WOLF IN SHEEP'S CLOTHING FOR FAST FOOD SALADS

VISUALIZING THE NUTRITIONAL INFORMATION OF FAST FOOD SALADS

Nissim Panchpor

Gowri Ramaprasad

Luiza Wainer

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A. Dataset

We decided to create a visualization that charts the nutritional information of salads from McDonald's, Burger King, Starbucks, Wendy's and Subway, comparing them to the nutritional information of McDonald's Big Mac. The restaurants were chosen for their ubiquity and popularity in the American food landscape[1].

The data was sourced from FastFoodNutrition.org, an independent website devoted to educating consumers about their fast food options, showcasing the nutrition facts for the menu items from 30 of the largest fast food chains in the USA. We parsed this data out into a CSV file and added a column for the name of the restaurant. We cross-referenced the nutrition information provided by FastFoodNutrition.org for a sample of the food items with the nutrition information provided by each restaurant's website as a way to guarantee the accuracy of the data collected.

Since the Office of Disease Prevention and Health Promotion (ODPHP) states[2] that healthy eating patterns include a variety of proteins and fibers, and limits sodium and calories from saturated and trans fats and added sugars, we decided to work specifically with Calories, Total Fat, Sugars, Sodium, Fibers and Proteins.

A snippet of the data can be seen below:

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[1] Fitzpatrick, Hayley. The 20 most successful fast food chains in America. http://www.businessinsider.com/the-20-most-successful-fast-food-chains-in-america-2015-8/

[2] Key Elements of Healthy Eating Patterns.
https://health.gov/dietaryguidelines/2015/guidelines/chapter-1/a-closer-look-inside-healthy-eating-patterns

	Restaurant	Food item	Calories	Calories From Fat	Total Fat (g)	Saturated Fat (g)	Trans Fat (g)	Cholesterol (mg)	Sodium (mg)	Carbohydrates (g)	Fiber (g)	Sugar (g)	Protein (g)	min A (%ır
2	Starbucks	gie & Brown Rice	430	200	22	3	0	0	640	50	8	8	10	180
3	Starbucks	nal Harvest Fruit	90	5	0	0	0	0	0	24	4	19	1	2
4	Starbucks	en & Black Bean !	360	130	15	2.5	0	30	840	38	8	9	14	50
5	Wendy's	Pecan Chicken Sal	340		11	7	0	105	1150	28	5	20	35	
6	Wendy's	Pecan Chicken Sal	180		6	3.5	0	55	490	14	3	9	18	
7	Wendy's	ashew Chicken Sa	110		2	0	0	45	260	8	3	3	17	
8	Wendy's	shew Chicken Sala	210		4	0	0	90	520	13	5	5	33	
9	Wendy's	anch Chicken Sala	210		8	3.5	0	60	510	17	3	9	20	
10	Wendy's	nch Chicken Salac	390		15	7	0	125	940	28	4	12	40	
11	Wendy's	arella Chicken Sala	520	220	24	8	0.5	125	1130	36	5	16	41	120
12	Wendy's	irella Chicken Sala	360	160	18	6	0	70	750	26	3	9	24	70
13	Wendy's	iterranean Chicke	230	70	8	2	0	55	630	21	5	10	20	80
14	Wendy's	erranean Chicken	430	130	14	4	0	115	1220	38	8	18	39	120
15	Wendy's	hicken Caesar Sal	250		14	6	0	45	520	14	4	2	18	
16	Wendy's	icken Caesar Sala	470		25	12	1	90	1240	26	5	3	37	
17	Wendy's	r Berry Chicken Sa	380	80	9	3.5	0	100	980	41	6	30	35	90
18	Wendy's	r Berry Chicken Sa	210	50	6	2	0	50	500	24	4	17	18	60
19	Wendy's	aco Salad Full Size	660	290	32	13	1	85	1820	63	10	18	32	110
20	Wendy's	aco Salad Half Siz	470	210	23	8	0.5	45	1320	49				
21	Subway	nn Carved Turkey	300	80	9	3	0	60	1120	26	3	22	25	40
22	Subway	B.L.T. Salad	150	70	8	4	0	20	420	10	4	5	10	50

Here's a table showing description and type of variables that users were interested to see in the visualization:

Sr. No.	Variable Name	Description	Variable Type	Data Type
1	Restaurant	Name of the restaurant	Categorical	Text
2	Food Item	Name of the salad	Categorical	Text
3	Calories	Calorie count of food item	Ratio	Number
4	Total Fat (g)	Fat content of food item	Ratio	Number
5	Protein (g)	Protein content of food item	Ratio	Number
6	Sugar (g)	Sugar content of food item	Ratio	Number
7	Sodium (mg)	Sodium content of food item	Ratio	Number
8	Cholesterol (mg)	Cholesterol content of food item	Ratio	Number

We used the Big Mac as a comparison since it is considered a quintessential American burger and has been used as an allegory for notoriously unhealthy food. In our research,

we found one particularly compelling infographic which inspired this comparison. Thus, considering this reputation we decided to compare it with salads, which most people associate with healthy foods.

"What happens 1 hour after eating a Big Mac".
Source: https://fastfoodmenuprice.com/big-mac-revealed

B. Audience

The audience for this visualization is health conscious people who are concerned about the nutritional information of the food items they consume. However, to scope down for this particular visualization project, we decided to focus on two audience groups as follows:

- **Audience 1 - Working Parents:**

For working parents of young children, it can get difficult to whip out nutritious home food at all times. On many occasions, they have no option but to stop by a fast-food restaurant and grab a meal for their entire family. Still, they don't like to compromise on making sure that they and especially their children are eating healthy food.

We considered working parents' who have children no more than 18 years of age. Children less than 18 years of age are more likely to live with their parents and are not considered adults yet. Thus, parents have a greater responsibility of children's well-being during this period.

Tasks: Users within this audience group would probably have their entire family in mind while looking at the visualization. They would compare different salad options from fast-food restaurants and suggest the variety suitable for each member of their family. For example, parents themselves would want to choose an option with less amount of sodium and calories. Whereas for their children, a high calorie salad would probably be okay.

- **Audience 2 - Students**

  Student, especially those pursuing advanced degrees have a high workload a busy schedule. Many of them are living away from their homes, which means they have to cook for themselves. Thus, they frequently find themselves unable to invest enough time to cook a nutritious meal, twice a day. A healthy yet quick bite from a fast-food restaurant is a go-to option in these cases.

  As mentioned above, we are focusing on graduate students because of two reasons: first, they are more likely to live away from their home and second, they usually have a high workload which means less time for other activities such as cooking.

  Tasks: Users of this audience group would be looking for a quick bite on the go, though they would still want the food to be as nutritious as possible. Most users would be looking for a low total fat, sodium and sugar count. As far as the calorie count is concerned, users would follow their diet plans, if any. For some, a high calorie count might be important due to their age and being a student usually involves a lot of physical activity. However, some users who are striving for better fitness might prefer a fast-food with low calorie count.

- **Assumptions and prior knowledge**

  We assume our audience is worried about maintaining a healthy diet and are familiar with the nutrition facts represented on food labels. Also, our two audiences fall in the 'Millennials' generation, who are born between early-80s to mid-90s.

  Furthermore, we also considered that the audience has a prior knowledge of calorie counts, and what is considered to be high or unhealthy levels of calories and fats. For example, a person might assume that anything more than *"x calories is unhealthy"* and thus would reconsider consuming it, if presented with the information.

C. Motivation

Our primary motivation was to aid fast food consumers with information about nutrition that fast foods provide and help them make informed choices when consuming fast food. In a recent study[3] conducted, which measured the impact of fast food on Millennials the following were of interest to us:

1. Millennials tend to consume fast food due to its convenience and low cost and low wait times lead me to get fast food quickly. Young adults spend more on fast foods than electronics and higher education.
2. The fast food has grown into a $246.6 Billion industry over the last three decades and the primary consumers of this are people transitioning from adolescence to adulthood. A whopping 83.1 % of fast food consumers are millennials according to U.S. census conducted in 2015.
3. Millennials who consume fast food are most likely to have a higher BMI. Furthermore, millennials with below-average nutritional knowledge are more likely to be influenced by fast food advertising.

This brief study made us conceptualize a possible educational visualization which would people make informed and healthier choices when consuming fast food. We also thus identified our primary audience as students and working parents.

After talking with a few representatives of our audience, we realized that many of them visit fast-food restaurants to grab a quick meal. For example, a few students we talked to

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[3] Segokgo, K., Ogbeide, Godwin-Charles A., Bailey, Mechelle, & Hammond, Rhonda. (2016). The Impact of Fast Food Marketing on Millennials, ProQuest Dissertations and Theses.

mentioned that they have to depend on fast-food restaurants when they need to grab a quick meal in between their classes or meetings. Occasionally they resort to these food items when they are really exhausted to cook for themselves. Similarly, some parents we talked to said that they usually visit fast-food restaurants when they are on a trip and need a quick bite, but don't want to fill up with junk (unhealthy) food. Hence, parents prefer an item like chicken salad over a greasy burger and ask their children to follow the same as much as possible.

The two driving forces that both two audiences have when choosing to eat at a fast food restaurant are time constraint and nutrition. With this in mind, members of our audience probably think that the salads offered in these establishments are a good option in situations described above. But are salads really the best option in these scenarios?

In this light, for our final visualization project, we are trying to make apparent the *"Wolves in sheep's clothing"* of fast food salads: food items that consumers might think are healthy, but that may be just as unhealthy - or more - than the other food items on the menu. Our goal is to inform our audience on the nutritional information of different salads to help them make healthy decisions when ordering food at fast food restaurants.

We hope the visualization will help answer the following questions:
- What are the unhealthiest salads?
- What are the healthiest salads?
- How do salads compare to a notoriously unhealthy fast-food item such as the Big Mac?
- What fast food chain has the unhealthiest salads?
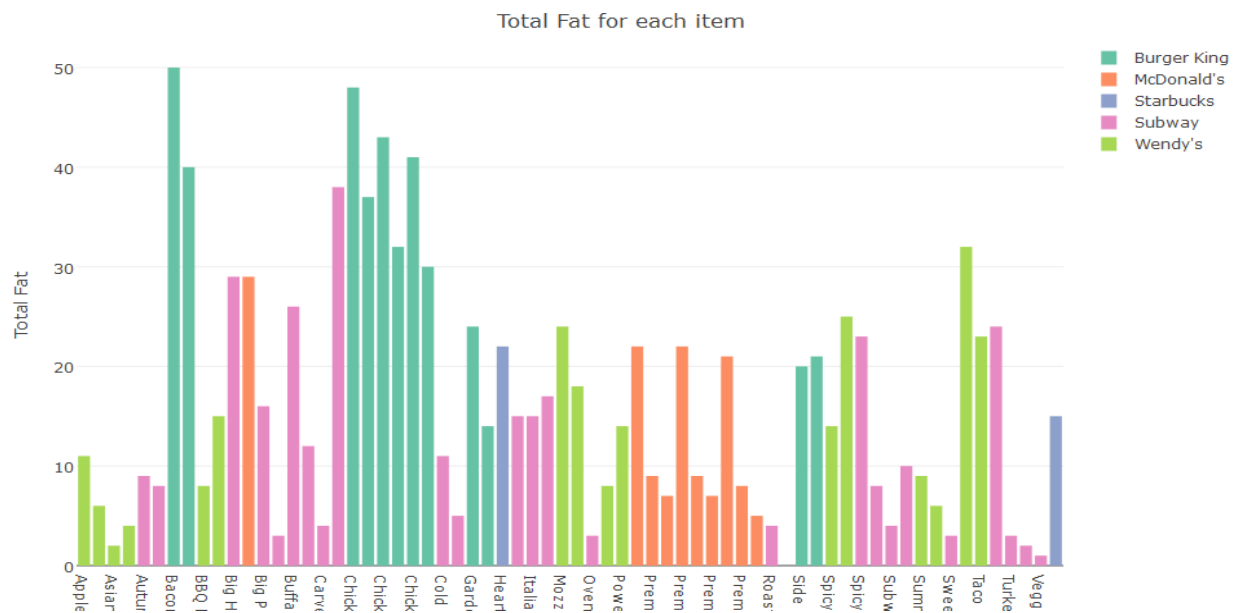- What fast food chain has the healthiest salads?
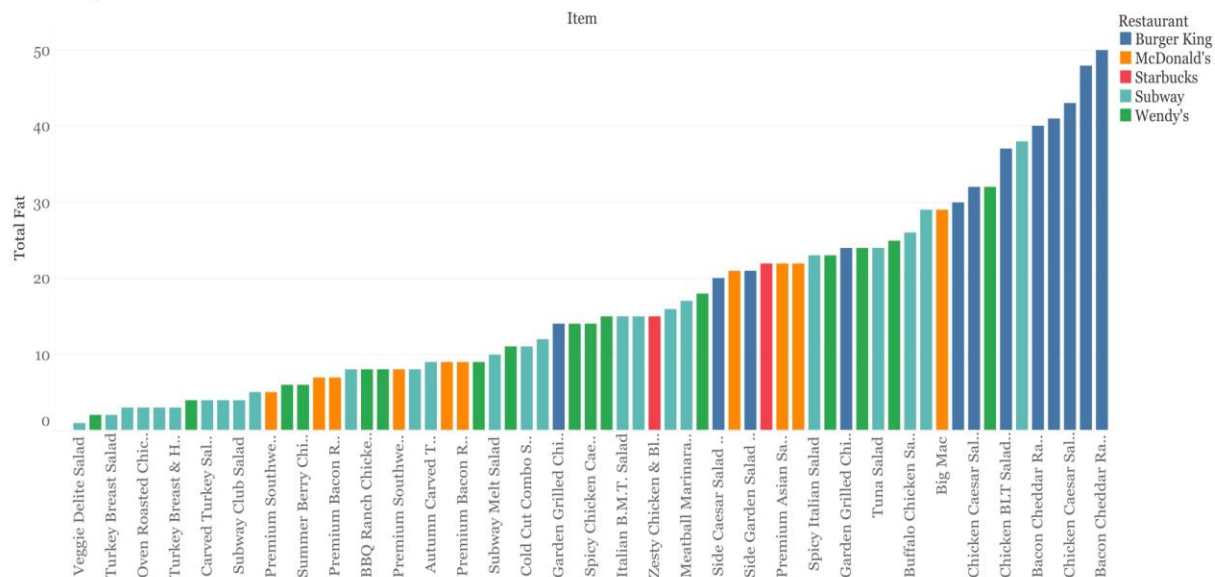
D. Iterations

- ## Sketch 1: Bar-Plot

  Original sketch

Iterations:

Total Fat for each item
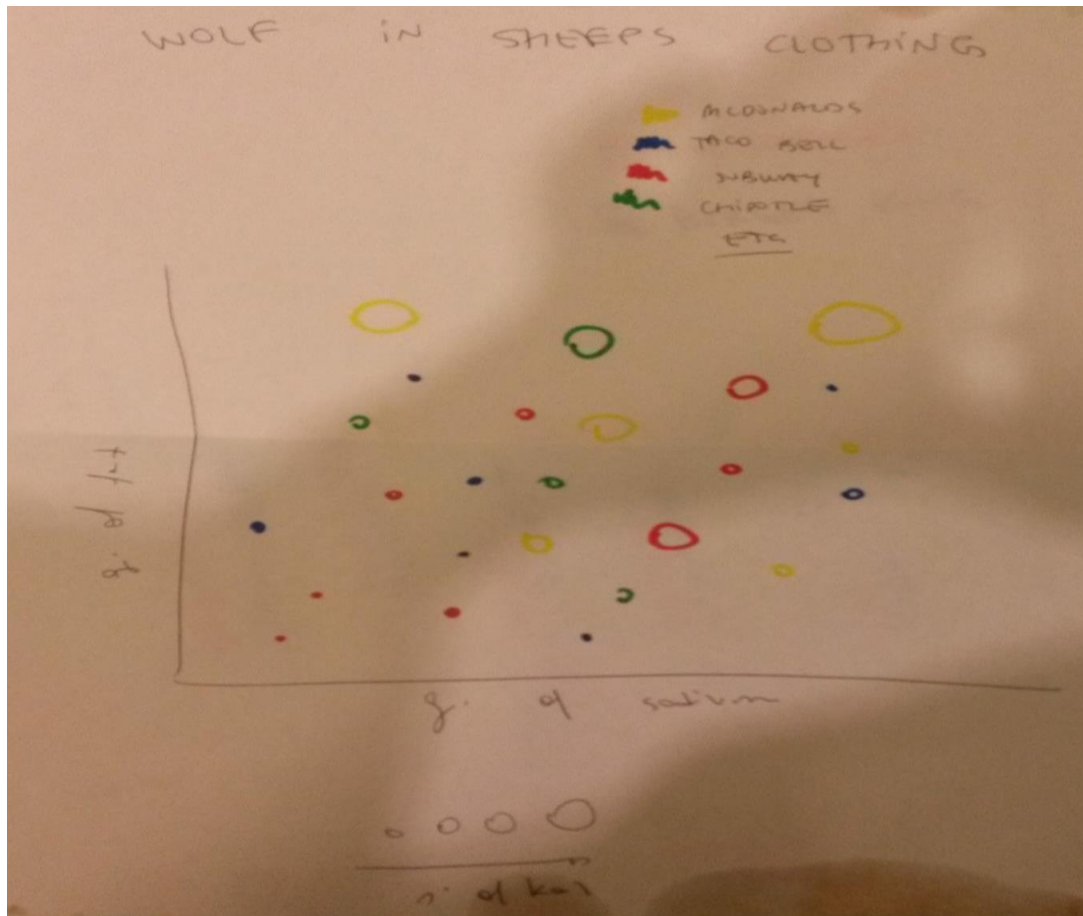
Item by Total Fat

Sum of Total Fat for each Item. Color shows details about Restaurant.

Design Rationale:

Most users from our audience usually check total amount of fat present in each food item they buy at a fast-food restaurant. That's the reason we decided to create a bar plot that shows amount of total fat present in each of our selected salads and the Big Mac. We sorted the bars in ascending order to provide a simpler visualization to users.
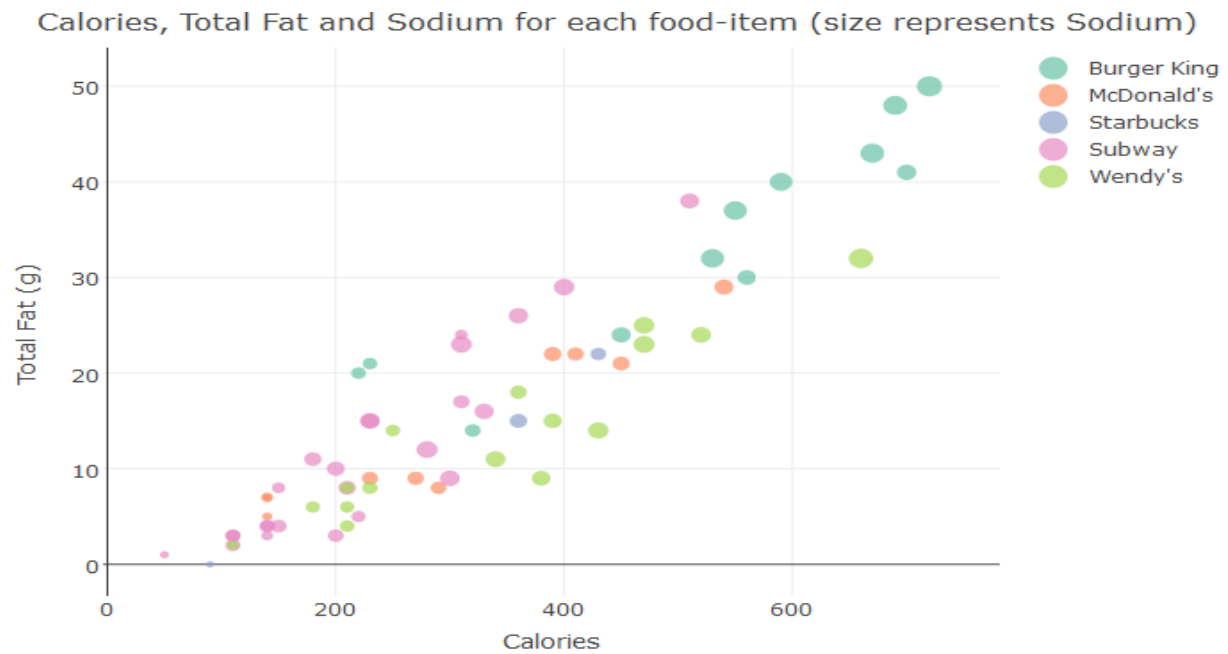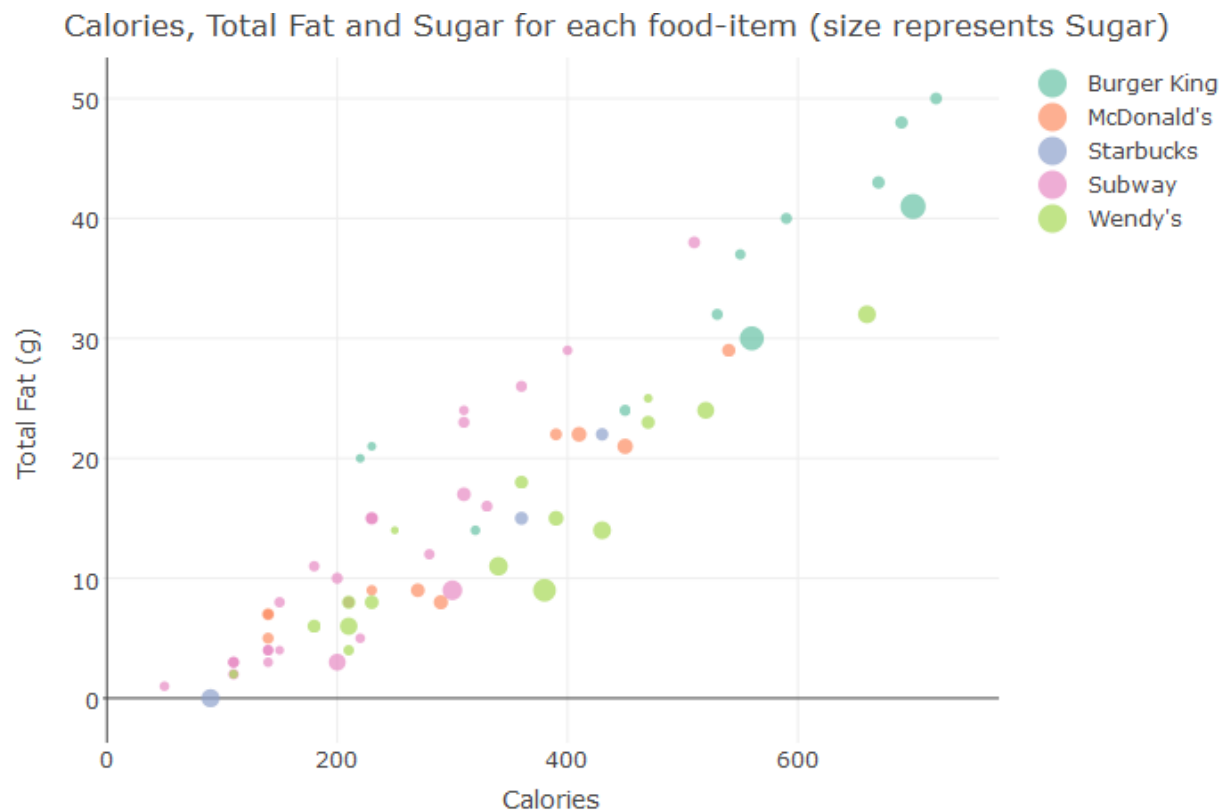
- Sketch 2: Scatter-plot

Original sketch

Iterations and Variations

2 A:

Calories, Total Fat and Sodium for each food-item (size represents Sodium)

2 B:

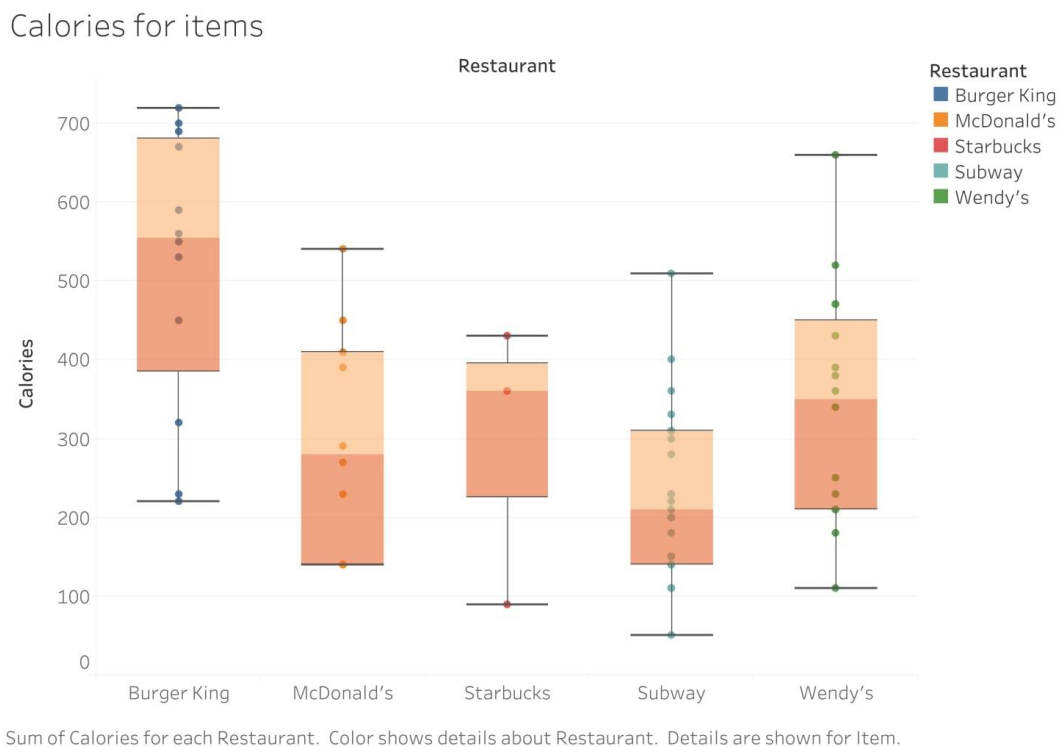Calories, Total Fat and Sugar for each food-item (size represents Sugar)

Design Rationale:

Scatter plots are suitable to visualize more than 2 measures on a single plot. Our dataset consists of multiple quantitative measures of nutrition such as calories, total fat, sodium, sugar, along with each food item by our chosen 5 fast-food restaurants. For users to understand the nutritional value of each food item, it would be more helpful to have 2-3 measures in the visualization simultaneously instead of a single measure. That makes scatter plot an obvious choice.

We made two iterations with different nutritional information (Calories, Total fat, Sodium AND Calories, Total fat, Sugar) to see what aspect was more concerning to our Users.

● Sketch 3: Box-whisker Plot

Calories for items

Sum of Calories for each Restaurant. Color shows details about Restaurant. Details are shown for Item.

Design Rationale:

Since we were using different categories of data such as: Proteins, Fibers, Calories etc., and trying to find outliers, we also considered a box whisker plot, which we felt was a handy way of showing outliers in the data. In the following visualization, we are using box-whisker

plots which measures the sum of the calories. Thus, the median calories for salads in each restaurant is measured. Furthermore, this helps us identify the least calorific and most calorific salads in each fast food chain. This also helped us notice a particularly stark contrast in the case of Wendy's and Burger King.

E. User Evaluation

We conducted a user study with the three versions of our visualization in order to determine how effectively they transmitted the intended information that could help answer the questions specified above. Their feedback and suggestions for improvement was collected in order to produce the final visualization.

- **Participants:**

User 1: This participant is a 33-year-old graduate student who really enjoys fast food, tending to prefer breakfast options. They eat at fast food restaurants once or twice a month. Since they are scared of losing health insurance in the near future, maintaining a healthy lifestyle has become a priority.

User 2: A 22-year-old health conscious female who eats fast food about once in a week. Due to her hectic workload and schedule, she ends up consuming fast food because it is a cheap and less time-consuming alternative. She is, however, trying to lose some weight and is maintaining a calorie count of less than 1200 calories. She uses MyFitnessPal, an app which can be used to keep track of calories and plan meals.

User 3: A 35-year-old working mother of two kids that is also attending graduate school. While most days the family consumes home cooked meals, they occasionally (twice a month) end up eating at fast food restaurants. She tries to still make sure that they are consuming healthier food options in the menu.

User 4: A women in her fifties who runs, swims and bikes recreationally and for exercise. Fearing she lost too much weight in the recent years because of her active hobbies, she started paying more attention to what she is eating, trying to intake more healthier fats. Because of work, she travels a lot and cannot always maintain the healthy diet she thrives

for - and will sometime eat at fast food restaurants when in airports or road stops. She has two late adolescent daughters.

User 5: A 32-year-old student finishing his graduate degree in nursing. He pays close attention to what he eats, striving for balance, moderation, and organically and locally sourced ingredients. He occasionally succumbs to eating at fast food restaurants because of the pressures of graduate school and the odd hours of his job in healthcare.

● **Protocol**

To evaluate the effectiveness of the three different iterations of the visualization, we conducted 10-15 minutes informal interviews with our participants.

The interviews began with a brief introduction that specified our intentions and the purpose of the test. We decided not to provide specific information about each visualization in order to let our participants tell us about what they see. The overall process was designed as an ideation to see whether or not the participants were able to understand the visualizations and use them to answer the guiding questions.

Since most of these were conducted remotely, we send the participants all files at once and asked them priming questions:
- What do you understand from these charts? Could you describe to me what you are seeing?
- What *don't* you understand?
- What is confusing?
- What do you think about the colors?
- What do you think about the legends?
- Which visualization is the easiest to understand? Why?
- Which visualization is the most aesthetically pleasing? Why?
- What could be different (in terms of information)?
- What could be different (in terms of aesthetics)?
- Would any of these visualizations help you make healthier choices next time you are at a fast food restaurant?
- Any other comments?

● Results

Visualization 1: Bar-plot

- Users thought this chart was easy to understand: it shows how much fat in each item, from least to most. Items are further color-coded by restaurant.
- User 1 things having the colors of the bars reflect the colors of the restaurant logos would make it easier to understand what salad is from what restaurant without having to refer to the legend all the time. User 4 likes the colors, but thinks the colors for Wendy's and Subway are too similar. User 5 thought the colors provided good contrast.
- User 1 suggests that instead of having the names of the salad in the x-axis, if it is possible to have them inside the bars since they are not very clear to read at the bottom. User 4 would like the legend to be bolded.
- They did not understand why there was a column for the Big Mac.
- They noticed that we did not put the unit for total fat on y-axis.

Visualization 2: Scatter-plot variations

- All users liked this visualization the most, not only because it is easier to read, but because it shows more information, making it clear what salads are the outliers.
- Users 1 and 4 thought that Sodium content information is more relevant to them than Sugar, although none of them could give a clear reason why (User 1 concluded that because salads are savory foods, sodium should be depicted; but that argument could be flipped: because salads are thought to be savory foods, it would be of interest to show the amount of sugars that are unknowingly being consumed).
- They wish there was a legend to explain what the size of the dot means. User 5 thought that the contrast in bubble sizes is much easier to read in the scatter plot with Sugar than the one with Sodium.
- They like the idea of having the Big Mac as a reference, but wish it was visually distinct from the rest of the McDonald's food items.
- They recommend having the measure of unit on the axis (mg for Fat, Cal for Calories, etc.).

Visualization 3: Box-whisker plot

- Participants thought this visualization was confusing and for the most part did not understand it: "This confuses me. I don't know what the different box colors indicate

or what the size of the boxes mean. They also did not understand the choice of beige colors inside the box or the variation that the box plots are trying to show.
- The color-coding isn't necessary because the boxes are clearly labeled at the x-axis.
- On the plus side, users reported that it looks less busy than the bar plot.

Overall
- Should it be written somewhere that each dot represents an item or is that just implied?
- Visualizations do not show units of fat, sodium, or sugar, i.e. grams, percentage, volume, etc.
- Visualizations do not show relative size of the items. For example, does an item have a higher amount of fat because the portion is greater?
- User 5 asked if we know anyone who is color blind that could look at these.
- Better encoding of the Big Mac

● Actions taken

We found the user testing to be very helpful in identifying issues our audiences might have in interpreting our final visualization. From their feedback, we found that the scatter plot depicting Calories, Fat and Sodium was the best one to develop into a full-fleshed visualization.

As per their suggestions, we added the unit of measure on the axis and a legend for the amount of Sodium (i.e., the size of the dots). We also made the dot representing the Big Mac visually distinct by using an icon of the burger.

To make the visualization more understandable, we added a more descriptive title as well as a brief explanation of what is being depicted.

We increased the size of all dots proportionally, since they seemed to be too small and somewhat indistinguishable in a cluster. Also, we changed the dot denoting 0mg of sodium to be hollow instead of a filled dot. Finally, we corrected a few typos users noticed on both the visualization and in the brochure.

F. Final visualization

Our final refined visualization is rendered below. We used R (ggplot) to create the scatterplot and refined the visuals in Adobe Illustrator.

The one-page brochure based on this visualization is meant to be a tri-fold pamphlet that could be easily distributed to fast-food patrons.

Wolves in Sheep's Clothing for Fast-Food Salads

This visualization plots Calories, Total Fat and Sodium content of different salads offered by the top 5 fast-food chains in the US.
As a reference point, the Big Mac is used to draw contrast.

Total Fat in mg

The Wolf : Burger King's 'Bacon Cheddar ranch chicken w/ crispy chicken and Dressing' is unhealthier than a big mac: 720 Cal, 450 mg of fat and 1960 mg of Sodium!

The Big Mac: The signature burger has about 540 Cal, 260 mg of fat and 1040 mg of Sodium.

The healthiest Salad : Veggie Salad Delite with 10 Cal, 1mg of Fat and 0mg of Sodium.

Sodium in mg

- 0
- 10
- 20
- 30
- 40
- 50

Top 5 fast food chains in the United States:

- Burger King
- McDonald's
- Starbucks
- Subway
- Wendy's

Total amount of Calories