

**BALLARD BRIEF**

# Childhood Obesity in the United States

Emma Stohl  
*August 2023*



# Summary

Childhood obesity has been a problem in the United States for decades. The rate of childhood obesity has tripled since the 1970s. As of 2023, 1 in 5 children in the US are obese, with this number rising yearly.<sup>1</sup> Childhood obesity is exacerbated by the lifestyle of children, where their attention is consumed by technology use at the expense of consuming nutritious foods and participating in physical activities. The lack of physical education in schools influences children's health education and is partly responsible for childhood obesity. Genetics also play a role in childhood obesity depending on the characteristics of a child's unique genetic makeup. Some negative consequences of childhood obesity are poor physical health, mental health, and social isolation. Many children who currently suffer from obesity will continue to suffer with these consequences far into their adult lives. Family-centered interventions focusing on heavy parent involvement in children's diet and exercise are the best

current practice to combat childhood obesity. Organizations are providing programs and resources for parents to educate their children. However, there is still a need for more research, outcome assessment, and measurement evaluation for the current best practices.

## Key Terms

**Body Mass Index (BMI)**—Commonly used to determine childhood weight status. It is calculated by dividing a person's weight in kilograms by the square of height in meters. The BMI is age and sex-specific, which is why it is commonly referred to as BMI-for-age.<sup>5</sup>

**Childhood obesity**—"Children in the 95th percentile or greater based on their age and weight growth pattern."<sup>6</sup>

**Central obesity**—The excessive buildup of fat in the abdominal region, specifically caused by an excess amount of fat stored deep inside the belly.<sup>7</sup>

**Environment**—The setting and influence of a child's upbringing, including the physical, biological, and

social elements shaped by parents, caregivers, and schools.

**Genetic makeup**—A person’s set of genes (segments of DNA) that determine distinctive characteristics and traits that make them unique.

**Processed foods**—Food that has been altered by freezing, canning, or baking during preparation which often contains high levels of fat, sugar, and salt.<sup>8</sup>

**Social isolation**—The absence of regular social interactions resulting in fewer connections with others.<sup>9</sup>

**Discretionary snacks**—Foods and drinks that are advised against for children to consume because of excessive amounts of salt, fat, or sugar.<sup>10</sup>

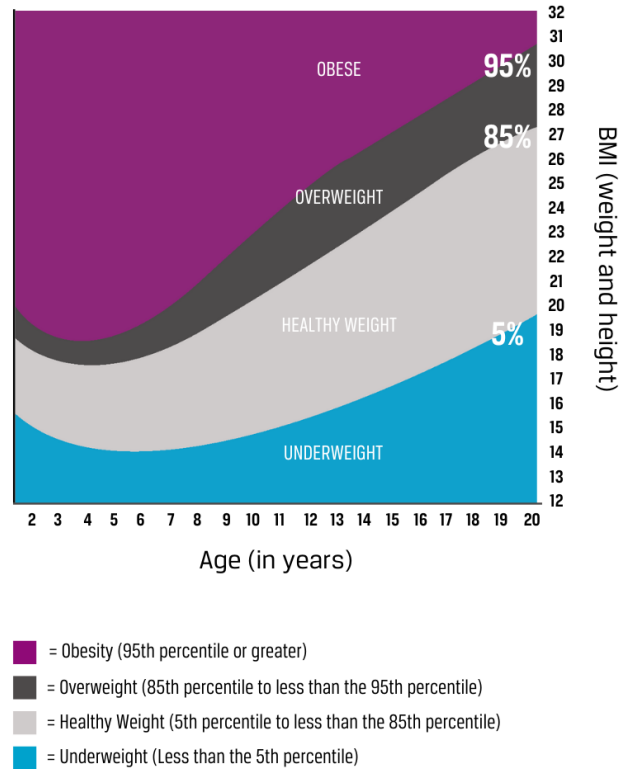
# Context

## *Q: How is obesity evaluated?*

**A:** The United States uses Body Mass Index (BMI) to calculate obesity in adults and children based on their body fat. In the United States, there are five BMI categories: underweight, healthy weight, overweight, obesity, and severe obesity.<sup>11</sup> Among adults, BMI is found by dividing a person's weight in kilograms by their height in meters and assigning a number.<sup>12</sup>

However, with children, their BMI is created based on their age and sex instead of their height because children's muscles and bone structure are still developing, resulting in inconsistencies if just height and weight are the contributing factors.<sup>13,14,15</sup> Waist circumference is another benchmark for obesity that measures body fat, which is used alongside the body mass index, especially in children.<sup>16</sup> Waist circumference is used in these circumstances to measure central obesity in developing children.<sup>17</sup>

## BMI Categories, Ranges, and Percentiles



This brief will focus on children who are overweight and obese. The main difference between a child being overweight or obese is based on their BMI category percentile.<sup>18</sup> A child is considered overweight if their BMI is between the 85th and 95th percentile for their age and gender category and obese if their BMI is at or above the 95th percentile.<sup>19</sup> Severe obesity occurs when a child has a BMI that is 120% of the 95th percentile based on

their age and sex or has a BMI greater than 35.<sup>20,21</sup> For instance, a 15-year-old girl who is 63.7 inches tall and weighs 210 pounds would have a BMI of 36.4, which is the 99th-percentile of people her age and sex. Her BMI of 36.4 is 129% of the 95th percentile for her age and sex and therefore categorizes her as severely obese.<sup>22</sup> In 2017–2018, about 1 in 16 children aged 2–16 were severely obese, 1 in 5 were obese, and 1 in 6 were overweight.<sup>23</sup>

***Q: Who is affected by childhood obesity in the United States?***

**A:** Research from the United States Centers for Disease Control (CDC) found that between 2017 and 2020, approximately 19.7% of children and adolescents ages 2–19 were affected by obesity. This means that over 14.7 million children, or every 1 in 5 children, were affected by childhood obesity.<sup>24</sup> Research has shown that between 2017–2020, 22.2% of children and adolescents ages 12–19 years old were obese, 20.7% of children ages 6–11 years old were

obese, and 12.7% of children ages 2–5 years old were obese.<sup>25</sup>

Studies have shown that household income level and race both factor into which children are most affected by childhood obesity.<sup>26</sup> Between 2011–2014, The CDC administered a National Health and Examination Survey throughout the United States. The results from this survey showed that children ages 2–19 in lower-income households were more likely to be obese than those in higher-income households.<sup>27</sup> The results were as follows: 18.9% of children in the lowest-income group were obese, 19.9% of children in the middle-income group were obese, and 10.9% of children in the highest-income group were obese.<sup>28</sup> Studies have also shown that race can have an impact on childhood obesity. The CDC conducted a national survey which found that obesity is more prevalent among Hispanic children (26.2%) and Black children (24.8%) and less common among White children (16.6%) and Asian children (9%).<sup>29</sup> The 2019 Childhood Obesity

Atlas shows a slight difference in childhood obesity rates between genders. In 2017–2018, 21% of boys from ages 2–19 were obese compared to 18% of girls that were found to be obese in the same age range.<sup>30</sup>

***Q: When did childhood obesity become a significant concern for Americans?***

**A:** Obesity in the United States did not become a significant concern until the 1980s and 1990s.<sup>31</sup> Research shows that in the 1970s, only 5% of children ages 2–19 were considered obese. Through the 1980s and 1990s, obesity rates in children ages 2–19 tripled from 5– 15%.<sup>32</sup> This dramatic increase is due to changes in American lifestyle and portion sizes, as well as the rise of fast food chains which captured national attention.<sup>33</sup> The Centers for Disease Control and Prevention began nationwide research and studies on obesity and published their first-ever issue and research about childhood obesity in 1999.<sup>34</sup> In 2000, the CDC published state-wide obesity prevention programs. Shortly after the

issues and programs were published, the public realized childhood obesity was a growing and severe problem. As a result, more advertisements were promoting physical activity, discussions surrounding children’s BMI, public health speakers inspiring change, and more education and marketing for healthier foods.<sup>35</sup> Since then, the CDC has continued its research, studies, preventions, and programs on childhood obesity with the hope to level out and reduce the obesity rates in the US.<sup>36</sup>

One of the CDC’s national surveys compared obesity rates in children and adults from 1999–2000 to 2015–2016. The result was definitive—obesity was increasing rapidly.<sup>37</sup> In children aged 2–19, there was an increase of 4.6% from 1999 to 2016.<sup>38</sup> In their most recent survey results from 2017–2020, the CDC found that 19.7% of children in the United States are obese, and 41.9% of adults in the United States are obese.<sup>39</sup>

***Q: How does childhood obesity in America compare to the rest of the world?***

**A:** This brief is focused on childhood obesity in the United States. The United States ranks among the top 5 countries with the highest childhood obesity rates.<sup>40</sup> The Pacific Island states of Nauru and Palau have the highest percentage of children that are obese, both more significant than 30%,<sup>41</sup> and Tonga, Kiribati, and the Marshall Islands have the second highest rate of childhood obesity at 23%.<sup>42</sup> Childhood obesity is highly prevalent in the United States and will continue to affect children into adulthood.<sup>43</sup> One study showed that 80% of obese adolescents would be obese in adulthood.<sup>44</sup> Furthermore, research has shown that the number of children who suffer from childhood obesity is projected to increase worldwide from 150 million currently to more than 250 million by 2030.<sup>45</sup> The primary focus for this brief is on the United States, but the proposed prevention strategies contain potential

for successful implementation and replication worldwide.

## **Contributing Factors**

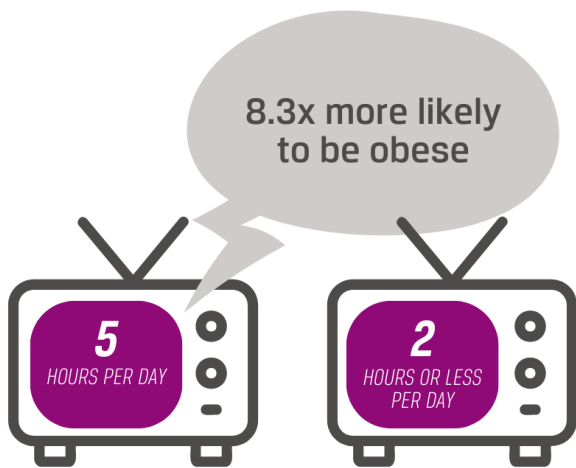
### ***Lifestyle***

The main contributing factor to childhood obesity in the United States is lifestyle. Three main components of children's lifestyles directly relate to obesity: technology, nutrition, and physical activity.

### **Technology**

Higher rates of technology use contribute to child obesity because it often leads to increased calorie consumption and reduced activity. Within the past few decades, the United States has become more technology-driven. Children living in the United States today spend 6 more hours per day online compared to children living in the late 1900s.<sup>46</sup> Children are being exposed to technology at younger and younger ages. The United States found that the number of 8-year-olds who owned

smartphones rose from 11% in 2015 to 31% in 2021.<sup>47</sup> A significant portion of children's time online is spent watching television and movies. The United States collected data that found children ages 8–12 are watching an average of 2 hours and 40 minutes of TV or videos and an average of 9 minutes reading books.<sup>48</sup>



Children are also spending a significant amount of time on social media platforms. In 2022, the United States found that children allocate approximately 113 minutes each day to TikTok and 90 minutes per day on Snapchat.<sup>49</sup> A survey conducted in 2017 directed towards US parents and caregivers determined that children ages 2–10 years old spend 18.6 hours

inside playing on and watching technology per week.<sup>50</sup> This survey also found that, on average, children ages 2–10 years old play outside for 10.6 hours per week.<sup>51</sup> In other words, on average, children are spending 8 more hours on technology than playing outside.<sup>52</sup> Studies have shown that the prevalence of obesity is 8.3 times higher for children who watch television for 5 hours a day versus children who watch television for 2 hours or less a day.<sup>53</sup> The additional time spent on technology increases the amount of time a child is sitting instead of being active.<sup>54</sup> When children are on technology, they consume more calories than they are burning and less time exercising, resulting in childhood obesity.

### **Nutrition**

The massive increase in technology has also affected fast-food businesses, significantly reducing the time costs for food production.<sup>55</sup> Children in the United States are eating large amounts of fast food, thus reducing the amount of nutrition in their diets.<sup>56</sup> The CDC



conducted a fast food survey from 2015-2018 and found that 36.3% of children and adolescents ages 2-19 ate fast food daily.<sup>57</sup> The survey results also found that 14.4% of children and adolescents' total calories were consumed from fast food, which has increased by 4% from 2010.<sup>58</sup> Children who eat fast food are consuming processed foods containing high amounts of fat, carbohydrates, and sugars.<sup>59</sup> Research has shown that children whose parents cook meals at home consume lower amounts of carbohydrates, sugar, and fat.<sup>60</sup> Research has also found that children whose parents cook at home at least 5 times per week consume an increase of 63.2 g in fruit consumption and 97.8 g in vegetable consumption.<sup>61</sup> To put this into perspective, a portion of both fruits and vegetables is 80 g, meaning that children are eating more than 1 extra portion of vegetables and almost an entire portion of fruit each week.<sup>62</sup> Children who eat at home less than 3 times per week are not getting the fruits, vegetables, or nutrients they need to remain healthy.<sup>63</sup> Studies have

shown that children who eat at least 5 home-cooked meals per week have a 28% lower risk of falling into the overweight BMI category and a 24% reduced likelihood of having excess body fat.<sup>64</sup>

In addition to increasing fast food, children are getting accustomed to constant snacking as they spend time on technology. Studies have shown that children consume half of their meals and up to one-third of their energy intake in front of a screen.<sup>65</sup> When children are watching media through a screen, they tend to consume more energy (calories) without feeling hungry.<sup>66</sup> Research has shown that children consumed an average of 8.2 snacks per day in 2020 compared to an average of 3 snacks per day in 2004.<sup>67,68</sup> Of those 8.2 daily snacks, 5.2 were discretionary snacks and beverages such as candy, cookies, cakes, soda, and juice.<sup>69</sup> Discretionary snacks are high energy and dense, which keep children feeling hungry, which can lead to even more snacking and childhood obesity.<sup>70</sup> A study revealed that children consumed 15

times the amount of discretionary snacks compared to healthy snacks at home and 2.4 times the amount of discretionary snacks compared to healthy snacks at school.<sup>71</sup>

Snacking can affect children in 3 ways: prompt children to eat even if they aren't hungry, encourage children to continue eating even if they are complete, and distract children from evaluating if they are full.<sup>72</sup> Studies have also shown that children will eat fewer fruits and vegetables instead of more fast food or energy-dense snacks and beverages as they use technology.<sup>73</sup> Children are consuming more calories than they are burning due to their increased exposure and use of technology and lack of healthy nutritious foods.<sup>74</sup>

### ***Physical Activity***

A lack of physical activity contributes to childhood obesity because caloric intake exceeds children's outtake. When children are physically active, they increase their total energy expenditure. Increased energy expenditure balances the child's

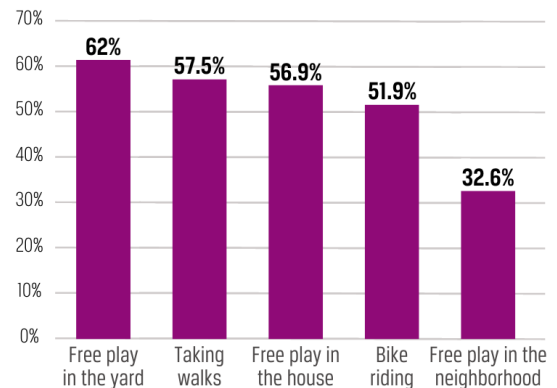
energy stay balanced which leads to maintaining or losing weight.<sup>75</sup> When children are physically active, it decreases their total amount of body fat, which reduces the chance of being overweight or obese.<sup>76</sup> A study was done in 2016 that examined the relationship between physical activity and childhood obesity in 1,640 children ages 3–15 years old.<sup>77</sup> This study found that the risk of becoming overweight and obese decreased by 7% in children who increased the number of days they were physically active for at least 60 minutes a day.<sup>78</sup> Furthermore, researchers concluded that if children who are overweight or obese exercise for at least 60 minutes a day, they can reduce their risk of obesity by 49%.<sup>79</sup> Studies have shown that only 22% of children in the United States are meeting the basic activity level recommendations, and another 25% of children in the United States are entirely sedentary.<sup>80</sup> To put this into perspective, 1 out of 4 children will spend their entire week sitting. Research has shown that in 2018, 17.1% of children ages 6–12 did not

participate in any sporting activities.<sup>81</sup> In 2021, the United States collected data from the participation rates among different age groups for various sports, and the data found that Millennials (1980–1999) were participating more in winter sports, team sports, racquet sports, outdoor sports, and individual sports than Gen Z (2000+).<sup>82</sup>

The Coronavirus pandemic played a role in the lack of physical activity. Data from 2020 showed that 28.6% of children ages 6–18 participated in much less physical activity in 2020 than in previous years.<sup>83</sup> Data from 2020 has shown that the most common forms of physical activities among children were playing in the backyard (62%), going for walks (57.5%), playing inside the house (56.9%), going on a bike (51.9%), and free play in the neighborhood (32.6%).<sup>84</sup> Furthermore, only 16% of children walk or bike to school today compared with 42% in the late 1960s.<sup>85</sup> Overall, the physical activity and participation in activity rates for children in the United States are

decreasing, which is one of the root causes of childhood obesity.

**Most Common Forms of Physical Activities Among Children 2020**



### ***Lack of Physical Education in Schools***

School environments contribute to childhood obesity in the United States due to their lack of physical education. Experts recommend that elementary-aged students receive 150 minutes of physical education per week and middle school-aged students receive 225 minutes per week while at school, which is 2.5 and 3.75 hours of physical education per week, respectively.<sup>86</sup> However, only 13.8% of elementary, middle, and high schools provide at least 4 hours of physical education per week.<sup>87</sup> Harvard School

of Public Health conducted a study that surveyed 1,368 parents with children in K–12 about the physical education offered in their child’s school. Results found that 28% of parents (3 out of 10 parents) gave their school a low grade (C, D, or F) on supplying adequate time for physical education.<sup>88</sup> Furthermore, 68% of parents disclosed that their school does not offer daily physical education classes.<sup>89</sup> Because of the lack of physical education classes being offered in elementary schools and middle schools, students do not develop active skills or an active lifestyle.<sup>90</sup> Research has shown that children who learn motor skills (such as jumping, kicking, throwing, and catching) in their physical education classes are more physically active than those who do not.<sup>91</sup> In addition to the lack of time allocated to physical education, another study conducted by Harvard Public Health found that 18% of parents gave their child’s school a low grade (C, D, or F) because of their inability to provide proper facilities for physical activity.<sup>92</sup> Without

appropriate facilities, children cannot get enough active time to have effective physical education programs in their schools, making them susceptible to becoming overweight and obese over time.



An experimental study that compared obesity rates in children who receive different amounts of physical education during a school week found that a lack of physical education in schools leads to childhood obesity.<sup>93</sup> The children (ages 5–11) in this study were observed from 2008–2013. In this study, 6 intervention schools gave their students 4.5 hours of physical education classes per week, and the four control group schools gave them 1.5 hours per week. Before the study was conducted, 12% of the children

were overweight, and 15% of the children were obese in the intervention schools (13% and 19% in the control schools, respectively).<sup>94</sup> After five years, 43% of the students in the intervention group who received 4.5 hours of physical education classes per week were overweight, and 78% of students in the intervention group were obese.<sup>95</sup> But after five years, 51% of the students in the control group who received 1.5 hours of physical education classes per week were overweight, and 84% of students in the control group were obese.<sup>96</sup> This study shows that students who spent less time in physical education classes were more overweight and obese than the students who spent 3 hours more in physical education classes per week in their schools.

## Genetics

Another contributing factor to childhood obesity in the United States is genetics. Seven percent of children who were severely obese have a genetic predisposition to obesity.<sup>97</sup> There are 3 different types of

childhood obesity based on distinct genetic and phenotypic characteristics, which are syndromic obesity, non-syndromic obesity, and common polygenic obesity.<sup>98</sup> Children that fall into one of these categories are more prone to obesity than other children because of their genetic makeup.

Recent data has found that genetics could determine up to 70% of the risk for developing childhood obesity.<sup>99</sup>

Children with syndromic obesity are genetically predisposed to have excess body fat, physical features that are different from regular appearance, challenges with intellectual abilities, and problems related to hormones and the nervous system.<sup>100</sup> This condition affects the hypothalamus, which controls appetite by managing energy levels concerning food consumption. Children in this category gain weight quickly because of this genetic imbalance which causes them to overeat.<sup>101</sup> A few examples of syndromic obesity include Prader-Willi Syndrome, Bardet-Biedl Syndrome (100,000 cases in North America and Europe),<sup>102</sup> and Down

Syndrome. Prader-Willi Syndrome, the most common form of syndromic obesity, occurs in 1 of every 10,000–30,000 births.<sup>103</sup> Children with PWS need only about 60–80% of their recommended caloric intake due to their decreased resting energy expenditure, or they will gain excess weight.<sup>104</sup> An estimated 10,000–20,000 people in the US are living with Prader-Willi Syndrome that manifested in early childhood.<sup>105</sup>

Children with non-syndromic obesity gain weight because of mutations in 8 critical genes instead of the presence of other clinical symptoms such as disabilities, intestine issues, or eating disorders.<sup>106,107</sup> This form of obesity is caused by mutations in 8 critical genes, including a variety of receptors, leptin, and nervous tissue growth.<sup>108</sup> These genes typically work together to send signals in the hypothalamus to maintain energy balance while the child consumes nutrients. Although this form of childhood obesity can be considered less severe and, in some cases, maintainable, these genetic

mutations still prove to be a cause of obesity.<sup>109</sup>

A subset of non-syndromic obesity is monogenic obesity, which occurs due to a single gene mutation that regulates body weight. This type of genetic obesity occurs in less than 1% of patients in pediatric clinics, but some forms (like those that affect the MC4R gene) make up 3–5% of children with early-onset severe obesity.<sup>110</sup>

The last type, common polygenic childhood obesity, is caused by similar genetic mutations in non-syndromic obesity. However, in common obesity, the genes have a more negligible phenotypic effect, making it less severe. Genes found in this type engage with factors in the environment which lead to positive energy balance, which develops significant increases in body weight, proving that common childhood obesity is a “genetic and metabolic disorder.”<sup>111</sup> All 3 types of childhood obesity are categorized by their genetic makeups and prove to be contributing factors in overall

childhood obesity rates in the United States.

## Consequences

### *Physical Health*

Childhood obesity leads to lasting physical limitations and consequences that children will struggle with for the rest of their lives. Studies have found that asthma and type 2 diabetes are among the two main influences that result from children being obese.<sup>112</sup> Research has shown that obesity causes 23–27% of asthma cases in children, and more than 85% of children who are diagnosed with Type 2 diabetes are overweight or obese.<sup>113,114</sup>

### **Asthma**

Childhood obesity leads to asthma because the extra weight increases the pressure on the chest wall causing the child to breathe at lower lung volumes.<sup>115</sup> Additionally, it can cause excessive or prolonged inflammation, which contributes to asthma.<sup>116</sup>

Obesity forces larger body masses to

work harder to perform normal bodily functions like breathing. Furthermore, obesity limits the child's ability to control asthma-like symptoms, therefore making the symptoms worse.<sup>117</sup> Research has shown that when a child is obese, the likelihood of developing asthma is increased by 92% compared to normal-weight children.<sup>118</sup> Studies have shown that asthma caused by obesity is characterized as having more symptoms, worse control, more severe and frequent asthma attacks, poor response to inhalers, and a lower quality of life.<sup>119</sup> Children who are obese will suffer from an increased risk of asthma symptoms and episodes. Research has shown that children who are obese have a higher frequency of asthma exacerbations that require visits to the Emergency Department. It has also shown that children who are overweight and have been admitted to the hospital for asthma are more likely to require additional visits to the emergency room in the future in comparison to healthy weighted children with

asthma.<sup>120</sup> Over 4.8 million children have asthma in the United States, and childhood obesity has caused 1.08 million of those asthma cases, making it one of the main physical consequences of childhood obesity.<sup>121</sup>

## Asthma Cases in Children in the United States



■ = children with asthma  
■ = children with asthma caused by childhood obesity

## Type 2 Diabetes

Type 2 diabetes develops from childhood obesity because the extra weight increases inflammation and levels of fatty acids, which results in insulin resistance.<sup>122</sup> This resistance causes high blood pressure due to blood sugar build up.<sup>123</sup> Elevated blood pressure for a child is characterized by the top number ranging from 120–129 mm Hg and the bottom number reading below 80 mm Hg. High blood pressure in a child is any number above 130 mm Hg or below 80 mm Hg.<sup>124</sup> High blood sugar can be the cause of several other major health problems like diabetes, heart disease, vision loss, and kidney disease.<sup>125</sup> Research has shown that 85% of children (33,150) with Type 2 diabetes are either overweight or obese.<sup>126,127</sup> As of 2019, 39,000 children under the age of 20 in the United States were diagnosed with type 2 diabetes.<sup>128,129</sup> Children with obesity had approximately a 3.7 times higher likelihood of developing type 2 diabetes compared to those with an average BMI.<sup>130</sup> Children can mitigate



the risk of developing Type 2 diabetes by changing their current lifestyles by consuming less fat, sugars, and carbohydrates.<sup>131</sup> Otherwise, they are at risk of developing diabetes and other possible life-threatening health conditions such as heart and kidney disease.<sup>132</sup>

## ***Mental Health***

Children struggling with obesity face mental health challenges that impact their lives long into adulthood.

Research has proven that there are common physiological and behavioral pathways shared between depression and obesity, including serotonin dysregulation, sedentary behavior, alterations in appetite, and disturbances in sleep patterns.<sup>133</sup>

Behaviors linked to depression are similar to obesity behaviors. Research has shown that children who are obese are 32% more likely to be depressed.<sup>134</sup> Children struggling with their eating behaviors and emotional patterns turn to food for comfort and stability, which starts a vicious cycle leading to obesity and depression.<sup>135</sup> A

case study of 112 overweight children was conducted and found that 33% of the children reported instances where they lost control of their eating, meaning they experienced binge eating.<sup>136</sup> Binge eating led to increased levels of depressive symptoms and increased levels of food intake.<sup>137</sup>

Childhood obesity leads to feelings and behaviors of depression.



Anxiety is another common mental illness that results from childhood obesity. A study conducted in 2019 found that 39.8% of obese children were diagnosed with anxiety, but only 13.9% of normal-weight children were diagnosed with anxiety.<sup>138</sup>

Furthermore, research has shown that obese girls are 43% more likely to have anxiety than healthy-weight

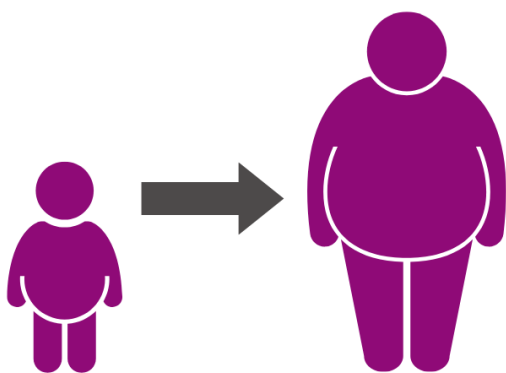
girls.<sup>139</sup> Obese children tend to feel anxious because of their current physical state. To override the feelings of anxiety that arise from their physical condition, obese children often engage in emotional eating to override the feelings of anxiety such as fear, concern, and worry.<sup>140</sup> Children who are obese are often not accepted by their peers, causing them to feel anxious in everyday social situations.<sup>141</sup> As a result, children turn to food in search of something to fill their lack of comfort and acceptance. Eating becomes something “to do” instead of having to force social interactions.<sup>142</sup> Research has shown that children who are obese are more likely to have anxiety and feelings of low self-esteem, which can affect their engagement with their peers.<sup>143</sup> The anxiety that obese children feel because of their physical state makes it difficult for them to play on sports teams, play outside, hike, or do any form of activity with or without other children.<sup>144</sup> Feelings of anxiety and worry make it hard for children to

make the necessary changes in their lifestyle, environment, and nutrition.<sup>145</sup>

## ***Social Isolation***

Childhood obesity brings social consequences that are just as serious as other dangerous physical conditions. Children suffering from childhood obesity are often bullied and teased because of their weight.<sup>146</sup> Research has shown that children who are overweight and obese are 34% more likely to be a bully victim than normal-weight children.<sup>147</sup> In a recent study of 60 obese children and 60 healthy-weight children, results found that 46.7% of obese children were victims of bullying.<sup>148</sup> Bullying brings about feelings of loneliness and social isolation from their peers and friends. Obese children who are bullied experience increased levels of low self-esteem, low self-worth, and negative body image that lasts well beyond childhood.<sup>149</sup> The social consequences of being bullied are not easy to overcome, impacting obese children for the rest of their lives.<sup>150</sup> Overweight and obese children have

fewer friends than normal weighted children, which results in more time spent alone participating in sedentary activities.<sup>151</sup> Having few friends and spending lots of time alone are key indicators of feeling socially isolated from people and the rest of the world.<sup>152</sup> Childhood obesity does not disappear after childhood: 80% of obese children will be obese in their adult lives, and 70% will be obese over the age of 30, which means the chances for social isolation to continue are high.<sup>153</sup> Because of their physical state, obese children can be left out of everyday social activities, causing them to engage in the same cycle of sedentary lonely activities and become socially isolated.<sup>154</sup>



**70% of obese children  
will be obese adults**

## Practices

### *Family-Centered Interventions*

The home environment is crucial to shaping children's eating and physical activity habits.<sup>155</sup> Family-centered interventions combat childhood obesity, a technique used for decades. However, recently, studies have shown that these interventions are not as effective unless they involve some sort of parental involvement.<sup>156</sup> When family-centered interventions target parent involvement, they better prevent and attack childhood obesity as they educate parents regarding more competent nutrition, increased physical activity, and monitoring screen time.<sup>157</sup> These interventions are solely focused on helping parents develop a more robust understanding of healthy behaviors to be incorporated into the home and parenting styles. Parent engagement is the key to the success of family-centered interventions to combat childhood obesity.<sup>158</sup>

Family-centered interventions should

focus on behaviors that can be modified to prevent childhood obesity, such as eating behavior, physical activity, sleep, and screen time.<sup>159</sup> Getting children to bed earlier to optimize sleep time, reducing the time and access children have to screens, and providing healthier snacks and meals, are all behaviors that family-centered interventions help parents implement in their homes to combat childhood obesity. When parents become directly engaged with family-centered intervention concerning childhood obesity, they can make a unique influence in their home and on the child's life.<sup>160</sup> Together, parents and children can help each other create healthy habits and hold each other accountable for the desired behaviors they are both trying to work on. Family-centered approaches that target parental engagement throughout intervention are the best current practice to combat childhood obesity. The Alliance for a Healthier Generation is an example of an organization that focuses on family-centered interventions and parent involvement. This organization was established in

2005 and is dedicated to preventing and treating childhood obesity.<sup>161</sup> They are focused on creating healthy environments for children at school, in their communities, and at home.<sup>162</sup> The Alliance for a Healthier Generation provides parents and caregivers with resources that explain how to help their children eat healthier, engage in more physical activity, and stay engaged in their child's health, snacking, and food planning. They also provide a healthy at-home toolkit that includes training and additional resources to help parents get engaged in their child's health to prevent and treat childhood obesity.<sup>163</sup> In 2020, The Alliance for a Healthier Generation reached 2.8 million families through Kohl's Healthy at Home guide to help families create a healthier environment at home.<sup>164</sup> In 2022, they served 31.1 million children to gain access to quality physical activity, better nutrition, improved social-emotional skills, and healthier environments.<sup>165</sup> They have helped 6.4 million families gain resources and support to provide healthy home environments and behaviors for their children.<sup>166</sup>

## Impact

A study that tested the effectiveness of family-centered interventions found that after engaging in a family-based weight loss intervention, 70% of participants experienced notable and significant changes in their children's BMI, with changes ranging from moderate to large.<sup>167</sup> Another study conducted by the International Journal of Behavioral Nutrition and Physical Activity involved enrolling parents in a 6-week program aimed at educating and enhancing their skills, which included areas such as communication, conflict resolution, and promoting healthy lifestyles.<sup>168</sup> After the intervention, significant enhancements were observed in children's rate of obesity, light physical activity, daily TV viewing, and dietary intake.<sup>169</sup> Children who participated in this study had lower BMI scores and lower rates of obesity due to more time spent doing physical activity, fewer minutes on TV, and healthier nutrition.<sup>170</sup> Post-intervention results also showed that parents were more capable of establishing healthier eating patterns and habits within their homes, in addition to supporting their

child to engage in more physical activity.<sup>171</sup> These study results convey the effect that parents can have on family-centered interventions. They also show that family-centered interventions can increase healthier nutrition and physical activity by targeting parents.

## Gaps

While studies have proven this intervention practice to be highly effective, there are a few areas where this practice can fall short. This intervention requires a high level of family and parent engagement which can prove to be difficult in some cases because of the wide variety of family structures, cultures, and family values.<sup>172</sup> For instance, it becomes difficult for single parents raising their children to try to stay engaged in a family intervention plan with the need to balance work, financial stress, relationships, and limited time outside of work.

It can also be challenging for parents of different races to stay engaged in the family intervention program due to different values in their culture and

educational background. These difficulties require this intervention to be flexible for other parents and families.<sup>173</sup> In an analysis consisting of 20 studies researching family-based interventions, it was found that 25% of families left the intervention strategy before the intervention was complete.<sup>174</sup> The intervention was still successful. However, the families who dropped out got less out of the intervention and, in

some cases, can bias the overall results of the intervention.<sup>175</sup> Family-centered interventions have proven to be successful in combating childhood obesity. Yet more research should be done to make this a replicable intervention strategy worldwide.

# Endnotes

1. "Obesity," Centers for Disease Control and Prevention, August 10, 2022, <https://www.cdc.gov/healthyschools/obesity/index.htm>.
2. "Childhood Obesity Facts," Overweight and Obesity, May 17, 2022, <https://www.cdc.gov/obesity/data/childhood.html#Prevalence>.
3. Jennifer Miller, Arlan Rosenbloom, and Janet Silverstein, "Childhood Obesity," *The Journal of Clinical Endocrinology & Metabolism* 89, no. 9, (2004): 4211–18, <https://doi.org/10.5551/jat.10.63>.
4. Ibid.
5. "Defining Child BMI Categories," Centers for Disease Control and Prevention, March 21, 2023, <https://www.cdc.gov/obesity/basics/childhood-defining.html>.
6. Ibid.
7. "Central Obesity Significantly Increases Risk of Serious Health Problems," Bangkok Hospital, accessed June 29, 2023, <https://www.bangkokhospital.com/en/content/metabolic-syndrome-creates-disease>.
8. Chayil Champion, "What You Need to Know about Processed Foods - and Why It Is so Hard to Quit Them," UCLA Health System, December 21, 2021, <https://www.uclahealth.org/news/what-you-need-to-know-about-processed-foods-and-why-it-is-so-hard-to-quit-them>.
9. "Loneliness and Social Isolation - Tips for Staying Connected," National Institute on Aging, accessed June 28, 2023, <https://www.nia.nih.gov/health/loneliness-and-social-isolation-tips-staying-connected>.
10. Ryan Gage et al., "The Frequency and Context of Snacking among Children: an Objective Analysis Using Wearable Cameras," *Nutrients* 13, no. 1 (2020): 103, <https://doi.org/10.3390/nu13010103>.
11. "Defining Child BMI Categories," Centers for Disease Control and Prevention, March 21, 2023, <https://www.cdc.gov/obesity/basics/childhood-defining.html>.
12. Ibid.
13. "Defining Child BMI Categories," Centers for Disease Control and Prevention, March 21, 2023, <https://www.cdc.gov/obesity/basics/childhood-defining.html>.
14. Krushnapriya Sahoo et al., "Childhood Obesity: Causes and Consequences," *Journal of Family Medicine and Primary Care* 4, no. 2 (2015): 187, <https://doi.org/10.4103/2249-4863.154628>.
15. Ibid.
16. Ibid.
17. Ibid.
18. "Defining Child BMI Categories," Overweight and Obesity, March 21, 2023, <https://www.cdc.gov/obesity/basics/childhood-defining.html>.
19. Ibid.
20. Adekunle Sanyaolu et al., "Childhood and Adolescent Obesity in the United States: a Public Health Concern," *Global Pediatric Health* 6 (2019), <https://doi.org/10.1177/2333794X19891305>.
21. "Defining Child BMI Categories," Center for Disease Control, accessed June 29, 2023, <https://www.cdc.gov/obesity/basics/childhood-defining.html>.
22. Ibid.
23. "Overweight & Obesity Statistics," NIDDK, accessed June 1, 2023, <https://www.niddk.nih.gov/health-information/health-statistics/overweight-obesity>.
24. "Childhood Obesity Facts," Overweight and Obesity, May 17, 2022, <https://www.cdc.gov/obesity/data/childhood.html#Prevalence>.
25. Ibid.
26. Ibid.
27. Ibid.
28. Ibid.
29. Ibid.

30. John Elflein, "Topic: Obesity in the United States Statistics and Facts," Statista, January 25, 2023, <https://www.statista.com/topics/1005/obesity-and-overweight/#topicOverview>.
31. William H. Dietz, "The Response of the US Centers for Disease Control and Prevention to the Obesity Epidemic," *Annual Review of Public Health* 36 (2015): 575–96, <https://doi.org/10.1146/annurev-publhealth-031914-122415>.
32. "CDC Grand Rounds: Childhood Obesity in the United States," *Morbidity and Mortality Weekly Report*, January 21, 2011, <https://www.cdc.gov/mmwr/preview/mmwrhtml/mm6002a2.htm>.
33. John Elflein, "Topic: Obesity in the United States Statistics and Facts," Statista, January 25, 2023, <https://www.statista.com/topics/1005/obesity-and-overweight/#topicOverview>.
34. William H. Dietz, "The Response of the US Centers for Disease Control and Prevention to the Obesity Epidemic," *Annual Review of Public Health* 36 (2015): 575–96, <https://doi.org/10.1146/annurev-publhealth-031914-122415>.
35. Ibid.
36. Ibid.
37. Adekunle Sanyaolu et al., "Childhood and Adolescent Obesity in the United States: A Public Health Concern," *Global Pediatric Health* 6 (2019), <https://doi.org/10.1177/2333794X19891305>.
38. Ibid.
39. "Childhood Obesity Facts," *Overweight and Obesity*, May 17, 2022, <https://www.cdc.gov/obesity/data/childhood.html#Prevalence>.
40. "Obese Children," *Health, Society, Obese Children*, February 10, 2020, <https://worldmapper.org/maps/obese-children-2015/#>.
41. Ibid.
42. Ibid.
43. Johnson III, James Allen, and Asal Mohamadi Johnson, "Urban-Rural Differences in Childhood and Adolescent Obesity in the United States: A Systematic Review and Meta-Analysis," *Childhood Obesity* 11, no. 3 (2015): 233–41, <https://doi.org/10.1089/chi.2014.0085>.
44. Mark Simmonds et al., "Predicting Adult Obesity from Childhood Obesity: A Systematic Review and Meta-Analysis," *Obesity Reviews: An Official Journal of the International Association for the Study of Obesity* 17, no. 2, (December 2015): 95–107, <https://doi.org/10.1111/obr.12334>.
45. Bindra Shah et al., "Sex and Gender Differences in Childhood Obesity: Contributing to the Research Agenda," *BMJ Nutrition, Prevention & Health* 3, no. 2 (2020): 387, <https://doi.org/10.1136/bmjnph-2020-000074>.
46. Adekunle Sanyaolu et al., "Childhood and Adolescent Obesity in the United States: A Public Health Concern," *Global Pediatric Health* 6 (2019), <https://doi.org/10.1177/2333794X19891305>.
47. Aaron O'Neill, "Topic: Children and Technology Statistics and Facts," Statista, November 17, 2022, <https://www.statista.com/topics/9840/children-and-technology/#topicOverview>.
48. Ibid.
49. Aaron O'Neill, "Topic: Children and Technology Statistics and Facts," Statista, November 17, 2022, <https://www.statista.com/topics/9840/children-and-technology/#topicOverview>.
50. Martin Armstrong and Felix Richter, "Infographic: Screen Time Dominates Kid's Play," Statista Infographics, November 1, 2017, <https://www.statista.com/chart/11651/screen-time-dominates-kids-play/>.
51. Ibid.
52. Ibid.
53. Jennifer Miller, Arlan Rosenbloom, and Janet Silverstein, "Childhood Obesity," *The Journal of Clinical Endocrinology & Metabolism* 89, no. 9, (2004): 4211–18, <https://doi.org/10.5551/jat.10.63>.
54. "The Negative Effects of Technology on Children," National University, May 13, 2021, <https://www.nu.edu/blog/negative-effects-of-technology-on-children-what-can-you-do/>.
55. Adekunle Sanyaolu et al., "Childhood and Adolescent Obesity in the United States: a Public Health Concern," *Global Pediatric Health* 6 (2019), <https://doi.org/10.1177/2333794X19891305>.
56. Ibid.
57. Cheryl D. Frayer et al., "Fast Food Intake Among Children and Adolescents in the United States, 2015-2018," *Centers for Disease Control and Prevention*, August 14, 2020, <https://www.cdc.gov/nchs/data/databriefs/db375-h.pdf>.



58. Ibid.
59. Julia A Wolfson and Sarah N Blich, "Study Suggests Home Cooking Is a Main Ingredient in Healthier Diet," John Hopkins Center for a Livable Future, November 17, 2014, <https://clf.jhsph.edu/about-us/news/news-2014/study-suggests-home-cooking-main-ingredient-healthier-diet>.
60. Ibid.
61. Susanna Mills et al., "Frequency of Eating Home Cooked Meals and Potential Benefits for Diet and Health: Cross-Sectional Analysis of a Population-Based Cohort Study," *The International Journal of Behavioral Nutrition and Physical Activity*, August 17, 2017, <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5561571/>.
62. "5 A Day portion sizes," NHS, accessed August 17, 2023, <https://www.nhs.uk/live-well/eat-well/5-a-day/portion-sizes/>.
63. Ibid.
64. Ibid.
65. Thomas N. Robinson et al., "Screen Media Exposure and Obesity in Children and Adolescents," *Pediatrics* 140, no. 2 (2017): S97–101, <https://doi.org/10.1542/peds.2016-1758K>.
66. Ibid.
67. Ryan Gage et al., "The Frequency and Context of Snacking among Children: an Objective Analysis Using Wearable Cameras," *Nutrients* 13, no. 1 (2020): 103, <https://doi.org/10.3390/nu13010103>.
68. Carmen Piernas and Barry M. Popkin, "Trends in Snacking among US Children," *Health Affairs* 29, no. 3 (2010): 398–404.
69. Ryan Gage et al., "The Frequency and Context of Snacking among Children: an Objective Analysis Using Wearable Cameras," *Nutrients* 13, no. 1 (2020): 103, <https://doi.org/10.3390/nu13010103>.
70. Carmen Piernas and Barry M. Popkin. "Trends in Snacking Among US Children." *Health Affairs* 29, no. 3 (2010): 398–404.
71. Ryan Gage et al., "The Frequency and Context of Snacking among Children: An Objective Analysis Using Wearable Cameras," *Nutrients* 13, no. 1 (2020): 103, <https://doi.org/10.3390/nu13010103>.
72. Thomas N. Robinson et al., "Screen Media Exposure and Obesity in Children and Adolescents," *Pediatrics* 140, no. 2 (2017): S97–101, <https://doi.org/10.1542/peds.2016-1758K>.
73. Ibid.
74. Adekunle Sanyaolu et al., "Childhood and Adolescent Obesity in the United States: A Public Health Concern," *Global Pediatric Health* 6 (2019), <https://doi.org/10.1177/2333794X19891305>.
75. Harvard T.H. Chan, "Physical Activity," Obesity Prevention Source, April 12, 2016, <https://www.hsph.harvard.edu/obesity-prevention-source/obesity-causes/physical-activity-and-obesity/>.
76. Harvard T.H. Chan, "Physical Activity," Obesity Prevention Source, April 12, 2016, <https://www.hsph.harvard.edu/obesity-prevention-source/obesity-causes/physical-activity-and-obesity/>.
77. Ickpyo Hong et al., "Relationship between Physical Activity and Overweight and Obesity in Children: Findings from the 2012 National Health and Nutrition Examination Survey National Youth Fitness Survey," *The American Journal of Occupational Therapy*, July 27, 2016, <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4993132/>.
78. Ibid.
79. Ibid.
80. Jennifer Miller, Arlan Rosenbloom, and Janet Silverstein, "Childhood Obesity," *The Journal of Clinical Endocrinology & Metabolism* 89, no. 9, (2004): 4211–18, <https://doi.org/10.5551/jat.10.63>.
81. "Share of Children Aged 6 to 12 Who Engaged in No Sporting Activity during the Year in the United States from 2011 to 2018," Statista, December 9, 2022, <https://www.statista.com/statistics/986526/physically-inactive-children/>.
82. "Participation Rate in Selected Physical Activities in the United States in 2021, by Age Group," Statista, December 9, 2022, <https://www.statista.com/statistics/1023923/physical-activity-participation-rate-type-age/>.
83. Ibid.
84. "Most Common Ways Children Have Stayed Active during the Coronavirus (COVID-19) Pandemic in the United States as of September 2020," Statista, December 9, 2022, <https://www.statista.com/statistics/1233349/youth-activities-covid/>.
85. Adekunle Sanyaolu et al., "Childhood and Adolescent Obesity in the United States: A Public Health Concern," *Global Pediatric Health* 6 (2019), <https://doi.org/10.1177/2333794X19891305>.

86. Todd Data, "Poll Finds Lack of Physical Education in Public Schools a Concern of Parents," Harvard T.H. Chan School of Public Health, January 15, 2014, <https://www.hsph.harvard.edu/news/press-releases/lack-of-physical-education-in-schools-concerns-parents/>.
87. Adekunle Sanyaolu et al., "Childhood and Adolescent Obesity in the United States: A Public Health Concern," *Global Pediatric Health* 6 (2019), <https://doi.org/10.1177/2333794X19891305>.
88. Todd Data, "Poll Finds Lack of Physical Education in Public Schools a Concern of Parents," Harvard T.H. Chan School of Public Health, January 15, 2014, <https://www.hsph.harvard.edu/news/press-releases/lack-of-physical-education-in-schools-concerns-parents/>.
89. Ibid.
90. Judith E. Rink and Tina J. Hall, "Research on Effective Teaching in Elementary School Physical Education," *The Elementary School Journal* 108, no. 3 (2008): 207–218.
91. Collin Webster, "Kids Need Physical Education – Even When They Can't Get It at School," University of South Carolina, June 5, 2020, [https://sc.edu/uofsc/posts/2020/06/06\\_conversation\\_pe\\_webster.php](https://sc.edu/uofsc/posts/2020/06/06_conversation_pe_webster.php).
92. Todd Data, "Poll Finds Lack of Physical Education in Public Schools a Concern of Parents," Harvard T.H. Chan School of Public Health, January 15, 2014, <https://www.hsph.harvard.edu/news/press-releases/lack-of-physical-education-in-schools-concerns-parents/>.
93. Petra Kühr et al., "Three Times as Much Physical Education Reduced the Risk of Children Being Overweight or Obese after 5 years," *Acta Paediatrica* 109, no. 3 (2020): 595–601.
94. Ibid.
95. Ibid.
96. Ibid.
97. "Unexplained Childhood Obesity? Consider Genetic Causes," Children's Hospital of Philadelphia, December 8, 2021, <https://www.chop.edu/news/unexplained-childhood-obesity-consider-genetic-causes>.
98. William S. Garver et al., The Genetics of Childhood Obesity and Interaction with Dietary Macronutrients, *Genes Nutr* 8, 271–87 (2013), <https://doi.org/10.1007/s12263-013-0339-5>.
99. Cristina Mărginean, Claudiu Mărginean, Lorena E. Meliș, "New Insights Regarding Genetic Aspects of Childhood Obesity: A Minireview," *Frontiers in Pediatrics* 6 (2018): 271, <https://doi.org/10.3389/fped.2018.00271>.
100. William S. Garver et al., The Genetics of Childhood Obesity and Interaction with Dietary Macronutrients, *Genes Nutr* 8, 271–87 (2013), <https://doi.org/10.1007/s12263-013-0339-5>.
101. Ibid.
102. Sonali Malhotra, Ramya Sivasubramanian, and Gitanjali Srivastava, "Evaluation and Management of Early Onset Genetic Obesity in Childhood," *Journal of Pediatric Genetics* 10, no. 3 (February 2021): 194–204. <https://doi.org/10.1055/s-0041-1731035>.
103. Ibid.
104. Ibid.
105. Ibid.
106. William S. Garver et al., The Genetics of Childhood Obesity and Interaction with Dietary Macronutrients, *Genes Nutr* 8, 271–87 (2013), <https://doi.org/10.1007/s12263-013-0339-5>.
107. Hélène Choquet and David Meyre, "Genomic Insights into Early-Onset Obesity," *Genome Medicine* 2, no. 6 (2010): 1–12, <https://genomemedicine.biomedcentral.com/articles/10.1186/gm157>.
108. William S. Garver et al., The Genetics of Childhood Obesity and Interaction with Dietary Macronutrients, *Genes Nutr* 8, 271–87 (2013), <https://doi.org/10.1007/s12263-013-0339-5>.
109. Ibid.
110. Sheridan H. Littleton, R. I. Berkowitz, and S.F.A. Grant, "Genetic Determinants of Childhood Obesity," *Molecular Diagnosis & Therapy* 24, no. 6 (2020): 653–663, <https://doi.org/10.1007/s40291-020-00496-1>.
111. William S. Garver et al., The Genetics of Childhood Obesity and Interaction with Dietary Macronutrients, *Genes Nutr* 8, 271–87 (2013), <https://doi.org/10.1007/s12263-013-0339-5>.

112. Anna Rosiek et al., "Effect of Television on Obesity and Excess of Weight and Consequences of Health," *International Journal of Environmental Research and Public Health*, August 12, 2015, <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4555288/>.
113. Ibid.
114. Elizabeth R. Pulgaron and Alan M. Delamater, "Obesity and Type 2 Diabetes in Children: Epidemiology and Treatment," *Current Diabetes Reports*, August 2014, <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4099943/>.
115. Fariba Ahmadizar et al., "Childhood Obesity in Relation to Poor Asthma Control and Exacerbation: A Meta-Analysis," *European Respiratory Journal* 48, no. 4 (2016): 1063–73, <https://www.doi.org/10.1183/13993003.00766-2016>.
116. Ibid.
117. Ibid.
118. Anna Rosiek et al., "Effect of Television on Obesity and Excess of Weight and Consequences of Health," *International Journal of Environmental Research and Public Health*, August 12, 2015, <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4555288/>.
119. Jason E. Lang, "Obesity, Nutrition, and Asthma in Children," *Pediatric Allergy, Immunology, and Pulmonology* 25, no. 2 (2012): 64–75, <https://doi.org/10.1089/ped.2011.0137>.
120. Emanuela di Palma et al., "Childhood Obesity and Respiratory Diseases: Which Link?" *Children*, February 25, 2021, <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7996509/>.
121. Anna Rosiek et al., "Effect of Television on Obesity and Excess of Weight and Consequences of Health," *International Journal of Environmental Research and Public Health*, August 12, 2015, <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4555288/>.
122. M. Schwartz and A. Chadha, "Type 2 Diabetes Mellitus in Childhood: Obesity and Insulin Resistance," *Journal of Osteopathic Medicine* 108, no. 9 (2018): 518–24, <https://doi.org/10.7556/jaoa.2008.108.9.518>.
123. Ibid.
124. "High Blood Pressure in Kids," *High Blood Pressure in Kids – Children's Health*, 2020. <https://www.childrens.com/health-wellness/high-blood-pressure-and-kids>.
125. Elizabeth R. Pulgaron and Alan M Delamater, "Obesity and Type 2 Diabetes in Children: Epidemiology and Treatment," *Current Diabetes Reports*, August 2014, <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4099943/>.
126. Ibid.
127. Ibid.
128. "Prevalence of Diagnosed Diabetes," Centers for Disease Control and Prevention, September 30, 2022, <https://www.cdc.gov/diabetes/data/statistics-report/diagnosed-diabetes.html>.
129. (283,000 children under the age of 20 with diabetes) – (244,000 with Type 1 diabetes) = 39,000 children and adolescents under the age of 20 with Type 2 diabetes
130. "Type 2 Diabetes Is Becoming More Common in Children," NIHR Evidence, January 7, 2023, <https://evidence.nihr.ac.uk/alert/type-2-diabetes-is-becoming-more-common-in-children/>.
131. Mohammad Asif, "The Prevention and Control the Type-2 Diabetes by Changing Lifestyle and Dietary Pattern," *Journal of Education and Health Promotion*, February 21, 2014, <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3977406/>.
132. "Type 2 Diabetes," Centers for Disease Control and Prevention, April 18, 2023, <https://www.cdc.gov/diabetes/basics/type2.html>.
133. Michael Pizzi and Kerryellen Vroman, "Childhood Obesity: Effects on Children's Participation, Mental Health, and Psychosocial Development," *Occupational Therapy In Health Care* 27, no. 2 (2013): 99–112, <https://doi.org/10.3109/07380577.2013.784839>.
134. Aikaterini Kanellopoulou et al., "The Association between Obesity and Depression among Children and the Role of Family: A Systematic Review," *Children*, August 18, 2022, <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC9406476/>.
135. Michael A. Pizzi and Kerryellen Vroman, "Childhood Obesity: Effects on Children's Participation, Mental Health, and Psychosocial Development," *Occupational Therapy In Health Care* 27, no. 2 (2013): 99–112, <https://doi.org/10.3109/07380577.2013.784839>.
136. Ibid.
137. Ibid.
138. Simeng Wang et al., "The Prevalence of Depression and Anxiety Symptoms among Overweight/Obese and Non-Overweight/Non-Obese Children/Adolescents in China: A Systematic Review and Meta-Analysis," *International Journal of Environmental Research and Public Health*, January 26, 2019, <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6388174/>.

139. Louise Lindberg et al., "Anxiety and Depression in Children and Adolescents with Obesity: A Nationwide Study in Sweden - BMC Medicine," *BioMed Central*, March 3, 2020, <https://bmcmedicine.biomedcentral.com/articles/10.1186/s12916-020-1498-z>.
140. Moria Golan, "Parents as Agents of Change in Childhood Obesity—From Research to Practice," *International Journal of Pediatric Obesity* 1, no. 2 (2006): 66, <https://doi.org/10.1080/17477160600644272>.
141. Michael A. Pizzi and Kerryellen Vroman, "Childhood Obesity: Effects on Children's Participation, Mental Health, and Psychosocial Development," *Occupational Therapy In Health Care* 27, no. 2 (2013): 99–112, <https://doi.org/10.3109/07380577.2013.784839>.
142. Moria Golan, "Parents as Agents of Change in Childhood Obesity—From Research to Practice," *International Journal of Pediatric Obesity* 1, no. 2 (2006): 66, <https://doi.org/10.1080/17477160600644272>.
143. Aikaterini Kanellopoulou, George Antonogeorgos, Konstantinos Douros, and Demosthenes B Panagiotakos, "The Association between Obesity and Depression among Children and the Role of Family: A Systematic Review," *Children*, August 18, 2022, <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC9406476/>.
144. Sarah-Jeanne Salvy et al., "Influence of Peers and Friends on Overweight/Obese Youths' Physical Activity," *Exercise and Sport Sciences Reviews*, July 2012, <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7187637/>.
145. Ibid.
146. Michael Pizzi and Kerryellen Vroman, "Childhood Obesity: Effects on Children's Participation, Mental Health, and Psychosocial Development," *Occupational Therapy In Health Care* 27, no. 2 (2013): 99–112, <https://doi.org/10.3109/07380577.2013.784839>.
147. Kristie Rupp and Stephanie M McCoy, "Bullying Perpetration and Victimization among Adolescents with Overweight and Obesity in a Nationally Representative Sample," *Childhood Obesity*, July 2019, <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7364321/>.
148. Rania Hussein, Ragaa Mohammed, Inass Ahmed, "Psychological Impact of Obesity in Children," *The Scientific Journal of Al-Azhar Medical Faculty, Girls* 4, no. 1 (January 2020): 17–21, [https://doi.org/10.4103/sjamf.sjamf\\_98\\_19](https://doi.org/10.4103/sjamf.sjamf_98_19).
149. Michael Pizzi and Kerryellen Vroman, "Childhood Obesity: Effects on Children's Participation, Mental Health, and Psychosocial Development," *Occupational Therapy In Health Care* 27, no. 2 (2013): 99–112, <https://doi.org/10.3109/07380577.2013.784839>.
150. Ibid.
151. Ibid.
152. "Loneliness and Social Isolation - Tips for Staying Connected," National Institute on Aging, accessed June 28, 2023, <https://www.nia.nih.gov/health/loneliness-and-social-isolation-tips-staying-connected>.
153. Mark Simmonds et al., "Predicting Adult Obesity from Childhood Obesity: A Systematic Review and Meta-Analysis," *Obesity Reviews: An Official Journal of the International Association for the Study of Obesity* 17, no. 2 (December 2015): 95–107, <https://doi.org/10.1111/obr.12334>.
154. Kenneth H. Rubin, Robert J. Coplan, and Julie C. Bowker, "Social Withdrawal in Childhood," *Annual Review of Psychology*, 2009, <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3800115/>.
155. Moria Golan, "Parents as Agents of Change in Childhood Obesity—From Research to Practice," *International Journal of Pediatric Obesity* 1, no. 2 (2006): 66, <https://doi.org/10.1080/17477160600644272>.
156. Ibid.
157. Ibid.
158. Jiyong Ling and Mekdes Gebremariam, "Embracing Parenting Role in Childhood Obesity," *BMC Public Health*, June 12, 2023, <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC10258925/>.
159. Ibid.
160. Ibid.
161. "About Us," Alliance for a Healthier Generation, 2023, <https://www.healthiergeneration.org/about-us>.
162. Ibid.
163. Ibid.
164. "Annual Impact Report FY2020," Alliance for a Healthier Generation, 2023, <https://www.healthiergeneration.org/annual-reports/fy2020>.
165. Ibid.
166. Ibid.

167. Jerica M. Berge and Jessie C Everts, "Family-Based Interventions Targeting Childhood Obesity: A Meta-Analysis," *Childhood Obesity*, April 2011, <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4504253/>.
168. Kirsten K. Davison et al., "A Childhood Obesity Intervention Developed by Families for Families: Results from a Pilot Study - International Journal of Behavioral Nutrition and Physical Activity," *BioMed Central*, January 5, 2013, <https://ijbnpa.biomedcentral.com/articles/10.1186/1479-5868-10-3>.
169. Ibid.
170. Ibid.
171. Ibid.
172. Jerica M. Berge and Jessie C Everts, "Family-Based Interventions Targeting Childhood Obesity: A Meta-Analysis," *Childhood Obesity*, April 2011, <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4504253/>.
173. Ibid.
174. Ibid.
175. Ibid.