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Association Between Family Structure and Childhood Obesity in Essex County, NJ.

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This is to certify that the doctoral study by

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Abstract

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MS, Strayer University, 2010

BS, Southern Illinois University, 2006

Doctoral Study Submitted in Partial Fulfilment

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Doctor of Public Health

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Abstract

Obesity is one of the most prevalent nutritional disorders in children in the United States. There are many factors associated with childhood obesity, but there is limited information about the association between family structure and childhood obesity. This quantitative retrospective cross-sectional study, guided by the Social Ecological Model, was carried out to identify the effect of family structure on childhood obesity. For this study, the 2017 National Survey of Children's Health (NSCH) of children 6-13 years old residing in the state of New Jersey was analyzed. Binary logistic regression was used to determine the relationship between family structure and obesity, and a Chi-square test of independence was used to analyze the relationship between the independent variables. There was statistically significant association between family structure and childhood obesity χ^2 (16) = 482.90, $p < .001$. This study's findings can impact positive social change by encouraging further studies leading to quality improvement in the management of childhood obesity. Moreover, the results could encourage public health professionals to design and implement effective childhood obesity management programs addressing clinical and psychosocial services needed to improve the knowledge and management of childhood obesity.

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Dedication

I dedicate this study to the Almighty God for instilling in me a courageous spirit. Accomplishing this doctoral journey was tremendously tasking however, God Almighty in His infinite mercies saw me through.

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First, I would like to thank my dissertation committee, Dr. Egondu Onyejekwe, Dr. Debo I. Awosika-Olumo and Dr. German Gonzalez for your immense assistance. I truly appreciated all your comments, questions, and expertise in content and methodology. Your feedback, guidance, and encouragement enabled me get this far in my academic pursuit. Also, not forgetting my former Chair, the late Dr. Ekong for guiding me in the right direction with this project, may his soul rest in peace.

I would also like to thank my dear wife, Obiageli Onyeagoro, who has been extremely supportive of me throughout this entire process and has made countless sacrifices to help me get to this point. She has been my muse, editor, proofreader, and sounding board but most of all, I'd like to thank her for being my best friend. I owe her everything.

My thanks also goes to my father, Tony Onyeagoro, for sharing with me his personal experiences navigating the academics here at Walden University which significantly grounded my successful conclusion of this journey. Lastly, I would also like to thank my mother, Ego Onyeagoro, for her support and encouragement throughout my academic pursuit.

Table of Contents

List of Tables

List of Figures

Section 1: Foundation of the Study and Literature Review

Introduction

Obesity is one the most prevalent nutritional disorders in children in the United States, approximately 26% of children are obese (Segal et al., 2017). Though childhood obesity has increased significantly in recent years, it is a complex disorder. Studies have shown that childhood obesity tends to be more prevalent in children from families characterized by a domineering, overprotective mother, indisposed father and lack of responsiveness and support toward the obese child (Allender et al., 2016; Renzaho et al., 2015*)*. Previous studies also reported that childhood obesity could be linked to some specific family characteristics such as family cohesion (Allender et al., 2016; Cyril et al., 2016; Renzaho et al., 2015*)*.

Nutrition and physical activity have been identified as the primary determinants of children's weight status, however, social factors have also been shown to play a role too (Huffman et al., 2012). In the United States, obesity is also believed to be more prevalent among children of the ethnic minorities, parents with less income and low levels of education (Huffman et al., 2012). Studies also show that childhood obesity affects genders differently (Miller & Nepomnyaschy, 2013; Suomalainen et al., 2017; Trust for America's Health and Robert Wood Johnson Foundation, 2017). The reason why childhood obesity affects genders differently is not well understood.

Family structure may also be a predisposing factor for obesity, but no studies have established how it could be a social predictor of obesity in children. Family size, marital status of parents, sibship, birth order and gender composition of children are all factors

belonging to family structure (Miller & Nepomnyaschy, 2013). Additional, subsystems are formed by generation, ethnicity, gender, interest or function (Chan, 2016). From birth a child's quality of life is directly influenced by the kind of care, support, stimulation and education received from family members in the home (Danford et al., 2015). Children can acquire multiple unhealthy eating habits directly from their parents or family members by observing and internalizing the unhealthy eating behaviors that are frequently module into them (Ogden et al., 2014). Children are most likely to be affected by their relationship with other adults, for example, grandparents. This is because children's lives are lived interdependently with parents, siblings and other kin members (CDC, n.d.-b). It is common for children to live with extended family members and 40% of children live in household that have other adults present than their parents (World Family Map, 2016).

Family living arrangements and absence or presence of extended family members, shape the course and context of children's life and in particular affect children's access to human resources such as good nutrition (Danford et al., 2015). Children spend most of their time in their home, in the company of their parents and family members; therefore, examining the association between family structure and obesity in children as well as the significance of racial inequality and gender of obese children, especially in New Jersey, is significant. Since the family is an important influencer in child nutrition outcomes (World Family Map, 2016; Young Lives, 2016), it is significant to study the association between family structure and obesity in school aged children, 6 to 13 years old. This study will add to the knowledge needed to improve the health and lives of children.

Problem Statement

Childhood obesity is a serious issue with respect to the health and well-being of children (Ash *et al.,* 2017). In the United States, from 2013 to 2014, 33.4% of children were overweight and 26% were obese. The prevalence of overweight increased from 28.8% in 1999 to 33.4% in 2014 (Park, 2016). In New Jersey, obesity rate is ranked 28th in the data from the 2017 and 2018 (Karen, 2019). The obesity rate for children in New Jersey has increased over the past 2 years. Furthermore, a factsheet from the National Initiative for Children's Healthcare Quality, showed that Essex County has a higher percentage of obese children when compared to other counties in New Jersey.

Children who are overweight are more likely to grow up to be obese, suffer serious health consequences at childhood and adulthood and also experience health, social and behavioral issues (Terry, 2016; Sahoo, 2015). The adverse effects of childhood obesity to include; high blood pressure, high cholesterol, type II diabetes, asthma, joint pain, and social and psychological problems (such as social bullying, poor body image and suicide) occurring during childhood years (U.S. Centers for Disease Prevention and Control [CDC], n.d.-c). The major populations affected by the adverse effect of this epidemic are the preschool-aged and school-aged children (Sahoo, 2015). As childhood obesity continues to be a significant issue affecting both younger preschool-aged children and school-aged children, identifying the contributing factors to this epidemic becomes an important goal. This study fills the gap in the literature by gaining new insight into the causes of childhood obesity, allowing for more effective attempts at reducing the number of children in Essex County New Jersey suffering from life threatening weight problems.

Purpose of the Study

This study was conducted to establish if family structure has an effect on childhood obesity. Family environment can be a social predictor of obesity in children (Huang et al., 2017; World Family Map, 2016; Young Lives, 2016), justifying the need to study family structure as a factor in the rise in childhood obesity. Studies have also shown that overweight and obesity affect girls and boys differently (Miller & Nepomnyaschy, 2013; Suomalainen, 2017) but they did not emphasis on family structure factors such as gender, number of siblings, or family size because the major populations affected by childhood obesity are the preschool-aged and school-aged children (Sahoo, 2015), I focused on school-aged (6 to 13 years) children living in Essex County, New Jersey for this study. This study contributes to positive social change regarding childhood obesity and a system change engaging more than one caregiver or multiple family members (siblings and extended family) in treatment. This study also adds to the knowledge to improve the health and lives of children.

Research Questions and Hypotheses

The research questions and hypotheses for this study are as follows:

Research Question 1: Is there a relationship between family structure and childhood obesity?

H_o 1: There is no relationship between family structure and childhood obesity.

H_a 1: There is a relationship between family structure on childhood obesity.

Research Question 2: Is there a relationship between gender and obesity in children?

H_o 2: There is no significant relationship between gender and obesity in children.

H_a 2: There is a significant relationship between gender and obesity in children.

These research questions were chosen because a gap existed in information regarding the effect of family structure on childhood obesity. Additionally, childhood obesity may affect genders differently, but, the reason have not been studied in Essex County, New Jersey. These research questions helped to ascertain the association between family structure and obesity in school aged (6 to 13 years old) children.

Theoretical Foundation of the Study

Theoretical frameworks are paradigms in literature and provide a context for examining and understanding the links between concepts (Vinz, 2015). The theoretical framework of this study was based on the Social Ecological Model (SEM), which is transdisciplinary and multilevel (Bronfenbrenner, 1979). Biological, psychological and environmental factors are intertwined, so none can be fully considered without understanding the system in which they are embedded. Rather than studying the contributors to overweight status alone, the intertwined system was studied holistically. Biological factors are impacted by behavioral factors which are related to diet, activity and sedentary patterns (Huffman et al., 2012). Demographics, socioeconomic factors and family structure are factors believed to influence obesity in children. Furthermore, societal factors such as cultural norms, food availability and environment are also

believed to influence obesity in children (Townsend & Foster, 2012). Thus, concept from the SEM guided this study during the development process.

The Social Ecological Model

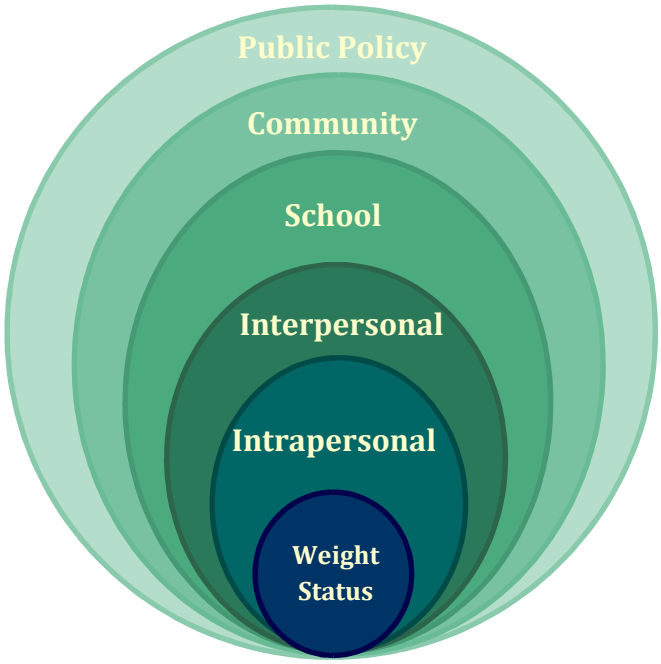
The SEM was introduced as a conceptual model in the 1970s and formalized as a theory in the 1980s in order to understand the dynamic interrelations among various personal and environmental factors. This model bridges the gap between behavioral theories that focus on small settings and anthropological theories that analyze larger settings (Townsend & Foster, 2012). The SEM is a graphic depiction of the ecological theory of a given health, behavior, or outcome and shows how the health and well-being of an individual is determined by multiple factors and their interactions (Townsend & Foster, 2012). The SEM suggests that health emerges from the day-to-day interaction between individuals and their environment which affects all individuals differently and guides the development of health beliefs and behaviors (Davison et al., 2012). Childhood obesity when considered within the context of this theory, is conceptualized as being influenced by multiple factors which includes individual and family structure (Davison et al., 2012). The use of this framework embraced complex factors such as urban planning, social networks, social, and psychological and biological factors (Lytle, 2010). Thus, it provides a useful framework for achieving a better understanding of different factors and barriers that affect health behaviors and outcomes and interpersonal characteristics (Townsend & Foster, 2012). When considering children's exposure to social environment and their interaction, it can be anticipated that no two children will respond in the same manner. Therefore, the SEM helped to understand the complex interplay

between the different exposures children face daily as well as the influence the exposures may have on the outcome (childhood obesity).

The SEM usually used in Public Health has five different levels that influence childhood obesity (Barbara & Blake, 2012). The SEM is depicted as factors associated with childhood obesity embedded in multiple spheres of influence ranging from those most influential to a child's experience such as the family, to those more distal such as policies set in place at the local, state, and federal level which individually influence the development of overweight (Barbara & Blake, 2012; see Figure 1). The intrapersonal level is most related to obesity in children; it is the most personal level of this model. As the levels move away from the center, they tend to pose a lesser influence on obesity. Though not all levels may have a direct influence on obesity, they are connected to a child's weight status in some way. The intrapersonal and interpersonal level will be discussed in the following sections.

Figure 1

Social Ecological Model of Childhood Obesity



Note. Adapted from *Theoretical foundation: What is health promotion?*, by University of Victoria, Centre for Additions research, 2013 (http://www.carbc.ca/knowledgeinPractice/HealthyCommunities/BackgroundTheory.aspx)

Intrapersonal Level

The first level of the SEM is the intrapersonal level. The biological and personal history factors that increase the likelihood of obesity in children are identified in this level (Sarrafzadegan et al., 2013). These factors include; knowledge, attitude and behaviors related to diet, exercise, nutrition, and overall health in addition to age, race, and gender (Sarrafzadegan et al., 2013). This level is usually the focus of childhood

obesity studies because the energy imbalance is easily seen and analyzed (Dev et al., 2013). Overall, within the individual factors in this level is where the effects of all of a child's ecological influences are seen (Dev., 2013).

Interpersonal Level

This level addresses the close associations and influence that may directly affect the health behaviors that a child develops. These health behaviors often times lead to an increased risk of obesity (Dev et al., 2013). In this level of SEM, the people and environment tend to hold great importance to a child's life. Family members, home environment and the closest circle of peers may influence the health status of a child (Fuemmeler et al., 2011). The influences found at this level are those that children are usually surrounded by as they grow.

Nature of the Study

The nature of this study is a quantitative retrospective cross-sectional study, designed to determine the association between family structure and childhood obesity in Essex County, New Jersey. The approach for this study included analysis of secondary archived dataset from the 2017 NSCH. which provided rich data on multiple, intersecting aspects of children's lives—including physical and mental health, access to quality health care, and the child's family, neighborhood, school, and social context. The NSCH is funded and directed by the Health Resources and Services Administration and Maternal and Child Health Bureau.

Literature Review

Obesity is the most prevalent nutritional disorder in children in the United States with about 33.4% of children overweight and approximately 18% is obese (Segal et al., 2017). The National Health and Nutrition Examination Survey reports that prevalence of childhood obesity is increasing in all pediatric age groups: 13.9% (2 to 5 years old), 18.4% (6 to 11 years old), and 20.6% (12 to 19 years old) are obese. Additionally, both sexes and, various ethnic and racial groups are obese - 25.8% of Hispanic children and 22% of African-American children are obese. Childhood obesity causes a risk for type 2 diabetes, hypertension, and cardiovascular disease (Schwarz, 2016). Various factors such as genetics, environment, metabolism, lifestyle as well as eating habits have been believed to play a role in obesity. About 90% of obesity cases in children are idiopathic and about 10% are genetic causes (Schwarz, 2016).

Literature Search Strategy

While constructing this literature review, the following databases were searched: MEDLINE and MEDLINE Complete, CINAHL and CINAHL Complete, PubMed, EBSCOhost, Science Direct, Web of Science, Health and Medical Complete, American Health Line, Demographics Now, Sage and Oxford Journals and Nursing and Allied Health Source. In addition, some search engines were used such as Google Scholar, ProQuest (dissertation and thesis database) as well as websites from various government (federal, state, local), education and related topics. The selected dataset, from the Lourdes Health System (2016) was retrieved from Google. Databases were also searched using an initial set of keywords that included *obesity, childhood obesity, family structure,*

childhood obesity research, obesity origins, causes of childhood obesity, BMI, classification of BMI and health concerns related to childhood obesity.

Peer-reviewed journal articles, books and dissertations were included in this literature review. Most of the works retained for the purpose of this literature review were published between 2011 and 2017. Seventy-six separate works were reviewed and of these, 42 were chosen for inclusion. Approximately 80% of all the works reviewed here were quantitative, and the remaining 20% were qualitative. Research articles were chosen for inclusion based on their discussion of family structure, childhood obesity, health consequences of obesity, factors influencing childhood obesity and measurement of obesity.

Literature Review Related to Key Variables and Concepts

Definition of Obesity

Obesity occurs if the range of weight for a child is greater than the ideal weight considered healthy for the particular height. The BMI is used as an outcome measure to determine obesity. Childhood obesity is the BMI being at or above 95^{th} percentile for children of the same age and sex; however, the classification of obesity in children is dependent upon the body composition of a child which varies with respect to age and sex (Deckelbaum & Williams, 2012).

Healthy People 2010 ranked obesity as a major health issue in the United States with the prevalence of childhood obesity increasing over the years (CDC, n.d.-b). An increase in the prevalence of childhood obesity has adverse morbidity and mortality

effects that may continue in adulthood. This has given medical experts and public health professionals a course for concern. Most times, children are not considered obese until their weight exceeds at least 10% higher than the recommended weight for their height and body type but obesity in a child often begins at the age of 5 and 6 or during adolescence (American Academy of Child & Adolescent Psychiatry, 2016).

Measuring Obesity in Children

As mentioned, obesity in children is defined as the excess of body fat (Nemiary et al., 2012). Various noninvasive ways exist in which fat can be estimated. These include: under water weighing, bioelectric impedance, the use of skin fold calipers as well as BMI calculation. The most commonly used method is the BMI calculation derived from the weight and height of a child but BMI is only a proxy for adiposity in children. There are other measurement options such as dual x-ray absorptiometry, air displacement plethysmography, and MRI which gives more detailed information into fat deposition in children (Spruij-Metz, 2011). Even though these methods provide detailed information, they are much more expensive and more invasive. Some concerns have been reported regarding the reliability of self- reported height and weight to capture BMI. In most cases, height was generally over-reported and weight was mostly under-reported. The use of self-reported BMI in epidemiological studies could result in an underestimated prevalence of BMI though research has indicated that self-reported measurements were accurate (Bowring et al., 2012). Despite its technical limitations, BMI has been recommended as an important single indicator of overweight and obesity in children. BMI changes in children with normal longitudinal growth; however, to determine BMI in

children, it must be adjusted for age and sex (Skinner & Skelton, 2014). BMI in children is reported in percentiles where overweight falls within the 85th - 95th percentiles and obesity is the 95th percentile and above (Hamide et al., 2013). The breakdown of the classification of BMI-for-age and sex of children ages 2 to 17 can be seen in table 1.

Table 1

Classification of BMI-For-Age and Sex of Children

Classification	**Body Mass Index (Kg/m^2)**
Underweight	Below the 5th percentile ranking
Normal/Recommended	≥ 5th and < 85th percentile ranking
Overweight	≥ 85th and <95th percentile ranking
Obese	≥ the 95th percentile ranking

CDC, 2014

Health Concerns Related To Childhood Obesity

In the United States, obesity in children has been reported among the most widespread public health issues affecting children (Hamide et al., 2013). This has led to comorbidities beginning to emerge in young children (Glavin et al., 2014). There has been an increased rate of obesity related comorbidities among children (Flynn, 2013). For instance, type 2 diabetes has been reported to have increased significantly among children (Flynn, 2013). This rise of type 2 diabetes among children can lead to an increased likelihood of nephropathy and retinopathy among the younger generation if they do not comply with treatment. Furthermore, obese children are more likely to suffer

cardiovascular diseases risk factors which includes high cholesterol levels and blood pressure.

A study by Domingo and Scheimann (2012) showed that 70% of the subjects 5-17 years old had at least one risk factor for cardiovascular disease and 30% had two or more risk factors. Obese children have also been seen to have bone and joint problems, sleep apnea and can also develop pre-diabetes (CDC, n.d.-). They are also more likely to have insulin resistance, asthma and depression (CDC, n.d.-a). Obesity is a disease that affects almost all organs in the body and manifests into unpredictable chronic conditions and comorbidities (Domngo & Scheimann, 2012). Health concerns related to obesity in children are not only limited to physical condition but are also likely to face social and psychological problems such as stigmatization and poor self -esteem (CDC, n.d.-a). As a result of this rise in the early onset of chronic conditions associated with childhood obesity, children today may be the first in more than a century to live less healthy and shorter lives than their parents if this epidemic is not addressed (Spruij- Metz, 2011).

Chronic diseases associated with childhood obesity develop with time and 70% to 80% of obese children remain overweight throughout their life time (Schaub & Marian, 2011). Finkelstein, Graham & Malhotra (2014) reported in their study that 77% to 92% of obese children remained obese in adulthood. In these situations, the health conditions associated with childhood obesity continues till adulthood and pose even more serious health concerns (heart disease, stroke, several types of cancer, osteoporosis, hypertension, hyperlipidemia, liver and renal diseases (CDC, n.d.-a; Hamid et al., 2013). The long-term effects of childhood obesity can be devastating in adulthood therefore, it is important to

stop this trend of obesity in children in order to improve current and future health outcomes of children in the United States.

Factors Influencing Childhood Obesity

It has been reported that childhood obesity results from the imbalance between caloric intake of a child and the calories utilized for growth, development, metabolism as well as physical activities. The amount of calories consumed by a child through food or beverages, if not used for energy activities will lead to obesity (Halfon, Kandyce & Slusser, 2013). Factors causing childhood obesity could be genetic, behavioral or environmental (social factors) however, obesity in children can be multifactorial (Halfon, Kandyce & Slusser, 2013). For the purpose of this study, emphasis was laid on social factors.

Demographic Characteristics

Childhood obesity has been reported to be increasing steadily in boys and girls of all ages and ethnicities (Ogden et al, 2014) however, there has been differences in the prevalence of childhood obesity with differences in age, sex, race, and ethnicity. The risk of obesity in children varies across sex, age, and race. Studies have shown that there has been considerable differences between preschool children 2 years to 5 years and older school age children (6 years to 11 years). These age groups have shown differences in the prevalence of obesity (Wang, 2011). Racial and ethnic disparities among childhood obesity have also been reported (Ogden et al., 2014). Non-Hispanic Asians (19.5%) and Non- Hispanic Whites (28.5%) had the lowest prevalence of childhood obesity (Ogden et al., 2014). Hispanics (38.9%) and Non-Hispanic Blacks (35.2%) had a higher rate of

childhood obesity when compared to other races (Ogden et al., 2014). Hispanic males (40.7%) and Hispanic females (37.0%) had the highest rate of obesity in children when combining all age groups with non-Hispanic black females being close to second (36.1%) (Ogden et al., 2014).

Family Demographic Characteristics

Veldhuis et al. (2013) documented that certain parents and family demographics have different influences on childhood obesity risk. Parents educational attainment have shown to influence the risk of obesity in children (Veldhuis et al., 2013) while low family income has significantly shown to be associated with high risk of obesity in children (Davidson, Jurkowski, Kaigang, Kranz, & Lawson, 2013). The family demographic characteristics to be studied include: parents'/guardian's education level, family income, mother's age, father's presence, gender, age of child and number of siblings.

Parents' Socioeconomic Status

Parental socioeconomic status (SES) is the social standing or class of the parents of an individual. It is usually measured as a combination of education, income and occupation (Sharon, Sara & Marcia, 2012). SES has been reported to have a link to satisfaction and stability in romantic unions, the quality of parent-child relationship as well as range of developmental outcomes for children (Sharon, Sara & Marcia, 2012). Parents earning lower incomes are more likely to experience difficulties purchasing healthy foods and as a result may lead to unhealthy weight status in children (Sharon, Sara & Marcia, 2012). Studies have also shown that children living in neighborhoods with single-parent households, low household income and high proportion of non-white

residents are usually seen to be obese (Bass & Eneli, 2015; Byrne, Cook, Skouteris & Do, 2011).

It has been reported that there is a chance that the association between childhood obesity and family structure is moderated by a child's characteristics or family (Suglia, Duarte, Chambers & Boynton-Jarrett, 2012). Suglia, Duarte, Chambers & Boynton-Jarrett (2012) also found that girls raised by single parents have a high risk of obesity. Indicators of parents' SES, including parents' educational level and poverty level are other factors that may moderate the influence of family structure on child obesity (Bass & Eneli, 2015). In the United States, children from families who fall below the poverty line have more than twice the odds of obesity when compared to children from families with poverty level at 400% or above (Bass & Eneli, 2015). Lower BMI levels have been reported in children from single mothers with a high school degree when compared with children from single mothers with less than a high school education. While parents' education level and parents' poverty level present risks to children's weight status (Suglia, Duarte, Chambers & Boynton-Jarrett, 2012). It is still not clear the factors that moderate the impact of family structure on obesity in children.

Family Structure

Family structure states that family as a human living system is organized (family structure) around family subsystems (Chan, 2016). These subsystems are formed by generation, ethnicity, sex, interest or by function (Chan, 2016), they focus on the most important component of environmental influence—home and family. For instance, from birth a child's quality of life is directly influenced by the kind of care, support,

stimulation and education he or she receives from family members in the home (Danford, Schultz & Marvicsin, 2015). As infants begin to develop secure attachments with significant others, particularly family members, they begin to establish themselves as members of the first and most basic unit of society—the family, which forms the foundation for secure membership in other groups throughout life (Danford, Schultz & Marvicsin, 2015). Children can acquire multiple unhealthy eating habits directly from their parents or family members by observing and internalizing the unhealthy eating behaviors that are frequently modeled into them (Ogden, Carroll, Kit & Flegal, 2014). It is common for children to live with extended family members and 40% of children live in household that have other adults present than their parents (World Family Map, 2016). Children are most likely to be affected by their relationship with other adults for example grandparents, this is because children's lives are lived interdependently with parents, siblings and other kin members (CDC, n.d.-b).

In the United States, there has been changes in the family structure, in recent times. Presently, it is common to have both parents working whereas in the past, the father usually works while the mother usually stays home and looks after the children (Formison et al., 2013). There has also been a high percentage of families with single parents in a household as well as changes in the structure of the family, with grandparents, aunts, and uncles as care givers (Formisano et al, 2013). A child's family structure can be diverse from what was once the norm. Differences in the aspect of family structure has shown to have an influence on the likelihood of a child to be at risk of obesity (Hunsberger, 2014). Within a family, there can be many different relationships

which affects a child's weight status (Barbara & Blake, 2012). Also, within different types of family relationship, different levels of risk for obesity and other associated comorbidities have been recorded (Barbara & Blake, 2012). Children living with their grandparents or have a single parent have been found to have higher BMIs when compared to children with both biological parents (Formisano et al, 2013). Sarrafzadegan et al., (2013) reported that children with step parents, single mothers or grandparents are more likely to have poorer health outcomes when compared to children with two biological parents.

As mentioned earlier, the U.S society has experienced significant changes in many families over the several decades. These changes have been referred to as the "second demographic transition" (Bzostek, McLanahan & Carlson, 2012) which includes women getting married and having children at later ages, increase in women's labor force participation, increased rate of divorce, cohabitation and non-marital fertility. As a result of this increased transition in women's union formation and fertility behavior, a large number of children are being raised outside two biological parents, married context in a variety of new family forms (Deckelbaum & Williams, 2012). For instance, cohabitation between both biological parents has emerged as a common family form, a pattern which reflects changes in both fertility behavior. These trends in cohabitation has also given rise to other family types such as married/unmarried step-parent families, single-mother families as well as families headed by adult relatives. In a recent U.S cohort study of children born in urban areas found that, approximately two-thirds of births to unmarried mothers, ended their relationship with the child's biological father by the time the child

was 5years old and half of these mothers entered a new relationship (Suglia, Duarte, Chambers & Boynton-Jarrett, 2012). This however, illustrates the complex reason why families in the United States have become more diverse than they were in the past (Suglia, Duarte, Chambers & Boynton-Jarrett, 2012). Turning to the link between family structure and a child's weight status, it is believed that family structure is linked to differences in family routines surrounding diet, a child's physical activities, and mother's work as well as family's use of time. These factors have been implicated for the unhealthy weight status of children (Suglia, Duarte, Chambers & Boynton-Jarrett, 2012).

In addition, families that rely upon two incomes/those that have a parent working and the other parent with more flexible schedule, may have more resources for healthy nutrition and physical activity as well as time to focus on parenthood. There may be differences in the likelihood of obesity based on the family structure in which children live, it is still not clear which family structure(s) presents the greatest risk of obesity in children (Byrne, Cook, Skouteris & Do, 2011). Despite this uncertainty, family structure may play a role in the weight status of a child. There is a small but burgeoning literature on the association between childhood obesity and family structure, which states that children in families with both biological parents/married household are less likely to be obese when compared to children with single-parent household (Augustine & Kimbro, 2013). These findings persist, even when parents' socioeconomic characteristics is accounted for (Augustine & Kimbro, 2013).

Operational Definitions

Body Mass Index (BMI): An outcome measure to determine obesity based on the weight and height of a child (Nemiary et al., 2012).

Family: The human living system that is organized around subsystems, formed by generation, ethnicity, sex, interest or by function (Chan, 2016).

Normal weight: The weight of a child that falls between the 5th percentile and less than 85th percentile on the BMI growth chart (CDC, n.d.-b).

Obese: The weight of a child that falls at the 95th percentile or greater on the BMI chart (CDC, n.d.-b).

Overweight: The weight of a child that falls at the 85th percentile but less than 95th on the BMI chart (CDC, n.d.-b).

Assumptions

For this study, two assumptions were made. First, I assumed that the parents or guardians answered the questions truthfully since the secondary data were obtained from NSCH. Second, I assumed that the parents or guardians were self-identified as being more familiar with the child's health status, health care needs, and behaviors for the completion of the questionnaire used for the survey (NSCH, 2018). The sample population is nationally representative of the study population under investigation (NSCH, 2018).

Scope and Delimitations

The data for this study were taken from the 2017 NSCH. The findings from NSCH were weighted to represent the population of noninstitutionalized children ages 0-17 residing in each state and on a national level (NSCH, 2018). For the NSCH, approximately 15,427 interviews were completed for New Jersey. The sample population was limited to children 6-13 years old residing in New Jersey. Furthermore, the NSCH data set contains the variables under study which are; age of child, ethnicity/race, BMI, family structure (gender, highest education level of parent, family income, whether the father is present, age of mother, sex of child and number of siblings). All data collected were secondary based on the data collected by the data host.

Significance, Summary and Conclusions

Childhood obesity is considered a complex disorder and more prevalent among children of the ethnic minorities, parents with less income, and low levels of education. Obesity is the most prevalent nutritional disorder in children in the United States (Segal, Rayburn & Martin, 2017). It is a very complex disorder and its prevalence has increased significantly in recent years. The prevalence of childhood obesity has implications for children's future health as well as the health trajectory of the nation. Overweight children are more likely to grow up to be obese, suffer serious health consequences at childhood and adulthood and also experience social and behavioral issues (Terry, 2016). Family structure could be a predisposing factor; however, no studies have established its effect on childhood obesity. Since family is seen as an influencer in child nutrition outcomes, it is important to study the association between family structure and obesity in school aged

children, 6 to 13 years old. It is believed that family structure is associated with obesity in children. Family structure organized (family structure) around family subsystems are formed by generation, ethnicity, sex, interest or by function (Chan, 2016), focus on the most important component of environmental influence—home and family. The goal of this study was to fill the gap within the literature in establishing the association between family structure and childhood obesity.

It is expected that this study will contribute to the positive social change regarding childhood obesity and a system change with medical providers, purposefully engaging more than one caregiver or of multiple family members (siblings and extended family) in treatment contexts. The implication for social change is expected to be promoted by medical providers reinforcing the important role of family members in the treatment process and creating new avenues for childhood obesity prevention and treatment. This study is also expected to expand the knowledge needed to ultimately improve the health and lives of children, and consequently improving long term health and well-being across the lifespan for individuals and the population. Section 2 presents the research design and data collection.

Section 2: Research Design and Data Collection.

Introduction

This section describes the study design, methodology based on the dataset from the 2017 NSCH, and sampling. This section also presents ethical concerns, and the threat to validity.

Research Design and Rationale

This research involved a quantitative retrospective cross-sectional approach (Creswell, 2013; Sullivan, 2017). This approach enables researchers to make precise comparisons and document information on the participants without affecting the study environment as well as compare several different variables at similar times (Institute for Work & Health, 2015). This study design was used to describe the study samples and offer baseline information on the study (Institute for Work & Health, 2015). The baseline data includes demographic data such as gender, age of child, education level of parents, mother's age, father's presence, number of siblings and family income. Furthermore, the relationships between other variables and demographic data could be investigated (Creswell, 2013). There is no time nor resource constraints with this design because it is less time consuming and more economical to perform compared to other research designs, which permits for a larger sample size (Sullivan, 2017). Utilizing secondary data is beneficial, cost effective, and time effective (Sullivan, 2017). The secondary approach to using data enables the use of a large amount of data with minimal to no ethical issues and ensures the privacy of the individuals who participated in the study (Creswell, 2013). The datasets for this study were retrieved from the 2017 NSCH. The NSCH is a national,

self-administered survey using a web-based questionnaire or a mail-back paper questionnaire. The NSCH also includes a cross-sectional telephone survey with stratification by state. The responders were parents or guardians who knew the child's health and health care needs. Letters were sent to families explaining details of the study along with a toll-free telephone number to call if household members had additional questions (NSCH, 2018). Data relating to the independent variables consisted of the following; family structure (gender, age of child, family income, number of siblings, highest education level of parents, race, father's presence and age of mother) and the dependent variable was obesity.

Methodology

This section will presents how the study was be carried out. It includes description of the population, sampling, sampling procedure, secondary data management processes, instrumentation, and operationalization of constructs. These section are followed by a discussion on, threats to validity, and ethical procedures.

Population

The NSCH was administered nationally between August 2017 and February 2018 with a total of 15,427 surveys completed for New Jersey (NSCH, 2018). The findings from the NSCH are weighted to represent the population nationwide which consisted of noninstitutionalized children 0 - 17 years old in each of the 50 states and the District of Columbia (NSCH, 2018). The population of interest for this study included, children ages 6 to 13 residing within the 22 counties in Essex County, New Jersey. About 15.8% of

children 6 to 17 are obese in Essex County, New Jersey (The State of Obesity, 2018) out of an estimated population of 808,285 (Essex County New Jersey Population, 2019).

Sampling and Sampling Procedures

The selection process for the participants was done by random sampling to allow everyone in the population have an equal chance of being chosen (NSCH, 2018). During data collection, a screener was first used to identify households with children. If children were present, the respondent created a roster of children in the household. The roster included the age and other demographics of each child as well as a battery of questions designed to identify children with special health care needs. After completing this screener component of the survey, one child was randomly selected from all children in each household to be the subject of an age-specific topical survey. By using survey weights, this ensures the final estimations are representative of every noninstitutionalized child in America from birth to 17 years in each state (NSCH, 2018). The purpose of the survey design was to create samples representative of populations of children per state. To accomplish this task, state samples were intended to attain at least 1,000 completed interviews (NSCH, 2018). The data collection for the datasets used for this research was a stratified multistage cluster sampling technique.

Access to data and permission.

The data and findings from the NSCH are available on the Data Resource Center website. This data is available to individuals, community health providers, parents, and researchers involved in maternal and child health (Data Resource Center for Child & Adolescent Health, n.d.). Individuals can obtain a dataset by completing a data form.

Once the form is received, a data user agreement must be completed and emailed back to the organization (Data Resource Center for Child & Adolescent Health, n.d.). The requests are typically processed within five business days once the data user agreement form is returned (Data Resource Center for Child & Adolescent Health, n.d.). Researchers can gain free access to the NSCH datasets to conduct their studies through the following: public-use documentation and data files, non-public-use data files, NCHS data linkage program, and national death index. Individuals can access vital health data through online resources and use tools to tailor and present data in a way that meets their research goal (Data Resource Center for Child & Adolescent Health, n.d.).

Justification for Effect Size, Alpha Level, and Power

The minimum effect size was used to allow for best external validity because this is a stratified multistage cluster study. The alpha level 0.5 was used to reduce Type 1 errors and the power level of 80 was used to reduce Type 2 errors (Creswell, 2013). These figures were chosen in respect to external validity and to improve generalization of this research. The sample size for this study was 15,427 with normal distribution.

Binary logistic regression was used to determine the relationship between family structure and obesity. Variance Inflation Factors (VIFs) were also used to examine presence of multicollinearity between proxies (highest education level of parent, age of child, family income, race, whether the father is present, age of mother, sex of child and number of siblings). While McFadden's R-squared was used to develop a model of family structure to predict obesity status categories. Frequencies and percentages were used to examine the trends of the nominal-level variables. Means and standard deviations

were used to summarize the trends in the continuous-level data. Chi-square test of independence was utilized to analyze the relationship between the independent variables and the dependent variables. The main explanatory variables in the models was an indicator variable for father present versus father not present; and indicator variables for number of siblings, categorized as none, one, two or more. Covariates in the models included the following sociodemographic characteristics: indicator for child's age; gender; race/ethnicity, which was categorized as non-Hispanic white, non-Hispanic black, Hispanic or others; family income, which was categorized as poor (1.00 times the federal poverty level [FPL]), low-income (1.00 -1.99 times the FPL), middle-income (2.0-3.99 times the FPL), or high-income (4.00 times the FPL); mother's education, which was categorized as high school or less, high school graduate, some college, bachelor's degree or higher; and mother's age, which was categorized as 24 years or younger, 25-34, 35-44, or 45 years or older.

Estimated coefficients from the regression models was used to predict each outcome for each child, alternatively assigning the child to each category of the family structure variable of interest (for instance, father present vs father not present), while all other explanatory variables were left at their original values. Predictions across all children in the sample were averaged. This procedure yielded what the mean value of each outcome would be if all children in the sample lived in each particular family type.

Instrumentation and Operationalization of Constructs

The NSCH was developed to evaluate how well each state in the United States meet the Maternal and Child Health Bureau's goals (NSCH, 2018). These findings from NSCH validate Maternal and Child Health Bureau goals by offering an objective basis for state and federal program planning as well as evaluation. This survey is conducted every 4 years (NSCH, 2018). The funding for the NSCH 2017 was arranged by the U.S. Department of Health and Human Services and MCHB. This survey was appropriate for this study. The goal of NSCH is to estimate state and national level frequency for emotional, physical, and behavioral child health indicators of children aged 0 to 17 years old (NSCH, 2018).

The NSCH also looks at the prevalence of family interactions and neighborhood characteristics as well as provide data on the health of the child population. This data can be used to identify health disparities by race/ethnicity, special health care needs, and SES within and across states. Furthermore, the survey presents information about neighborhoods, children, and their families to help guide advocates, researchers, and policymakers (CDC, National Center for Health Statistics, State and Local Area Integrated Telephone Survey, 2013). The NSCH offers a broad range of information related to children's health and well-being (NSCH, 2018). It is the only survey that provides extensive information about children, families, and neighborhoods with sample sizes adequate for users to make 46 individual state analysis, comparisons between states, and at the national level (NSCH, 2018). The NSCH provides information on topics such as emotional and physical health, as well as factors that might be associated with the

well-being of children, such as family interactions, medical home, school experiences, parental health, and safe neighborhoods (NSCH, 2018).

The NSCH questionnaire is composed of 11 sections which are initial demographics, child's health and functional status information, health insurance coverage, health care access and utilization, and medical home. The final sections are early childhood (0-5 years), middle childhood and adolescence (6-17 years), family functioning, parental health, neighborhood and community characteristics, and additional demographics (CDC, National Center for Health Statistics, State and Local Area Integrated Telephone Survey, 2013). The questionnaire was administered using the Computer- Assisted Telephone Interviewing system (NSCH, 2018). This software displays the questionnaire on a computer screen which directs the interviewer through the questionnaire. The respondent answers were entered in the computer by the interviewer (NSCH, 2018). The Computer- Assisted Telephone Interviewing system establishes if the selected response is within an acceptable range and saves it in a survey data file (NSCH, 2018). Online assistance was available to the interviewer through text and help screens which decrease the time needed to transmit, process, and release data as well as supports data accuracy (NSCH, 2018).

Data Analysis Plan

The 2017 NSCH datasets was used for this research. A data form and a data user agreement was required to obtain the NSCH datasets. There were independent and dependent variables of interest. The independent variable was family structure (gender,

age of child, number of siblings, family income, highest education level of parent, race, father's presence and age of mother) while the dependent variable was obesity.

Binary logistic regression was utilized to determine the relationship between family structure and obesity. VIFs were also used to examine presence of multicollinearity between proxies (highest education level of parent, age of child, family income, race, whether the father is present, age of mother, sex of child and number of siblings). While McFadden's R-squared was used to develop a model of family structure to predict obesity status categories. Frequencies and percentages were used to examine the trends of the nominal-level variables. Means and standard deviations were used to summarize the trends in the continuous-level data. Chi-square test of independence was utilized to analyze the relationship between the independent variables and the dependent variables. The main explanatory variables in the models was an indicator variable for father present versus father not present; and indicator variables for number of siblings, categorized as none, one, two or more. Covariates in the models included the following sociodemographic characteristics: indicator for child's age; gender; race/ethnicity, which was categorized as non-Hispanic white, non-Hispanic black, Hispanic or others; family income, which was categorized as poor (1.00 times the FPL), low-income (1.00 -1.99 times the FPL), middle-income (2.0-3.99 times the FPL), or high-income (4.00 times the FPL); mother's education, which was categorized as high school or less, high school graduate, some college, bachelor's degree or higher; and mother's age, which was categorized as 24 years or younger, 25-34, 35-44, or 45 years or older.

Estimated coefficients from the regression models was used to predict each outcome for each child, alternatively assigning the child to each category of the family structure variable of interest (for instance, father present vs father not present), while all other explanatory variables were left at their original values. Predictions across all children in the sample were averaged. This procedure yielded what the mean value of each outcome would be if all children in the sample lived in each particular family type.

Threat to Validity

The datasets for this study was evaluated and measured several times. However, threats to validity may exist. Some of these threats may center on content and construction of the datasets. The use of secondary data collection may reveal a few threats to validity which may include limitations of data construction, limited variables, missing data, attrition, inherent bias, and the absence of needed variables (Creswell, 2013). The use of SPSS: version 16.0 enabled validation of the datasets again. The internal validity may be affected by history, statistical regression or instrumentation. The validity of the NSCH depends on sampling and non-sampling errors (NSCH, 2018).

Ethical Procedures

The primary data collector needed to receive approval from the parent or guardian. Once verbal consent was obtained, it was recorded in the computer-assisted telephone interviewing system. The interviewer read the script to the participants about the survey, informed them their responses would be kept confidential, and they could withdraw at any time. Participation in the NSCH is voluntary, and data is confidential. The NSCH follow strict procedures with agents and data collection contractors to avoid

the release of confidential data in survey operations and data distribution. To protect the confidentiality of the children and respondents in the survey, responses for the race variable were broken down into three groups: African American or Black only, White only, and other race.

The information given by the participants were used for statistical purposes and analysis based on the following laws: Confidential Information Protection and Statistical Efficiency Act (44 USC 3501) and the Public Health Service Act (42 USC 61 242m Section 308d). Any direct identifiers in the data set were removed. Any effort to establish the identity of reported cases are forbidden by these laws (CDC, National Center for Health Statistics, State and Local Area Integrated Telephone Survey, 2013). The archival data will remain confidential and stored in a secure location. Data will be destroyed after five years. There is no conflict of interest with secondary data within the work environment.

As a secondary researcher, approval from the Walden University's Institutional Review Board was needed before proceeding to data retrieval, data analysis, and developing new results. Once approval was received, dataset was downloaded, analyzed and will follow up with the publication. After all results are ascertained, all secondary data will be documented and saved in SPSS: version 16.0.

Summary

This section presented the research design, data collection for the study, the rationale behind the analyses, and the methodology used. The study population consisted of school age children, 6 to 13 years within the 22 counties in Essex County, New Jersey. A quantitative retrospective cross-sectional approach was used to conduct the study. Descriptive statistics was used to summarize the data gathered from the NSCH 2018 dataset. To depict the data and describe the association between dependent and independent variables, binary logistic regression and chi-square tests were carried out. The SPSS: version 16.0 Statistics software was used for statistical analysis and also to calculate sample size. Section 3 included the presentation of the results and findings.

Section 3: Presentation of the Results and Findings

Introduction

This quantitative study was designed to determine the association between family structure and childhood obesity in children 6 to13 years in Essex County, New Jersey. In this section, the findings of the data analysis are presented. Frequencies and percentages were used to examine the trends of the nominal-level variables. Means and standard deviations were used to summarize the trends in the continuous-level data.

Results

Intellectus Statistics was used to analyze the data. Results of the binary logistic regression were used to determine the relationship between family structure and obesity, addressing the following research questions:

- Research Question 1: Is there a relationship between family structure and childhood obesity?
- Research Question 2: Is there a relationship between gender and obesity in children?

Results of the VIFs were also used to examine presence of multicollinearity between proxies (highest education level of parent, age of child, family income, race, whether the father is present, age of mother, sex of child and number of siblings). Results of the McFadden's R-squared was used to develop a model of family structure to predict obesity status categories. The frequencies for the variables are presented in Table 1.

Table 2

Frequency Table for Nominal and Ordinal Variables

Variable	*n*	*%*
Sex		
Female	7317	47.43
Male	8110	52.57
Race		
Hispanic or other	2326	15.08
Black or African American alone	1053	6.83
White alone	12048	78.10
Family Income		
400% FPL or greater	6561	42.53
200-399% FPL	4682	30.35
100-199% FPL	2474	16.04
0-99% FPL	1710	11.08
Father Present		
No Father	3531	23.31
Father Present	11617	76.69
Age of Mother		
45 or older	55	0.37
35 – 45	3538	23.49
25 – 34	8426	55.93
24 or younger	3045	20.21
Highest Education Level of Parent		
College degree or higher	8975	58.18
Some college or technical school	3787	24.55
High school or GED	2212	14.34
Less than high school	453	2.94
Obesity		
Obese	2029	13.15
Not obese	13398	86.85

Note. Due to rounding errors, percentages may not equal 100%.

The majority (52.57%) of the children were males, and most (78.10%) were White. FPL was used to determine the economic measure of each family income. Family income of the children showed that the majority (42.53%) were at 400% FPL or greater.

Approximately, 77% of the children had their father present while (23.31%) and more than half (55.93%) of the mothers fell between the age group 25-34; (23.49%). Additionally, more parents (58.18%) had college degree or higher. Furthermore, most (86.85%) of the children were not obese when compared to the obese children (13.15%). The mean age of child was 13.83 with standard deviation, SD $\pm$ 2.29.

A binary logistic regression (Menard, 2009) was conducted to examine whether highest education level of parent, age of child, family income, race, whether the father is present, age of mother, sex, and number of siblings had a significant effect on obesity.

VIFs were calculated to detect the presence of multicollinearity between proxies. High VIFs indicate increased effects of multicollinearity in the model. Since none of the variables had a VIF greater than ten, the assumption of multicollinearity was met. Table 3 presents the VIF for each predictor in the model.

Table 3

Variance Inflation Factors

Variable	VIF
Highest education level of parent	1.37
Age of child	1.05
Family Income	1.46
Race	1.09
Father Present	1.21
Age of Mother	1.16
Sex	1.00
Number of Siblings	1.16

The model was evaluated and the overall model was significant, $\chi^2(16) = 482.90$, $p < .001$, suggesting that highest education level of parent, age of child, family income, race, whether the father was present, age of mother, sex, and number of siblings had a significant effect on observing the obese category. McFadden's R-squared was also calculated to examine the model fit, where values greater than .2 are indicative of models with excellent fit (Louviere et al., 2000). The McFadden R-squared value calculated for this model was 0.04. The effect of the college degree or higher category of highest education level of parent was significant, $B = -0.50$, OR = 0.61, $p < .001$, indicating that parent with a college degree or higher decreases the likelihood of obesity by approximately 39% relative to the less than high school category of highest education level of parent. The effect of the age of child was also significant, $B = -0.05$, OR = 0.95, $p < .001$, indicating that a one-unit increase in age of child decreases the likelihood of observing the obese category of obesity by approximately 5%.

Further, the effect of the 200 - 399% of the FPL category of family income was significant, $B = -0.27$, OR = 0.76, $p < .001$, indicating that observing the 200-399% FPL category of family income decreases the chance of observing the obese category of obesity by approximately 24% relative to the 0 - 99% FPL category of family income. The effect of the 400% FPL or greater category of family income was also significant, $B = -0.58$, OR = 0.56, $p < .001$, indicating that observing the 400% FPL or greater category of family income decreases the likelihood of observing the obese category of obesity by approximately 44% relative to the 0-99% FPL category of family income.

The effect of the Black or African American alone category of race was significant, $B = 0.45$, OR = 1.56, $p < .001$, indicating that being Black or African American increases the chance of observing obesity by approximately 56% relative to the White alone category of race. Additionally, the effect of the 35 - 45 category of age of mother was significant, $B = -0.20$, OR = 0.81, $p = .009$, indicating that the 35- 45 category of age of mother decreases the likelihood of observing obesity by approximately 19% relative to the 24 or younger category of age of mother. The effect of the female category of sex was significant, $B = -0.36$, OR = 0.70, $p < .001$, indicating that being female decreases the chance of obesity by approximately 30% relative to the male category of sex. The effect of the 1 category of number of siblings was significant, $B = -0.18$, OR = 0.84, $p = .002$, indicating that observing the 1 category of number of siblings decreases the likelihood of observing the obese category of obesity by approximately 16% relative to the 0 category of number of siblings. The effect of the 2 or more category of number of siblings was also significant, $B = -0.37$, OR = 0.69, $p < .001$, indicating that observing the 2 or more category of number of siblings decreases the chance of observing the obese category of obesity by approximately 31% relative to the 0 category of number of siblings. Table 4 summarizes the results of the regression model.

Table 4

Logistic Regression Results

Variable	*B*	*SE*	χ^2	*p*	*OR*	95% CI
(Intercept)	-0.30	0.22	1.91	.167	-	-
Education level of parent: High school or GED	0.13	0.14	0.89	.346	1.14	[0.87, 1.49]
Education level of parent: Some college	-0.01	0.14	0.00	.948	0.99	[0.76, 1.29]
Education level of parent: College degree	-0.50	0.14	13.36	< .001	0.61	[0.46, 0.79]
Age of child	-0.05	0.01	22.50	< .001	0.95	[0.93, 0.97]
Family Income: 100-199% FPL	-0.15	0.08	3.09	.079	0.86	[0.73, 1.02]
Family Income: 200-399% FPL	-0.27	0.08	10.99	< .001	0.76	[0.65, 0.90]
Family Income: 400% FPL or greater	-0.58	0.09	43.86	< .001	0.56	[0.47, 0.66]
Race: Black or African American alone	0.45	0.09	26.25	< .001	1.56	[1.32, 1.85]
Race: Hispanic or other	0.07	0.07	0.94	.333	1.07	[0.93, 1.23]
Father present: No Father	0.11	0.06	3.40	.065	1.12	[0.99, 1.25]
Age of mother25 - 34	-0.09	0.06	2.07	.150	0.91	[0.81, 1.03]
Age of mother35 - 45	-0.20	0.08	6.88	.009	0.81	[0.70, 0.95]
Age of mother45 or older	-0.35	0.44	0.64	.423	0.70	[0.29, 1.67]
Sex: Female	-0.36	0.05	51.55	< .001	0.70	[0.63, 0.77]
Number of Siblings: 1	-0.18	0.06	9.58	.002	0.84	[0.75, 0.94]
Number of Siblings: 2 or more	-0.37	0.07	24.56	< .001	0.69	[0.60, 0.80]

Note. χ^2 (16) = 482.90, $p < .001$, McFadden $R^2 = 0.04$.

To further examine the effects of family structure and gender on childhood obesity, chi-square tests of independence (McHugh, 2013) were conducted. The results of

the chi-square test for sex on childhood obesity were significant based on an alpha value of 0.05, χ^2 (1) = 52.14, $p < .001$, suggesting that sex and obesity are related to one another. The following level combinations had observed values that were greater than their expected values: sex (female): obesity (not obese) and sex (male): obesity (obese). The following level combinations had observed values that were less than their expected values: sex (male): obesity (not obese) and sex (female): obesity (obese). Table 5 presents the results of the chi-square test.

Table 5

Observed and Expected Frequencies of Obesity in Sex Group

	Obesity				
Sex	Not obese	Obese	χ^2	*df*	*p*
Male	6892[7043.35]	1218[1066.65]	52.14	1	< .001
Female	6506[6354.65]	811[962.35]			

Note. Values formatted as Observed [Expected].

The results of the chi-square test for number of siblings were significant based on an alpha value of 0.05, χ^2 (2) = 14.35, $p < .001$, suggesting that obesity and number of siblings are related to one another. The following level combinations had observed values that were greater than their expected values: obesity (obese): number of siblings (0), obesity (not obese): number of siblings (1), and obesity (not obese): number of siblings (2 or more). The following level combinations had observed values that were less than their expected values: obesity (not obese): number of siblings (0), obesity (obese): number of siblings (1), and obesity (obese): number of siblings (2 or more). Table 6 presents the results of the chi-square test.

Table 6

Observed and Expected Frequencies of Obesity in Sibship Group

	Obesity				
Number of Siblings	Not obese	Obese	χ^2	*df*	*p*
0	6114[6193.11]	1017[937.89]	14.35	2	< .001
1	4844[4794.86]	677[726.14]			
2 or more	2440[2410.02]	335[364.98]			

Note. Values formatted as Observed [Expected].

The results of the chi-square test for whether the father was present were significant based on an alpha value of 0.05, χ^2 (1) = 93.54, $p < .001$, suggesting that obesity and father present are related to one another. The following level combinations had observed values that were greater than their expected values: obesity (not obese): father present (father present) and obesity (obese): father present (no father). The following level combinations had observed values that were less than their expected values: obesity (obese): father present (father present) and obesity (not obese): father present (no father). Table 7 presents the results of the chi-square test.

Table 7

Observed and Expected Frequencies of Obesity with Father present vs No Father

	Father present				
Obesity	Father Present	No Father	χ^2	*df*	*p*
Not obese	10266[10096.24]	2899[3068.76]	93.54	1	< .001
Obese	1351[1520.76]	632[462.24]			

Note. Values formatted as Observed [Expected]

Summary

This section presented a description of the data analysis and the key findings. The findings indicated that family structure was a significant predictor and had a significant relationship with childhood obesity among children 6 - 13 years old in Essex County, New Jersey. A model of family structure was generated and the overall model was significant, χ^2 (16) = 482.90, $p < .001$ predicting a significant effect of family structure on the obese category. Section 4 will explain the research findings, conclusion, and implications for positive social change as well as provide recommendations for future research.

Section 4: Application to Professional Practice and Implications for Social Change

Introduction

The purpose of this study was to establish if family structure had a relationship with childhood obesity in children 6-13 years old in Essex County, New Jersey. The dataset used for this study was retrieved from the 2017 NSCH, which gathered information from the respondents of the parents or guardians who knew the child's health and healthcare needs. In this section, an interpretation of the results presented in section 3 are explained in detail.

Interpretation of the Findings

Family structure has become more diverse and children's likelihood of living outside an intact family has become an important indicator of socioeconomic background. Since family is an important influencer in child nutrition outcomes (World Family Map, 2016; Young Lives, 2016), the effect of family structure is an important factor to study regarding the rise in childhood obesity.

This study was designed to answer two research questions. The first research question that is addressed in this study was "Is there a relationship between family structure and childhood obesity?" VIFs were done to detect the presence of multicollinearity between predictors. High VIFs indicates increased effects of multicollinearity in the model. No variables had a VIF greater than 10: thus, the assumption of multicollinearity was met. McFadden's r-squared was also calculated in order to determine the model fit, where values greater than .2 are indicative of models

with excellent fit (Louviere et al., 2000). The McFadden r-squared value calculated for this model was 0.04.

Binary Logistic Regression was done to examine whether highest education level of parents has a significant effect on observing the obese category. The effect of the college degree or higher category of highest education level of parent was significant, B= -0.05, OR = 0.61, $p<.001$. This suggests that a college degree or higher decreases the likelihood of observing obesity by approximately 39% relative to parents with less than high school education level. Chi-square test of independence was conducted to further examine the effect of parents' highest education level on childhood obesity, which showed that the highest education level of parent had a significant effect on obesity, X^2 (16) = 482.90, p<.001. Previous research has also shown that in the United States, the prevalence of childhood obesity decreased with increasing level of parental education in 2011 - 2014 (CDC, 2018). One explanation for the significant relationship between parents highest education level and childhood obesity is that parents with a lower level of education tend to bottle-feed their children more (Liu et al., 2018). This is because parents with a higher level of education are better informed about the advantages of breastfeeding. Another explanation is the differences in cultural and social norms between parents of high and low education level (Liu et al., 2018). Dieting and healthy weight control practices like reducing high energy and fat intake and increasing exercise are seen commonly among parents of higher education level because they are better informed (Liu et al., 2018).

Parents who have higher education level may open to new diets, nutrition innovations, practice healthy eating habits as well as practice a more active lifestyle (Kunto & Bras, 2021). Parents with lower education level may not indicate diverse ways of parenting practice (Liu et al., 2018).

Age of child also had a significant effect on observing the obese category. Logistic regression and chi-square test of independence was conducted to analyze the relationship between age of child and obese category. The effect of the age of the child was significant, $B = -0.05$, $OR = 0.95$, $p<.001$ which indicates that a one unit increase in the age of the child decreases the likelihood of observing the obese category of obesity by approximately 5%. Previous studies have suggested that there are three critical periods during childhood for the development of obesity: the prenatal period, the period of adiposity rebound (between the ages of 4 to 6 years), and the adolescent period (Svensson et al., 2011). Genes are influential; however, there are differential effects at distinct childhood ages and may not be exerted equally throughout the life cycle of the child (Svensson et al., 2011). For example, in the United States, children between the ages of 4 to 10 years old surpass the current guidelines to limit screen time to two hours per day (Tester et al., 2018). Another likely reason why one unit increase in age of child decreases the likelihood of observing obesity is that most children between the ages of three to nine years have access to more motorized transport and hence, less active travel (Muthuri, 2016).

Further, the effect of the 200 - 399% of the FPL category of family income was significant, $B = -0.27$, $OR = 0.76$, $p<.001$, indicating that this category decreases the

chance of obesity by approximately 24% relative to the 0 - 99% FPL category of family income. The effect of the 400% FPL or greater category of family income was also significant, B = - 0.58, OR = 0.56, p<.001 indicating that this category decreases the chance of observing obesity by approximately 44% relative to the 0 - 99% FPL category of family income. There are several reasons for the significant relationship between FPL and the likelihood of observing obesity. For instance, populations who fall within the low FPL category are more likely to live in a low SES community, which may lead to a concern for safety that results in children not playing outdoors, restricting physical activities (Jin et al., 2015). Communities with residents of low SES may also have fewer physical activity facilities, limiting access to opportunities for physical activities (Jin et al., 2015). Furthermore, considering the perspective at an individual's level, families with lower income may experience several stressors and barriers to health and as a result may place less priority on leisure time physical activities compared to families with higher income. Several leisure activities may also be expensive for low income parents due to membership participation or equipment fees (Jin et al., 2015). Further, communities with low income residents have reduced access to supermarkets and recreation centers however, these same communities have many convenience stores and fast food chains which promotes poor nutrition and little or no physical activities (Rogers et al., 2015).

Logistic regression was also done to observe any effect between race and the obese category. Chi-square test of independence was carried out to further examine the effect of race on child obesity. The effect of the Black or African American alone category of race was significant, B = 0.45, OR = 1.56, p<.001, indicating that the Black

or African American alone category of race increases the likelihood of observing obesity by approximately 56% relative to the White alone category of race.

Promotion of processed food culture could be a contributing factor to the rise in childhood obesity. Study have shown that exposure to fast food advertising was found to be 60% among African American children (McIntosh, 2015). African American children tend to watch television for a long period of time if they live in areas where safety is an issue (McIntosh, 2015). Another factor linked to the increased prevalence of obesity in African American children is cultural norms that accept, uplift, and sometimes reward persons who are considered "big-boned", fat or thick" (McIntosh, 2015). Such cultural norms may lead parents to remain satisfied with the weight of their children or may want their kids heavier or even at an unhealthy weight. Some ethnic groups including African Americans equate weight in children with successful parenting (Gauthier & Gance-Cleveland, 2015). The desire for rapid growth in infants tends to promote the practices of supplementing breastfeeding with formula, adding cereal to the formula and introducing solids at an early stage. However, there has been a strong correlation between early rapid growth and later-life obesity in these ethnic groups (Andrea et al., 2017; Isong et al., 2018). Food is also an expression of cultural identity and a means of preserving family and community unity (Gauthier & Gance-Cleveland, 2015), which may raise the risk of obesity in African American children due to high consumption of fast food (McIntosh, 2015).

Results of the logistic regression for whether the father was present, was significant. Chi-square test was also significant based on an alpha value of 0.05, X^2 (1) =

93.54, p< .001, suggesting that obesity and presence of father are related to one another. The following level combinations had observed values that were greater than their expected values: obesity (not obese): father present (father present) and obesity (obese): father present (no father). The following level combinations had observed values that were less than their expected values: obesity (obese); father present (father present) and obesity (not obese); father present (no father). The reason behind the relationship between obesity in children and the presence of father could be that the fathers are completely uninvolved in the children's daily activities and sometimes some fathers could promote unhealthy behaviors in the home (Smith et al, 2018). Some of the unhealthy paternal behaviors are seen in the experiences of some mothers in the Unites States who stated that fathers encouraged early weaning and started feeding infants snacks and sugar sweetened beverages during early childhood (Woo et al., 2015). A child's caregiving environment can be influenced by the father either negatively or positively by influencing the mother's decisions and actions and also by actively participating in caregiving (Smith et al, 2018).

The effect of the 35-45 category of age of mother was significant, B = -0.20, OR = 0.81, p = .009, indicating that observing the 35-45 category of age of mother decreases the likelihood of observing the obese category of obesity by approximately 19% relative to the 24 or younger category of age of mother. This data further validates the study by (Morinis et al., 2013) who documented that older maternal age was an advantage for a child's nutritional status, schooling and adult height owing to improved child-rearing practices by more experienced or empowered women.

The effect of the 1 category of number of siblings was significant, B = -0.18, OR = 0.84, p< .002, indicating that observing the 1 category of number of siblings decreases the chance of observing the obese category of obesity by approximately 16% relative to the 0 category of number of siblings. The effect of the of 2 or more category of number of siblings was significant, B = -0.37, OR = 0.69, p< .001, indicating that observing the 2 or more category of number of siblings decreases the likelihood of observing the obese category of obesity by approximately 31% relative to the 0 category of number of siblings. Result of the chi-square test for number of siblings was also significant based on alpha value of 0.05, X^2 (2) = 14.35, p< 0.01, suggesting that obesity and number of siblings are related to one another. The following level combinations had observed values that were greater than their expected values; obesity (obese): number of siblings (0), obesity (not obese); number of siblings (1), and obesity (not obese): number of siblings (2 or more). The following level combinations had observed values that were less than their expected values: obesity (not obese): number of siblings (0): obesity (obese): number of siblings (1), and obesity (obese): number of siblings (2 or more). The obese category with 0 number of siblings had the highest value, this is consistent with the findings of (Miller et al., 2018) who reported that less number of siblings was a contributing factor for obesity. Children with no siblings were at a higher risk for obesity (Miller et al., 2018).

A few explanations for these association is that siblings may serve as a stimulus for child-to-child interactions, cooperative play, or may engage in activities that increase the time each child devotes to physical activity (Miller et al., 2018). Another reason could be due to the relationship between the number of siblings and the amount of food per

child, for example, in a large family, the amount of food for each child is smaller than the amount of food for each child in a smaller family (Miller et al., 2108). Thus, sib ship may decrease the availability of food for each child resulting in decreased risk of obesity (Miller et al., 2018).

The second research question that is addressed in this study is; “Is there a relationship between gender and obesity in children?” The result of the chi-square test for gender on childhood obesity was significant based on alpha value of 0.05, X^2 (1) = 52.14, p<.001, suggesting that gender and obesity are related to one another. Previous studies have also documented a relationship between gender and obesity in children. Some differences in the prevalence of obesity in children could be driven in part by biological influences that is biological differences in body composition between male and female children emerge at an early stage, during the fetal and postnatal periods (Broere-Brown et al., 2016). There is significantly smaller late second and third trimester fetal growth measurement in female fetuses than in male fetuses (Broere-Brown et al., 2016). Following birth, it is known that females have a greater fat mass and less fat free mass, which is associated with less energy intake and lower calorie needs for females compared to the males (Cambell, 2016). There are also sex steroid hormones that associated with differences in body compositions in children (Cambell, 2016). Females have higher circulating concentrations of leptin, a hormone that suppresses appetite and promotes energy utilization (Cambell, 2016). On the other hand, higher levels of androgens in males have suppressive effect which is known to lower leptin serum concentrations compared to females.

Furthermore, differences in the prevalence of obesity between males and females may also be driven in part by sociocultural influences (Wang et al., 2018). Some documents suggests that females may prefer foods lower in energy and nutrient-dense like fruits and vegetables, while males tend to consume more meat and calorie-dense foods (Wang et al., 2018). These differences could be as a result of gender based-stereotypes as a feminine identity is typically characterized by eating smaller portions and preferring healthier options to maintain appearance while a masculine eating identity is characterized by a full feeling with focus on optimizing physical performance. Another emphasis is on "thin stature" as a cultural ideal stature for girls which may also lead to different parental nurturing, feeding practices and attitudes (Keller et al., 2019; Xie et al., 2014). Some studies have shown that parents tend to be more concern about the weight status of their daughters than their sons while the sons are encouraged to eat more (Keller et al., 2019). These findings are paramount due to the risk of obesity in children which are greatly impacted by family (Isong et al., 2018).

Limitations of the Study

This study had a few limitations too. One limitation is the use of self-reported data from parents and guardians of the children. The parents reported the height and weight of their children in a web-based questionnaire which was computed into BMI. The findings may differ if the height and weight were measured and reported by a trained personnel. Another limitation is that the questions which were asked in order to determine family structure, perceived parental promotion of autonomy as well as perceived affection may not be generalized to all population. The use of culturally

appropriate surveys would have been more beneficial. Another limitation is that the BMI of parents were not analyzed. Analyzing parental weight status would have been integral in this study however, the secondary data was missing parental BMI. The last limitation is the use of secondary data. This is because the data collected was for a different purpose and designed to answer different research questions. Using primary data allows the researcher to have more control over the data.

The major strength of this study is the large sample size and diverse population which allowed for the assessment of the association between family structure and obesity in children. The diverse population makes the findings in this study to be generalized across the entire United States.

Recommendation for Future Research

Future research studies such as qualitative and observational studies should be carried out in order to provide more understanding on the perspectives and cultural characteristics influencing families' nutrition and physical activity patterns which lead to obesity. Results from such studies could be used to build culturally tailored obesity assessment tools. Conducting more studies and ensuring that there is proper representation from each county is recommended in order to have a well-rounded study for New Jersey landmass.

Implications for Professional Practice and Social Change

The study findings provided insight into the association between family and childhood obesity in children six to thirteen years. Family structure significantly affected

the obese category. Family structure was seen to be a predictor of obesity. Family structure, being a significant predictor of obesity in children, can affect many areas in the childhood stages of a child such as neighborhood in which a child lives, access and means to buy healthy food and participation in physical activities within and outside the home. Some studies have documented that obesity in children is as a result of consumption of excess calories than expended (Meller et al., 2018). However, family structure could have the greatest impact due to families being able to afford or have access to unhealthy food choices with limited access to opportunities for physical activities too.

Health professionals, stakeholders and policymakers are in a good position to help reduce the prevalence of childhood obesity. Health professionals should take the lead to change the system by purposefully engaging more than one or more multiple family members in the treatment context. Health professionals can also advocate for policies to be changed in order to improve healthy home environments for children. Stakeholders who are interested in outcomes for positive policy change, should be engaged in all processes that leads to a positive result. Stakeholders such as healthcare providers, policy makers and parents provide valuable insights which can bring about optimal outcomes. Furthermore, policymakers are in a position to view obesity from a broader perspective thereby, not only instituting policies that could reduce the prevalence of obesity in children but most importantly reducing health disparities which are associated with childhood obesity.

Conclusion

Obesity in children is a global health concern for which there is limited information on the association between family structure and childhood obesity. The findings suggest that there is an association between family structure and childhood obesity. Highest education level of parents had a significant relationship with the obese category. This is due to poor parenting practices (Liu et al., 2018) and inadequate exposure to information and resources necessary to promote healthy practices for their children. Age of the child had a significant relationship with obesity. Prolong screen time use is common among children four to ten years of age and they exceed the recommended two hour limit hence, the observed relationship. Family income showed a significant relationship, owing to low SES of parents and inability of parents to provide healthy nutrition and prioritize leisure time physical activities for their children. Ethnicity also plays a role in obesity in children, owing to expression of cultural identity. Findings indicated that African American category increases the likelihood of observing obesity. Previous studies showed that African American children are exposed to fast food more than any other ethnic group. This finding also indicated that there is a potential influence of fathers on the obese category hence, the observed significant relationship. Children of younger mothers have a higher risk of obesity because older mothers are likely to be more experienced and empowered.

Meller et al., (2018) was supported by the findings in this study that children with no siblings were at a higher risk for obesity because they serve as a stimulus for physical activity and decrease the availability of food per child thereby putting each child at a

lesser risk of obesity. Male children tend to be at a greater risk of obesity than girls due to biological and sociocultural influences.

Childhood obesity is a multifaceted disease however, the many contributing factors encompassed by this disease should be treated using a multi-level system approach. This will help in the determination of factors that have the greatest impact. An understanding of the factors with the greatest impact can aid in generating predictive models of obesity among children. A full recognition of the predictors of obesity in children can aid healthcare professionals in developing and implementing appropriate cultural-sensitive surveys, assessments, interviews and interventions in order to reduce the prevalence of obesity in children.

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