



# Food Addiction: Current Understanding and Implications for Regulation and Research

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# Food Addiction:

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Current understanding and implications for  
regulation and research

Course Paper by Margareta Sorenson, Class of 2012

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## Abstract

The idea that some processed foods can be addictive has gained support in recent years. Animal and human studies show extensive overlap between the neuronal signaling involved in palatable food consumption and drug addiction. A growing number of individuals also report being unable to stop consuming certain foods despite repeated efforts, and consuming them to feel better emotionally, rather than to satisfy hunger. While food addiction can contribute to overconsumption of calories and excessive weight gain, it is not synonymous with obesity. The food addiction concept, while controversial, can have important implications for treatment and regulation. Government initiatives have focused on spreading nutrition information, but evidence indicates that most people are eating unhealthy food for emotional reasons, not due to lack of information. If the existence of food addiction gains greater acceptance, it may be particularly important in facilitating the regulation of food advertising directed to children. The model also has implications for research and treatment.

## Introduction

Americans eat too much. In 2009-2010, 68.8% of the adult population was overweight or obese (BMI >25kg/m<sup>2</sup>) and 35.7% of adults were obese (BMI >30 kg/m<sup>2</sup>).<sup>1</sup> In the same year, 31.8% of children and adolescents ages 2-19 were overweight or obese and 16.9% were obese.<sup>2</sup> It is well established that obesity increases the risk of developing a number of health problems, including diabetes, hypertension, cardiovascular disease, high cholesterol, stroke, certain cancers, and arthritis.<sup>3</sup> Obese individuals are also more likely to suffer from mood disorders,

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<sup>1</sup> K. M. Flegal et al., *Prevalence of Obesity and Trends in the Distribution of Body Mass Index Among US Adults, 1999-2010*, 307 JAMA, 491 (2012).

<sup>2</sup> C. L. Ogden et al., *Prevalence of Obesity and Trends in Body Mass Index Among US Children and Adolescents, 1999-2010*, 307 JAMA, 483 (2012).

<sup>3</sup> S.D.H. Malnick et al., *The medical complications of obesity*, 99 QJM, 565, (2006).

particularly depression.<sup>4</sup> The healthcare cost attributable to weight related conditions has been estimated to 10% of total spending, or ~ \$150 billion annually.<sup>56</sup> In addition, many individuals of normal weight consume excessive amounts of processed foods with low nutritional value and large amounts refined carbohydrates, sodium and fat, thus putting themselves at risk for malnutrition and diet-related diseases.

Many obese and overweight individuals, (as well as many people of normal weight) fail to lose weight despite repeated attempts and desire to do so.<sup>7</sup> Total spending on weight loss in the United States was estimated at \$3.3 billion in 2011.<sup>8</sup> This is in spite of evidence that dieting is ineffective, at least in the long term.<sup>9</sup> A review of major weight loss programs in the U.S., showed a 15-25% weight loss over the short term (3-6) months, but >90% of dieters had failed to maintain their weight loss at one year.<sup>10</sup> This data suggests that Americans are unable to control how much they eat, despite being aware of adverse consequences.

There is mounting evidence for the idea that certain foods can be addictive in a manner that resembles nicotine, alcohol and drug addiction. Neurobiological studies have demonstrated extensive overlap between the pathways implicated in drug abuse and those

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<sup>4</sup> F. Amianto et al., *The forgotten psychosocial dimension of the obesity epidemic*, 378 Lancet, e8 (2011).

<sup>5</sup> E. A. Finkelstein, et al., *Annual Medical Spending Attributable To Obesity: Payer-And Service-Specific Estimates*, 28 Health Affairs, w822 (2009).

<sup>6</sup> <http://www.cdc.gov/CDCTV/ObesityEpidemic/Transcripts/ObesityEpidemic.pdf> ;

<sup>7</sup> <http://www.apa.org/news/press/releases/stress/national-report.pdf>

<sup>8</sup> *Weight Loss Services Market Research Report Now Available from IBISWorld*, PRWEB, October 20, 2011; <http://www.prweb.com/releases/2011/10/prweb8894700.htm>

<sup>9</sup> N. Nguyen et al, *A Review of Unmet Needs in Obesity Management*, Mar 22. Epub ahead of print, Obes Surg. (2012) ; <http://www.springerlink.com/content/271656607838n25l/> .

<sup>10</sup> Tsai AG et al. *Systematic review: an evaluation of major commercial weight loss programs in the United States*, 142 Annals of Internal Medicine, 56 (2005).

involved in regulation of palatable food consumption, particularly consumption of sweet substances. Animals that are allowed to binge on sugar develop brain changes resembling those in drug addicted animals, including changes to dopamine, opiate and acetylcholine signaling.<sup>11 12</sup>

A growing body of medical doctors, psychologists and scientists are studying food addiction. Publications containing the phrase "food addiction" have risen exponentially since 2006<sup>13</sup> and The Yale Rudd Center for Obesity Research and Policy Researchers has brought attention to the issue, including organizing meetings<sup>14</sup> and creating the "Food Addiction Scale," a diagnostic tool for identifying individuals exhibiting signs of addiction towards certain types of foods.<sup>15</sup> In his book "The End of Overeating: Taking Control of the Insatiable American Appetite," former FDA Commissioner and pediatrician David Kessler suggests that the food industry produces highly refined, "hyperpalatable" foods that are intentionally designed to trigger repeated overconsumption. Kessler admits to his own inability to control himself in the presence of chocolate chip cookies.<sup>16</sup>

The ubiquity of support groups for self-identified food addicts also indicates that the phenomenon is real and widespread. Food Addicts Anonymous organizes meetings all over the US as well as in Canada, Russia, Australia and Northern Europe.<sup>17</sup> Its members follow a Twelve-Step program to achieve abstinence from addictive foods. Overeaters Anonymous, is another

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<sup>11</sup> D.M. Blumental et al., *Neurobiology of food addiction*, 13 Current Opinion in Clinical Nutrition and Metabolic Care, 359 (2010).

<sup>12</sup> Ifland et al., *Refined food addiction: a classic substance use disorder*, 72 Med Hyptheses, 18 (2009).

<sup>13</sup> A.N. Gearhardt et al., *The Addiction Potential of Hyperpalatable Foods*, 4 Curr Drug Abuse Rev. 140 (2011).

<sup>14</sup> <http://www.yaleruddcenter.org/resources/upload/docs/what/reports/RuddCenterAddictionMeeting.pdf>

<sup>15</sup> A.N. Gearhardt et al., *Preliminary validation of the Yale Food Addiction Scale*, 52 Appetite, 430 (2009).

<sup>16</sup> D. Kessler, *The End of Overeating: Taking Control of the Insatiable American Appetite* (2009).

<sup>17</sup> <http://www.foodaddictsanonymous.org/>

large, international group that offers a Twelve-Step program for “compulsive eaters.”<sup>18</sup> While it does not overtly address food addiction, its members cite addiction to sugar and refined carbohydrates.<sup>19</sup> Other groups include Food Addicts in Recovery Anonymous<sup>20</sup>, Food Addiction Meetup<sup>21</sup> and the online support group Daily Strength.<sup>22</sup>

This paper briefly introduces current evidence for the existence of food addiction. While the biological mechanisms are fundamental to the addiction analysis, they are too intricate to describe in detail here. However, there are several excellent reviews on the topic.<sup>23,24,25</sup> This is followed by a discussion of whether food addiction is a true addiction, including whether it fits the definition of substance use disorder listed in DSM-IV. The relationship between food addiction and the obesity epidemic is also discussed in some detail, because there is some confusion about how much the two overlap. Then a discussion of the particular impact of stress is included, since stress in America is on the rise and may influence excessive consumption of unhealthy foods. Finally, topics for further research are outlined, and the potential implications for the federal regulation are discussed, with particular emphasis on the regulation of unhealthy food advertising directed to children.

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<sup>18</sup> <http://www.oa.org/>

<sup>19</sup> S. Russell-Mayhew et al., *How does overeaters anonymous help its members? A qualitative analysis*, 18 *Eur. Eat. Disorders Rev.* 33 (2010).

<sup>20</sup> <http://www.foodaddicts.org/>

<sup>21</sup> <http://food-addiction.meetup.com/>

<sup>22</sup> <http://www.dailystrength.org/c/Food-Addiction/people>

<sup>23</sup> N.M. Avena, et al., *Animal models of sugar and fat bingeing: relationship to food addiction and increased body weight*, 829 *Methods Mol Biol.*, 351 (2012).

<sup>24</sup> N.M. Avena, et al., *Further developments in the neurobiology of food and addiction: Update on the state of the science*, 28 *Nutrition*, 341 (2012).

<sup>25</sup> S.L. Parylak et al., *The dark side of food addiction*, 104 *Physiol Behav.*, 149 (2011).

## Can food really be addictive?

Proponents of the food addiction hypothesis cite a wealth of animal and human data showing overlap between the neurological pathways involved in the regulation of food intake and those involved in drug abuse. Skeptics argue that unlike drugs and alcohol, food is essential to our survival, not an addictive substance. But proponents of the food addiction hypothesis point out that the highly processed foods in modern diets damage health and are more similar to drugs of abuse than to the foods that our ancestors consumed.<sup>26</sup> Indeed, refined sugar and flour do not occur naturally, but like some highly addictive drugs, they have been purified from plant sources for quicker absorption and more intense effect.<sup>27</sup> Coca leaves when chewed or stewed as tea have little addictive potential, but when processed, the resulting cocaine or crack is highly addictive.<sup>28</sup> Further, processed foods typically consist of a large number of ingredients to enhance flavor and texture, similarly to tobacco products, which contains hundreds of added ingredients that enhance flavor and speed absorption.<sup>29</sup>

## Biological Evidence

Both human and animal studies have revealed extensive overlap between the pathways involved in food regulation and those activated in drug addiction.<sup>30</sup> In a study where rats were given a high sugar solution followed by deprivation each day for 30 days, their brains were altered much in the same way as observed in response to drugs of abuse (including increased dopamine binding to the D-1 receptor and decreased binding to the D-2 receptor as well as

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<sup>26</sup> Gearhardt (2011), *supra*.

<sup>27</sup> *Id.*

<sup>28</sup> *Id.*

<sup>29</sup> *Id.*

<sup>30</sup> N.M. Avena et al., *Evidence for sugar addiction: Behavioral and neurochemical effects of intermittent, excessive sugar intake*. 32 *Neurosci Biobehav Rev.*, 20 (2008).

increased opioid mu-1 receptor binding in several regions).<sup>31</sup> A related study found that rats that were given a high sugar solution followed by intermittent deprivation showed signs of withdrawal that resembled that of morphine and nicotine, suggesting that the rats had developed a physical dependence on sugar.<sup>32</sup> This effect is specific to sugar – a similar experiment using a high-fat solution produced no withdrawal symptoms.<sup>33</sup> Further, rats that had developed sugar-dependence by intermittent access to high-glucose solutions consumed more sugar than ever before after a two-week period of deprivation.<sup>34</sup> A study of Rhesus monkeys demonstrated reduced self-administration of an addictive drug when the monkeys were provided a sweet drink (saccharin solution) as an alternative.<sup>35</sup> In addition to dopamine and opioid pathways, sugar addiction in animals also involves acetylcholine signaling, which is also affected in ways that closely resemble drug abuse.<sup>36</sup>

While sugar addiction has clearly been established in animal studies, human data is less abundant. One study found that the density of striatal dopamine D-2 receptors is decreased in obese individuals, and that the magnitude of the decrease was proportional to BMI.<sup>37</sup> Since dopamine modulates motivation and reward circuits, an implication of the study is that

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<sup>31</sup> C. Colantuoni et al., *Excessive sugar intake alters binding to dopamine and mu-opioid receptors in the brain*, 12 *Neuroreport*, 3549 (2001).

<sup>32</sup> C. Colantuoni et al., *Evidence that intermittent, excessive sugar intake causes endogenous opioid dependence*, 10 *Obesity Research*, 478 (2002).

<sup>33</sup> M.E. Bocarsly et al., *Rats that binge eat fat-rich food do not show somatic signs or anxiety associated with opiate-like withdrawal: implications for nutrient-specific food addiction behaviors*. 105 *Physiol Behav.*, 865 (2011).

<sup>34</sup> N. M. Avena et al., *Sugar-dependent rats show enhanced responding for sugar after abstinence: evidence of a sugar deprivation effect*, 84 *Physiology & Behavior*, 359 (2005).

<sup>35</sup> U.C. Campbell et al., *Reduction of drug self-administration by an alternative non-drug reinforcer in rhesus monkeys: magnitude and temporal effects*, 147 *Psychopharmacology*, 418 (2000).

<sup>36</sup> Avena (2008), *supra*.

<sup>37</sup> Wang et al., *Brain dopamine and obesity*, 357 *Lancet*, 9253 (2001).



dopamine deficiency in obese individuals may perpetuate pathological eating to compensate for decreased activation of these circuits.<sup>38</sup>

### Human Survey Data

Data collected from an open access website for overweight children and adolescents, ages 8-21, strongly suggests that many of the respondents are truly unable to resist eating, despite severe physical and psychological consequences. A 5'9" and 235 lbs twelve year old girl writes: "someone is always making fun of me or mocking me or calling me names! I laugh along but on the inside im dying!"<sup>39</sup> Many share accounts of being unable to stop eating, despite struggling to lose weight. In a poll asking whether they considered themselves addicted to food, 29% considered themselves addicted to most foods, 37% considered themselves addicted to particular foods, and 34% answered in the negative.<sup>40</sup>

Another study, also focused on overweight and obese children, suggested that food addiction may be a real problem and that it correlates positively with overeating, uncontrolled eating, emotional eating, and BMI.<sup>41</sup> Food addiction is also prevalent in obese adults (25-45 years old). In a recent study, 25% of responders met the diagnostic criteria under the Yale Food

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<sup>38</sup> *Id.*

<sup>39</sup> R.A. Pretlow, *Addiction to Highly Pleasurable Food as a Cause of the Childhood Obesity Epidemic: A Qualitative Internet Study*, 19 *Eating Disorders*, 295 (2011).

<sup>40</sup> *Id.*

<sup>41</sup> L.J. Merlo et al., *Exploration of food addiction in pediatric patients: A preliminary investigation*, 3 *J Addict Med.*, 26 (2009).

Addiction Scale.<sup>42</sup> A number of reviews have been published in recent years summarizing human and animal findings.

### Parallels to Alcoholism

Alcoholism is characterized by 1) impaired control of consumption 2) preoccupation with the substance, 3) continued use despite adverse consequences, and 4) distortions in thinking, particularly denial.<sup>43</sup> Both impaired control and continued use despite adverse consequences are clearly present when a person overeats on a regular basis despite wishing not to and despite awareness of adverse health consequences and social stigma.

Preoccupation with food may also be a prominent factor. In a survey of self-reported food addicts, respondents reported having trouble getting things done due to preoccupation with buying and over-consuming food.<sup>44</sup> Whether denial is a salient factor in food addiction is unclear. To answer this requires psychological evaluation of food addicts which may not acknowledge that they have a problem.

### Parallels to nicotine addiction

Nicotine is characterized by positive reinforcement including mild euphoria, relaxation, and improved memory and attention.<sup>45</sup> Both human and animal studies have demonstrated that consumption of sugar-rich foods and drinks primes the release of euphoric endorphins and dopamine in some individuals.<sup>46</sup> Thus, the euphoric effect can be triggered by food as well, at least if it contains sugar. Sugar and carbohydrates generally have also been shown to have a

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<sup>42</sup> C. Davis et al., *Evidence that 'food addiction' is a valid phenotype of obesity*, 57 *Appetite*, 711 (2011).

<sup>43</sup> R. M. Morse et al., *The Definition of Alcoholism*, 268 *JAMA*, 1012 (1992).

<sup>44</sup> Ifland, *supra*.

<sup>45</sup> A. W. Bruijnzeel et al, *Tobacco addiction and the dysregulation of brain stress systems*, *Neuroscience & Behavioral Reviews*, Available online 3 March, 2012; <http://www.sciencedirect.com/science/article/pii/S0149763412000413>.

<sup>46</sup> J.L. Fortuna, *Sweet preference, sugar addiction and the familial history of alcohol dependence: shared neural pathways and genes*, 42 *J Psychoactive Drugs*. 147 (2010).

relaxing effect in animal and human studies.<sup>47</sup> Like nicotine, food affects memory and attention, although a recent study indicates that the particular effect depends on the macronutrient content. Young adults were given a drink containing glucose, protein or fat and the effect on memory and attention was measured. Attention and speed of processing were enhanced 15 min following fat or glucose ingestion and working memory was enhanced 15 min following protein ingestion. Interestingly, sixty minutes post drink memory enhancements were observed following protein ingestion whereas memory impairment was observed following glucose.<sup>48</sup> Food thus clearly affects memory and attention, although the particular effect is dependent on the macronutrient composition.

Nicotine withdrawal is associated with depressed mood, increased anxiety, and impaired memory and attention.<sup>49</sup> Withdrawal from consumption of palatable foods produces similar effects in both animals and human subjects. Rats that were allowed to binge on high sugar solutions followed by deprivation showed signs of opiate withdrawal, including anxiety-like behaviors.<sup>50</sup> Self-reported food addicts report withdrawal symptoms including restless, insatiable cravings, fatigue, and negative mood, even in the absence of hunger.<sup>51</sup> They further report ingesting refined foods to alleviate the symptoms.<sup>52</sup>

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<sup>47</sup> L. Christensen et al., *Effect of meal composition on mood*, 107 Behavioral Neuroscience, 346 (1993).

<sup>48</sup> E.K. Jones, et al., *Acute ingestion of different macronutrients differentially enhances aspects of memory and attention in healthy young adults*, 89 Biol Psychol. 477 (2012).

<sup>49</sup> Bruijnzeel, *supra*.

<sup>50</sup> Colantuoni (2002), *supra*.

<sup>51</sup> Ifland, *supra*.

<sup>52</sup> *Id.*

### **Food addiction, like drug addiction, can shift to negative reinforcement over time**

Drug addiction is characterized by three phases: a binge intoxication phase, a withdrawal phase, and a preoccupation and anticipation stage that precedes new intake.<sup>53</sup><sup>54</sup> In transitioning from casual use to addiction, there tends to be a shift from positive reinforcement in the form of intense pleasure from the drug to negative reinforcement, where use ameliorates the negative emotions associated with the withdrawal phase. While positive affect, rather than intoxication is achieved in food addiction, evidence indicates that food addicts, like drug addicts, shift towards the “dark side” of addiction over time, where food is used to relieve negative feelings, rather than for hedonic pleasure.<sup>55</sup>

### **Kessler's "conditioned hypereating" model**

David Kessler argues that what he terms “conditioned hypereating” works in the same way as compulsive gambling and substance abuse. A person is subjected to a mental cue (e.g. a cookie), a mental battle ensues, the person gives in to relieve anxiety and this in turn strengthens the association between the cue and the reward making it even more difficult to resist the next time the cue is presented.<sup>56</sup>

### **Food Addiction as a Substance Dependence disorder**

According to the DSM-IV, substance dependence is a maladaptive pattern of substance use that leads to significant impairment and distress.<sup>57</sup> Specifically, at least three of the seven diagnostic criteria outlined below must be met within a 12-month period for a positive

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<sup>54</sup> Parylak, *supra*.

<sup>55</sup> *Id.*

<sup>56</sup> Kessler, *supra*.

<sup>57</sup> American Psychiatric Association 4th edition. American Psychiatric Association; Washington, DC: 1994. Diagnostic and statistical manual of mental disorders.

diagnosis.<sup>58</sup> Ifland et al. have presented evidence supporting food addiction as a substance use disorder, as defined in the DSM-IV. The evidence includes survey responses by self-identified food addicts as well as data from the neurobiology literature. Gearhardt et al. have similarly argued for food addiction as a substance use disorder.<sup>59</sup> Ziauddeen et al. by contrast, have argued against a fit.<sup>60</sup> Each DSM-IV criterion is discussed below and specific objections are addressed.

### (1) Substance taken in larger amount and for longer period than intended

- Evidence: There is ample anecdotal evidence of this phenomenon, e.g. Kessler's inability to resist chocolate chip cookies, as well other accounts by self-reported food addicts.<sup>61,62</sup>
- Objection: requires severity and impairment thresholds to be meaningful.<sup>63</sup>
- Comment: Threshold severity and impairment is reached whenever consumption exceeds that intended.

### (2) Persistent desire or repeated unsuccessful attempt to quit

- Evidence: Self-reported food addicts explain how they have managed to cut back for short periods of time only to fall back into their old patterns of consuming candy, desserts, chips and soda.<sup>64</sup>
- Objection: requires severity and impairment thresholds to be meaningful.<sup>65</sup>

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<sup>58</sup> *Id.*

<sup>59</sup> A.N. Gearhardt, *Food addiction: an examination of the diagnostic criteria for dependence*, 3 J. Addict. Med. 1 (2009).

<sup>60</sup> H. Ziauddeen et al., *Obesity and the brain: how convincing is the addiction model?*, 13 Nature Reviews Neuroscience, 279 (2012).

<sup>61</sup> Kessler, *supra*.

<sup>62</sup> Ifland, *supra*.

<sup>63</sup> Ziauddeen, *supra*.

<sup>64</sup> Ifland, *supra*.

- Comment: Threshold severity and impairment is reached whenever a person desires to quit consuming a particular food or group of foods, but fails to do so more than once. This information can be obtained by simply by asking the affected individual.

### **(3) Much time/activity to obtain, use, recover**

- Evidence: Self-reported food addicts describe getting a “hangover” from chocolate, napping excessively after eating, and spending all foregoing chores in favor of eating and napping.<sup>66</sup>

- Objection: Difficult to apply, because of the easy availability of foods in most developed societies.<sup>67</sup>

- Comment: Application simply requires comparison to how much a person with normal eating habits spends on food. The availability of food is presumably the same for both food addicts and non-addicts, and not a confounding variable. Further, normal eating habits do not require recovery, and the need for recovery is in itself an indication of the disorder.

### **(4) Important social, occupational, or recreational activities given up or reduced**

- Evidence: As discussed under Criteria 3, excessive focus on eating takes away time from other activities. In addition, self-reported food addicts isolate because of shame about their weight and from fatigue as well as not wanting to eat in front of others.<sup>68</sup>

- Objection: A strict equivalence would require engagement in eating to the exclusion of other activities<sup>69</sup>

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<sup>65</sup> Ziauddeen, *supra*.

<sup>66</sup> Ifland, *supra*.

<sup>67</sup> Ziauddeen, *supra*.

<sup>68</sup> Ifland, *supra*.

- Comment: This “strict” equivalence is not difficult to establish. If excessive amounts of time are spent on food, it will almost inevitably take away time from other important activities. In addition to having less time for these activities, food addicts report avoiding activities that involve social contact, which include most occupational and recreational activities as well. Such avoidance can thus severely limit participation in important activities.

**(5) Use continues despite knowledge of adverse consequences (e.g., failure to fulfill role obligation, use when physically hazardous)**

- Evidence: Self-reported food addicts describe overeating in spite of “horrible knee and leg pain” caused by excess weight, social fear and embarrassment and fatigue. They describe rationalizing continued use by convincing themselves that “Just this once won’t hurt”, “I’ll start the diet tomorrow” or “It’ll be used up.”

- Objection: This criterion requires the application of severity and impairment thresholds to be meaningful<sup>70</sup>

- Comment: Threshold severity and impairment is reached whenever use occurs despite knowledge of adverse consequences.

**(6) Tolerance (marked increase in amount; marked decrease in effect)**

- Evidence: Self-reported food addicts describe how their consumption of cookies, chocolate and other foods has increased with repeated use.<sup>71</sup>

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<sup>69</sup> Ziauddeen, *supra*.

<sup>70</sup> *Id.*

<sup>71</sup> Ifland, *supra*.

- Objection: Not a convincing equivalent to drug tolerance because it assumes an equivalence between satiety and intoxication. In addition, key characteristics of binges are eating in the absence of hunger and to the point of physical discomfort (beyond satiety)<sup>72</sup>
- Comment: The comment focuses on the word "satiety," as used in the Gearhardt article<sup>73</sup>, but despite this unfortunate choice of words, physical satiety is clearly not the effect that the food addict is trying to achieve. The effect consists of pleasure and/or relief of negative emotions, and evidence does indicate that increased amounts of food are required to reach the same emotional satisfaction.

#### (7) Characteristic withdrawal symptoms; substance taken to relieve withdrawal

- Evidence: Self-reported food addicts describe restless, insatiable cravings accompanied by fatigue and poor mood. Responses include: "Cutting down on breads makes me shaky."; "I eat sugar to alleviate the feeling of depression, anxiety, and agitation."; and "I eat sugar filled foods to correct being tired and/or depressed. To fix anxiety, I eat something crunchy, like chips or crackers to calm myself".<sup>74</sup> Further, the existence of opiate-like withdrawal symptoms in response to sugar (but not to fat) withdrawal has been established in animal models.<sup>75,76,77</sup>

- Objection: No convincing evidence of a human withdrawal syndrome for foods.

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<sup>72</sup> Ziauddeen, *supra*.

<sup>73</sup> Gearhardt, J. *Addict. Med.*, (2009), *supra*.

<sup>74</sup> Ifland, *supra*.

<sup>75</sup> Colantuoni (2002), *supra*.

<sup>76</sup> N.M. Avena et al., *After daily bingeing on a sucrose solution, food deprivation induces anxiety and accumbens dopamine/acetylcholine imbalance*, 94 *Physiol Behav*, 309 (2008).

<sup>77</sup> M.E. Bocarsly et al., *Rats that binge eat fat-rich food do not show somatic signs or anxiety associated with opiate-like withdrawal: implications for nutrient-specific food addiction behaviors*, 105 *Physiol Behav*, 865 (2011).



- Comment: The animal data for sugar withdrawal is well established, and findings in animal models, though not dispositive, are strong indicators of the presence of similar mechanisms in humans. Though Ifland's survey data was based on a rather small sample size, it corroborates the animal data. Additional anecdotal evidence for sugar withdrawal can be found in various internet discussion fora.<sup>78</sup> However, a formal study demonstrating withdrawal in humans would be helpful.

### **Food Addiction and Obesity overlap only partially**

Food Addiction and obesity are not the same, and while some have argued for food addiction as an explanation for obesity, and even for listing obesity as a mental disorder in the next version of the DSM<sup>79</sup>, food addiction and obesity are separate phenomena. They are related in that they both likely result from an overabundance of highly processed foods, but weight gain can occur without addiction, and addiction can exist without weight gain.

Critics of the food addiction hypothesis have attacked the validity of the hypothesis based on the weakness of the correlation between obesity and food addiction.<sup>80</sup> This is misguided, because the validity of the food addiction model does not require that it explain the obesity epidemic. Food addiction is simply the chronic inability to resist certain foods despite knowledge that they are unhealthy.

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<sup>78</sup> <http://board.crossfit.com/showthread.php?t=52493> ; <http://howtothinkthin.com/freedom.htm> ; <http://ehealthforum.com/health/withdrawal-from-sugar-t168269.html> ; <http://sweetpoison.myfreeforum.org/ftopic278-0.php> ;

<sup>79</sup> N.D. Volkow et al., *Issues for DSM-V: should obesity be included as a brain disorder?* 164 Am. J. Psychiatry 708 (2007).

<sup>80</sup> Ziauddeen, *supra*.

Rats that binge on sugar solution do not become overweight.<sup>81</sup> They simply substitute sugar for other sources of nutrients. They nevertheless show biological signs of addiction. While animals who binge on vegetable fat combined with sugar do gain weight over time, they compensate by eating less between binges resulting in intermittent weight loss.<sup>82</sup> Thus, food addiction can be present even if there is no weight gain or only moderate weight gain. Human data supports this idea. Very few of the respondents in the validation of the Yale Food Addiction Scale were obese (2.7%), but >11% of respondents were identified as having suffering from food dependence. Additional anecdotal evidence can be found in David Kessler's book, which contains interviews with individuals of normal to low body weight who are unable to control their consumption of particular trigger foods.<sup>83</sup>

A binary distinction between obese or not is also of limited use. Many individuals who are not obese have a serious weight problem and even more individuals have poor eating habits, which may very well be due to or aggravated by addiction to particular foods. "Normal weight" (BMI of 18-25 kg/m<sup>2</sup>) is a generous category: a 5'6" woman can weigh up to 155 lbs and before crossing into "overweight" territory. Our bodies respond differently to poor eating habits and weight gain tends to plateau at different points for different individuals, and even for the same individual depending on age. It appears that the obese population is just the unfortunate subset of a much larger population with poor eating habits, whose weight tends to get very high before it reaches a plateau. Just like some people smoke heavily without ever

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<sup>81</sup> Avena, *Physiol Behav.* (2008), *supra*.

<sup>82</sup> Avena, *Methods in Molecular Biology* (2012), *supra*.

<sup>83</sup> Kessler, *supra* at 151.

developing lung cancer, some individuals may be addicted to unhealthy foods without becoming obese.

Further, obesity can occur without food addiction. A number of factors contribute to obesity, including sedentary lifestyle, genetic predisposition, eating calorie dense processed foods, and eating excessively large portions.<sup>84</sup> Even if most overweight and obese individuals consume excessive amounts of calories – as both research and common sense suggests<sup>85</sup> - they don't necessarily do so due to food addiction. Overconsumption can also result from mind-less overeating, excessive availability of food and most importantly, the composition of modern food. The most readily available foods are often also highly processed, low in fiber and calorie dense. Kessler points out that much of the food we consume is “prechewed,” such as chicken that has been injected with so much meat tenderizer that it is virtually ready to swallow. Since chewing signals satiety, over-consumption of “pre-chewed,” calorie-dense food can occur rapidly, before satiety signals have time to set in. A person may thus become overweight by simply eating to satiety, without any signs of food addiction.

### **The impact of stress food addiction**

David Kessler explains that “when stress comes into play, holding myself back [from a platter of cookies] becomes even harder. By intensifying my arousal and approach behavior, stress steamrolls over the cognitive voice that had been trying to say no to the cue.”<sup>86</sup>

Americans are reporting increasing levels of psychological stress. In the 2011 Stress in America Survey by the American Psychological Association, 44% of adults reported feeling more

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<sup>84</sup> <http://www.cdc.gov/CDCTV/ObesityEpidemic/Transcripts/ObesityEpidemic.pdf> ;

<sup>85</sup> Kessler, *supra* at 152.

<sup>86</sup> *Id.*

stressed than five years ago, and only 29% believed that they were doing an excellent or very good job managing stress.<sup>87</sup> The survey also found a correlation between stress and weight in both children and adults. 31% of overweight children reported that they worry a great deal, compared to only 14% of children of normal weight. Overweight children were also more likely to report that their parents are always or often stressed out (39% versus 30% for normal weight children). 27% of overweight children also reported eating to feel better when really worried or stressed, compared to 14% of normal weight children.<sup>88</sup> 39% of adults also reported overeating or eating unhealthy foods due to stress within the past month.<sup>89</sup>

Psychological stress makes individuals more vulnerable to overeating.<sup>90</sup> Food can have a calming effect,<sup>91</sup> and in pre-modern society, eating more in response to a perceived threat may have been adaptive. In a situation where food is at least seasonally scarce, and where a perceived threat is likely to affect the food supply, such as war or inclement weather, eating in response to stress may provide the stores needed to survive anticipated scarcity. In modern, Western society, however, calorie dense food is cheap and readily available even to those with limited financial means. In addition, the composition of modern food differs significantly from the food that we evolved to consume. A stress induced preference for carbohydrates may have stimulated our ancestors to consume more whole grains and fruits, but the modern day availability of refined carbohydrates allow us to shock our systems with large amounts of white sugar and flour. While the initial response may be comforting or even euphoric, long term

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<sup>87</sup> <http://www.apa.org/news/press/releases/2012/01/chronic-disease.aspx> ; accessed 3/27/2012.

<sup>88</sup> <http://www.apa.org/news/press/releases/2010/11/stress-in-america.aspx> ; accessed March 27, 2012.

<sup>89</sup> p. 7 American Psychological Association, Stress in America 2011 Report, <http://www.apa.org/news/press/releases/stress/2011/final-2011.pdf> ; accessed March 27, 2012.

<sup>90</sup> Kessler, *supra* at 151.

<sup>91</sup> Gearhardt (2011), *supra*.

effects may include impaired ability to cope with stress, malnutrition, insulin resistance and weight gain.

Notably, the decrease in smoking nicotine in recent years coincides reasonably well with the obesity epidemic. 42.4% of adults in the US smoked cigarettes in 1965, compared with 19.3% in 2010.<sup>92</sup> By contrast the proportion of obese adults has increased drastically from remaining stably around 15% in the period 1960-1980 to more than tripling to 35.7% in 2009-2010.<sup>93</sup> However, studies indicate that smoking cessation cannot account for the obesity epidemic, as the weight gain following smoking cessation is rather moderate.<sup>94</sup> The correlation between smoking cessation and *food addiction* may however be stronger, given the similarity between the calming effects of smoking and eating and the fact that many food addicts are normal weight. Many former smokers may have turned to highly palatable foods to manage stress, but done so without gaining significant amounts of weight.

While dopamine is most well understood for its role in reward pathways, stressful stimuli also trigger dopamine release in both humans and animals.<sup>95</sup> Overeating, however, reduces the number of striatal D2 dopamine receptors.<sup>96</sup> Thus, chronic overeating may interfere with the normal stress response, causing a person to become more susceptible to the negative effects of stress and more prone to compensate by overeating of refined foods. While

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<sup>92</sup> [http://www.cdc.gov/tobacco/data\\_statistics/tables/trends/cig\\_smoking/index.htm](http://www.cdc.gov/tobacco/data_statistics/tables/trends/cig_smoking/index.htm)

<sup>93</sup> K.M. Flegal et al., *Prevalence and Trends in Obesity Among US Adults, 1999-2008*, 303 JAMA, 235 (2010).

<sup>94</sup> P. Kasteridis et al, *Smoking Cessation and Body Weight: Evidence from the Behavioral Risk Factor Surveillance Survey*, Health Services Research, Published online ahead of print on Feb. 22, 2012; <http://onlinelibrary.wiley.com/doi/10.1111/j.1475-6773.2012.01380.x/full>

<sup>95</sup> A. Soliman et al., *Stress-induced dopamine release in humans at risk of psychosis: a [11C]raclopride PET study*, 33 *Neuropsychopharmacology*, 2033 (2008).

<sup>96</sup> Wang, *supra*.

this is pure speculation, more research in this area may reveal whether such a relationship exists.

### Further Research

Much of current research has focused on the neurobiology of food addiction. While this provides support of food addiction as a legitimate addiction, it is also important to obtain more survey data from affected individuals to determine which foods are most addictive and what methods are most effective in combating addiction to these foods.

### Trigger Foods

To gain a better understanding of food addiction, it is important to identify particular foods that trigger addictive behavior. While sugar and other refined carbohydrates have been shown to have addictive properties in animal studies, they are even more potent in combination with fat and salt.<sup>97</sup> Different forms of refined carbohydrates may also have different effects. It is interesting to note that the annual per capita consumption of High Fructose Corn Syrup (HFCS) increased 1240% between 1970 and 1997 from 0.5 lbs per capita to 62.4 lbs per capita.<sup>98</sup> While HFCS is similar to sucrose, it is not identical, and given that the increase in HFCS consumption coincides with the obesity epidemic, further study of its effect is warranted. Its fructose content is higher than that of sucrose, and unlike sucrose, which is disaccharide consisting of glucose and sucrose, it is delivered as a monosaccharide. Fructose,

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<sup>97</sup> Kessler, *supra* at 151.

<sup>98</sup> Ifland, *supra*.

unlike glucose, does not significantly stimulate insulin release, thus bypassing satiety signals.<sup>99</sup> It also raises triglycerides and lower high-density lipoprotein levels.<sup>100</sup>

More survey data is required to determine which particular foods are most addictive. Once a list of foods has been identified, these can be used to analyze the composition to determine the influence of particular ingredients and predict other foods that are likely to have the same effect.

### **Treatment Strategies**

Research is also needed to identify which strategies are most effective in treating food addiction. Treatment of food addiction presents unique challenges, since complete abstinence from food is not an option. To date, self-identified food addictions have sought help through twelve-step programs, but the efficacy of these programs is unclear. Other eating disorders have been successfully treated with cognitive behavioral therapy, and this may be effective in food addiction as well.

### **Twelve Step Programs**

Food Addicts Anonymous Joan Ifland<sup>101</sup> and, which recommends complete abstinence from sugar, flour and wheat as part of their Twelve Step program.<sup>102</sup> While this rather extreme approach may work for some, highly restrictive diets where certain foods are “forbidden” often backfire by creating hypervigilance about food that can make the problem worse.<sup>103</sup>

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<sup>99</sup> Gearhardt, (2011), *supra*.

<sup>100</sup> *Id.*

<sup>101</sup> Ifland, *supra*.

<sup>102</sup> <http://www.foodaddictsanonymous.org/abstinence>

<sup>103</sup> D.M. Garner, *Cognitive therapy for anorexia nervosa*, in *Handbook of Psychotherapy for Anorexia Nervosa and Bulimia* 107–146 (2nd Ed. 1985).

In addition, the twelve-step approach, while used in treating a wide variety of addictive behaviors, is unlikely to appeal to those that don't subscribe to the principles of Christianity or at least monotheism, as it involves recognizing and submitting to a higher power (or "God" explicitly). It is also difficult to assess whether the Twelve Step approach is effective, because the "Anonymous" organizations are reluctant to share information with outsiders. A recent review of the strategies used by Overeaters Anonymous suggested that the approach is of questionable use<sup>104</sup>. Members cited addiction to flour and sugar and found that the addiction model gave their problem legitimacy. They also appreciated the focus on spiritual and emotional aspects. Assessment by an outside observer however suggested that unhealthy relationships with food were not challenged at meetings and that members tended to blame themselves for not working hard enough when faced with failure.<sup>105</sup>

### *Cognitive Behavioral Therapy*

Cognitive behavioral therapy (CBT) has been the treatment of choice for other eating disorders, Bulimia Nervosa (BN) and Binge Eating Disorder (BED).<sup>106</sup> BN is listed in the DSM-IV and characterized by over-evaluation of shape and weight and recurrent binge eating in combination with extreme weight control measures, such as induced vomiting and use of laxatives.<sup>107</sup> BED is similar, but without the extreme control measures characteristic of BN.<sup>108</sup> DSM-IV recognizes BED only as a provisional diagnosis requiring further study.<sup>109</sup> DSM-IV also

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<sup>104</sup> Russell-Mayhew, *supra*.

<sup>105</sup> *Id.*

<sup>106</sup> R. Murphy, *Cognitive Behavioral Therapy for Eating Disorders*, 33 *Psychiatr Clin North Am.*, 611 (2010).

<sup>107</sup> American Psychiatric Association 4th edition. American Psychiatric Association; Washington, DC: 1994. Diagnostic and statistical manual of mental disorders.

<sup>108</sup> *Id.*

<sup>109</sup> *Id.*



includes a category for eating disorders not otherwise specified (NOS), for eating disorders that are clinically severe, but to not meet the diagnostic criteria for Anorexia nervosa, BN or BED.<sup>110</sup> NOS is currently the most commonly diagnosed eating disorder.<sup>111</sup> It is likely that many of those suffering from the eating disorders recognized by the DSM-IV also display signs of food addiction, although further studies are required to determine the extent of overlap.

CBT has produced good outcomes in two-thirds of patients with BN and NOS.<sup>112</sup> CBT has also been effective in treating BED, although treatment has had little effect on body weight, which is often elevated in BED sufferers.<sup>113</sup> Thus, CBT may also be effective in treating food addiction, although critics argue that the moderate consumption taught by CBT is ineffective in treating addiction, where abstinence is the method of choice.<sup>114</sup>

### Who is to blame?

Classifying a particular food as addictive shifts the responsibility from the consumer to the producer of the addictive substance. Kessler presents compelling evidence from representatives of the food industry who, on condition of anonymity, reveal that they very consciously and deliberately design foods to be as addictive as possible.<sup>115</sup> The idea that eating behaviors are not entirely voluntary is very important when considering government intervention and treatment. As discussed *infra*, government initiatives to improve healthy eating habits have primarily focused on information. If people are eating unhealthy foods for

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<sup>110</sup> *Id.*

<sup>111</sup> Murphy, *supra*.

<sup>112</sup> *Id.*

<sup>113</sup> *Id.*

<sup>114</sup> C. Davis et al., *Compulsive overeating as an addiction disorder. A review of theory and evidence*, 53 *Appetite* 1 (2009).

<sup>115</sup> Kessler, *supra*.

emotional reasons rather than lack of information, campaigns focusing on nutritional information alone are unlikely to be effective. Indeed responders in the Stress in America survey cited lack of willpower, not lack of information, as their main barrier to a healthier lifestyle.<sup>116</sup>

It is unclear however, how much regulation is possible for several reasons. First, there is a problem of classification. Which foods should be classified as addictive? If any foods that contain refined sugar and fat are addictive, we will end up categorizing apple pie and birthday cake as addictive substances. Any effort to introduce warning labels or impose taxes on such foods would likely be met with political resistance, not only by the politically strong food industry, but by consumers. This issue can be overcome by conducting surveys of individuals with food dependence to determine which foods trigger addictive behavior. The composition of foods identified can be used to predict which other foods will have a similar effect.

Second, blaming the food is inconsistent with the American ideal of independence and free choice. Having the government interfering with what we can eat is very intrusive, arguably much more so than its regulation of tobacco and alcohol. It is unclear, however, how free our choices really are. Refined and processed foods are typically cheaper and more accessible than healthier options. It is much faster and less labor intensive to grab a bag of potato chips at the checkout counter than to bring home a dirty potato that has to be scrubbed, peeled and prepared. With their added fat and sodium, and perhaps even sugar, potato chips also win on palatability for most consumers. It's also much cheaper to grab something packaged from the vending machine than to go to the salad bar. Thus those with the least time and money also

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<sup>116</sup> <http://www.apa.org/news/press/releases/stress/national-report.pdf>

have the least choice when it comes to healthy food. The choice is further skewed by advertising. I cannot recall ever seeing an ad for carrots on television. Anyone who watches TV is bombarded with seemingly delicious packaged creations that only require taking off the wrapper or possibly a short moment in the microwave. The happy and attractive people eating these foods on television would clearly never go through the effort of preparing something from scratch, so why should you?

The issue of choice is particularly important when it comes to children. Even if one contends that adults should be able to obtain enough information to make healthy choices without any government intervention, children do not have the same resources. Children are much more likely to be influenced by what their parents and peers are doing and what they are viewing on television. Research confirms that children consume substantially more food than the controls after viewing a fastfood advertisement.<sup>117</sup> That many children are struggling with weight and associated anxiety is evident from the obesity statistics and the APA survey discussed *supra*. Many countries already have laws in place that restrict advertising of unhealthy foods to children,<sup>118</sup> but the US presently has none. Intervention is likely particularly important when it comes to children, because exposure to unhealthy and addictive foods early in life may have long lasting effects.<sup>119</sup>

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<sup>117</sup> J.C.G Halford et al., *Effect of television advertisements for foods on food consumption in children*, 42 *Appetite* 221 (2004).

<sup>118</sup> V.G. Oommen et al., *Policies on Restriction of Food Advertising During Children's Television Viewing Times: An International Perspective*, Proceedings Australian College of Health Service Executives 2008 Conference, Going for Gold in Health- Motivation, Effort, Performance. Gold Coast, Australia (2008).

<sup>119</sup> A. Gearhardt et al., *Can food be addictive? Public health and policy implications*, 106 *Addiction* 1208 (2011).

David Kessler suggests that the consumption of unhealthy foods is not going to end until there is an attitude change towards unhealthy foods, similar what happened to smoking which went from cool and sexy to unhealthy and plain disgusting. Steven Gortmaker, at the Harvard School of Public Health has pointed out that the smoking epidemic was not really reversed “until there were bans on advertising and limits on consumption through things like taxation.”<sup>120</sup> The media has a strong role to play in changing public attitudes and the government has at least some power to regulate what information we receive through advertising. While the First Amendment protects advertising as commercial speech, it does not protect misleading information. Some argue that food advertising to children is inherently misleading because children cannot recognize the persuasive intent or apply the critical evaluation required to comprehend commercial messages.<sup>121</sup>

### **Government Intervention**

The Department of Agriculture (USDA) and several agencies of the Department of Health and Human Services (HHS) administer research programs and informational campaigns to combat obesity, but none of these have addressed food addiction to date. In addition, Michelle Obama has introduced “Let’s Move,” an anti-obesity initiative with particular focus on children.<sup>122</sup> Government focus to date has been on informing the public of healthy eating patterns. Well-intended brochures and websites explain that weight gain is due to taking in too many calories and that weight loss can be achieved by eating a vegetables and whole grains

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<sup>120</sup> “Obesity Rates Hit Plateau in U.S., Data Suggest”, P. Belluck, New York Times, January 13, 2010; [http://www.nytimes.com/2010/01/14/health/14obese.html?\\_r=2](http://www.nytimes.com/2010/01/14/health/14obese.html?_r=2) ; accessed March 27, 2012

<sup>121</sup> S. Graff et al., *Government Can Regulate Food Advertising To Children Because Cognitive Research Shows That It Is Inherently Misleading*, 31 *HealthAffairs*, 392 (2012).

<sup>122</sup> <http://www.letsmove.gov/>

while reducing intake of fat, sugar and refined carbohydrates.<sup>123</sup> Even children, however, are typically aware of the basic rules for healthy eating<sup>124</sup>, but overeat for other reasons, including emotional. Indeed, the website that was used to collect information was intended to encourage healthy eating habits, an effort that proved ineffective. The children are puzzled and frustrated by their inability to stop eating. Postings include: "“WHY is it SO hard to resist CRAVEings??? I’m SUFFERing with all this WEIGHT but I still HAVE to eatwhat I’m craveing!” (female, age 14, 5’0”, 304 lbs).!; ""it’s like i couldn’t stop eating . . . i don’t understand why i get this feeling "(female, age 17, 5’2”, 240 lbs)'; and ""god i can’t stop eating . . . this is so retarded." (female, age 16, 5’4”, 216 lbs)<sup>125</sup>

The Centers for Disease Control and Prevention (CDC) has presented a list of factors contributing to childhood obesity as well as proposed solutions.<sup>126</sup> The facts are disturbing. Nearly half of US middle and high schools allow advertising of “less healthy foods,” and more than half offer such foods as well as sugar drinks for purchase. Currently 80% of children consume sugar drinks on a given day and children 8-18 years old spend an average of 7.5 hours a day using entertainment media, 4.5 hours of which is dedicated to viewing television.<sup>127</sup> Since children’s programming is interspersed with frequent advertisements for unhealthy food, the media time does not only indicate an excessively sedentary lifestyle, but also additional exposure to unhealthy food advertisement.

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<sup>123</sup> See e.g. <http://www.letsmove.gov/eat-healthy> ; <http://www.letsmove.gov/eat-healthy> ; <http://www.fruitsandveggiesmatter.gov/>

<sup>124</sup> Pretlow, *supra*.

<sup>125</sup> *Id.*

<sup>126</sup> <http://www.cdc.gov/obesity/childhood/problem.html>

<sup>127</sup> *Id.*

The CDC does a good job of identifying some of the factors contributing to obesity. While it does not directly discuss the possibility of addiction to hyperpalatable foods, it identifies the presence of sugar laden foods and advertising of unhealthy foods as major factors. The solutions, however, do not sufficiently address the problem. They include steps that states and communities can take, such as providing incentives for supermarkets and schools to provide healthier foods, and steps for parents, including limiting screen time, providing healthy foods at home and encouraging physical activity. None of the steps place any responsibility on private actors or suggest that the food industry should be more carefully regulated, however.

#### **Efforts directed to increasing the availability of fresh produce**

Recent legislation has provided state grants to increase the availability of fruit and vegetables to children, as well as tax credits to retailers that increase availability of fruits and vegetables to children. However, the programs have been underutilized by state and local actors.<sup>128</sup> Further, the combined spending on fruit and vegetable related activities by the NIH, CDC and USDA was only 2.8% of the total budget.<sup>129</sup> A recent assessment suggests that the spending must be increased by more than 3.5 billion to adequately address diet-related chronic disease.<sup>130</sup>

#### **Government Obesity Research**

In its obesity research agenda for 2011, the NIH proposes to study a number of areas related to obesity and weight management. The agenda includes a list of very broad initiatives including discovering biologic mechanisms regulating energy balance, understanding correlates,

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<sup>128</sup> Kraak, (2012), *supra*.

<sup>129</sup> *Id.*

<sup>130</sup> *Id.*

determinants and consequences of obesity, and designing and testing interventions to promote healthy weight (including surgical methods). While the goals are so broad and vague that they may encompass food addiction, there is no explicit mention of such research focus.

The focus appears to be more skewed towards biological phenomena, such as gut flora and genetic variants. This is unfortunate, because neither the gut flora nor genetic changes are likely to explain the recent obesity epidemic or unhealthy eating patterns in general. As mentioned *supra*, the human generation time is simply too long to account for the drastic weight changes that have occurred in the last thirty years. Further, certain regions have much higher rates of obesity,<sup>131</sup> suggesting that the underlying reasons are environmental, not genetic (unless there is significant genetic homogeneity in those regions). Although the gut flora can evolve rapidly, it is unlikely to be responsible for the obesity epidemic. Why would there suddenly be a strong selection for bacteria that make us fat? The mechanism is also unclear. How could bacteria cause someone to gain weight unless the person is actually taking in more food than necessary (in which case, the bacteria should not take the blame). This seems to violate the principle of conservation of energy. For these reasons, studying the gut flora is unlikely to provide a solution to the obesity problem.

### Advertising

In 2004, Congress directed the Institutes of Medicine (IOM), non-profit organization of the National Academies, to convene an expert committee to review food and beverage marketing practices that influence the diets of children and adolescents and to make

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<sup>131</sup> [http://apps.nccd.cdc.gov/DDT\\_STRS2/NationalDiabetesPrevalenceEstimates.aspx?mode=OBS](http://apps.nccd.cdc.gov/DDT_STRS2/NationalDiabetesPrevalenceEstimates.aspx?mode=OBS)

recommendation for promoting a healthful diet.<sup>132</sup> The resulting report found, not surprisingly, that children are consuming too much fat, sodium and added sugars, and that the food industry devotes substantial resources to marketing unhealthy foods directly to children. The report made recommendations to industry for marketing a healthful diet to children and adolescents.<sup>133</sup> Following the report, the Children’s Food and Beverage Advertising Initiative (CFBAI) was created, and by 2010, 17 companies participated and voluntarily pledged to shift their child-directed advertising messages to encourage healthier choice<sup>134</sup>. The effect of this initiative has been limited or moderate at best, and companies continue to market unhealthy foods and beverages to young people, often by means of misleading health and advertising claims.<sup>135</sup> Indeed, the problem appears to be getting worse, not better. In 2009, “quick-serve chain restaurants” (QSR) spent \$4.2 billion on marketing, and from 2003-2009 exposure to QSR TV advertisements increased by 21% for preschoolers; 34% for children (2-11 years); and 39% for adolescents (2-17 years).<sup>136</sup> Further, African-American children and adolescents are disproportionately affected by the obesity epidemic and were targeted more aggressively by QSR advertising.<sup>137</sup><sup>138</sup>

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<sup>132</sup> V.I. Kraak et al., *Industry Progress to Market a Healthful Diet to American Children and Adolescents*, 41 Am J Prev Med, 322 (2011).

<sup>133</sup> *Id.*

<sup>134</sup> *Id.*

<sup>135</sup> *Id.*

<sup>136</sup> *Id.*

<sup>137</sup> L.M. Powell et al., *Trends in exposure to television food advertisements among children and adolescents in the U.S.*, 164 Arch Pediatr Adolesc Med, 878 (2010).

<sup>138</sup> J.L. Harris et al., *Fastfood f.a.c.t.s. Evaluating fast food nutrition and marketing to youth*, Rudd Center for Food Policy and Obesity (2010); [http://www.fastfoodmarketing.org/media/FastFoodFACTS\\_Report.pdf](http://www.fastfoodmarketing.org/media/FastFoodFACTS_Report.pdf)



### *The Role of the FTC*

The Federal Trade Commission has statutory authority to regulate advertising that is either deceptive or unfair.<sup>139</sup> The Commission “will find deception if there is a representation, omission or practice that is likely to mislead the consumer acting reasonably in the circumstances, to the consumer’s detriment.”<sup>140</sup> For a deception finding, the representation, omission or practice must be likely to mislead a reasonable consumer, and it must materially affect the consumer’s choice or conduct, leading to injury.<sup>141</sup> An act or practice is unfair if it causes or is likely to cause substantial and not reasonably avoidable consumer injury, and if the harm is not offset by countervailing benefits to consumers or competition.<sup>142</sup>

Although the FTC has statutory authority to regulate deceptive and unfair advertising to children, it is very reluctant to do so, at least in part due to a failed rulemaking attempt in 1978. The proposed “kidvid” rule intended to restrict television advertisements of highly sugared foods directed to children, particularly those too young to understand the nature of commercial advertising or the health hazards of excessive sugar consumption.<sup>143</sup> The proposed rule would ban all television advertising directed to children that are too young to understand the selling purpose of advertising; 2) ban television advertising for food products posing the most serious dental health risk, direct to audiences with a significant proportion of older children, and 3) require that all television advertising for sugared food products not included in the ban be

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<sup>139</sup> 15 U.S.C. §45(a)

<sup>140</sup> Deception Policy Statement, appended to *Cliffdale Associates, Inc.*, 103 F.T.C. 110, 176 (1984).

<sup>141</sup> *Id.*

<sup>142</sup> 15 U.S.C. § 45(n)

<sup>143</sup> Advertising to Kids and the FTC: A Regulatory Retrospective That Advises the Present (2004). <http://www.ftc.gov/speeches/beales/040802adstokids.pdf>

balanced by nutritional disclosures funded by the advertisers.<sup>144</sup> The proposed rulemaking produced more than 60,000 pages of written comments, and though the FTC terminated the rulemaking three years later, members of the agency has described it as “toxic to the Commission as an institution.”<sup>145</sup> The FTC lost funding, its other law enforcement functions were “left in tatters,” and Congress passed a law prohibiting the FTC from adopting any rule in children’s advertising rulemaking that relied on an unfairness theory.<sup>146</sup> Even the Washington Post criticized the proposed rulemaking as a “ ‘preposterous intervention that would turn the FTC into a great national nanny.’”<sup>147</sup> In addition to the negative publicity, major problems in justifying the rule were difficulty defining which foods and beverages should be covered by the ban, and in proving a causal relationship between dental caries and consumption of the particular products.

The FTC has referred to the KidVid rulemaking in arguing against rulemakings to ban “junk food” advertising to children. The agency argues that like the high sugar food, defining which foods should be considered junk food is difficult. The agency also argues that a “junk food” ban would be unlikely to pass *Central Hudson* analysis, the Supreme Court’s First Amendment test for commercial speech.<sup>148</sup> For regulation of commercial speech to be constitutional under *Central Hudson*, 1) the state must assert a substantial interested to be achieved by the restrictions; 2) the restriction must directly advance this interest, and 3) there

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<sup>144</sup> 43 Fed. Reg. at 17,969; 1978 Staff Report at 10-11.

<sup>145</sup> Advertising to Kids and the FTC: A Regulatory Retrospective That Advises the Present (2004). <http://www.ftc.gov/speeches/beales/040802adstokids.pdf>

<sup>146</sup> *Id.*

<sup>147</sup> *Id.*

<sup>148</sup> *Central Hudson Gas & Elec. Corp. v. Public Serv. Comm’n*, 447 U.S. 557 (1980).

should be no less speech-restrictive alternatives that serve the same interest equally well.<sup>149</sup>

The FTC argues that the “directly advance” requirement is problematic if the interest to be served is reducing childhood obesity, because the causes of obesity are complex.<sup>150</sup> It also argues that there are less restrictive alternatives, such as encouraging ads promoting balanced nutrition, making improvements to nutrition labeling and encouraging self-regulation on the part of industry.<sup>151</sup> The reluctance of the FTC to attack the problem is not necessarily warranted. The KidVid rulemaking occurred in different political climate and prior to the obesity epidemic.

The food addiction framework would facilitate regulation of advertising. The addiction model shifts responsibility from the consumers to the producers. A finding of deception is much more likely when advertising foods with addictive potential. A reasonable child would conclude after watching his or her favorite cartoon character munching away on something that looks delicious, that it is something that he or she should try. The child would not have any reason to suspect that consumption of the food could lead to a substance abuse disorder. The choice to consume the product would be materially affected by exposure to the advertisement, since it strongly increases the child’s awareness of and desire for the product.

If the FTC promulgates a rule that bans advertising of addictive foods, the Hudson issues would also be easier to overcome than if the ban is directed to unhealthy foods based on their link to obesity. First, the interest to be advanced could be defined as protecting our children from exposure to addictive substances. The causal link to obesity would not have to be made,

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<sup>149</sup> *Id.*

<sup>150</sup> Advertising to Kids and the FTC, *supra*.

<sup>151</sup> *Id.*

because the public has a compelling interest in not becoming addicted to unhealthy foods, regardless of whether the addiction also leads to obesity. Overconsumption of unhealthy foods can lead to a number of problems besides obesity, including malnutrition and diabetes.

The public has a particularly compelling interest in preventing children from becoming conditioned to desiring highly processed, nutrient poor, foods that are high in refined carbohydrates, sodium and fat, because early conditioning can predict lifelong habits. Further, children need particular protection since they do not have the same ability to make critical, informed choices as adults. A restriction on advertising of addictive foods would directly advance the interest of protecting children from becoming addicted to such foods. Finally, less restrictive alternatives that serve the interest equally well will be difficult to identify. Even if “positive advertising” may be used to balance out the negative effects of the addictive food advertising, it cannot possibly serve the interest as adequately as avoiding exposure to unhealthy food advertising altogether.

The problem of defining which foods should be considered addictive will still be a challenge, but that can be determined based on more extensive surveys. David Kessler has already suggested that the combination of large amounts of fat, sugar or refined flour and salt is common to most hyperpalatable foods, and anonymous industry officials agree that they purposely combine these ingredients because they make consumers come back again and again. If enough survey data is obtained from people with food dependence, the foods identified can be used to estimate a formula for a typical addictive food. Threshold levels of

carbohydrates, fat and sodium can be identified, and the combination of all three may be required, depending on the survey data reveals.

### **The Role of the FDA**

Food addiction is still controversial and the FDA has not addressed the issue. Unlike tobacco, where the FDA's authority to regulate was struck down by the Supreme Court until explicitly authorized by Congress,<sup>152153</sup> food regulation is clearly within the agency's scope of authority. Food addiction, however, is not something Congress anticipated in drafting the Food, Drug & Cosmetic Act, and it may best be addressed by a statutory amendment directed specifically to the problem. Such an amendment would of course have to withstand strong opposition from the politically strong food industry.

The FDA can require labeling of food if it finds that "the food presents a threat of serious adverse health consequences or death to humans or animals"<sup>154</sup> Food addiction can have serious adverse health consequences, both physiological and psychological. Whether labeling hyperpalatable foods is an effective strategy, however, is unclear. Since many unhealthy foods are so commonplace in our society, warning labels may appear ridiculous or intrusive to consumers, even if the warnings are valid. The category of addictive foods is yet to be defined, but it may encompass foods like ice-cream and pecan pie. By the same token, a warning label on the ice-cream container stating that overconsumption can lead to diabetes and heart-disease, may serve to deter consumption in the same way that the warnings on cigarette packages deter some from buying cigarettes. Consumers are typically aware that ice-cream is

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<sup>152</sup> *FDA v. Brown & Williamson Tobacco Corp.*, 529 U.S. 120 (2000).

<sup>153</sup> <http://www.fda.gov/TobaccoProducts/GuidanceComplianceRegulatoryInformation/ucm246129.htm>

<sup>154</sup> 21 U.S.C. § 343(v)(2)

not health-food, but being reminded of this fact when making a decision about how much to buy or consume could have some deterrent effect. Still, the political resistance by the food industry as well as from consumers would likely prevent such labeling from ever becoming reality, even if the scientific data supporting harm is strong.

Labeling that explicitly warns about the product's addictive potential would likely be ineffective or even counter-productive. Many companies already use the addictive qualities of their products as an advertising tool. Pringles, for example, is proud to announce that “Once you pop, you can’t stop!” Any labeling indicating addictive potential would thus likely benefit the company by validating the irresistible quality of the product. Consumers may also perceive the message or disregard it as silly or intrusive.

## Final Words

Recognizing the existence of food addiction has important implications for treatment and regulation. The concept of addiction can have a negative connotation for the affected – people suffering from alcoholism and compulsive gambling are often viewed as morally deficient, even if the behaviors are strongly influenced by biological factors. Yet the addiction framework can be helpful by placing responsibility on the food industry, particularly when it comes to children and young adults. The effect on children can be devastating, as seen by the accounts of obese children and teenagers posting information that they would not even share with family members on an anonymous website.<sup>155</sup> For young people affected by food addiction and who also become obese, the effects are devastating. Obese children are teased

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<sup>155</sup> Pretlow, *supra*.

and ridiculed, unable to go on amusement park rides or wear popular clothes.<sup>156</sup> They tend to be very ashamed of their inability to stop eating and blame themselves for their condition.<sup>157</sup> Providing these children, with information about the condition and possible treatment options, could be life-changing. Recognition of food addiction as a substance use disorder would also increase the possibility of insurance coverage for treatment. Most importantly, the food addiction concept places greater responsibility on the food industry and opens up the possibility for greater governmental regulation and control.

## Conclusion

There is growing evidence that certain foods have the potential to become addictive. While food addiction can contribute to overconsumption of calories and excessive weight gain, it is not synonymous with obesity. The addiction framework has important implications because it shifts responsibility from the consumer to the food industry. If the model gains greater acceptance, it may be particularly important in facilitating the regulation of food advertising directed to children. The model also has implications for further research and treatment approaches.

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<sup>156</sup> *Id.*

<sup>157</sup> *Id.*