

Supersize Me: An Exploratory Analysis Of The Nutritional Content In Mcdonald's Menu Items

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Abstract: *The prevalence of fast food around the world has led to nutrition deficiencies and calorie hyper-consumption. Therefore, it is important to scrutinize the menu from McDonald's, a popular standard for fast food, to improve the quality of the American diet and guide the fast-food industry to create nutritious, yet convenient meals. Using McDonald's publicly available menu, food items were recorded, organized into a CSV file, and then further classified by their nutritional features. Afterward, Seaborn and Plotly were used to create Kernel Density Estimation (KDE) plots that displayed the relationships between nutritional variables. This study found that McDonald's Big Breakfast range is among the biggest contributors to cholesterol, sodium, and calories. It is important to visualize and analyze this nutritional data as it can guide the public and fast-food industry into making nutritional-based decisions.*

Keywords: *Calorie Intake, Daily Value, Fast Food, McDonald's, McMuffin, Nutrition, Sodium.*

I. INTRODUCTION

1.1 Background and Objectives

Fast food has become a distinct element of the American diet and lifestyle. Furthermore, there are many fast-food establishments in counties outside of the United States, indicating its global prevalence. Understanding the benefits of nutritional meals, fast-food or not, will enhance Americans' diets and pressure fast-food industries to design meals that cater to the nutritional standard. Due to McDonald's popularity and worldwide establishment, its menu is used as an approximation of the standard for the fast-food industry. Thus, the objective of this study is to understand and visualize the nutrition content of the McDonald's menu. This study examines the correlation between nutritional content variables and "unhealthy" menu items.

1.2 Significance of the Study

In 2016, McDonald's was ranked first among the fast-food industry in sales with a brand value of 36.4 billion dollars among its 14,155 worldwide facilities. As fast-food restaurants are so prevalent in everyday society, it is integral that people are aware of their nutritional value. Fast food is a significant contributor to the obesity epidemic and related health problems like diabetes, heart disease, and high blood pressure. Furthermore, fast food portions are often larger than recommended serving sizes, leading to overconsumption of calories, fat, and sodium. By understanding portion sizes and the nutritional content of different items on fast food menus, consumers can make choices that better align with their dietary needs. By understanding the nutritional content of fast food, consumers can make more informed decisions about what they eat and limit their intake of unhealthy options.

Increasing company-to-consumer transparency is also a trend in the fast-food industry. As McDonald's was on the rise in the United States, the idea of menu labeling was introduced as a part of a nationwide initiative to reduce consumer calorie intake. As this applied to the entire nation, large chain restaurants were required to provide caloric information for menu items, allowing consumers to read the nutritional and calorie content of meals. Fast food companies are increasingly providing more information about the nutritional content of their products. By understanding this information, consumers can hold fast-food companies accountable and make informed decisions about where to eat.

II. METHODOLOGY

2.1 Variables

The selected nutritional content variables were sodium, cholesterol, saturated fats, and sugars. According to the Food and Drug Administration (FDA), these variables can lead to adverse health effects such as heart disease and obesity. Analyzing these four variables will determine the relationship between specific menu items and their possible health implications.

2.2 Data Sources and Organization

The menu items and nutrition facts were taken from McDonald's website and organized into a CSV file. The 260 menu items were then sorted into 130 categories. Each menu item was analyzed with 24 nutritional features including calories, calories from fat, amount of protein, etc. An example of the dataset is shown in Table 1. Each row represents a single item on the menu. Each column is a feature of the item. While there are 26 columns, only a subset of the total columns is shown for display purposes.

Table 1. Example of McDonald's Menu Data

Item	Calories	Sugars	Total Fat (% Daily Value)	Protein
Egg McMuffin	300	3	20	17
Egg White Delight	250	3	12	18
Sausage McMuffin	370	2	35	14

2.3 Programs

The CSV file was loaded into a Pandas data frame. Pandas is a flexible and efficient open-source data analysis and manipulation tool that relies on Python. Matplotlib, Seaborn, and Plotly were also used to aid in data visualization. KDE plots were later created to display the relationships between nutritional variables such as iron, fat, and sodium. In addition, a Pearson correlation was plotted to identify the strength of the feature correlation.

To provide a more granular analysis of the individual variables, the Plotly interactive visualization package was used; this allowed for the creation of unique scatterplots for each item on the McDonald's menu; wider circles represented a variable with a higher variable content level.

The distribution of features is displayed by a contour - Kernel Density Estimation (KDE) plot. The KDE plot is used to obtain a quantitative measure of the data; the KDE was composed using the Seaborn library's plotting capabilities. Fig.1 displays contour examples for fat and cholesterol variables.

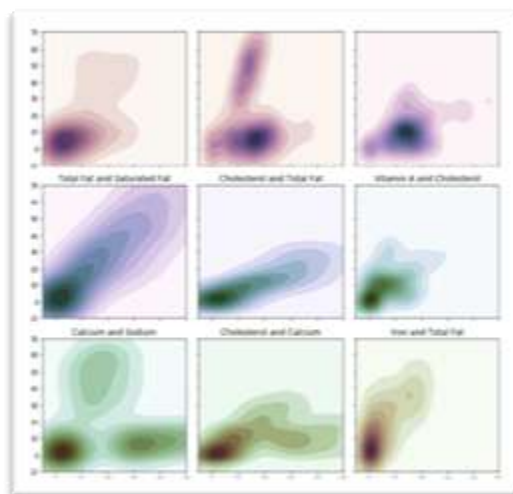


Figure 1. Contour Plots to Identify Relationships Between Different Variables

III. DATA VISUALIZATION AND ANALYSIS

3.1 Pearson Correlation Heatmap

After the data was put on a Kernel Density Estimation (KDE) plot to display the relationships between nutritional variables such as iron, fat, and sodium, a Pearson correlation was calculated to identify the strength of the feature correlation. Fig. 2 shows a heatmap of the Pearson correlation of all nutritional metrics. This heatmap reveals that a correlation exists between nutritional features. For example, items with high protein correlated with items with high cholesterol and carbohydrates. Another example of a positive correlation is the relationship between serving size and calories. In addition, negative correlations were also identified; one example is the relationship between the percentage of Vitamin A and the number of carbohydrates.

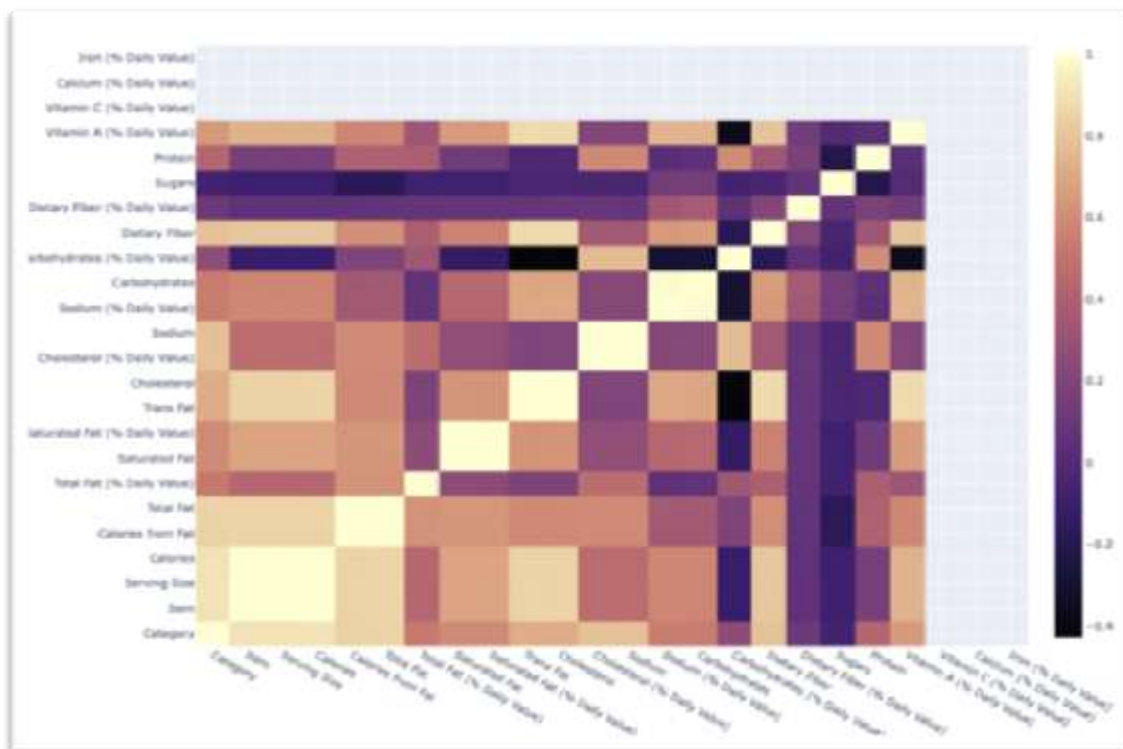


Figure 2. Pearson Correlation Heatmaps of Nutritional Metrics

3.2 Plotly Interactive Visualization

Plotly interactive visualization packages yielded unique scatterplots for each McDonald's menu item. Fig. 3, 4, 5, and 6 display these plots for cholesterol (% Daily Value), sodium (% Daily Value), saturated fat (% Daily Value), and sugars (g) respectively.

In Fig. 3, the McDonald's Big Breakfast range is the biggest perpetrator (red circle), responsible for 185 percent of cholesterol (% Daily Value). The other turquoise-blue circular plots can be attributed to products such as the Egg/Sausage McMuffin range, which contains a day's worth of cholesterol. Fig. 3 thus shows that breakfast menu items contained the highest cholesterol levels.

Fig. 4 shows that 10-piece chicken nuggets contain the highest sodium value. It is important to note that other chicken menu items (e.g., chicken sandwich), as well as breakfast food items, were among the highest on the list for sodium amount.

Fig. 5 identifies that there are several menu items with dangerous amounts of saturated fat. For example, the McFlurry and the Frappe contain over 100 percent of the recommended daily fat intake. This data established the unhealthy sugar levels in the dessert drink menu items.

The McFlurry is quite an unhealthy item—Fig. 6 shows that the McFlurry with Oreo cookies (size small) contained the highest amount of sugar. This data established the unhealthy sugar levels in the dessert drink menu items.

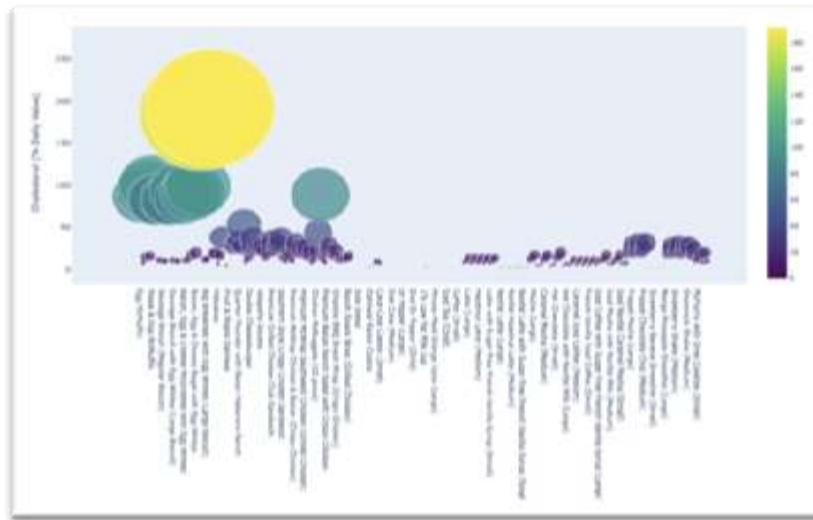


Figure 3. Cholesterol (% Daily Value) Scatter Plot for Each McDonald's Item

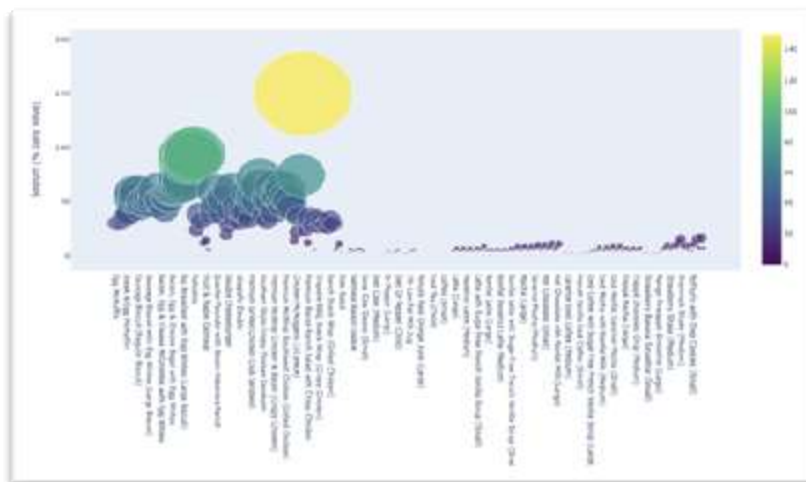


Figure 4. Sodium (% Daily Value) Scatter Plot for Each McDonald's Item

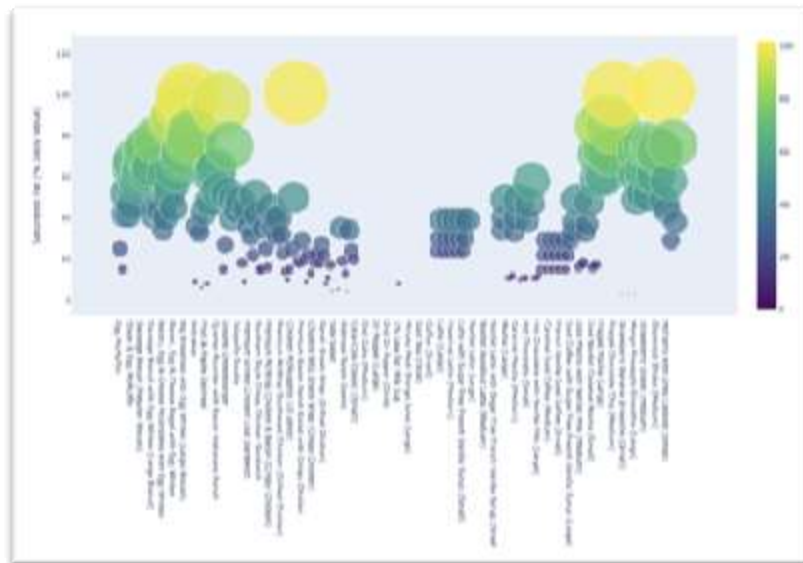


Figure 5. Saturated Fat (% Daily Value) Scatter Plot for Each McDonald's Item

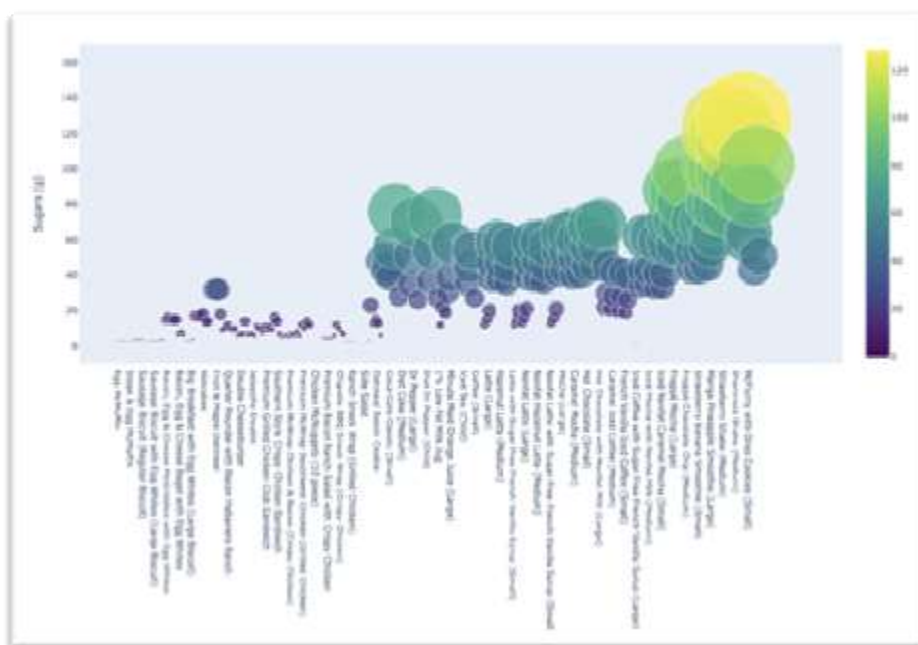


Figure 6. Sugars (g) Scatter Plot for Each McDonald's Item

3.3 Bar Plot

The number of calories was simply plotted on a bar plot in Fig. 7. From this, it is evident that the Big Breakfast with Hotcakes contains the highest number of calories. This is followed by the Big Breakfast with Hotcakes and Egg Whites, and then the 10-piece Chicken McNuggets.

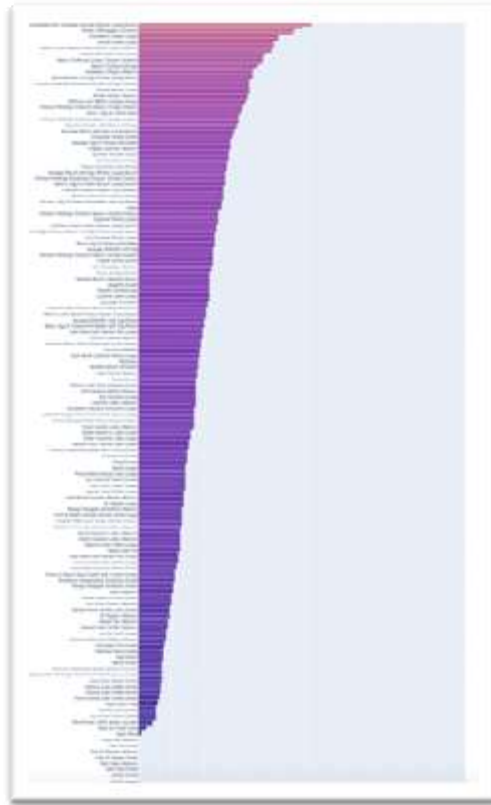


Figure 7. Number of Calories for Each McDonald's Item

IV. CONCLUSION

Nutrition in fast food menu items is important because it plays a crucial role in maintaining good health and preventing chronic diseases. However, the nutritional value of fast-food menu items is an issue that disproportionately affects the working population and lower socioeconomic classes given that they depend on fast food for its affordability. Fast food is also more prevalent in low-income neighborhoods, making it the only option for many people. This is known as a food desert, which refers to an area where healthy food is difficult to access due to a lack of grocery stores or markets that sell fresh produce, ultimately leading to higher levels of malnutrition. However, these issues are not limited to the working class as the general American population relies on fast food as a way of obtaining quick, easily accessible meals. According to a study by the Centers for Disease Control and Prevention (CDC), 37 percent of adults consumed fast food between 2013 and 2016. Furthermore, children are specifically targeted by the “toys” offered at fast-food chains.

To avoid unhealthy menu items, it is first important to identify these culprits. Thus, this study visualizes the nutritional information of the McDonald's food menu via Plotly interactive visualization packages to identify the “unhealthiest” menu items. The study discovered that breakfast items contained the greatest number of calories, sodium, fat, and cholesterol, with up to 192 percent of the Daily Value for cholesterol, 116 percent of the Daily Value for sodium, and 100 percent of the Daily Value for saturated fats. This analysis should guide the public on what items to avoid on the breakfast menu, contributing to a healthier lifestyle.

One limitation of the study is that only McDonald's menu items were used. As such, studying the nutritional and caloric content of other fast-food restaurants is crucial for examining the broader impact of fast food on the American population. Such restaurants can be selected and analyzed similarly to this study. In addition, the study assumes that each menu item is distributed uniformly in nutritional content throughout all restaurant locations based on the information provided by McDonald's. This information may not be accurate given the varying manners of handling, preparation, and customer preferences across different locations. Therefore, to generate more precise data statistics, it is recommended to analyze the nutritional contents at different locations as well as other fast-food chains.

In conclusion, further efforts need to be made to make the public more aware of the nutrition in fast food menu items so that changes can be made. For example, such change can include offering more plant-based options and reducing unhealthy ingredients, which will improve the health of those who rely on fast food as a primary source of sustenance. Additionally, efforts to increase access to healthy food in food deserts and promote nutrition education can help to address the underlying socioeconomic factors that contribute to poor nutrition and health outcomes.

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