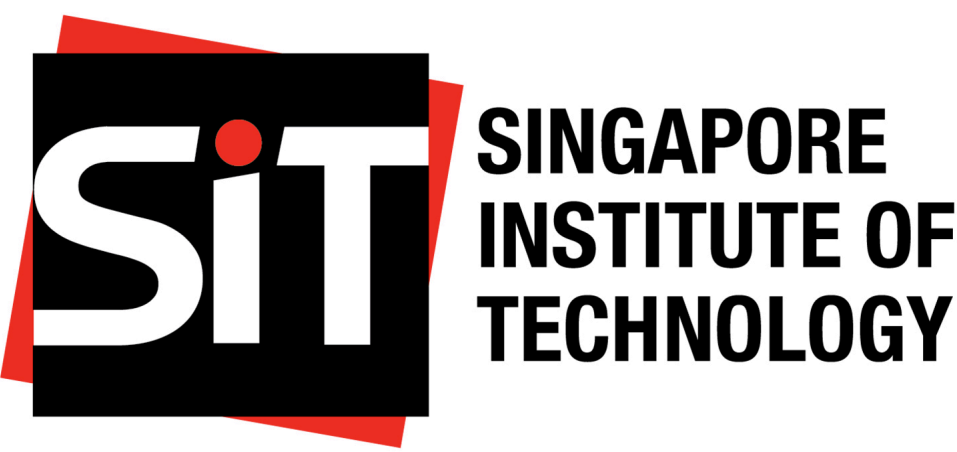


The Rise of Virtual Kitchens (2019–2023)

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INTRODUCTION

The COVID-19 pandemic has 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 added online ordering options. These innovative culinary ventures have gained significant traction, reshaping the landscape of food service. 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.¹ On the other hand, many traditional restaurants have adapted by integrating online ordering systems, allowing customers to place orders through their websites, mobile apps, or third-party delivery platforms. This hybrid model offers both online and offline ordering capabilities, expanding their reach and providing greater convenience to their customers. The significance of both virtual kitchens and traditional restaurants with online ordering extends beyond mere convenience. They represent a fundamental shift in how food is produced and consumed. In this project, we aim to improve the previous visualizations and provide a comprehensive overview of how virtual kitchens and online-ordering-enabled restaurants have expanded across various states. This transformation of the food industry encourages consumers and restaurateurs to adapt to and embrace these new models.

PREVIOUS VISUALIZATION

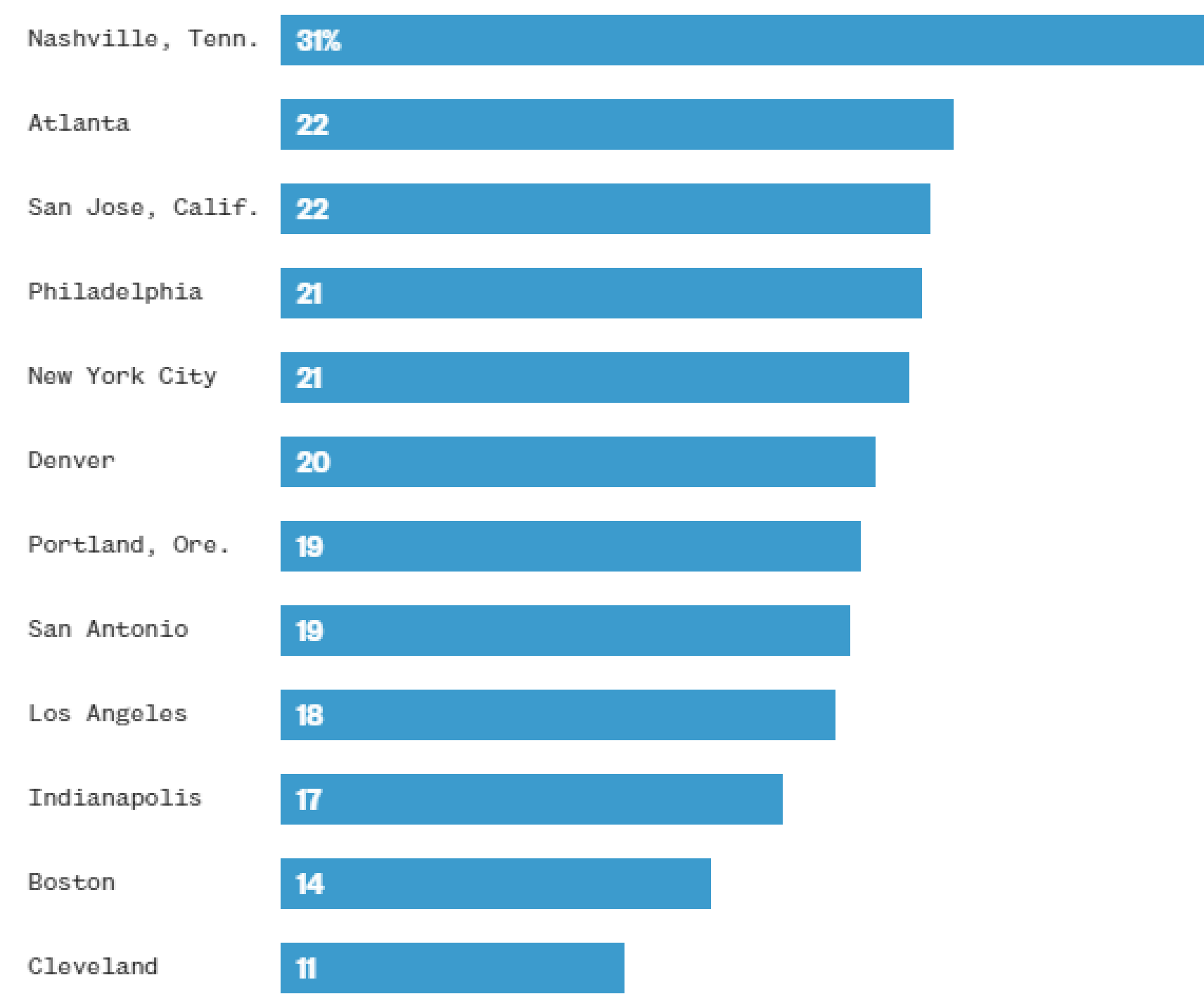


Figure 1: Percentage of restaurant listings in a city.

¹<https://academy.getbackbar.com/understanding-the-concept-of-virtual-restaurants>

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 Kaggle², that was scraped from Uber Eats³. This dataset contains information on the number of restaurants and important data such as name, full address, lat, long.

Software

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

- *readxl* for data import
- *tidyverse* for data transformation, including *ggplot2* for visualization based on the grammar of graphics
- *knitr* for dynamic document generation
- *usmap* for plotting the US map

IMPROVED VISUALIZATION

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

³<https://www.ubereats.com>

Increase in virtual restaurants by State
between 2020 and 2023

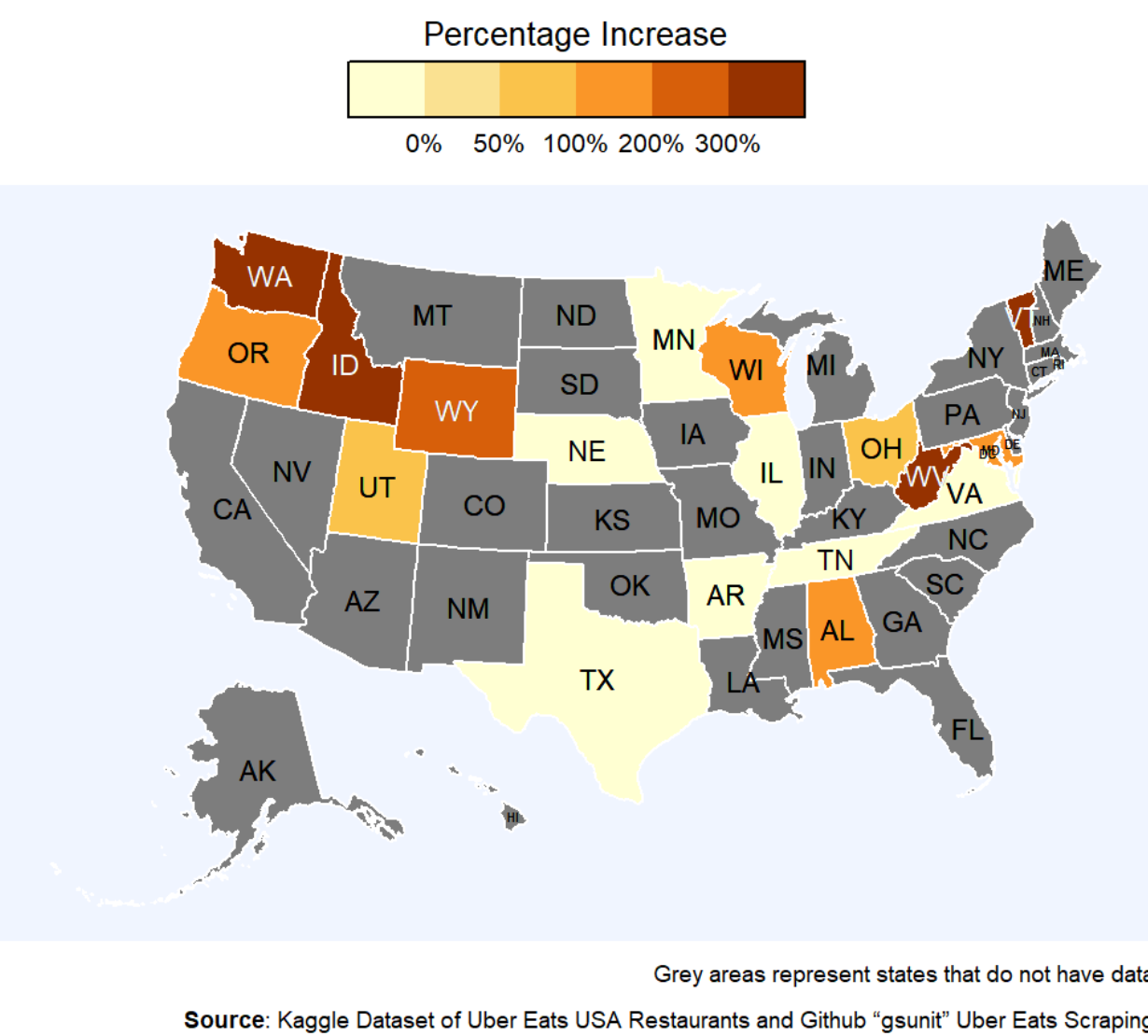


Figure 2: Heatmap of virtual and online restaurants.

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.