

# Resilient Restaurants:

DISCOVERING THE FACTORS THAT LEAD TO WHICH  
RESTAURANTS STAYED OPEN OR CLOSED DURING  
THE COVID-19 PANDEMIC

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## **Introduction**

In early 2020, Wuhan China experienced a mass infection of SARS-CoV2 (hereinafter COVID or COVID-19). This virus soon spread around the world leaving a trail of destruction wherever it went. On 20 March 2020, the World Health Organization declared COVID-19 as a pandemic, (Adhanom, 2020). A pandemic is defined, as “an epidemic occurring worldwide, or over a very wide area, crossing international boundaries and usually affecting a large number of people” (Feinleib, 2001) COVID-19 will perhaps be the defining event for the 2020 decade. This monumental pandemic has affected nearly every person on earth in one way or another during the time of this study there has been almost 32 million cases with nearly 570,000 deaths. The future implications of COVID will be apparent in the coming years, but we do know that many different industries are affected. With over 100 countries currently under or having been previously under COVID related lockdowns or travel bans, traveling both internationally and domestically is down as a whole (Dunford et al., 2020). Airlines have seen a 94.3% shrink in revenue passenger kilometers based on April 2020 to April 2019 (The International Air Transport Association, 2020)

Given its reliance on human mobility the tourism industry and thus restaurants have been hit particularly hard (Yang et al., 2020). With the National Restaurant Association, estimating over 110,000 restaurants in the United States have closed and over restaurant sales falling over \$240 billion over the past year (National Restaurant Association, 2021) business owners need to have new updated information that was

published after or during COVID to be able to account for all the changes made in the past year. In Arizona, around 10-12% of the 10,000 restaurants have closed which is up from the yearly average of 2-3% (Sanders, 2020). Many factors determine whether a small business will be successful such as financial conditions (Yang et al., 2020) and survive another major world event. Location is a factor that needs to be taken into consideration. In the beginning of the pandemic, the total amount of miles driven dropped by 40-65% (Nendorf et al., 2020) see Figure 1, with more and more people wanting to stay home or close to home. A study done in 2011 found that “Buffers of 1 or 2 miles around the home covered 55% to 65% of visited food establishments” (Liu et al., 2011), there has not been a new study to see how this has been affected by COVID. With this information, a 1-mile radius will be used for this analysis. I argue in this paper that in the Phoenix Metro area (hereinafter Phoenix or the Valley) restaurant closures were not as severe in census tracts that were predominantly mid to high capacity multifamily housing (majority of housing units with 20-50+ units).

## Americans Are Starting To Drive More Miles After Drop In March

Data from Arity, a mobility data analytics company, shows a significant drop in total miles driven in March, followed by a slight increase in late April. Day-to-day variations in mileage have been removed and normalized to numbers from Feb. 2, before the crisis began. Predicted figures show Arity's projections of what would have happened without the COVID-19 pandemic.

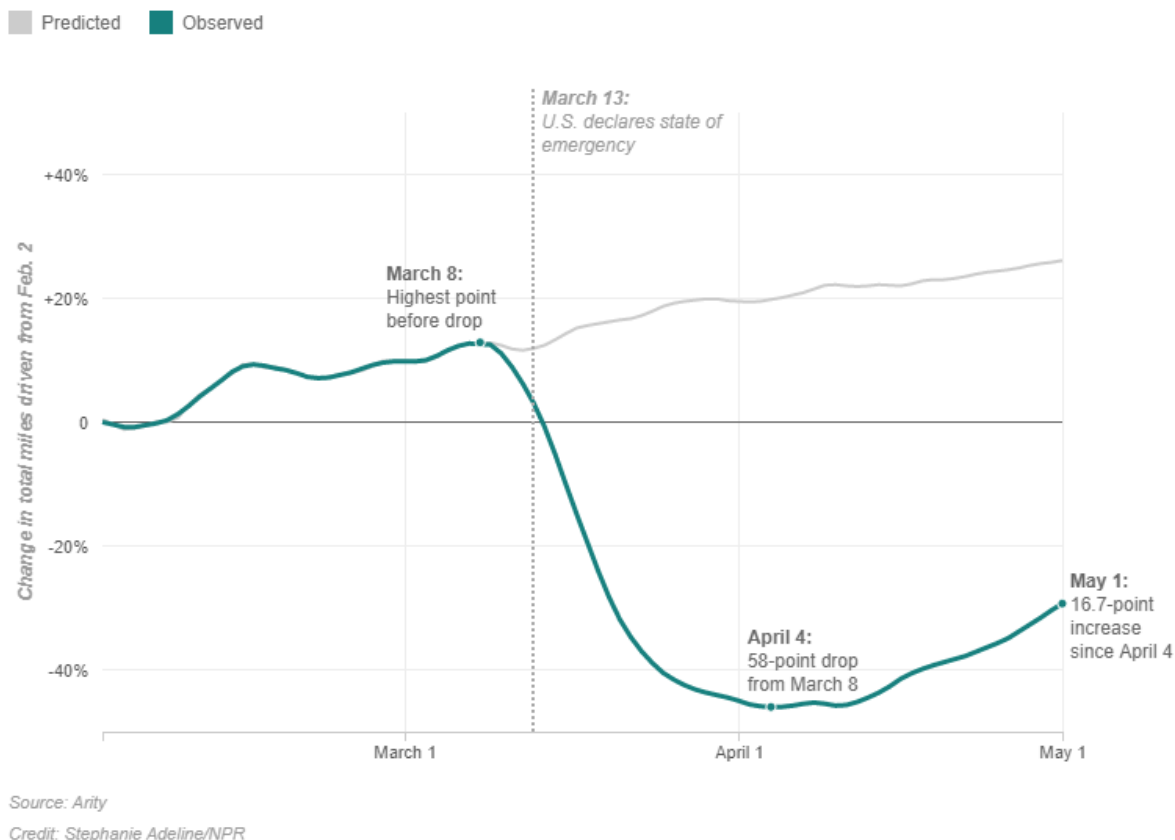
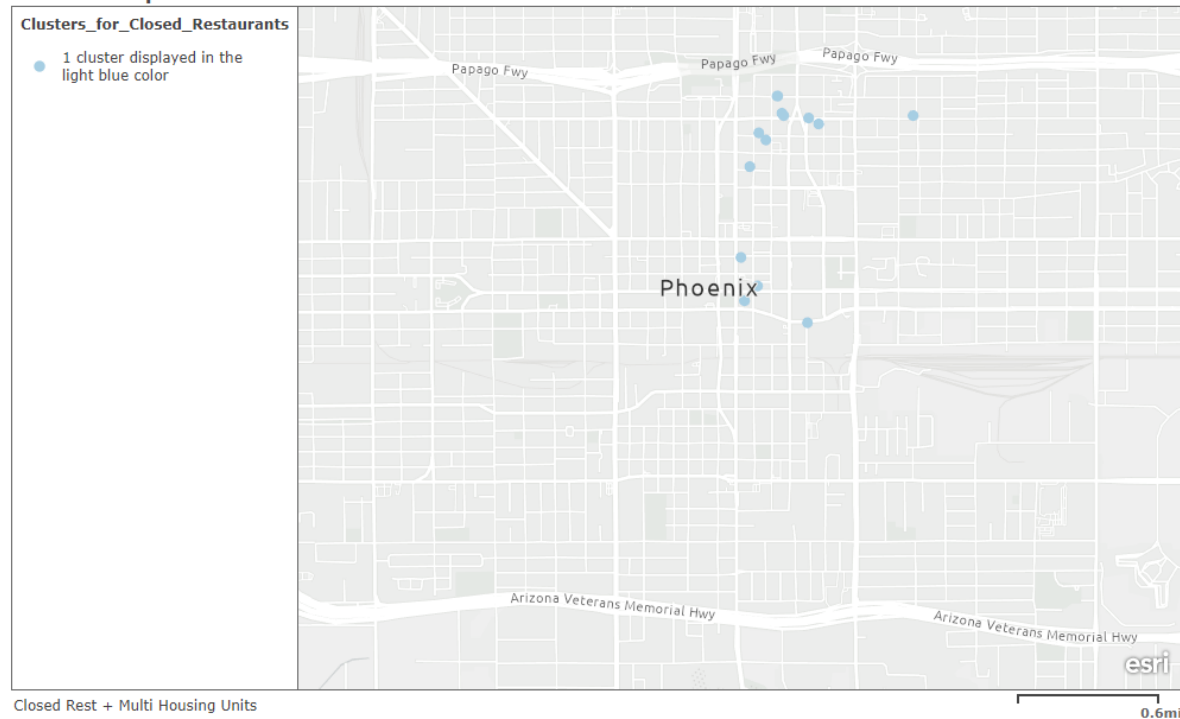


Figure 1: Driving Statistics for 2020

In Phoenix 90 restaurants closed from 3 March 2020 to 16 March 2021, all of which cited COVID as the predominant reason for closure (Cusimano, 2021). These restaurants were a mix of cuisines from casual burger spots to steakhouses and small bites. By creating a spreadsheet of all these restaurants with their addresses, and thus geocoding that spreadsheet became a point shapefile, which will be available for future use. By analyzing that data and using the cluster function on ArcGIS Online it was apparent that there was only one cluster of restaurants (cluster is to be defined for this

study as five or more restaurants within a half-mile radius). This area of downtown Phoenix was also a hotspot (See Figure 1 and 2). The goal for this paper is prove that the majority of restaurant's that closed during the pandemic were in census tracts that are predominantly low-capacity housing.

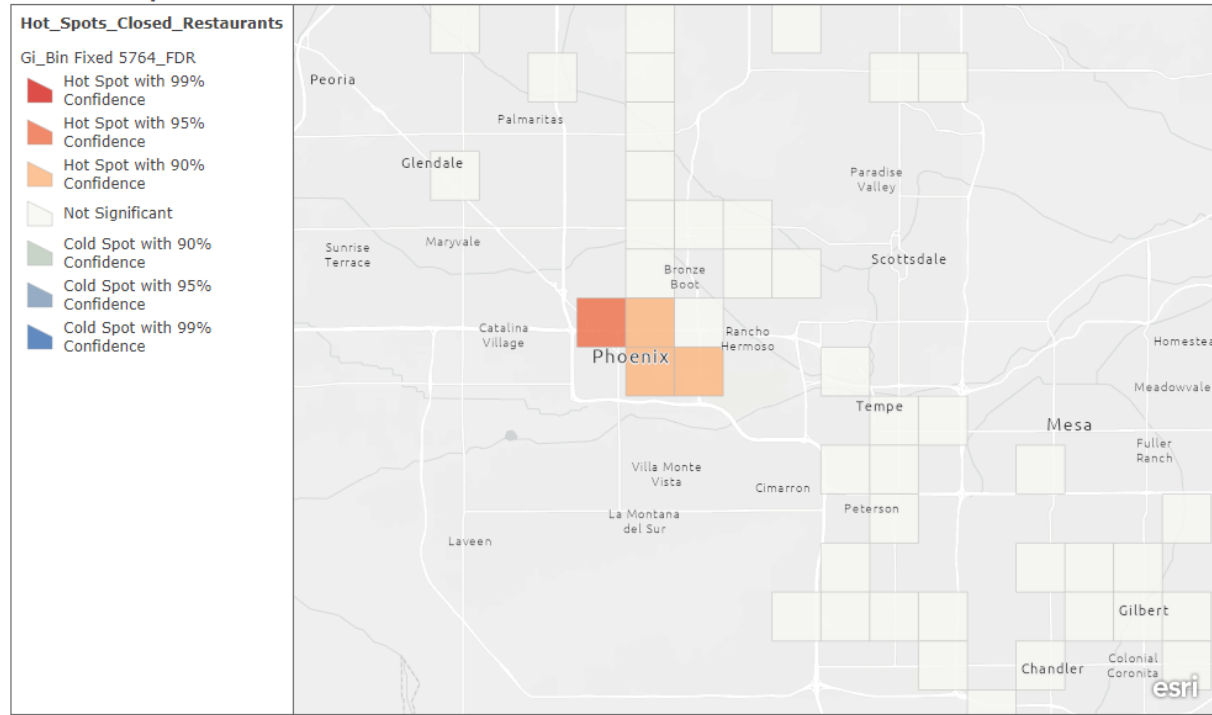
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*Figure 2: A Cluster (5 of more Locations within a half- mile Radius) of Closed Restaurants in Downtown Phoenix*

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Closed Rest + Multi Housing Units

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Figure 3: A Hotspot of Closed Restaurants in Downtown Phoenix

### Data and Methods

Data Layer	Data Type	Coordinate System
Closed restaurants	Vector - Point	WGS 1984 Web Mercator (auxiliary sphere)
Predominant Housing Structure Type by Tract, 2012-2016	Vector - Point	WGS 1984 Web Mercator (auxiliary sphere)
Census Tracts	Vector - Line	WGS 1984
Basemap	Vector Tile Service	WGS 1984 Web Mercator (auxiliary sphere)

Using census data in correlation with the proximity to closed restaurants was the analysis that ran. By using census data, mapping the predominant housing capacity of

each census tract was used heavily within this analysis. Living Atlas contributor Diana Clavery (username dianaclavery\_uo) had already geocoded and mapped this information from the Census Bureau (2012-2016). As we see in Figure 3, the majority of the United States is predominantly single-family homes. However when this data is adjusted it to fit into the study area it begins to diversify. See Figure 4 for a layout of the Predominant Housing by Capacity by Census Tract, Figure 4.1 Includes the census tracts for the study area.

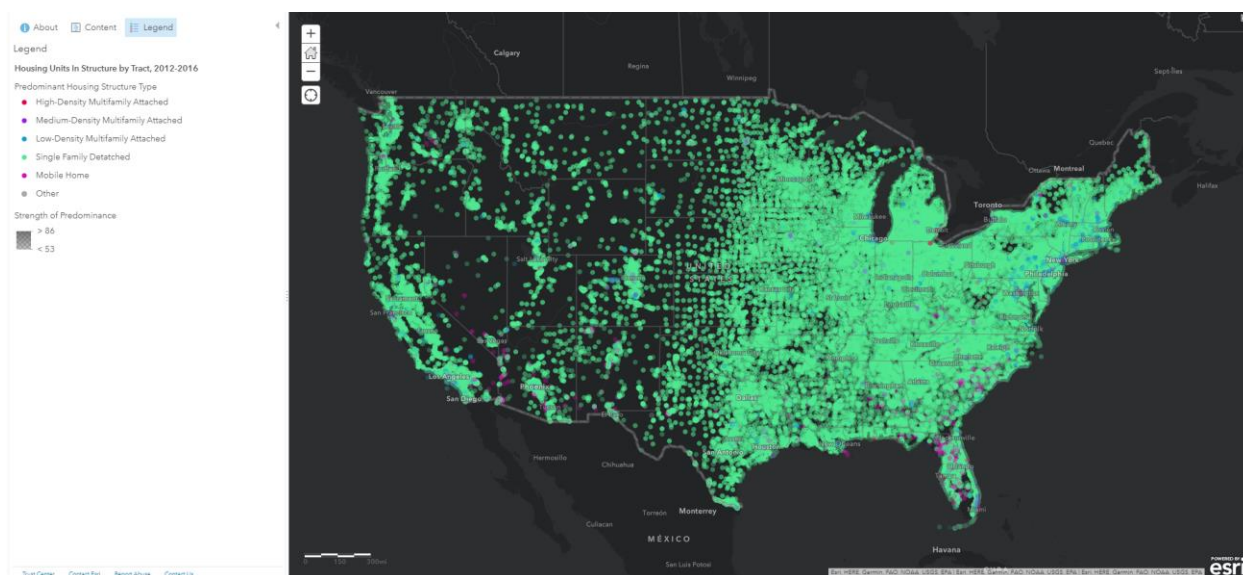
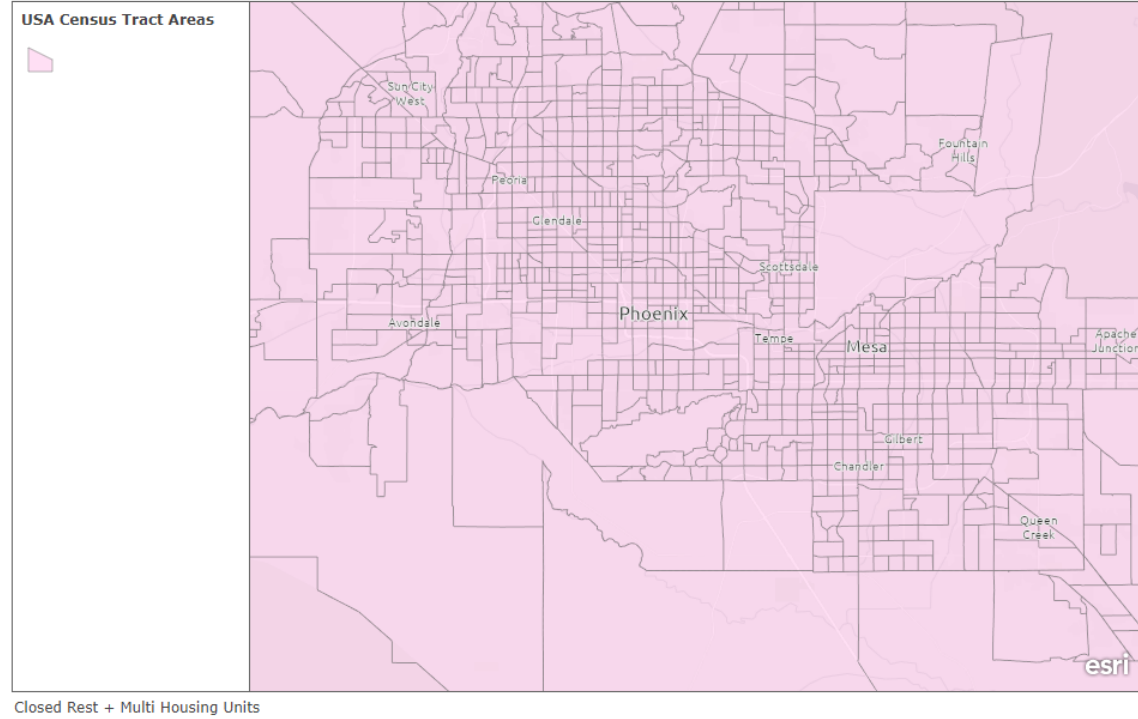


Figure 4: Predominant Housing Structure Type by Tract, 2012-2016 By: Diana Clavery

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*Figure 5.1: AZ Census Tracts*



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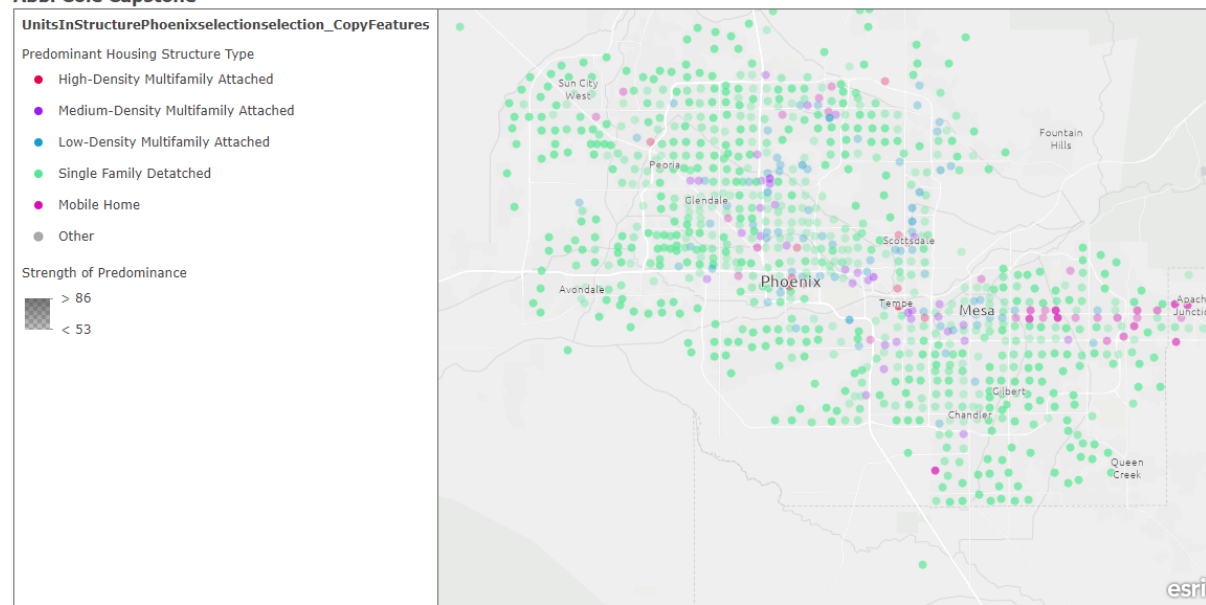
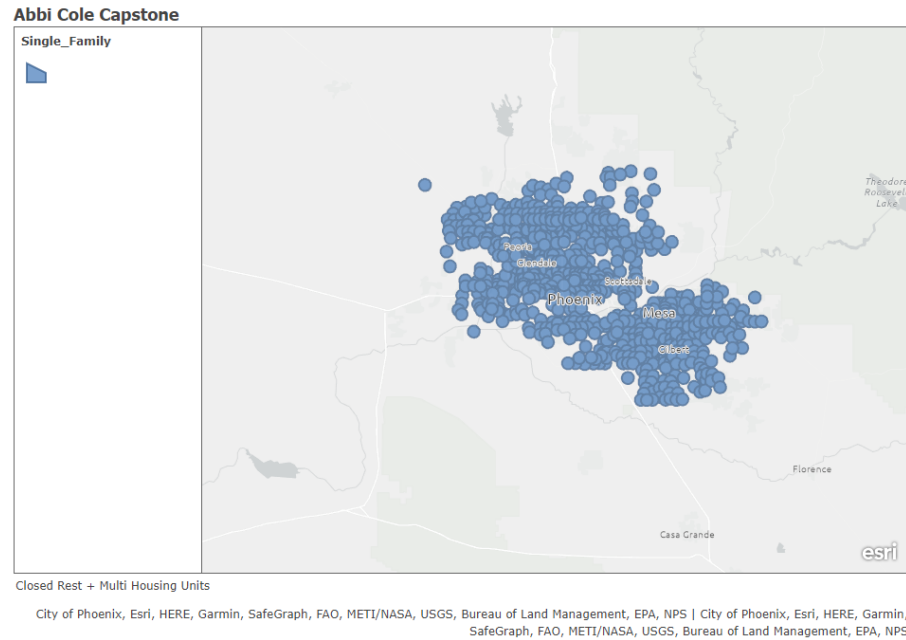


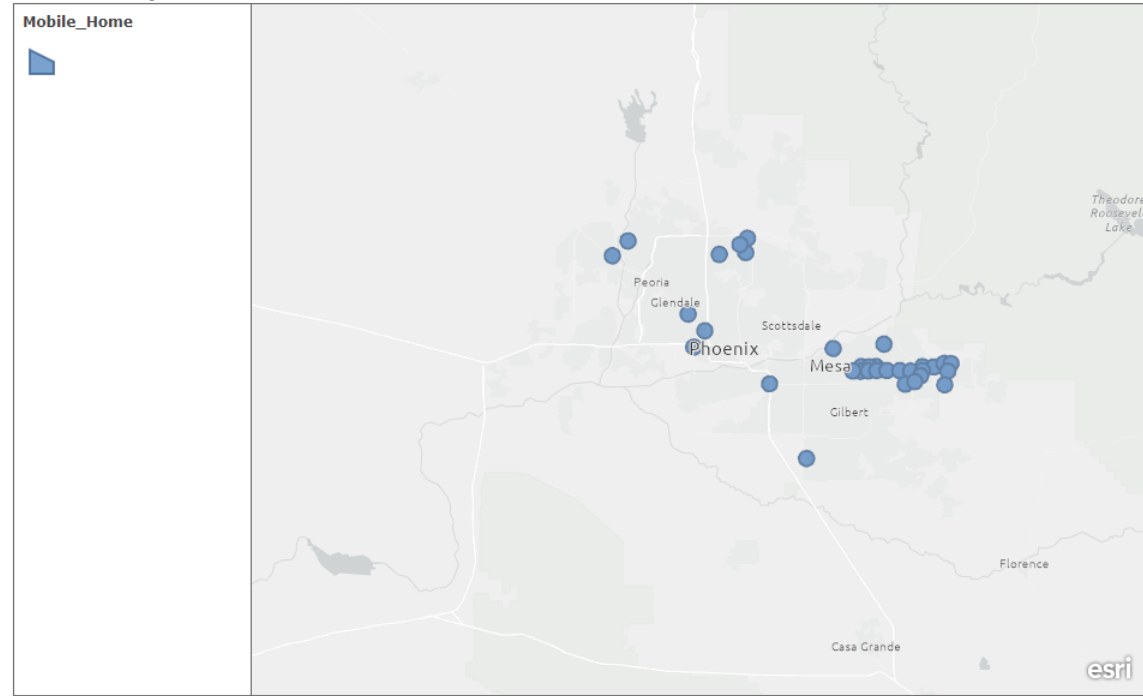
Figure 6; Predominant Housing Type in Phoenix

While the majority of the census tracts do have a majority of single-family homes, we do see more tracts that have low to high-capacity housing areas the further we zoom into the Phoenix area. By then separating the predominate housing types and extracting those performing an analysis will be more precise. Since a point feature represents each tract, adding a buffer of 1 mile around the census tract points helps visualize those people who live in the tracts. This was done because studies have shown that “Buffers of 1 or 2 miles around the home covered 55% to 65% of visited food establishments” (Lui et al, 2015). Each predominate housing type is given its own layer for the analysis

(Figure 6-10). Using the Summarize Within Tool counting the restaurants within each tract buffer was the next step.



*Figure 7: Census Tracts that are Primarily Single Family Residences with a 1-mile Buffer*

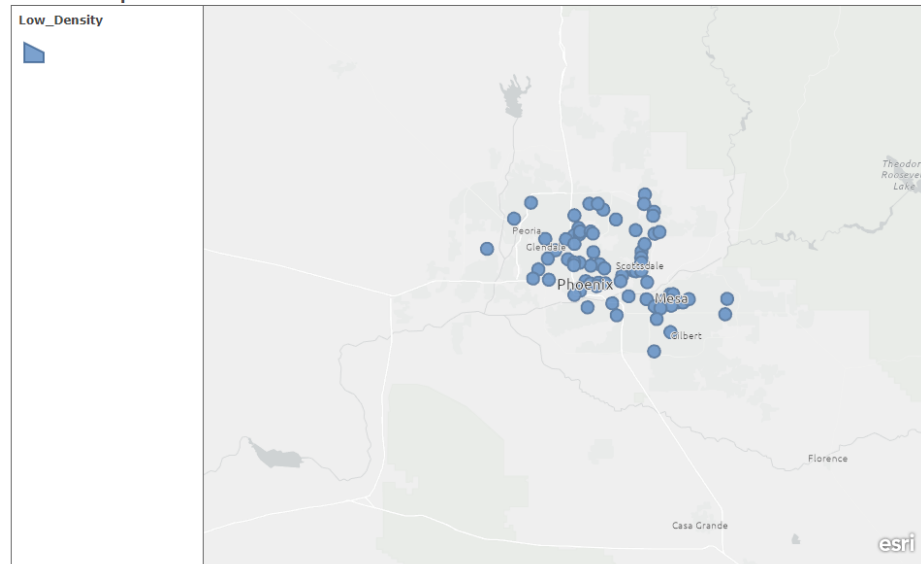
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Closed Rest + Multi Housing Units

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*Figure 8: Census Tracts that are Primarily Mobile Homes with a 1-mile Buffer*

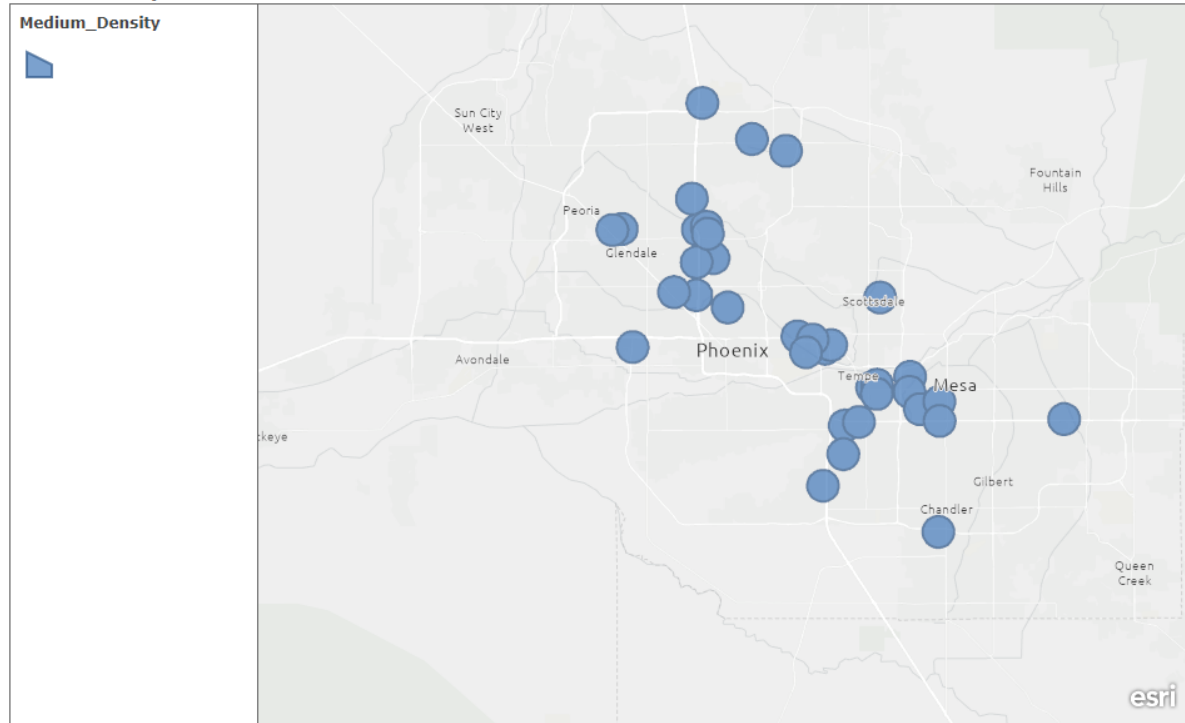
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Closed Rest + Multi Housing Units

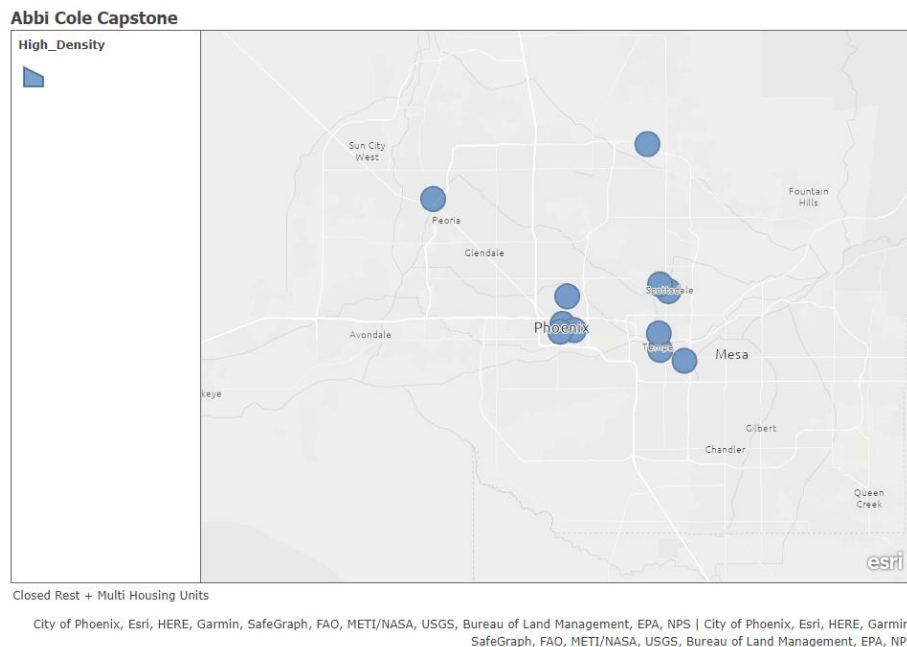
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*Figure 9: Census Tracts that are Primarily Low Density (2-19 Units) Residences with a 1-mile Buffer*

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*Figure 10: Census Tracts that are Primarily Medium Density (20-49 Units) Residences with a 1-mile Buffer*



*Figure 11: Census Tracts that are Primarily High Density (50+ Units) Residences with a 1-mile Buffer*

Location is not the only factor when it comes to a successful restaurant so the data that populated from the analysis is not a defining factor for whether or not a restaurant would stay open, however this information if made available to future restaurateurs may prove to be beneficial.

The extent of the study is major cities within the Phoenix Metro Area, which is defined as the entirety of Maricopa County and Pinal County (See Figure 11). However, for this paper I chose not to go any further north than Peoria, any further west than Glendale, any further south than Chandler and any further east than Apache Junction. By regulating the data constraints, the data will be more concentrated and will be less

likely to have outliers. The theme of the paper is public health data along with service industry. While the primary lens is that of business/service industry, public health does play a big part because a large public health issue caused the data that is used. The timeframe of the data collected is from March 2020 to March 2021, which is the start of the pandemic to the current timeframe.

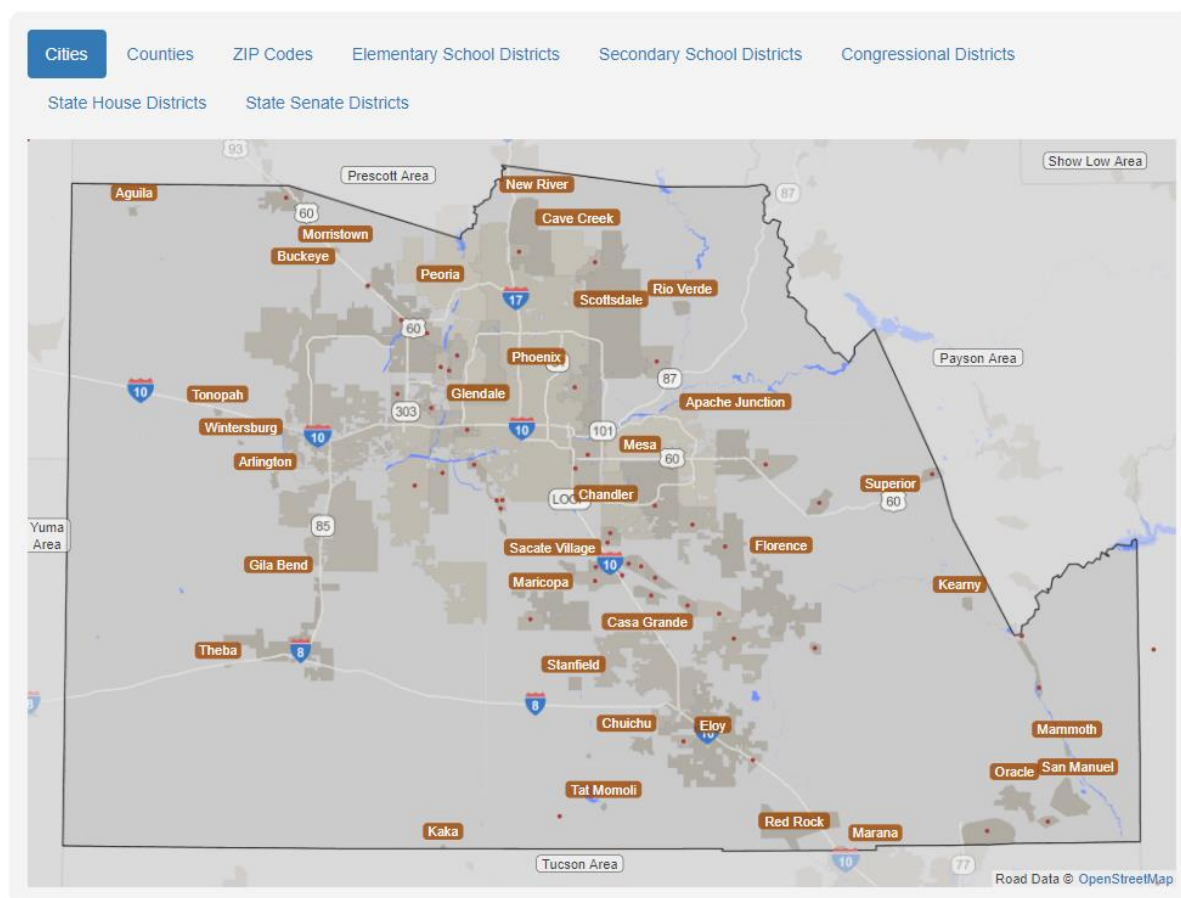


Figure 12: Phoenix Metro Area

For the analysis, the Proximity Toolset was used available on ArcGIS Pro (ArcGIS Pro 2.7) which “contains tools used to determine the proximity of features within on or more

feature classes or between two feature classes). Within this toolset, the Buffer tool to create buffers around the census tracts. Using the Summarize Within tool in ArcGIS Online (ArcGIS Online 2.16) closed restaurants were analyzed within the buffers of the census tracts. In my initial analysis I also used a the Generate Near Table which calculated distances and other proximity information however I found that using this data was a bit too convoluted and did not include the results in my final analysis.



## Results

After running the analysis, I could not conclude on my hypothesis and more analysis is in order. By comparing the single-family tracts (Figure 12) with the high-capacity tracts with (Figure 18) the average point count (closed restaurants) for each census tract is much higher for the high-density housing than compared to the averages for the census tracts with single family. Low density and medium density housing tracts are represented in Figures 14- 17. The count for the single-family tracts is much higher than the high density. For this analysis we used 866 census tracts of which 707 were predominantly single family and 11 were high density. The number census tracts that had a closed restaurant were 125 for single family and 6 for high density. Making the percentage of census tracts that had a closed restaurant 17.68 for single family and 54.55 for high density. The chart below shows the results for all housing types. The data from this chart is collected from the statistics for each of the final layers (Figures 13, 15, 17, and 19)

	Single Family	Low Density	Medium Density	High Density
Number of Tracts	707	75	35	11
Number of Tracts that have a closed Restaurant	125	22	11	6
Percentage	17.68%	29.33%	31.43%	54.55%
Total Number of Restaurants within the Buffer Zone for all Census Tracts (Sum)	209	67	12	40
Average per tract	0.29	0.89	.34	3.63

These results show the inverse of what I was expecting. I would like to take these results and compare them to the percentage of existing/open restaurants to understand the percentage of restaurants closed with comparison to overall restaurant capacity. However, currently I do not have access to that data. Prior to making a conclusion that analysis needs to be completed to have a better understanding of the density of existing restaurants in the Phoenix area.

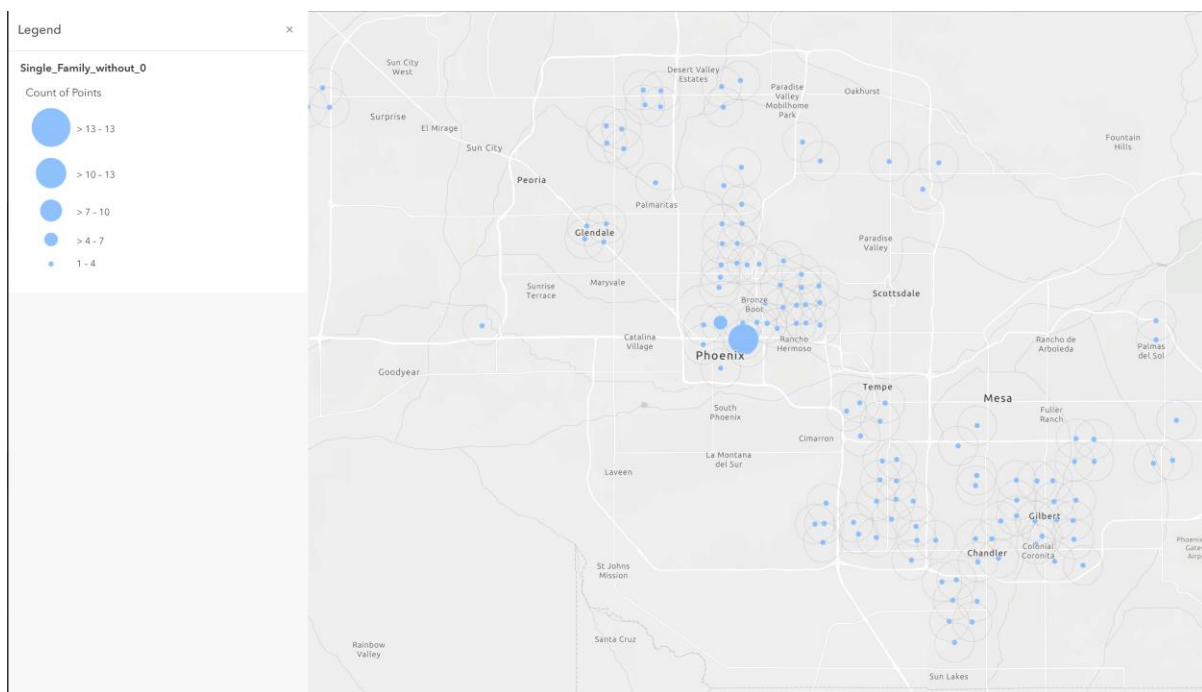


Figure 13: Census Tracts with Single Family Predominance Showing how many Closed Restaurants are within 1 mile

Count of Points

Point\_Count

Field value type has not been set.

Sample value

1

Statistics

Number of records

125

Sum of values

209

Minimum

1

Maximum

13

Average

1.67

Standard deviation

1.41

Number of empty records

0

Figure 14: Statistics for Census Tracts with Single Family Predominance Showing how many Closed Restaurants are within 1 mile

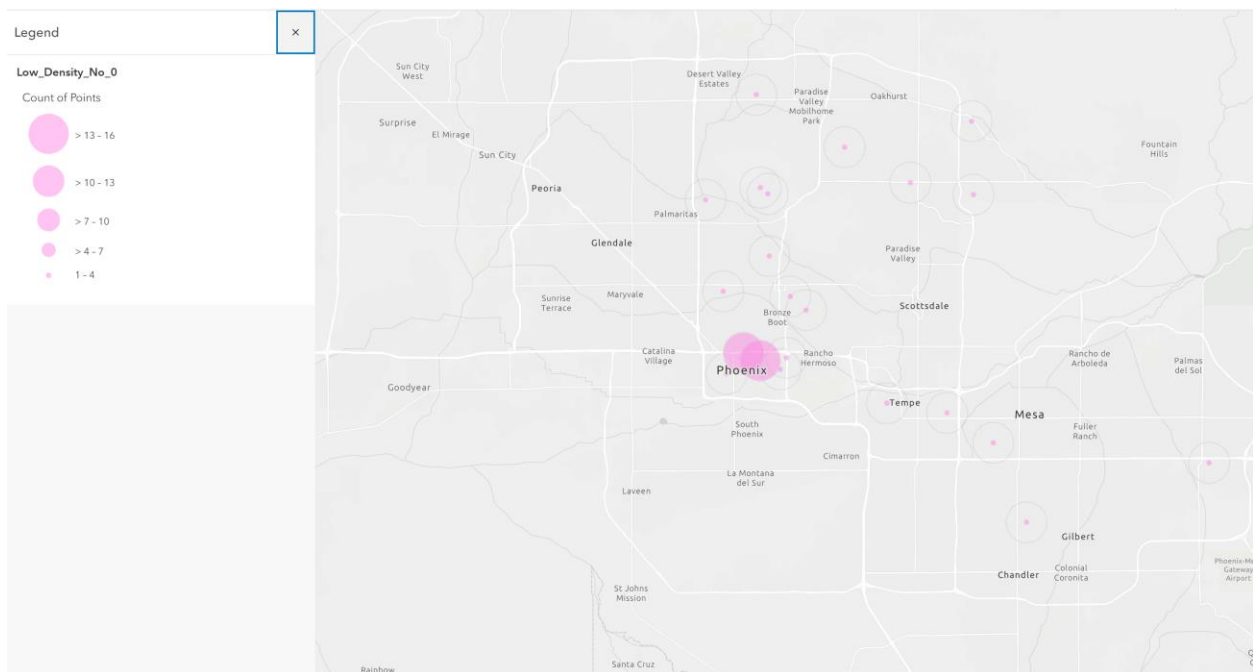


Figure 15: Census Tracts with Low Density Predominance Showing how many Closed Restaurants are within 1 mile

Count of Points	
Point_Count	
Field value type has not been set.	
Sample value	
1	
Statistics	
Number of records	22
Sum of values	67
Minimum	1
Maximum	16
Average	3.05
Standard deviation	4.31
Number of empty records	0

Figure 16: Statistics for Census Tracts with Low Density Predominance Showing how many Closed Restaurants are within 1 mile

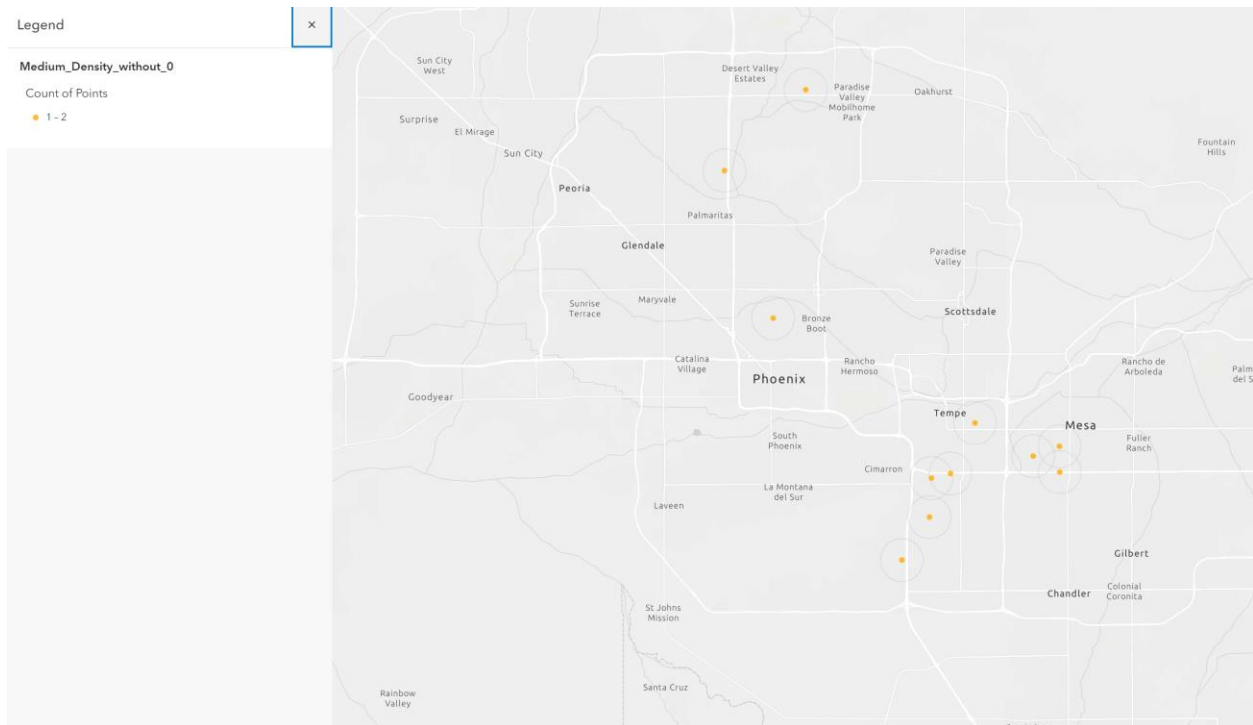


Figure 17: Census Tracts with Medium Density Predominance Showing how many Closed Restaurants are within 1 mile

Count of Points	
Point_Count	
field value type has not been set.	
Sample value	
1	
Statistics	
Number of records	11
Sum of values	12
Minimum	1
Maximum	2
Average	1.09
Standard deviation	0.3
Number of empty records	0

Figure 18: Statistics for Census Tracts with Medium Density Predominance Showing how many Closed Restaurants are within 1 mile

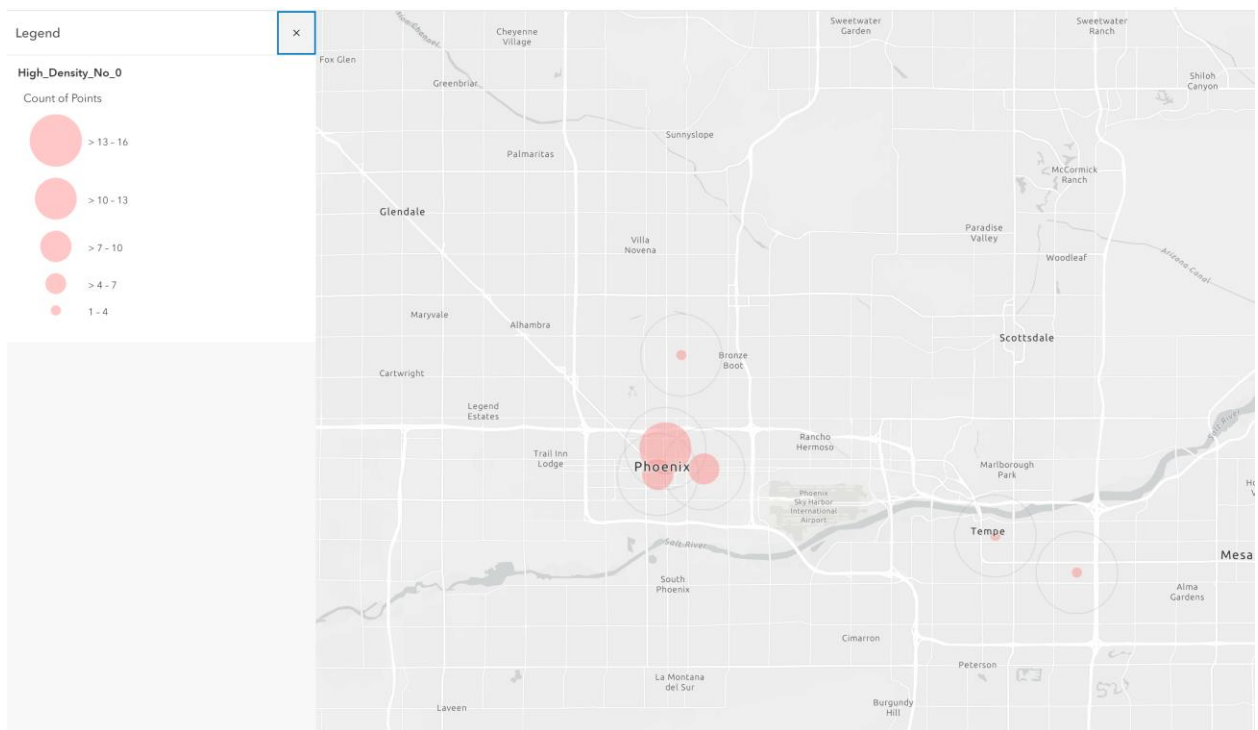


Figure 19: Census Tracts with High Density Predominance Showing how many Closed Restaurants are within 1 mile

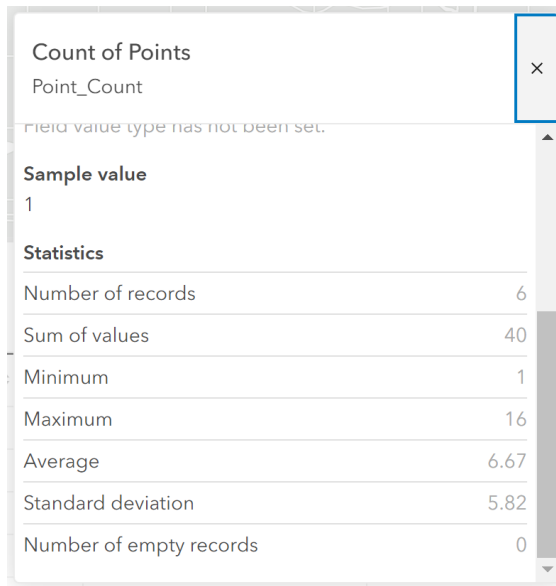


Figure 20: Statistics for Census Tracts with High Density Predominance Showing how many Closed Restaurants are within 1 mile

## **Conclusion**

Analyzing closed restaurants within the Phoenix area in conjunction with predominant housing capacity by census tracts did lead to an inverse correlation between the two.

Some issues that arose involve using external data that created into a map previously. Looking into the meta-data and looking at the coding they used is critical to being able to use the data for yourself, and being able to reapply the analysis they made if needed. During this process, multiple analysis techniques were tried such as buffer the restaurants instead of the census tracts or using the Generate Near Table. All of which did not provide acceptable results.

If I were to redo this study, I would do one of two things. I would either include multiple metropolitan areas to get more robust results to make a definitive conclusion or I would get data that includes all restaurants in Phoenix, but with over 10,000 restaurants (Sanders, 2021) in Arizona (there is not a definitive count for Phoenix area restaurants) that is a feat I was not able to tackle by myself. However, my analysis is a good starting point for continuing this study. As the months go on COVID will continue to change the service industry and studies on the effect will need to continue.

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