



# Policy Statement—Children, Adolescents, Obesity, and the Media

## COUNCIL ON COMMUNICATIONS AND MEDIA

### KEY WORDS

media, obesity, overweight, screen time, junk food, television

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## abstract

Obesity has become a worldwide public health problem. Considerable research has shown that the media contribute to the development of child and adolescent obesity, although the exact mechanism remains unclear. Screen time may displace more active pursuits, advertising of junk food and fast food increases children's requests for those particular foods and products, snacking increases while watching TV or movies, and late-night screen time may interfere with getting adequate amounts of sleep, which is a known risk factor for obesity. Sufficient evidence exists to warrant a ban on junk-food or fast-food advertising in children's TV programming. Pediatricians need to ask 2 questions about media use at every well-child or well-adolescent visit: (1) How much screen time is being spent per day? and (2) Is there a TV set or Internet connection in the child's bedroom? *Pediatrics* 2011;128:201–208

## INTRODUCTION

Obesity represents a clear and present danger to the health of children and adolescents. Its prevalence among American youth has doubled in the past 3 decades,<sup>1</sup> and there are now more overweight and obese adults in the United States than adults of normal weight.<sup>2</sup> However, obesity is also a worldwide problem; rates are increasing in nearly every country.<sup>3,4</sup> It is increasingly clear that the media, particularly TV, play an important role in the etiology of obesity.<sup>5</sup> As a result, many countries are now establishing new regulations for advertising to children on TV, and many government health agencies are now issuing recommendations for parents regarding the amount of time children spend watching TV.<sup>6</sup> Unfortunately, there are currently no data relating other media to obesity.

## MEDIA AND OBESITY

There are a number of ways that watching TV could be contributing to obesity: (1) increased sedentary activity and displacement of more physical pursuits; (2) unhealthy eating practices learned from both the programming and the advertisements for unhealthy foods; (3) increased snacking behavior while viewing; and (4) interference with normal sleep patterns. However, most researchers now agree that the evidence linking excessive TV-viewing and obesity is persuasive.<sup>7–9</sup> There have been dozens of longitudinal and correlational studies documenting a connection.<sup>9</sup> An increasing number of these studies hold ethnicity and socioeconomic status—known to be key factors in obesity—constant and still reveal that TV-viewing is a significant con-

tributor to obesity.<sup>7,10</sup> Results of the longitudinal studies are particularly convincing. For example, a remarkable 30-year study in the United Kingdom found that a higher mean of daily hours of TV viewed on weekends predicted a higher BMI at the age of 30. For each additional hour of TV watched on weekends at age 5, the risk of adult obesity increased by 7%.<sup>11</sup> A group of researchers in Dunedin, New Zealand, followed 1000 subjects from birth to 26 years of age and found that average weeknight TV-viewing between the ages of 5 and 15 years was strongly predictive of adult BMI.<sup>12</sup> In a study of 8000 Scottish children, viewing more than 8 hours of TV per week at age 3 was associated with an increased risk of obesity at age 7.<sup>13</sup> Also, in 8000 Japanese children, more TV-viewing at age 3 resulted in a higher risk of being overweight at age 6.<sup>14</sup> Numerous American studies have had similar findings.<sup>15–23</sup>

The presence of a TV set in a child's bedroom seems to exacerbate the impact of TV-viewing on children's weight status.<sup>24–28</sup> A study of 2343 children aged 9 to 12 years revealed that having a bedroom TV set was a significant risk factor for obesity, independent of physical activity.<sup>24</sup> A cross-sectional study of 2761 parents with young children in New York found that 40% of the 1- to 5-year-olds had a bedroom TV, and those who did were more likely to be overweight or obese.<sup>25</sup> Teenagers with a bedroom TV spent more time watching TV, less time being physically active, ate fewer family meals, had greater consumption of sweetened beverages, and ate fewer vegetables than did teenagers without a bedroom TV.<sup>26</sup>

Recent correlational studies have also found a strong association between time spent watching TV and blood glucose level control in young people with diabetes,<sup>29</sup> type 2 diabetes mellitus,<sup>30</sup>

insulin resistance,<sup>31</sup> metabolic syndrome,<sup>32</sup> hypertension,<sup>33,34</sup> and high cholesterol levels.<sup>35–37</sup> Furthermore, when TV time is diminished, so are measures of adiposity.<sup>38,39</sup>

## MECHANISMS

How might time spent with media result in obesity? Contrary to popular opinion, overweight and obesity probably result from small, incremental increases in caloric intake (or increases in sedentary activities).<sup>40</sup> An excess intake of 50 kcal/day (eg, an extra pat of butter) produces a weight gain of 5 lb/year. Drinking a can of soda per day produces a weight gain of 15 lb/year.<sup>41</sup> Nearly 40% of children's caloric intake now comes from solid fat and added sugars, and soda or fruit drinks provide nearly 10% of total calories.<sup>42</sup> Because obesity is caused by an imbalance between energy intake and energy expenditure, screen time may contribute in several different ways.

## Displacement of More Active Pursuits

Children spend more time with media than in any other activity except for sleeping—an average of more than 7 hours/day.<sup>43</sup> Many studies have found that physical activity decreases as screen time increases,<sup>44–46</sup> but many other studies have not.<sup>47–49</sup> Children and teenagers who use a lot of media may tend to be more sedentary in general,<sup>7,50</sup> or researchers' measures of physical activity may be too imprecise.<sup>9</sup> Nevertheless, increasing physical activity, decreasing media time, and improving nutritional practices have been shown to prevent the onset of obesity, if not decrease existing obesity as well.<sup>51–55</sup> Some of the newer interactive video games may be useful in this way.<sup>56,57</sup> For example, a study of preteens playing *Dance Revolution* and Nintendo's *Wii Sports* found that energy expenditure was equivalent to moderate-intensity walking.<sup>58</sup>

## Unhealthy Eating Habits and Effects of Advertising

Children and teenagers who watch more TV tend to consume more calories or eat higher-fat diets,<sup>59–64</sup> drink more sodas,<sup>65</sup> and eat fewer fruits and vegetables.<sup>66</sup> Some researchers have argued that the viewing of TV while eating suppresses cues of satiety, which leads to overeating.<sup>60</sup> Others believe that viewers are primed to choose unhealthy foods as a consequence of viewing advertisements for foods high in fat, salt, and/or sugar and low in nutritional content (“junk food”).<sup>61</sup> On any given day, 30% of American youngsters are eating fast food and consuming an additional 187 kcal (equaling 6 lb/year).<sup>67,68</sup> Fast food is big business: Americans spend more than \$110 billion annually on it, which is more than that spent on higher education, computers, or cars.<sup>69</sup> A December 2010 study examined 3039 possible meal combinations at a dozen restaurant chains and found only 12 meals that met nutrition criteria for preschoolers. The same study found that 84% of parents had purchased fast food for their children in the previous week.<sup>70</sup> More than 80% of all advertisements in children's programming are for fast foods or snacks,<sup>71–73</sup> and for every hour that children watch TV, they see an estimated 11 food advertisements.<sup>74</sup> Although exposure to food ads has decreased in the past few years for young children,<sup>75</sup> it has increased for adolescents.<sup>75</sup>

In 2009, the fast-food industry alone spent \$4.2 billion on advertising in all media.<sup>70</sup> A study of 50 000 ads from 2003–2004 on 170 top-rated shows found that 98% of food ads seen by children aged 2 to 11 years and nearly 90% of food ads seen by teenagers are for products that are high in fat, sugar, and/or sodium and low in nutritional content (junk food).<sup>76</sup> A newer study of 1638 hours of TV and nearly 9000 food

ads found that young people see an average of 12 to 21 food ads per day, for a total of 4400 to 7600 ads per year, yet they see fewer than 165 ads that promote fitness or good nutrition.<sup>77</sup> In 1 study, black children viewed 37% more ads than other youth.<sup>78</sup> New technology is enabling advertisers to reach young children and teenagers with a variety of online interactive techniques.<sup>79–82</sup> A study of the top 5 brands in 8 different food and beverage categories found that all of them had Internet Web sites: 63% had advergames (games used to advertise the product), 50% had cartoon characters, and 58% had a designated children's area.<sup>79</sup> Half of the Web sites urged children to ask their parents to buy the products, yet only 17% contained any nutritional information.<sup>79</sup> Teenagers' cell phones can be targeted by fast-food companies that can offer teenagers a discount on fast food as they walk by a particular restaurant.<sup>81</sup>

Available research results clearly indicate that advertising is effective in getting younger children to request more high-fat/low-nutrition food (junk food) and to attempt to influence their parents.<sup>5,9,83–85</sup> For example, a 2006 study of 827 third-grade children followed for 20 months found that total TV time and total screen media time predicted future requests for advertised foods and drinks.<sup>86</sup> Even brief exposures to TV food ads can influence children as young as preschool age in their food choices.<sup>87</sup> In 1 recent experiment, children consumed 45% more snacks when exposed to food advertising while watching cartoons than advertising for other products.<sup>84</sup> Similarly, children who played an online advergame that marketed healthy foods were more likely to eat healthy snacks than those who played an online advergame that advertised junk food.<sup>82</sup> Perhaps the most convincing study about the impact of advertising involved 63

children who tasted 5 pairs of identical foods (eg, French fries) and beverages (eg, milk) from unbranded packaging versus branded packaging. The results of the experiment revealed that the children strongly preferred the branded food and drinks to the unbranded foods.<sup>88</sup>

To illustrate the power of marketing, compare the commitment of the Robert Wood Johnson Foundation to spend \$100 million per year to try to decrease childhood obesity with the fact that the food industry spends more than that every month marketing primarily junk food and fast food to young people.<sup>84,89</sup>

Food is also unhealthily portrayed in most TV programming and movies.<sup>9,84,90,91</sup> A study of the 30 highest-rated programs among 2- to 5-year-olds found that an average child would see more than 500 food references per week, half of which were to empty-calorie or high-fat/sugar/salt foods (D. L. G. Borzekowski, EdD, "Watching What They Eat: A Content Analysis of Televised Food References Reaching Preschool Children," unpublished manuscript, 2001). In an analysis of 100 films from 1991 through 2000, fats and sweets were the most common foods depicted.<sup>91</sup> Hollywood product placements are also being used to influence the food preferences and purchasing patterns of children and adolescents.<sup>92,93</sup> In the 200 movies examined from 1996 to 2005, a total of 1180 brand placements were identified. Candy (26%) and salty snacks (21%) were the most prevalent food brands, sugar-sweetened beverages (76%) were the most prevalent beverage brands, and fast food composed two-thirds of the food retail establishment brand placements.<sup>93</sup>

### Effect of Media on Sleep Habits

TV and other media are known to displace or disturb young people's sleep patterns.<sup>5,94,95</sup> A longitudinal study of

adolescents in New York found that viewing 3 or more hours/day of TV doubled the risk of difficulty falling asleep compared with adolescents who watch less than 1 hour/day.<sup>96</sup> There is also now evidence that later bedtimes and less sleep may be associated with a greater risk of obesity.<sup>97–101</sup> The mechanism may be that sleep loss leads to increased snacking and consumption of less healthy foods to maintain energy,<sup>102,103</sup> that sleep deprivation leads to fatigue and therefore greater sedentary behavior,<sup>104</sup> or that children who do not get enough sleep have metabolic changes as well.<sup>105</sup>

Stress may also play a role, although there are only a handful of studies that have studied this subject so far. For example, a Scottish study of nearly 1500 4- to 12-year-olds found that heavier TV use produced greater psychological stress in children and that this effect was independent of, but exacerbated by, decreases in exercise.<sup>106</sup>

## CONCLUSIONS

Media clearly play an important role in the current epidemic of childhood and adolescent obesity. The sheer number of advertisements that children and adolescents see for junk food and fast food have an effect. So, too, does the shift away from good nutritional practices that increased media screen time seems to create. Any success in dealing with the current epidemic will require a major change in society's recognition of media exposure as a major risk factor for obesity and in young people's media habits and the advertisements to which they are exposed.<sup>107,108</sup>

## RECOMMENDATIONS

1. Pediatricians should ask parents and patients 2 key questions about media use: (1) How much time per day does the child or teenager spend with screen media? and (2) Is there a TV set or unrestricted,

unmonitored Internet connection throughout the house, including in the child's bedroom?<sup>109</sup> This recommendation should be incorporated into every well-child visit, as outlined in *Bright Futures*.<sup>110</sup>

2. Pediatricians should encourage parents to discuss food advertising with their children as they monitor children's TV-viewing and teach their children about appropriate nutrition.<sup>111–113</sup>
3. Pediatricians should continue to counsel parents to limit total non-educational screen time to no more than 2 hours/day, to avoid putting TV sets and Internet connections in children's bedrooms, to coveiw with their children, to limit nighttime screen media use to improve children's sleep, and to try strongly to avoid screen exposure for infants under the age of 2 years. In a recent study of 709 7- to 12-year-olds, children who did not adhere to the American Academy of Pediatrics guidelines of less than 2 hours/day of screen time<sup>114</sup> and 11 000 to 13 000 pedometer steps per day were 3 to 4 times more likely to be overweight.<sup>115</sup> Conversely, preschool-aged children who ate dinner with their parents, got adequate sleep, and had limited screen-time hours had a 40% lower prevalence of obesity than those exposed to none of these routines.<sup>116</sup>
4. Pediatricians should work with community groups and schools to implement media education programs in child care centers, schools, and community-based programs such as the YMCA. Such programs that teach children how to understand and interpret advertisements may have the potential to immunize young people against harmful media effects.<sup>117</sup> In addition, programs that educate parents about limiting media

use in general have already been shown to be highly effective.<sup>8,38,39,118,119</sup> Pediatricians should work with their state chapters, the AAP, parent and public health groups, and the White House<sup>120</sup> to do the following:

- Ask Congress, the Federal Trade Commission, and the Federal Communications Commission to implement a ban on junk-food advertising during programming that is viewed predominantly by young children.<sup>84,121,122</sup> Currently, several European countries restrict food advertising aimed at young children.<sup>123</sup> Several food manufacturers have already indicated a willingness to implement such a ban voluntarily,<sup>124,125</sup> but it remains to be seen whether they will follow through.<sup>126–128</sup> For example, children's cereals remain considerably healthier than adult cereals; they contain 85% more sugar, 65% less fiber, and 60% more sodium.<sup>129</sup> One-quarter of all food and beverage advertising originates from companies that do not participate in the initiative, and two-thirds of all advertising by companies that do participate is still for food and beverages of low nutritional value.<sup>85</sup> In addition, the food and beverage industry remains steadfastly opposed to any regulation. For example, in 2007, 1 soft drink company spent more than \$1.7 million to lobby against marketing restrictions and school nutrition legislation.<sup>130</sup> Two recent studies showed that a ban on fast-food ads would reduce the number of overweight children and adolescents in the United States by an estimated 14% to 18%.<sup>131,132</sup> Just eliminating federal tax deductions for

fast-food ads that target children would reduce childhood obesity by 5% to 7%.<sup>131</sup> On the other hand, advertisements and public service announcements for health foods and healthy nutritional practices should be encouraged. One recent experiment showed that children exposed to attractive advertisements for healthy foods develop significantly more positive attitudes than children shown junk-food ads.<sup>133</sup>

- Ask Congress and the Federal Communications Commission to prohibit interactive advertising involving junk food or fast food to children via digital TV, cell phones, and other media<sup>79–81,121</sup> and to ban payments for product placement in movies. Restoring power to the Federal Trade Commission to more tightly regulate children's advertising could be another way of accomplishing this goal.<sup>84,134,135</sup>
- Ask Congress to fund media research (eg, the Children Media Research and Advancement Act [CAMRA]). More research is specifically needed to determine (1) how heavy media use in children reflects or contributes to psychosocial elements of the child's life, such as stress in the home, (2) how new media technologies may be playing a role in exacerbating exposure to ads or encouraging more sedentary behavior, and (3) which of the above-mentioned mechanisms is most responsible for contributing to obesity and how such mechanisms can be ameliorated.<sup>83,134</sup>
- Encourage the production of more counteradvertising and more prosocial video games<sup>136,137</sup> and Web sites that encourage

children to choose healthy foods.<sup>82</sup>

6. Pediatricians should be aware that children with high levels of screen time have higher levels of childhood stress, which puts them at risk not only for obesity but also for a number of stress-associated morbidities (eg, mood disorders, substance abuse, diabetes, cardiovascular disease, asthma).<sup>138</sup> Consequently, displacing screen time with more prosocial or resilience-building activities (eg, exercise, imaginative or social play) is an important ap-

proach to addressing a wide array of societal ills including obesity.<sup>139</sup>

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#### REFERENCES

1. Skelton JA, Cook SR, Aunger P, Klein JD, Barlow SE. Prevalence and trends of severe obesity among US children and adolescents. *Acad Pediatr*. 2009;9(5):322–329
2. Ogden CL, Carroll MD, McDowell MA, Flegal KM. Obesity among adults in the United States: no statistically significant change since 2003–2004. *NCHS Data Brief*. 2007; (1):1–8
3. Preidt R. Overweight now a global problem. Available at: <http://abcnews.go.com/print?id=4509129>. Accessed April 29, 2010
4. Guthold R, Cowan MJ, Autenrieth CS, Kahn L, Riley LM. Physical activity and sedentary behavior among schoolchildren: a 34-country comparison. *J Pediatr*. 2010; 157(1):43–49
5. Jordan AB, Strasburger VC, Kramer-Golinkoff EK, Strasburger VC. Does adolescent media use cause obesity and eating disorders? *Adolesc Med State Art Rev*. 2008;19(3):431–449
6. Kelly B, Halford JC, Boyland EJ, et al. Television food advertising to children: a global perspective. *Am J Public Health*. 2010;100(9):1730–1736
7. Jordan AB. Heavy television viewing and childhood obesity. *J Child Media*. 2007; 1(9):45–54
8. Dennison BA, Edmunds LS. The role of television in childhood obesity. *Progr Pediatr Cardiol*. 2008;25(2):191–197
9. Strasburger VC, Wilson BJ, Jordan AB. *Children, Adolescents, and the Media*. 2nd ed. Thousand Oaks, CA: Sage; 2009
10. Singh GK, Kogan MD, Van Dyck PC, Siahpush M. Racial/ethnic, socioeconomic, and behavioral determinants of childhood and adolescent obesity in the United States: analyzing independent and joint associations. *Ann Epidemiol*. 2008;18(9):682–695
11. Viner RM, Cole TJ. Television viewing in early childhood predicts adult body mass index. *J Pediatr*. 2005;147(4):429–435
12. Hancox RJ, Milne BJ, Poulton R. Association between child and adolescent television viewing and adult health: a longitudinal birth cohort study. *Lancet*. 2004; 364(9430):257–262
13. Reilly JJ, Armstrong J, Dorosty AR, et al; Avon Longitudinal Study of Parents and Children Study Team. Early life risk factors for obesity in childhood: cohort study. *BMJ*. 2005;330(7504):1357
14. Sugimori H, Yoshida K, Izuno T, et al. Analysis of factors that influence body mass index from ages 3 to 6 years: a study based on the Toyama cohort study. *Pediatr Int*. 2004;46(3):302–310
15. Proctor MH, Moore LL, Gao D, et al. Television viewing and change in body fat from preschool to early adolescence: the Framingham Children’s Study. *Int J Obes Relat Metab Disord*. 2003;27(7):827–833
16. Kaur H, Choi WS, Mayo MS, Harris KJ. Duration of television watching is associated with increased body mass index. *J Pediatr*. 2003;143(4):506–511
17. Lumeng JC, Rahnema S, Appugliese D, Kaciroti N, Bradley RH. Television exposure and overweight risk in preschoolers. *Arch Pediatr Adolesc Med*. 2006;160(4):417–422
18. O’Brien M, Nader PR, Houts RM, et al. The ecology of childhood overweight: a 12-year longitudinal analysis. *Int J Obes (Lond)*. 2007;31(9):1469–1478
19. Henderson VR. Longitudinal associations between television viewing and body mass index among white and black girls. *J Adolesc Health*. 2007;41(6):544–550
20. Boone JE, Gordon-Larsen P, Adair LS, Popkin BM. Screen time and physical activity during adolescence: longitudinal effects on obesity in young adulthood. *Int J Behav Nutr Phys Act*. 2007;4:26. Available at: [www.ijbnpa.org/content/4/1/26](http://www.ijbnpa.org/content/4/1/26). Accessed June 19, 2009
21. Davison BA, Marshall SJ, Birch LL. Cross-sectional and longitudinal associations between TV viewing and girls’ body mass index, overweight status, and percentage of body fat. *J Pediatr*. 2006;149(1):32–37
22. Danner FW. A national longitudinal study of the association between hours of TV viewing and the trajectory of BMI growth among US children. *J Pediatr Psychol*. 2008;33(10):1100–1107
23. Meyer AM, Evenson KR, Couper DJ, Stevens J, Pereira MA, Heiss G. Television, physical activity, diet, and body weight status: the ARIC cohort. *Int J Behav Nutr Phys Act*. 2008;5(1):68. Available at: [www.ijbnpa.org/content/5/1/68](http://www.ijbnpa.org/content/5/1/68). Accessed June 19, 2009
24. Adachi-Mejia AM, Longacre MR, Gibson JJ, Beach ML, Titus-Ernstoff LT, Dalton MA. Children with a TV set in their bedroom at higher risk for being overweight. *Int J Obes (Lond)*. 2007;31(4):644–651
25. Dennison BA, Erb TA, Jenkins PL. Television viewing and television in bedroom associated with overweight risk among low-income preschool children. *Pediatrics*. 2002;109(6):1028–1035
26. Barr-Anderson DJ, van den Berg P, Neumark-Sztainer D, Story M. Characteristics associated with older adolescents

- who have a television in their bedrooms. *Pediatrics*. 2008;121(4):718–724
27. Delmas C, Platat C, Schweitzer B, Wagner A, Oujaa M, Simon C. Association between television in bedroom and adiposity throughout adolescence. *Obesity*. 2007; 15(10):2495–2503
  28. Sisson SB, Broyles ST, Newton RL Jr, Baker BL, Chernausk SD. TVs in the bedrooms of children: does it impact health and behavior? *Prev Med*. 2011;52(2):104–108
  29. Margeisdottir HD, Larsen JR, Brunborg C, Sandvik L, Dahl-Jørgensen K; Norwegian Study Group for Childhood Diabetes. Strong association between time watching television and blood glucose control in children and adolescents with type 1 diabetes. *Diabetes Care*. 2007;30(6):1567–1570
  30. Hu FB, Li TY, Colditz GA, Willett WC, Manson JE. Television watching and other sedentary behaviors in relation to risk of obesity and type 2 diabetes mellitus in women. *JAMA*. 2003;289(14):1785–1791
  31. Hardy LL, Denney-Wilson E, Thrift AP, Okely AD, Baur LA. Screen time and metabolic risk factors among adolescents. *Arch Pediatr Adolesc Med*. 2010;164(7):643–649
  32. Mark AE, Janssen I. Relationship between screen time and metabolic syndrome in adolescents. *J Public Health (Oxf)*. 2008; 30(2):153–160
  33. Pardee PE, Norman GJ, Lustig RH, Preud'homme D, Schwimmer JB. Television viewing and hypertension in obese children. *Am J Prev Med*. 2007;33(6):439–443
  34. Martinez-Gomez D, Tucker J, Heelan KA, Welk GJ, Eisenmann JC. Associations between sedentary behavior and blood pressure in children. *Arch Pediatr Adolesc Med*. 2009;163(8):724–730
  35. Fung TT, Rimm EB, Spiegelman D, et al. Association between dietary patterns and plasma biomarkers of obesity and cardiovascular disease risk. *Am J Clin Nutr*. 2001; 73(1):61–67
  36. Martinez-Gomez D, Rey-López JP, Chillón P, et al; AVENA Study Group. Excessive TV viewing and cardiovascular disease risk factors in adolescents. The AVENA cross-sectional study. *BMC Public Health*. 2010; 10:274
  37. Stamatakis E, Hamer M, Dunstan DW. Screen-based entertainment time, all-cause mortality, and cardiovascular events: population-based study with ongoing mortality and hospital events follow-up. *J Am Coll Cardiol*. 2011;57(3):292–299
  38. Robinson TN. Reducing children's television viewing to prevent obesity: a randomized controlled trial. *JAMA*. 1999;282(16): 1561–1567
  39. Epstein LH, Roemmich JN, Robinson JL, et al. A randomized trial of the effects of reducing television viewing and computer use on body mass index in young children. *Arch Pediatr Adolesc Med*. 2008;162(3): 239–245
  40. Dietz WH Jr. Television, obesity, and eating disorders. *Adolesc Med*. 1993;4(3): 543–549
  41. Apovian CM. Sugar-sweetened soft drinks, obesity, and type 2 diabetes. *JAMA*. 2004; 292(8):978–979
  42. Reedy J, Krebs-Smith SM. Dietary sources of energy, solid fats, and added sugars among children and adolescents in the United States. *J Am Diet Assoc*. 2010; 110(10):1477–1484
  43. Rideout V. *Generation M2: Media in the Lives of 8- to 18-Year-Olds*. Menlo Park, CA: Kaiser Family Foundation; 2010
  44. Nelson MC, Neumark-Sztainer D, Hannan PJ, Sirard JR, Story M. Longitudinal and secular trends in physical activity and sedentary behavior during adolescence. *Pediatrics*. 2006;118(6). Available at: www.pediatrics.org/cgi/content/full/118/6/e1627
  45. Hardy LL, Bass SL, Booth ML. Changes in sedentary behavior among adolescent girls: a 2.5-year prospective cohort study. *J Adolesc Health*. 2007;40(2):158–165
  46. Sisson SB, Broyles ST, Baker BL, Katzmarzyk PT. Screen time, physical activity, and overweight in U.S. youth: National Survey of Children's Health 2003. *J Adolesc Health*. 2010;47(3):309–311
  47. Burdette HL, Whitaker RC. A national study of neighborhood safety, outdoor play, television viewing, and obesity in preschool children. *Pediatrics*. 2005;116(3):657–662
  48. Taveras EM, Field AE, Berkey CS, et al. Longitudinal relationship between television viewing and leisure-time physical activity during adolescence. *Pediatrics*. 2007; 119(2). Available at: www.pediatrics.org/cgi/content/full/119/2/e314
  49. Melkevik O, Torsheim T, Iannotti RJ, Wold B. Is spending time in screen-based sedentary behaviors associated with less physical activity: a cross national investigation. *Int J Behav Nutr Phys Act*. 2010;7:46
  50. Vandewater E, Shim M, Caplovitz A. Linking obesity and activity level with children's television and video game use. *J Adolesc*. 2004;27(1):71–85
  51. Epstein LH, Paluch RA, Consalvi A, Riordan K, Scholl T. Effects of manipulating sedentary behavior on physical activity and food intake. *J Pediatr*. 2002;140(3):334–339
  52. Washington R. One way to decrease an obesogenic environment. *J Pediatr*. 2005; 147(4):417–418
  53. Dietz WH. What constitutes successful weight management in adolescents? *Ann Intern Med*. 2006;145(2):145–146
  54. Goldfield GS, Mallory R, Parker T, et al. Effects of open-loop feedback on physical activity and television viewing in overweight and obese children: a randomized, controlled trial. *Pediatrics*. 2006;118(1). Available at: www.pediatrics.org/cgi/content/full/118/1/e157
  55. Haerens L, Deforche B, Maes L, Stevens V, Cardon G, De Bourdeaudhuij. Body mass effects of a physical activity and healthy food intervention in middle schools. *Obesity*. 2006;14(5):847–854
  56. Mellecker RR, McManus AM. Energy expenditure and cardiovascular responses to seated and active gaming in children. *Arch Pediatr Adolesc Med*. 2008;162(9): 886–891
  57. Pate RR. Physically active video gaming: an effective strategy for obesity prevention? *Arch Pediatr Adolesc Med*. 2008;162(9): 895–896
  58. Graf DL, Pratt LV, Hester CN, Short KR. Playing active video games increases energy expenditure in children. *Pediatrics*. 2009; 124(2):534–540
  59. Robinson TN, Killen JD. Ethnic and gender differences in the relationships between television viewing and obesity, physical activity and dietary fat intake. *J Health Educ*. 1995;26(2 suppl):S91–S98
  60. Blass EM, Anderson DR, Kirkorian HL, Pempek TA, Price I, Koleini MF. On the road to obesity: television viewing increases intake of high-density foods. *Physiol Behav*. 2006;88(4–5):597–604
  61. Zimmerman FJ, Bell JF. Associations of television content type and obesity in children. *Am J Public Health*. 2010;100(2): 334–340
  62. Wiecha JL, Peterson KE, Ludwig DS, Kim J, Sobol A, Gortmaker SL. When children eat what they watch: impact of television viewing on dietary intake in youth. *Arch Pediatr Adolesc Med*. 2006;160(4):436–442
  63. Barr-Anderson DJ, Larson NI, Nelson MC, Neumark-Sztainer D, Story M. Does television viewing predict dietary intake five years later in high school students and young adults? *Int J Behav Nutr Phys Activity*. 2009;6:7. Available at: www.ijbnpa.org/content/6/1/7. Accessed March 25, 2011
  64. Harris JL, Bargh JA, Brownell KD. Priming

- effects of television food advertising on eating behavior. *Health Psychol.* 2009;28(4):404–413
65. Giammattei J, Blix G, Marshak HH, Wollitzer AO, Pettitt DJ. Television watching and soft drink consumption: associations with obesity in 11- to 13-year old schoolchildren. *Arch Pediatr Adolesc Med.* 2003;157(9):882–886
  66. Krebs-Smith S, Cook A, Subar A, Cleveland L, Friday J, Kahle LL. Fruit and vegetable intakes of children and adolescents in the United States. *Arch Pediatr Adolesc Med.* 1996;150(1):81–86
  67. Bowman SA, Gortmaker SL, Ebbeling CB, Pereira MA, Ludwig DS. Effects of fast-food consumption on energy intake and diet quality among children in a national household survey. *Pediatrics.* 2004;113(1 pt 1):112–118
  68. Brownell KD. Fast food and obesity in children. *Pediatrics.* 2004;113(1 pt 1):132
  69. Schlosser E. *Fast Food Nation.* Boston, MA: Houghton Mifflin; 2001
  70. Harris JL, Schwartz MB, Brownell KD, et al. *Evaluating Fast Food Nutrition and Marketing to Youth.* New Haven, CT: Yale Rudd Center for Food Policy & Obesity; 2010
  71. Harrison K, Marske AL. Nutritional content of foods advertised during the television programs children watch most. *Am J Public Health.* 2005;95(9):1568–1574
  72. Powell LM, Szczypka G, Chaloupka FJ, Braunschweig CL. Nutritional content of television food advertisements seen by children and adolescents in the United States. *Pediatrics.* 2007;120(3):576–583
  73. Kunkel D, McKinley C, Stitt C. *Food Advertising During Children's Programming: A Two-Year Comparison.* Tucson, AZ: University of Arizona; 2010
  74. Stitt C, Kunkel D. Food advertising during children's television programming on broadcast and cable channels. *Health Commun.* 2008;23(6):573–584
  75. Powell LM, Szczypka G, Chaloupka FJ. Trends in exposure to television food advertisements among children and adolescents in the United States. *Arch Pediatr Adolesc Med.* 2010;164(9):794–802
  76. Powell LM, Szczypka G, Chaloupka FJ. Exposure to food advertising on television among US children. *Arch Pediatr Adolesc Med.* 2007;161(6):553–560
  77. Gantz W, Schwartz N, Angelini JR, Rideout V. *Food for Thought: Television Food Advertising to Children in the United States.* Menlo Park, CA: Kaiser Family Foundation; 2007
  78. Harris JL, Weinberg ME, Schwartz MB, Ross C, Ostroff J, Brownell KD. *Trends in Television Food Advertising.* New Haven, CT: Yale Rudd Center for Food Policy & Obesity; 2010
  79. Weber K, Story M, Harnack L. Internet food marketing strategies aimed at children and adolescents: a content analysis of food and beverage brand Web sites. *J Am Diet Assoc.* 2006;106(9):1463–1466
  80. Moore ES. *It's Child's Play: Advergaming and the Online Marketing of Food to Children.* Menlo Park, CA: Kaiser Family Foundation; 2006
  81. Montgomery KC, Chester J. Interactive food and beverage marketing: targeting adolescents in the digital age. *J Adolesc Health.* 2009;45(3 suppl):S18–S29
  82. Pempek TA, Calvert SL. Tipping the balance: use of advergaming to promote consumption of nutritious foods and beverages by low-income African American children. *Arch Pediatr Adolesc Med.* 2009;163(7):633–637
  83. Institute of Medicine. *Preventing Childhood Obesity: Health in the Balance.* Washington, DC: National Academies Press; 2005
  84. Harris JL, Pomeranz JL, Lobstein T, Brownell KD. A crisis in the marketplace: how food marketing contributes to childhood obesity and what can be done. *Annu Rev Public Health.* 2009;30:211–225
  85. Kunkel D, McKinley C, Wright P. *The Impact of Industry Self-regulation on the Nutritional Quality of Foods Advertised on Television to Children.* Oakland, CA: Children Now; 2009
  86. Chamberlain LJ, Wang Y, Robinson TN. Does children's screen time predict requests for advertised products? *Arch Pediatr Adolesc Med.* 2006;160(4):363–368
  87. Borzekowski DLG, Robinson TN. The 30-second effect: an experiment revealing the impact of television commercials on food preferences of preschoolers. *J Am Diet Assoc.* 2001;101(1):42–46
  88. Robinson TN, Borzekowski DLG, Matheson DM, Kraemer HC. Effects of fast food branding on young children's taste preferences. *Arch Pediatr Adolesc Med.* 2007;161(8):792–792
  89. Robert Wood Johnson Foundation. *F as in Fat 2009: How Obesity Policies Are Failing in America.* Princeton, NJ: Robert Wood Johnson Foundation; 2009. Available at: <http://healthyamericans.org/reports/obesity2009>. Accessed April 29, 2010
  90. Greenberg BS, Rosaen SF, Worrell TR, Salmon CT, Volkman JE. A portrait of food and drink in commercial TV series. *Health Commun.* 2009;24(4):295–303
  91. Bell R, Berger C, Townsend M. *Portrayals of Nutritional Practices and Exercise Behavior in Popular American Films, 1991–2000.* Davis, CA: Center for Advanced Studies of Nutrition and Social Marketing, University of California-Davis; 2003
  92. Eisenberg D. It's an ad, ad, ad world. *Time Magazine.* August 26, 2002:38–42. Available at: [www.time.com/time/magazine/article/0,9171,1101020902-344045,00.html](http://www.time.com/time/magazine/article/0,9171,1101020902-344045,00.html). Accessed April 29, 2010
  93. Sutherland LS, MacKenzie T, Purvis LA, Dalton M. Prevalence of food and beverage brands in movies, 1996–2005. *Pediatrics.* 2010;125(3):468–474
  94. Zimmerman FJ. *Children's Media Use and Sleep Problems: Issues and Unanswered Questions.* Menlo Park, CA: Kaiser Family Foundation; 2008
  95. Landhuis CE, Poulton R, Welch D, Hancox RJ. Childhood sleep time and long-term risk for obesity: a 32-year prospective birth cohort study. *Pediatrics.* 2008;122(5):955–960
  96. Johnson JG, Cohen P, Kasen S, First MB, Brook JS. Association between television and sleep problems during adolescence and early adulthood. *Arch Pediatr Adolesc Med.* 2004;158(6):562–568
  97. Sekine M, Yamagami T, Handa K, et al. A dose-response relationship between short sleeping hours and childhood obesity: results of the Toyama Birth Cohort Study. *Child Care Health Dev.* 2002;28(2):163–170
  98. Agras W, Hammer L, McNicholas F, Kraemer H. Risk factors for child overweight: a prospective study from birth to 9.5 years. *J Pediatr.* 2004;145(1):20–25
  99. Taheri S. The link between short sleep duration and obesity: we should recommend more sleep to prevent obesity. *Arch Dis Child.* 2006;91(11):881–884
  100. Bell JF, Zimmerman FJ. Shortened nighttime sleep duration in early life and subsequent childhood obesity. *Arch Pediatr Adolesc Med.* 2010;164(9):840–845
  101. Lytle LA, Pasch K, Farbaksh K. Is sleep related to obesity in young adolescents [abstract]? Presented at: Pediatric Academic Societies meeting; May 4, 2010; Vancouver, British Columbia, Canada
  102. Wells TT, Cruess DG. Effects of partial sleep deprivation on food consumption and food choice. *Psychol Health.* 2006;21(1):79–86
  103. Oliver G, Wardle J. Perceived effects of stress on food choice. *Physiol Behav.* 1999;66(3):511–515

104. Nelson MC, Gordon-Larsen P. Physical activity and sedentary behavior patterns are associated with selected adolescent health risk behaviors. *Pediatrics*. 2006; 117(4):1281–1290
105. Van Cauter E, Holmback U, Knutson K, et al. Impact of sleep and sleep loss on neuroendocrine and metabolic function. *Horm Res*. 2007;67(suppl 1):2–9
106. Hamer M, Stamatakis E, Mishra G. Psychological distress, television viewing and physical activity in children aged 4 to 12 years. *Pediatrics*. 2009;123(5):1263–1268
107. Jordan AB, Robinson TN. Children, television viewing, and weight status: summary and recommendations from an expert panel meeting. *Ann Am Acad Polit Soc Sci*. 2008;615(1):119–132
108. Brownell KD, Schwartz MB, Puhl RM, Henderson KE, Harris JL. The need for bold action to prevent adolescent obesity. *J Adolesc Health*. 2009;45(3 suppl):S8–S17
109. Strasburger VC. First do no harm: why have parents and pediatricians missed the boat on children and media? *J Pediatr*. 2007;151(4):334–336
110. Hagan JF Jr, Shaw JS, Duncan PM, eds. *Bright Futures: Guidelines for Health Supervision of Infants, Children, and Adolescents*. Elk Grove Village, IL: American Academy of Pediatrics; 2008
111. Harris JL, Bargh JA. Television viewing and unhealthy diet: implications for children and media interventions. *Health Commun*. 2009;24(7):660–673
112. He M, Piche L, Beynon C, Harris S. Screen-related sedentary behaviors: children's and parents' attitudes, motivations, and practices. *J Nutr Educ Behav*. 2010;42(1): 17–25
113. Carlson SA, Fulton JE, Lee SM, Foley JT, Heitzler C, Huhman M. Influence of limit-setting and participation in physical activity on youth screen time. *Pediatrics*. 2010; 126(1). Available at: [www.pediatrics.org/cgi/content/full/126/1/e89](http://www.pediatrics.org/cgi/content/full/126/1/e89)
114. American Academy of Pediatrics, Committee on Public Education. Media education. *Pediatrics*. 1999;104(2 pt 1):341–343
115. Laurson KR, Eisenmann JC, Welk G, Wickel EE, Gentile DA, Walsh DA. Combined influence of physical activity and screen time recommendations on childhood overweight. *J Pediatr*. 2008;153(2):209–214
116. Anderson SE, Whitaker RC. Household routines and obesity in US preschool-aged children. *Pediatrics*. 2010;125(3):420–428
117. McCannon R. Media literacy/media education. In: Strasburger VC, Wilson BJ, Jordan AJ, eds. *Children, Adolescents, and the Media*. 2nd ed. Thousand Oaks, CA: Sage; 2009: 519–569
118. Gortmaker SL. Innovations to reduce television and computer time and obesity in childhood. *Arch Pediatr Adolesc Med*. 2008;162(3):283–284
119. Escobar-Chaves SL, Markham CM, Addy RC, Greisinger A, Murray NG, Brehm B. The Fun Families Study: intervention to reduce children's TV viewing. *Obesity (Silver Spring)*. 2010;18(suppl 1):S99–S101
120. White House Task Force on Childhood Obesity. *Solving the Problem of Childhood Obesity Within a Generation: Report to the President*. Washington, DC: Executive Office of the President of the United States; 2010. Available at: [www.letsmove.gov/sites/letsmove.gov/files/TaskForce\\_on\\_Childhood\\_Obesity\\_May2010\\_FullReport.pdf](http://www.letsmove.gov/sites/letsmove.gov/files/TaskForce_on_Childhood_Obesity_May2010_FullReport.pdf). Accessed January 12, 2011
121. American Academy of Pediatrics, Committee on Communications. Children, adolescents, and advertising [published correction appears in *Pediatrics*. 2007;119(2): 424]. *Pediatrics*. 2006;118(6):2563–2569
122. Pomeranz JL. Television food marketing to children revisited: the Federal Trade Commission has the constitutional and statutory authority to regulate. *J Law Med Ethics*. 2010;38(1):98–116
123. Strasburger VC. Adolescents and the media. In: Rosenfeld W, Fisher M, Alderman E, eds. *Textbook of Adolescent Medicine*. Elk Grove Village, IL: American Academy of Pediatrics; 2011;359–373
124. Gold J. Snickers maker will aim higher. *Albuquerque Journal*. February 7, 2007:B4
125. Union of European Beverages Associations. *International Council of Beverages Associations Adopts Groundbreaking Guidelines on Marketing to Children* [press release]. Brussels, Belgium: Union of European Beverages Associations; May 20, 2008
126. Wilde P. Self-regulation and the response to concerns about food and beverage marketing to children in the United States. *Nutr Rev*. 2009;67(3):155–166
127. Schwartz MB, Ross C, Harris JL, et al. Breakfast cereal industry pledges to self-regulate advertising to youth: will they improve the marketing landscape? *J Public Health Policy*. 2010;31(1):59–73
128. Noah T. Toy story: why self-regulation of children's advertising is a joke. *Slate Magazine*. Available at: [www.slate.com/id/2278241](http://www.slate.com/id/2278241). Accessed January 12, 2011
129. Harris JL, Schwartz MB, Brownell KD, et al. *Cereal FACTS: Evaluating the Nutrition Quality and Marketing of Children's Cereals*. New Haven, CT: Rudd Center for Food Policy and Obesity; 2009
130. Associated Press. Coca-cola spent more than \$1.7M to lobby. February 21, 2007
131. Chou SY, Rashad I, Grossman M. Fast-food restaurant advertising on television and its influence on childhood obesity. *J Law Econ*. 2008;51(4):599–618
132. Veerman JL, Van Beeck EF, Barendregt JJ, Mackenbach JP. By how much would limiting TV food advertising reduce childhood obesity? *Eur J Public Health*. 2009;19(4): 365–369
133. Dixon HG, Scully ML, Wakefield MA, White VM, Crawford DA. The effects of television advertisements for junk food versus nutritious food on children's food attitudes and preferences. *Soc Sci Med*. 2007;65(7): 1311–1323
134. Larson N, Story M. *Food and Beverage Marketing to Children and Adolescents: What Changes Are Needed to Promote Healthy Eating Habits?* Princeton, NJ: Robert Wood Johnson Foundation; 2008
135. Pertschuk M. The little agency that could. *The Nation*. June 29, 2009:21–22
136. Durant NH. Not just fun and games: harnessing technology to address childhood obesity. *Child Obes*. 2010;6(5):283–284
137. Biddiss E, Irwin J. Active video games to promote physical activity in children and youth: a systematic review. *Arch Pediatr Adolesc Med*. 2010;164(7):664–672
138. Strasburger VC, Jordan AB, Donnerstein E. Health effects of media on children and adolescents. *Pediatrics*. 2010;125(4): 756–767
139. Ginsburg KR; American Academy of Pediatrics, Committee on Communications and Committee on Psychosocial Aspects of Child and Family Health. The importance of play in promoting healthy child development and maintaining strong parent-child bonds. *Pediatrics*. 2007;119(1):182–191



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