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Review

Combating The Obesogenic Environment: Helping Children Hold Onto Health

Author
Tanya D. Whitehead,
School of Nursing, University of Missouri- Kansas City

Address For Correspondence
Tanya D. Whitehead,
School of Nursing
University of Missouri- Kansas City
E-mail: whiteheadt@umkc.edu

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Abstract:
Given the unprecedented global incidence of overweight in children, the issues that potentially create and sustain a circumstance of epidemic childhood overweight, and the efforts that are underway to prevent and remediate childhood overweight need to be examined. The article explores potentially interrelated causes of obesity/overweight in children and their families, and describe efforts underway to remediate environmental correlates through direct intervention, legislation and a shift in public policy.
Key Words: Childhood obesity, Obesogenic environment, Control

Introduction:

Issues in childhood overweight in the 21st Century

The World Health Organization (WHO) has recommended that all nations make immediate response to the current worldwide epidemic of overweight and obesity a national priority.[1] Indeed, the literature on child health is well stocked with publications citing a dangerous trend toward childhood overweight from Australia, Canada, Korea, England, Japan, Ireland, Samoa, Finland, Brazil, China, Mexico, Saudi Arabia, the United States, Kuwait, and various African nations. Obesity among persons of all ages has reached epidemic proportions worldwide, affecting more than one billion persons who are overweight, worldwide; and 300 million persons who are obese.[1,2]

Projections made by WHO rate preventable, non-communicable diseases related to overweight as the leading cause of death worldwide by the year 2020, based upon overweight as the fifth major risk factor for morbidity and mortality for citizens of industrialized nations in the year 2002. Obesity is no longer a problem that occurs only in high socio-economic areas of the world. Even in developing nations obesity is found in epidemic proportions. Some African nations have reported a bi-model distribution of weight among their populations due to unequal food distribution patterns, with some countries having equal numbers of obese persons and those who are starving. The distribution is differential by age, gender and socio-economic status. For example among some East and North African nations, women have an obesity rate higher than do women the same age in the United States. It has been reported that Japan has an obesity rates of less than 5% of the population, while Samoa has a reported 75% of the population in the overweight/ obese category. In China the obesity rate is over 20% in urban areas and under 5% in rural[1], with 12% of adults and 8% of children meeting the criteria.

In the United States the National Center for Health Statistics (NCHS[3]) reports that 30% of US adults aged 20 years or older (some 60 million persons) are obese. Over 9 million American children are overweight.

Among the dozens of articles reviewed there are dozens of explanations for both global and local prevalence of overweight. It has been variously suggested by authors that fast foods, television watching, eating while watching television, snacking, poverty, parental neglect, baby formulas, maternal obesity, stress, failing to eat breakfast, race and ethnicity, lack of vitamin D in the diet, periodic lack of food availability, computer gaming, using email, eating meat and lack of exercise are complicit. Clearly the causes of obesity are complex in nature, and encompass an interlocking set of conditions and behaviors that collude to result in worldwide overweight epidemic.

Benchmark issues impacting healthy attitudes and behaviors

It is generally (although not always) agreed that since obesity results from an imbalance of energy created by behaviors that increase energy intake (calorie consumption) and reduce energy expenditure (inactivity), both eating and activity habits impact the occurrence of obesity.[4] However, this easily drawn correlation may simply be just the tip of the iceberg of causality for childhood overweight.

A summary of the key factors related to childhood overweight as reported in the literature are shown below and will be discussed in the body of this article:

- Not all neighborhoods are safe enough for out-door exercise.[5] The child may be prevented from outdoor play for safety reasons, or be-cause no adult is home between 3:00 PM when school gets out and 6:00 PM when parents are

able to get back home after work. While they are waiting, children watch TV, play video games and eat whatever snacks they find in the kitchen.

- Simply telling the child and the child's family what to do will not work.[6] Lower income mothers report that they find it "emotionally difficult" to deny food to their children when it is available.[7] It is not easy to limit a child's sugar intake once their body has become used to frequent sugar and carbohydrate hits.[8]
- Sawaya et al.[2] describe a range of metabolic changes in all tissues and alterations in all body systems in malnourished human children. After restoration of food availability to a malnourished child, evidence has shown a "disproportionately greater replenishment" of body fat stores than protein stores during the "catch up phase" of growth as children recover from under-nutrition.
- A consortium of international health promoting agencies has called for international legislation to combat the occurrence of what has come to be known as an "obesogenic" environment. By an obesogenic environment they are referring to the extent to which neighborhood safety, poverty, advertising and socially constructed desire for food as recreation, along with the poor quality of available foods, high costs of natural and organically grown foods and similar components, impact obesity.

Current Status of Knowledge:

While obesity in adults has been a problem for decades, childhood obesity appeared on the scene so rapidly that it does not yet have a medical definition.

The Center for Disease Control (CDC) recommends using a gender and age based weight per height percentile to evaluate children for overweight. They have identified two levels of overweight in children: 1) "at risk for overweight" defined as a BMI between 85-95th percentile of weight over height; and 2) "overweight" defined as a BMI greater than 95th percentile of weight over height for age and gender. Despite the two levels of overweight, the CDC does not recommend using the term "obesity" in regard to children for two reasons. First, the term is stigmatizing, and second, since children are still growing their BMI may change enough to move them through either diagnostic category. Therefore, at the suggestion of the CDC this article will refer to children as overweight, regardless of the amount overweight.

"Overweight" in children and adolescence is commonly measured by calculating Body Mass Index (BMI), the measure of body weight adjusted for stature. Through the use of this tool as a screening devise, the incidence of childhood obesity has been reported to have doubled over the past twenty years.[4] Since the Lowry study was based upon a self report of height and weight by 1, 270 randomly selected adolescents, it may reflect an underreporting of youth with high BMI ratio. According to Budd and Volpe[5] the prevalence of "at risk for overweight" or "overweight" children has tripled in the past 20 years and now exceeds 30%. The figure of 30% was also reported by Murnan, Price, Telljohann, Drake & Boardley[5], and others.[9] Overweight is the most widespread health risk for children and adolescents in the United States, surpassing childhood disease and accident.[9]

Children from lower socio-economic backgrounds and those from minority ethnicities are disproportionately affected by childhood obesity.[11] A commonly held misconception about obesity is that it is the result of a lack of will power, and that overweight people "just overeat". While it is quite true that people gain weight when their food intake exceeds their energy output over time, obesity is now believed to be a disease that involves a complex interaction between genetics, physiology, metabolism, hormonal, and appetite regulation by the brain.[12] As will be described more fully below, in certain populations a decrease in available food intake has been correlated with increased overweight within an impoverished segment of society.[2] It is believed that environmental, psychosocial and cultural factors also contribute to the development of an obesity condition that is not directly related to overeating.[7]

What is the current state of childhood health?

The magnitude of community contribution to the problem of childhood overweight is not readily apparent to the general public or even to parents. A 27 state study done by the Center for Disease Control[3] (CDC) in 2005 found that nearly 60% of parents supported the idea of restricting access to high-calorie, low-nutrient snack foods, and that half of the

parents believed that their children's school was already doing an "excellent" or a "good" job in this area. However, the study went on to describe the widespread prevalence in those schools of selling students the very snacks parents reported were unacceptable.[13]

The CDC study additionally documented a widespread (77%) opinion among parents that schools should have physical education as a daily requirement for every child, while only 5.8% to 8% of schools do so.[14] Students who have regular physical activities and exercise are better able to concentrate in the classroom, and exercise reduces asthma symptoms, a major cause of student absenteeism in lower income areas.[15]

Levels of childhood overweight and related predispositions to chronic illness

The health consequences of childhood obesity are not yet fully known. Mason, et al.[16] raise the question "will there be a greatly increased need for liver transplants for persons in their early 20s?" Many children are being treated at present for preventable diseases formerly found only among adults. The long-term health impact of childhood pharmaceutical management of obesity and its related health consequences are not known. It has been asserted that society will have to shoulder more health care responsibility as chronic diseases develop in children and adolescents due to obesity in the years ahead.[16]

The magnitude of the problem has been projected by a number of researchers. Lowry[4] reported that more than 60% of overweight children have at least one additional risk for cardiovascular disease, such as elevated blood pressure, hyperlipidemia or hyperinsulinema. Worse yet, overweight children are believed to grow into overweight adults, and adolescent obesity has been linked to a higher rate of mortality in adulthood, across a wide array of illnesses such as heart disease and Type 2 Diabetes (T2D). One study[17] reported that eighty percent of overweight children become overweight adults.

There may be serious implications for children's health that are not even on our radar yet. For example, it has been reported in the Journal of Clinical Investigation that a high-fructose diet (such as high-fructose corn syrup, present in virtually all processed foods and beverages) decreased levels of sex-hormone-binding globulin in the liver by 80%, resulting in higher levels of circulating estrogen. Decreased hormonal levels have implications for breast cancer, since breast cancer's growth can be fueled by estrogen circulating in blood.[18]

Sequelae of Childhood Overweight

Childhood overweight is a predisposition to psycho-social problems, school achievement outcomes, and chronic illness as adults

It has been reported that there are 4.7 million children and adolescents who are either overweight or obese.[3] Nationally the demographics for overweight in children and adolescents[19] were varied by ethnicity, as shown in the table below.

Race/ Ethnicity	USA National Prevalence
Hispanic	43%
Non-Hispanic White	22%
Non-Hispanic African Am.	45.5%
Indian/ Native American	39%
Asian	*%
Males	32.7%
Females	27.8%

* US Citizens of Asian descent overweight was not reported

Studies show that child and adolescent overweight impacts the child's physical, psychological, and social development in both the short and long term.[9] It is reported that childhood overweight often leads to depression, peer rejection, low self esteem and discrimination in the short term; and the development of Type 2 Diabetes, impaired glucose tolerance, asthma, cardiovascular conditions including heart disease, hypertension and high cholesterol, sleep apnea and obesity in adulthood.[9]

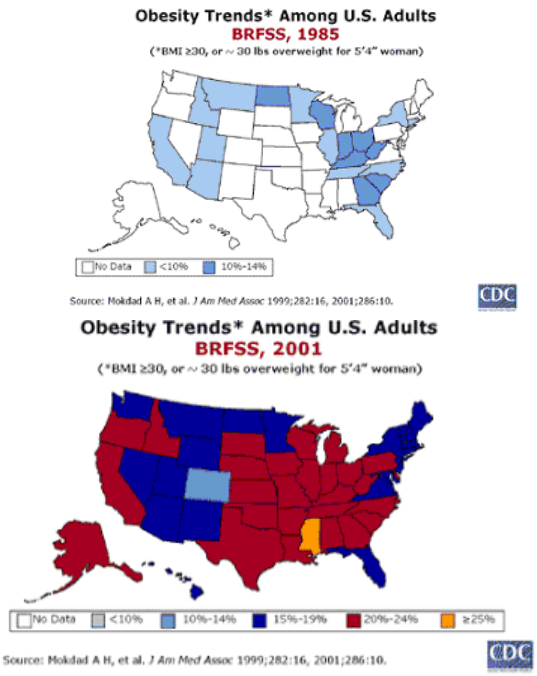
Since society has a strong bias against overweight, children who are overweight are likely to face stigmatization and discrimination from all three factors as they enter employment. The social stigma against overweight can be observed in very early childhood. Children as young as kindergarten have reported that "fat people" are "lazy, ugly, not as

clean and not as smart" as normal weight children.[20] Once a child learns to perceive himself or herself as overweight, it becomes part of their identity as a person, adding to the risk of developing emotional disorder along with diseases such as diabetes, high blood pressure, heart disease, high cholesterol, joint pain, and asthma formerly rare in childhood.

Canadian health authorities have warned that unless immediate action is taken, this generation of children could be the first in many to have a shorter life span than did their parents.[20]

Projection of lifetime obesity and disease on workforce productivity, economic competitiveness, and premature death

Over the past 20 years the incidence of adult obesity has dramatically increased. At present a reported 64% of adults are either overweight or obese.[21]



Adults who are obese have an increased risk of diabetes mellitus, hypertension, dyslipidemia, certain forms of cancer, sleep apnea and osteoarthritis; all of which place a high burden on health care utilization and lead to premature mortality in adulthood.

Cultural, socio-economic, and regional factors in childhood overweight

The causes of global increases in overweight and obesity are not well understood. The current surge of prevalence of childhood obesity in the United States is thought to be an interaction between genetic disposition toward efficient energy storage, a permissive dietary environment, readily available food, and inactive or sedentary lifestyles.[22] It can not be ignored that as a formerly agrarian society has gradually become an urban one[2] exercise decreased while reliance on mass produced foods increased. In developed nations, financial pressures on students and their families are thought to increase the time children spend at home alone in sedentary activities, and to increase the utilization of both fast food and convenience foods high in fat and sugar, including high fructose beverages and fruit juices. A reduced consumption of vegetables with an increased consumption of meat, dairy and sugar appears to be related to weight gain, even when the total number of calories is reduced.

The simple formula of reducing food intake and increasing activity does not hold true across all segments of the world population. A number of studies demonstrate metabolic changes in tissues and alterations in all body systems in malnourished human children. After restoration of food availability to a malnourished child, evidence has shown a "disproportionately greater replenishment" of body fat stores than protein stores during the "catch up phase" of growth as children recover from undernutrition.[2] While the process is not completely clear, it is believed that in the poorly nourished child the imbalance of growth factors leads to the development of a relatively high proportion of fat to lean body tissue during the recovery phase, resembling the process that occurs in fully grown adults as they gain weight. In developing nations this process could easily be related to child growth and development over a period of alternating scarcity and availability of food. In developed nations not all citizens have equal access to food, and there is a lack of availability of foods over time among a large segment of society. Additionally, overweight could result from an overabundance of the high calorie/ low nutrient snacks and foods that are thought to comprise a large proportion of the diet of many low income children especially among children who periodically lack food, through the process of dispropor-

tionate replenishment described above. While the process is still under exploration, findings to date are consistent with the theory that there are long-term adverse effects in metabolism associated with under-nutrition in childhood.

Findings did not indicate that increased activity alone could remedy overweight among children. The lack of a robust difference in the "exercise studies" indicates the complex interactions between factors that lead to obesity in children.

Apart from the initial agreement that overweight is caused by eating more calories than are used, studies reported a wide variety of social factors were also found to be related to a high incidence of obesity.

Factors that show a positive correlation with childhood overweight are:

1. Female-headed households[23]

2. Unlimited access to high fat/ high sugar foods[24] including fruit juice and high-fructose beverages.

3. Lack of health insurance[25]

4. Location: obesity is higher in seven states: Alabama, Louisiana, Michigan, Mississippi, South Carolina, Texas, and West Virginia[25]

5. Watching television[26-28]

6. Living in a "dangerous neighborhood" [11]

7. Limited access to food, stress related to living with "food insecurity" [29]; and **Physiological changes related to body system** response to starvation and lack of food availability.[2]

8. Maternal obesity[30], particularly during pregnancy.

9. Sleep deprivation or "sleep debt"[31]

10. Low birth weight [21]

International scientists, public policy organizations and others are working under the belief that obesity is, in part, a product of a "built environment" rather than a natural one, and that it is, to some extent out of the control of the individual. The consortium of international health promoting agencies has called for international legislation to combat the occurrence of what has come to be known as an "obesogenic" environment. By an obesogenic environment they are referring to the extent to which neighborhood safety, poverty, advertising and socially constructed desires, along with the poor quality of available foods, high costs of natural and organically grown foods and similar components impact obesity.

Some of the factors relevant to childhood obesity are deeply buried in public policy and legislation that act as barriers to childhood nutrition and directly contribute to childhood obesity. For example, school lunch menus are filled with entrees such as Salisbury steak, sausage pizza, cheeseburgers, fried chicken nuggets and the like. These foods are provided to children because Federal law requires the US Department of Agriculture to purchase beef, pork, chicken, cheese and other products of American farms as a way to assure there is not a surplus of food on the market that would drive down prices for farmers. Then, another law requires that schools must serve these salvaged foods in order to qualify for federal support.[32] The farms served by the legislation are not small owned and operated family farms; they are the giants of the industry. For example, Tyson Foods, reportedly the largest meat producer in the United States with over $26 billion in annual revenues received $46 million dollars in US Government commodity contracts. This was not an isolated case as Smithfield Foods with $11 Billion in annual revenues received $18.2 million in contracts through two subsidies; Pilgrims Pride received $42.4 million; and Hormel received $28 million in commodity contracts.[32]

Once the role played by government legislation to protect food production was implicated in the prevalence of childhood obesity, several authors recommended that parents, youth serving agencies and other concerned community members lobby the government to subsidize health foods, rather than meat and dairy to reduce costs[20] of low calorie/ high nutrition fruits and vegetables. Concerned citizens are also requesting that the government provide legislation to restrict fast-food advertising, use of cartoons in advertising high calorie foods and

snacks, and advertising during children's programming or directed at children (WHO) as has been done in Britain. Furthermore, some communities have also petitioned local school districts to remove soft drink and junk food vending machines from schools. A statewide study in Ohio[9] found that parents were very supportive of schools playing a significant role in reducing the prevalence of overweight through preventative measures. Parents particularly favored the following actions to be taken by schools: 1) not using food as an award, 2) increasing time spent in physical activity, 3) increasing children's knowledge about healthful eating, 4) removing access to junk food and high sugar/ high fat foods.

Conclusions:

Epidemic of childhood obesity in the recent times has meant that there is little time for preparation of intervention modalities, without which this generation of children will be the first to have a shorter projected lifespan than did their parents.

While there are dozens of explanations for both global and local prevalence of overweight, some of which indicate eating and exercise behaviors, consumption of hidden calories, and ethnicity, there can be no doubt that the prevalence of obesity in children is also related to living in poverty, maternal obesity, stress, and the periodic lack of food availability followed by high calorie consumption. Clearly the causes of obesity are complex in nature, and encompass an interlocking set of conditions and behaviors that collude to result in the present epidemic.

Since some of the factors relevant to childhood obesity concern public policy and legislation, it is clear that a changed public policy based upon a heightened focus on childhood health is needed across national boundaries.

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