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## Childhood obesity

The childhood obesity rate in the United States more than doubled during the past 30 years before recently plateauing at a high level, making it an ongoing public concern. This research and policy brief summarizes current research on childhood obesity and its relationship to other social and health outcomes. It is important to emphasize that this research identifies associations between childhood obesity, its predictors, and other social outcomes rather than the causal effects, which limits our understanding of childhood obesity and how to address it. Nonetheless, some interventions have produced promising results, which are synthesized on the second page of this brief.

### Trends

The overall obesity rate among children and adolescents has remained stable, albeit high, in recent years at a rate of 17.0 percent;<sup>1</sup> but rates and trends vary across population subgroups. Obesity rates among children whose parents have a high school diploma or less rose between 2005 and 2010, whereas obesity among children whose parents have at least a college degree declined.<sup>2</sup> Obesity rates also vary by (and increase with) age. Children ages 2–5 have an average obesity rate of 8.9 percent; the rate jumps to 17.5 percent for children ages 6–11, and then to 20.5 percent for children ages 12–19.<sup>3</sup>

### Obesity and sociodemographic factors

**Family stress.** Stressors in early childhood including childhood poverty, father incarceration, and overall cumulative family-level stress are associated with girls' but not boys' risk for obesity.<sup>4</sup> Family disruption and financial stress are associated with female, but not male, adolescents' overweight/obesity.<sup>5</sup>

**Maternal characteristics, health, and behaviors.** Maternal characteristics, health, and behaviors are closely associated with child obesity rates. The odds of obesity at age 4 were greatest for children whose mother was overweight, obese, or very obese prior to pregnancy, or had chronic hypertension<sup>6</sup>; that children of mothers with a high-risk body mass index (BMI) prior to pregnancy have a 53 percent chance of being overweight or obese themselves; and that maternal risky health behaviors are associated with higher weight for male adolescents.<sup>7</sup>

**Race and ethnicity.** Rates of childhood obesity differ by race and ethnicity, particularly when other risk factors are present.<sup>8</sup> Studies show that young African American and Latino children have higher average BMI scores and higher BMI growth trajectories than their white peers; that lower BMI growth rates were associated with higher maternal education, living in a two-parent home, and having been breastfed; that soda consumption

is an especially strong predictor of BMI growth trajectory for black children.<sup>9</sup> Children from racial/ethnic minorities have higher rates of several early-life risk factors for obesity than their white peers, including maternal depression and fast food consumption.<sup>10</sup> Accounting for these differential risk factors attenuates the racial and ethnic differences.<sup>11</sup>

### Obesity and the environment

Children are more likely to become obese if their childcare centers, schools, and community centers do not support healthy diets and physical activity. Although affordability and marketing of healthful food options can affect the health of children,<sup>12</sup> weight is more associated with physical activity infrastructures than with food environments. Higher accessibility to parks and recreational facilities are associated with lower BMI scores, and access to sports facilities is associated with more physical activity.<sup>13</sup>

### Obesity, health, and social outcomes

**Long-term health.** A large body of evidence shows that childhood and adolescent obesity can have a lasting, negative impact on premature mortality and physical morbidity in later life.<sup>14</sup> They are associated with adult health risks like high blood pressure, high cholesterol, metabolic syndrome, Type 2 diabetes, asthma, sleep apnea, fatty liver disease, and orthopedic problems. These health consequences are not just found in adulthood, but during childhood as well.<sup>15</sup> And, adults who were obese as children are more than twice as likely to die by age 55 than those who had a BMI in the average range.<sup>16</sup>

**Weight stigma.** Children who are obese are likely to experience weight stigma, which has its own negative health consequences, yet is rarely addressed in obesity prevention efforts.<sup>17</sup> Experiencing weight-based teasing is associated with lower physical self-concept and self-confidence, and lower levels of physical fitness.<sup>18</sup>

**Self-concept and peers.** Childhood obesity is associated with negative body image, lower self-esteem, depression, discrimination and stigmatization by peers, and overall lower quality of life.<sup>19</sup> At the same time, high social status in school may act as a protective factor against weight gain in adolescence.<sup>20</sup>

**Achievement and mental health.** Obese children are more likely to experience grade repetition, attention deficit/hyperactivity disorder, and depression and learning disabilities. They also exhibit lower IQs and lower executive functioning and attention than their non-overweight counterparts.<sup>21</sup> Obese youth have a 39 percent lower chance of obtaining a college degree than their normal weight peers.<sup>22</sup>

## Promising interventions by age group

**Infancy.** Experimental evidence indicates that reducing maternal pre-pregnancy and gestational weight can help reduce weight gain of the fetus.<sup>23</sup> Research also suggests that infants gain less weight in the first year of life when parents are taught soothing strategies other than feeding and focus on prolonging infant sleep duration, delaying the introduction of solid foods, and encouraging acceptance of new foods.<sup>24</sup>

**Early childhood.** Promising interventions with childcare providers include improving understanding of obesity,<sup>25</sup> modifying menus, improving nutrition, and engaging parents to help promote healthful eating,<sup>26</sup> and increasing exercise.<sup>27</sup> These activities are associated with decreases in children's BMI; greater consumption of fruits and vegetables by parents and children; and decreased junk food consumption by children, resulting in decreased obesity.

**Middle childhood.** Recent meta-analysis results suggest that successful programs targeting middle childhood include providing information on nutrition and physical activity, modifying the environment, involving parents, and improving physical activity; the most promising programs tend to last more than one year in duration.<sup>28</sup> A particularly promising program, APPLE Schools in Alberta, CN, employs full-time School Health Facilitators to promote healthy eating and active lifestyles while engaging stakeholders, parents, and the community.<sup>29</sup>

**Adolescence.** Public middle school policies that restrict high-fat and sugary snacks, the availability of sweetened beverages, and the fat content of all foods served are associated with increases in students' consumption of nutritious foods and decreases in consumption of undesirable foods.<sup>30</sup> A study of public schools in New York examined the impact of installing cooled water dispensers to promote water over high-calorie beverages on BMI scores, finding a significant decrease in BMI and a reduction in being overweight.<sup>31</sup>

## Cross-cutting interventions

**School.** School-based interventions appear to be most effective for obesity prevention, especially when combined with parent engagement. A recent international literature review concluded that physical-activity and diet interventions in school-based settings that also include family, home, and community components have produced the most robust evidence for effectiveness in preventing obesity.<sup>32</sup> The most effective components appear to be: school curricula that address healthy eating, physical activity, and body image; increased physical activity sessions; improvements in nutrition quality of food supplies within schools; and creating an environment and culture that supports children's healthy eating and physical activity.<sup>33</sup>

**Community.** Promising interventions include improving children's access to healthy environments and the use of community health workers; for African American youth, culturally sensitive obesity programs delivered during activities outside of school hours, with community engagement, show promise. A review of environmental components of obesity found promising the provision of free or low-cost fruit, free or low-cost water in school, and a healthy breakfast;

availability of school playgrounds; and limiting screen time at home.<sup>34</sup> Additionally, a recent literature review of community-level obesity interventions for African American youth concluded that, in general, activities outside of school focused on weight-related behavior and emphasized cultural adaptation and community engagement, had a positive impact on healthful eating behaviors for African American youth.<sup>35</sup>

**Soda tax.** There is mixed evidence about taxes on sugar-sweetened beverages. Soda-specific taxes, for instance, have been shown to reduce household purchases of carbonated beverages;<sup>36</sup> but may result in substitution from soda to other sugary beverages. Moreover, vending machine restrictions and soft drink taxes have not demonstrated effectiveness at reducing children's weight.<sup>37</sup> Thus, it may be more productive to incorporate such taxes as part of larger initiatives to promote healthier foods rather than stand-alone policies.<sup>38</sup> A recent analysis of the cost-effectiveness of seven large-scale obesity interventions found that a sugar-sweetened beverage excise tax; elimination of the tax subsidy for advertising unhealthy food to children; and nutrition standards for food and beverages sold in schools saved more in health care costs than they cost to implement.<sup>39</sup>

**Multisector.** Results from multi-setting interventions are mixed. For example, a randomized control trial (RCT) of Shape Up Somerville focused on policy and environmental change to help children increase physical activity; results indicated a reduction in BMI for intervention communities compared to control communities.<sup>40</sup> In contrast, the Massachusetts Childhood Obesity Research Demonstration (MA-CORD) spanned several domains including community health centers, after-school care settings, and the community in general.<sup>41</sup> The RCT results for children ages 2 through 5 found that intervention sites did better on some but not all of the process improvements and had small changes in BMI scores.<sup>42</sup>

**Technology.** Mobile technologies (apps; games) are promising components of some interventions although additional rigorous research is needed. Apps that are used to monitor health and behaviors have shown some evidence of promoting physical activity, readiness to change physical routines, and improved self-monitoring of diets and physical activity goals.<sup>43</sup> In addition, "exergaming," which combines physical activity with video games as part of a multifaceted weight intervention program has shown promising trends in improved fitness, and reduced caloric intake for children.<sup>44</sup>

## Research gaps

Methodologically rigorous studies have generated information about childhood obesity prevention and intervention, but most have been conducted in school settings, leaving a gap in evidence on interventions that target environmental and society-level factors. In addition, more rigorous evidence is needed about interventions that target older children and adolescents; that assess long-term influences on BMI scores and obesity rates; that are comprised of cross-cutting, multi-system interventions; that implement and test emerging innovative strategies and technologies; and that assess specific effects for important subgroups such as gender, socioeconomic status, and race and ethnicity. ■

*For a list of the sources used for this brief and further reading, visit [www.irp.wisc.edu/publications/fastfocus.htm](http://www.irp.wisc.edu/publications/fastfocus.htm).*

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