McDonald's Menu Nutritional Analysis

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Introduction

In today's world, people are becoming more conscious about the food they eat, especially when it comes to fast food. This report aims to provide a simple analysis of the nutritional content of McDonald's menu items. By examining nutrients like **calories**, **protein**, **fats**, and **carbohydrates**, the goal is to help customers make more informed choices about what they eat.

Objectives:

The main objectives of this analysis are:

- *Understand the nutritional distribution of menu items, comparing calories, fats, proteins, and carbohydrates across different categories like breakfast, burgers, and beverages.*
- *Identify healthier options for customers who want lower-calorie or higher-protein meals.*
- *Visualize the nutritional data using graphs and charts to highlight trends and patterns.*

Food categories:

Here's a refined breakdown of McDonald's menu categories and their nutritional highlights:

- **Breakfast:** Breakfast items tend to be calorie- and protein-rich, but they often contain high levels of sodium and total fat, which are important when considering their overall health impact.
- **Beef & Pork:** These menu items are excellent sources of protein but also come with high cholesterol and total fat content, making these nutrients crucial in evaluating their nutritional profile.
- **Chicken & Fish:** While great sources of protein with typically lower fat than beef, chicken and fish items should be assessed for their sodium and cholesterol content.
- **Salads:** Generally lower in calories, salads are nutrient-dense, rich in vitamins A and C, calcium, and dietary fiber, offering a healthier option on the menu.
- **Snacks & Sides:** These items often have high carbohydrate and sodium levels, with some sides containing added sugars that impact their nutritional evaluation.
- **Desserts:** Desserts are typically high in sugars, calories, and fats, key nutrients to consider when assessing their effects on diet and overall health.

- **Beverages:** Many beverages are high in sugars and calories, with some also contributing significantly to sodium intake.
- **Coffee & Tea:** Although low in calories, the sugar and fat content in coffee and tea can vary widely based on added ingredients like cream and syrups.
- **Smoothies & Shakes:** These indulgent drinks are usually high in sugars, fat, and calories, making them important items to assess in terms of their nutritional impact.

Key Nutrients in McDonald's Menu Items:

- *Calories: A measure of the energy provided by the food.*
- *Calories from Fat: The portion of total calories that come from fat content.*
- *Total Fat: The sum of all fats in the item.*
- *Total Fat (% Daily Value): The percentage of the recommended daily fat intake in one serving.*
- *Saturated Fat: A type of fat that can raise cholesterol levels.*
- *Saturated Fat (% Daily Value): The percentage of the daily recommended limit for saturated fats.*
- *Trans Fat: An unhealthy fat that increases the risk of heart disease.*
- *Cholesterol: A substance found in animal products, linked to heart health.*
- *Cholesterol (% Daily Value): The percentage of the daily recommended cholesterol in the item.*
- *Sodium: The salt content, which can influence blood pressure.*
- *Sodium (% Daily Value): The percentage of the recommended daily sodium intake per serving.*
- *Carbohydrates: The primary source of energy, consisting of sugars, starches, and fibers.*
- *Carbohydrates (% Daily Value): The contribution to the recommended daily intake of carbohydrates.*
- *Dietary Fiber: Aids in digestion and promotes a sense of fullness.*
- *Sugar: Simple carbohydrates that can affect blood sugar levels.*
- *Protein: Essential for muscle growth and repair.*
- *Vitamin A (% Daily Value): Supports vision and immune function by contributing to the daily vitamin A intake.*
- *Vitamin C (% Daily Value): Contributes to immune health and skin repair.*
- *Calcium (% Daily Value): Important for bone strength and health.*
- *Iron (% Daily Value): Vital for oxygen transport in the blood.*

*Understanding these key nutrients helps **McDonald's customers** make better decisions about their meals, allowing them to balance their diets and take care of their health. For the organization, this analysis improves menu transparency and encourages the creation of healthier options, contributing to a positive brand image focused on health and well-being.*

Approach

The analysis was carried out using Jupyter Notebook along with Python libraries, including Pandas, NumPy, and Matplotlib, for data manipulation and visualization. The following steps were implemented:

Data Source:

The data was sourced from McDonald's official nutritional information. Each item is listed with details such as its calories, fat content, protein, carbohydrates, and other nutrients.

Data Analysis:

- The data was cleaned and prepared for analysis. This included removing any irrelevant or incomplete data points.
- Each item was categorized into groups (Breakfast, Burgers, Beverages, etc.) to facilitate comparison.

Analysis Method:

We analyzed the nutritional data by calculating the averages and ranges of key nutrients like calories, fats, and proteins across the menu. Visualizations, such as bar charts and histograms, were used to show how different menu items compare nutritionally.

Exploratory Data Analysis (EDA)

The following table provides a detailed summary of the key nutritional statistics for McDonald's menu items. It includes important metrics such as the mean, which shows the average values for each nutrient, and the standard deviation, which indicates how much these values vary across different items. The minimum and maximum values reflect the range of nutritional content, while the percentiles (25%, 50%, 75%) give insight into how nutrients are distributed. This summary allows for a clearer understanding of calorie counts, fat content, protein levels, and other nutrients, highlighting both typical values and any extreme outliers.

Nutrients	Count	Mean	Std	Min	25%	50%	75%	Max
Calories	260	368.3	240.3	0	210	340	500	1880
Calories From Fat	260	127.1	127.9	0	20	100	200	1060
Total Fat	260	14.2	14.2	0	2.4	11	22.3	118
Total Fat (% Daily Value)	260	21.8	21.9	0	3.8	17	35	182
Saturated Fat	260	6	5.3	0	1	5	10	20
Saturated Fat (% Daily Value)	260	30	26.6	0	4.8	24	48	102
Trans Fat	260	0.2	0.4	0	0	0	0	2.5
Cholesterol	260	54.9	87.3	0	5	35	65	575
Cholesterol (% Daily Value)	260	18.4	29.1	0	2	11	21.3	192
Sodium	260	495.8	577	0	107.5	190	865	3600
Sodium (% Daily Value)	260	20.7	24	0	4.8	8	36.3	150
Carbohydrates	260	47.3	28.3	0	30	44	60	141
Carbohydrates (% Daily Value)	260	15.8	9.4	0	10	15	20	47
Dietary Fiber	260	1.6	1.6	0	0	1	3	7
Dietary Fiber (% Daily Value)	260	6.3	6.3	0	0	5	10	28
Sugars	260	29.4	28.7	0	5.8	17.5	48	128
Protein	260	13.3	11.4	0	4	12	19	87
Vitamin A (% Daily Value)	260	13.4	24.4	0	2	8	19	170
Vitamin C (% Daily Value)	260	8.5	26.3	0	0	4	15	240
Calcium (% Daily Value)	260	21	17	0	6	20	30	70
Iron (% Daily Value)	260	7.7	8.7	0	0	4	15	40

Analyzing distribution of calorie counts across menu items.

Distribution of Calorie Counts across Menu Items
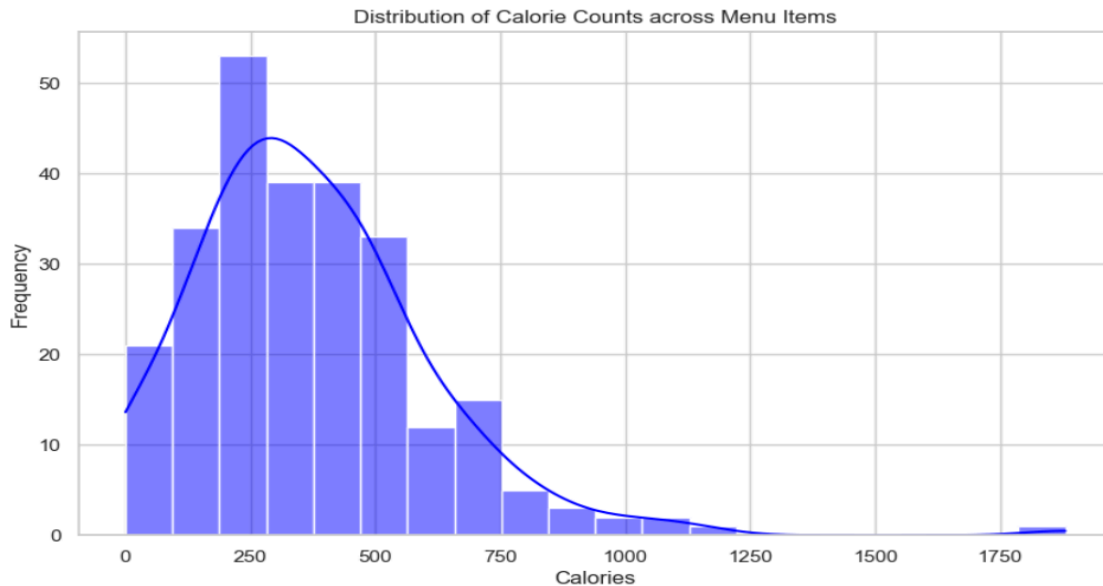
Insights from the Histogram:

- The majority of McDonald's menu items have calorie counts between 200 and 500 calories.
- The distribution is right-skewed, with a long tail of higher-calorie items that extend beyond 1000 calories.
- The Kernel Density Estimate (KDE) line reinforces this skewness and shows that there are fewer high-calorie items compared to lower-calorie options.
- There is a noticeable drop in frequency after the 600-calorie mark, indicating that most items are designed to be within a moderate calorie range.

Category	Menu Items per Category	Centerpoint Calories
Beef & Pork	15	500
Beverages	27	100
Breakfast	42	470
Chicken & Fish	27	480
Coffee & Tea	95	270
Desserts	7	250
Salads	6	255
Smoothies & Shakes	28	540
Snacks & Sides	13	260

The table offers a summary of different food categories from McDonald's menu, highlighting the number of items in each group and their median calorie values. The Coffee & Tea category has the most items, with 95 offerings and a median of 270 calories. Categories like Breakfast and Chicken & Fish have a moderate selection, featuring 42 and 27 items, with median calorie counts of approximately 470 to 480. Smoothies & Shakes stand out with the highest median calories at 540, while Beverages and Desserts provide lighter options, with median calorie counts of 100 and 250 respectively. Salads and Snacks & Sides also fall on the lighter side, with median calories around 255 and 260.

Explore the nutritional content (e.g., fat, protein, carbohydrates) of different items.

Distribution of Total Fat, Protein, and Carbohydrates
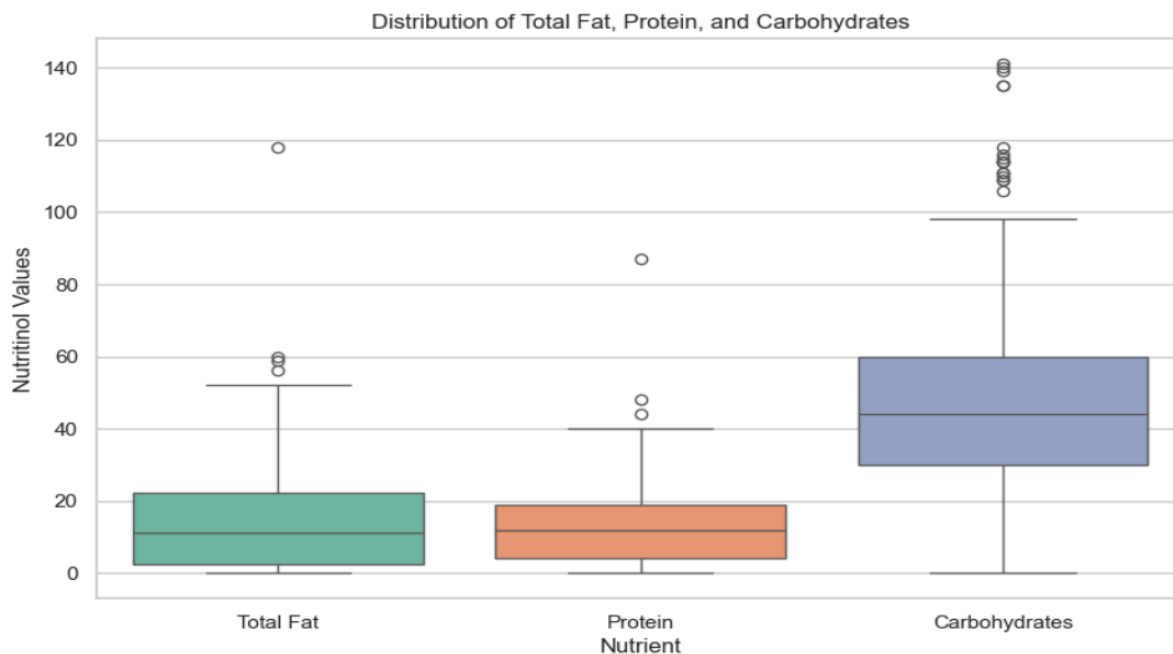
Nutritional Content Analysis

The box plot illustrates the distribution of total fat, protein, and carbohydrate content across McDonald's menu item:

- Total Fat: The median fat content is around 20 grams. A few outliers have higher fat content above 60 grams.
- Protein: The median protein content is slightly lower, around 20 grams, with some outliers reaching higher levels.

- Carbohydrates: Carbohydrate content varies significantly, with the median around 60 grams, and several outliers exceed 100 grams.

This visualization highlights the range of nutritional content across menu items, helping customers to make informed dietary choices requirements.

# Identify Trends And Patterns In The Dataset.

1. IRON

Total Iron by Food Category
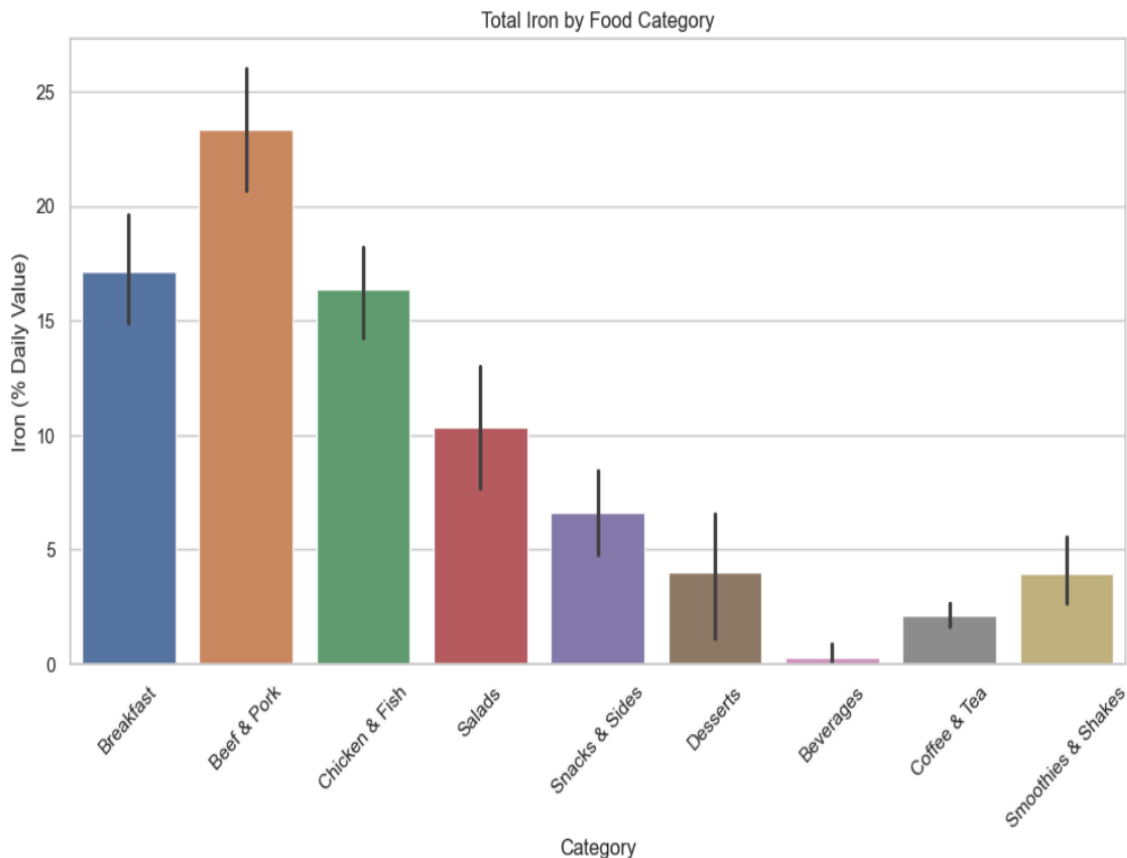
Iron Distribution Analysis

The iron distribution analysis shows that Beef & Pork has the highest iron content, averaging over 20% Daily Value, while Breakfast options follow closely with iron levels ranging from 15-20%. In contrast, Beverages have the lowest iron content.

2. Calcium

Total Calcium by Food Category
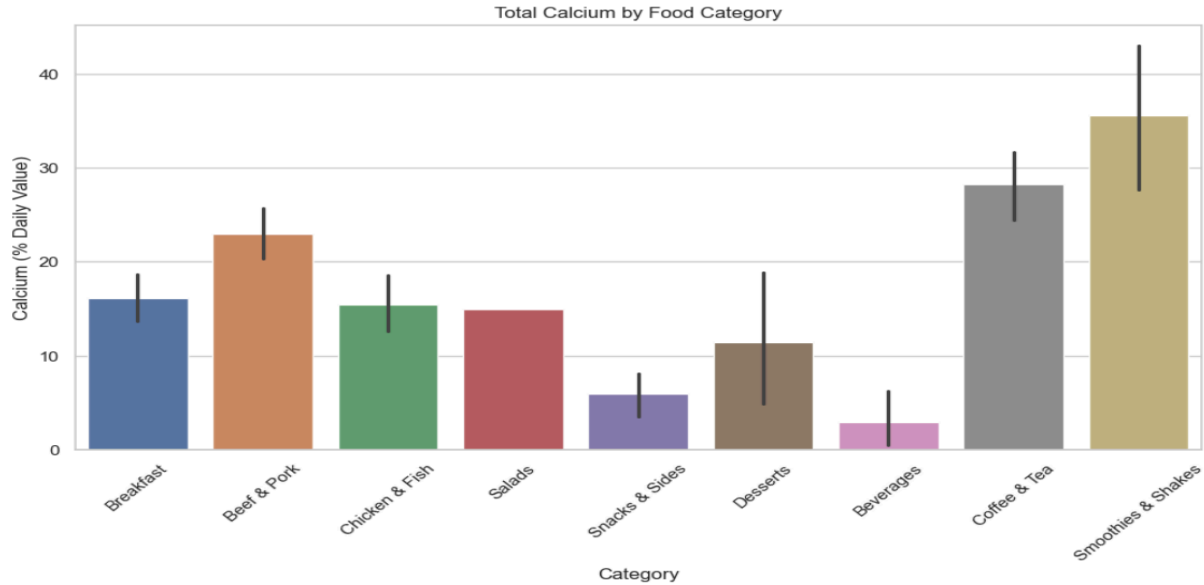
Calcium Distribution Analysis

Smoothies & Shakes have the highest calcium content, followed by Coffee & Tea and Desserts, while Snacks & Sides, Beverages, and Breakfast provide lower amounts. It reveals high variability in calcium levels for Smoothies & Shakes and Coffee & Tea, while Snacks & Sides, Breakfast, and Chicken & Fish show more consistency, lower calcium values.

3. Vitamin A

Total Vitamin A by Food Category
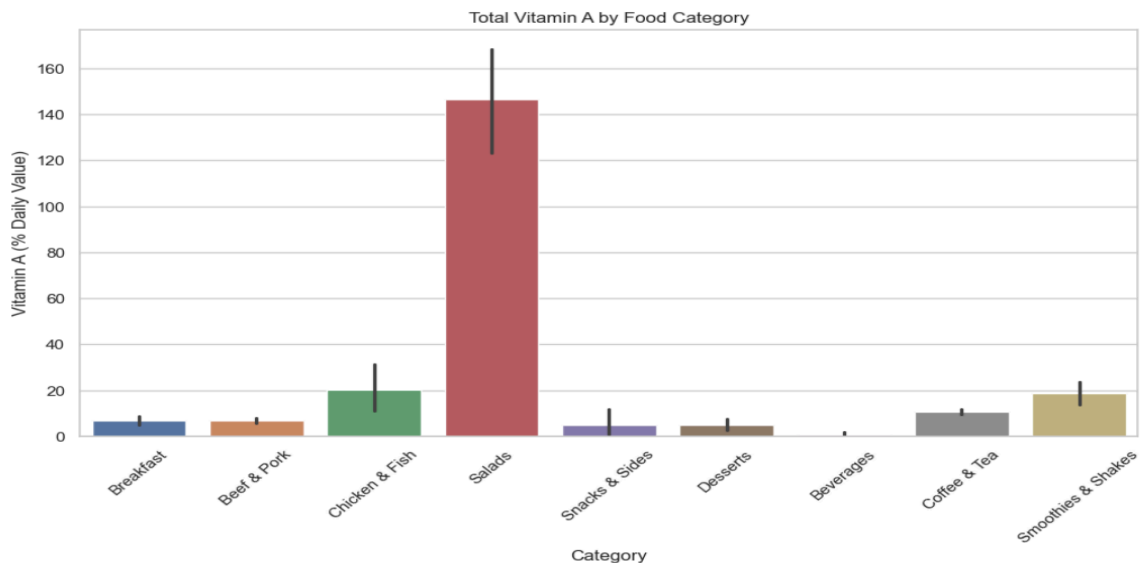
Vitamin A Distribution Analysis

The analysis of Vitamin A content across five food categories shows that **Salads** stand out as the richest source of Vitamin A, with values ranging from 100 to 170. In comparison, the other categories

have significantly lower Vitamin A levels, with the highest content reaching only 70. This highlights **Salads** as the best choice for those looking for Vitamin A-rich options in McDonald's menu items.

Data Visualization

Histogram:

To better understand the calorie distribution and nutritional content of the menu items, I will create a series of data visualizations. First, I will generate a histogram and a box plot to explore the distribution of calorie counts across the menu. These plots will highlight the range of calorie values, reveal any outliers or skewness, and provide an overall view of the calorie distribution. Next, I will create bar charts comparing the nutritional characteristics—such as total fat, saturated fat, carbohydrates, and protein—across different food categories like burgers, salads, and desserts. These comparisons will help identify key differences in the nutrient profiles of these groups. Through these visualizations, we can gain a clearer understanding of the calorie and nutrient composition of the menu, aiding both consumer decision-making and menu development strategies.

Distribution of Calories

The histogram and boxplot for the said distribution can be plotted together with the help of a subplot, so that we can compare both the visuals side by side to get more comprehensive insights about the distribution as well as the outliers.
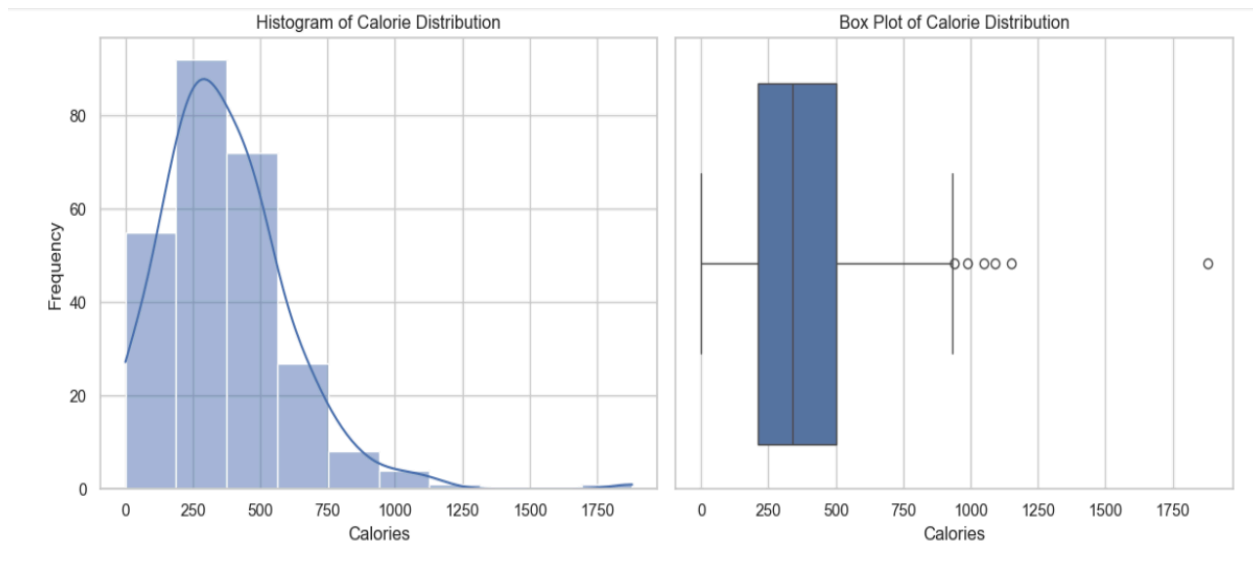
The histogram reveals a right-skewed distribution, with a peak between 125 and 500 calories, and a long tail extending toward higher calorie values. Most menu items cluster on the lower end of the

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calorie spectrum, while only a few high-calorie outliers are present. The box plot supports this observation, showing a median calorie count of approximately 340 calories, with the 25th and 75th percentiles at 210 and 500 calories, respectively. The plot also highlights several outliers, particularly high-calorie items, beginning with the "McFlurry with Reese's Peanut Butter Cups (Medium)" at 810 calories.

Nutritional Content Comparison

With the help of several bar-charts, histograms and boxplots we compare the nutritional characteristics of different food categories. As the count of nutrients is 22(which will not be as feasible), we create the visualizations for 4 selected list of nutrients namely,

1. Total Fat (% Daily Value)
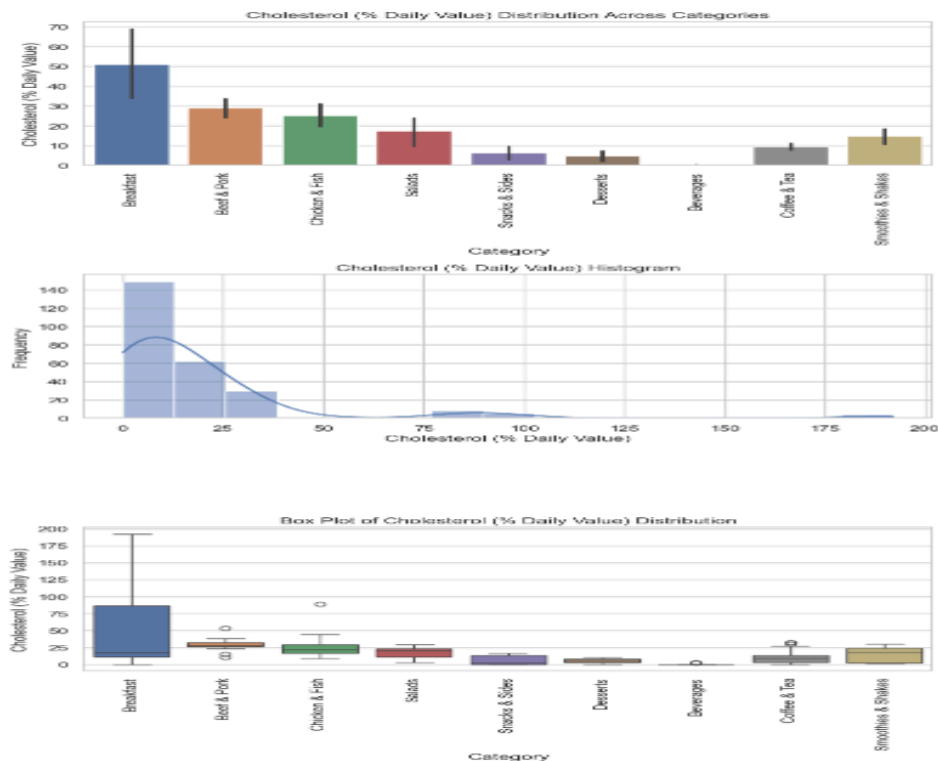2. Cholesterol (% Daily Value)
3. Sugars
4. Protein

Total Fat (% Daily Value)
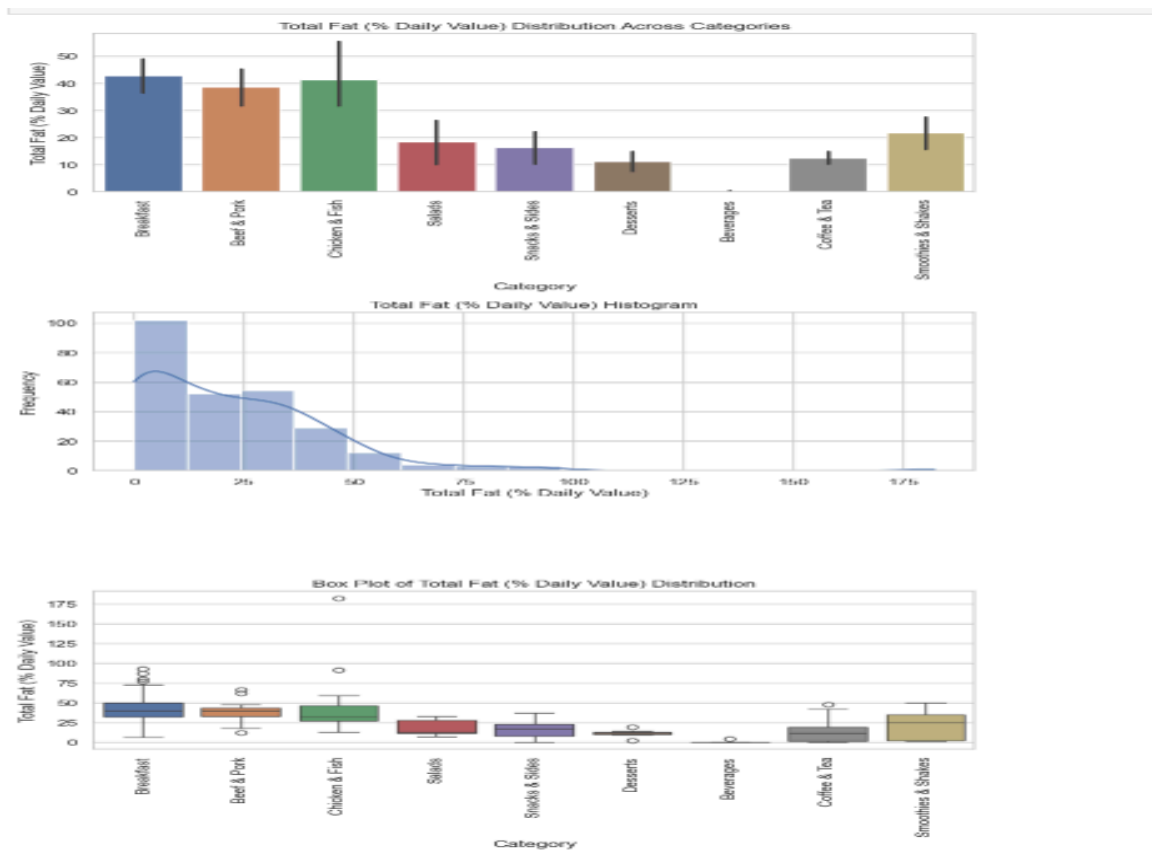
Analysis of Total Fat (% Daily Value) Distribution

1. From the bar plot, we observe that the Breakfast category has the highest average Total Fat (% Daily Value) at approximately 43%, followed closely by the Chicken & Fish category at around 40%. In contrast, the Beverages category shows the lowest average Total Fat (% Daily Value), with negligible values.
2. From the histogram, the distribution of Total Fat (% Daily Value) is right-skewed, with the majority of items having lower fat values. The peak lies between 0 and 25%, showing that most menu items contain relatively low Total Fat (% Daily Value). However, there is a long tail extending towards higher fat values, indicating that a few items contain significantly higher Total Fat (% Daily Value).
3. From the box plot, focusing on the two categories with the highest average Total Fat (% Daily Value):
   - Breakfast: The box plot reveals a relatively even distribution of Total Fat (% Daily Value) across breakfast items, with a median of 43%. The 25th percentile is around 30%, while the 75th percentile is 50%. Several outliers exist, indicating some breakfast items have significantly higher fat content.
   - Chicken & Fish: The distribution here is more skewed, with a median of approximately 40%. The 25th percentile lies around 28%, while the 75th percentile is around 48%. Similar to breakfast, a few outliers reflect higher Total Fat (% Daily Value) values.

Cholesterol (% Daily Value)

Analysis of Cholesterol (% Daily Value) Distribution:

1. From the Bar Plot: The Breakfast category has the highest average cholesterol content, approximately 50% of the daily value, followed by the Beef & Pork category at around 30% and the Chicken & Fish category at approximately 25%. Notably, the Beverages category exhibits the lowest cholesterol levels, with values that are almost negligible.

2. From the Histogram: The histogram shows a right-skewed distribution of cholesterol values, with a peak around 0 to 25%. Most items fall into this lower cholesterol range, indicating that many menu items have relatively low cholesterol content. There is a gradual decline in frequency as cholesterol levels increase, with only a few items reaching higher values beyond 75% of the daily value. The distribution suggests that while the majority of items are low in cholesterol, there are outliers that significantly exceed this range.

3. From the Box Plot (Focusing on the Top Two Categories with Highest Average Cholesterol % Daily Value):
   - Breakfast: The Breakfast category demonstrates a broader range of cholesterol values, with some items nearing 90% of the daily recommended value. The median cholesterol level in this category is higher compared to others, highlighting its overall richness in cholesterol content.
   - Beef & Pork: This category presents a more concentrated distribution, with most items clustered between 25% and 35% of the daily value.
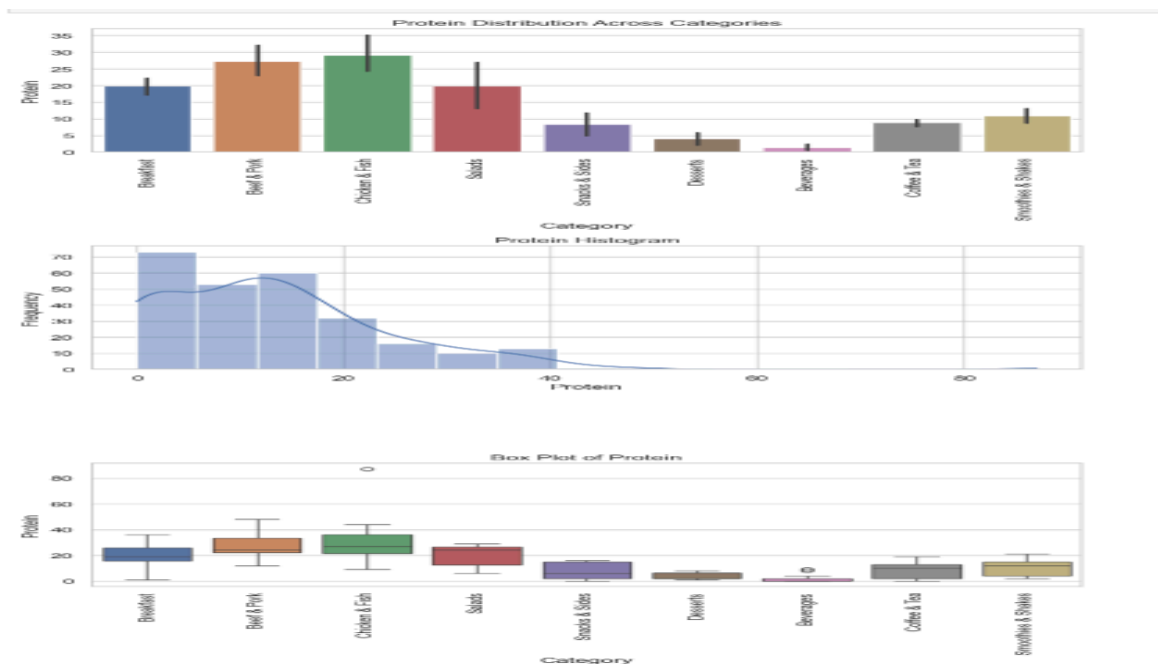
Sugars
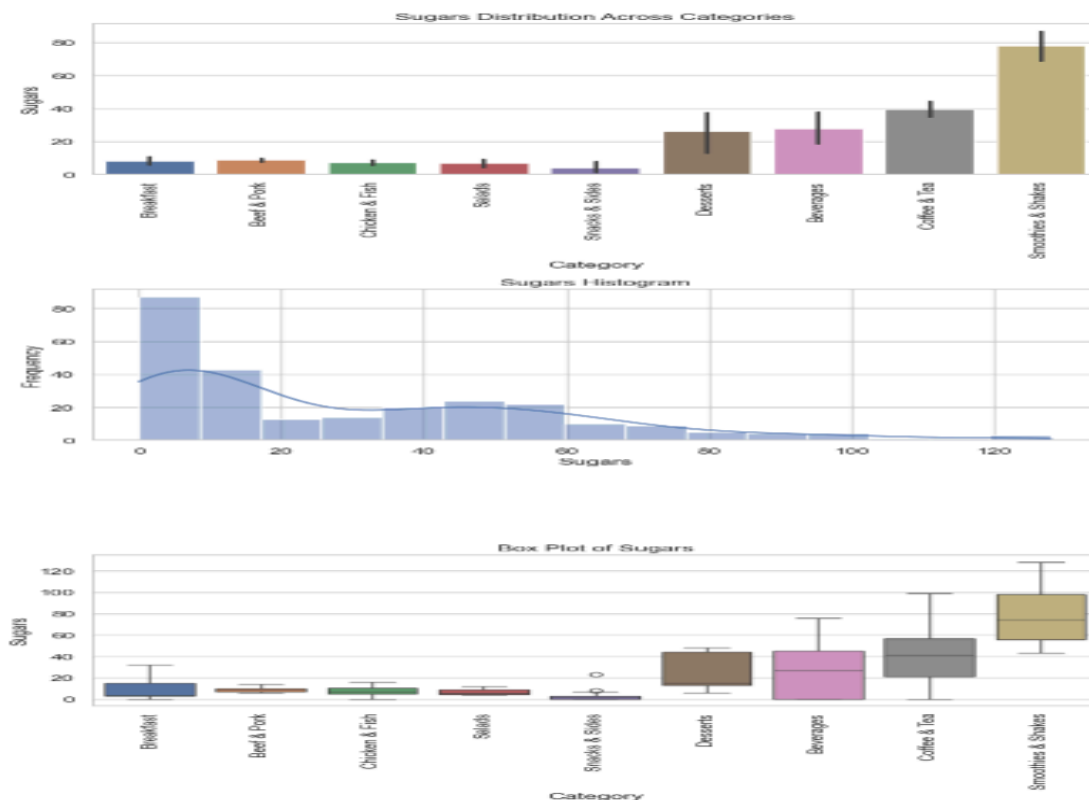
Analysis of Sugars Distribution:

1. From the barplot:
   - The Smoothies & Shakes category contains the highest average sugar content, with servings averaging around 80 grams of sugar.
   - The Coffee & Tea category ranks second, with an average of approximately 40 grams of sugar per serving.
   - The Snacks & Sides category has the lowest average sugar content, with around 8 grams per serving.
2. From the histogram:
   - The histogram of sugar content reveals that most products contain less than 20 grams of sugar per serving, with the highest frequency occurring in the 0-10 gram range.
   - A gradual decline in frequency can be observed as sugar content increases, with fewer products containing more than 60 grams of sugar.
   - The data shows a long tail towards higher sugar levels, with some items reaching over 120 grams of sugar per serving, though these cases are much rarer.
3. From the boxplot (focusing on the top two categories with the highest average sugar content):
   - The Smoothies & Shakes category exhibits the widest range in sugar content, with some products containing up to 100 grams of sugar per serving.
   - The Coffee & Tea category also shows a considerable range in sugar content, with some items reaching as high as 60 grams of sugar per serving.
   - Other than the Snacks & Sides category, which has the lowest sugar content, there are no significant outliers in sugar content across the categories.
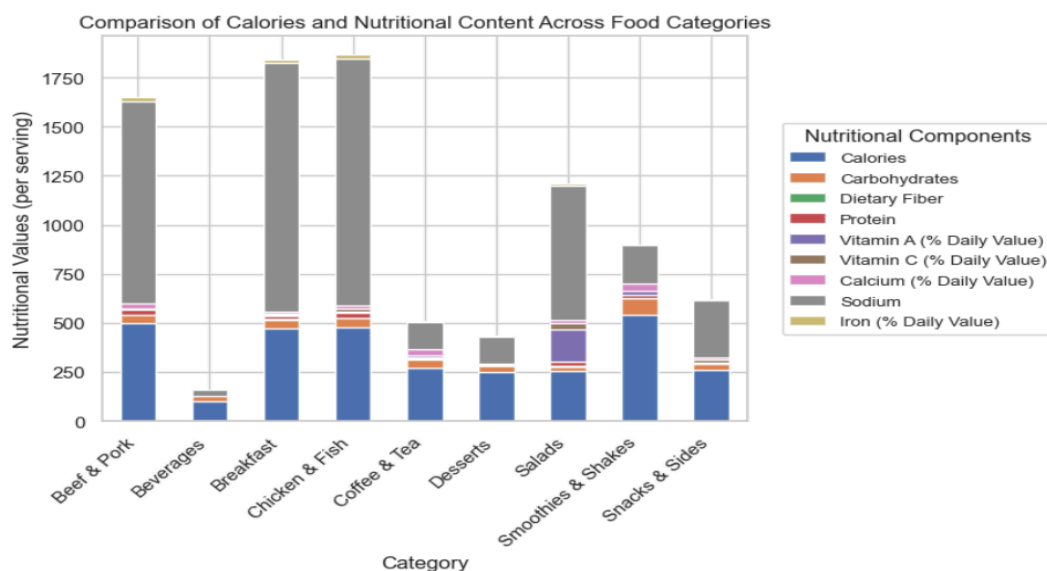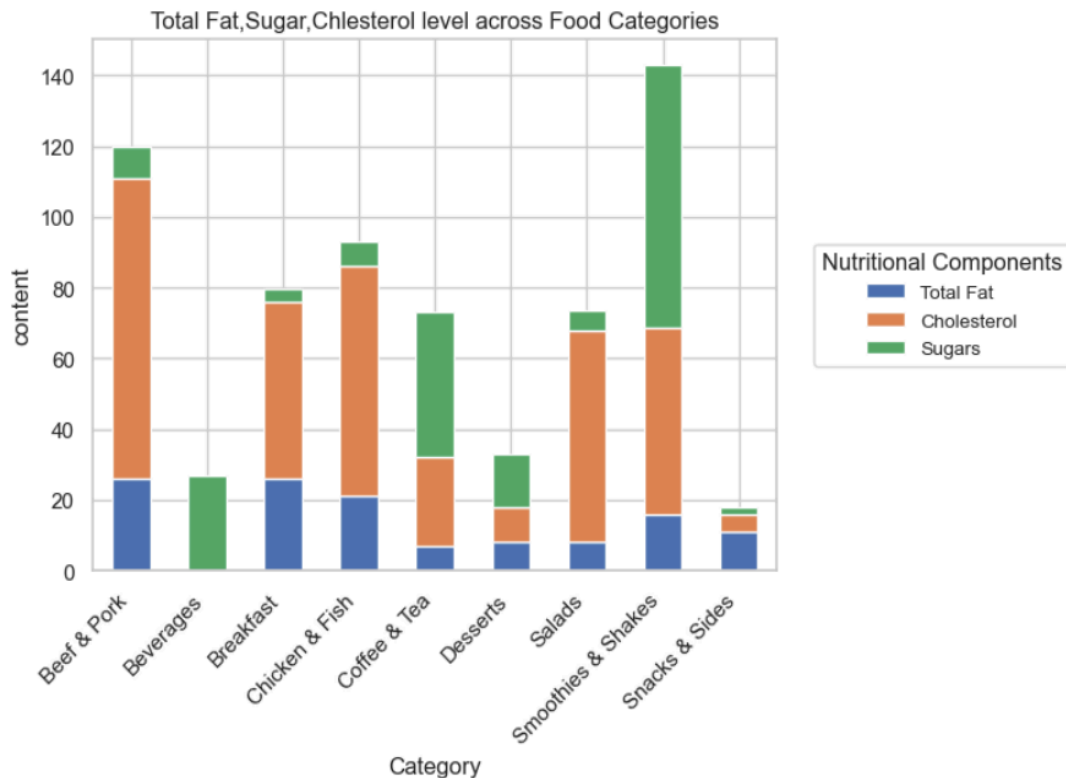
Protein

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Analysis of Protein Distribution:

1. From the barplot:
   - The Chicken & Fish category contains the highest average protein content, with servings averaging around 29 grams of protein per serving.
   - The Beef & Pork category ranks second, with an average of approximately 27 grams of protein per serving.
   - The Beverages category has the lowest average protein content, with only around 2-3 grams of protein per serving.
2. From the histogram:
   - The histogram of protein content reveals that most products contain less than 15 grams of protein per serving, with the highest frequency occurring in the 0-10 gram range.
   - A clear decline in frequency is observed as protein content increases, with fewer products containing more than 20 grams of protein.
   - There is a long tail in the distribution, showing some items with over 40 grams of protein, though these are rare occurrences, and a few items even reaching over 80 grams of protein.
3. From the boxplot (focusing on the top two categories with the highest average protein content):
   - The Chicken & Fish category has the widest range in protein content, with some items containing up to 40 grams of protein per serving.
   - The Beef & Pork category shows a slightly more compact distribution, with most items ranging between 22-37 grams of protein per serving.
   - There are no substantial outliers in protein levels across the categories, but a few small outliers can be noted in the Chicken & Fish and Beverages categories, with a limited number of items showing spiked protein levels. in levels.

Compare nutritional characteristics of different food categories

Comparison of Calories and Nutritional Content Across Food Categories

Total Fat, Sugar, Chlesterol level across Food Categories

The stacked bar charts and accompanying tables provide a comprehensive comparison of both beneficial and less desirable nutrients across different food categories, helping consumers make informed dietary decisions. For beneficial nutrients, categories like Salads and Chicken & Fish are highlighted for their high protein content, as well as vitamins and essential minerals such as Vitamin A, Vitamin C, and iron, while Smoothies & Shakes offer a rich source of calcium.

Conversely, less desirable nutrients like total fat, cholesterol, and sugars are significantly higher in categories such as Beef & Pork, Smoothies & Shakes, and Beverages, suggesting that these foods should be consumed in moderation due to their elevated levels of fat, cholesterol, and sugar. This insight encourages individuals to better manage their nutritional intake in alignment with their health goals.

Determine the average nutritional content of popular menu categories.

Average Calories Distribution Across Categories
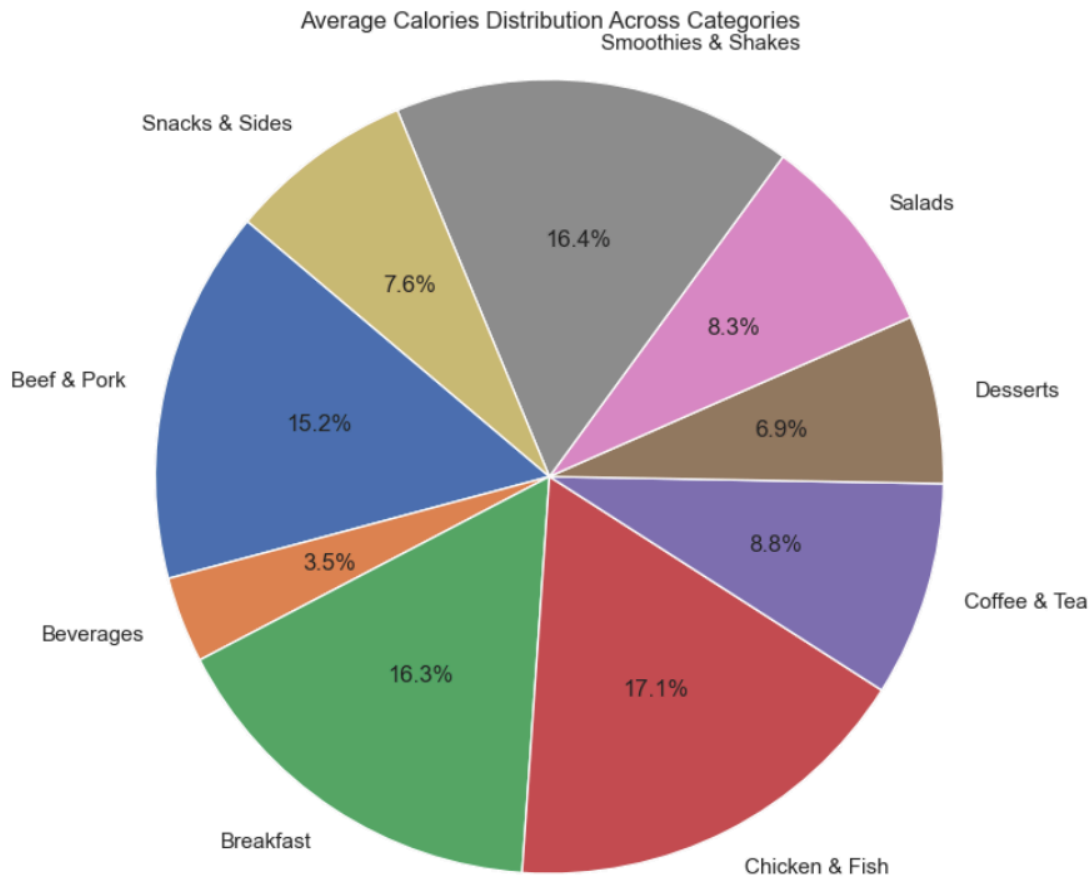
The values displayed in the pie chart and table indicate which foods offer good nutritional content.

Average Nutritional Content of Popular Menu Categories

Breakfast:

The Breakfast category is extremely popular among McDonald's customers, providing a convenient option for a well-balanced meal that delivers essential nutrition to kickstart the day. A common choice is to pair breakfast items with Coffee & Tea, which many people enjoy to complement their meal.

Lunch:

The Chicken & Fish category is favored by McDonald's patrons due to its comprehensive nutrient profile. This category is notably high in calories, carbohydrates, vitamins, and sodium, along with other nutritional elements. It's advisable to consider this menu option alongside Salads and Smoothies & Shakes for a nutritious combination.

Dinner:

The Beef & Pork category ranks as one of the most popular selections on McDonald's menu, featuring a range of nutrient-rich options such as burgers and wraps that help wrap up the day. Many diners enjoy pairing these meals with Beverages, Desserts, and Snacks & Sides, particularly at dinner. While these options offer a substantial amount of nutrients, the combination of fat, cholesterol, and sugar can be high, which may not be the best choice for those aiming to maintain a healthy diet.

Benefits of Nutritional Analysis for McDonald's Customers and the Organization

For McDonald's Customers

A detailed nutritional analysis provides several advantages to McDonald's customers:

- **Informed Choices**: With access to nutritional data, customers can make smarter meal choices that align with their dietary needs, whether they're aiming for low-calorie, high-protein, or well-balanced options.
- **Healthier Eating Habits**: By identifying which food categories are rich in nutrients like Protein, Dietary Fiber, and Vitamins, customers can plan more nutritious meals, fostering better eating habits.
- **Customization**: The analysis highlights menu items that may be high in fat, sodium, or sugar. This helps customers who need to limit these nutrients due to health conditions like hypertension or diabetes, allowing them to tailor their meals accordingly.
- **Dietary Preferences**: Customers with specific dietary goals or restrictions can easily find suitable options. For example, high-protein items like Chicken & Fish or low-calorie beverages are helpful for those focused on weight management or muscle gain.

For McDonald's Organization

McDonald's can leverage this analysis to benefit both their customers and the business itself:

- **Menu Optimization**: By understanding how nutrients are distributed across their offerings, McDonald's can refine their menu, adjusting portion sizes, ingredient combinations, or developing new items that cater to healthier preferences without sacrificing flavor.
- **Targeted Marketing**: Nutritional insights can drive personalized marketing efforts. McDonald's can emphasize healthier choices like Salads, Smoothies & Shakes, or low-calorie drinks to attract health-conscious customers, enhancing targeted promotions for different consumer groups.
- **Improved Customer Loyalty**: Transparency around nutrition builds trust and fosters a stronger connection with customers. Providing clear, accessible nutritional information helps McDonald's build long-term loyalty, especially among those prioritizing healthy eating.
- **Regulatory Compliance**: Many regions require restaurants to provide detailed nutritional information. This analysis ensures McDonald's remains compliant with these regulations, avoiding legal issues and demonstrating their commitment to transparency.

- **New Product Development**: Nutritional insights can guide the development of healthier menu items that appeal to a wider audience, including individuals who previously avoided fast food due to health concerns.

Recommendations on how McDonald's could improve the nutritional profile of their menu

Recommendations for Improving McDonald's Nutritional Profile:

McDonald's can enhance the nutritional quality of their menu by adopting the following strategies:

- Reduce sodium, saturated fat, and added sugars in popular menu items to promote healthier choices.
- Incorporate leaner protein options, such as grilled chicken or plant-based alternatives, to provide more balanced meal offerings.
- Increase the availability of fresh vegetables and whole grains to boost the overall nutritional value of meals.
- Offer smaller portion sizes to help customers manage their calorie intake more effectively.
- Provide greater transparency about ingredients, enabling customers to make informed, health-conscious decisions.
- Adopt healthier cooking methods, like baking instead of frying, to lower the fat content in select items.

By implementing these changes, McDonald's would not only support healthier eating habits but also meet the growing demand for nutritious, balanced meals among consumers.

Conclusion:

This analysis offers valuable insights into the nutritional content of McDonald's menu across different categories, helping customers make more informed choices based on their dietary needs. While categories like Chicken & Fish and Salads provide a good balance of proteins, vitamins, and minerals, other categories such as Beef & Pork and Smoothies & Shakes are higher in fat, cholesterol, and sugars, requiring more careful moderation. By understanding the nutritional profiles of these items, consumers can better tailor their meals to meet their health goals, fostering healthier eating habits.

GitHub Link : https://github.com/sagargoel93/McDonald-s-Menu-Nutritional-Analysis---Project