Deciding on a New Restaurant for Johnson City, Tennessee

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Introduction and Business Problem

Our Task

We are tasked with gathering information on the downtown restaurant market in Johnson City, Tennessee. The business problem that we want to solve is providing foundation data for deciding if opening a new restaurant in downtown Johnson City would be advisable.

This primary user for this report is a restauranteur who has a broad range of skills, experience, and cuisine tastes. The user should have a working knowledge of the general restaurant market in Johnson City.

We feel that we will sufficiently solve out problem when we answer the following questions:

- How many venues are there in downtown Johnson City?

- What categories make up the venues and how many are there?

- Where are they located?

- What do the venues look like visually?

- How many restaurants are there in downtown Johnson City?

- Where are they located?

- What are key details of these restaurants?

- What are the key economic indicators for the area?

- How do those key economic indicators compare to the entire state?

About Johnson City

Johnson City, Tennessee was originally settled by William Beam, Tennessee's first colonizer, in 1768 when he built his cabin along Boone's Creek. The city itself was officially founded in 1856 by Henry Johnson as a railroad station. The city quickly emerged as a major rail hub for the southeast U.S. And in 1869, it was officially incorporated.

Today, Johnson City is best known as a gateway to the important lake and mountain recreation areas of the region. In addition, it is home to East Tennessee State

University, a major medical school, and a teaching hospital. Siemens, Eastman Chemical, and American Water Heater are home to Johnson City.

Johnson City is located in the upper East Tennessee Valley against the ridge of the Appalachian Mountains. The area enjoys four pronounced seasons. And while topography is variable – which can influence weather – in general winters are mild except in the higher environs.

Limitations

We looked at our job as providing foundation data for more research. We believe this report – along with its data analysis -- is a good building block for more extensive research on whether or not to open a new restaurant in downtown Johnson City. As a result, the user of this report should use it along with other financial, marketing, and strategic reports.

Data Sources

Our sources of data included Foursquare API, the U.S. Census Bureau, and on-the-ground experiences of the author.

Foursquare API

Foursquare is a location technology platform that provides developers with data about venues, users, ratings, and tips. The company is popular among developers and has more than 150,000 partners, including Apple, Samsung, and Twitter.

That data provided by Foursquare was broad and deep. It is organized through Endpoint Groups, which include venues, users, tips, checkins, and others. Regular endpoints include basic data like category, ID, name, and location. Premium endpoints include ratings, URLs, photos and others. Our data was collecting using the "venue" endpoint group and the "search" endpoint. Accessing the data was provided by typical API with credentialing.

Site: https://foursquare.com/

U.S. Census Bureau

The U.S. Census Bureau is the federal government's largest statistical agency. It is tasked with provided high quality data about the U.S., including its people, businesses, and economy.

We utilized a section of the Census Bureau's site called QuickFacts. This interface allowed us to gain a broad range of data on Johnson City, Tennessee and the State of

Tennessee. From population and race to education and the economy, we were able to collect key data that we thought was most germane to our task at hand. Accessing the data was provided by a csv download from the U.S. Census Bureau website.

Site:
https://www.census.gov/quickfacts/fact/table/johnsoncitycitytennessee,TN/PST045219

On-the-Ground Experiences

The author used to work in Johnson City when he lived in nearby Asheville, NC. In addition, he has visited the city on numerous occasions. Through these experiences, he can attest to the general makeup of downtown Johnson City, including a high-level view of its businesses, development, and overall trendiness. Theses experiences helped to organize and color the conclusions in this report. However, no hard data was collected and used.

Jupyter Notebook

The coding for this project is housed in a Jupyter Notebook, created in Jupyterlab.

Data Wrangling

Foursquare API

Raw data from Foursquare had to wrangled and cleaned.

The setup process for opening a developer account at Foursquare was straight forward. While a sandbox account would have given us data access, by adding a credit card we gained access to a personal account. This gave us access to 99,500 regular calls/day and 500 premium calls/day. In general, we found this access to be more than sufficient for our analysis.

Once credentialing was complete, we experimented with a variety of search calls from the venues endpoint group.

We decided our first job was to build a dataframe of all venues within 1,000 meters of downtown and a maximum of 500 results. To determine the precise location of downtown, we used an address web search. The result was 300 E Main St, Johnson City, TN. We then input the data into geopy. With that latitude and longitude information, we were able to provide sufficient parameters to the Foursquare API to produce results. This 1,000-meter radius of downtown is our target area.

We extracted the relevant part of JSON from the Foursquare API and created a filtered dataframe of all venues within our target parameters. Our results included a total of 123

venues in our target area from a wide range of categories, including restaurants, nightclubs, bridal shops, and businesses. In addition, we used 15 features, including name, categories, and address. We felt these were sufficient for our analysis.

With that our all venues dataframe in hand and our first job complete, we felt our second job was to produce a second dataframe of restaurants. We were able to use the existing JSON that we used for the all venues dataframe. We then filtered the results by the search parameter "restaurants of the categories feature and created a new dataframe. Our results included six restaurants with the same 15 features as the all venues dataframe. We felt these were sufficient for our analysis.

In addition to these dataframes, we also produced a folium map and bar plot of all venues and a folium map of restaurants within our target area. These were created to help visualize the results.

We also exported the restaurant dataframe to an excel file. We felt this would be a plus for the user.

We will discuss our analysis of the these dataframes, bar plot, and folium maps in the sections below.

U.S. Census Bureau

Raw data from the U.S. Census Bureau had to wrangled and cleaned.

The U.S. Census Bureau has a fairly friendly user interface. By navigating to the QuickFacts section, we simply input search criteria for Johnson City and the State of Tennessee. At this point, we could have filtered the results, but we wanted the entire dataframe to come over to our notebook for analysis. So, we exported the entire file to csv and then read it into our notebook.

The data came with long feature names, null values, unusable characters, and string values with unusable characters. We dropped records with null values or unusable characters. We also replaced a variety of unusable string characters in the "numeric" data so that we could properly convert them to usable numeric data (floats).

We then decided on three data points that were most vital to our analysis and created a new dataframe included just those data points. We also changed their names. And since these were significant changes in the feature string labels, we have summarized the changes in the table below:

Original Feature Name	New Feature Name
Per capita income in past 12 months (in 2018 dollars), 2014-2018	income_per_cap
Total retail sales per capita, 2012	retail_per_cap
Median value of owner-occupied housing units, 2014-2018	avg_house_val

In addition to this dataframe, we also created a bar plot of the key indicators and how they compared between Johnson City and the State of Tennessee.

We will discuss out analysis of this data frame and bar plot in the sections below.

Methodology

The problem we were tasked to solve was straight forward:

Provide foundation data for deciding if opening a new restaurant in downtown Johnson City would be advisable. And if it were, where should it be.

So, as we begun our journey, we wanted to take a look at what was existing in downtown Johnson City. We knew that would be an important first step. As we put our dataframes together, we discovered that there were 123 venues in downtown Johnson City. And just six of those were restaurants.

We knew that a population of six observations wasn't going to support predictive analysis. Plus, the data points themselves were not robust or informative enough to support predictive modeling.

As a result, we concluded that our best approach was use our data for exploratory data analysis and provide a good foundation for more research in different sub-domains, such as finance, marketing, and culinary strategy.

With our approach of exploratory data analysis, we felt that we should lean heavily on clean dataframes and visualizations. As a result when we look at the results of our analysis in the following sections, we'll see that dataframes and visualizations are used for three key areas, including all venues in Johnson City, restaurants in Johnson City, and key economic indicators for Johnson City and the State of Tennessee. By applying these exploratory data analysis techniques in these three key areas, we felt that the questions that define our business problems would be solved.

Results

All Venues

Within downtown Johnson City, there are 123 different venues. Since categories was one of the features we preserved when wrangling the data, we discovered a wide range of venues. These included nightclubs, bridal shops, and of course restaurants. Here is the dataframe of the first five results:

|	name	categories	address	crossStreet	lat	lng	labeledLatLngs	distance	postalCode	cc	city	state	country	formattedAddress	id
92	#occupyjohnsoncity	Field	NaN	NaN	36.315938	-82.349875	[{'label': 'display', 'lat': 36.31593814887468, 'lng': -82.34987511371533}]	168	NaN	US	NaN	Tennessee	United States	[Tennessee, United States]	4e999b105c5caa2f4519c541
71	112	None	NaN	NaN	36.316909	-82.351496	[{'label': 'display', 'lat': 36.31690884694869, 'lng': -82.35149623132787}]	74	37601	US	Johnson City	TN	United States	[Johnson City, TN 37601, United States]	4d732a68d145a1cd90e6bff3
95	2 Dye 4	Boutique	NaN	NaN	36.316238	-82.351931	[{'label': 'display', 'lat': 36.316237901728584, 'lng': -82.35193064207675}]	153	37604	US	Johnson City	TN	United States	[Johnson City, TN 37604, United States]	4f0732bae4b09a8a3da63599
111	4tress Studios	Rock Club	85 Buffalo St	NaN	36.316582	-82.352639	[{'label': 'display', 'lat': 36.316582, 'lng': -82.352639}, {'label': 'entrance', 'lat': 36.316475, 'lng': -82.352661}]	182	37604	US	Johnson City	TN	United States	[85 Buffalo St, Johnson City, TN 37604, United States]	4d7c0aa4136bf04dbd00588d
72	AVI	Building	207 E Main St	Buffalo	36.316920	-82.352032	[{'label': 'display', 'lat': 36.31692, 'lng': -82.352032}]	118	37604	US	Johnson City	TN	United States	[207 E Main St (Buffalo), Johnson City, TN 37604, United States]	4d839f09f1e56ea8c06b648a

While the dataframe was informative, we felt a visualization of the venues by category would add additional useful information. When wrangling the data, we grouped categories together and then counted each venue in a category. Here's what we found:

Number of Venues by Category, Johnson City
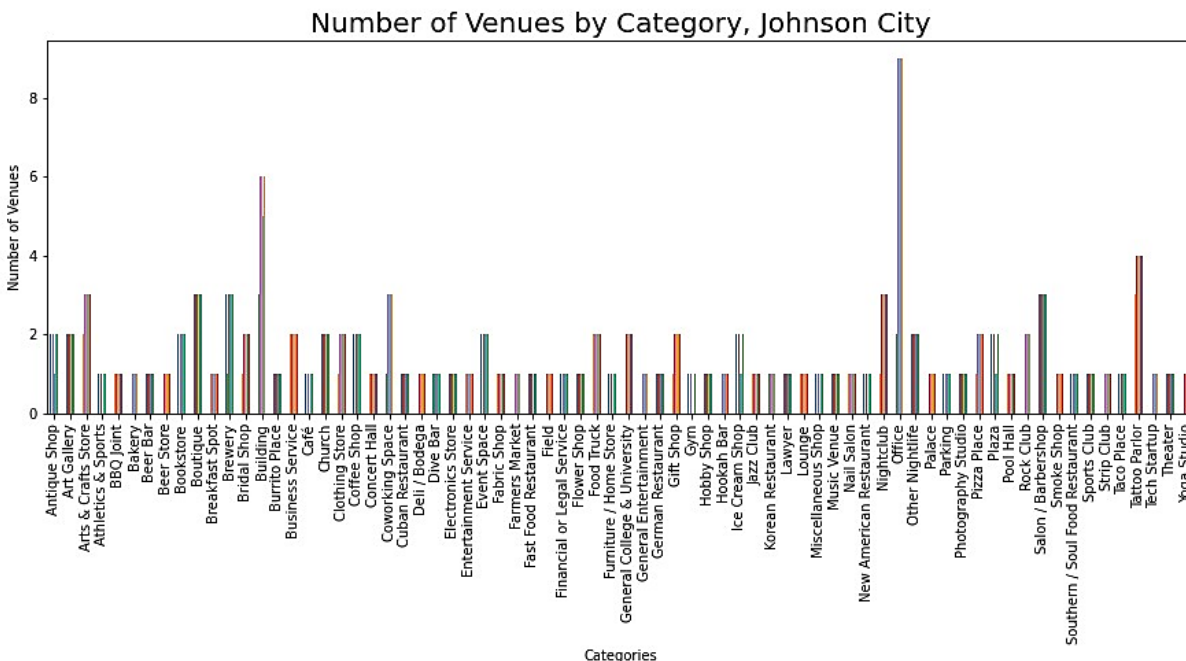
As you can see from the above bar plot the 123 venues in downtown Johnson City are fairly evenly distributed across a broad range of categories. We felt this broad range of businesses was an indicator of an active and vibrant downtown Johnson City. And that told us it was a good sign for a new restaurant.

We went a step further and plotted where the venues were located using folium maps. Here's what we got:
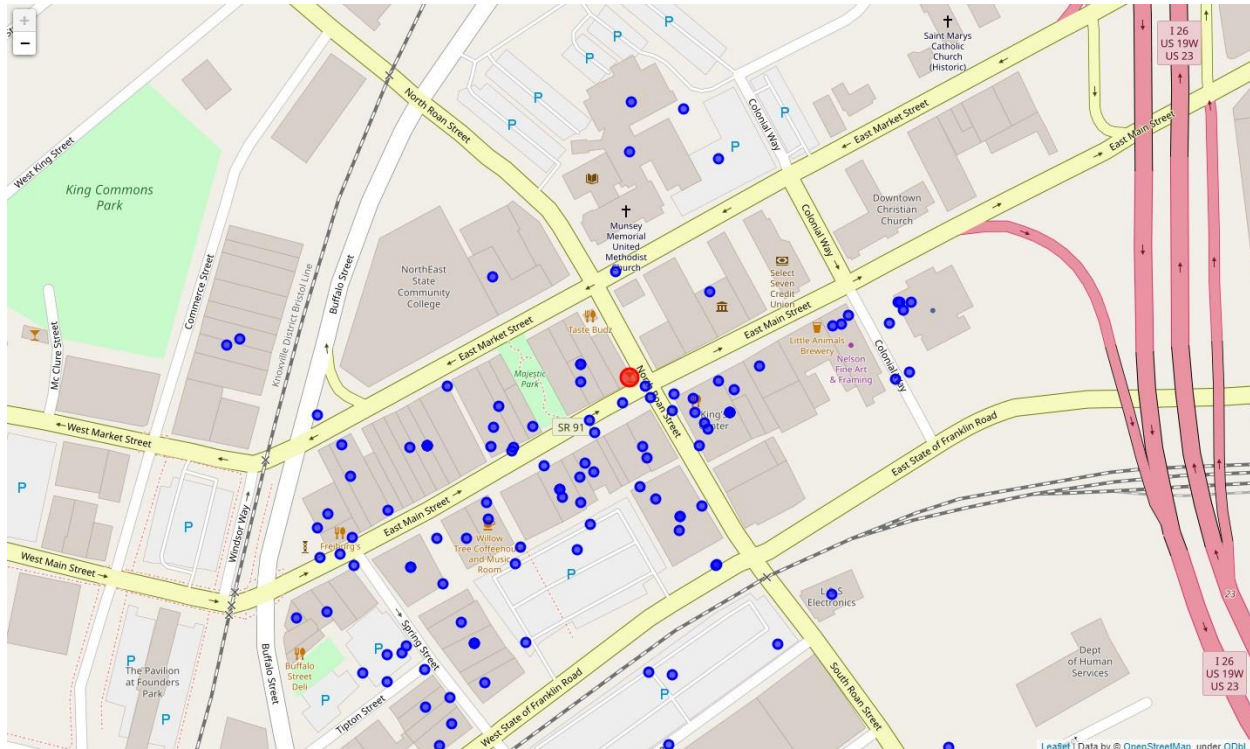
The solid red circle indicates the heart of downtown, 300 E Main St, Johnson City, TN. The smaller blue circles indicate a venue. As you can see the venues are broadly distributed across downtown with heavier concentration of the west side of downtown.
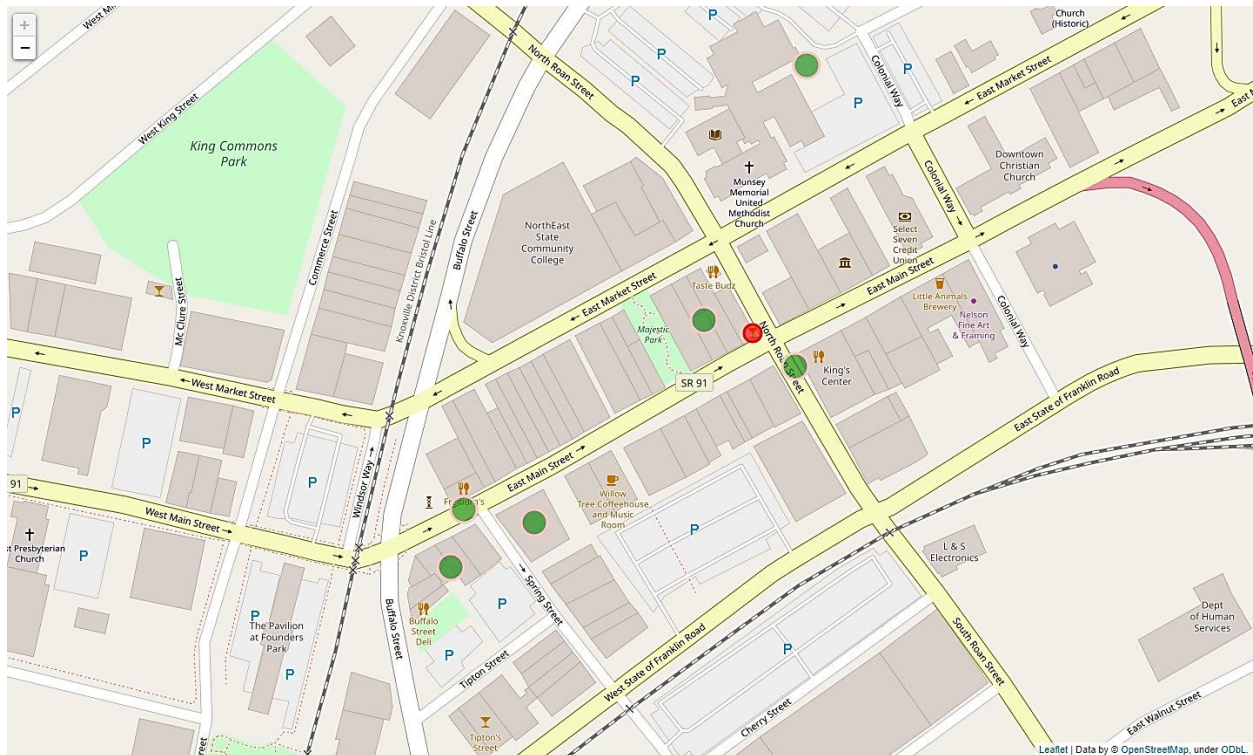
Restaurants

When we made the pivot to looking at all restaurants in downtown Johnson City and began data wrangling, we discovered there wasn't a category called "restaurant" in the categories feature. Instead, the term "restaurant" was appended to cuisine type. For example, we found "German Restaurant" instead of "Restaurant." This information was helpful because we had no other features that furnished cuisine information.

As a result, we filtered the dataframe using the parameter "restaurant' in the categories feature and we found six restaurants in downtown Johnson City. Here they are:

	name	categories	address	crossStreet	lat	lng	labeledLatLngs	distance	postalCode	cc	city	state	country	formattedAddress	id
12	Freiberg's	German Restaurant	203 E Main St	at Spring St	36.316382	-82.352567	[{'label': 'display', 'lat': 36.316382369881445, 'lng': -82.35256692569367}]	187	37604	US	Johnson City	TN	United States	[203 E Main St (at Spring St), Johnson City, TN 37604, United States]	4b4771a5f964a5204a3226e3
54	Korean Taco House	Korean Restaurant	101 Buffalo St	Main Street	36.316096	-82.352646	[{'label': 'display', 'lat': 36.316096, 'lng': -82.352646}]	211	37604	US	Johnson City	TN	United States	[101 Buffalo St (Main Street), Johnson City, TN 37604, United States]	52420b9811d247e40c81f2f8
17	McDonald's	Fast Food Restaurant	NaN	NaN	36.318582	-82.350453	[{'label': 'display', 'lat': 36.318581819104104, 'lng': -82.35045257495463}]	150	NaN	US	Johnson City	TN	United States	[Johnson City, TN, United States]	5165bd33e4b04adace3cbce2
55	Saborés	Cuban Restaurant	202 E Main St	NaN	36.316316	-82.352130	[{'label': 'display', 'lat': 36.316316, 'lng': -82.35213}, {'label': 'entrance', 'lat': 36.316439, 'lng': -82.352168}]	159	37604	US	Johnson City	TN	United States	[202 E Main St, Johnson City, TN 37604, United States]	59952b73603d2a64d3373e68
95	Taste Budz	Southern / Soul Food Restaurant	300 S Roan St	NaN	36.317323	-82.351083	[{'label': 'display', 'lat': 36.317322999999995, 'lng': -82.351083}, {'label': 'entrance', 'lat': 36.317543, 'lng': -82.351061}]	27	37601	US	Johnson City	TN	United States	[300 S Roan St, Johnson City, TN 37601, United States]	4f3290eb19836c91c7e448c0
106	bacon fest	New American Restaurant	NaN	NaN	36.317093	-82.350525	[{'label': 'display', 'lat': 36.31709289550781, 'lng': -82.35052490234375}]	29	NaN	US	Johnson City	TN	United States	[Johnson City, TN, United States]	522b72c511d20dc0b91abb44

While the we thought this information was good, a visualization of the six restaurants would take us a step further:


The solid red circle again indicates the heart of downtown Johnson City. The solid green circles indicate the six restaurants.

Economic Indicators

Another important part of our task was to look at some key economic indicators for Johnson City. We felt this would give us a view of the higher level, broader economic power of the city. And while data about Johnson City alone would be informative, a comparison with the entire state of Tennessee would be even better. Here's what we found:

	data_name	johnson_city	tn
19	avg_house_val	165900.0	158600.0
43	income_per_cap	29707.0	28511.0
40	retail_per_cap	27593.0	14194.0

Here's what this looks like visually:

Key Economic Indicators, Johnson City vs Tennessee
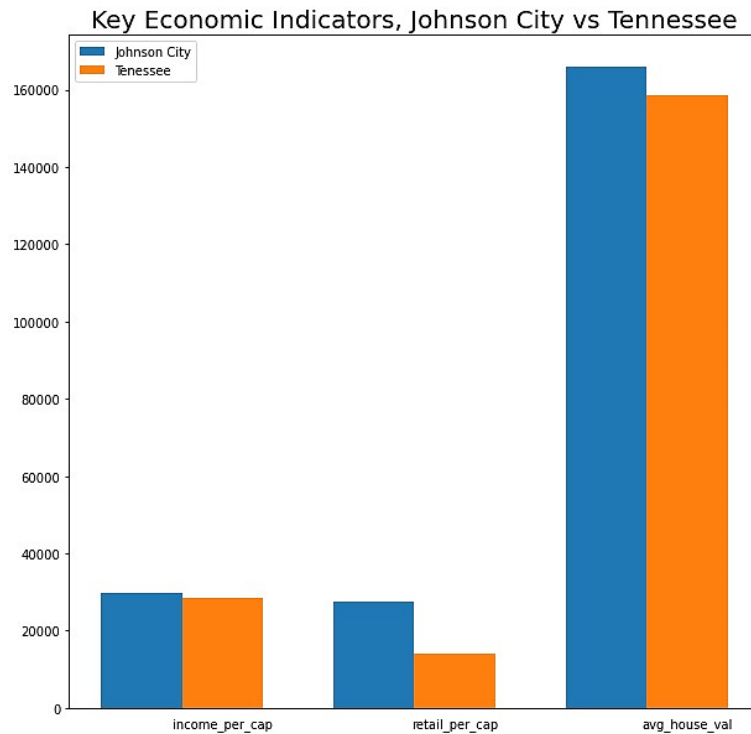
Median house value was 4.6% better in Johnson City than in Tennessee. Income per capita was 4.2% better. And retail sales per capita was nearly twice as good at 94%. We felt all these results bode well for a new restaurant in downtown Johnson City.

Discussion

With 123 venues across a broad range of business categories, six restaurants, and solid economic indicators we feel that this exploratory data analysis provides a solid data foundation to further research into opening a restaurant in downtown Johnson City. That additional research should include sub-domains such as finance, marketing, and culinary strategy.

While there wasn't sufficient data – or the right kind of data – for predictive modeling, our best approach was to lean heavily on clean data frames and visualizations. From that perspective, we felt that the questions that support our business problem were solved.

Conclusion

Johnson City was founded in 1856 as a major rail for the southeast U.S. and has grown to be an important community in the eastern Tennessee mountains.

The business problem we were tasked was providing foundation data for deciding if opening a new restaurant in downtown Johnson City would be advisable.

Our data sources included location data from Foursquare, economic data from the U.S. Census Bureau, and on-the-ground experiences of the author. The data was cleaned, wrangled and organized into dataframes, folium maps, and bar plots.

Once the data was in front of us, we knew there wasn't sufficient data for predictive analysis for modeling. As a result, we looked at our job as answering the questions that support our business problem. We felt like we accomplished that task.