Using Business Analyst to Benchmark Your Way to Success

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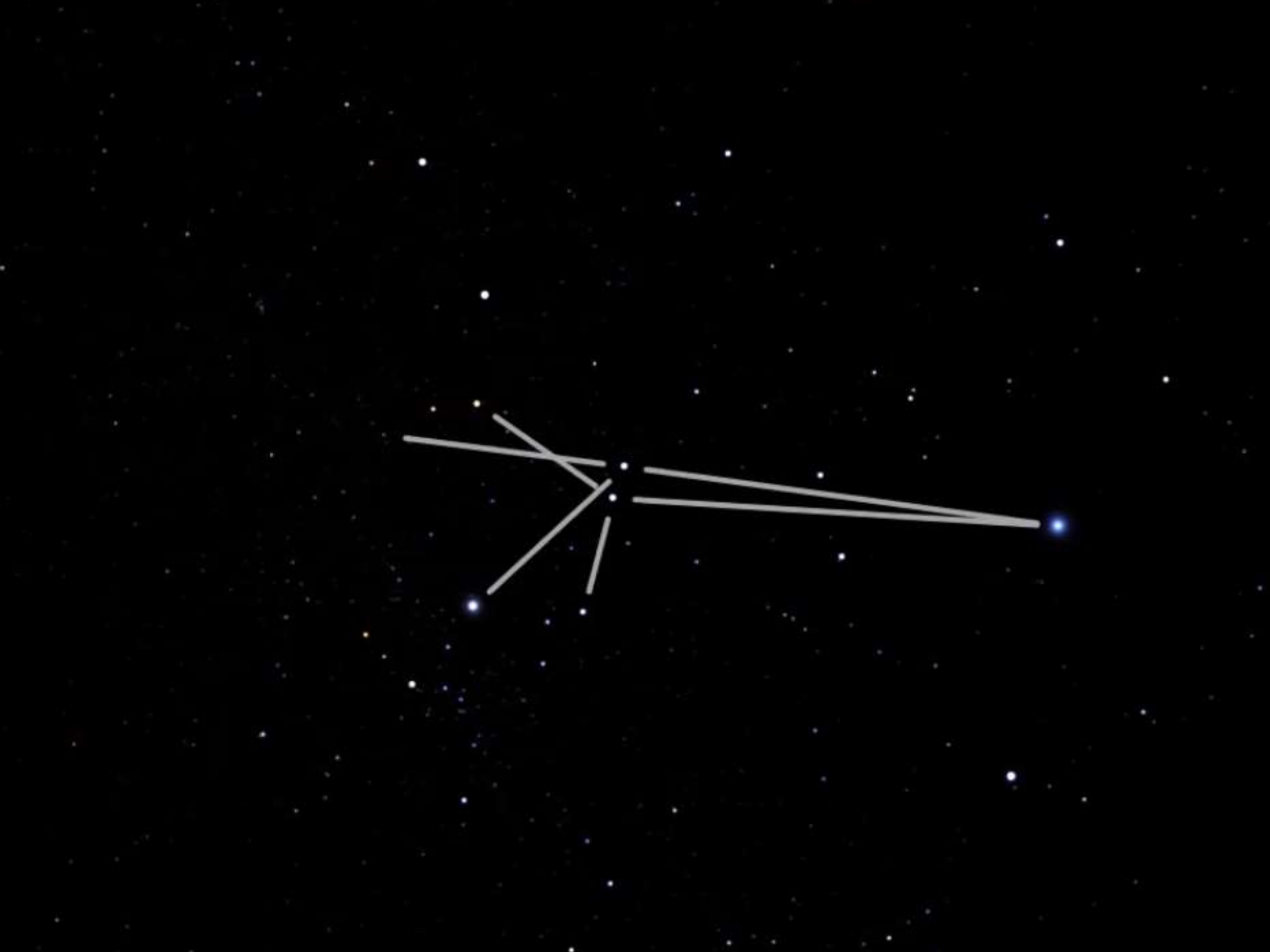
Abstract

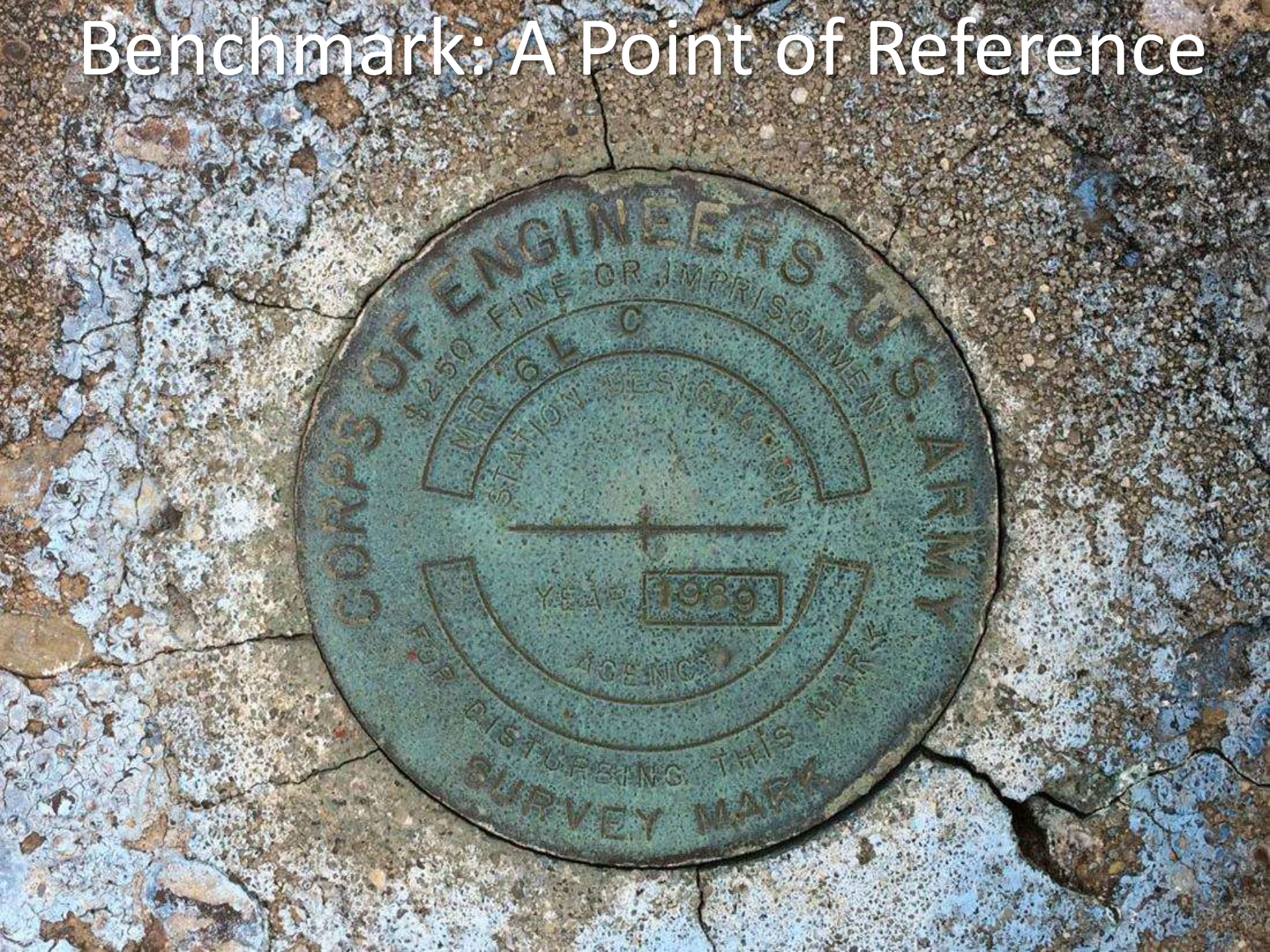
Benchmarking is an essential and sometimes overlooked skill. It can help us to provide context, set meaningful targets, gain insight into trends, and evaluate performance relative to a business strategy or value proposition. This presentation will describe 8 techniques to improve location analytics for retail applications. The techniques are analogous to 8 scientific tools, which are: 1) The Mass Spectrometer, 2) The Telescope, 3) The Microscope, 4) The Scale, 5) The Black Light, 6) The Funnel, 7) The Petri Dish and 8) The Mirror. Each tool will be translated into an analytics technique using an example from retail projects that used Esri Business Analyst and the Spatial Statistics toolbox. After the data has been created through the analytics process, it can be transformed into a dashboard that provides business value and improves operational decisions.

This presentation expands upon my UC 2015 presentation (4 Lessons in Creating a New Trade Area Methodology for Retail Stores) and it is inspired by the 8 techniques from the "Seven Data Story Types" described by Ben Jones who based his data visualization techniques on Christopher Booker's *The Seven Basic Plots: Why We Tell Stories*. The benchmarking techniques are not necessarily new ideas, but innovation and insight are often the result of a *process* and not an epiphany. The goal of this presentation is to encourage analysts to develop their own analytical process to improve the business decisions for their organization.

Beazley, David. "The Forensic Photographer." Online documentary video. http://www.beazknees.com/ Beazknees, March 2015. Web. 15 April 2015. All images used with permission.



Benchmark: A Point of Reference

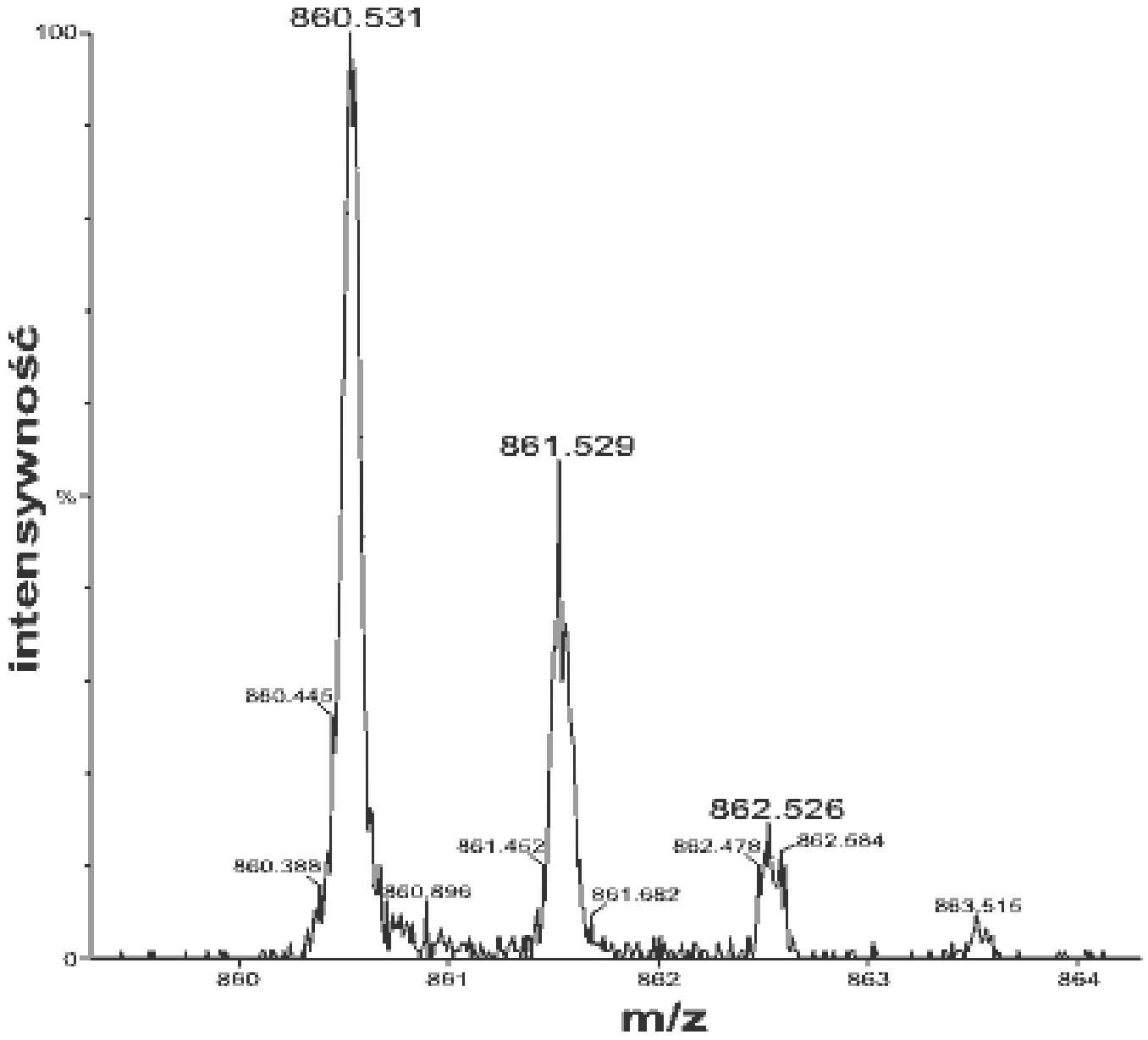


8 Scientific Tools – 8 Techniques for Benchmarking

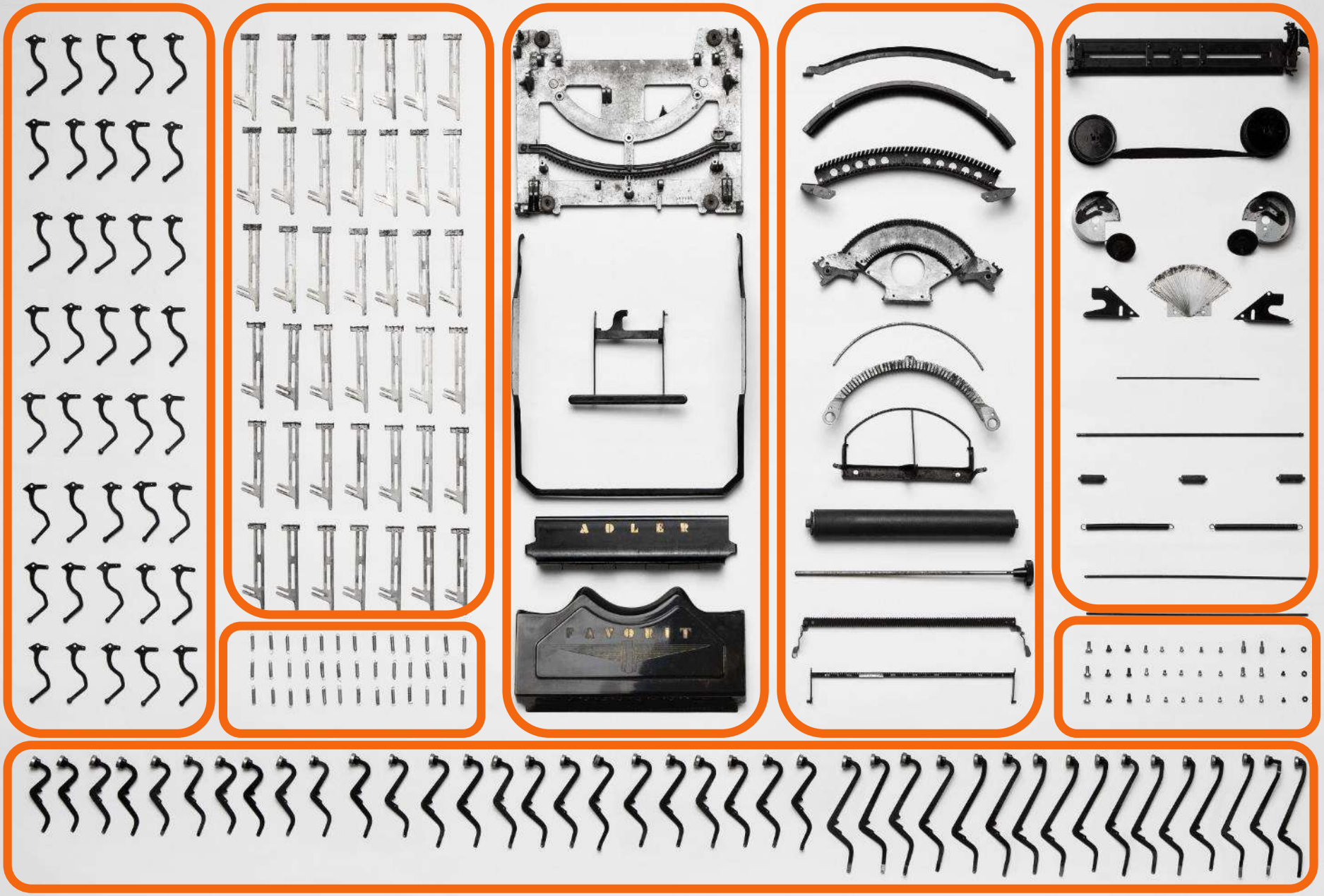
1. The Mass Spectrometer
2. The Telescope
3. The Microscope
4. The Scale
5. The Black Light
6. The Funnel
7. The Petri Dish
8. The Mirror

1) The Mass Spectrometer: Parts of the Whole

The Mass Spectrometer: Parts of the Whole




ADLER
FAVORIT


ADLER
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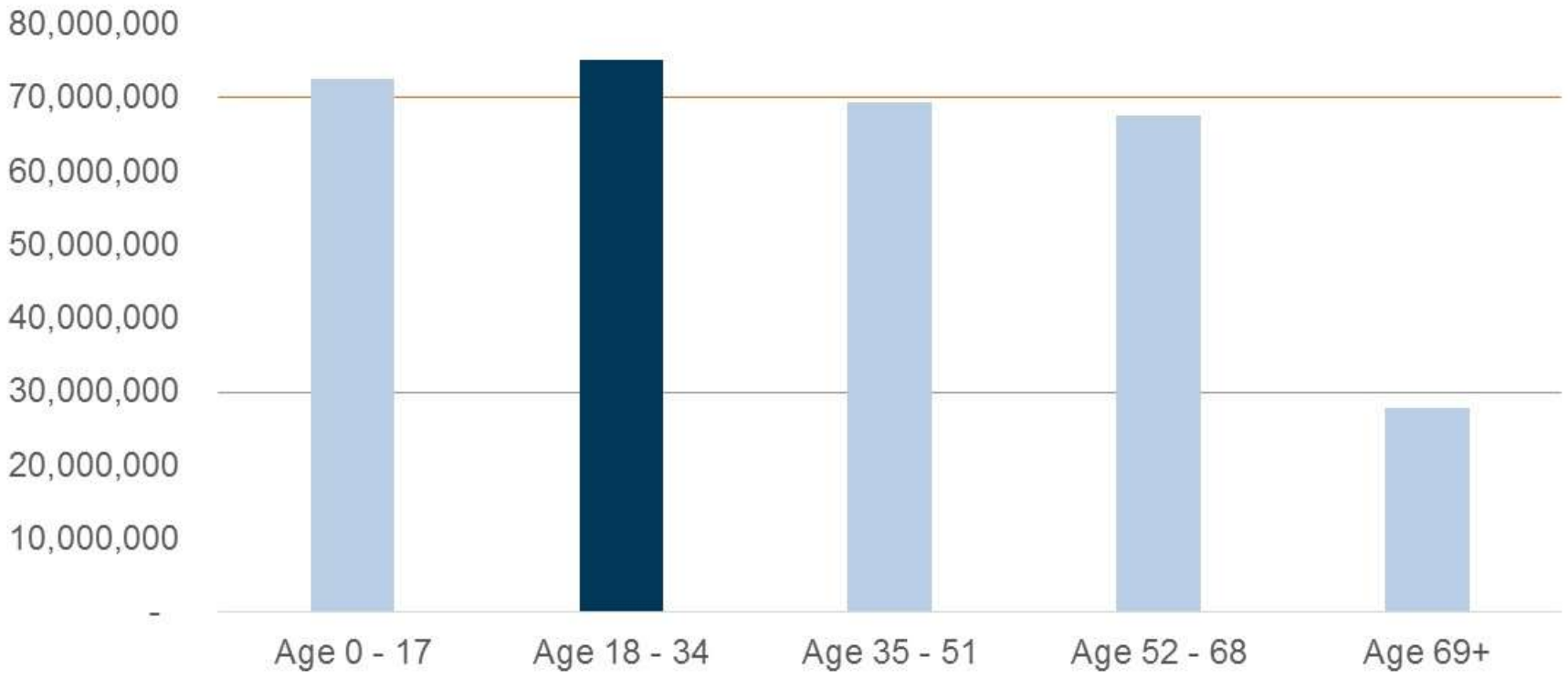
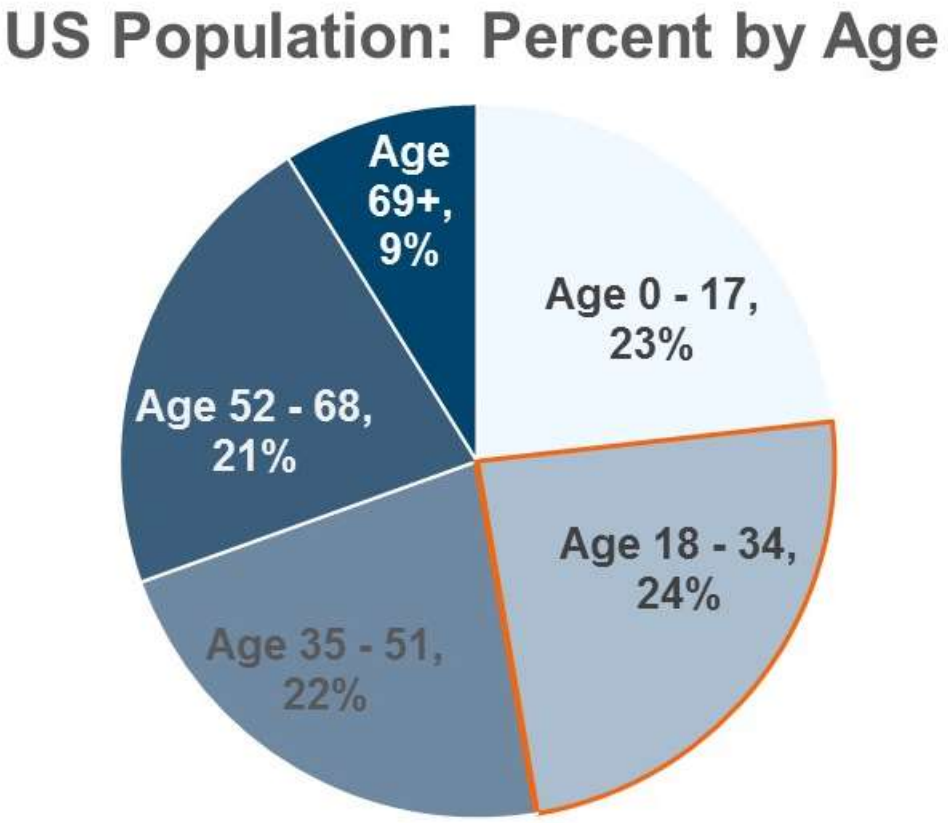
Where are the best markets for craft beer and pizza?

US Population by Age Groups

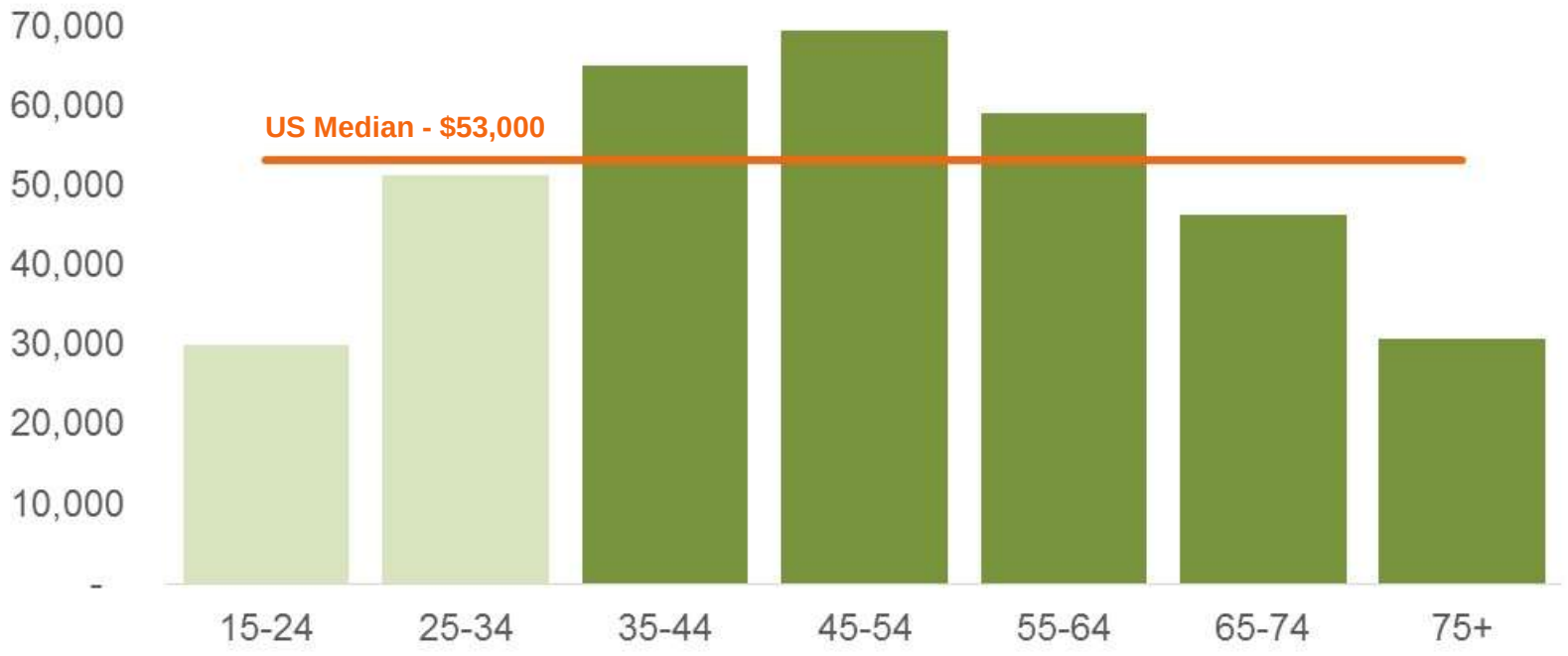


2015 Millennial Context in the US

- 24% of the US population
- Just slightly more than other groups, except those age 65+

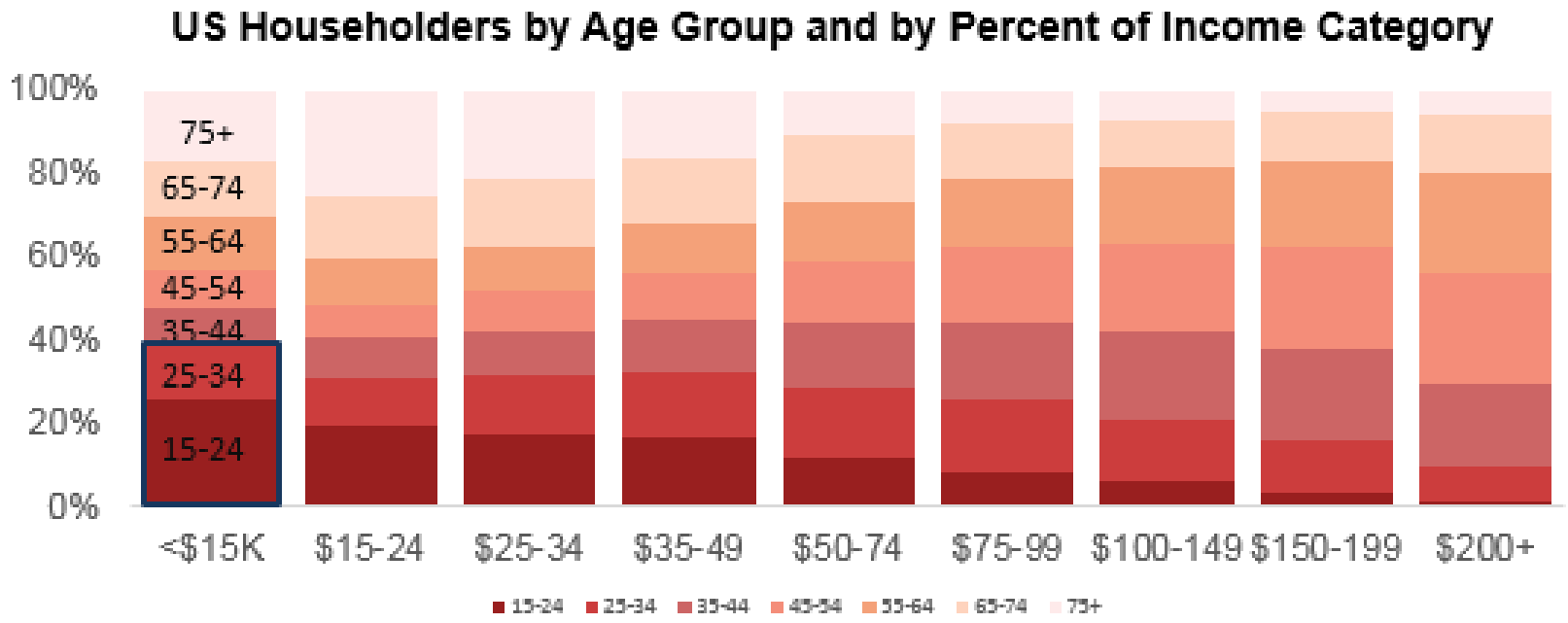


US Median Household Income by Age Group



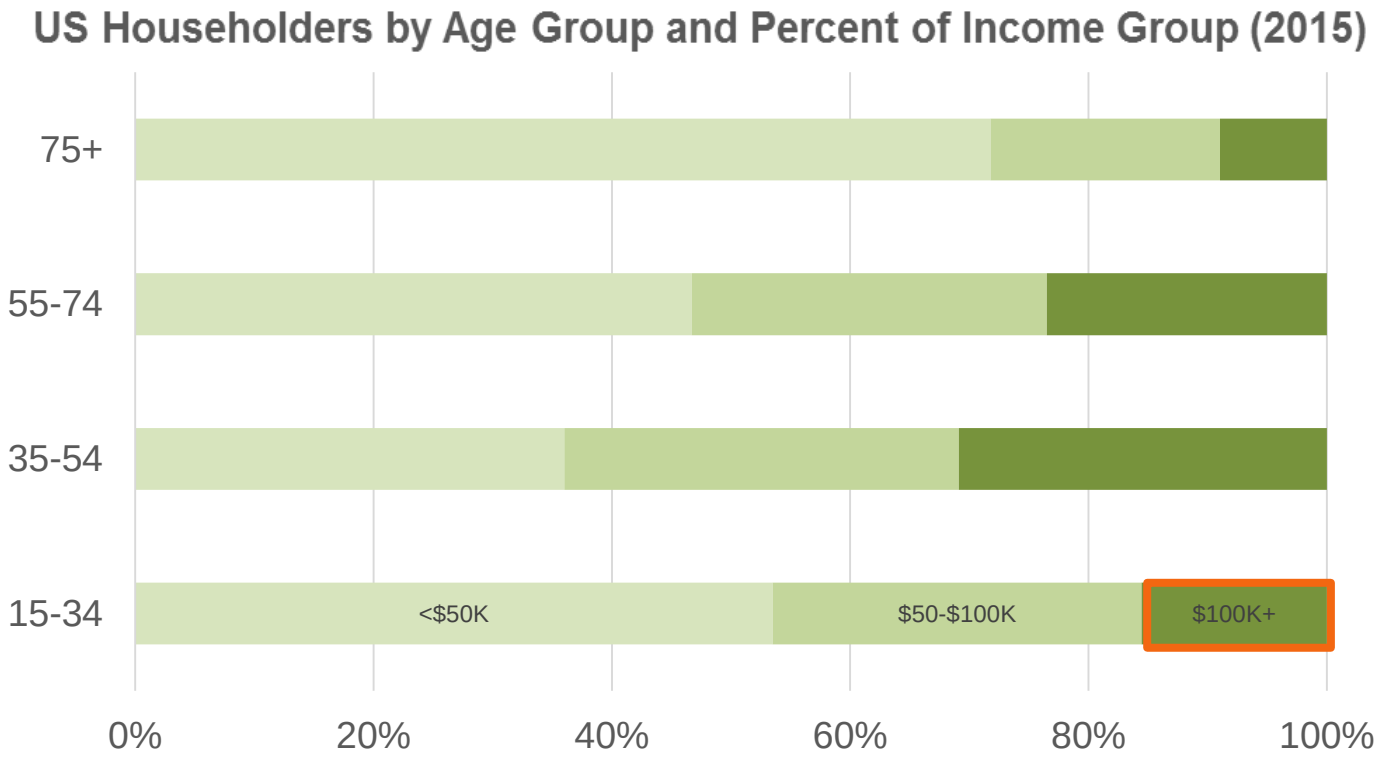
2015 Millennial Income Context in the US

- 42% of millennials make < $15,000 in annual income.
- % of millennials in higher income categories is low compared to other age groups.



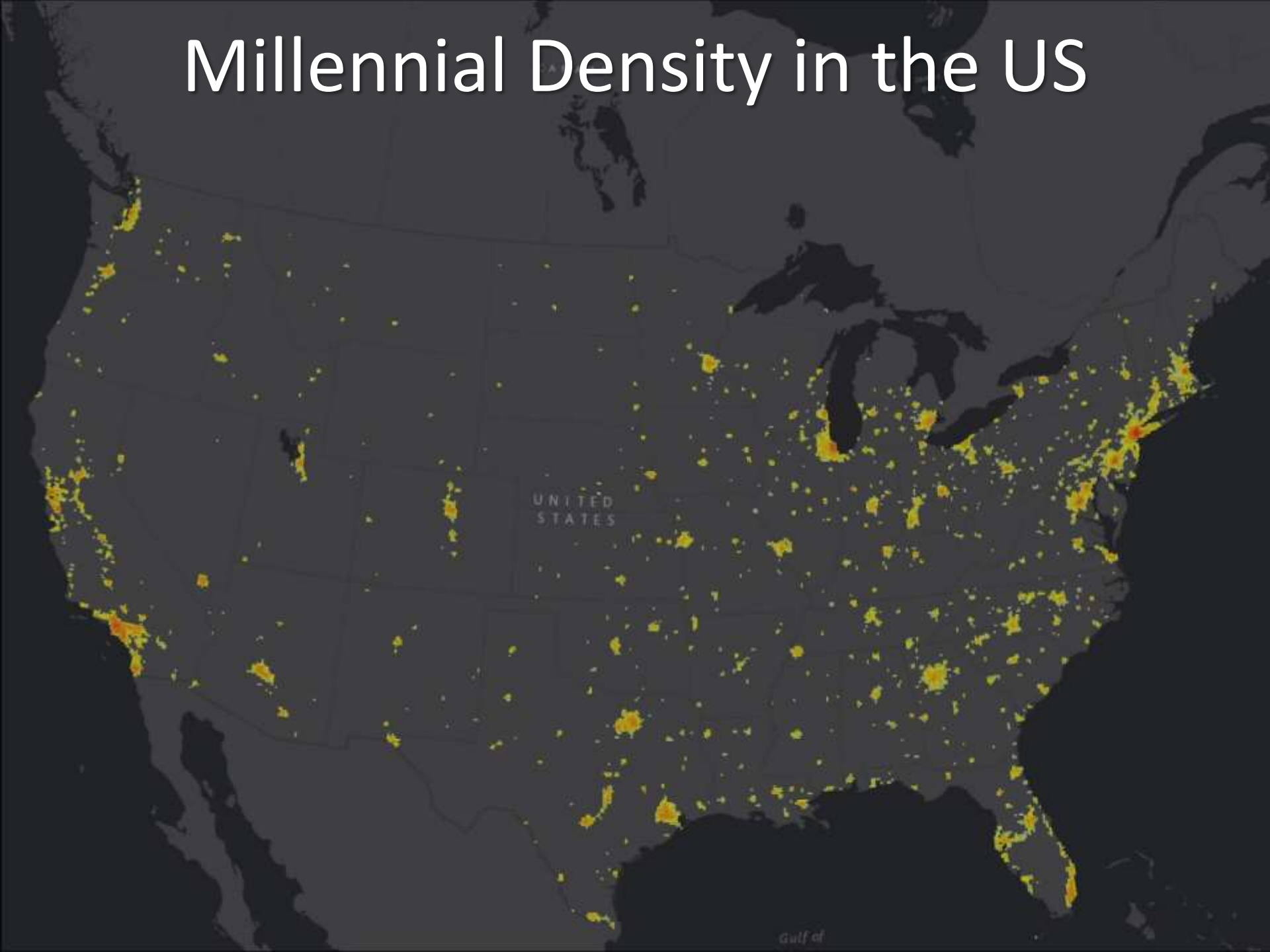
2015 Millennial Income Context in the US

- 53% of millennials make < $50,000 in annual income.

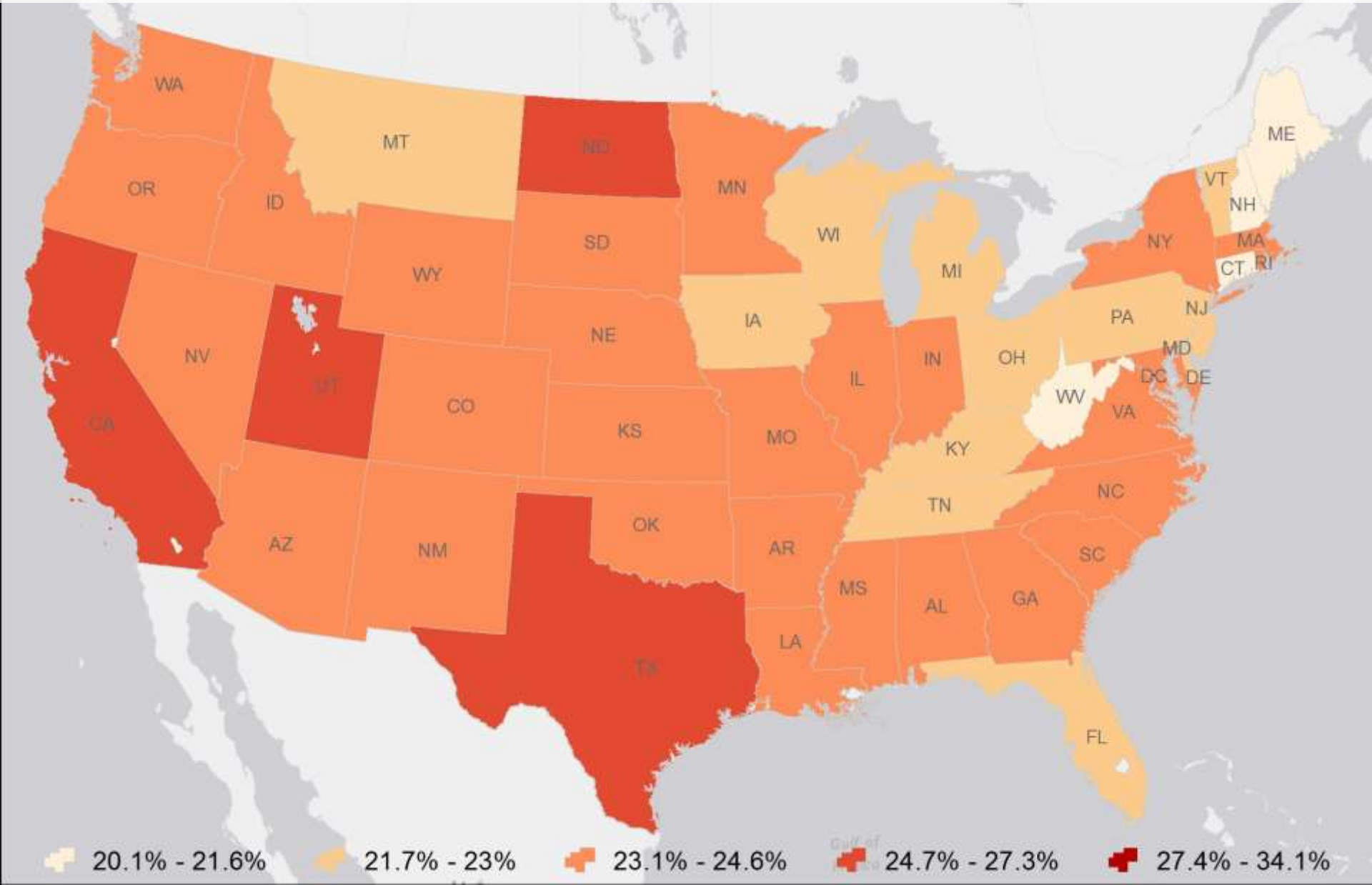


2) The Telescope: Zoom Out

Millennial Density in the US



Percent Millennials by State



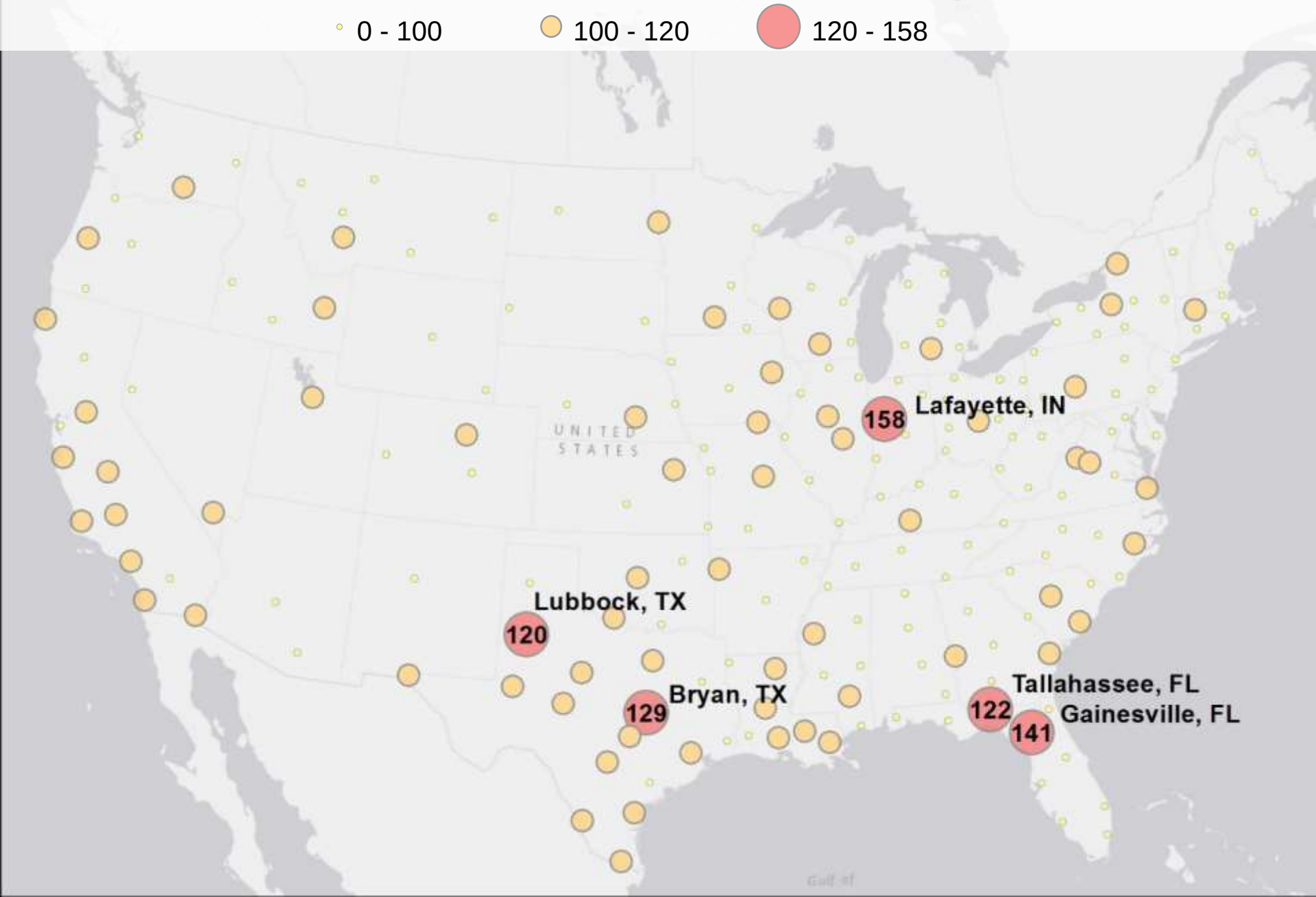
How to Calculate a Base Comparison Index

- First, calculate the percentage for your area of interest.
  - Washington D.C.’s population is about 34% millennials.
- Second, calculate the percentage for your base area.
  - The US 2015 Population is about 24% millennials.
- Divide the percentage of your area of interest by the base area and multiple by 100.
  - (34.137%/23.615%) * 100 = an index of 145

Millennial Index by State

85 - 100 101 - 110 111 - 145

Millennial Percent Index by DMA



DMA Millennial Percent: Top 5

Number of Millennials Index: Top 10 DMAs

How to Calculate an Average Comparison Index

- First, calculate the values for each area and then the average of these values
  - The average number of millennials in DMAs is 358,076.390476
- Second, divide 100 by the average value
  - 100 / 358,076.390476 = 0.00027927001796199 8
- Multiply each record by the result in the second step.
  - [Age18_34_CY] * 0.00027927001796199 8
  - This ensures that the average will always equal 100, which then serves as the benchmark.

3) The Microscope: Zoom In


San Francisco
County


Daly
City


Skyline
Shopping
Center
122°29'54"W 37°40'26"N elev 0.34m, eye alt 545.21 m


Skyline
Shopping
Center
Carmel Ave
Highland Ave
Skyline Dr
Easton Ave
Skyline Blvd
199


Skyline Blvd
Skyline Dr
Higate Dr
Pizza Site

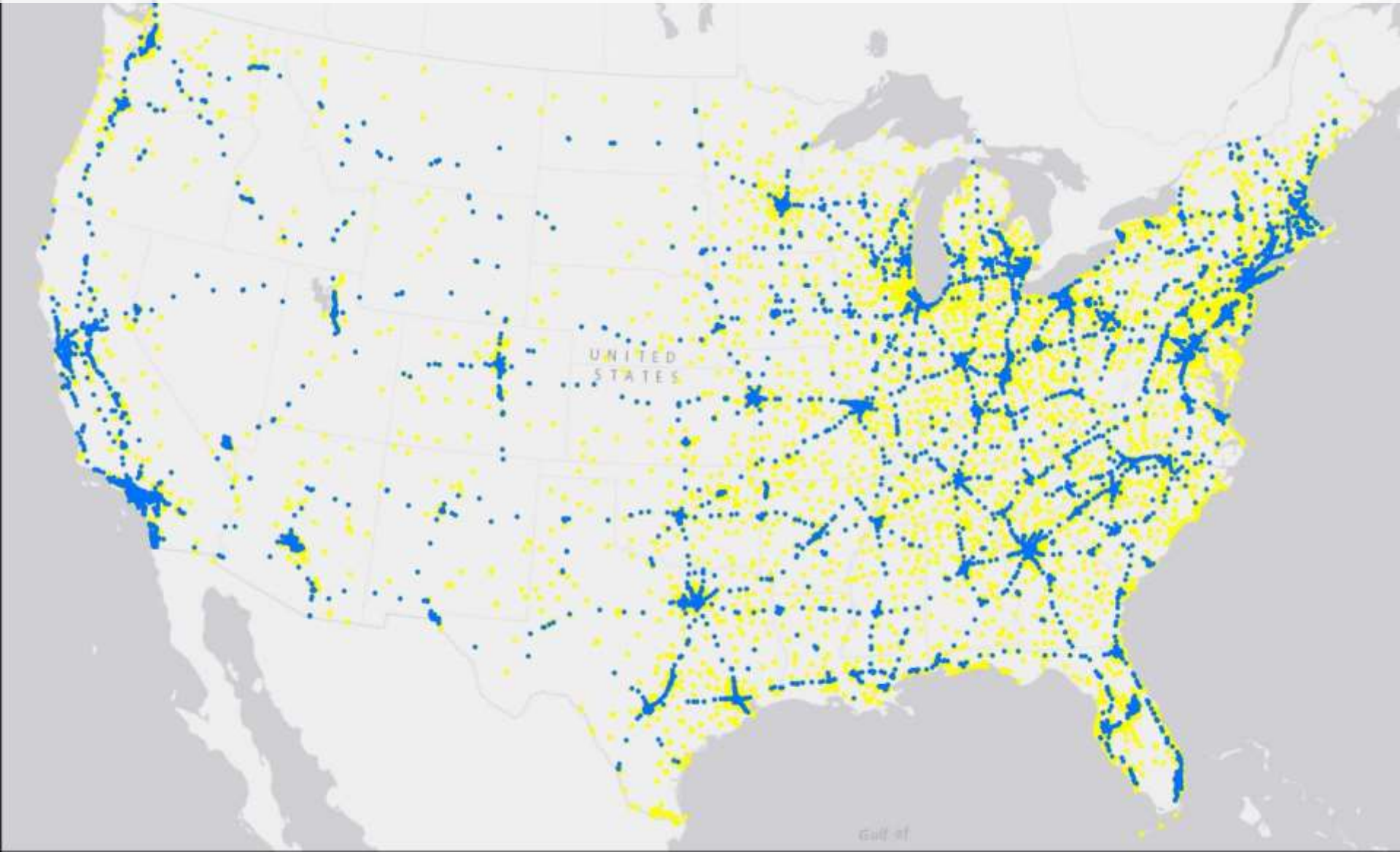

Pizza Hut

Refining Site Selection Criteria

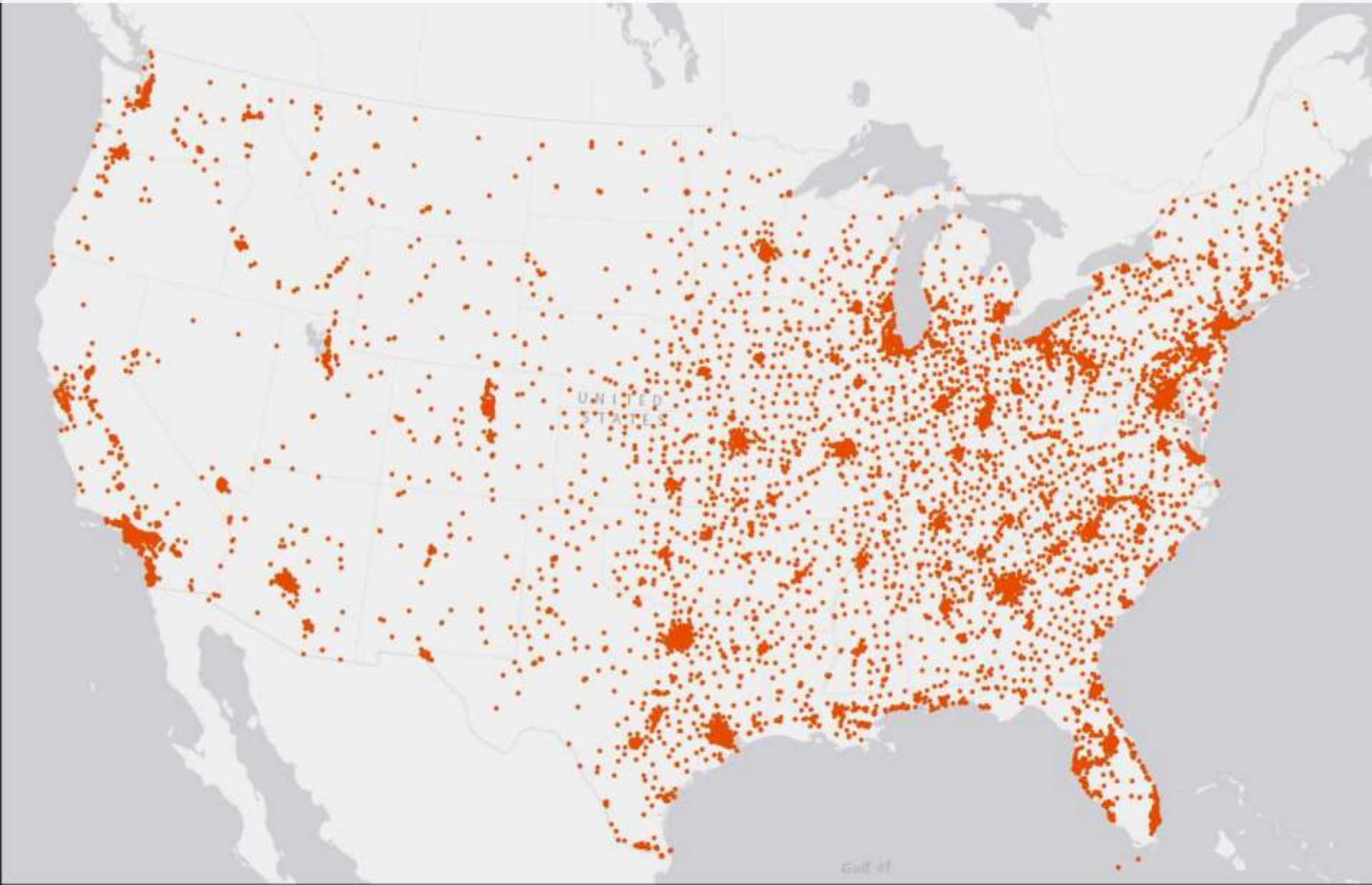


43,942 Highway Exits in the US

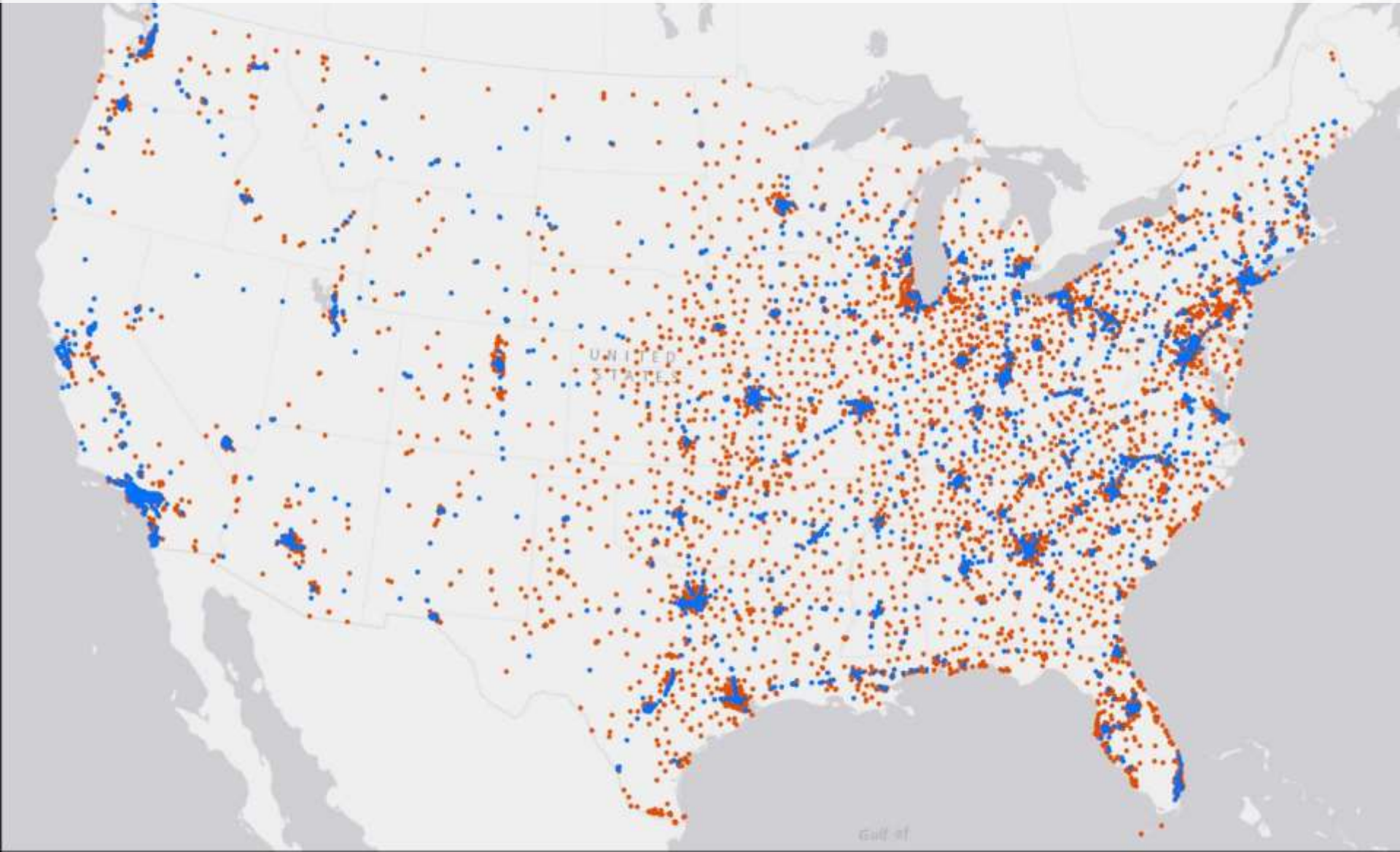
40% of McDonalds are within 1 Mile of a Highway Exit



7400+ Pizza Hut Locations in the US

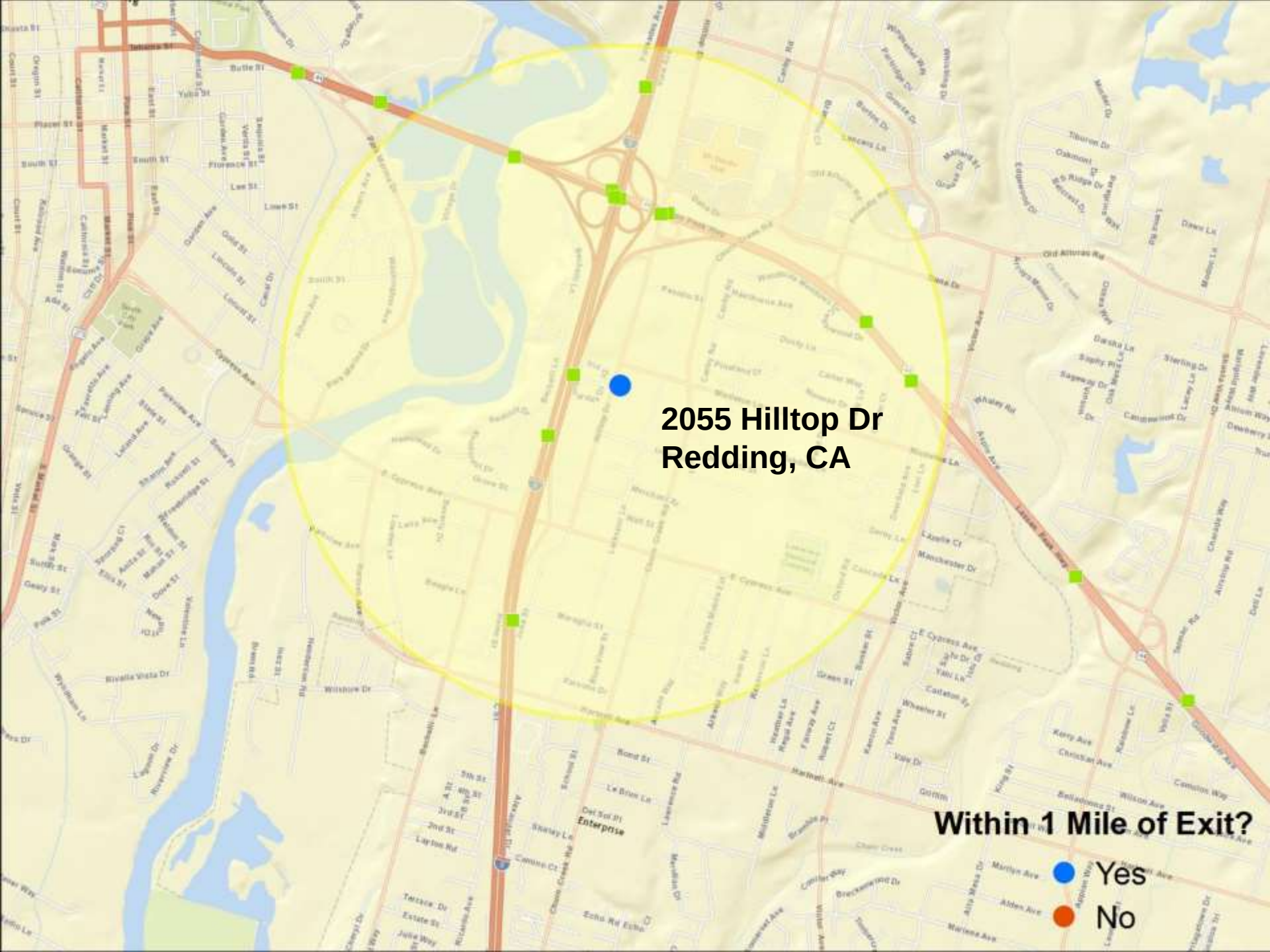


30% of Pizza Huts are within 1 Mile of a Highway Exit

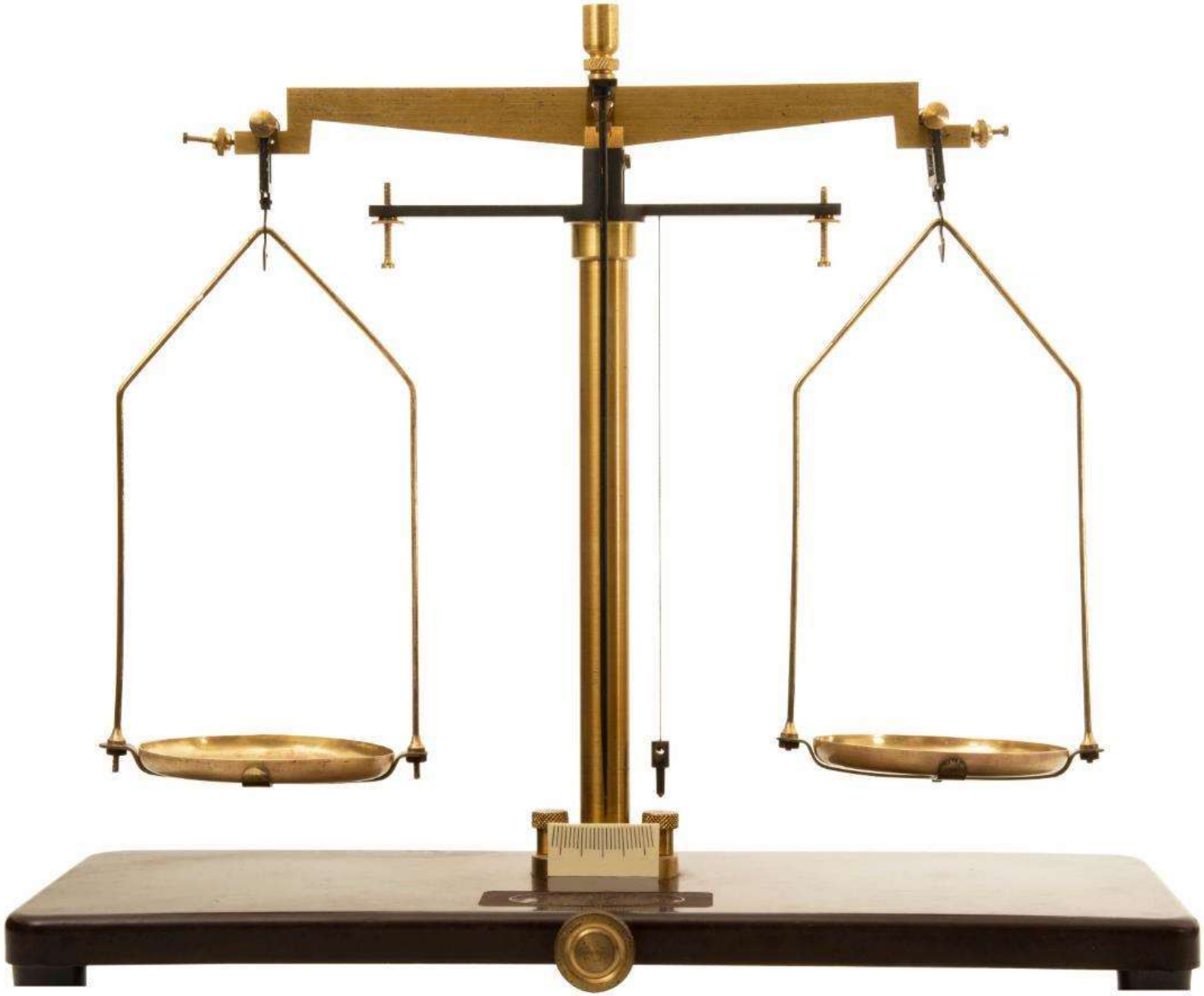



Skyline Plaza
Within 1 Mile of Exit?
Yes
No


Golden Gate
Geary St
Skyline Plaza
Mission St
Skyline Plaza
El Camino Real
Within 1 Mile of Exit?
Yes
No


2055 Hilltop Dr
Redding, CA
Within 1 Mile of Exit?
Yes
No

4) The Scale: Show the Differences




DEA 160841
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METTLER
AE 260
DeltaRange®
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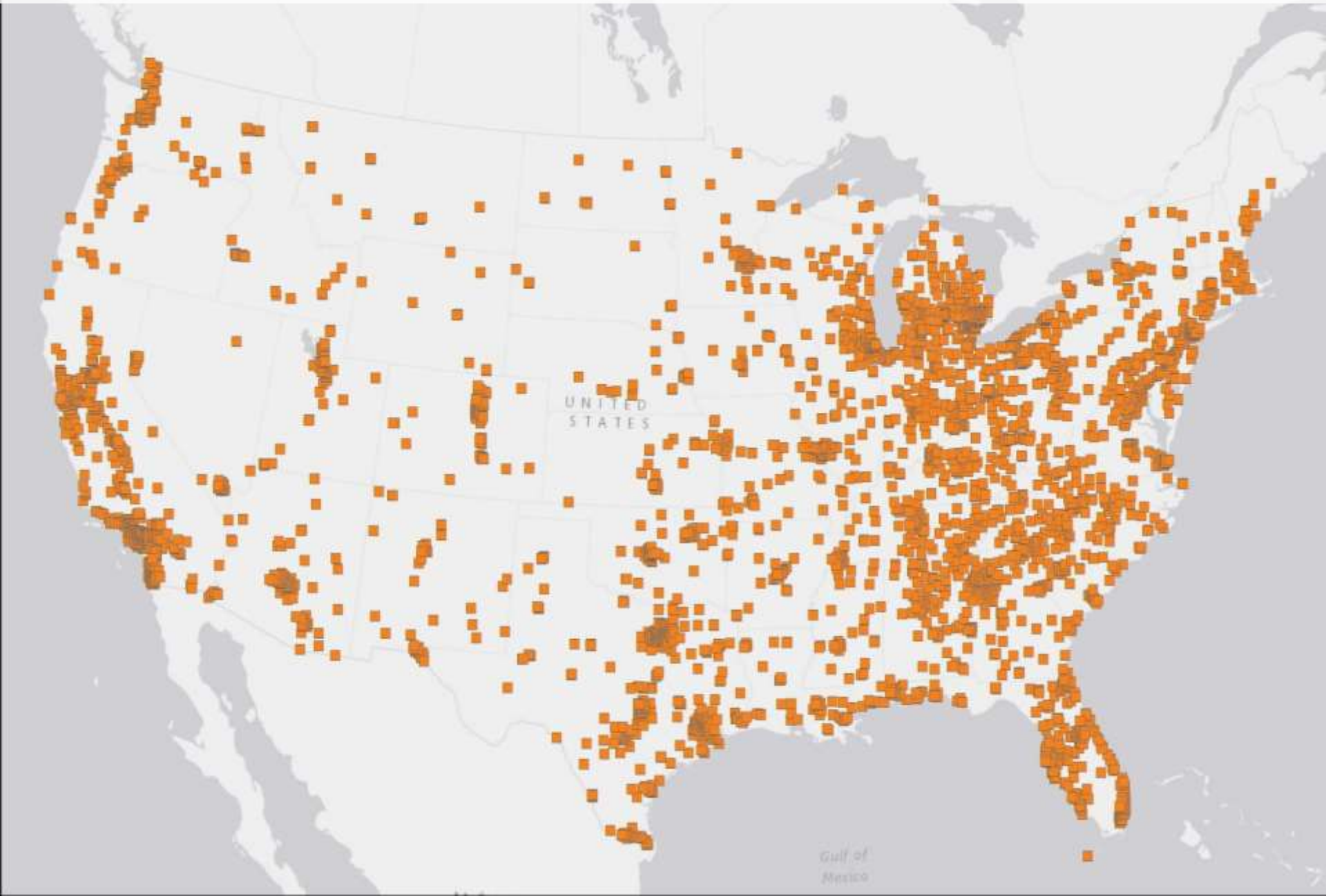
Comparing Customer Income Profiles

4200+ Little Caesars Pizza Locations



152 MOD Pizza Locations

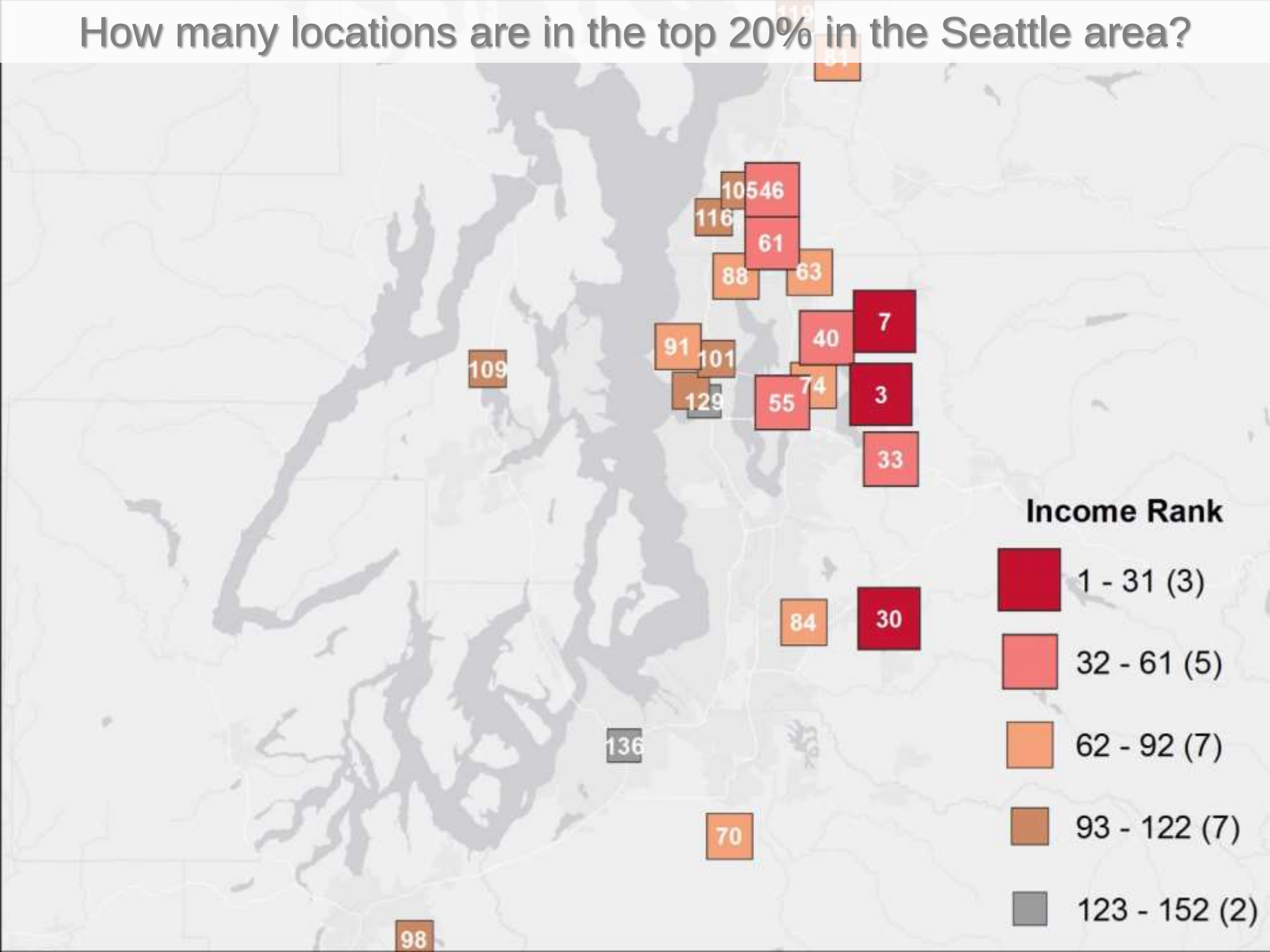
Comparison of Major Pizza Chains in California

Competitor Average for 2-Mile Ring Areas	Average of 2015 Total Population	Average of 2015 Average Household Size	Average of 2015 Median Household Income
Little Caesars	69,969	3.06	$54,193
Shakey's	99,752	3.22	$55,949
Papa Murphy's	41,075	2.67	$55,983
Me-n-Ed's	42,911	3.03	$57,393
Domino's	71,866	2.86	$59,284
Pizza Hut	84,619	3.09	$59,844
Papa John's	80,387	2.90	$61,334
Pizza Guys	62,917	2.97	$61,659
Blast 825	39,333	2.60	$62,613
Mountain Mike's	50,663	2.86	$66,915
Pizza Rev	106,999	2.78	$68,437
Round Table	55,323	2.76	$68,642
Blaze	81,632	2.67	$71,434
Pieology	64,763	2.90	$74,737
Mod Super Fast	71,542	2.78	$79,452

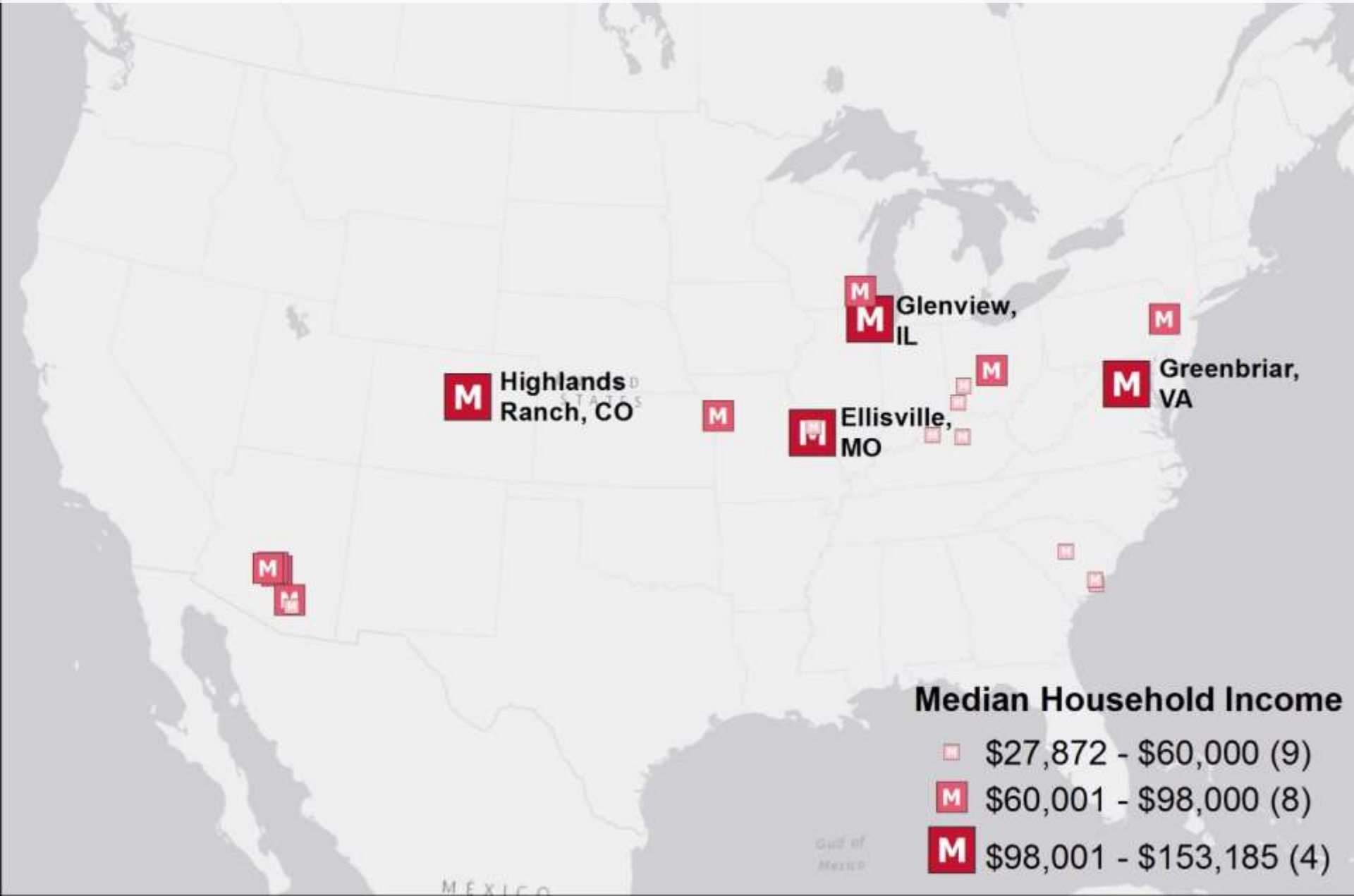
Traditional

Fast Casual

How many locations are in the top 20% in the Seattle area?



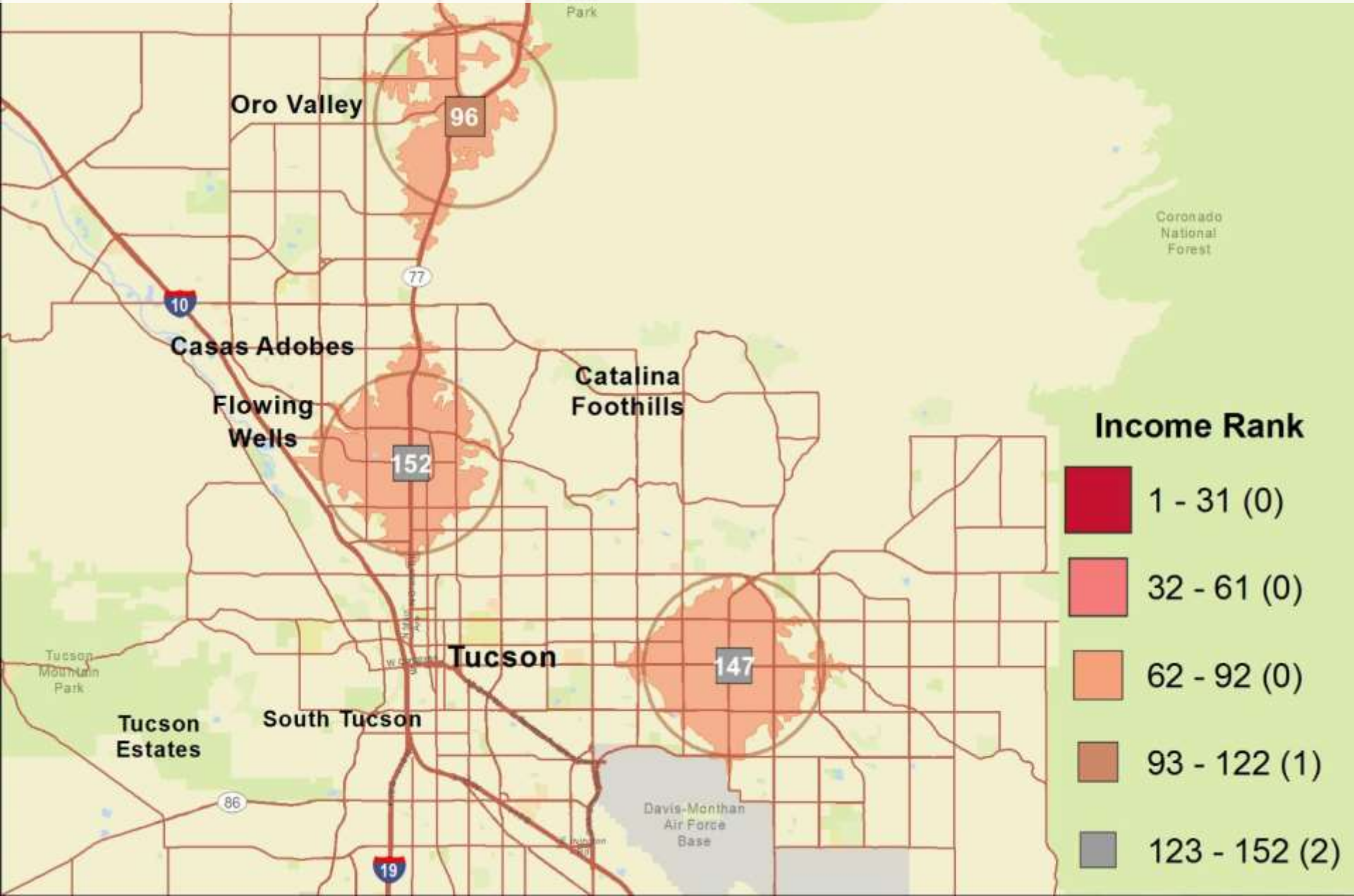
Which new MOD Pizza locations look like the top 20% in terms of median household income?



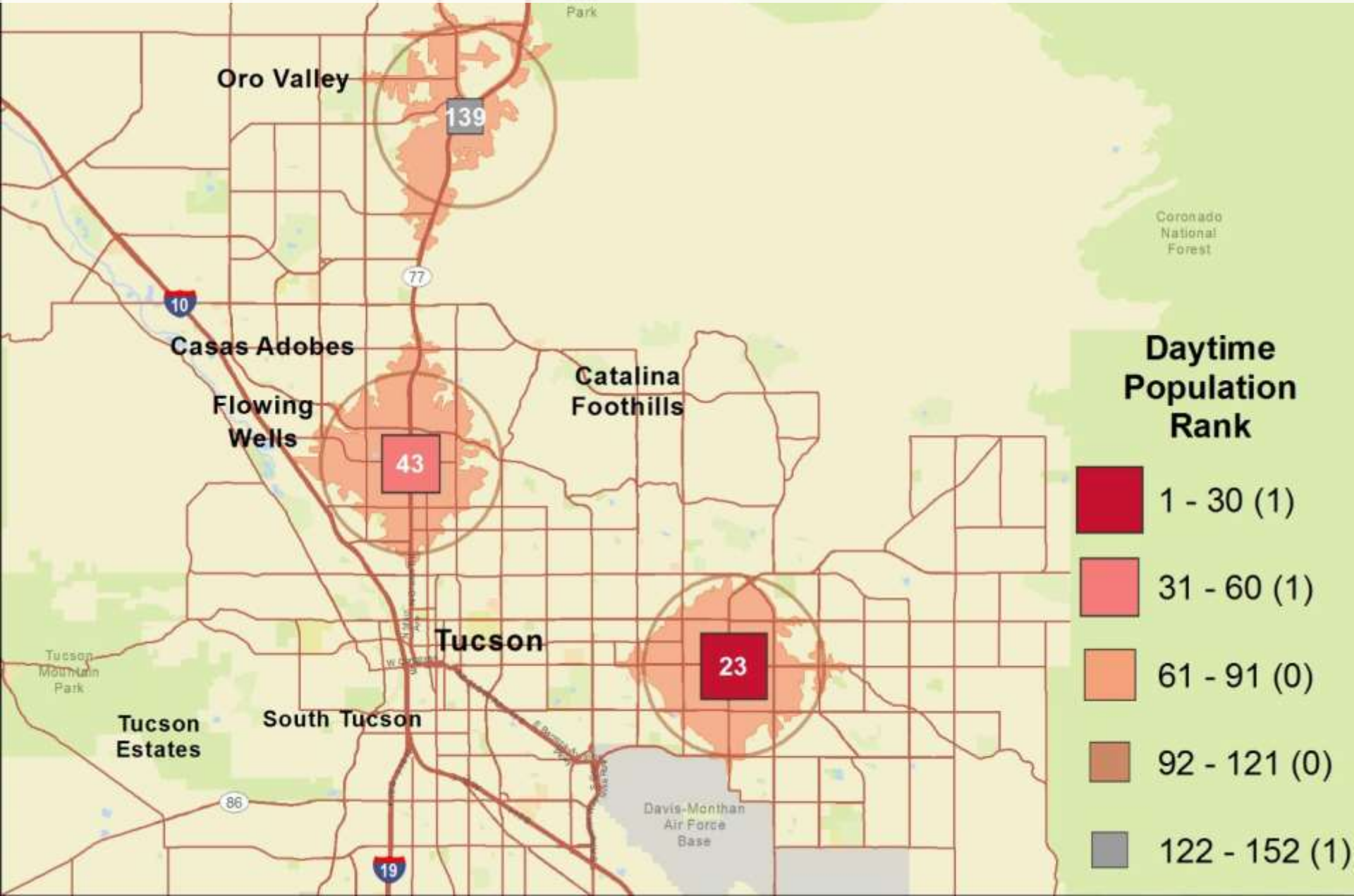
5) The Black Light: Find the Outliers

5) The Black Light: Find the Outliers

Why is median income the lowest for Flowing Wells ($27,872) and can the site still be profitable?

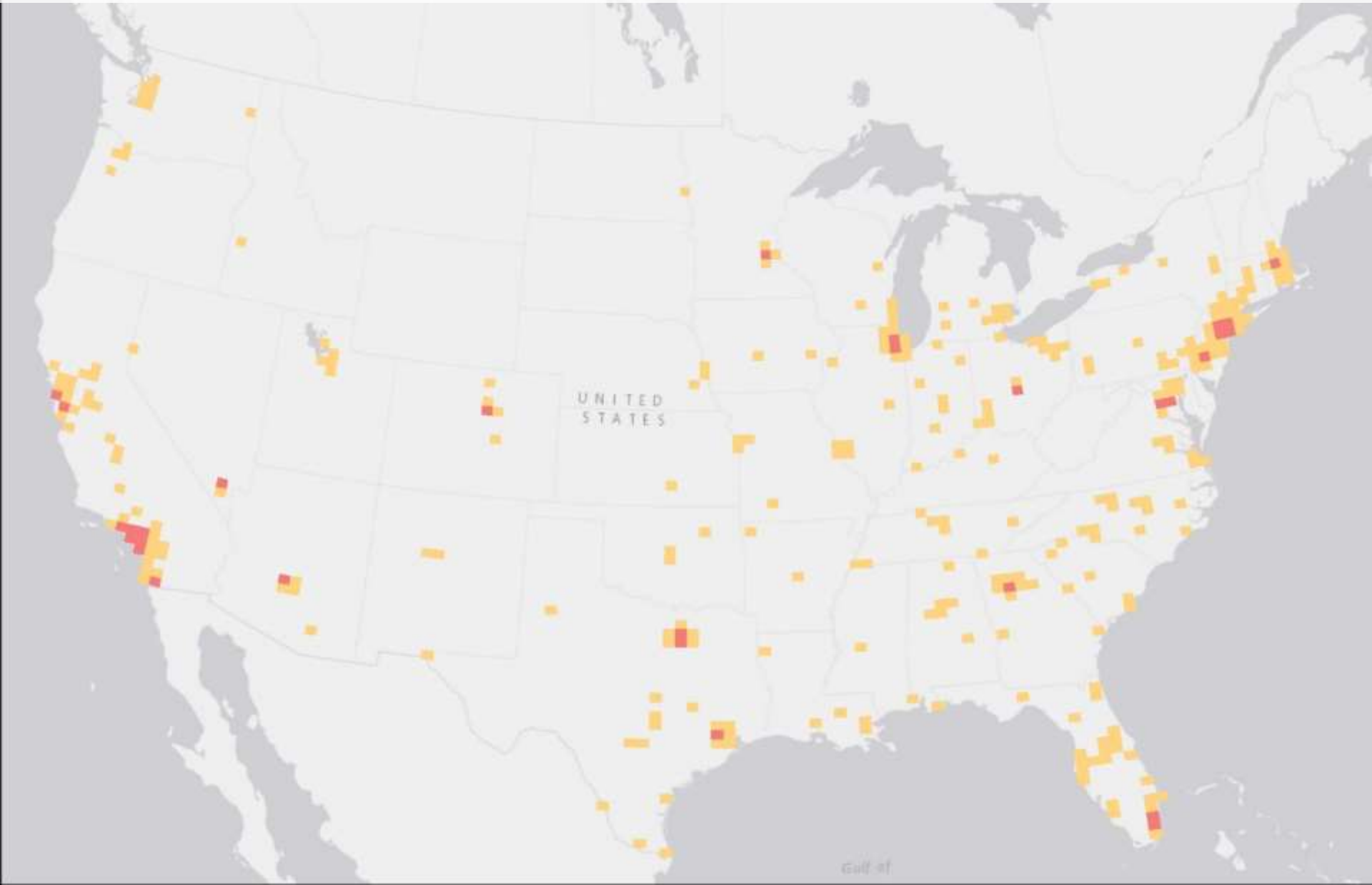


Daytime population for Flowing Wells (33,225) is in the top 40% of all MOD locations

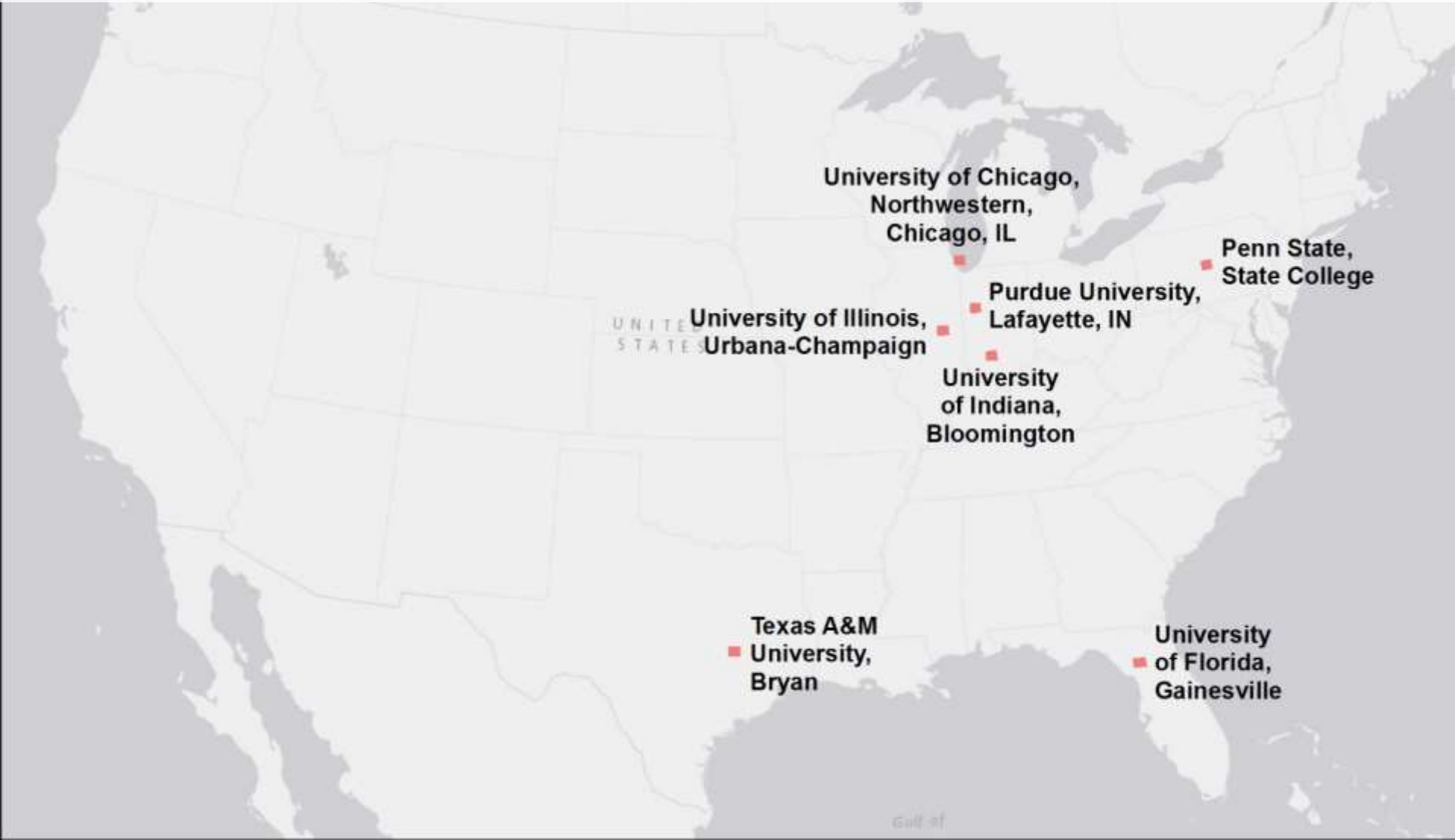


6) The Funnel: Combine and Intersect

Hot Spot Grid by Millennial Number



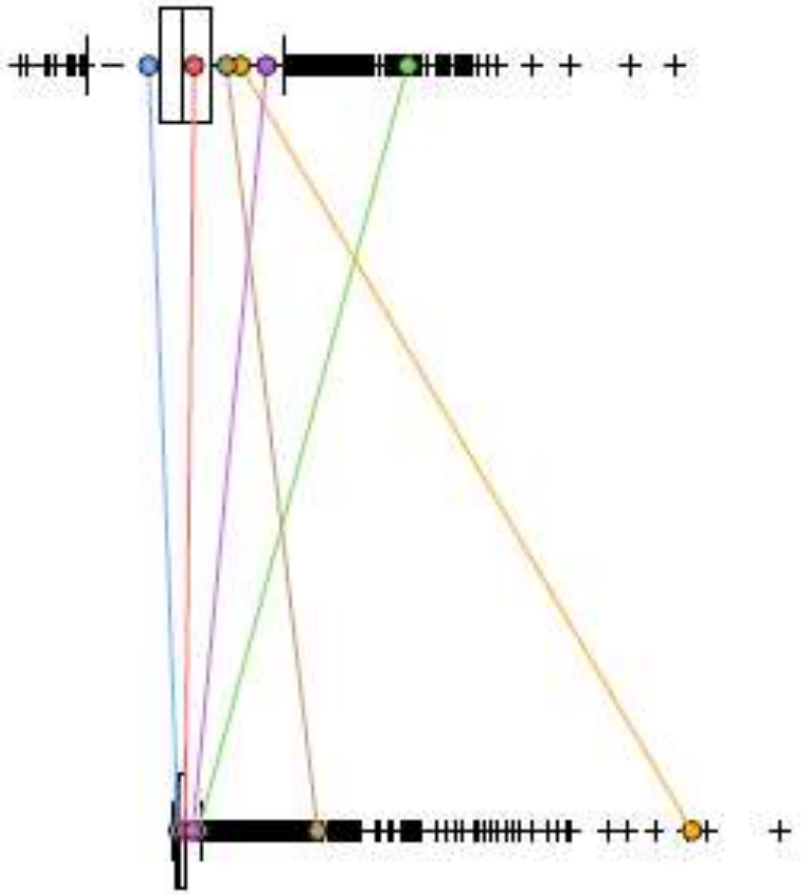
7 Areas that are 40% or more Millennial with 50,000 or more Millennials



30 Hot Spot Grids that are 24% + and 300,000 + Millennials

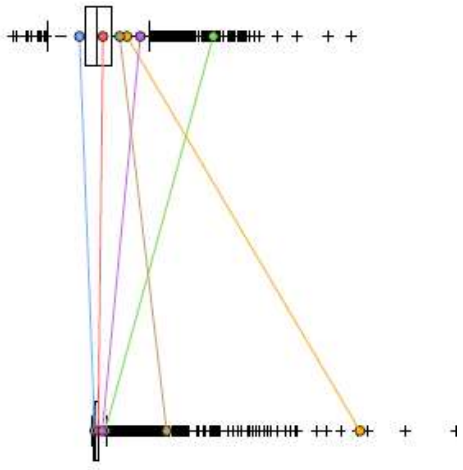
Grouping Analysis

- Using Grouping Analysis in the Spatial Statistics Toolbox, we can combine the percent millennials and the total number in the 20 mile grid areas to see how these factors combine.



Group 3 – Highest %, Average Total

- The green group has an average percentage of 40% and an average of 27,931 millennials.

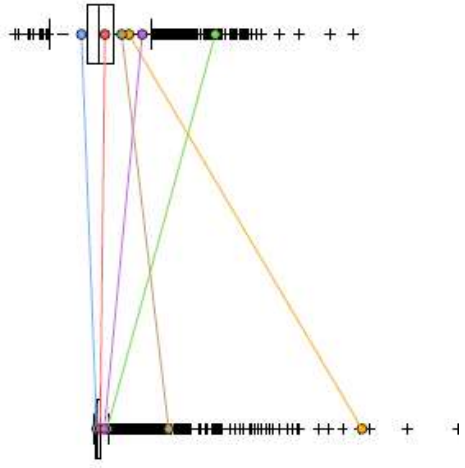


Group 3: Count = 84, Std. Distance = 23995.3854, SSD = 127.1698

Variable	Mean	Std. Dev.	Min	Max	Share
P_AGE18_34	0.4043	0.0565	0.3439	0.6389	0.5105
AGE18_34_CY	27931.6786	23995.3854	1974.0000	137389.0000	0.0777

Group 4 – Highest Total, Above Average %

- The orange group has an average percentage of 25% and an average of 586,128 millennials.

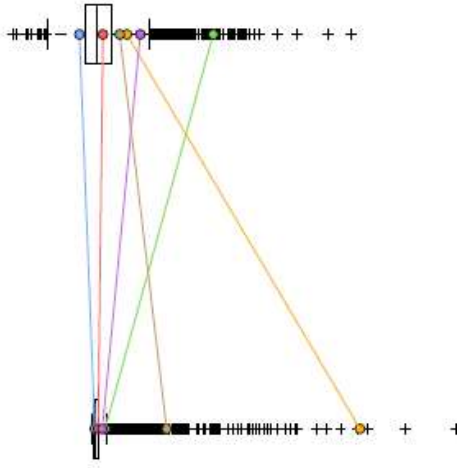


Group 4: Count = 21, Std. Distance = 311737.9932, SSD = 534.0620

Variable	Mean	Std. Dev.	Min	Max	Share
P_AGE18_34	0.2568	0.0194	0.2313	0.3106	0.1373
AGE18_34_CY	586128.0476	311737.9932	376373.0000	1743002.0000	0.7843

Group 6 – High Total, Average %

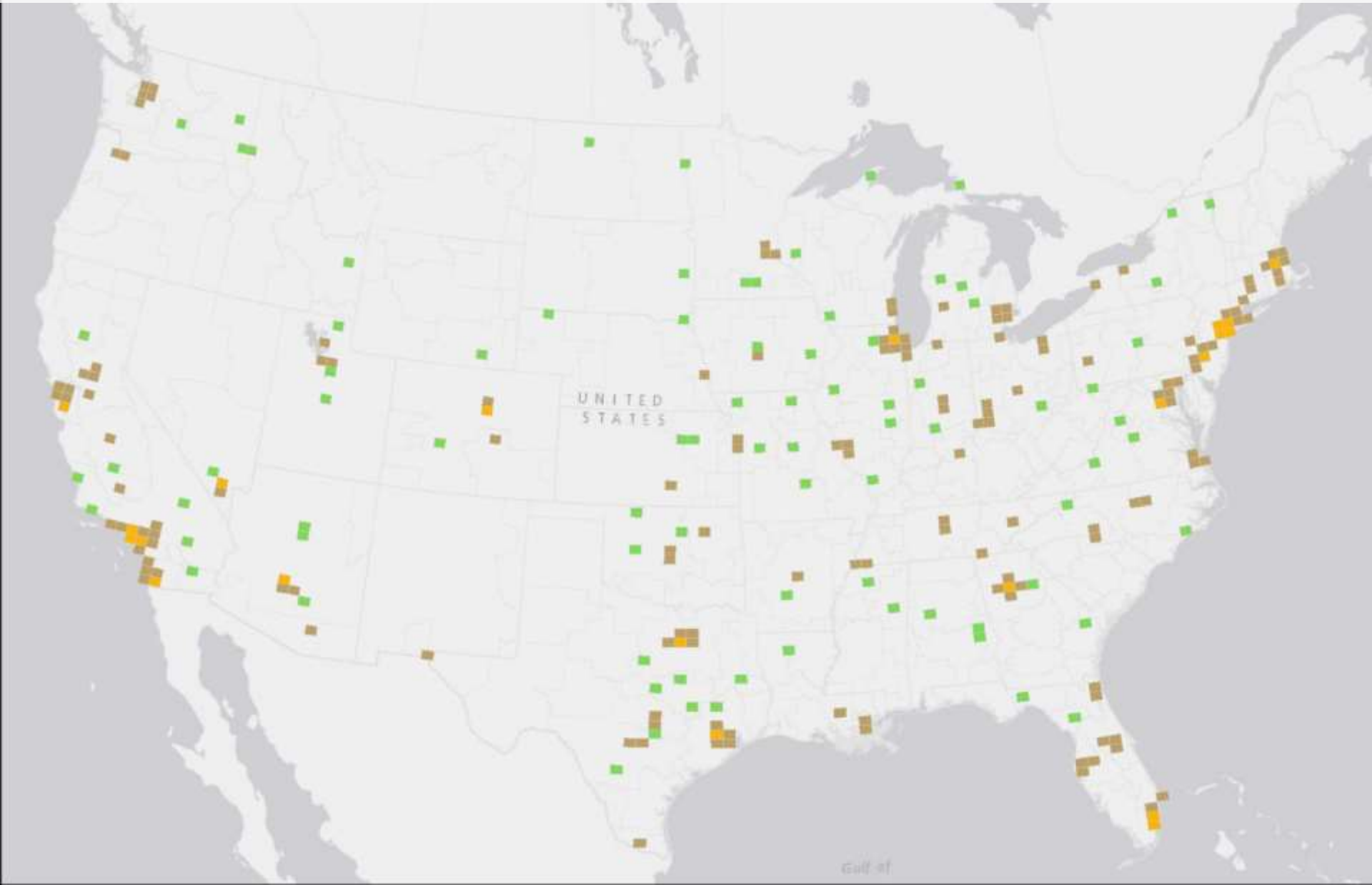
- The brown group has an average percentage of 24.5% and an average of 162,655 millennials.



Group 6: Count = 148, Std. Distance = 66575.6965, SSD = 225.5755

Variable	Mean	Std. Dev.	Min	Max	Share
P_AGE18_34	0.2446	0.0295	0.1859	0.4112	0.3899
AGE18_34_CY	162654.7500	66575.6965	88434.0000	366730.0000	0.1597

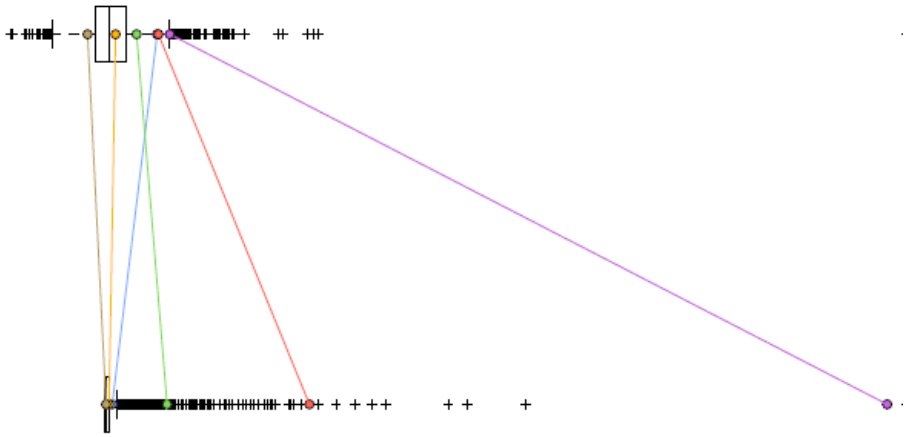
Grouping Analysis for Millennial Hot Spots



Grouping Analysis for Older Millennials

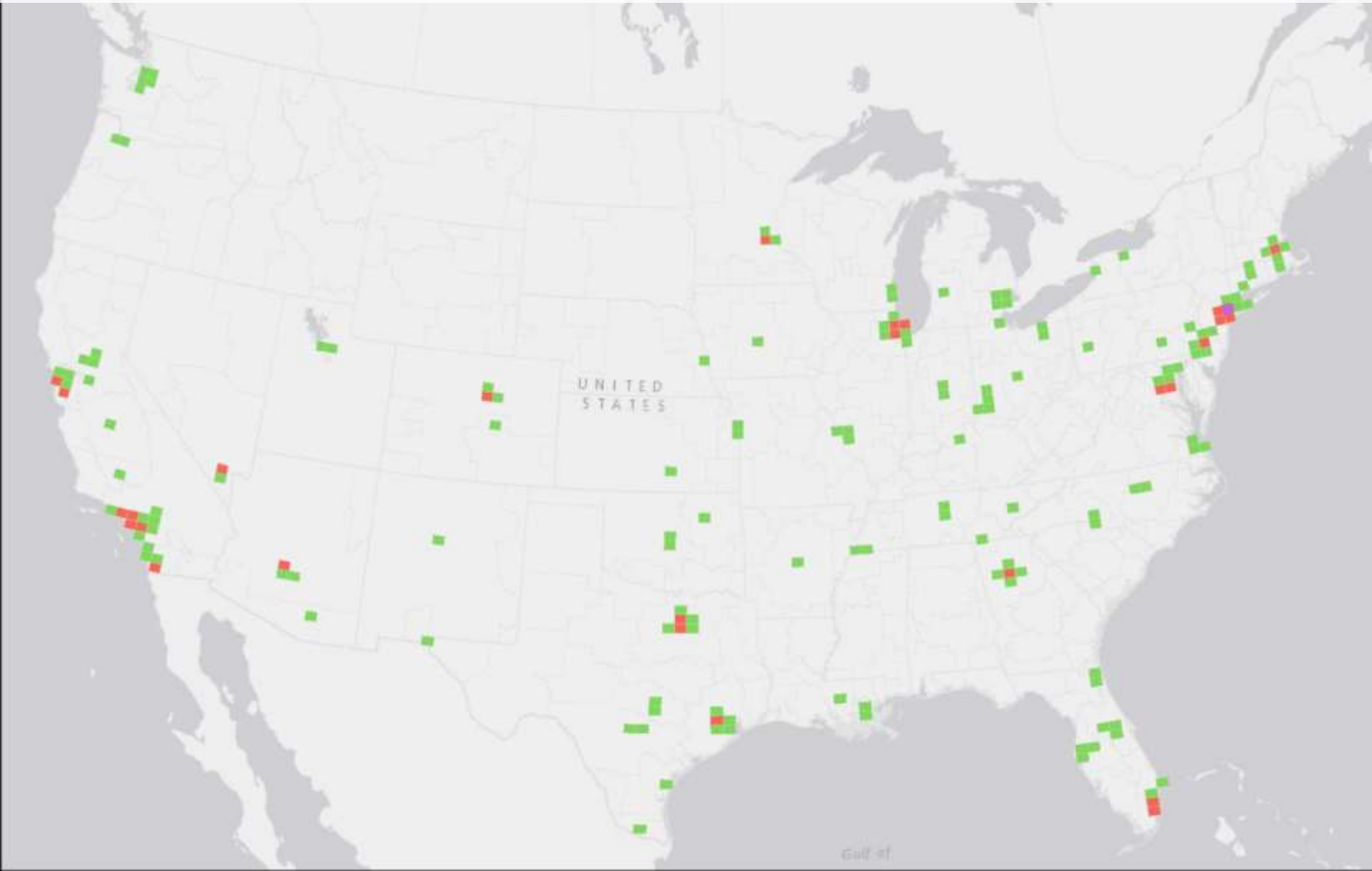
- The purple, red, and green groups all have a higher than average percent and total older millennials.

	# of Older Millennial	%
Average	12,112	12.1%
Purple	**1,104,853**	**17.0%**
Red	**289,840**	**16.0%**
Green	**89,052**	**14.2%**
Blue	11,631	15.9%
Orange	7,163	12.4%
Brown	2,966	10.0%



Grouping Analysis for Older Millennials

115 of the 152 MOD Pizza are in these areas

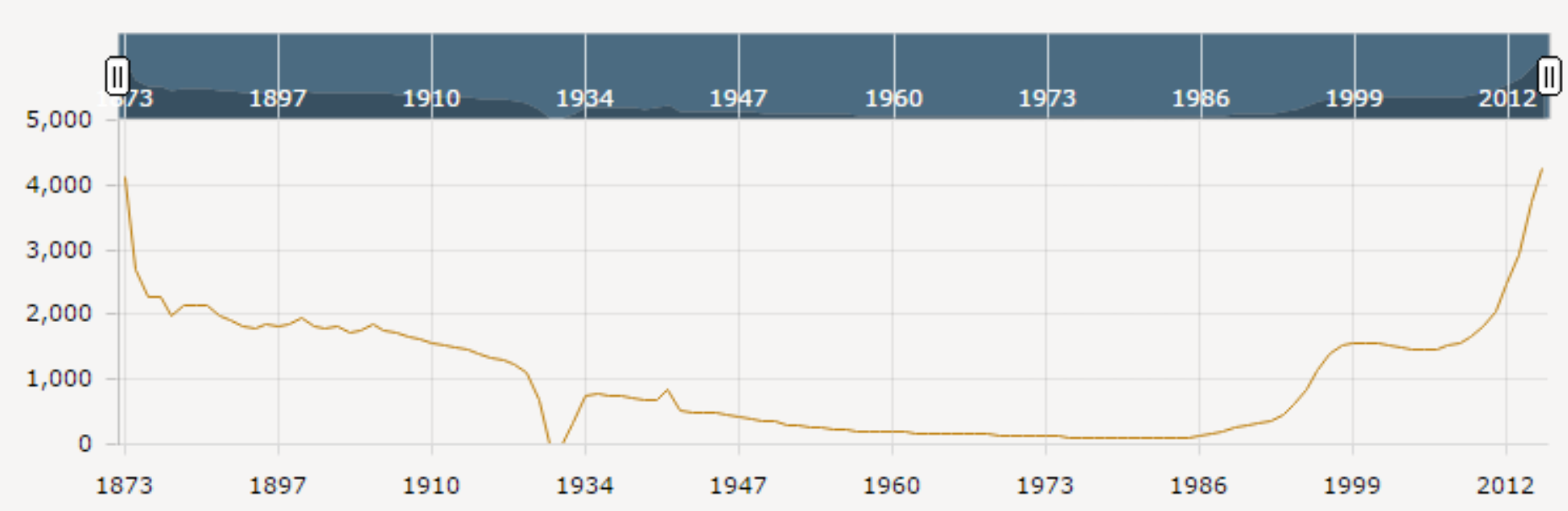


Older Millennial Hot Spots with No MOD

118 Opportunity Areas

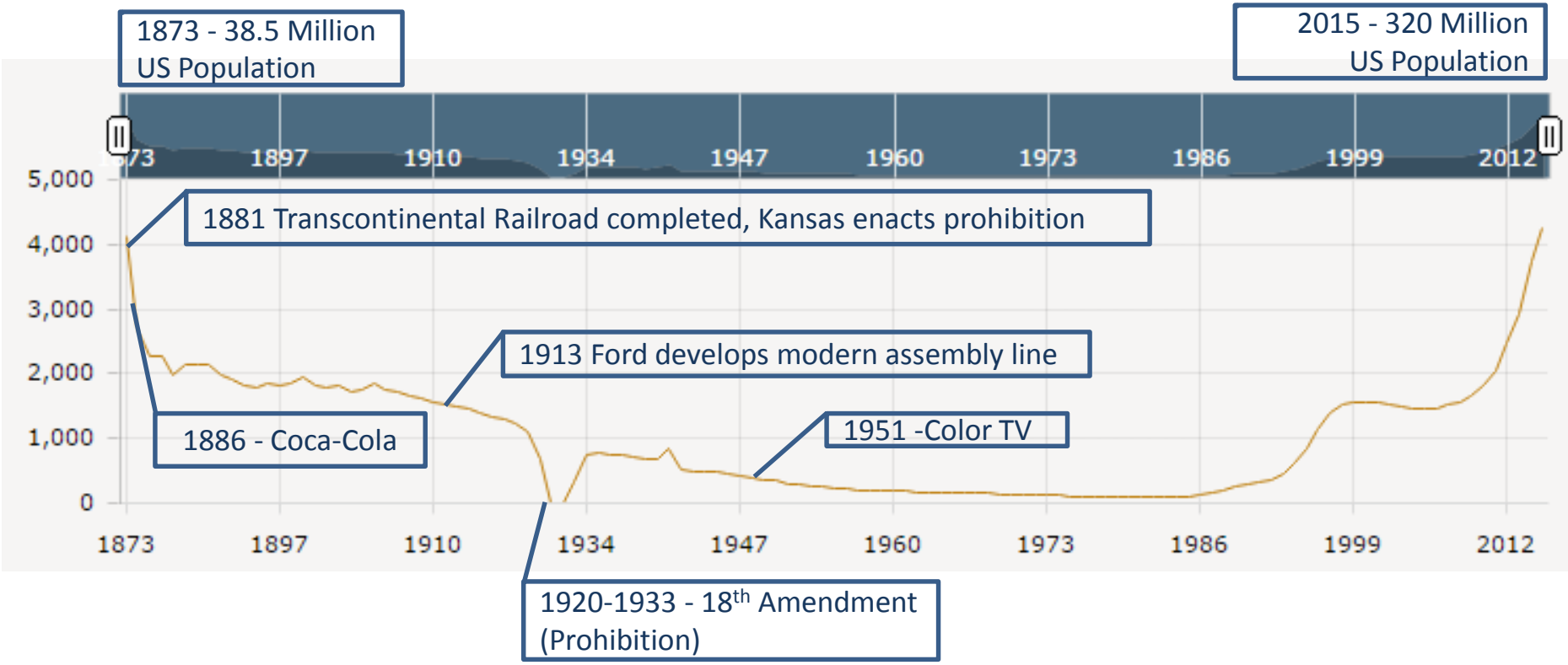
7) The Petri Dish: Change Over Time

Historical US Brewery Count



https://www.brewersassociation.org/statistics/number-of-breweries/
Bart Watson, Used with permission.

Historical US Brewery Count



https://www.brewersassociation.org/statistics/number-of-breweries/

Bart Watson, Used with permission.

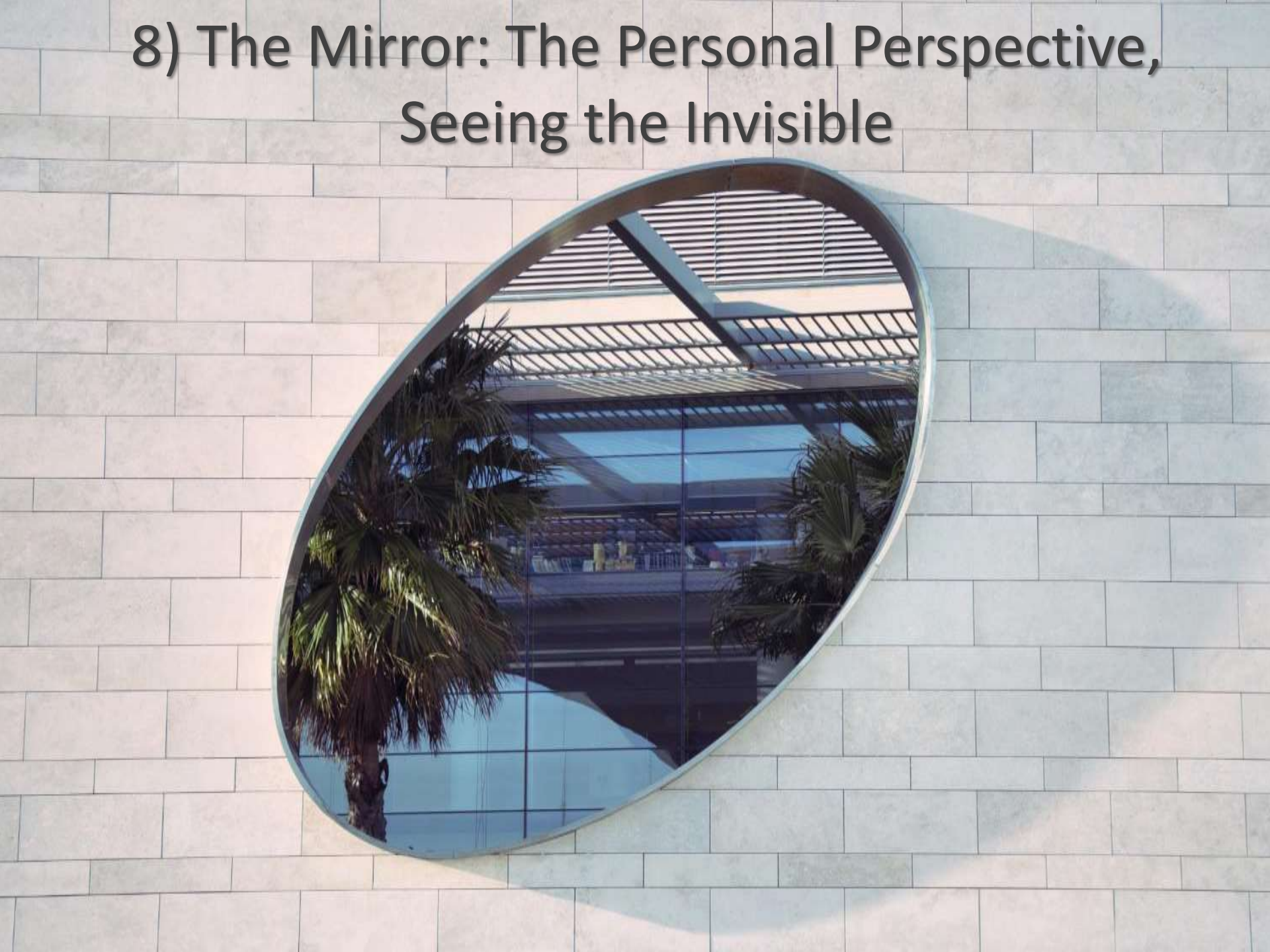
17.9% Increase from 2014 to 2015

U.S. Brewery Count

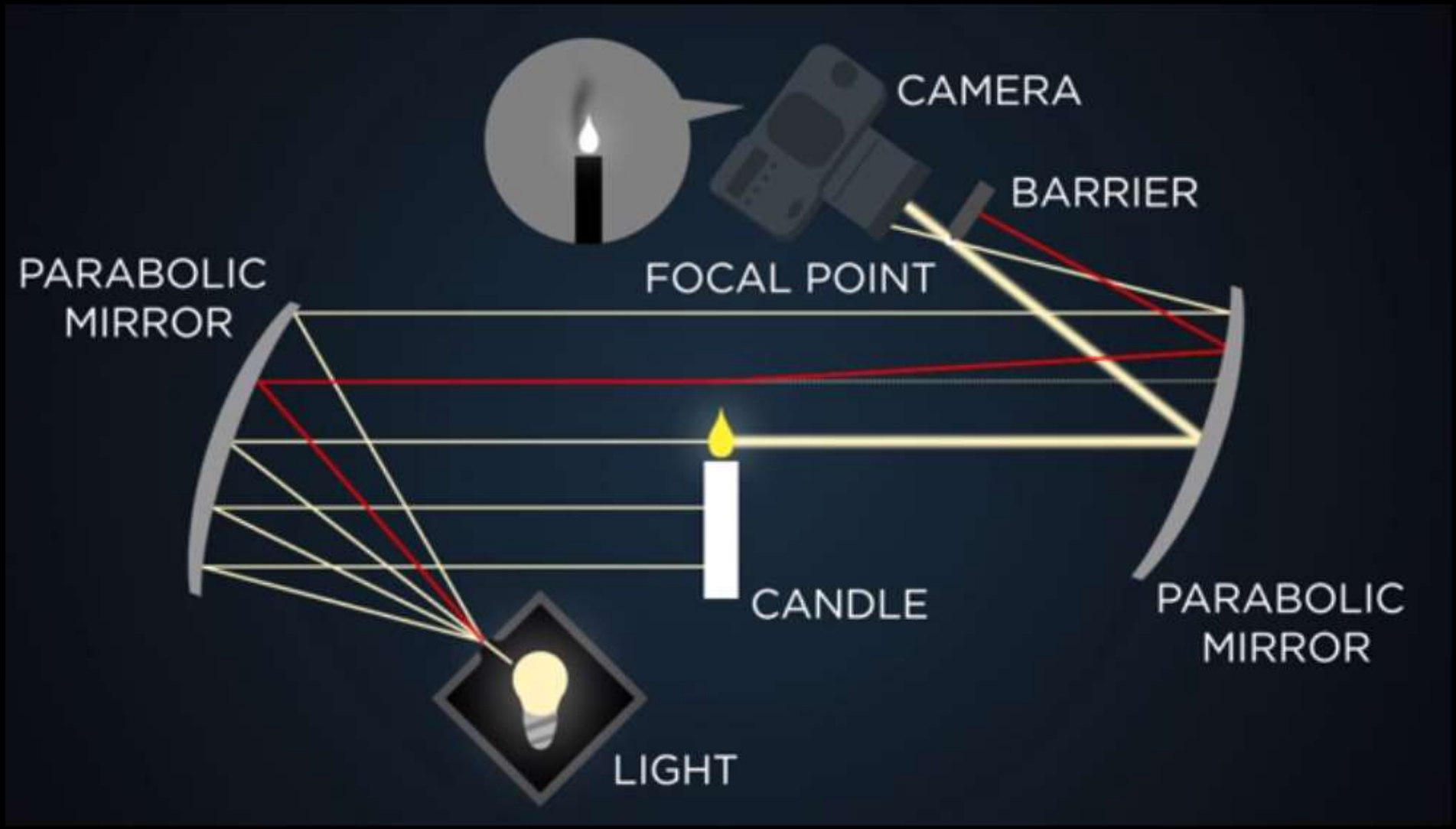
	2012	2013	2014	2015	'14 to '15 % Change
CRAFT	2,401	2,863	3,676	4225	+ 18.1
Regional Craft Breweries	97	119	135	178	+ 31.9
Microbreweries	1,149	1,464	2,041	2,397	+ 21.6
Brewpubs	1,155	1,280	1,500	1,650	+ 12.2
LARGE NON-CRAFT	23	23	26	30	
OTHER NON-CRAFT	32	31	20	14	
Total U.S. Breweries	**2,456**	**2,917**	**3,722**	**4,269**	**+ 17.9**

https://www.brewersassociation.org/statistics/number-of-breweries/
Bart Watson, Used with Permission.

8) The Mirror: The Personal Perspective, Seeing the Invisible



Seeing the Invisible: Schlieren Flow Visualization



Adam Cole/NPR YouTube. Used with permission.
http://www.npr.org/2014/04/09/300563606/what-does-sound-look-like

Seeing the Sound of a Clap

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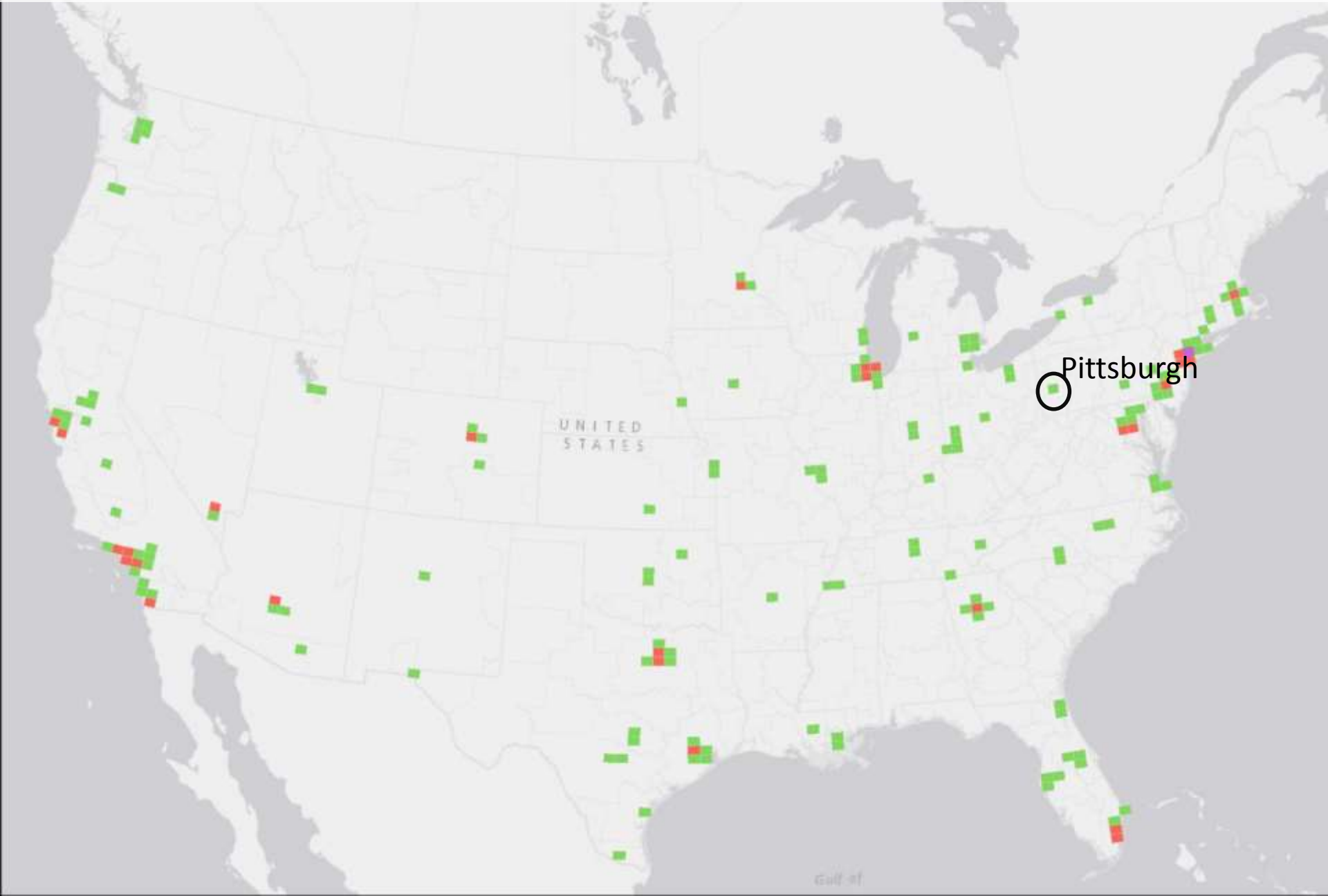
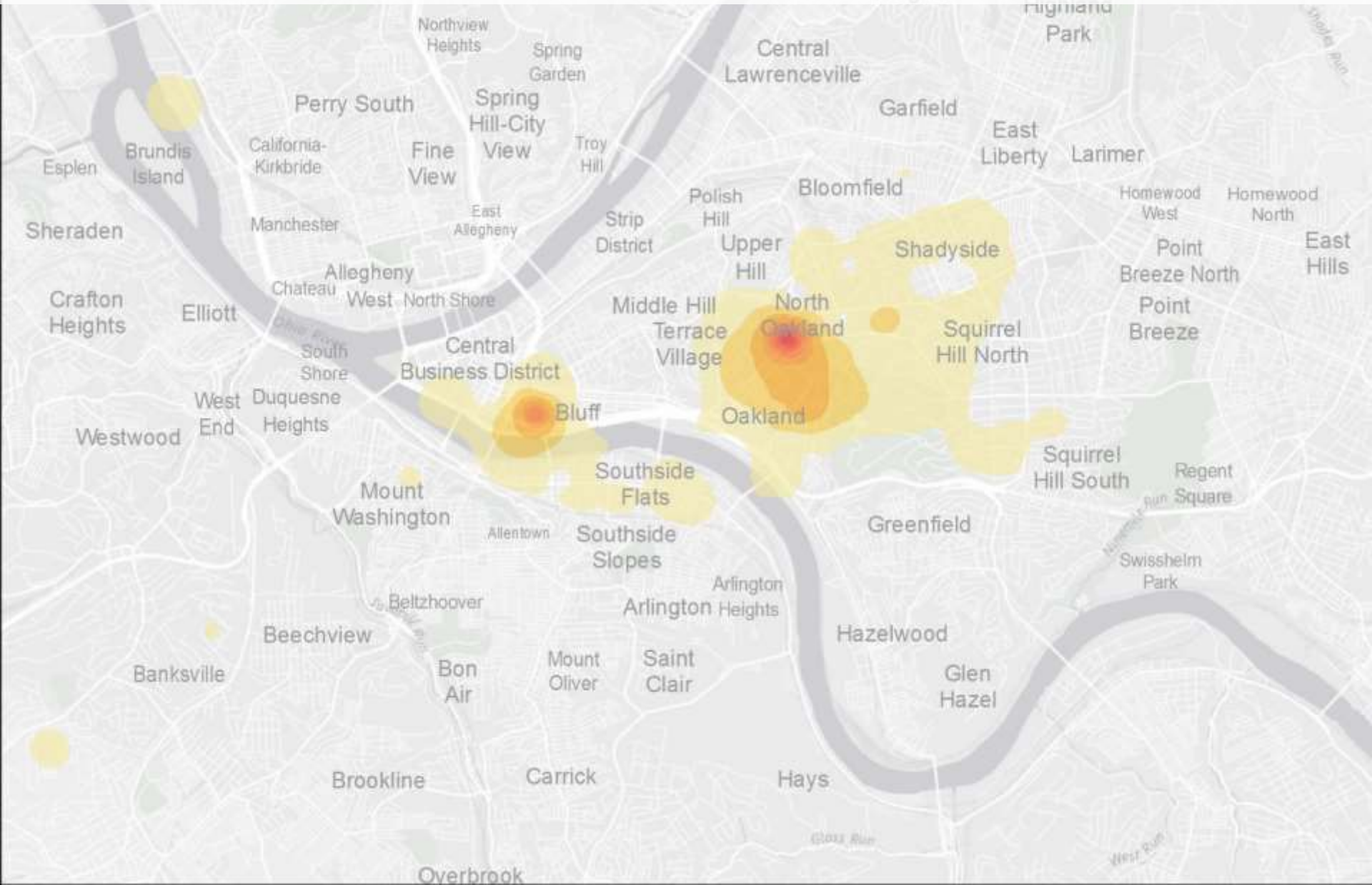
http://www.npr.org/2014/04/09/300563606/what-does-sound-look-like

Should a craft beer and pizza place open in my neighborhood?

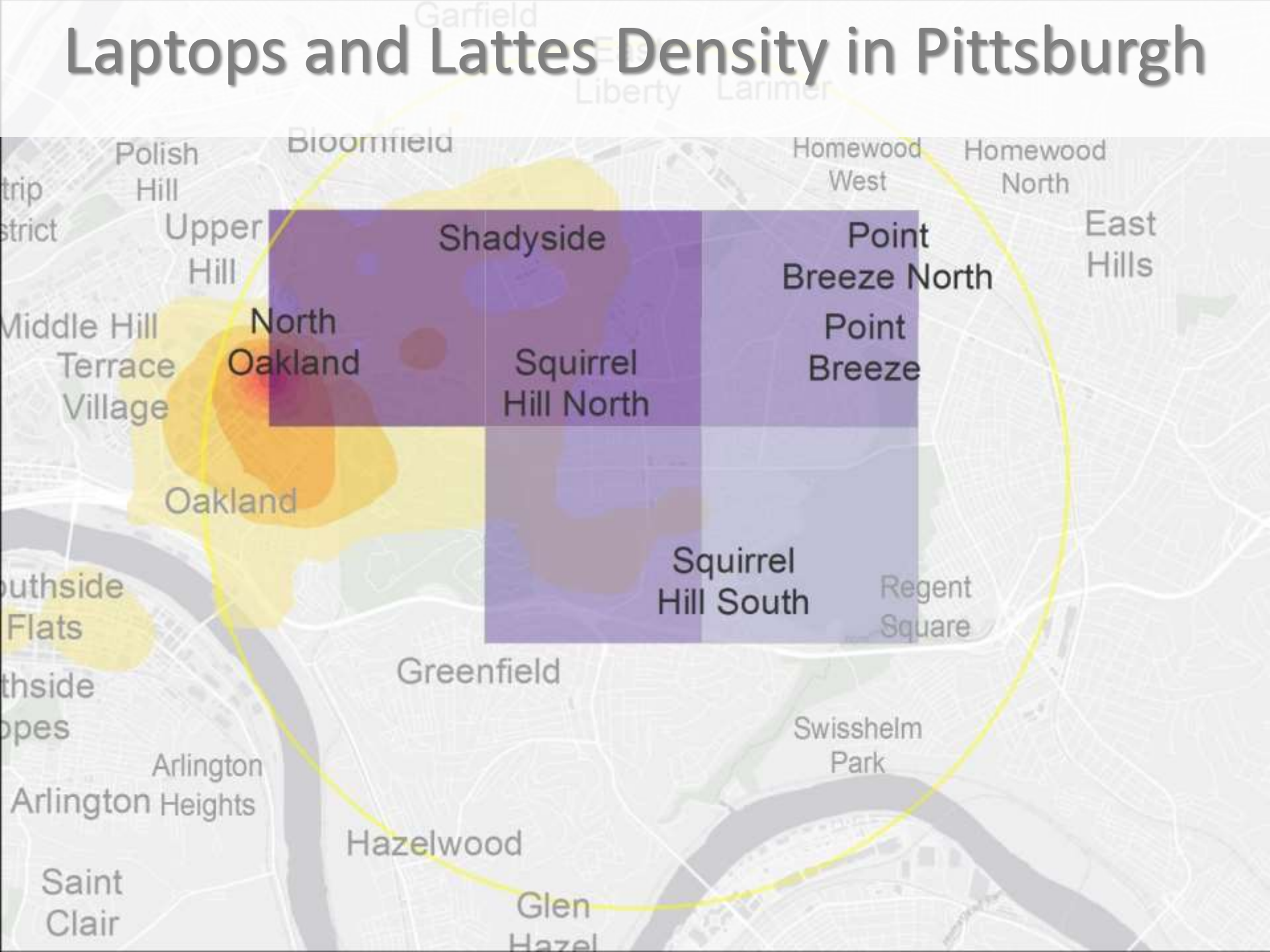
Grouping Analysis for Older Millennials



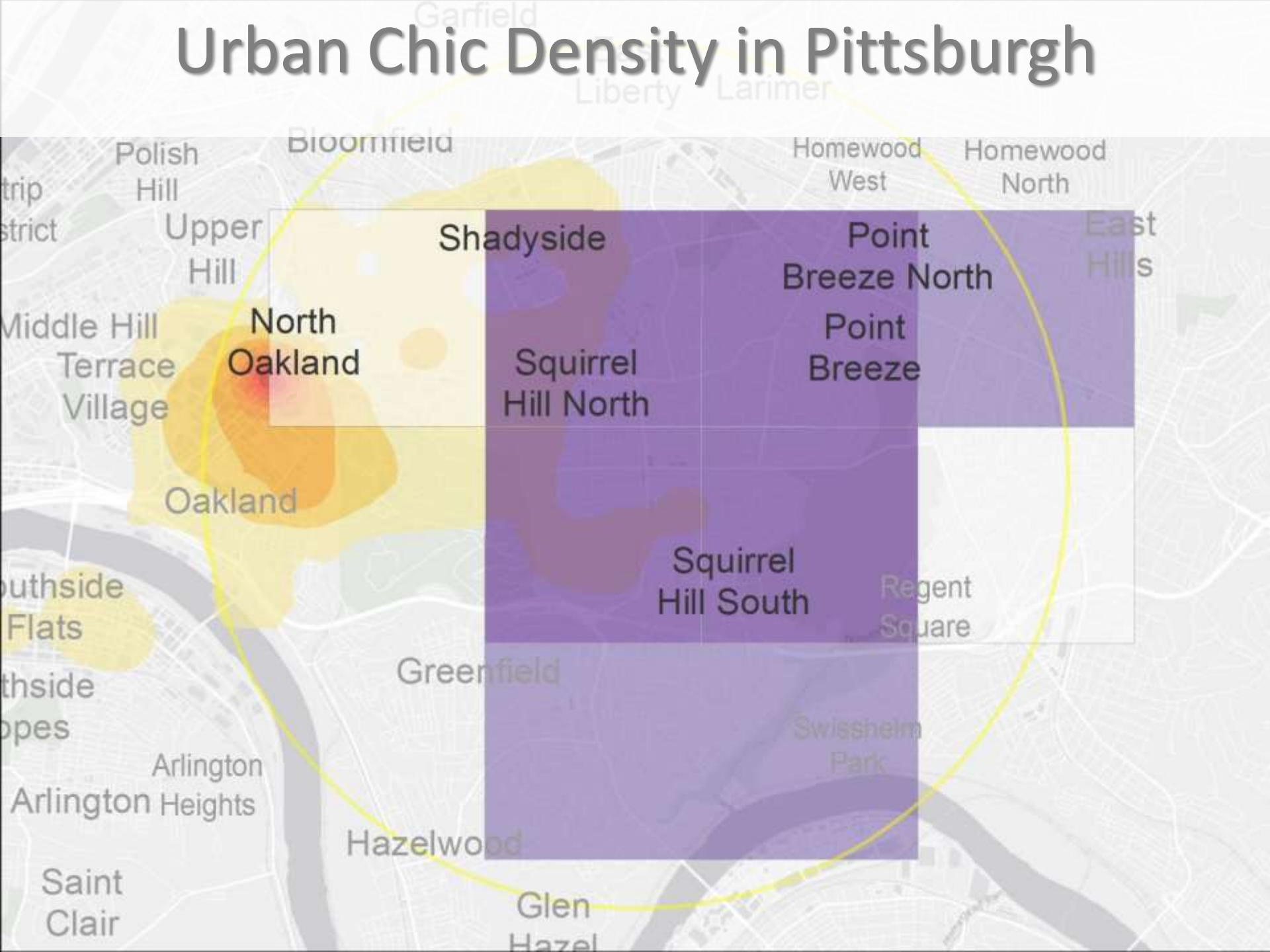
Millennial Density in Pittsburgh



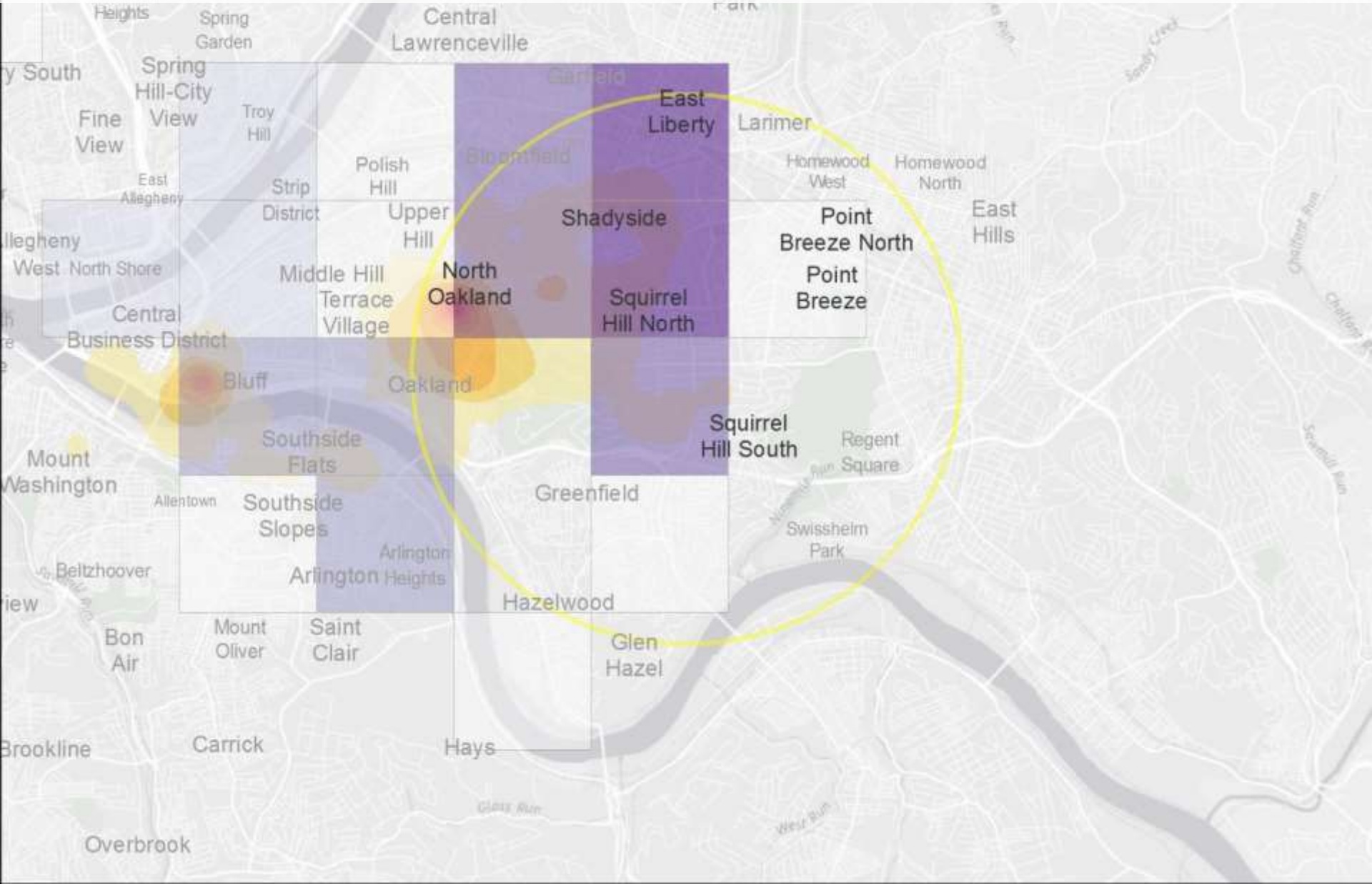
Laptops and Lattes Density in Pittsburgh



Urban Chic Density in Pittsburgh



Metro Renters Density in Pittsburgh



8 Scientific Tools – 8 Techniques for Benchmarking

1. The Mass Spectrometer (Parts of the Whole)
2. The Telescope (Zoom Out, Aggregation)
3. The Microscope (Zoom In, Individual, Specific)
4. The Scale (Show the Difference, Rank)
5. The Black Light (Understand the Outliers)
6. The Funnel (Combine & Intersect)
7. The Petri Dish (Change Over Time)
8. The Mirror (The Personal Perspective, Seeing the Invisible)

Benchmarking:
Starts with a PROCESS;
leads to an epiphany.

References

- Beazley, David. “The Forensic Photographer.” Online documentary video. http://www.beazknees.com/ Beazknees, March 2015. Web. All images used with permission. (Slide 3)
- Hubble Space Telescope. https://youtu.be/WNVY9BcIDok Mar 6, 2014. Standard YouTube license, Creative Commons. F. Summers (STScI) http://hubblesite.org/video/5/science Production date: May 20, 2011. (Slide 4-6)
- Author’s photo. (Slide 7)
- Ben Jones. Tapestry 2015 Short Stories - Ben Jones: "Seven Data Story Types". https://www.youtube.com/watch?v=sEZj-eUfbNo Published on Mar 13, 2015. (Slide 8)
- Michael Pereckas. https://en.wikipedia.org/wiki/Mass_spectrometry#/media/File:IonSpec_FT-ICR_(Fourier_transform_Ion_cyclotron_resonance)_Mass_spectrometer.jpg Uploaded December 23, 2010 Creative Commons. (Slide 9)
- https://en.wikipedia.org/wiki/Mass_spectrometry#/media/File:ObwiedniaPeptydu.gif Uploaded: November 19.20,5. GNU General Public License. (Slide 10)
- Florian Klauer. https://images.unsplash.com/27/type-set.jpg?ixlib=rb-0.3.5&q=80&fm=jpg&crop=entropy&s=0c0d7694be5d16aec2f65c99f075b432 Free photos. (Slide 11-12)
- Alex Franzelin. https://unsplash.com/photos/7HVGbM4JilI Free photos. (Slide 19)
- Greg Rakozy. https://images.unsplash.com/photo-1452611545118-2b35b308caf5?ixlib=rb-0.3.5&q=80&fm=jpg&crop=entropy&s=f7d930472b1c3a2e6d13098cbecd4006 Free photos. (Slide 20)
- NASA, ESA, K. Kuntz (JHU), F. Bresolin (University of Hawaii), J. Trauger (Jet Propulsion Lab), J. Mould (NOAO), Y.-H. Chu (University of Illinois, Urbana), and STScI. http://hubblesite.org/newscenter/archive/releases/2009/07/image/h/results/100/ (Slide 21)

References

- Acagastya. https://en.wikipedia.org/wiki/Microscope#/media/File:Compound_Microscope_(cropped).JPG Creative Commons. Created: 3 December 2014. Creative Commons. (Slide 30)
- © Giuseppe Porzani. https://stock.adobe.com/stock-photo/bilancia-di-precisione/49469340 Purchased image. April 21, 2016. (Slide 45)
- http://www.dea.gov/pr/multimedia-library/image-gallery/lab/analytical_balance_mettler_ae-260.jpg Public Domain. (Slide 46)
- Author's photo. (Slide 53-54)
- Andres Arango/Demand Media. Mark Heidelberger. "How to Make Things Glow in the Dark." http://www.ehow.com/how_4843493_things-glow-dark.html (Slide 53-54 - Photos are the authors, not from the website.)
- Author's photo. (Slide 57)
- Moomsabuy. http://www.freedigitalphotos.net/images/Science_g174-Mold_Colonies_In_Petri_Dish_p83272.html Published on May 16, 2012 (Slide 69)
- Bart Watson. https://www.brewersassociation.org/statistics/number-of-breweries/ Used with permission. (Slide 70-72)
- André Branco. https://unsplash.com/photos/OYcO1xSyrQ0 Free photos. (Slide 73)
- Adam Cole/NPR YouTube. http://www.npr.org/2014/04/09/300563606/what-does-sound-look-like Used with permission. (Slide 74-75) Also on https://aeon.co/videos/is-it-possible-to-see-sound-yes-but-it-takes-some-crafty-photographic-wizardry

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