



OBESITY IN AMERICA: CROSS-SECTIONAL STUDY ON THE ASSOCIATIONS BETWEEN FAST FOOD RESTAURANTS' DENSITY AND OBESITY AMONG U.S. ADULTS IN WASHINGTON STATE

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ABSTRACT: Obesity has become the world's most significant public health epidemic, and the prevalence of obesity and diet-related health problems have skyrocketed with the rapid growth of fast-food restaurants. Despite the rising prevalence of this issue, there is limited research on this topic. This research proposal aims to bridge the knowledge gap and to explore the correlation between fast-food restaurant density and obesity in the United States through a quantitative approach, using the measurement of the body mass index and participants' residential proximity to fast food restaurants. The goal of this research is to provide valuable insights to help healthcare professionals and policymakers to create tangible interventions on obesity, and overall improve public health outcomes.

Introduction & Background

Globalization's Impact on the World

As the world advances in development and technology, globalization has overwhelmed the world with an abundance of food. The world has transitioned from food scarcity to food abundance, shifting health concerns from malnutrition to overweight health problems. Globalization has increased the accessibility and affordability of ultra-processed food across the world and results in a diet shift from traditional diets of minimally processed food to ultra-processed food diets in people. This ultra-processed food diet has now fully taken over as the mainstream diet – the media has named it the western diet, as many of the ultra-processed foods originated from the western countries. The skyrocketing rate of the overweight and obese population can be seen shortly after World War II and due to the convenience, accessibility, affordability, and marketing, the western diet, also known as the ultra-processed diet is now the new daily diet for many people. A new type

of restaurant known as the fast-food restaurant has gained popularity, entering the food industry around the globe, to better serve the public diet preference.

Obesity Risk Factors

Along with the many benefits brought by the fast-food business, the ultra-processed food diet also brings in a new kind of public health crisis around the globe, Obesity. Obesity is defined as a noncommunicable disease of “abnormal or excessive fat accumulation that presents a risk to health”, according to the World Health Organization (2022). Every 3 in 4 American adults are found to be overweight or obese in the US, making Obesity one of the prominent leading health diseases around the world (NIH, 2022). Obesity-related diseases including cardiovascular diseases, type 2 diabetes, and musculoskeletal disorders are the top rank of the main cause of diseases (CDC, 2019). This is an alarming global issue that affects everyone as we have shifted our diet to ultra-processed food. Among all the countries in obesity rate, the



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United States was ranked 12th highest obesity rate with a 36.2% obesity rate (ProCon, 2020) and is the only developed country that places in high ranking in obesity rates. The new survey done in 2023 shows nearly half of the United States adults (41.9%) are obese (TFAH, 2023). Comparing the data from 2020 and 2023, there is a significant increase of 5.7% obesity rate. It tells us an alarming fact that more Americans are getting obese as the years go by. As a result of the high obesity rate, the US spends \$173 billion a year on treating obesity and around \$327 billion on diabetes annually for treating ultra-processed food related health problems (CDC 2020). The obesity rate is anticipated to rise in the coming years, further increasing healthcare spending in the United States.

U.S. Healthcare Spending

A handful of research demonstrated a strong correlation between obesity and higher medical costs in the United States. The significant amount of healthcare spending on obesity and diabetes, in combination with other healthcare spending, places the United States in first rank on healthcare spending among all the developed countries. According to OECD Health Statistics (2022), the United States healthcare spending has skyrocketed, consistently spending a greater percentage of GDP on healthcare since 1980. As of 2021, the US healthcare expenditure was twice as much as the second ranked country, Germany, and three to four times higher when compared to the lowest-ranked developed countries, South Korea, New Zealand, and Japan. Despite being the first ranked for healthcare spending, the United States is the only country that does not provide health coverage among the other developed countries (OECD Health Statistics, 2022). The surge in obesity rates appears to coincide with the start of the high percentage of GDP allocation on healthcare spending. Would a decrease in obesity decrease the U.S. national GDP percentage on healthcare spending? Cawley et. al (2021) conducted a cross-sectional analysis study on the medical

spending between adults with obesity and adults with no obesity on medical spending. The finding shows a significant increase of \$2,505 in medical care with adults diagnosed with obesity, in comparison with individuals without obesity - a suggestion of relation of healthcare spending with the rate of obesity in the US. Similarly, a study conducted by Ramasamy et. al (2019) found that obesity across classes I, II, and III was associated with a substantial economic burden, contributing to an increase in healthcare cost. Moreover, research by Revels et. al (2017) found that obesity is linked to a 36% increase in both inpatient and outpatient spending, along with a 77% increase in medication costs. It is predicted by the NIH 2015, that the healthcare expense will increase up to 956.9 billion from 860.7 by 2030. These collective findings underscore the substantial economic impact of obesity on healthcare expenditure. The United States has been actively working to reduce healthcare expenditure in the past decades. However, to reduce healthcare expenditure, it is essential to allocate resources to the root of the cause - obesity, and design intervention programs to effectively reduce healthcare spending in the US.

Dietary Shift to Ultra Processed Food

As ultra-processed food is gradually replacing the minimally processed food diet, there seems to be a rapid decline in fruit and vegetable consumption in contrast. According to the CDC from 2019, it is found that only 1 in 10 adults get recommended fruit and vegetable consumption. There are numerous studies that show a correlation between diet and obesity. In a study of "Public Health Response to Ultra-processed Food and Drinks," Jean Adams and her colleagues found a consistent correlation of higher sales of ultra processed drinks and BMI seen in women and men and an extra 508 kcal calories were consumed by participants on ultra-processed diets in comparison to unprocessed diets, along with an increase of 0.9kg weight gain findings over the span of two weeks (Adams



et. al 2020). The shift from a non-processed diet to one high in ultra-processed foods exacerbates negative health outcomes, resulting in a rapid increase of healthcare spending around the world. Numerous studies have revealed the detrimental health outcomes associated with ultra-processed food diets, such as obesity and non-communicable diseases. More resources and expenditure are required due to the decline of health outcomes. Consequently, more people are suffering from economic hardships including inflation and high expenses, forming a vicious circle in the health industry. This is an urgent public health issue that needs to be addressed to minimize all the undesirable outcomes. Health outcomes and cost of healthcare expenditure will continue to rise if no effective health interventions on ultra-processed foods are implemented.

Leading Cause of Obesity

Healthy diets have been proven to be the key factor that contributes to an individual's health. With the rise of health awareness, people are becoming more aware of the food they are consuming. However, with the rise of fast-food restaurants, it is increasingly difficult to find healthy food in this modern era. As fast-food restaurant businesses such as McDonald's, Burger King, and KFC, are becoming more prominent in the US, dominating the food market in the United States. The affordability, accessibility, and convenience that fast food restaurants provide have attracted many people to choose fast food over the traditional, expensive, time-consuming, and inaccessible unprocessed diet. In addition, fast-food restaurants invested \$14 billion annually in food advertising to further increase their presence in the food industry. The significant marketing investment from unhealthy food sources has greatly outcompeted the healthy diet marketing of merely \$1 billion (Ha, 2020), resulting in an unprecedented wave of fast-food diets around the world. The amount of fast-food consumption shows an alarming public health concern. There

is seemingly more evidence suggesting a direct correlation between the high number of fast-food restaurants to the high obesity prevalence rate.

Research Question and Hypothesis

According to IBIS World 2023, there were 198,153 numbers of fast-food restaurants in the United States that were opened in the US. As the public demand for fast food is increasing, the number of fast food restaurants is also growing annually. The rapid growth of fast-food restaurants also increases the rate of obesity. The expansion of fast-food restaurants in America seems to coincide with the rise in obesity rates. Yet there is little to no research done on the correlation of fast-food restaurant density and obesity. This study aims to explore the impact of proximity to fast-food restaurants residence has on an individual health outcome and to understand how the accessibility of fast-food restaurants affects the obesity rate among US adults. It is our responsibility to further explore and understand the topic of fast-food restaurant density, to develop effective interventions against obesity and other diet-related illnesses. This study will be conducted with a quantitative approach to determine the correlation between fast-food restaurants and obesity rate using the Body Mass Index (BMI) guideline from the Center of Disease Control and Prevention (CDC). If individuals live near fast food restaurants, will the individuals have a higher BMI than other individuals who live further from fast food restaurants? By the end of this study, we aim to find an answer to these questions and explore the possible factors that contribute to this worldwide epidemic.

Research Approach

Study Design

A cross-sectional study will be conducted to see the individual dietary habits as it is considered the most appropriate method due to the benefit



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of minimizing bias on self-report obesity risk. Height and weight will be collected to calculate an individual risk for obesity. Other health information including dietary behavior and the frequency that they visit fast food restaurants, takeouts, and how often they cook at home will also be collected. Fast-food restaurants were defined as those like chains like McDonald's, Pizza Hut, Burger King, and so on; fast-casual restaurants were defined as somewhat quieter and slower paced than fast-food restaurants, for example, Noodles and Company, Panera Bread, or cafeterias (Burgoine et al. 2018).

Population and Sample

This study will use convenience sampling recruitment by posting flyers and posts on Instagram and Facebook. This recruitment method enables a wide-reach group of audience and is cost-effective. The eligibility of the participants must be above 18 years old and Washington state residents. Selected participants will fill out an application and undergo a series of background and identification checks to ensure individual eligibility. An approximate 2,000 participants will be recruited in the study.

Operationalization

According to the 2022 CDC guidelines, a BMI under 18.5 is defined as underweight, 18.5 to 25 is a healthy weight, 25 to 30 is overweight. BMI is equal to or greater than 30 is obesity. This guideline will be used to calculate the individual obesity risk.

Data Collection

Participants will be asked for their demographic data including gender, age, ethnicity, address, and dietary habits. The address given by the participants will be used to determine the location of their house and to determine the density of the fast-food restaurant as to the location they reside in. A survey will be conducted using the Likert scale and open-ended questions to determine their diet preference

and habits including the frequency of fast-food restaurant consumption, how often they cook at home, as well as their vegetable and processed meat consumption habits. Processed meat is defined as products such as bacon, ham, sausage, meat pies, kebabs, burgers, and chicken nuggets (Burgoine et al., 2018).

Data Analysis

A fast-food density map in Washington State will be generated based on the participants approximate residential address. A multivariable linear and binomial logistic regression model (Burgoine et al., 2018) will be used to determine the correlation between the accessibility of fast-food restaurants and BMIs, as well as to explore whether it will be a factor in increasing their chance of obesity risk.

Ethical Consideration

Details of this study will be thoroughly recorded on the paper including the ethical guideline, regulation, and the potential risks of this study for IRB approval before the start of this study. To address the ethical aspect of this research, participants are given a clear overview and purpose of this study. All benefits and potential risks of participating in the study will be clearly stated and reinstated verbally by our researchers. Participants are asked to sign and verbally consent to participate. Participants are given the autonomy to participate voluntarily in the study and the option to withdraw from the study if they no longer want to participate. To ensure clarity of the study, interpretation services will be provided if participants need assistance in English. \$40 gift cards will be given to participants at the end of the study to compensate for their valuable time. To protect the identity of participants in this study, each participant will assign an identifier for data reference purposes that is only known to the research team for data collection purposes. Participant identification will be removed from the published paper and will not be seen by the public.



Discussion

This study provides the most up-to-date and comprehensive evidence of the association between obesity and high fast-food restaurant density among the US adult population, which may provide further evidence to support current existing research. This research adds to the growing body of literature about fast food outlet density in the neighborhoods associated with obesity and overweight. With the increasing number of fast-food restaurants in the US, it is essential for us to understand the outcome of the large number of fast-food restaurants on public health. In addition, this study can be used to help policymakers regulate fast food business in residential areas, such as implementing regulations to increase healthy food options and other healthy diet promotions to enhance public health outcomes and to reduce the substantial healthcare expenditure in the US.

Limitations

This study is subject to some limitations. This study employed a cross-sectional study design, and it may not be representative of the whole population in Washington State. The recruitment of this study uses convenience sampling by posting on social media, which adds a possible limitation of recruiting younger adult sample size. The findings of this study may not be applicable to other parts of the US. Given the frequency of dietary habits and food preferences are self-reported, responses may vary from individual to individual. Future studies can be conducted to minimize the limitations of this study by conducting a qualitative study, to understand the reasoning behind participants' dietary choices and factors that may have guided participants in their dietary choices. Future mixed-method study can be conducted in addition to the quantitative study to explore the impact of fast-food restaurants and public health marketing on individual's diet choices to promote healthy diets.

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