Diving into the U.S. Census Bureau Planning Database and ROAM Application: Tools for Survey and Census Planning

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Disclaimer: This presentation is intended to inform people about research and to encourage discussion. The views expressed are those of the authors and not necessarily those of the U.S. Census Bureau.

Overview

- Goal of the 2020 Census
- The 2020 Census and the American Community Survey
- The Planning Database: Background, Introduction, and Examples
- What is the Low Response Score?
- Live Demo of the Response Outreach Area Mapper (ROAM)
- What can you expect from the 2019 Planning Database and next version of ROAM?

The Goal of the 2020 Census

Count everyone once,
only once,
and in the right place.

The 2020 Census and the American Community Survey (ACS)

- The ACS is the premier source for detailed population and housing information about our nation
- Starting in 2005, the ACS became a critical element of the Census Bureau's reengineered Decennial Census program:
  - Gathers annual, instead of decennial, data on a sample of the U.S. population
  - The sample is large enough that if we aggregate it over five years, we can produce estimates at very small levels of geography
- The 2010 Census was a short form that counted all residents in the U.S.
  - Asked name, sex, age, date of birth, race, ethnicity, relationship, and tenure (rent vs. own)
- The 2020 Census will also be a short Decennial Census form

Levels of Geography Available

- The ACS sample is aggregated over 5 years to produce estimates at census tract and block group levels
- A census tract is a subset of a county
  - More than 74,000 in the U.S.
  - Generally have a population size between 1,200 and 8,000; optimum size is about 4,000 people
- A block group is a subset of a census tract
  - More than 220,000 in the U.S.
  - Generally have a population size between 600 and 3,000

Where Can I Find ACS Estimates?

- American FactFinder - factfinder.census.gov (before July 1, 2019)
- New *Explore Census Data* Tool - data.census.gov (after July 1, 2019)

- Planning Database:

census.gov/topics/research/guidance/planning-databases.html

Why do we have a Planning Database (PDB)?

- To plan for field resources and to create tailored communication and partnership campaigns
- 1990: Hard to Count Score (HTC) and an early internal PDB
  - Households in each census tract were assigned a score
  - The higher the score, the harder to count
  - Field Division used the score and internal PDB to make hiring decisions and resource allocations
- 2000 and 2010: Continued hiring and resource decisions made with it. Additional staff across the country used the score to identify areas that needed extra outreach, engagement, and education
- 2020 Census: HTC upgraded to Low Response Score, and it is now free and publicly available to internal and external stakeholders

What is in the Planning Database?

- "Greatest hits" of ACS 5-year estimates and 2010 Census variables
- Types of variables
  - Population: gender, age, education, poverty
  - Household: language, relationship, income
  - Housing unit: tenure, number of units
  - Census operational: mailout/mailback, bilingual
- We calculate the percentage variables for each estimate
- Available at census tract and block group level
- Available as a comma-delimited file (CSV) or through the Census API

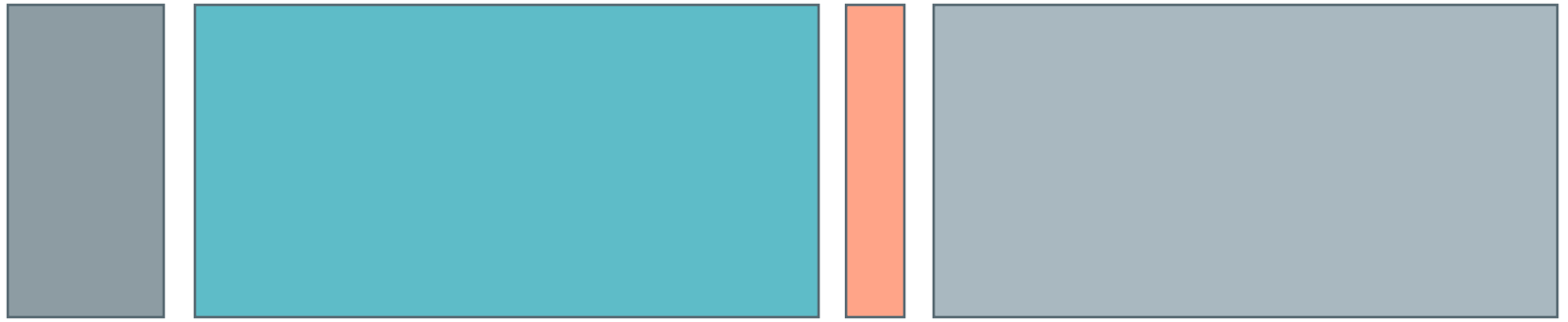
Broad Scope of Uses

- Useful for:
  - Identifying areas with likely low survey response rates
  - Stratifying small areas
  - Creating thematic maps
  - Enhancing reports with population metrics

Why Use the Planning Database?

- Easier to download than full ACS Summary Files
- Contains most popular ACS 5-year census tract & block group aggregated estimates
- Estimates are matched to 2010 Census estimates for each geography
- Contains this decade's hard to count score—the Low Response Score (LRS)
- Updated annually with the latest ACS data
- The ROAM application makes the PDB even more accessible

The Structure



Geography Identifiers

- GIDBG (12 chars) = State (2 chars) + County (3 chars) + Tract (6 chars) + Block Group (1 char)
- GIDTR (11 chars) = State (2 chars) + County (3 chars) + Tract (6 chars)

Demographic, Socioeconomic, and Housing data

- Order of variables is consistent. Census data first, followed by ACS estimates and ACS MOEs
- For example, Males_CEN_2010, Males_ACS_13_17, Males_ACSMOE_13_17

Census Operational data including Mail Return Rate and Low Response Score

Percentages and MOE Percentages. Listed in the same order as their respective estimate

- Variables identified with 'pct_' added to their variable name
- For example, pct_Males_CEN_2010, pct_Males_ACS_13_17, pct_Males_ACSMOE_13_17

Ways to Use
The Planning Database

Area Demographics:
District of Columbia

- 672,391 people live in 179 tracts in the District of Columbia

	DC	United States
Male to female ratio	0.90	0.97
Population under 5 years old	6.5%	6.2%
Population that identifies as Hispanic	10.7%	17.6%
Population that was not born in the US	14.0%	13.4%

Source: 2013-2017 ACS 5-year Estimates

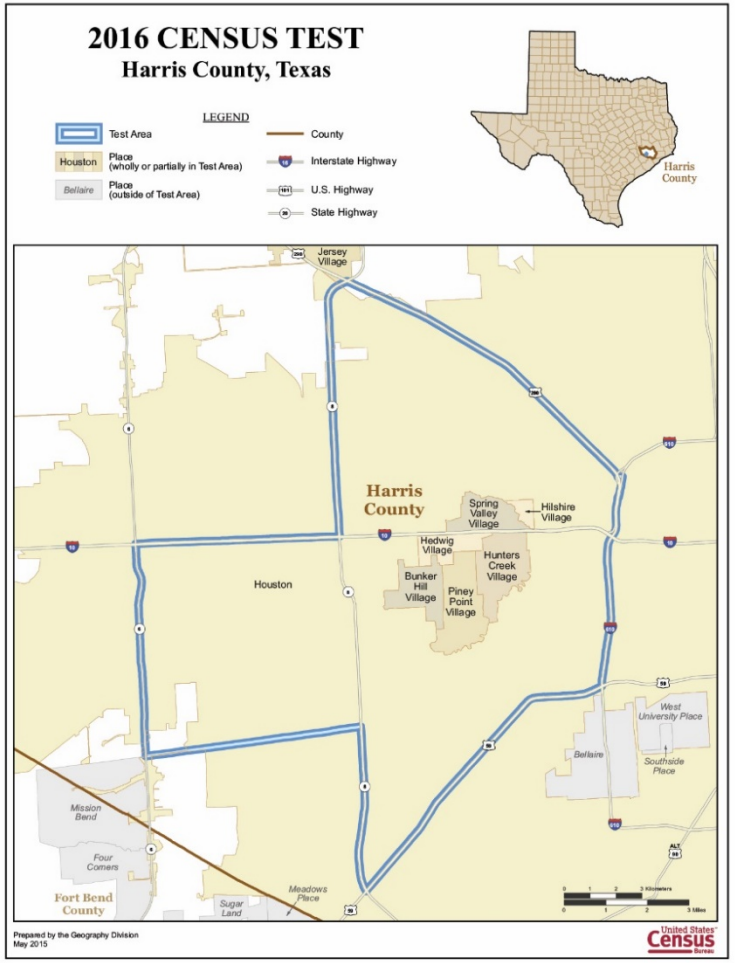
2016 Census Test:
Harris County, Texas Demographics

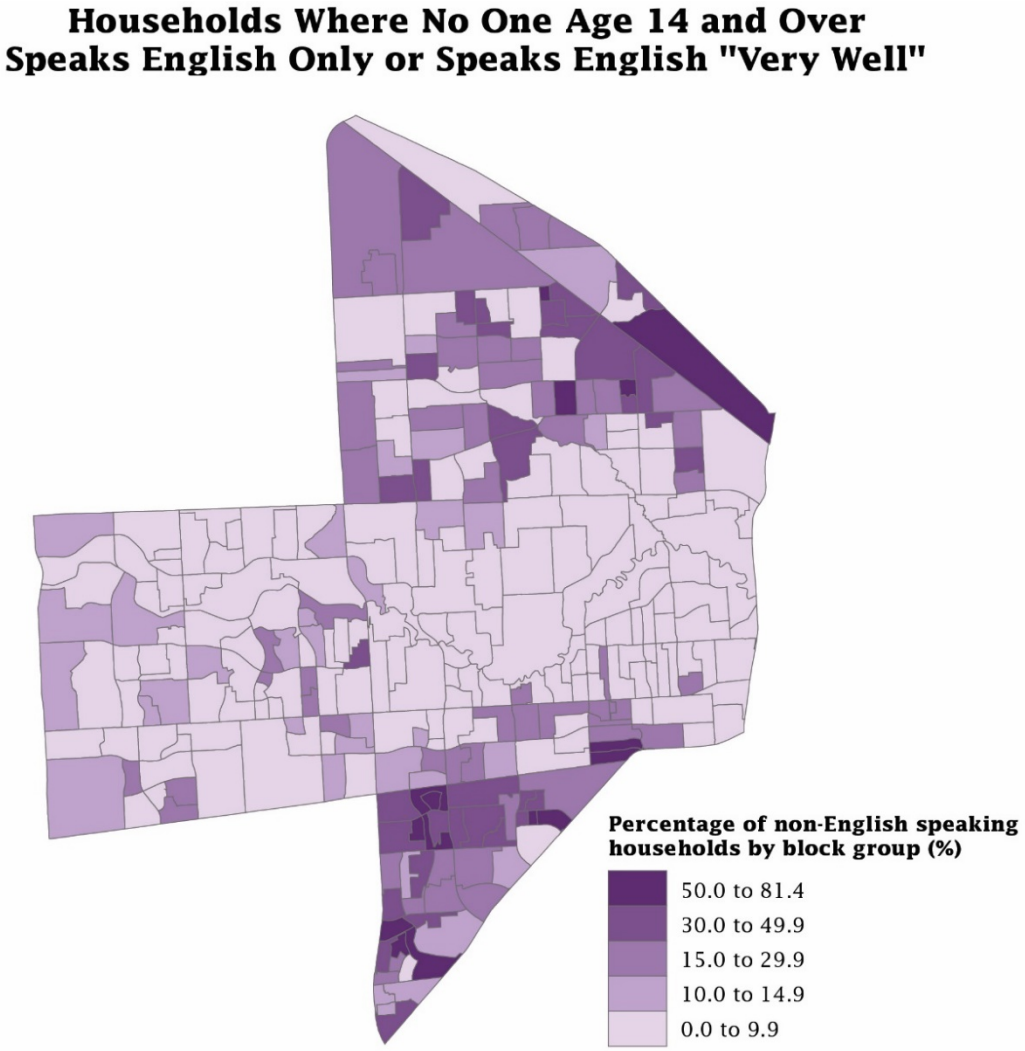
- 484,358 people live in 292 block groups in the test site

	Harris County, TX	United States
Households where no one over 14 speaks English "very well"	14.8%	4.6%
Population 18-24 years old	9.4%	10.0%
Renter Occupied Units	60.9%	35.1%
Population 25 and over, with less than a HS diploma	19.1%	13.9%

Source: 2009-2013 ACS 5-Year Estimates

2016 Census Test:
Harris County, Texas





Source: U.S. Census Bureau 2015 Planning Database,
2009-2013 5-year American Community Survey (ACS) estimates

United States™ Census Bureau

Non-English Speaking Households

- What if you want to identify areas that may need support for a language other than English?
- Find block groups in the area that have a high percentage of housing units where no one over the age of 14 speaks English “very well”
- What language is spoken in these block groups?

2016 Census Test:
Non-English Speaking Block Groups in Harris County, TX

Rank	BG	No one speaks English "very well"	Spanish	Asian/Pacific Islander	Other
1	4327012	81.4% (14.3)	81.4% (14.0)	0% (2.1)	0% (2.1)
2	4330012	77.2% (13.4)	73.4% (13.5)	3.8% (4.1)	0% (2.3)
3	4327011	72.5% (11.1)	72.5% (10.9)	0% (1.6)	0% (1.6)
4	4335012	69.3% (10.9)	66.1% (10.7)	0% (1.7)	3.2% (4.8)
5	5214001	69.3% (21.1)	69.3% (20.6)	0% (3.7)	0% (3.7)

Source: 2009-2013 ACS 5-year Estimates

What is the Low Response Score (LRS)?

- LRS = predicted level of Census self non-response at the census tract or block group level
- Based on Ordinary Least Squares (OLS) regression of two dozen metrics from the PDB upon the Census 2010 mail return rate
- Values range from 0-100 percent
- For example, if LRS=25, we are estimating that 25 percent of households in that census tract will not self-respond to the 2020 Census
- LRS is updated yearly using the latest ACS 5-year estimates

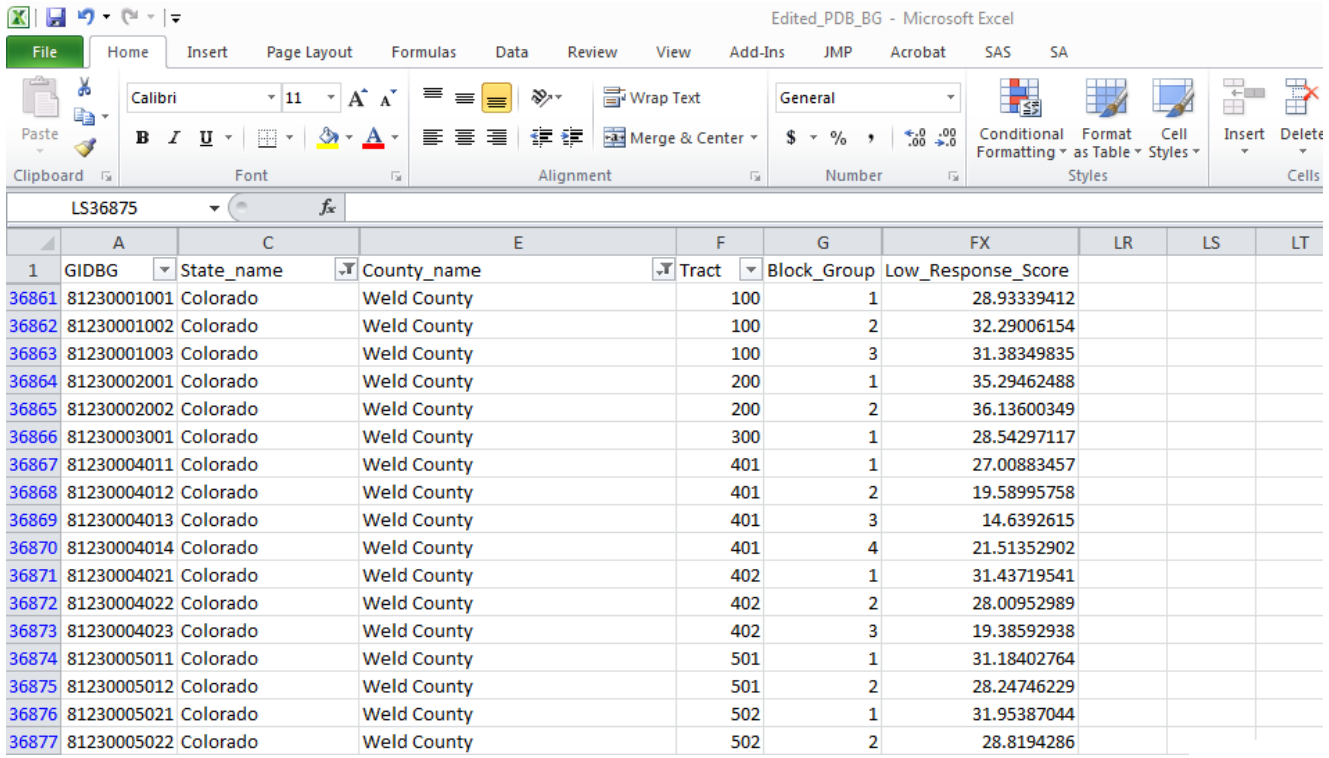
LRS OLS Linear Model (Block Group edition)

	Coef	Sig		Coef	Sig
(Intercept)	10.29	***	Renter occupied units	1.08	***
Ages 18-24	0.64	***	Female head, no husband	0.58	***
Non-Hispanic White	-0.77	***	Ages 65+	-1.21	***
Related child <6	0.46	***	Males	0.09	***
Married family households	-0.12	***	Ages 25-44	-0.06	
Vacant units	1.08	***	College graduates	-0.32	***
Median household income	0.24	***	Ages 45-64	-0.08	*
Persons per household	3.44	***	Moved in 2005-2009	0.09	***
Hispanic Any Race	0.41	***	Single unit structures	-0.52	***
Population Density	-0.40	***	Below poverty	0.11	***
Different HU 1 year ago	-0.12	***	Ages 5-17	0.17	***
Non- Hispanic Black	-0.04	**	Single person households	-0.24	***
Not high school grad	-0.06	***	Median house value	0.71	***

Sig: *** $p < .001$; ** $.001 \leq p < .01$; * $.01 \leq p < .05$ R-squared: 56.10%, n = 217,417

Main Effects only, no interaction terms

Identifying LRS Groups

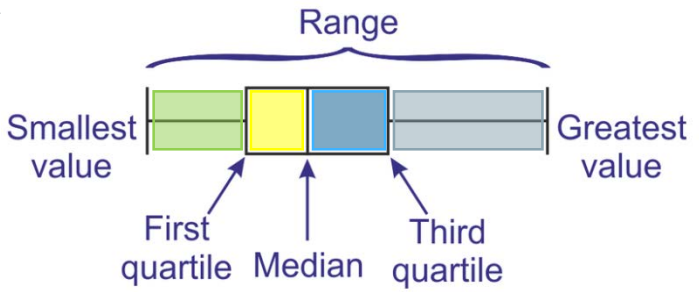


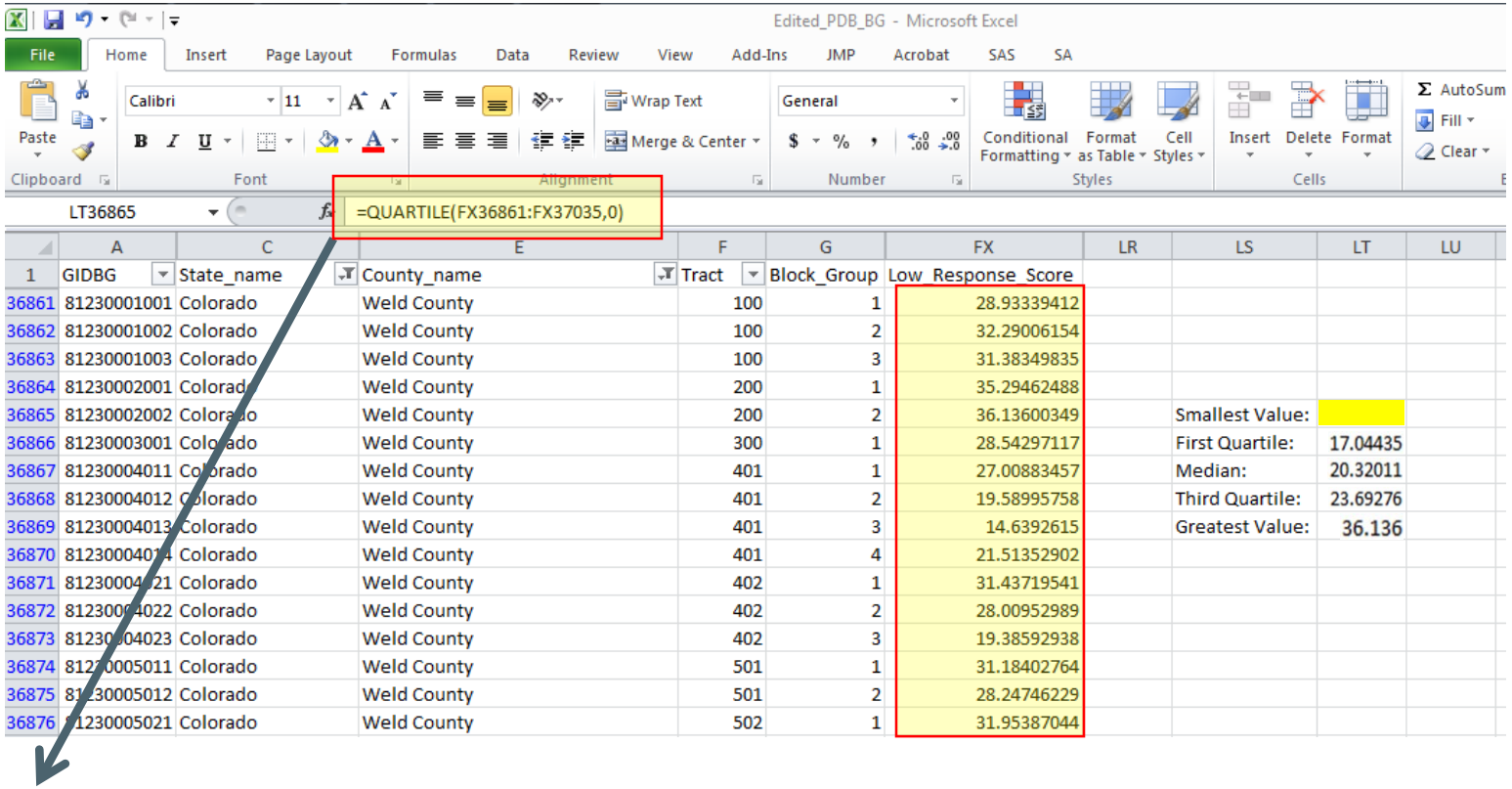
	A	C	E	F	G	FX	LR	LS	LT
1	GIDBG	State_name	County_name	Tract	Block_Group	Low_Response_Score			
36861	81230001001	Colorado	Weld County	100	1	28.93339412			
36862	81230001002	Colorado	Weld County	100	2	32.29006154			
36863	81230001003	Colorado	Weld County	100	3	31.38349835			
36864	81230002001	Colorado	Weld County	200	1	35.29462488			
36865	81230002002	Colorado	Weld County	200	2	36.13600349			
36866	81230003001	Colorado	Weld County	300	1	28.54297117			
36867	81230004011	Colorado	Weld County	401	1	27.00883457			
36868	81230004012	Colorado	Weld County	401	2	19.58995758			
36869	81230004013	Colorado	Weld County	401	3	14.6392615			
36870	81230004014	Colorado	Weld County	401	4	21.51352902			
36871	81230004021	Colorado	Weld County	402	1	31.43719541			
36872	81230004022	Colorado	Weld County	402	2	28.00952989			
36873	81230004023	Colorado	Weld County	402	3	19.38592938			
36874	81230005011	Colorado	Weld County	501	1	31.18402764			
36875	81230005012	Colorado	Weld County	501	2	28.24746229			
36876	81230005021	Colorado	Weld County	502	1	31.95387044			
36877	81230005022	Colorado	Weld County	502	2	28.8194286			

Here I have hidden all columns except for some geo locating variables and the Low Response Score.

I have also applied a filter to only show data from Weld County, CO.

Use Excel to help us locate and identify those block groups with a Low Response Scores that fall within the quartile groups.





	A	C	E	F	G	FX	LR	LS	LT	LU
1	GIDBG	State_name	County_name	Tract	Block_Group	Low_Response_Score				
36861	81230001001	Colorado	Weld County	100	1	28.93339412				
36862	81230001002	Colorado	Weld County	100	2	32.29006154				
36863	81230001003	Colorado	Weld County	100	3	31.38349835				
36864	81230002001	Colorado	Weld County	200	1	35.29462488				
36865	81230002002	Colorado	Weld County	200	2	36.13600349		Smallest Value:		
36866	81230003001	Colorado	Weld County	300	1	28.54297117		First Quartile:	17.04435	
36867	81230004011	Colorado	Weld County	401	1	27.00883457		Median:	20.32011	
36868	81230004012	Colorado	Weld County	401	2	19.58995758		Third Quartile:	23.69276	
36869	81230004013	Colorado	Weld County	401	3	14.6392615		Greatest Value:	36.136	
36870	81230004014	Colorado	Weld County	401	4	21.51352902				
36871	81230004021	Colorado	Weld County	402	1	31.43719541				
36872	81230004022	Colorado	Weld County	402	2	28.00952989				
36873	81230004023	Colorado	Weld County	402	3	19.38592938				
36874	81230005011	Colorado	Weld County	501	1	31.18402764				
36875	81230005012	Colorado	Weld County	501	2	28.24746229				
36876	81230005021	Colorado	Weld County	502	1	31.95387044				

=QUARTILE(Starting_Cell:Ending_Cell,0) ➔ Smallest Value

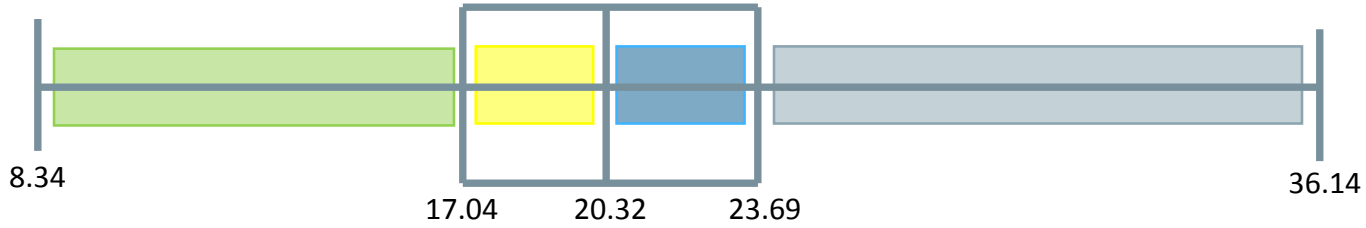
=QUARTILE(Starting_Cell:Ending_Cell,1) ➔ First Quartile

=QUARTILE(Starting_Cell:Ending_Cell,2) ➔ Median

=QUARTILE(Starting_Cell:Ending_Cell,3) ➔ Third Quartile

=QUARTILE(Starting_Cell:Ending_Cell,4) ➔ Greatest Value

Tip: When selecting your starting and ending cells, after selecting your starting cell hold shift and scroll to your ending cell and select. This will highlight all cells in between.



Edited_PDB_BG - Microsoft Excel

File | Home | Insert | Page Layout | Formulas | Data | Review | View | Add-Ins | JMP | Acrobat | SAS | SA

Calibri | 11 | Wrap Text | General | Conditional Formatting | Format as Table | Cell Styles | Insert | Delete | Format

Clipboard | Font | Alignment | Number | Styles | Cells

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	A	C	E	F	G	FX	LR	LS	LT	LU
1	GIDBG	State_name	County_name	Tract	Block_Group	Low_Response_Score				
36861	81230001001	Colorado	Weld County	100	1	28.93339412				
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36863	81230001003	Colorado	Weld County	100	3	31.38349835				
36864	81230002001	Colorado	Weld County	200	1	35.29462488				
36865	81230002002	Colorado	Weld County	200	2	36.13600349		**Smallest Value:**	8.339976	
36866	81230003001	Colorado	Weld County	300	1	28.54297117		**First Quartile:**	17.04435	
36867	81230004011	Colorado	Weld County	401	1	27.00883457		**Median:**	20.32011	
36868	81230004012	Colorado	Weld County	401	2	19.58995758		**Third Quartile:**	23.69276	
36869	81230004013	Colorado	Weld County	401	3	14.6392615		**Greatest Value:**	36.136	
36870	81230004014	Colorado	Weld County	401	4	21.51352902				
36871	81230004021	Colorado	Weld County	402	1	31.43719541				
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36873	81230004023	Colorado	Weld County	402	3	19.38592938				
36874	81230005011	Colorado	Weld County	501	1	31.18402764				
36875	81230005012	Colorado	Weld County	501	2	28.24746229				
36876	81230005021	Colorado	Weld County	502	1	31.95387044				
36877	81230005022	Colorado	Weld County	502	2	28.8194286				
36878	81230006001	Colorado	Weld County	600	1	33.52910431				
36879	81230007011	Colorado	Weld County	701	1	30.9415182				
36880	81230007012	Colorado	Weld County	701	2	28.78310569				
36881	81230007031	Colorado	Weld County	703	1	26.13298805				
36882	81230007032	Colorado	Weld County	703	2	32.75918394				

Limitations of the Low Response Score

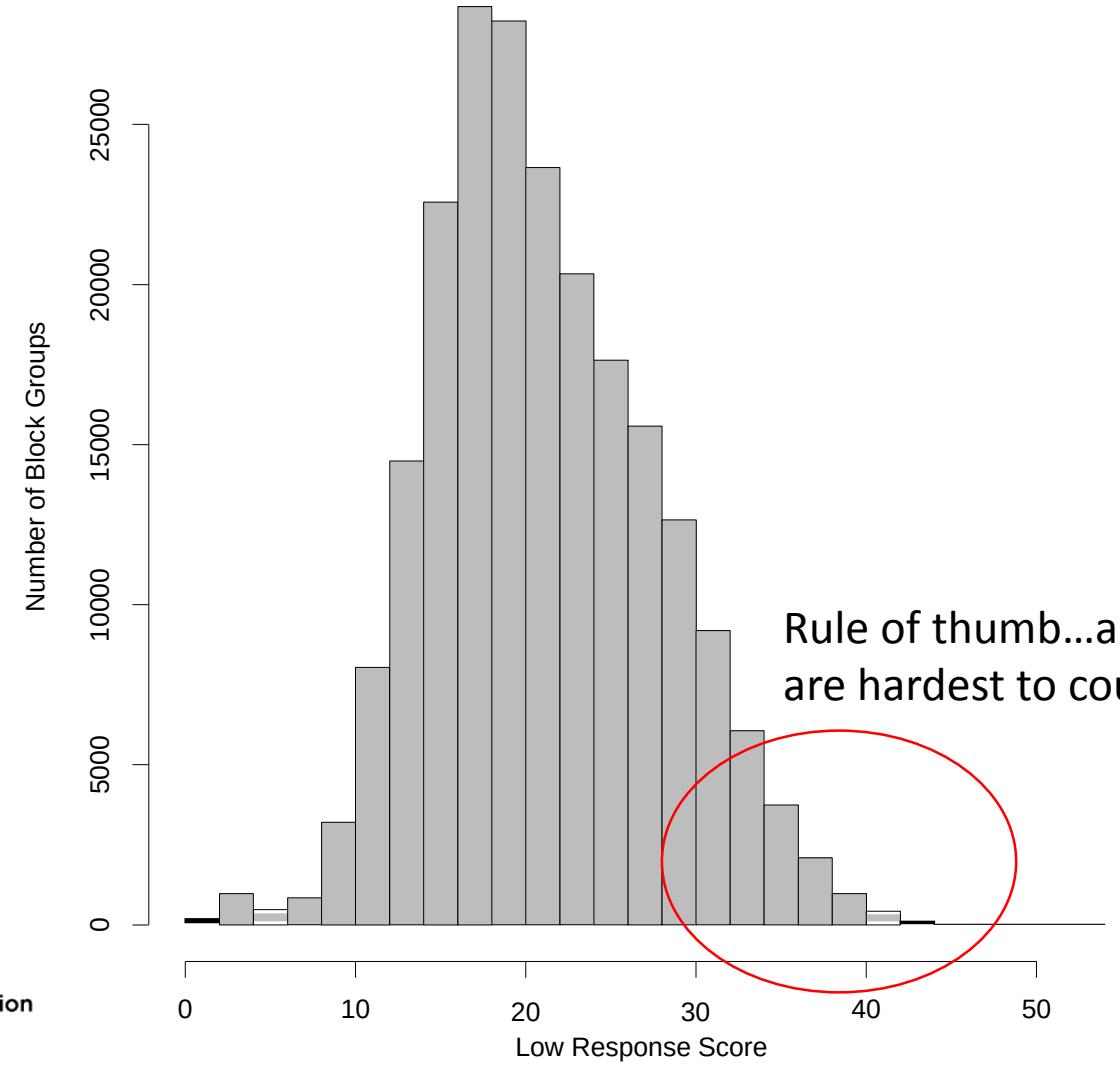
- Only considers mail self-response mode – 2020 Census will offer internet, phone, AND mail
- Some census tracts have small number of housing units in mailback universe (e.g., Indian reservations, very rural areas)
- LRS cannot be generated for Puerto Rico or select census tracts with post-2010 boundary changes
- If LRS is extremely high, take a closer look
  - There are not currently margins of error (MOEs) for LRS

Full Discussion of LRS Methodology:

Erdman, C. and N. Bates (2017). The Low Response Score (LRS): "A Metric to Locate, Predict, and Manage Hard-to-Survey Populations", *Public Opinion Quarterly*, Volume 81, Issue 1, 1 March 2017, pp. 144-156.

https://www.census.gov/research/data/planning_database/2018/docs/erdman_bates_2017.pdf

National Distribution of the LRS



Rule of thumb…areas with LRS = >30 are hardest to count?

Source: Erdman and Bates, 2017

Local Application of the LRS

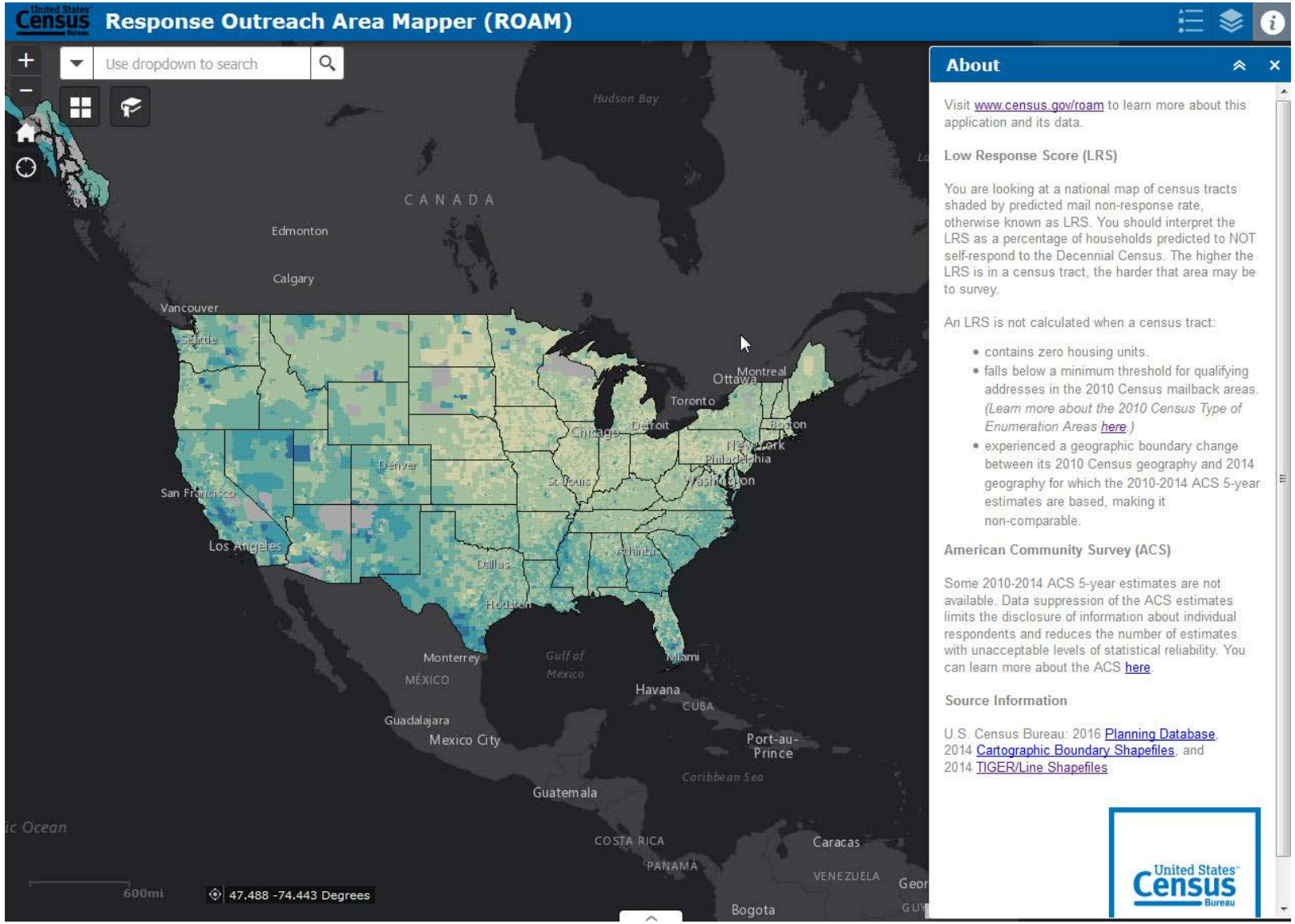
- What constitutes a “high” LRS depends
- Are you concerned with a particular State, Census Region, Place, or County?
- If yes, extract census tracts within that geographic area and produce custom LRS distribution
- What score is one or two standard deviations above the mean?
- Identify census tracts matching your cutoff

What is the Response Outreach Area Mapper (ROAM)?

- A web mapping application that provides a map and data table interface for users to identify and learn about hard-to-count census tracts
- Accessible through a web browser (no download required)
- Hosted by the Census Bureau

ROAM Demo

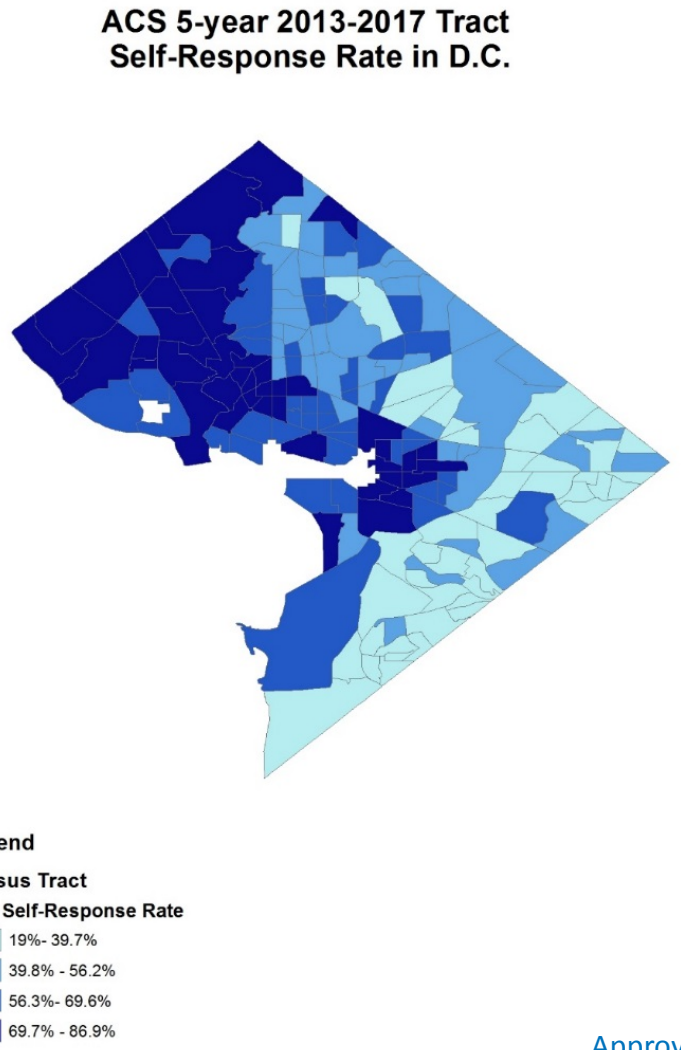
www.census.gov/roam



New in 2019 PDB and ROAM

- ACS 5-year Internet and Technology variables are now available at the census tract level
  - HHDs with broadband access
  - HHDs with smartphone only access, etc.
- We are adding several variables about children to the PDB at the census tract level
  - 3-4 year old school enrollment
  - HHDs with child under 5 present, etc.
- ACS median age available in the PDB at census tract and block-group levels
- 2020 Census Communications Campaign audience segmentation variable (census tract-level)

2013-2017 ACS 5-Year Census Tract Self-Response Rate



Approval Number: CBDRB-FY19-244

Tract Segmentation Goals and Applications

The goals of the segmentation are to:

- Provide an overarching framework for understanding the country
- Use geography to bring together behavioral, demographic, attitudinal, and media usage data for campaign planning
- Simplify complex data by identifying key shared characteristics

Segmentation will inform:

- Overall program strategy
- Planning for advertising, communications, and partnership activities
- Creative development
- Campaign optimization and tracking during enumeration

Tract Segmentation Goals and Applications

Responsive Suburbia

71% Predicted Self-Response

24% Of the U.S. Population

- High predicted rate of response, with a high percentage of that response coming online.
- Found in suburban neighborhoods of single-family homes.
- High % college educated, high % married, and high median household incomes.

Main Street Middle

67% Predicted Self-Response

21% Of the U.S. Population

- High predicted rate of response, with an above-average percentage of that response coming online.
- Found in small towns and less densely populated areas surrounding urban centers.
- Low diversity and a higher % 65 or older than the national average.

Country Roads

60% Predicted Self-Response

16% Of the U.S. Population

- Slightly below-average predicted rate of response, with a below-average percentage of that response coming online.
- Found in rural areas predominantly in the eastern United States, surrounding small towns and outside the suburbs of major cities.
- High % owner-occupied housing, low % college educated, and below-average median household incomes.

Downtown Dynamic

59% Predicted Self-Response

9% Of the U.S. Population

- Slightly below-average predicted rate of response, with a high percentage of that response coming online.
- Found in densely populated metro centers.
- High % college educated, above-average % foreign-born, high % 25-44 compared to the nation as a whole, and high median household incomes.

Student and Military Communities

56% Predicted Self-Response

2% Of the U.S. Population

- Below-average predicted rate of response, with a high percentage of that response coming online.
- Found in communities around college campuses or military bases.
- A majority 18-24, high % college educated, and high % renter-occupied housing.

Sparse Spaces

49% Predicted Self-Response

5% Of the U.S. Population

- Below-average predicted rate of response, with below-average internet response.
- Found in rural areas predominantly in the western United States, Appalachia, northern Maine, and Michigan's Upper Peninsula.
- High % owner-occupied housing and below-average levels of internet access.

Multicultural Mosaic

45% Predicted Self-Response

14% Of the U.S. Population

- Low predicted rate of response, with a below-average percentage of that response coming online.
- Found in California's Central Valley and parts of New Mexico, Texas, Florida, as well as concentrations in urban areas.
- High % foreign-born, low % college educated, and majority Hispanic.

Rural Delta and Urban Enclaves

43% Predicted Self-Response

7% Of the U.S. Population

- Low predicted rate of response, with the lowest percentage of that response coming online.
- Found in rural parts of the southeastern United States, as well as concentrations in urban areas.
- Low % college educated, low median household incomes, below-average levels of internet access, and majority non-Hispanic African American.

Note: U.S. population percentages do not add up to 100% due to tracts with no ACS mailout and, therefore, no tract segment assigned.

Multicultural Mosaic: Demographics

Where are they?

Tracts in this segment can be found in California's Central Valley and parts of New Mexico, Texas, and Florida, with additional concentrations in urban areas.

Who are they?

The tracts in this segment have relatively high concentrations of foreign-born residents, as well as low percentages of college-educated residents. A majority of the people in this segment are Hispanic.

How will they respond?

On average, this segment is predicted to respond at a low rate, with a below-average percentage of that response coming online.

14% of U.S. Population

Multicultural Mosaic
National Average

Number of Tracts

9,158

National: 74,001

Predicted Self-Response ‡ *

45%

National: 61%

Internet Access ‡ &

71%

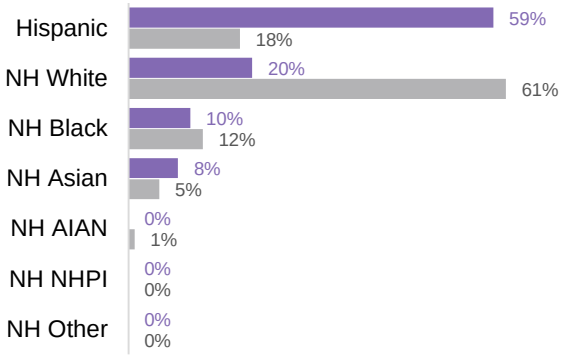
National: 77%

Share of Self-Response Online ‡ *

55%

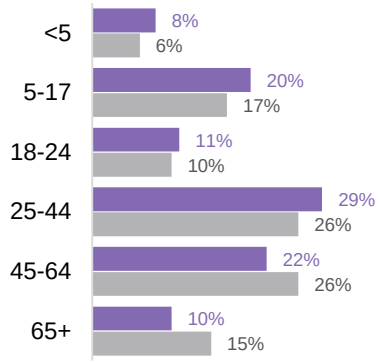
National: 66%

Race and Hispanic Origin†

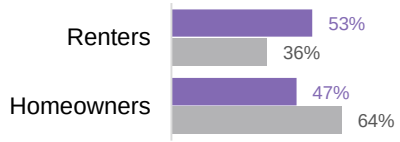


NH: Non-Hispanic.
AIAN: American Indian and Alaska Native
NHPI: Native Hawaiian and Pacific Islander

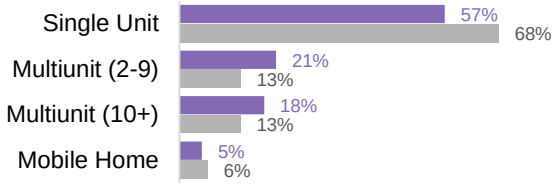
Age †



Owner vs. Renter‡



Types of Housing ‡



† - Population Average; ‡ - Household Average

Source: 2016 5-year ACS estimates unless otherwise marked by * (2020 ICC Modeled Scores, DRB# CBDRB-FY18-311) or & (ACS data from 2013-2017, DRB# CBDRB-FY18-311).

Multicultural Mosaic: Demographics and Mindsets

Where are they?

Tracts in this segment can be found in California's Central Valley and parts of New Mexico, Texas, and Florida, with additional concentrations in urban areas.

Who are they?

The tracts in this segment have relatively high concentrations of foreign-born residents, as well as low percentages of college-educated residents. A majority of the people in this segment are Hispanic.

How will they respond?

On average, this segment is predicted to respond at a low rate, with a below-average percentage of that response coming online.

14% of U.S. Population

Multicultural Mosaic **National Average**

Foreign-Born†
34%
National: 13%

Married Couple HH‡
45%
National: 48%

Non-English-Speaking ‡
18%
National: 5%

HH With Children ‡
43%
National: 32%

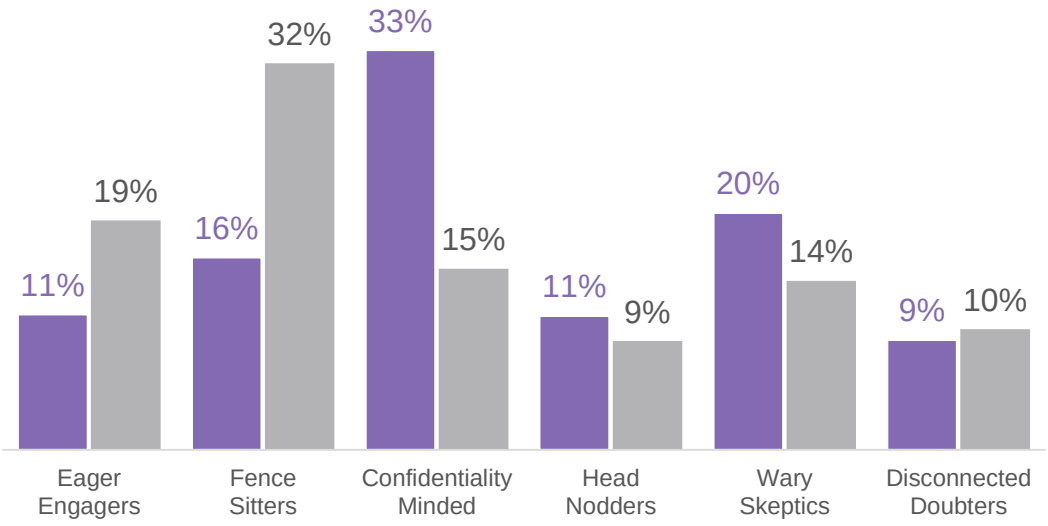
College-Educated †
15%
National: 30%

Family HH With Related Children Under 6 ‡
28%
National: 21%

Median HH Income ‡
$45,256
National: $60,835

Moved in the Last Year ‡
13%
National: 37%

Mindset Composition†^



† - Population Average; ‡ - Household Average

Source: 2016 5-year ACS estimates unless otherwise marked by ^ (2020 CBAMS Public Use Microdata Sample, DRB# CBDRB-FY18-422).

Multicultural Mosaic: Media Usage

Where are they?

Tracts in this segment can be found in California's Central Valley and parts of New Mexico, Texas, and Florida, with additional concentrations in urban areas.

Who are they?

The tracts in this segment have relatively high concentrations of foreign-born residents, as well as low percentages of college-educated residents. A majority of the people in this segment are Hispanic.

How will they respond?

On average, this segment is predicted to respond at a low rate, with a below-average percentage of that response coming online.

14% of U.S. Population

Compared to the national average, the average person in this segment…

Reads a **similar** number of **newspapers** in a 28-day period.

Reads a **similar** number of **magazine** issues in a month.

Drives 13% **fewer** miles in a car or truck in a 7-day period.

Listens to a **similar** number of half-hours of **radio** in a week.

Views **similar** number of half-hours of **TV** in a week.

Uses a **similar** number of hours of **internet** in a week.

Source: MRI's Survey of the American Consumer® Doublebase 2018

Questions?

census.PDB.questions@census.gov