Worldwide Relation between Fast Food Availability and Obesity Rates

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Abstract:- **With thirty nine percent (39%) adults worldwide as overweight or obese in 2016, obesity has alarmingly reached epidemic proportions. Obesity has been associated with decreased life expectancy, increased mortality rates and diminished quality of life. Data show that its economic costs like healthcare expenses, reduced productivity and work loss are staggering. Obese people suffer from discrimination, depression and low self-esteem. Indeed, an examination of the determinants of obesity has become imperative. This study examined how food environments, specifically the availability of fast foods are associated with obesity. Using a quantitative methodology, this study analyzed country level data from 93 countries. Correlation and regression analysis were done to determine whether relationships exist between obesity rates (dependent variable) and independent variables such as number of persons per fast food establishment, number of persons per McDonald establishment, population, globalization index, average disposal income. Correlation results show that only globalization index has a positive relationship with obesity rates. Income classification of countries, population, number of persons per McDonald's outlet and number of persons per fast food outlet are negatively correlated with obesity. Results from the regression analysis show three predictors of obesity rates: number of persons per McDonald's outlet and number of persons per fast food and population. These predictors can account only 25 percent of total variability in obesity levels. In conclusion, though the relationship between fastfood availability and obesity is established, fastfood availability is not a strong single cause of obesity.**

Keywords: **obesity, fast food availability, obesogenic environment, globalization**

I. INTRODUCTION

According to the World Health Organization, there are more than 1.9 billion adults who are overweight and 600 million of these are obese (WHO, 2016). Obesity is now a global concern affecting both young and old, in both the developed and developing world. The social, economic and health costs of obesity are staggering. According to the McKiney Global Institute (2014), the global economic impact from obesity is $20 trillion dollars or 2.8% of the global GDP, more or less equivalent to the global impact from smoking, war or terrorism. Risk of premature death, disability and chronic illness adversely affect the over-all quality of life of individuals and society in general. The alarming increase in obesity steered the World Health Organization to prioritize interventions to halt obesity or at least return to or maintaining the 2010 obesity prevalence level (WHO, 2016). Studies on the global determinants of weight gain from different disciplinary perspectives were done to understand the complexity of obesity.

Globalization forces like trade liberalization and global market integration are implicated in the global obesity epidemic. Opening markets to transnational food companies led to an explosion in the number of fast food outlets. Fast food is largely blamed for the increasing waistline of the populace. A perusal of the history of obesity reveals that it was only during the middle part of the 20th century that obesity started to increase into epidemic proportions. By 1930s, insurance companies in the US started to consider body weight in calculating insurance premiums (Caballero, 2007). During the 1960s, the US already has 13 percent obesity rate while 45 percent are overweight. Coincidentally, it was during this period, that fast foods started to become popular. The first ever fast food restaurant started in 1916 while McDonald's started as a hamburger restaurant in the 1940s. UK Calypso news stated that by 1951, "fast food" was included in the dictionary. Today, according to Euro monitor, fast food is the second largest and fastest growing global food category with burger fast food as the most in demand fast food type. McDonald's Corporation in its company profile boasts of having 36,525 restaurants in 119 countries at the end of 2015.

Although fast food chains enjoyed unprecedented growth in the past few decades, people are now becoming increasingly concerned about the health impacts of fast food consumption. Liability of fast food chains over increasing incidence of obesity was put into test by the case *Pelman vs. MacDonald's* where the plaintiffs claimed that they became obese due to McDonald's meals and the company must be liable for its non-disclosure of nutritional information and the health risks associated with its meals (Wald, 2003). Despite dismissal of the suit by a US court, researches on the relationship of fast food consumption and obesity must still continue. There is a great need to expand understanding about the underlying factors of obesity if the world were to control or put a stop to it. While there is truth in one's personal responsibility to take care of one's own diet, weight and health, individuals may not be able to control the socio-cultural, economic and environmental forces that generate and sustain obesity (Dobbs and Sawers, 2014). Much has been discussed about obesogenic environments in which fast food plays a part. This brings us to the issue on whether fast food really poses a health risk. The present article looked into studies that inspected the complicity of fast food to the global epidemic of obesity. It also examined global data related to globalization, fast food availability and prevalence of obesity. Is there really a relationship between the number of fast food restaurants and the prevalence of obesity worldwide? Fast food availability can be classified under the

umbrella of obesogenic environment which has been investigated by studies to account for the rising levels of obesity. This literature review looked into some areas of contention in obesity and fast food research like obesity measures, personal responsibility vs. societal responsibility debate, obesogenic environment and relationship between fast food availability and population density.

Obesity measures and perception

An area of contention is how obesity is measured medically and perceived culturally. Should the BMI measure be applied for all races that genetically exhibit variations in body constitution and built? Obesity is usually defined as excess in body fat. Body fat is difficult to measure so body weight has been used as a surrogate for body fat. In 1995, the World Health Organization used Body Mass Index (BMI) to measure obesity. It is defined as body weight in kilogram divided by body height in meter squared. Obese persons have a BMI of more than 30 kg/m2. However, the BMI which is calculated from Caucasian populations may not be applicable to Asians due to the difference in body built. In 2004, a WHO expert consultation in Singapore concluded that Asians have a higher percentage of body fat and have a risk factor for diabetes and cardiovascular diseases at even below the BMI cut-off point of 25 kg/m2. The cut-off point for Asians was adjusted at a lower level making a BMI of 27kg/m2 classified as high risk level. Other measures of obesity are the waist circumference (WC) or waist to hip ratio (WHR). While BMI measures general obesity, WC and WHR measures central obesity. (Ko, 2010)

Construction of body norms also differs across societies and cultures. While the slim-body ideal is the globally dominant perception celebrated in movies, beauty contests and mass media, there are still traditionally fat positive societies. Brewis et.al. (2011) in their study of the global proliferation of fat-stigmatizing beliefs, mentions ethnographic studies in the 1980s and 1990s about societies attributing beauty, attractiveness, marriageability, generosity, fertility to fat bodies. Using a cross-cultural sample, their results showed that the global model of obesity considers obesity as a disease and personal failure. This is corroborated by studies on the social cost of obesity that fatter people have less access to education, more likely to be bullied or fired, rejected romantically and more likely to receive worse health care service. The study of Brewis et.al. shows that for a fat-stigmatizing societies, obesity is indeed a personal responsibility.

Obesogenic environments

Obesity is a lifestyle related disease and it only make sense that individuals be held responsible for their choices (Resnik, 2007). The personal responsibility vs. corporate social responsibility debate was highlighted in the *Pelman vs McDonald's* case. However, there is a growing consensus that individual behavior cannot fully be blamed by the rapid rise in obesity levels (Sallis and Glanz, 2009). Obesity results from an interplay of genetic and environmental factors that it is difficult to put the entire blame on the individual. Obesogenic environment is defined in the literature as an environment that helps and contributes to obesity. Sallis and Glanz (2009) synthesized numerous cross-sectional studies on the attributes of physical and food environment came up with the following categories of obesogenic environments 1. Physical environment as places designed to support physical activities (parks, sidewalks, trails, etc.); 2. Settings for sedentary behavior like homes filled with electronic entertainments and labor saving devices, sport venues where majority sits and watch, roadways built to optimize travel by car; 3. Information environments that directly or indirectly encourage unhealthy eating habits and lifestyles through media and advertisement; 4. Food environment consisting of community environment like groceries, farmers' market, convenience stores and microenvironments like the home, workplace, school cafeteria, churches; 5. Consumer environment is what a person is exposed to inside the food sources in terms of availability, promotions, and prices.

Gostin (2005) presented different categories of obesogenic environments. These are the *informational environment* that includes advertisements, labeling and nutritional content disclosures; *built environment* that refers to poorly designed communities that lack safe, green spaces for physical activities, lack of access to inexpensive and nutritional food, reliance on automobiles and discouraging walking and cycling; *educational environment* where school have easy access to junk and unhealthy food; *socio-economic environment* where unhealthy food are cheap, prominent and abundant in workplaces.

Most obesogenic environment emerged due to urbanization, modernization and economic growth that drastically changed our lifestyles and eating habits. These "critical elements" brought technological changes in work, leisure, food processing and mass media that led to increased intake of fat, sugar and processed food, less physically demanding jobs due to labor saving devices and less energy expending lifestyle brought about by computers, cars, televisions and the like (Cabellero and Popkins 2002). Loureiro and Nayga (2005) looked into several socio-economic and environmental determinants of obesity that includes urbanization and the use of cars. Yancey et al studied a sociocultural factor, commercial advertising that influences food preferences and utilization of goods and services related to physical activity and sedentary behavior of African Americans and Latin Americans in the US. Thomas et.al. (2011) analyzed the shopping behavior of 1,000 households to determine the effect of credit cards on purchasing unhealthy food found that credit cards weaken the resolve to curb impulse buying unhealthy food alternatives.

Fast food can be obesogenic

Stender et.al. (2007) pointed several reasons why fast food is unhealthy and is considered obesogenic. They pointed out mechanisms by which fast food can be obesogenic: portion size, energy density, industrially produced trans- fat and fat content in fast food menus. Fast food restaurants often lures their customers with bigger portion size in their food and beverage items in addition to advertising techniques like buy

one take one and bottomless drinks. Logically, the bigger the portion size, the more food is being consumed. In addition to this, fast foods are supposed to contain more calories or higher energy density. The use of trans-fats in cooking fast food items prolongs shelf life of the items but deemed to increase abdominal fat and can contribute to central obesity. Recently, The Food and Drug Administration in the US has announced that that partially hydrogenated oils (PHOs), the primary dietary source of artificial *trans* fat in processed foods, are not "generally recognized as safe" for use in human food and is giving at least three years for food companies to remove it from their menus(FDA, 2016). This means that as of this moment, trans-fats are still being used in cooking fast food menu.

Fast food availability and obesity studies

Previous studies on the relationship of fast food availability and obesity show mixed and conflicting results (Fraser et.al, 2010). According to Currie et.al (2010), evidence linking fast food availability and obesity is not strong since only correlational studies are done on a small data set. In a review on the geography of fast food outlets done by Fraser et.al (2010), out of thirty three studies on fast food geography, fourteen studies showed positive association between fast food availability and obesity while thirteen showed mixed results. Although Lapostolle et.al. (2013) found a very strong correlation between number of McDonald restaurants and proportion of overweight; however, they were not able to establish causal relationship. Maddock (2004) concluded correlational relationship between both the number of residents per fast food restaurant and the square miles per fast food restaurants with state-level obesity prevalence. His results show that density of fast food restaurants accounted for 65 percent of the variability in obesity across the US. Taylor and Francis (2013) looked at the number of Subway restaurants per 100,000 people in 26 economically advanced countries considering factors like body mass index, gross national income, Gini coefficient , urbanization, motor vehicle and internet use. They found that density of Subway's outlets is positively associated with obesity. Dunn(2010) observed that studies linking fast food density and obesity lack generalizability since they are limited in terms of selected location and selected respondents. The results were objected on methodological grounds by Smagghe (2014) who questioned the inclusion of China and India, two largest countries that might have influenced the results. Dunn (2010) found that availability has no effect in weight outcomes in rural counties but tend to increase BMI among females and non-Whites in medium density counties.

II. METHODS

A total number of 93 countries were included in the study. Selection of countries with data on the number of McDonald's outlets was initially done base on the consideration that McDonald's is the leading player in the global fast food industry. Countries with missing data were excluded. Country level data were collected from the Internet search engines. Although as much as possible, data from the year 2012 were selected to reduce variations in time element, this study did not consider the time differences in the gathered data which is one limitation of this study. 2012 data include number of McDonald's and Kentucky Fried Chicken outlets, KOF Globalization Index and disposable income and population of each country. The percentage of obesity per country was based on the World Factbook of the Central Intelligence Agency, having had a more complete data on the obesity rates of countries. However, date of obesity data is from 2007- 2008. Another limitation of the data is the inclusion of only McDonald's and KFC restaurants. Aside from burger and chicken fast food, there are still other varieties of popular fast food that might have associations with obesity like pizza fast food, Asian fast food and other kinds of consumer food service like full restaurants, street kiosks/stalls,etc.

The number of KFC outlets was included to compare burger fast food and chicken fast food. The total number of fast food is the sum of McDonald's and KFC outlets. Fast food outlet per person was computed by dividing a country's population by the number of fast food restaurants in that country. Fast food outlet per person would indicate fast food availability. Correlation and regression analysis using SPSS were done to determine whether relationships exist between obesity rates (dependent variable) and the independent variables such as number of persons per fast food establishment, number of persons per McDonald establishment, population, index of globalization, disposal income.

III. FINDINGS

able one summarizes descriptive results of the variables. The mean obesity rate of the 93 countries included is 22.3151 percent. The average number of McDonald's restaurant per country is 369 while Kentucky Fried Chicken has 197. Fast food stores have a mean of 565 outlets. These figures might not correctly reflect reality since some countries have less than 10 fast food stores while other countries like China have more than 6,000 fast food stores. Iceland for one has no McDonald outlet and some high income countries like Belgium, Switzerland, Slovenia and Estonia do not have any KFC store. Russia and Japan are widely different in terms of land area but Japan has more than 3,000 McDonald's store and Russia has only around 350 stores. Some countries are continuously expanding their fast food industry like those in the Asia Pacific regions that recorded the fastest growing rate for global food industry (Euromonitor, 2014) except for Japan who closed around 130 McDonald's store in 2015 due to poor sales (Bloomberg.com). Mean population is 59.5 million while the mean number of persons per fast food outlet is 230,401. The mean number of person per McDonald's store is around 1.4 million. Disposable income was included assuming that people with more disposable income can afford to spend on fast foods. The mean of disposable income is USD 1,456.45.

Table 1. Summary Statistics of Variables *n= 93*

Variables	Definition	Mean	Standard Deviation
Obesity	% Obese per country	22.3151	8.15331
McDonald's	Number of McDonald's	369.81	1517.163
	Restaurants		
KFC	No. of KFC restaurants	197	648.547
Fast Food	McDOnald + KFC	564.68	2052.27
Population	Population per country	59,485496. 45	191816E6
Mcperson	Number of persons per		
	McDonald outlet	1409525	920303E6
Person/fast food	Number of persons per		
	Fast food outlet	230401.47	32964E5
KOF	KOF Index of		
Globalization		69.45	12.32
Disposable income	Net Disposable Income	USD1456.45	1205.38
Region	Geographical Location	2 (Mode)	1.395
Income	Country Income classification	1 (Mode)	.74

Tables 2 and 3 present the geographical locations and income classification of the country samples. Most of the samples are located in Europe, 41.9 percent and consequently most countries 52.7 percent are classified as high income. The reason might be that economically advanced countries have more robust researches on fast food and obesity. This is the reason why their country data are readily available in the internet. Most studies on the relationship between fast food and obesity were done in the US since the US is still the top fast food country in the world. Very few studies on the global impact of fast food in the obesity rates of low income countries were found. This consists a gap in the literature.

Table 2 Geographical Location

Region	Frequency	Percentage
Asia Pacific	18	19.4
Europe	39	41.9
North America	2	2.2
Latin America/Caribbean	20	21.5
Middle East/Africa	14	15.1

Table 3. Income Classification

Income Classification	Frequency	Percentage
High Income	49	52.7
Upper Middle Income	30	32.3
Lower Middle Income	14	15.1

Table 4 shows that except for globalization index which has a positive relationship with obesity rates, income classification of countries, population, number of persons per McDonald's outlet and number of persons per fast food outlet are negatively correlated with obesity. This means that as the income classification of a country becomes higher, there is a corresponding decrease in obesity. This can be observed in the data showing that many European and high income countries have fewer number of fast food establishments. High level of awareness on the unhealthy effects of a high fat and energy dense diet makes people in rich countries opt for a healthier living and the maintenance of a normal body weight. The poor have no choice but to choose cheaper food alternatives regardless of whether they are unhealthy or not.

Table 4. Variables with Significant Correlations with Obesity

Variables	Pearson Correlation
Income classification and obesity	-.365**
Population and obesity	-.385**
Number of persons per McDonald's outlet and obesity	-.308**
Number of persons per Fast food restaurant and obesity	-394**
KOF Globalization Index and obesity	.206*

Number of persons per McDonald store and number of persons per fast food store are also strongly correlated with obesity. The negative relationship tells that if the number of persons per fast food store decreases, obesity increases. In other words, this is equivalent to fast food density. Lesser number of persons per store can mean more fast food stores and more fast food density. Higher density of fast food leads to increase in obesity (Stendler et.al, 2009; American Cancer Society, 2014; Biomed Central, 2009). The correlation between obesity and globalization index shows a positive correlation with

significance at .05 level. This means that as the level of openness a country has towards globalization goes up, obesity rates also go up. The globalization index has three dimensions: economic, political and social. A country that has more networks connections with other countries and allow flows of goods, ideas capital a can be more exposed to factors that has impact on obesity like food accessibility, more transnational food companies and more exposure to technological devices that encourage sedentary lifestyles and less physical activities.

Table 5 . Multiple Linear Regression Analysis Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.393a	.155	.145	7.57425
2	.465b	.219	.201	7.32193
3	.524c	.275	.250	7.09519

a. Predictors: (constant) Number of persons per fast food outlet

b. Predictors: (constant) Number of persons per fast food outlet, population

c. Predictors: (constant) Number of persons per fast food outlet, population, number of persons per McDonald's outlet

The regression analysis in Table 5 shows three predictors of obesity rates: Number of persons per fast food outlet, population, and number of persons per McDonald's outlet. Based on the adjusted R square for model 3, only 25 percent of the total variability in obesity rates can be explained by these variables. This means that 75 percent of the total variability in obesity rates are explained by other factors. The ANOVA results for the three variables yielded a significance level of .000 for the 3 models. Hence, the number of persons per fast food outlet, population, and number of persons per McDonald outlet can predict obesity rates. However, since, all the coefficients both unstandardized and standardized, produce negative relationships, this means that as the number of persons per fast food outlets decreases, the obesity rates increase. This result is likewise the same for population and number of persons per McDonald outlet. Both correlation and regression analyses show a strong relationship between obesity and the three independent variables. These results show that despite, a strong association between fast food availability and obesity, there is still a wide gap to be filled if the complexities underlying the obesity epidemic can be understood.

IV. CONCLUSION

This study focused on the relationship between fast food availability and obesity. Country level data on the number of McDonald's restaurants, number of KFC restaurants, number of fast food restaurants, globalization index, disposable income, and obesity rates were correlated and regressed to determine whether associations between the dependent and independent variables are established. Correlation results show that only globalization index has a positive relationship with obesity rates. Income classification of countries, population, number of persons per McDonald's outlet and number of persons per fast food outlet are negatively correlated with obesity. Results from the regression analysis shows only three variables as predictors of obesity rates: number of persons per McDonald's outlet and number of persons per fast food and population. The adjusted R square for multiple regressions indicates that the three predictors of obesity can account only 25 percent of total variability in obesity levels. This means that aside from fast food availability, there are still many determinants of obesity that can be explored by further research. Results of the data analysis, like most studies in the literature, only established some strong correlations between the fast food and obesity but not causal links. Indeed, fast food availability alone cannot account for obesity. In conclusion,

though relationhip between fastfood availability and obesity is established, fastfood availability is not a strong single cause of obesity.

The literature review identified some areas of debate in obesity and fast food research that can lead to further studies like obesity measures, personal responsibility/ individual behavior vs. societal responsibility debate, the concept of obesogenic environment and relationship between fast food availability and obesity. These can be explored to be able to establish reasons and causes of the globesity epidemic.

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