Fast Food or Fat Food

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Abstract:

Studies have shown that a fast food diet tends to lead to greater weight gain in an individual, along with other associated health risks. In this paper I attempt to correlate the density of fast food restaurants with the average rate of obesity in an area.

Method: Using a data set of the locations of fast food restaurants around the United States as well as CDC data on the obesity rates across the nation, I attempt to find a correlation. Further, I examine research papers already completed on the subject from researchers in the United States to gain a better understanding of the intricacies involved with this matter.

Results: Despite the obvious implication of a surface-level analysis, the actual data seems to be far more fractured. The data seems to indicate the median income level of an area tends to be more of a factor rather than direct density. The effects tend to be more pronounced in women in general.

Conclusions: Though a correlation between the density of fast food restaurants and the average levels of obesity in an area cannot be directly linked, it stands to reason that it is still a factor. Furthermore, as all obesity studies depend on self-reporting, those results should be taken with a grain of salt.

This is not the only factor that indicates obesity but as most fast food customers answered "convenience" when asked why they chose to eat fast food, a greater density would seem to imply a greater convenience factor.

Introduction:

When looking at the links between fast food and obesity, it's important to understand why I am focusing on fast food. There are two primary factors that are problematic in standard fast food fare: processing and portion size.

Fast food became popular in the early 20th century in the United States, and brought mass production to a restaurant setting. As a result of this mass production and desire for consistency, fast food restaurants began serving highly processed food. This processing, while allowing for

consistency across large geographic regions, changed the diets of those who were eating said food. The changes I want to focus on are lessened nutritional value and greatly increased amounts of sugar and hydrogenated fats.

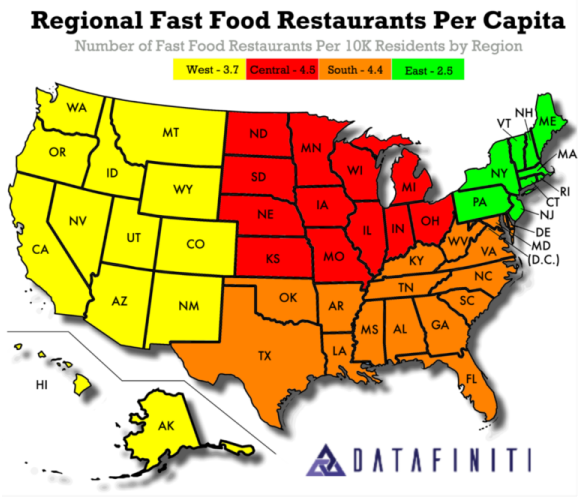
In unprocessed ingredients there are significant differences in consistency, both physically and nutritionally. These differences are detrimental to creating an identical dish repeatedly so mass-produced ingredients moved to highly processed food. This processing removes a great deal of the vitamins and nutrients present in 'raw' food. In an effort to both increase shelf life and appeal to the average American diet, this processing also led to a dramatically increased use of hydrogenated oils and sugar. Though not considered an issue at the time, diets high in sugar and hydrogenated fat have proven to lead to significant weight gain.

These changes also had a significant effect on portion size. Because the body responds differently to sugars than it does to nutrients, it is more difficult to feel full eating a sweeter diet [1]. This has led to increased portion sizes across the board. Not only does this have the effect of creating a much more high-calorie diet, it is not limited to food.

Drinks, and soft drinks in particular, add a significant amount of sugar to one's diet. Once soft drink companies started partnering with fast food restaurants in the 1950s soft drink serving sizes began increasing until it reached what we are familiar with today in the 1970s. The 70s also brought us high-fructose corn syrup as a cheaper replacement for granulated sugar as the primary sweetener in soft drinks. Because HFCS does not activate the signals that the body uses to regulate sugar intake [1], this leads to a significant uptake in sugar from soft drinks alone, which tends to result in excess body fat.

Methods:

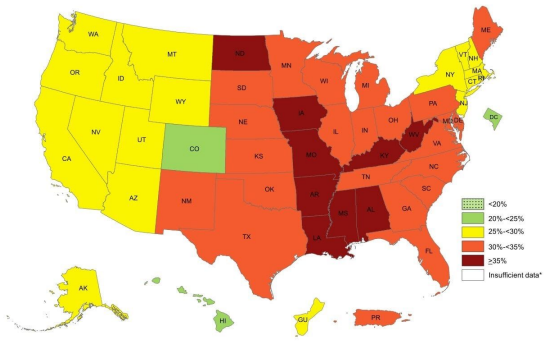
An investigation into a data set that contains a listing of fast food restaurants across the United States yielded this graphic on data from 2018:



(Figure 1: https://datafiniti.co/fast-food-restaurants-america/)

This image, and the supporting data show a significant regional difference in the number of fast food restaurants

per ten thousand residents. As I was curious about the possible health effects, I then looked into the CDC data about obesity rates in the United States that yielded this graphic, also from 2018:



(Figure 2: https://www.cdc.gov/obesity/data/prevalence-maps.html)

The correlation seems obvious; an increase in fast food restaurants per capita leads to increased obesity. Or does it?

I then looked into research to back up my hypothesis and the results were less obvious.

Crawford et al. researched the associations between density and proximity to fast food with children and their parents' body weight. Crawford and his colleagues found little association between exposure to fast food and obesity, though they noted that there were some variables that were not considered and perhaps should have been, such as price and the range of styles. [2]

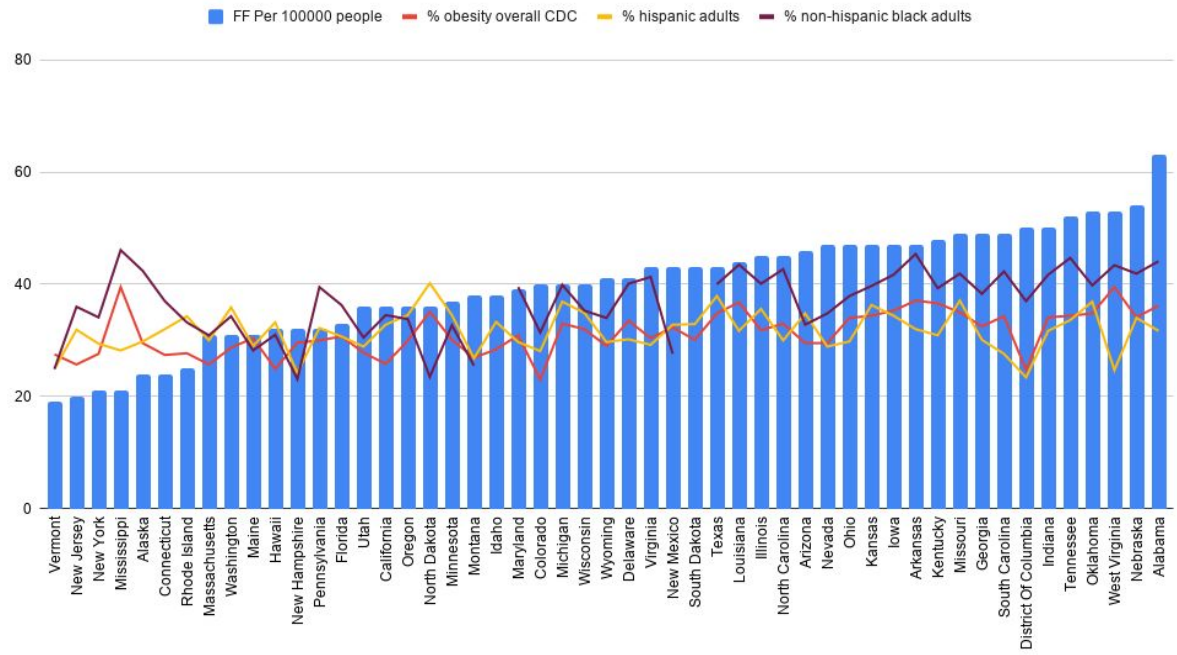
Jeffery et al. determined that people who ate fast food more often tended to gain weight. Jeffery also discovered other factors that led to eating fast food more often, for example having children. That being said, they found little evidence that the overall number of fast food restaurants had an effect on weight or patronage. They did discover that a greater number of restaurants in general did indicate that it was more likely for a person or family to eat away from home, but it was not fast food specific [3].

Li et al. did research into older Americans (mean age 65) and their eating habits in Portland Oregon. Their research showed with adults living in a neighborhood with a higher density of fast food restaurants there was an increase the likelihood of being obese along with not getting enough exercise [4].

Maddock used state-level data and determined that there is a strong correlation both with fast food density and with the number of residents per fast food restaurant. This implies that states with higher numbers of residents per fast food restaurants have lower rates of obesity. This study strongly matches my original hypothesis, but is an aggregate of other studies [5].

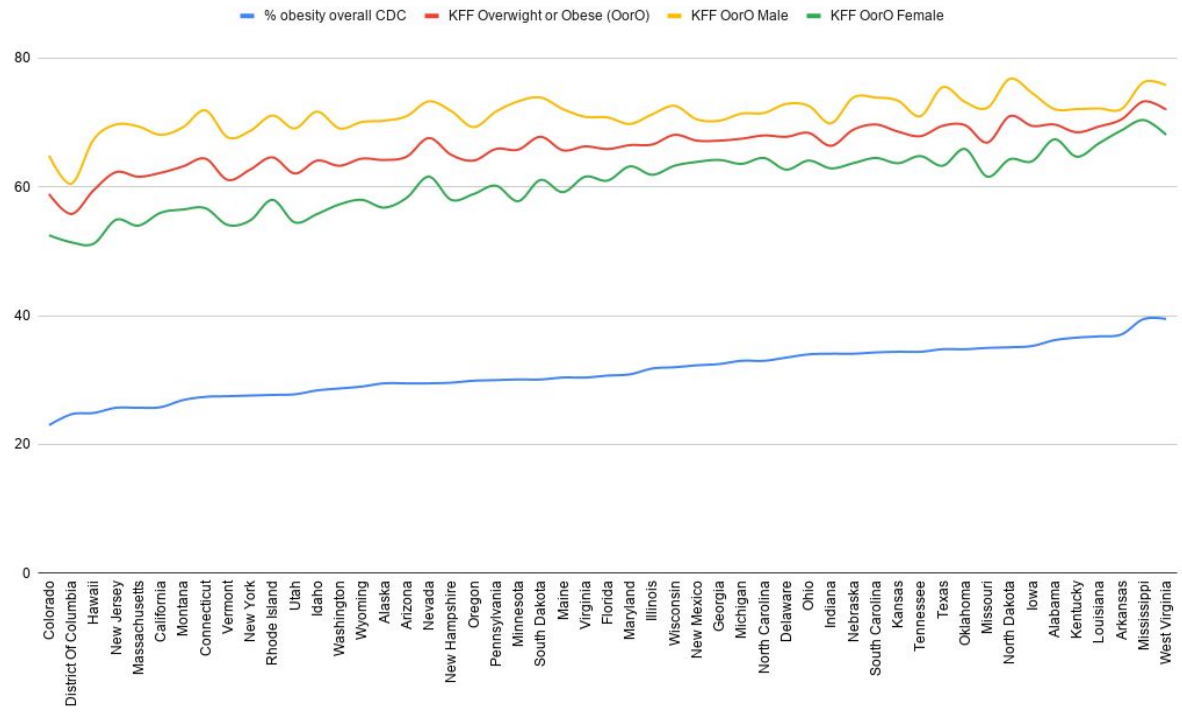
Dunn's study into fast food and obesity is more detailed in regards to

Figure 3



gender and race. His findings support the general trend that greater density tends to indicate higher levels of obesity in an area. His findings also indicate that there is stronger correlation with females and black and hispanic people as opposed to white males [6].

My own explorations into this subject seem to be more in line with Crawford and Jeffery, though there are other factors at play that will be mentioned later. Using the dataset regarding the density of fast food restaurants across the country, I correlated this data with the CDC obesity numbers directly. This direct correlation gave a result of .515. My numbers differed from Dunn's study as when I correlated the number of fast food restaurants with the obesity of the hispanic population found it to be .14; insignificant. When I did the same for the black population I found it to be .456, which is significant, but still less than overall. At this juncture I took a closer look at the CDC numbers and found some discrepancies that I considered problematic. I appreciated the fact that there was data by race, North Dakota and Idaho did not have data on black people, implying that there were not enough to measure. Furthermore, in the case of New Hampshire the obesity percentages for white people, black people, and hispanic people are all under the overall obesity percentage for the state. I decided that it was time to look for more data.



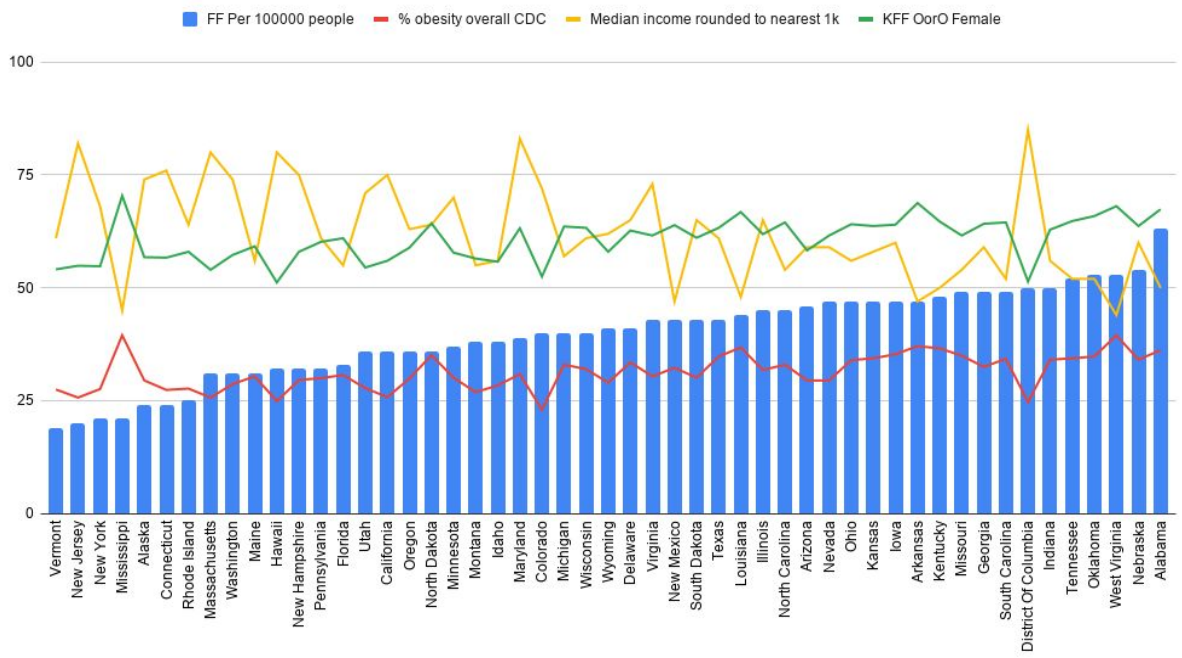
The Kaiser Family Foundation (KFF) is a non-profit organization that focuses on health policy. The KFF does polling and analysis and publicly releases that data regularly. The advantages to the KFF data is that instead of race it has separate gender data. The only minor issue is that their data lumps together overweight and obese, but that is not much of a factor in this analysis. The correlation between the KFF overall data and the CDC overall data was an excellent .929, so I decided that this data was usable.

I then correlated this new data with my data on fast food restaurant density, and the results were varied. For overall obesity and overweight, the correlation was lower at .42. The gender data was insightful in this case; .19 for males and .535 for females. This matches up with Dunn's research results of the correlation being higher specifically in women compared to the overall population.

At this point I took cues from Maddock, and my original instincts, and decided to incorporate the median income data into this project. I took median income data for each of the states from Wikipedia and added it to my database.

The correlation between income and the density of fast food restaurants is a -.448, which implies that wealthier areas simply have less fast food

Figure 4



restaurants per resident. What is more significant is the correlation between income and the KFF's overweight or obese rate is a -.772. The correlation between the CDC's obesity rate and income is higher, at -.763. Using the income data with the KFF's overweight or obese gender data gives us a correlation of -.552 for males and -.751 for females.

Discussion:

The connection between the density of fast food restaurants and obesity is not the direct link that figures 1 and 2 would suggest. My data does imply that the density of fast food restaurants affects the obesity levels somewhat, however I feel this number actually shows this is either not a factor or a factor that is lessening. Maddock, whose data was supportive of my hypothesis found that the correlation between obesity and the density of fast food restaurants was .53, which is higher than mine, and that poses its own issues. Maddocks data is from 2004, and in 2004 the low end of state obesity was 16.5% in Colorado and the high end was 27.6% in West Virginia. Why this is such an issue is that my data, centered around 2018 gives us low end obesity numbers of 23%, still in Colorado and a high end of 39.5%, still in West Virginia.

Interestingly, Maddock also did a comparison with income, with a correlation of -.55. This number is on par with my data regarding overweight or obese males, but

considerably less than my correlation numbers regarding overall overweight or obese (-.722) and overweight or obese females (-.751).

This would seem to imply that income is a greater factor in whether or not someone is likely to be overweight or obese compared to simple fast food restaurant density. Furthermore, based on the numbers of the other researchers, the correlation between income and obesity is increasing whereas the correlation between obesity and fast food restaurant density is holding steady or declining slightly. This is demonstrated by the fact that the correlation between fast food and obesity staying steady while the overall overweight and obese rate is increasing at an alarming rate.

On the other hand, there are significant differences in fast food in more recent times compared to 2004. For example most fast food used to be cheaper, even adjusting for inflation. Now that the prices are higher, more people may be inclined to dine at a fast-casual restaurant as there is less of a price difference for getting better food. This research does not take other restaurants into account. Similarly, this data also does not take into consideration locations such as food carts, taco trucks, and the like. Furthermore, this data does not even include other types of locations that fill the same niche, such as coffee shops. That being said, that data would most likely point to the density of food locations not being a factor in obesity as most coffee shops are located in affluent areas which already have a negative correlation with obesity.

I have an unused source that focuses on children and pregnant women. I omitted it because their findings were fairly insignificant in the scope of things. What I was interested in is the fact that pregnant women who lived within a half-mile of a fast food restaurant had a (very low) chance of gaining 20 kilos [7]. That is a shocking amount, even including an unborn child. This led me to consider the idea that an overlooked factor in this may be smell. I have not yet found any studies that include a consistent, pervasive smell of fast food permeating in a living or working area, and I imagine creating a study for that would be extremely difficult. That being said, since smell and taste are so strongly linked, I do believe that this connection would be a strong one.

Another factor is that all of the studies tended to rely on self-reporting. Self-reporting is inconsistent at best, and many items that involve one's self-confidence or other societal issues are misreported. Every study mentions this as a potential pitfall and it is not something that is easily remedied. If we were to ignore privacy concerns Facebook would probably have all of

the information we need based on pictures of people combined with the geolocation of their phone. It would not be completely accurate, but would give a better picture than we have now.

There is a connection that exists in some form, whether it be a direct connection or simply allowing the opportunity of fast food creates more obesity through convenience and availability. Without more data, and honestly more invasive data, we will not be able to fully quantify the effects.

I realize that eating is a complicated thing for everyone. When choosing food there are always going to be a variety of costs. Time cost and monetary costs are the most obvious, but it continues with effort costs and the influence of those with whom you may be eating. Also, even if somebody is not eating fast food, that does not mean that they are eating well. Poor eating choices can come from a variety of places, sit-down restaurants and the grocery store are not immune. Arguably nearly the entirety of the frozen food section is as bad for you as standard fast food fare, but that would not be data that this study would pick up.

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