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Knowledge, Attitudes, and Beliefs about Food Additives and Obesity

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Abstract

Obesity is a chronic health problem that affects the health and wellbeing of its population. The purpose of this cross-sectional, descriptive study was to examine whether there is a relationship between individuals' knowledge regarding food additives and obesity. The research questions concerned knowledge participants had regarding food additives and obesity. The theoretical foundation for this study was the social learning theory. The participants for this study were recruited from a religious organization in central Florida via announcements in the church bulletin. The method of study was a survey using Survey Monkey online website and the data analysis method was using SPSS software program. According to study results, on average, the level of knowledge regarding food additives and obesity was a score of 5 out of 7, and there was no difference in knowledge, attitudes, or beliefs among the study participants based on age, income, gender, education, or racial group. The linear regression model indicated that there was a statistically significant relationship between associate degree and knowledge; however, assumption testing revealed that there were issues of heteroscedasticity indicating that the results should be treated with caution. Social change implications based on the findings of this study include a need for additional education regarding the relationship between food additives and obesity, particularly among individuals with lower levels of education.

Keywords: Obesity; Food additives; Type 2 diabetes; Hypertension

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Introduction

The purpose of this study was to examine consumers' knowledge, attitudes, and beliefs (KABs) regarding food additives and obesity. Tarnavolgyi stated that "consumers expressed a variety of concerns such as potential health effects that are related to food additives" [1]. Lofstedt et al. suggested that information campaigns might decrease concern about health and food additives [2,3]. Communications aimed at allowing consumers to make informed decisions related to food additives should be designed and contain the central topics from risk-related perspectives, as well as from the consumers' viewpoints [4]. The intent of this study was to define people's KAB regarding food additives and obesity. This study was initiated based on literature on the epidemiology of food additives and obesity. The focal points included economic problems of food additives and obesity, background of food additives and obesity, cost of treating obesity, origins of food additives, and the current state of obesity [5,6].

Obesity results in humanitarian and economic problems for the U.S. population [7]. The National Institutes of Health (NIH, 2015) declared that obesity had become an epidemic in the United States [8]. The Centers for Disease Control and Prevention (CDC, 2015), and the National Center for Health Statistics (2015) claimed that 36.5% of U.S. adults were obese [9,10]. Based on the Office of the Surgeon General's Vision for a Healthy and Fit Nation (2010), each year, obesity contributes to 112,000 preventable deaths resulting from health conditions such as heart disease, stroke, Type 2 diabetes, and hypertension [11]. Also, certain types of cancers are some of the leading causes of preventable deaths [12,13]. Obesity has higher morbidity than mortality health problems such as diabetes, strokes, heart attacks, cardiac diseases, high blood pressure, retinopathy, kidney diseases, and amputation [14]. Obesity aligns with higher mortality rates for cardiovascular disease and cancer [15,16].

The Food Research & Action Center indicated that in the United States, 37.7% of adults are obese and 7.7% are severely obese [17,18]. According to the National Center for Health Statistics (2009), obesity rates have more than doubled in adults and children since the 1970s [19]. Flegal, et al. stated that "between 1994–1998 and 2007–2008, the prevalence of obesity increased in adults of all income and education levels" [20]. Obesity is widespread and continues to be a leading public health problem

in the United States stated that "obesity affects some groups more than others" [21-26]. The American Hospital Association (2016) documented that 48.1% of non-Hispanic Blacks have the highest age-related rates of obesity, followed by Hispanics (42.5%), non-Hispanic Whites (34.5%), and non-Hispanic Asians (11.7%) [27]. Disparities in obesity rates exist based on race/ethnicity, gender, age, geographic region, and socioeconomic status [28-30]. Experts in the field of public health suggest that confronting the obesity epidemic in the United States will require medical care, research, and more education [31]. Because of the complexity and multiplicity of various forces that drive the obesity epidemic, the NIH (2015) stated that "it could not solve this public health problem" [31-33]. Acknowledging obesity as a chronic disease should raise awareness of the problem among the general public and impact policymaking at all levels [34]. The epidemic of obesity is challenging; however, researchers have opportunities to help meet these challenges [8].

The purpose of this study was to assess the level and relationship between knowledge of food additives and attitudes and beliefs regarding the relationship between food additives and obesity. Study results may determine whether consumers' KAB regarding food additives, as obesity-influencing factors, contribute to obesity. Obesity is a public health priority in the United States. The rate of obesity in the world is a public health problem [35]. In 2015, the world housed 2.3 billion overweight people aged 15 years and older [36-38]. The rate of obesity encompasses more than a third of the U.S. population [39]. The obesity epidemic in the United States has proven difficult to reverse, with no large-scale successes in preventing obesity, based on statistics reported in previous studies [40]. Being overweight and obese is considered a precursor to chronic diseases such as diabetes. Being overweight and obese are causes of other comorbidities [41]. A relationship exists between obesity prevalence and SES, when measured based on educational level or income. Also, an association exists among poverty-income ratio, education levels, and obesity rates [29].

In 2008, the estimated annual financial cost of obesity in the United States was $147,000,000,000, billion, and medical costs for people who were obese were $1,429 higher than those for people of normal weight [42]. Other financial costs linked to obesity include low worker productivity and higher absenteeism, higher worker's compensation claims, and health and emergency safety costs [43]. The Congressional Budget Office (CBO, 2010) reported that from 1987 through 2007, U.S. spending on obesity increased by nearly 80%, driven in part by the development and diffusion of new medical technology, higher costs in insurance coverage, an aging population, and rising insurance health coverage for health care services [44]. Spending also grew among all weight categories; however, the CBO claimed that the rate of growth was much more rapid among people who are obese. Spending per adult on obesity-related diseases was high among the total amount of health care spending devoted to treating diseases (CBO, 2010).

Obesity link to more than 60 chronic diseases (Campaign to End Obesity, [CEO], 2014). If obesity rates stay constant, by 2030, 51% of the U.S. population will be obese. In addition, in 41 states, obesity rates superseded 25% [44]. As of 20 years ago, no U.S. state had an obesity rate above 15% [45-47]. Consequently, the Trust for America's Health (TFAH, 2015) suggested the United States needs better policies to address obesity for a healthier country [48]. Such policies include forming healthy communities in which people lead healthy lives by implementing small changes for people to gain access and buy affordable healthy foods and beverages. Being physically active can also lead to positive differences for obese people. Little is known about people's knowledge of food additives and their KAB regarding the relationship between KAB and obesity. Food additives are contributing factors to obesity [49]. Bisphenol A, which is found in canned foods and pesticides, is largely unstudied regarding its overall effects on human metabolic homeostasis [50]. Yet, Bisphenol A dysregulates endocrine function and adipocyte function in the body. Emulsifiers, which are additives in processed foods, are enablers in promoting obesity [51-54].

Purpose of the Study

Although dietary guidelines have become science-based, a gap exists among scientific evidence, consumers' behaviors, and dietary lifestyles [55,56]. Therefore, the main purpose of this study was to examine consumers' KAB regarding the relationship between food additives and obesity. Another purpose of this study was to examine additional literature available on consumers' KAB regarding the relationship between food additives and obesity [57-60].

Research Questions

This section lists the research questions (RQs) and the corresponding hypotheses.

RQ1: What is the consumers' knowledge of food additives and their attitudes about food being related to obesity?

H01a: There is no statistically significant difference in knowledge of food additives by gender.

Ha1a: a statistically significant difference in knowledge of food additives by gender.

H01b: There is no statistically significant difference in attitudes regarding food additives by gender.

Ha1b: There is a statistically significant difference in attitudes regarding food additives by gender.

H01c: There is no statistically significant difference in knowledge of food additives by age.

Ha1c: There is a statistically significant difference in knowledge of food additives by age.

H01d: There is no statistically significant difference in attitudes regarding food additives by age.

Ha1d: There is a statistically significant difference in attitudes regarding food additives by age.

H01e: There is no statistically significant difference in knowledge of food additives by race.

Ha1e: There in a statistically significant difference in knowledge of food additives by race.

H01f: There is no statistically significant difference in attitudes regarding food additives by race.

Ha1f: There is a statistically significant difference in attitudes regarding food additives by race.

H01g: no statistically significant difference in knowledge of food additives by income.

Ha1g: There is a statistically significance difference in knowledge of food additives by income.

H01h: There is no statistically significant difference in attitudes regarding food additives by income.

Ha1h: There is a statistically significant difference in attitudes regarding food additives by income.

H01i: There is no statistically significant difference in knowledge of food additives by education.

Ha1i: There is a statistically significant difference in knowledge of food additives by education.

H01j: There is no statistically significant difference in attitudes regarding food additives by education.

Ha1j: There is a statistically significant difference in attitudes regarding food additives by education.

The population consisted of members of a church in Orlando, Florida. This population had diverse SES backgrounds, race, and age groups. However, the majority of churchgoers was White, female, above the age of 55, and educated. Specific information regarding the exact demographic breakdown of the population at the church was not provided; thus, it is not possible to comprehensively conclude that the sample was representative of the population. It presents the full frequencies and percentages of these demographic variables **(Table 1)**.

Table 1: Frequency table for demographic variables.

Variable	n	%
Before-tax household income		
Less than $25,000	2	2.99
$25,000 to $34,999	2	2.99
$35,000 to $49,999	4	5.97
$50,000 to 74,999	4	5.97
$75,000 to $99,999	15	22.39
$100.000 to $149,999	10	14.93
$150,000 to 199,999	9	13.43
$200,000 or more	8	11.94
I prefer not to answer	13	19.4
Missing	0	0
Racial or ethnic group White or Caucasian	64	95.52
Black or African American	2	2.99
Other	1	1.49
Missing	0	0
Age 25–34	3	4.48
35–44	16	23.88
45–54	11	16.42
55 and over	37	55.22
Missing	0	0
Education High school graduate including equivalency	1	1.49
Some college, no degree	6	8.96
Associates degree	5	7.46
Bachelor's degree	24	35.82
Ph.D.	1	1.49
Graduate or professional degree	29	43.28
Missing	1	1.49
Gender		
Female	52	77.61
Male	15	22.39
Missing	0	0.00

I calculated summary statistics for knowledge and attitude: the two composite scores created to represent participants' knowledge of food additives and participants' attitudes toward food additives being related to obesity. I created the composite score of knowledge by summing participants' correct responses to questions about whether a substance was a food additive. I created the attitude score by averaging participants' responses related to their views on how food additives related to obesity. On average, participants scored 5.21 out of a possible 7.00 (SD=1.41) in knowledge. On average, participants scored 3.27 (SD=0.66) of a possible 5.00 in attitude. I also calculated skewness and kurtosis, shown in **Table 2**.

Table 2: Summary statistics table for knowledge and attitude.

Variable	Minimum	Maximum	M	SD	Skewness	Kurtosis
Knowledge	2.00	7.00	5.21	1.41	-0.34	-1.05
Attitude	1.00	4.50	3.27	0.66	-1.26	2.61

A skew greater than 2.00 in absolute value or kurtosis greater than 3.00 in absolute value indicates deviation from a normal distribution [61]. Scores were within normal limits for skew and kurtosis. **Table 2** presents the summary statistics.

Hypothesis 1a

The null hypothesis regarding gender and knowledge was that no statistically significant difference would emerge in knowledge of food additives when compared by gender. The corresponding alternate hypothesis was that a statistically significant difference in knowledge of food additives would emerge by gender. To assess these hypotheses, I conducted an ANOVA with a dependent variable of knowledge and an independent variable of gender. Assumption testing for this analysis appears in the section titled assumption testing **(Table 3-8)**.

Table 3: Income level.

Income	Dependent variable	W	p	Skew	Kurtosis
$34,999 or less	Knowledge	0.73	.024	0.00	-2.00
	Attitude	0.92	.519		
$35,000 to $49,999	Knowledge	0.86	.272		
	Attitude	0.80	.100		
$50,000 to 74,999	Knowledge	0.94	.683		
	Attitude	0.91	.492		
$75,000 to $99,999	Knowledge	0.84	.013	-0.98	-0.07
	Attitude	0.95	.549		
$100.000 to $149,999	Knowledge	0.93	.436		
	Attitude	0.87	.090		
$150,000 to 199,999	Knowledge	0.89	.180		

	Attitude	0.88	.176		
$200,000 or more	Knowledge	0.90	.273		
	Attitude	0.89	.230		

Table 4: Shapiro-Wilk test results by racial group.

Race or ethnicity	Dependent variable	W	p	Skew	Kurtosis
White or Caucasian	Knowledge	0.90	< .001	-0.39	-0.96
	Attitude	0.89	< .001	-1.44	2.99
Black or African American and other Knowledge	Knowledge	0.92	.463		
	Attitude	0.93	.497		

Table 5: Shapiro-Wilk test results by age group.

Age	Dependent variable	W	p	Skew	Kurtosis
25–34	Knowledge	0.96	.637		
	Attitude	0.98	.702		
35–44	Knowledge	0.83	.007	-0.92	-0.18
	Attitude	0.82	.005	-1.71	2.99
45–54	Knowledge	0.76	.003	-0.40	-1.58
	Attitude	0.96	.710		
55 and Over	Knowledge	0.89	.001	-0.02	-1.29
	Attitude	0.91	.005	-1.30	3.84

Table 6: Shapiro-Wilk test results by education level.

Education	Dependent variable	W	p	Skew	Kurtosis
High school graduate or some knowledgeCollege no degree		.82	.064		
	Attitude	.72	.006	-.71	-.51
Associate degree	Knowledge	.88	.314		
	Attitude	.93	.605		
Bachelor's degree	Knowledge	.89	.014	-.61	-.54
	Attitude	.96	.445		
Graduate and professional degree or knowledge PhD	.86	.001	-.11	-1.45	-0.92
	Attitude	.90	.008	-1.35	2.60

Table 7: Shapiro-Wilk test results by gender.

Gender	Dependent variable	W	p		Skew	Kurtosis
Female	Knowledge	0.91	< .001		-0.19	-1.11
	Attitude	0.90	< .001		-1.31	2.54
Male	Knowledge	0.82	.007			
	Attitude	0.97	***.820***			

Table8: Levene's test results.

Variable	Dependent variable	F	p
Income	Knowledge	0.47	.824
	Attitude	0.59	.740
Race	Knowledge	0.06	.801
	Attitude	0.38	.538
Age	Knowledge	0.57	.636
	Attitude	0.17	.917
Education	Knowledge	1.07	.370
	Attitude	0.09	.966
Gender	Knowledge	1.56	.217
	Attitude	0.51	.480

The results of the ANOVA were not significant, F (1,65)=2.75, p=0.102. This result indicates that no significant differences in knowledge emerged between genders **(Table 9)**.

Table 9: Analysis of variance table for knowledge by gender.

Term	SS	df	F	p	ηp2
Gender	5.31	1	2.75	.102	0.04
Residuals	125.76				

I present the means and standard deviations. I could not reject null Hypothesis 1a **(Table 10)**.

Table 10: Mean, Standard deviation, and sample size for knowledge for gender.

Combination	M	SD	n
Female	5.06	1.41	52
Male	5.73	1.33	15

Hypothesis 1b

The null hypothesis regarding gender and attitude was that no statistically significant difference in attitudes about food additives would emerge when compared by gender. The corresponding alternate hypothesis was that a statistically significant difference in attitudes about food additives would emerge when compared by gender. To assess these hypotheses, I conducted an ANOVA with a dependent variable of attitude and an independent variable of gender. Assumption testing for this analysis can be found in the section titled assumption testing. The results of the ANOVA were not significant, F (1, 65)=0.09, p=0.762. This result indicates that no significant differences emerged in attitude between genders **(Table 11)**.

Table 11: Gender.

Term	SS	df	F	p	ηp2
Gender	0.04	1	0.09	.762	0.00
Residuals	28.29	65			

The means and standard deviations appear in **Table 12**. I could not reject Null Hypothesis 1b.

Table 12: Mean, Standard deviation, and sample size for knowledge for gender.

Combination	M	SD	n
Combination	M	SD	n
Combination	M	SD	n

Hypothesis 1c

The null hypothesis regarding age group and knowledge, Hoc, was that no statistically significant difference would emerge in knowledge of food additives by age. The corresponding alternate hypothesis, Ha1c, was that a statistically significant difference would emerge in knowledge of food additives by age. To assess these hypotheses, I conducted an ANOVA with a dependent variable of knowledge and an independent variable of age group. Assumption testing for this analysis can be found in the section titled assumption testing. The results of the ANOVA were not significant, F (3, 63)=1.08, p=0.362. This shows that no significant difference in knowledge emerged based on age group **(Table 13)**.

Table 13: Age group.

Term	SS	df	F	p	ηp2
Age group	6.44	3	1.08	.362	0.05
Residuals	124.64	63			

The means and standard deviations appear in **Table 14**. I could not reject Null Hypothesis 1c.

Table 14: Mean, Standard deviation, and sample size for knowledge by age group.

Age	M	SD	n
25–34	5.33	1.53	3
35–44	5.62	1.31	16
45–54	4.64	1.63	11
55 and over	5.19	1.37	37

Hypothesis 1d

The null hypothesis regarding age group and attitude, Ho1 was that no statistically significant difference would emerge in attitudes regarding food additives by age. The corresponding alternate hypothesis, Ha1d, was that a statistically significant difference would emerge in attitudes toward food additives by age. To assess these hypotheses, I conducted an ANOVA with an independent variable of age group and a dependent variable of attitude. Assumption testing for this analysis can be found in the section titled assumption testing. The results of the ANOVA were not significant, F (3, 63)=0.18, p=0.909. This result indicates that no significant differences emerged in attitudes based on age group **(Table 15)**.

Table 15: Age group.

Term	SS	df	F	p	ηp2
Age	0.24	3	0.18	.909	0.01
Residuals	28.09	63			

The means and standard deviations appear in **Table 16**. I could not reject Null Hypothesis 1d.

Table 16: Mean, Standard deviation, and sample size for attitude by age group.

Age	M	SD	n
25–34	3.00	0.70	3
35–44	3.26	0.76	16
45–54	3.30	0.72	11
55 and over	3.29	0.61	37

Hypothesis 1e

The null hypothesis regarding race and knowledge, Ho1e was that no statistically significant difference would emerge in knowledge of food additives by race. The corresponding alternate hypothesis, Ha1e was that a statistically significant difference would emerge in knowledge of food additives by race. To assess these hypotheses, I conducted an ANOVA with an independent variable of race and a dependent variable of knowledge. Assumption testing for this analysis can be found in the section titled assumption testing. The results of the ANOVA were not significant, F (1, 65)=0.46, p=0.499. This result indicates that no significant differences emerged in knowledge based on race **(Table 17)**.

Table 17: Race.

Term	SS	df	F	p	ηp2
Race	0.92	1	0.46	.499	0.01
Residuals	130.15	65			

The means and standard deviations appear in **Table 18**. I could not reject Null Hypothesis 1e.

Table 18: Mean, Standard deviation, and sample size for knowledge by race.

Race	M	SD	n
White or Caucasian	5.23	1.39	64
Black, African American or Other	4.67	2.08	3

Hypothesis 1f

The null hypothesis regarding race and attitude, Ho1f, was that no statistically significant difference would emerge in attitudes regarding food additives by race. The corresponding alternate hypothesis, Ha1f, was that a statistically significant difference would emerge in attitudes regarding food additives by race. To assess these hypotheses, I conducted an ANOVA with an independent variable of race and a dependent variable of attitudes. Assumption testing for this analysis can be found in the section titled assumption testing. The results of the ANOVA were not significant, F (1, 65)=1.41, p=0.240. This result indicates that no significant differences emerged in attitudes among races **(Table 19)**.

Table 19: Race.

Term	SS	df	F	p	ηp2
Race	0.60	1	1.41	.240	0.02
Residuals	27.73	65			

The means and standard deviations appear in **Table 20**. I could not reject Null Hypothesis 1f.

Table 20: Mean, Standard deviation, and sample size for attitude by race.

Combination	M	SD	n
White Caucasian	3.25	0.64	64
Black African American or Other	3.71	0.97	3

Hypothesis 1g

The null hypothesis regarding income group and knowledge, Ho1g was that no statistically significant difference would emerge in knowledge of food additives by income. The corresponding alternate hypothesis, Ha1g, was that a statistically significant difference would emerge in knowledge of food additives by income. To assess these hypotheses, I conducted an ANOVA with an independent variable of income group and a dependent variable of knowledge. Assumption testing for this analysis can be found in the section titled assumption testing. The results of the ANOVA were not significant, F (6, 47)=0.90, p=0.506. This result indicates that the differences in knowledge among the levels of income group were not significant **(Table 21)**.

Table 21: Income group.

Term	SS	df	F	p	ηp2
Income	10.48	6	0.90	.506	0.10
Residuals	91.67	47			

The means and standard deviations appear in **Table 22**. I could not reject Null Hypothesis 1g.

Table 22: Mean, Standard deviation, and sample size for knowledge by income group.

Income	M	SD	n
$34,999 or less	5.50	1.73	4
$35,000 to $49,999	5.25	0.96	4
$50,000 to 74,999	6.00	0.82	4
$75,000 to $99,999	5.40	1.50	15

$100.000 to $149,999	4.70	1.25	10
$150,000 to 199,999	4.56	1.51	9
$200,000 or more	5.50	1.41	8

Hypothesis 1h

The null hypothesis regarding income group and attitudes, Ho1h, was that no statistically significant difference would emerge in attitudes regarding food additives by income. The corresponding alternate hypothesis, Ha1h, was that a statistically significant difference would emerge in attitudes regarding food additives by income. To assess these hypotheses, I conducted an ANOVA with an independent variable of income group and a dependent variable of attitude. Assumption testing for this analysis can be found in the section titled assumption testing. The results of the ANOVA were not significant, F (6, 47)=1.76, p=0.129. This result indicates that the differences in attitudes among the levels of income **Table 23 and 24**.

Table 23: Analysis of variance table for attitude by income.

Term	SS	df	F	p	ηp2
Income	3.71	6	1.76	.129	0.18
Residuals	16.53	47			

Table 24: Mean, Standard deviation, and sample size for attitude by income.

Income	M	SD	n
$34,999 or less	3.78	0.58	4
$35,000 to $49,999	3.53	0.40	4
$50,000 to 74,999	3.75	0.53	4
$75,000 to $99,999	3.17	0.57	15
$100.000 to $149,999	3.27	0.44	10
$150,000 to 199,999	3.44	0.50	9
$200,000 or more	2.90	0.91	8

Hypothesis 1i

The null hypothesis regarding education and knowledge, Ho1i, was that no statistically significant difference would emerge in knowledge of food additives by education. The corresponding alternate hypothesis, Ha1i, was that a statistically significant difference would emerge in knowledge of food additives by education. Assumption testing for this analysis can be found in the section titled assumption testing. The results of the ANOVA were not significant:, F (3, 62)=0.69, p=0.564. This result indicates that the differences in knowledge among the levels of education **Table 25 and 26**.

Table 25: Analysis of variance table for knowledge by education.

Term	SS	df	F	p	ηp2
Education	4.16	3	0.69	.564	0.03
Residuals	125.43	62			

Table 26: Mean, Standard deviation, and sample size for knowledge by education.

Education	M	SD	n
High school graduate or some college no degree	5.71	1.38	7
Associates degree	5.80	0.84	5
Bachelor's degree	5.17	1.37	24
Graduate and professional degree or PhD	5.07	1.53	30

Hypothesis 1j

The null hypothesis regarding education and attitude, Ho1j, was that no statistically significant difference would emerge in attitudes regarding food additives by education. The corresponding alternate hypothesis, Ha1j, was that a statistically significant difference would emerge in attitudes regarding food additives by education. To assess these hypotheses, I conducted an ANOVA with an independent variable of education and a dependent variable of attitude. Assumption testing for this analysis can be found in the section titled assumption testing. The results of the ANOVA were not significant, F (3, 62)=2.05, p=0.116. This result indicates that the differences in attitudes among the levels of education **Table 27 and 28**.

Table 27: Analysis of variance table for attitude by education.

Term	SS	df	F	p	ηp2
Education	2.51	3	2.05	.116	0.09
Residuals	25.28	62			

Table 28: Mean, Standard deviation, and sample size for attitude by education.

Education	M	SD	n
High school graduate or some college no degree	3.12	0.98	7
Associates degree	3.73	0.69	5
Bachelor's degree	3.41	0.52	24
Graduate and professional degree or PhD	3.10	0.63	30

Summary of Analyses for Research Question 1

Research Question 1: What is consumers' knowledge of food additives and the attitudes about food additives being related to obesity? To answer this research question, I conducted a series of ANOVAs with the independent variables of gender, race, age group, income group, and education, and the dependent variables of knowledge and attitude. Results of the analyses indicated no differences between genders, races, age groups, income groups, or educational backgrounds with regards to consumers' attitudes toward food additives being related to obesity.

Discussion

The purpose of this research was to study people's KABs about food additives and obesity and their KABs regarding relationship between food additives and obesity in Orlando, Florida. I chose to conduct a survey to measure peoples' KABs about food additives and obesity. The research questions asked about (a) differences in consumers' knowledge of food additives and attitudes about food being related to obesity between demographic factors, (b) the relationship between consumers' knowledge of food additives and their attitudes related to obesity, and (c) how demographics affected the relationship between consumers' knowledge of food additives and their attitudes about food additives being related to obesity. Another concept used for this study was to explain the aspects necessary to describe scientific processes using six interrelated principles, not necessarily in the same form of inquiry. Such fundamental principles conceptual (theoretical)

understanding, which constitutes empirically testable and reputable hypotheses using observational methods linked to theory. Such a format enables other scientists to verify the accuracy of a study and recognize the importance of replication and generalization (National Academies of Sciences, Engineering, and Medicine, 2019. However, it is unlikely that any one study would possess all these qualities [62]. This study was descriptive in nature, describing consumers' KABs about food additives and obesity. The study was formatted in the following way:

- Posed significant questions that can be investigated empirically
- Linked research to relevant theory
- Used methods that permitted direct investigation of the questions
- Provided a coherent and explicit chain of reasoning
- Replicated and generalized across studies
- Disclosed research to encourage professional scrutiny and critique

For Research Question 1, I could not reject the null hypotheses associated with the question and no significant differences emerged in knowledge or attitudes based on age, income, gender, education, or race. The results for Research Question 2 indicated that I could not reject the null hypothesis. No significant correlation emerged between knowledge and attitude. The results for Research Question 3 indicated that I could not reject the null hypothesis. No significant relationship emerged between knowledge and any demographic variables when predicting attitude. A significant relationship emerged between one level of education and knowledge; however, assumption testing particularly of this ANOVA analysis showed no difference; this model revealed issues of heteroscedasticity, indicating the results should be treated with caution [63-67].

Interpretation of the Findings

Research Question 1 asked, what is consumers' knowledge of food additives and attitudes about food being related to obesity? I found no significant interaction in knowledge or attitudes based on age, income, gender, education, or race. I used the SLT to explain human behavior as continuous reciprocal interactions between cognition, behavior, and environment. I used specific response options such as yes/no or Likert-type items through SurveyMonkey, an online data-gathering method, and used open coding to analyze the data [68-74]. Research Question 2 asked the following: Is there a relationship between consumers' knowledge about food additives and their attitudes about food additive related to obesity? No significant correlation emerged between knowledge and attitude. Kaplan and Kayisoglu claimed that consumers are increasingly cautious about food safety [75]. Some consumers fear the addition of additives to food [40]. Additionally, some consumers do not perceive food additives the same way [76]. Research Question 3 asked the following: Is there a statistically significant relationship between consumers' knowledge of food additives and about food related to obesity based on demographic characteristics? No significant interaction emerged between knowledge and any of the demographic variables when predicting attitude. A significant interaction emerged between only one level of education and knowledge; however, assumption testing for this model revealed issues of heteroscedasticity, indicating results should be treated with caution [77-84].

Limitations of the Study

Like all studies, the present study had limitations. According to Saunders, Lewis, and Thornhill (2009), research methods serve as the backbone of a study [85]. However, the main purpose of quantitative research is the quantification of data that represents the population from which it was drawn, by measuring the views and responses of the sample population. Younus stated that "every research methodology consists of two broad phases, namely planning and execution". Saunders et al., Simon further stated that "within these two phases, there likely would be limitations, which are beyond the researchers' control" [86,87]. Limitations were evident in the present study, as the sample population size fell in the limitations, due to nonresponses from certain age groups and ethnicities [88]. Limitations included self-reporting by participants of the study and sample size. The survey questionnaire targeted 400 participants, but the response rate was 69 participants. This marginal sample size was due to people's lack of interest in participating, or people feeling their participation would not have any effect on the study. Quantitative studies are problematic when they have too large a sample size and low participant response [89-92]. Self-reporting introduces the possibility of subjectivity and may not be as accurate as objective measures. Also, despite numerous announcements posted regarding the survey in the church's bulletin and on its website, responses from participants aged 18–24 and 25–34 were minimal. Therefore, the sample did not equitably represent all age groups. Additionally, African American participants were underrepresented, as responses from this population were low. I had no control over these factors. Because of unequal representation of age groups and ethnicity, the findings may not be generalized to other populations [93-106].

Recommendations for Further Research

Recommendations for future research include a larger, diverse population sample. This research sample lacked individuals from the age groups 18–24 and 25–34 and lacked people of certain cultural demographic backgrounds, which may have compromised this study. Because I used a descriptive with cross-sectional approach, future studies should use qualitative or longitudinal approaches, considering that previous literature and studies yielded different perspectives on the relationship between food additives and obesity. Further recommendations include additional literature reviews, different data collection methods, different statistical analyses, different sets of statistical variables to produce different outcomes, and a more diverse population. Research with the statistical data sets in the present study offered insight into consumers' KABs regarding food additives and whether KAB may be a causative agent for obesity from a qualitative perspective. Further research needs to be conducted to answer the gaps in literature.

Implications

The focus of this study was to test consumers' KABs about food additives and obesity. From a statistical analysis point of view, this focus was well documented in the data set write up, presented in the methods study section of this dissertation. I presented the data with the responses from participants. It was evident in the interpretations that although income and higher levels of education were not a significant factor in the results of certain age groups, education among lower age-group participants played a role in their KABs regarding food additives and obesity. Findings from the present study suggested that the need to elaborate on this study is vital. If consumers are in an educational or financially lower SES, they can escape obesity. Because the consumers in this study had higher educational levels, they were more likely to purchase foods that are healthy by virtue of educational status and financial resources. However, some people may not be cognizant that food additives can link to obesity. It is, therefore, necessary to improve consumer education and information through workshops and community participation. The Office of Public Health must demonstrate the dangers of food additives and obesity by informing, educating, and training the public. Waiting for manufacturers to offer that support is futile; the public must oversee its own health destiny. The goal of this study was to bring awareness regarding food additives and obesity to the forefront. A critical need exists for cost reduction and mortality rates related to obesity. If obesity is not reduced or eliminated in future years, it will rank as the leading mortality cause, surpassing cancer and diabetes.

Limited publications describe a relationship between food additives and obesity. When young consumers are educated, they may better protect their own health, safety, and economic and legal interests and those of society [107-111]. The intent of this study was to better understand consumers' KABs regarding food additives and obesity. Public health must make changes, advising those who are obese about their ability to change their lifestyle to avoid obesity-enhancing foods [112-116].

Conclusion

Ralph Waldo Emerson wrote, "Do not go where the path may lead, go instead where there is no path and leave a trail." Social change must start with local, community, state, and federal public health advocates, moving consumers from a mindset of comfort to initiating changes. Although invoking the behaviorist model is a response to environmental factors that ultimately affect a person's behavior, use of the cognitive model of internal behavior guided the theoretical framework of this study. The goal of this study was to effect social change by informing people of the association between their obesity and the additives in the foods they eat.

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