

# The Rise of Virtual Kitchens (2019–2023)

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## INTRODUCTION

The COVID-19 pandemic has profoundly transformed numerous industries, and the food and beverage sector is no exception. One of the most notable developments during this period has been the rapid growth of virtual kitchens, also known as ghost kitchens or cloud kitchens, along with traditional restaurants that have expanded their services to include online ordering options. These innovative culinary ventures have gained significant traction, reshaping the landscape of food service in unprecedented ways.

Virtual restaurants in this context means that the restaurant is only available for pickup/delivery and there's no dine in option. They are "ghost restaurants", there is no place to walk up to, no signage, no seating. These restaurants operate out of commercial warehouses or trailers. And people usually patronize these virtual restaurants through delivery apps due to the restaurant names, and attractive images.<sup>1</sup>

The significance of both virtual kitchens extends beyond mere convenience. They represent a fundamental shift in how food is produced, marketed, and consumed. These models offer increased flexibility and efficiency, allowing restaurateurs to minimize overhead costs associated with physical dining spaces while maximizing their reach through digital platforms. For consumers, the ease of access to a diverse range of cuisines from the comfort of their homes has revolutionized dining habits and preferences.

In this project, we aim to aim to improve the previous visualizations and provide a comprehensive overview of how virtual kitchens have expanded across various states. This transformation encourages both consumers and restaurateurs to adapt to and embrace these innovative approaches, paving the way for a more dynamic and resilient food service landscape.

## PREVIOUS VISUALIZATION

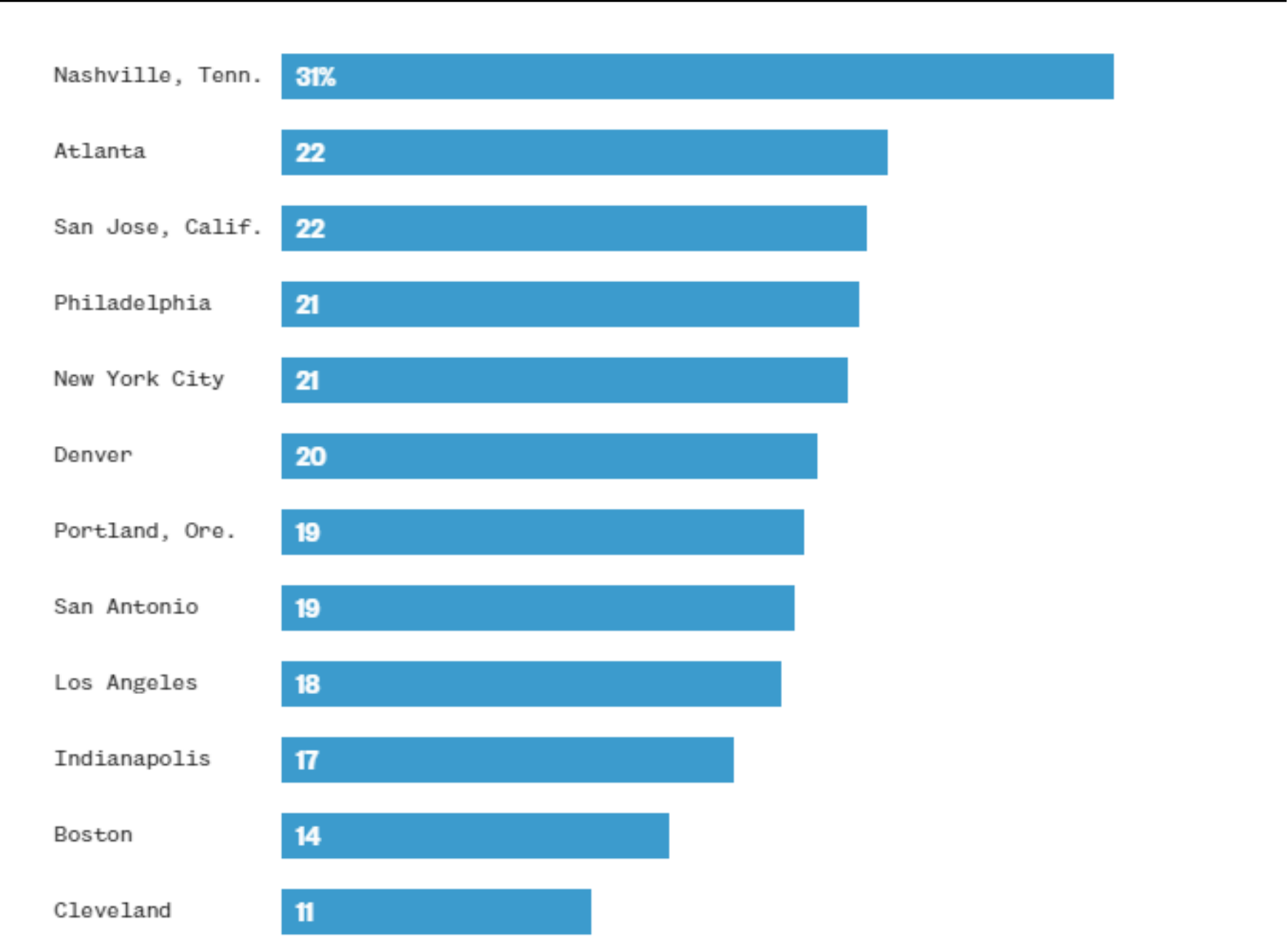


Figure 1: Percentage of restaurant listings in a city.

## STRENGTHS

- The visualization is simple and straightforward to understand.
- It shows the top 12 cities with the highest percentage increase of virtual restaurants, which allows the reader to understand the cities that are in popularity for these virtual restaurants.
- Based on the data, you can really see the huge boom in popularity of virtual restaurants over the years.

## SUGGESTED IMPROVEMENTS

1. *Add a plot title and a source note* so that figure 2 can be understood in isolation (e.g., when shared on social media).
2. *Identify missing data*. The data should cover all cities in the United States or in figure 1, all the years.
3. *Having consistency in labels*. Consistency in data annotation (the percentage) can help readers understand the visualization more easily.
4. *Adding a legend*. A legend can help readers understand the visualization more easily while reducing misinterpretation of the visualisation.
5. *Include statistics for every state*. Statistics will help readers get an overview of the restaurants across the country .
6. *Using a choropleth map*. A choropleth map can help readers visualize the distribution of restaurants in different states more effectively.

## IMPLEMENTATION

### Data

- The data used in this visualisation was obtained from Kaggle<sup>2</sup> and GitHub<sup>3</sup>, that was scraped from Uber Eats<sup>4</sup>. The datasets contains information on the number of restaurants and important data such as name, full address, lat, long.

- The data was cleaned and transformed to extract the state abbreviation and the year partnered.

### Software

We used the Quarto publication framework and the R programming language, along with the following third-party packages:

- *dplyr* for data manipulation
- *tidyverse* for data transformation, including *ggplot2* for visualization based on the grammar of graphics
- *usmap* for plotting the US map
- *scales* for formatting the scales of the plot
- *sf* for spatial data manipulation
- *ggtxt* for formatting text in the plot
- *stringr* for string manipulation
- *knitr* for dynamic document generation

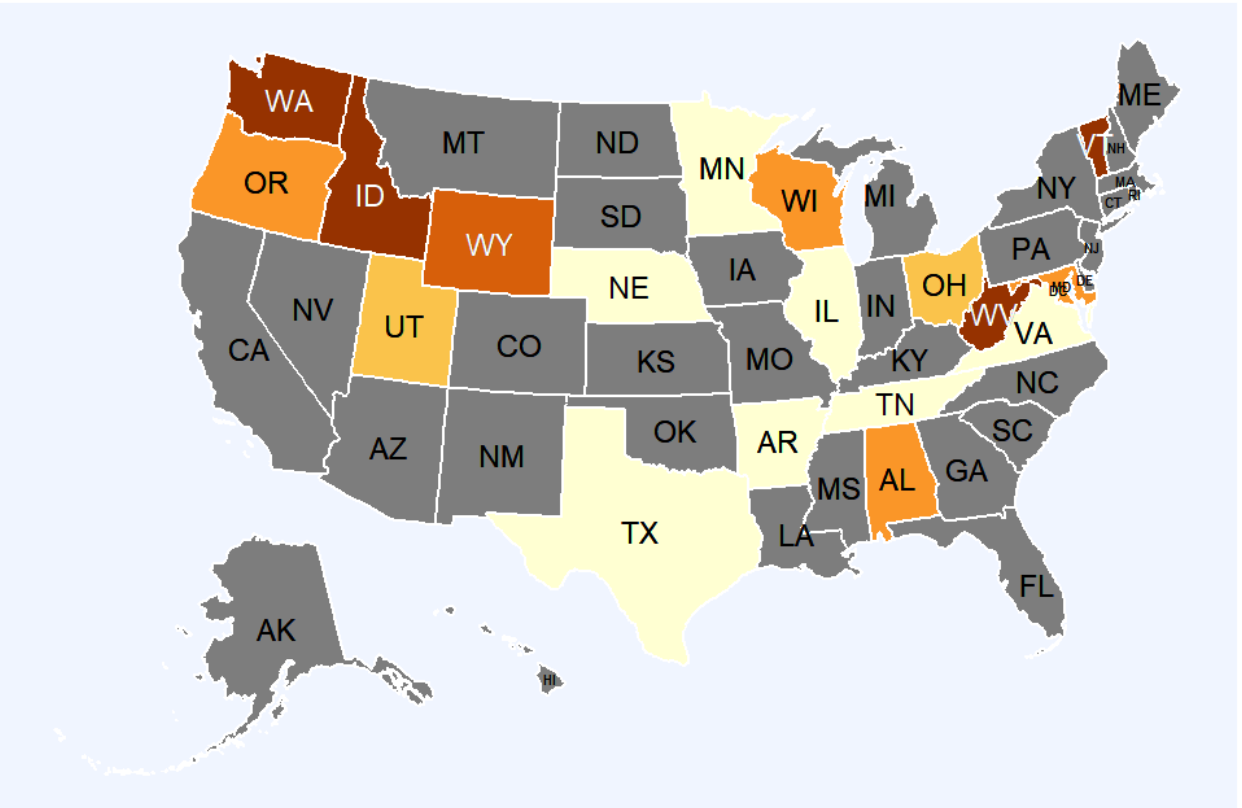
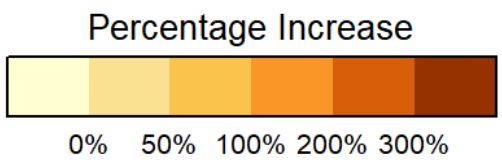
<sup>2</sup><https://www.kaggle.com/datasets/ahmedshahriarsakib/uber-eats-usa-restaurants-menus?resource=download&select=restaurants.csv>

<sup>3</sup><https://github.com/gsunitt/Extreme-Uber-Eats-Scraping/blob/master/1.5M-Uber-Eats-Restaurants.zip>

<sup>4</sup><https://www.ubereats.com>

## IMPROVED VISUALIZATION

Increase in virtual restaurants by State  
between 2020 and 2023



Grey areas represent states that do not have data  
Source: Kaggle Dataset of Uber Eats USA Restaurants and Github "gsunit" Uber Eats Scraping

Figure 2: Percentage increase of virtual kitchens in the United States.

## FURTHER SUGGESTIONS FOR INTERACTIVITY

Due to the intention of the visualisation to be used in a poster, there are no interactive elements. However, if the visualisation were to be used in a digital format, the following interactive elements could be added:

1. *Hover-over information*: When hovering over a state, the user can see the number of virtual kitchens in that state.
2. *Filtering*: Users can filter the data by year to see how the number of virtual kitchens has changed over time.
3. *Zooming*: Users can zoom in on a specific region to see the number of virtual kitchens in more detail.
4. *Search*: Users can search for a specific state to see the number of virtual kitchens in that state.

## CONCLUSION

We have implemented the suggested improvements to the visualization. By using a heatmap, it ensures that the data is much more easily understood as readers can identify areas with a higher percentage of virtual kitchens and get an overview of the distribution of virtual kitchens.