Roles of nature and nurture in childhood obesity

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Introduction

Every year in the United States there is a rise in the prevalence of obese people as well as obese children. There is much controversy though of what the underlying cause is of obesity in adults and children. In this paper I will focus on the roles of nature and nurture in childhood obesity. Many people say that biology, genetics, and environmental factors have a huge role in this overwhelming number of obese children in the United States, but is there one with a greater influence than all of the others? For example statistics state that children have an 80% chance of becoming obese if their parents are both obese and a 50% chance of becoming obese if only one of their parents is obese (Benioff Children's Hospital, 2018). Right now there are two sides to the argument of why there is an epidemic of obesity in children throughout the United States. The one side is nature in which we can look towards children's specific genetic makeup, predetermined physiological range, genetic alterations, and advantageous gene selection to help explain childhood obesity. The other side is nurture in which we can look towards children's physical inactivity, sociodemographic features, and their diet to help explain childhood obesity rates. There are many factors that contribute to childhood obesity, but is there a single factor that is more influential than all of the others? This is where the debate of nature versus nurture and their influence on childhood obesity begins.

Nature- Genetics and one's Predetermined Physiological Range, Genetic alterations, and Advantageous Gene Selection

On the side of nature leading to childhood obesity, there are various biological factors that have been discovered to cause obesity. In detail, the understanding that childhood obesity is caused by nature implies that one's own genetic inheritance influences a child's risk for developing obesity. Specifically, the genetic material provides the framework to develop an individual and is therefore important to examine when trying to gain a better understanding on the contributing factors to the obesity epidemic. In depth, obesity has been linked back to biological factors, such as one's genetic makeup by examining the body's natural physiological ranges, genetic alterations, and advantageous allelic selection.

Our body's natural tendency to maintain a certain weight and stature, based on the amount of energy our bodies require, can lead to childhood obesity. According to an interview with Dr. Randy Seeley, director of Nutrition Obesity Research Center at MIT, our bodies have the ability to regulate fat via the hormone leptin. Leptin is produced by our body's adipose cells to regulate the satiety and hunger centers in our brain, in which leptin travels to the hypothalamus to increase the satiety center (feeling of fullness) and decrease the hunger center (Cortell, 2014). This feedback mechanism tells us that our bodies have predetermined ranges for the amount of energy it requires to perform its daily bodily functions and activities. This mechanism is regulated by our fat cells, and can therefore stimulate the amount of food a child needs to consume, thereby leading to obesity in cases of positive energy intake.

In addition to a predetermined physiological range for our bodies, alterations in monogenic genes may also lead to childhood obesity. As discovered by Wabitsch et al. 2015, alterations in monogenic genes, such as the leptin gene, have been found to lead to severe early onset of obesity in a two year old child. In this study, a congenital leptin deficiency was found to alter the regulation of the satiety and feeding centers in the brain, leading to increased eating habits, as well as alterations in metabolic processes. In detail, the LEP gene has been mutated, thereby altering the correct formation of the leptin protein, thus altering the pathway in the central nervous system by decreasing the satiety center and increasing the hunger center. As a result, this tells your body that you are hungry and encourages the intake of food. Furthermore, immediate normalization of eating habits was rapidly achieved, in this study, when the child was treated with leptin, and thereby resulting in weight loss. Although this case points towards severe obesity resulting from a congenital mutation, it is important to recognize that congenital defects in the Leptin gene are rare (2%) and that this is also a case report on a single child, not a large population.

Not only can mutations occur in one’s genetic material to cause childhood obesity, advantageous selection of monogenic genes in humans distant past may also lead to childhood obesity. In the past, it was found that monogenic genes were advantageous, especially during time of famine, therefore the thrifty genotype theory may explain why some children become obese. The thrifty genotype theory focuses on the advantageous selection of specific genetic alleles that allowed our ancestors to survive when scarce food was available. Due to the selection of these variations and the availability of food

in today’s society, individuals with these types of previously beneficial genetic variations are actually experiencing the harmful outcomes of obesity and subsequent comorbidities. Although few of these advantageous genetic variations have been discovered, some have been found and may therefore account for a subset of individuals who are obese (Southam et. al, 2009).

Although there are various biological factors that have been discovered to cause childhood obesity and contribute to the obesity epidemic, only a subset of the population may actually be affected by these factors. As a result, the environmental factors may possibly contribute to the majority of cases of children with obesity, which will be examined next.

Nurture- Physical Inactivity, Sociodemographic Features, and Diet

On the other hand, nurture seems to play a much larger role in childhood obesity. As previously mentioned, a child whose parents are obese have an astronomical increased risk of becoming obese (80%), which may reflect environmental influences their parents play on their child (Benioff Children’s Hospital, 2018). In this case, nurture is referring to all the environmental factors that may have an impact on a child and may lead to obesity, such as physical inactivity, sociodemographic features, and/or diet.

In the past decade, there has been a decrease in physical activity and a rise in obesity, correlating the two and most likely contributing to the obesity epidemic, especially amongst children. According to the Center for Disease Control and Prevention (CDC), it is recommended that children engage in 60 minutes of exercise every day to encourage a healthy lifestyle and reduce the risk for obesity as well as subsequent comorbidities (Healthy Schools:

Physical Activity Facts, 2018). Unfortunately, most children are not meeting their recommended daily goal due to the increase in sedentary lifestyles, such as the shift from farmers and laborers to sitting in a classroom most of the day and focusing on studies, increased screen time on the computer or television, as well as influential behavior from family and friends (Pradinuk et. al, 2011). As a result, these environmental factors are decreasing children's physical activity levels and are contributing to obesity.

In addition to the increase in physical inactivity among school-aged children, a low socioeconomic status (SES), as well as racial or ethnic backgrounds, have been linked to a higher prevalence of obesity. Specifically, young children in these groups were found to eat a larger amount of food in a single meal, as well as eat less frequently than their school-aged counterparts. It is believed that these eating habits (eating less frequently, but consuming more food) early in a child's second year of life may influence their eating habits later in life in such a way that it may lead to over-eating, and ultimately obesity (Mcconahy et. al, 2002). Therefore, a child's sociodemographic has a large impact early in life.

Along with the impact that sociodemographic features play on obesity, diet throughout a child's life, especially during infancy, has been found to cause obesity in children. For instance, a child's upbringing post-partum has been known to alter their microbiota. In turn, it was found that these alterations in their microbiota are connected to obesity. Although it is unclear whether variations in the microbiota are the cause or result of obesity, a connection between the two was found in a study by Kalliomaki et. al, 2008. This study

compared children who were classified as obese to children of normal weight in the same age groups and were age-matched by the following features: birth method, BMI at birth, gestational age, duration of breastfeeding, use of antibiotics, probiotic supplementation, and atopic sensitization. It was found that children with higher levels of Bifidobacterium species in their microbiota were of normal weight, whereas higher levels of Staphylococcus aureus numbers were found in children with obesity. Therefore, environmental influences play an important role in influencing a child's health as well as health outcome, such as obesity.

Overall, a shift in the Western society poses various environmental challenges that have been found to contribute to childhood obesity, such as an increase in physical inactivity, sociodemographic features, and diet. Thus far, it seems as if nurture plays a much larger role in the obesity epidemic.

Conclusion- Nature and Nurture in Harmonious Interplay

Although most cases of children with obesity may result from influences on their nurture, who is it to say that they single-handedly cause childhood obesity. There may be a synergistic type of effect, in which an individual's genetic makeup may put a child at risk for obesity and on top of that environmental influences may drastically increase this risk. For instance, every individual's body makeup is predetermined by their genetics, in which one's genetics may interact environmental factors, such as stress, drugs, etc., that may alter their genetics, specifically a gene's expression. It is impossible to eliminate one's genetics, so although it seems as if nurture plays a larger role in leading to childhood obesity, it may have a synergistic

interaction with nature. For this reason, I believe that nature and nurture are in a harmonistic interplay when it comes to childhood obesity. That being said, since environmental influences play a huge impact on childhood obesity, whether it be adjoined with nature or alone, as a society, we can easily help prevent childhood obesity and stop the obesity epidemic. In addition, our families play a huge and important role in our development, making this is a great starting point to prevent childhood obesity. For instance, it was found that tackling obesity as a family greatly improves physical activity and encourages healthy weight loss (Healthy active living for children and youth, 2002). At large, both nature and nurture factors need to be addressed, in regard to childhood obesity, to help diminish their influence on the obesity epidemic, as well as subsequent health problems.

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