5-2016

The Influence of Socioeconomic Status and Ethnicity on Body Mass Index in Children in Northwest Arkansas

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Abstract

Body Mass Index (BMI) is a measure of body fat that is calculated based on the height, weight, age, and gender of a child. Body Mass Index (BMI) is an important indicator of potential health risks in children. Determining correlations between ethnicity, socioeconomic status, and BMI may assist in identifying children at risk for comorbidities associated with either an elevated or low BMI. An elevated BMI may lead to complications later in life such as hypertension, hyperlipidemia, type 2 diabetes, obesity in adulthood, and psychosocial issues (Geason & Dodd, 2009). On the other hand, a low BMI could lead to decreased immune function, respiratory and digestive diseases, and cancer (Department of Health & Human Services, 2014). 32.3% of children entering kindergarten in Arkansas are classified as either overweight or obese (Arkansas Center for Health Improvement [ACHI], 2014). Socioeconomics and ethnicity seem to play a role in the prevalence of obesity in these children. Minorities have a higher prevalence of obesity in Arkansas children. The purpose of this study is to examine if socioeconomics and ethnicity impact BMI rates at birth, two, four, five, and seven years of age. A retrospective medical record review of 200 children born between 2009 and 2014 being seen at Harvey Pediatrics was conducted. This pediatric clinic serves patients in Northwest Arkansas, Southeast Missouri, and Northeast Oklahoma. Results showed that there was no statistically significant correlation between socioeconomic status and ethnicity on body mass index from birth to five years of age. The correlation coefficient with birth weight and ethnicity was statistically significant at -.258. Although there was a statistically significant difference in ethnicity and birth weight, that significant difference did not follow throughout childhood. Data showed that the majority of data reported on Caucasian children due to lack of data among other ethnic groups. Further investigation needs to be conducted from a different database to determine

if there is a correlation between socioeconomic status and ethnicity on BMI.

Background

Childhood obesity has more than doubled in children and quadrupled in adolescents in the last 30 years (CDC, 2015c). Body Mass Index (BMI), is calculated based on a formula using height and weight and is a commonly used screening tool to identify the categories that may lead to future health problems (CDC, 2015b). In children, age and sex are also factored in the calculation of BMI. According to the Centers for Disease Control and Prevention (CDC), "overweight" is defined as having a BMI greater than or equal to the 85th - 95th percentile and "obesity" is defined as having a BMU greater or equal to the 95th percentile compared to children of the same age and sex. A child underweight is defined as a BMI less than or equal to the 5th percentile when compared to children of the same age and sex (2015a).

Both low and elevated BMI rates ($< 5^{th}$ percentile and $\geq$ the 85th percentile, respectively) in children are related to many significant health problems. Obesity is associated with the development of high blood pressure and cholesterol, which places the child at a higher risk for cardiovascular problems. Obesity is related to psychosocial issues such as sleep problems, depression and poor self esteem (Pulgarón, 2013). Other potential health problems associated with obesity in children include type 2 diabetes, continued obesity in adulthood, social and emotional effects (Gleason & Dodd, 2009).

While elevated BMI rates are of concern, low BMI rates have been associated with medical concerns as well. A low BMI may indicate malnutrition problems, which can contribute to compromised immune function, respiratory disease, digestive diseases, or cancer (Department of Health & Human Services, 2014).

Many factors may contribute to higher BMI's in children and adolescents. Studies suggest that children who live in closer proximity to fast food restaurants are significantly more likely to be obese (Mellor, Dolan & Rapoport, 2011). Parental education level and income levels have also been shown to attribute to rising obesity in young children (CDC, 2014).

The southern states have higher percentages of obesity in both children and adults. Among states reporting obesity data for two to four year old children, Arkansas ranked 18th (14.2%) and Missouri ranked 30th (12.7%) out of the 50 states for highest number of obese children in the two to four year old range. Oklahoma did not have data for the two to four year olds (Levi, Segal, Laurent, Rayburn, & Martin, 2014a). Evidence suggests obesity is more likely to occur in low-income areas and within minority groups (Magnusson, Sjoberg, Kjellgren, & Lissner, 2011). Jones-Smith, Dieckmann, Gottlieb, Chow, & Fernald (2014) find that socioeconomic and ethnic disparities may emerge early in life and contribute to childhood obesity.

In Arkansas, 32.3% of the children entering kindergarten in the 2013-2014 school year were classified as either overweight or obese (ACHI, 2014). In children from kindergarten to 10th grade, over 50% of Hispanic males were either obese or overweight. 46.6% of Hispanic females were either overweight or obese. On the other hand, only 36.6% of Asian males and 26.4% of Asian females were obese or overweight. Across the board, Hispanics had the highest prevalence of being overweight or obese while Asians had the lowest prevalence (ACHI, 2014). In 2011-2011, the ethnic group with the highest obesity rates among children two to nineteen years of age in the United States was Hispanics/Latinos with 38.9% being obese or overweight (Levi, Segal, Laurent, Rayburn, & Martin, 2014b). In children from kindergarten to 10th grade, 38.8% of children were overweight or obese. On the other hand, only 2.1% of children were underweight

(ACHI, 2014). Arkansas was the first state to enact legislation that directly addressed childhood obesity. This includes the BMI assessment and data collection. Since 2003, 22 other states have passed some form of legislation to report on BMI in public school children (ACHI, 2014, p.4). Even though some states have started to track information about obesity rates in children within the schools, there are still gaps in the information available. There continues to be a need to investigate the impact socioeconomic status and ethnicity in the development of obesity in children.

Hypotheses

Based on the review of the literature, these are the following hypotheses: 1) There is no statistically significant difference between socioeconomic status and BMI measurements in children between the ages of birth and seven years of age. 2) There is no statistically significant difference between ethnicity and BMI measurements in children between the ages of birth and seven years of age. The purpose of this study is to determine if socioeconomic status and ethnicity impact BMI in children from birth to seven years of age and is there a correlation between the three?

Methodology

This study was approved by the University of Arkansas Institutional Review Board (IRB). A retrospective medical record review of 200 children born between 2009 and 2014 being seen at Harvey Pediatrics was conducted. This pediatric clinic serves patients in NW Arkansas, SE Missouri and NE Oklahoma. The sample consisted of patients that had birth weight, weight at two, four, five, and seven years recorded. All patient information was de-identified as per the Health Portability and Accountability Act (HIPAA). Each medical record case was assigned a randomized case number. Demographic data that included sex, insurance status, and ethnicity

were recorded. Socioeconomic status was based on 3 different categories: self-insured/private insurance, non-insured, and Medicaid.

Statistical Analysis

This study utilized the Spearman's rho to see if there is a correlation between socioeconomic statue and BMI and ethnicity and BMI.

Results

We performed a Tukey post hoc test to assure homogeneity of variances. Then, a Spearman's correlation to determine whether there was a correlation between socioeconomic status and BMI from birth to seven years of age and between ethnicity and BMI from birth to seven years old of age. To be statistically significant, the correlation coefficient needs to be $\leq$ 0.05. We accept both hypotheses that there is not a statistically significant correlation between socioeconomic status, ethnicity and BMI from birth to seven years of age. The correlation coefficient with birth weight and ethnicity was statistically significant at -.258. Although there was a statistically significant difference in ethnicity and birth weight, that significant difference did not follow throughout childhood.

Correlations

			BMI 4Yr Percent	BMI 5YR Percent	BIRTHWEIGHT	Ethnicity
Spearman's rho	BMI 4Yr Percent	Correlation Coefficient	1.000	.477**	.134	-.043
		Sig. (2-tailed)	.	.000	.187	.677
		N	98	94	98	97
	BMI 5YR Percent	Correlation Coefficient	.477**	1.000	.034	.071
		Sig. (2-tailed)	.000	.	.743	.492
		N	94	96	96	95
	BIRTHWEIGHT	Correlation Coefficient	.134	.034	1.000	-.258*
		Sig. (2-tailed)	.187	.743	.	.010
		N	98	96	100	99
	Ethnicity	Correlation Coefficient	-.043	.071	-.258*	1.000
		Sig. (2-tailed)	.677	.492	.010	.
		N	97	95	99	99

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Discussion

Health outcomes in the pediatric patient can be influenced by their Body Mass Index. Socioeconomic status and ethnicity have been thought to play a role in a child's BMI. Although we had a sample of 200 individuals from the NWA clinic, the majority of patients did not regularly attend wellness exams, thus creating holes in the continuity of data. The sample size was not large enough to run at two, four, five, and seven years of age in this study. As a result, the data was narrowed down to 95 patients and only included the ages of birth, four, and five year olds. The largest ethnic group that we gathered information on was among Caucasian children. With a narrowed population, the results did not show a statistically significant correlation between socioeconomic status and BMI therefore causing us to accept the null hypothesis. Although there is a statistically significant correlation between ethnicity and BMI, the sample sizes of other ethnicities are less than five children for each group except for the

Caucasian ethnic group. There continues to be a need to investigate the correlation between socioeconomic status and ethnicity in BMI from birth to seven years of age.

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