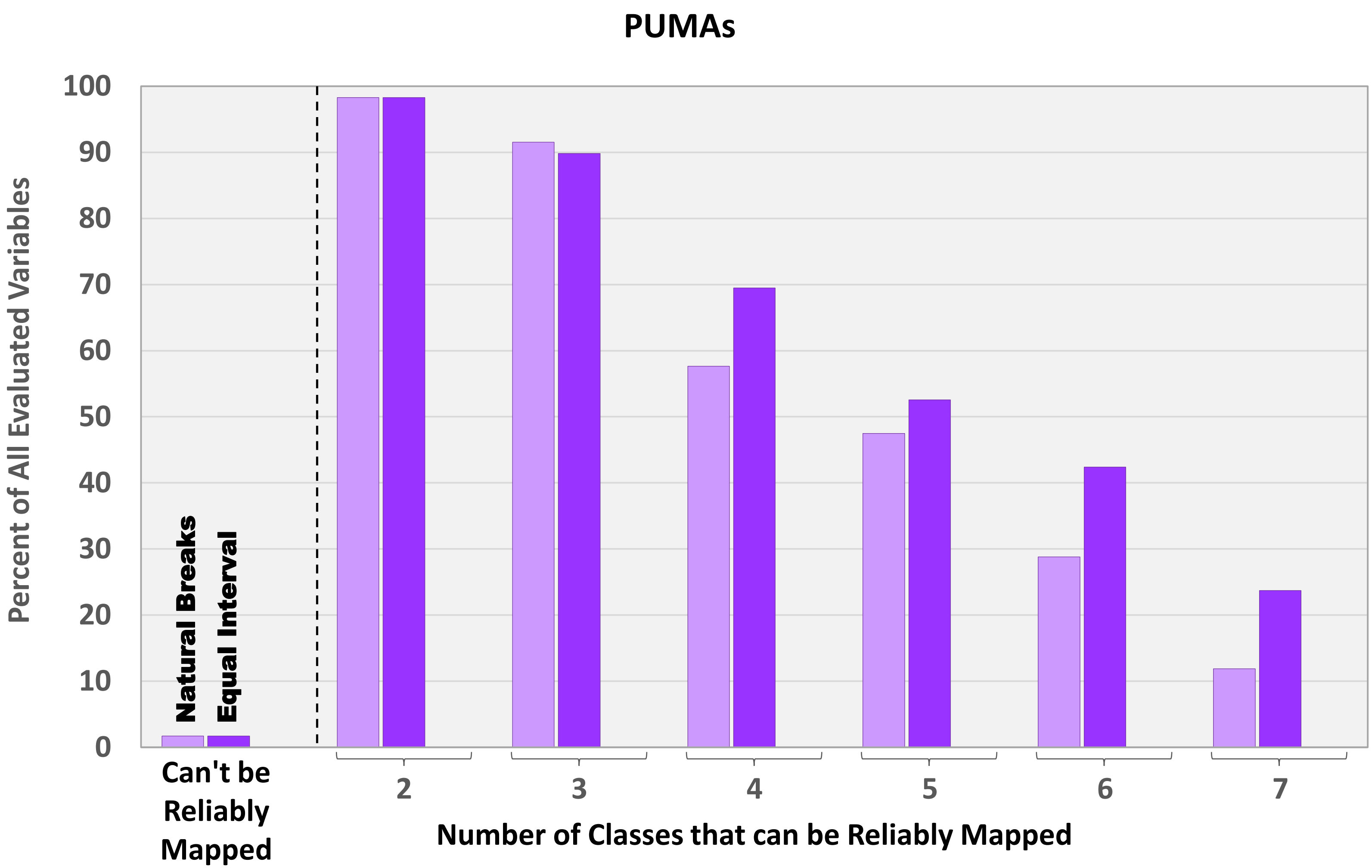
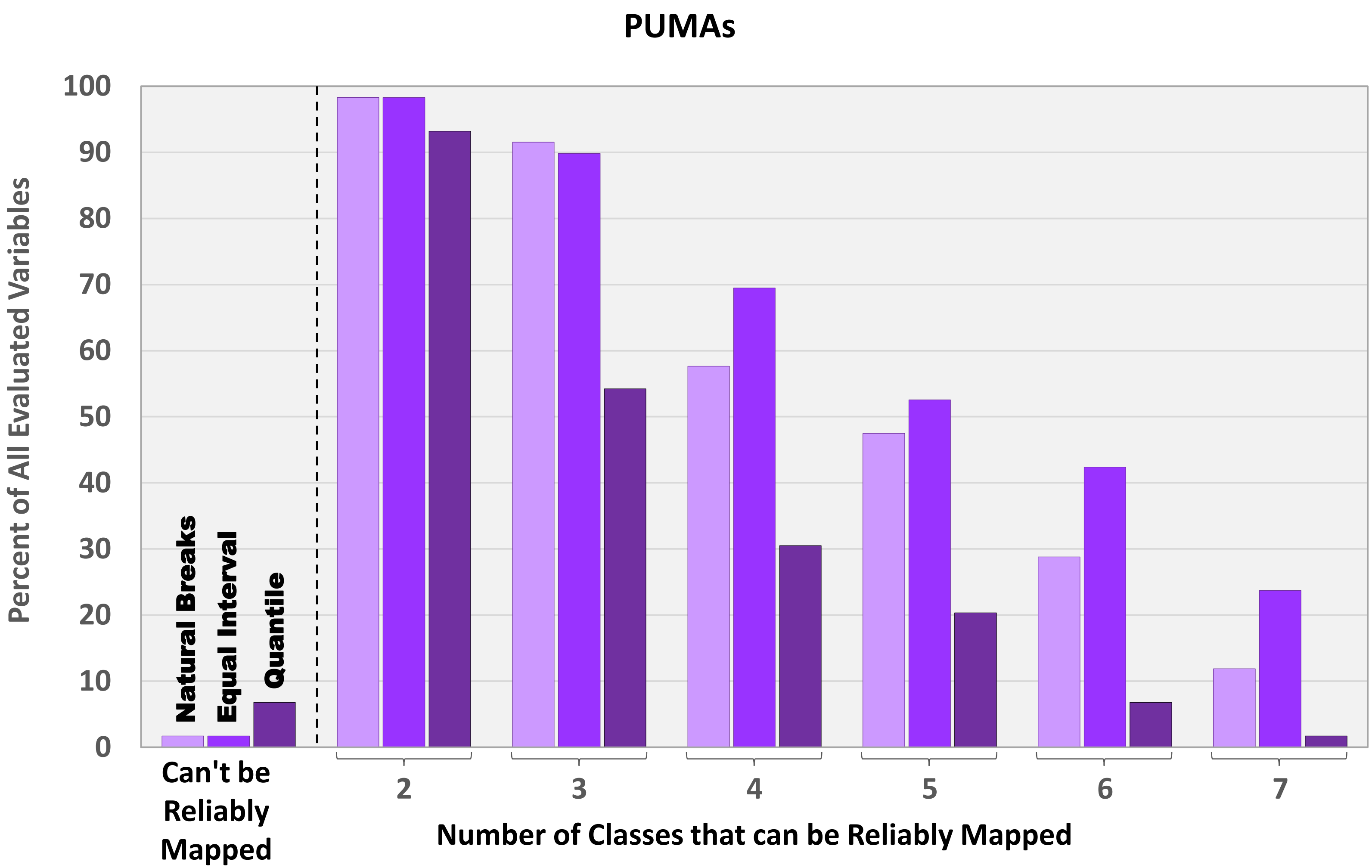
"Mapability" of Variables for New York City PUMAs – Number of Classes that can be Reliably Mapped



“Mapability” of Variables for New York City PUMAs – Number of Classes that can be Reliably Mapped



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Takeaway from Evaluation

1) Try to avoid mapping at a census tract level and exercise extreme caution if you do

2) Avoid using a quantile mapping scheme

3) NTAs and PUMAs are much more reliable than tracts, but still need to evaluate reliability

4) Reliability of maps not just about magnitude of error in ACS data – also about the characteristics of estimate/error distributions

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Demonstration of
Map Reliability Calculator

Map Reliability Calculator Demo

MAP RELIABILITY CALCULATOR

(Fill in boxes to get map reliability* for classification schemes)

STEP 1
Insert estimates & Margins of Error (MOEs)
(Insert up to 2,500 lines)

	Estimates	MOEs
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		
16		
17		
18		
19		

STEP 2
Select number of classes
(Type in number from 2 to 7)

Classes

STEP 3
Select class breaks
(Type in lower limit for each class)

	User Defined Class Breaks	Count	Reliability *
top class			
lowest (2 classes)			
lowest (3 classes)			
lowest (4 classes)			
lowest (5 classes)			
lowest (6 classes)			
lowest (7 classes)			
Total			

* Percent of estimates that are likely to be erroneously classed

** Classification is considered to be reliable if total reliability is less 10% and all individual classes are less than 20%

Suggested notation for maps that pass this reliability test:

There is less than a 10% that chance any given geography in this map is misclassified due to sampling error.

For each individual category, there is less than a 20% chance that any given geography is misclassified due to sampling error;

Source: New York City Department of City Planning, Population Division

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1	0.00	
2	1105.00	222.00
3	2667.00	358.00
4	0.00	
5	4028.00	998.00
6	6463.00	737.00
7	4132.00	619.00
8	1120.00	162.00
9	695.00	110.00
10	1882.00	560.00
11	1709.00	246.00
12	3419.00	400.00
13	1734.00	231.00
14	1470.00	244.00
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18	4951.00	778.00
19	1373.00	256.00

STEP 2
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Classes

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Select class breaks
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	User Defined *Class Breaks*	*Count*	*Reliability* *
top class			
lowest (2 classes)			
lowest (3 classes)			
lowest (4 classes)			
lowest (5 classes)			
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Classes
7

User Defined

	Class Breaks	*Count*	*Reliability* *
top class			
lowest (2 classes)			
lowest (3 classes)			
lowest (4 classes)			
lowest (5 classes)			
lowest (6 classes)			
lowest (7 classes)			
Total			

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STEP 2
Select number of classes
(Type in number from 2 to 7)

Classes
7

STEP 3
Select class breaks
(Type in lower limit for each class)

	User Defined Class Breaks	Count	Reliability *
top class	5,981.00		
lowest (2 classes)	4,832.00		
lowest (3 classes)	3,259.00		
lowest (4 classes)	2,390.00		
lowest (5 classes)	1,634.00		
lowest (6 classes)	789.00		
lowest (7 classes)	0.00		
Total			

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Select number of classes
(Type in number from 2 to 7)

Classes
7

STEP 3
Select class breaks
(Type in lower limit for each class)

User Defined

	Class Breaks	*Count*	*Reliability* *
top class	5,981.00	20	16.6
lowest (2 classes)	4,832.00	42	29.5
lowest (3 classes)	3,259.00	147	16.1
lowest (4 classes)	2,390.00	280	21.4
lowest (5 classes)	1,634.00	550	17.6
lowest (6 classes)	789.00	854	10.1
lowest (7 classes)	0.00	274	8.9
Total		2,167	14.2

Not Reliable

* Percent of estimates that are likely to be erroneously classed

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STEP 2
Select number of classes
(Type in number from 2 to 7)

Classes
4

STEP 3
Select class breaks
(Type in lower limit for each class)

	User Defined Class Breaks	Count	Reliability *
top class	4,793.00	64	12.2
lowest (2 classes)	2,488.00	374	10.5
lowest (3 classes)	1,260.00	969	9.4
lowest (4 classes)	0.00	760	5.7
lowest (5 classes)			
lowest (6 classes)			
lowest (7 classes)			
Total		2,167	8.4

Reliable

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Classes
4

STEP 3
Select class breaks
(Type in lower limit for each class)

	User Defined Class Breaks	Count	Reliability *
top class	5,000.00	52	11.9
lowest (2 classes)	2,500.00	384	11.0
lowest (3 classes)	1,000.00	1,241	6.4
lowest (4 classes)	0.00	490	7.3
lowest (5 classes)			
lowest (6 classes)			
lowest (7 classes)			
Total		2,167	7.6

Reliable

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For each individual category, there is less than a 20% chance that any given geography is misclassified due to sampling error;

Source: New York City Department of City Planning, Population Division

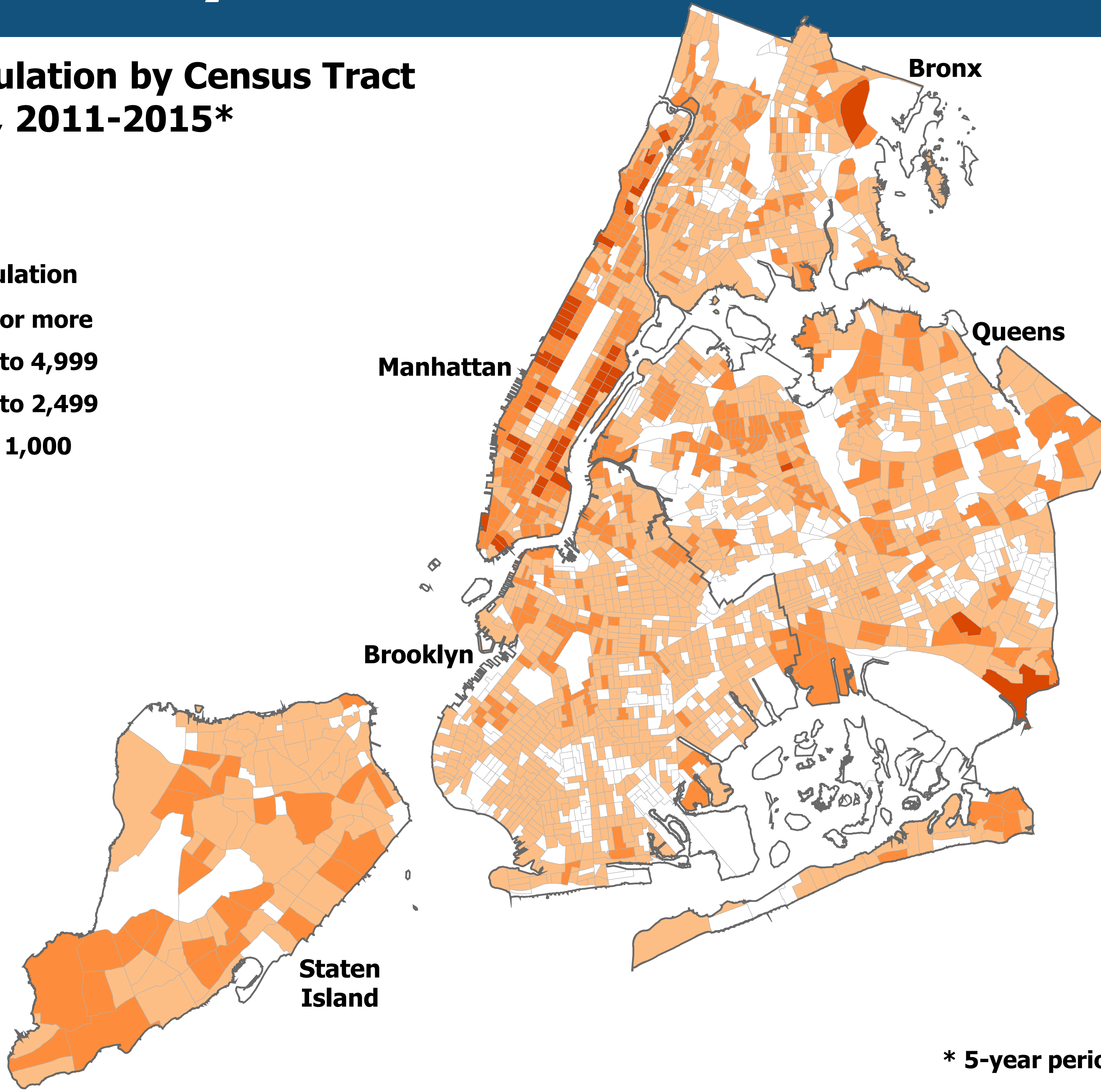
NYC PLANNING

Map Reliability Calculator Demo

Employed Population by Census Tract
New York City, 2011-2015*

Employed Population

- 5,000 or more
- 2,500 to 4,999
- 1,000 to 2,499
- Under 1,000



* 5-year period estimate

NYC PLANNING

Map Reliability Calculator Demo

MAP RELIABILITY CALCULATOR

(Fill in boxes to get map reliability* for classification schemes)

STEP 1
Insert estimates & Margins of Error (MOEs)
(Insert up to 2,500 lines)

	Estimates	MOEs
1	0.00	
2	1105.00	222.00
3	2667.00	358.00
4	0.00	
5	4028.00	998.00
6	6463.00	737.00
7	4132.00	619.00
8	1120.00	162.00
9	695.00	110.00
10	1882.00	560.00
11	1709.00	246.00
12	3419.00	400.00
13	1734.00	231.00
14	1470.00	244.00
15	3663.00	390.00
16	5231.00	428.00
17	3813.00	583.00
18	4951.00	778.00
19	1373.00	256.00

STEP 2
Select number of classes
(Type in number from 2 to 7)

Classes
4

STEP 3
Select class breaks
(Type in lower limit for each class)

User Defined

	Class Breaks	Count	Reliability *
top class	5,000.00	52	11.9
lowest (2 classes)	2,500.00	384	11.0
lowest (3 classes)	1,000.00	1,241	6.4
lowest (4 classes)	0.00	490	7.3
lowest (5 classes)			
lowest (6 classes)			
lowest (7 classes)			
Total		2,167	7.6

Reliable

* Percent of estimates that are likely to be erroneously classed

** Classification is considered to be reliable if total reliability is less 10% and all individual classes are less than 20%

<u>Suggested notation for maps that pass this reliability test:</u>

There is less than a 10% that chance any given geography in this map is misclassified due to sampling error.

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NYC PLANNING

Map Reliability Calculator Demo

MAP RELIABILITY CALCULATOR

(Fill in boxes to get map reliability* for classification schemes)

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Source: New York City Department of City Planning, Population Division

NYC PLANNING

Map Reliability Calculator Demo

MAP RELIABILITY CALCULATOR

(Fill in boxes to get map reliability* for classification schemes)

STEP 3

Select class breaks

(Type in lower limit for each class)

User Defined

	Class Breaks	*Count*	*Reliability* *
top class	5,000.00	52	11.9
lowest (2 classes)	2,500.00	384	11.0
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lowest (4 classes)	0.00	490	7.3
lowest (5 classes)			
lowest (6 classes)			
lowest (7 classes)			
Total		2,167	7.6
			Reliable

ALTERNATIVE CLASSIFICATION SCHEMES

Equal Interval

Class Breaks	*Count*	*Reliability* *
9,585.00	3	21.1
6,390.00	10	19.4
3,195.00	207	10.7
0.00	1,947	1.1
	2,167	2.2
		Not Reliable

Quantile

Class Breaks	*Count*	*Reliability* *
2,273.50	542	7.3
1,579.00	542	18.0
1,052.50	541	18.6
0.00	542	6.6
	2,167	12.6
		Not Reliable

* Percent of estimates that are likely to be erroneously classed

** Classification is considered to be reliable if total reliability is less 10% and all individual classes are less than 20%

Suggested notation for maps that pass this reliability test:

There is less than a 10% that chance any given geography in this map is misclassified due to sampling error.

For each individual category, there is less than a 20% chance that any given geography is misclassified due to sampling error;

Source: New York City Department of City Planning, Population Division

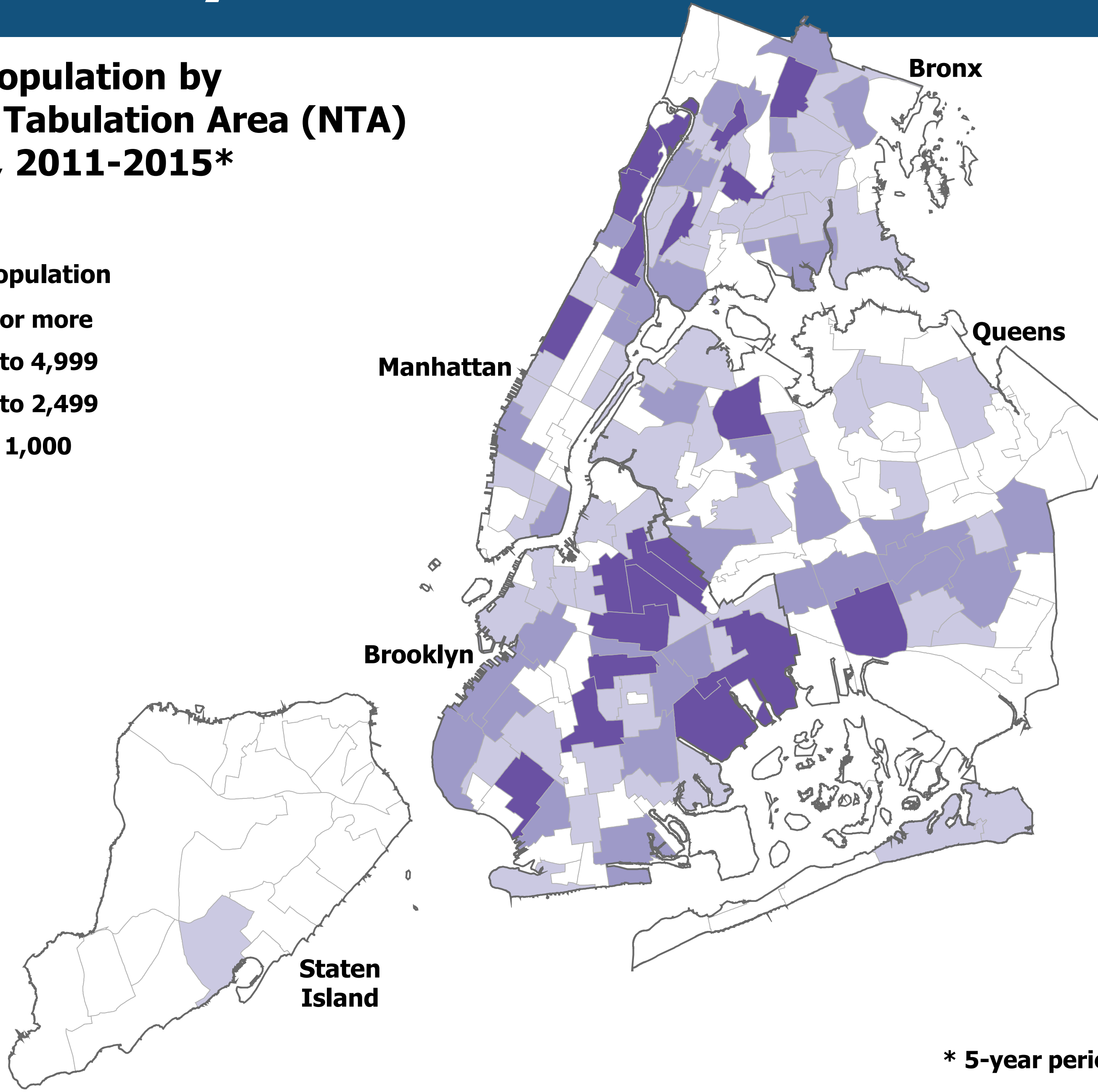
NYC PLANNING

Map Reliability Calculator Demo

Unemployed Population by Neighborhood Tabulation Area (NTA) New York City, 2011-2015*

Unemployed Population

- 5,000 or more
- 2,500 to 4,999
- 1,000 to 2,499
- Under 1,000



* 5-year period estimate

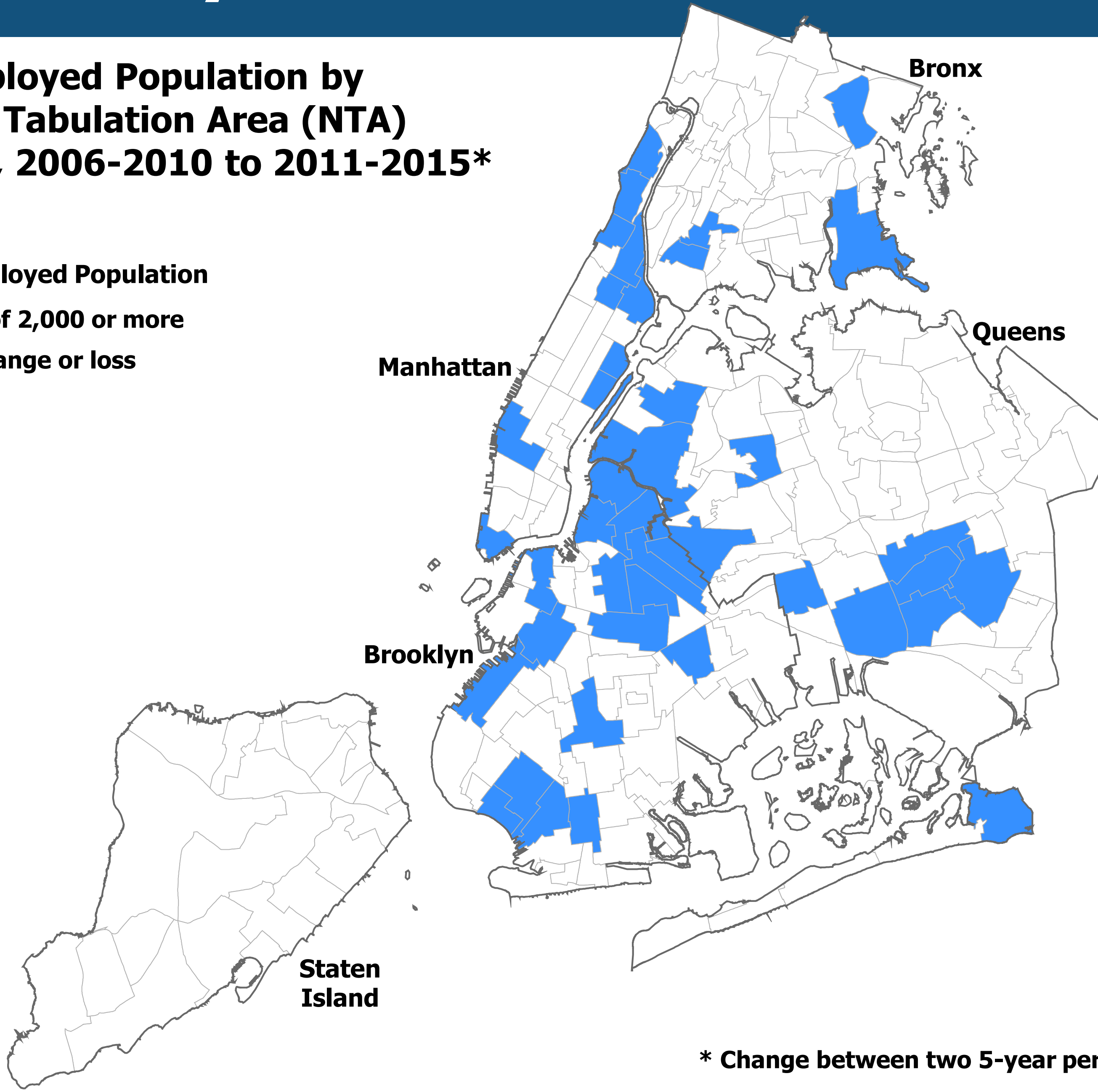
NYC PLANNING

Map Reliability Calculator Demo

Change in Employed Population by Neighborhood Tabulation Area (NTA) New York City, 2006-2010 to 2011-2015*

Change in Employed Population

- Gain of 2,000 or more
- No change or loss



* Change between two 5-year period estimates

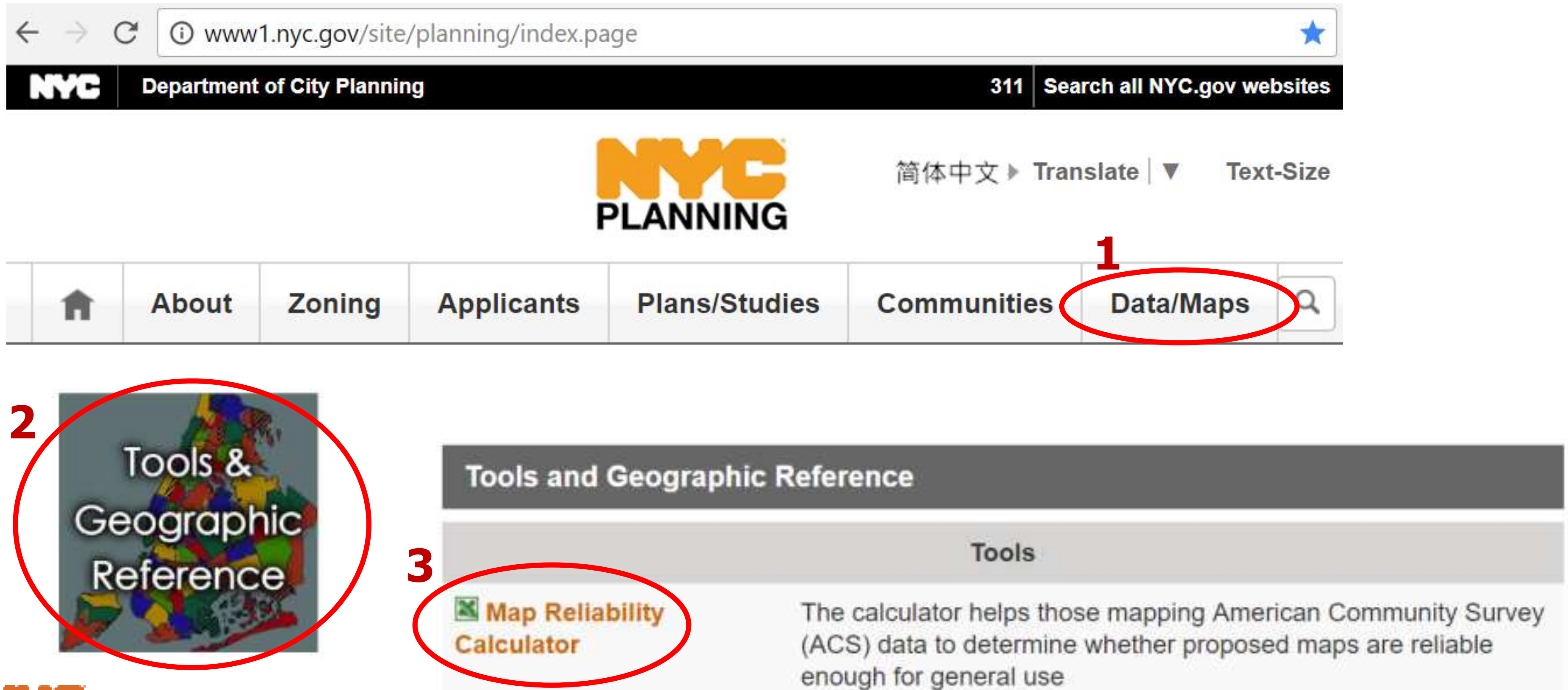
NYC PLANNING

Map Reliability Calculator

Link to Map Reliability Calculator:

http://www1.nyc.gov/assets/planning/download/office/data-maps/nyc-population/map_reliability_calculator.xlsx?r=1

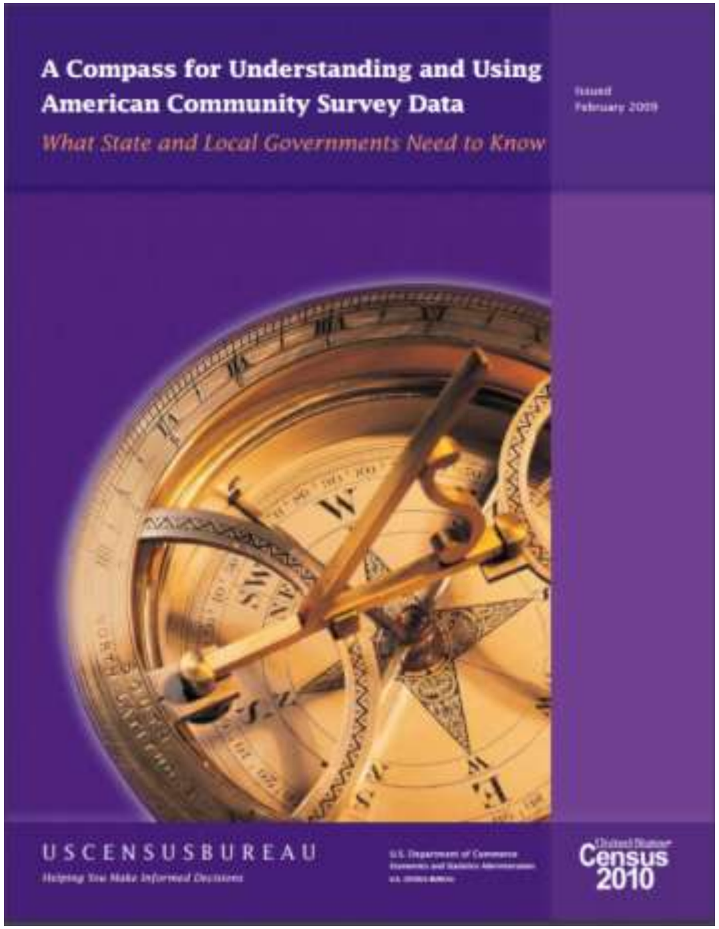
Location on NYC Department of City Planning website:



Map Reliability Calculator

Update to ACS Compass series –
Includes case study on uncertainty in mapping ACS data

Old Version



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