Television Advertising and Childhood Obesity

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I. Introduction

In 2006, the Institute of Medicine (“IOM”) Committee on Food Marketing and the Diets of Children and Youth published a report that reviewed the existing research on the link between food marketing and childhood obesity. The Committee members reached a consensus on a number of key issues based on this review. Because these conclusions were predicated on a comprehensive and exhaustive review of the evidence, they provide a useful framework for assessing subsequent research, including the studies presented at the FTC forum on childhood obesity in December, 2009. This article reviews the literature on the connection between television advertising and childhood obesity that has been published since the IOM report to assess whether any of the IOM panel’s fundamental conclusions must be reconsidered.

The articles included in this review were identified by searching EconLit, PubMed, and Google Scholar. The studies presented at the FTC forum on childhood obesity were also included, along with any additional relevant articles cited in the articles that were identified through the literature searches.

The IOM panel reached conclusions regarding four salient categories of research on the connection between childhood obesity and television advertising. First, they found that for

1. INSTITUTE OF MEDICINE, FOOD MARKETING TO CHILDREN: THREAT OR OPPORTUNITY (The National Academies Press 2006) [hereinafter IOM].
2. Articles were identified for inclusion in this study if they purported to empirically demonstrate a causal relationship between television advertising and childhood obesity. Searches on PubMed and Google Scholar yielded an enormous number of results across various permutations of searches. For instance, on PubMed searching for “childhood obesity, advertising” yields 63 results and “childhood obesity, television” yields 243 results. On Google Scholar, searching for “childhood obesity, advertising” yields 24,600 results and searching for “childhood obesity, television” yields 36,100 results. Thus, articles were selected only when their abstracts indicated that the article analyzed the link between childhood obesity and television advertising in an empirical manner. After this initial relevance screen, the universe of articles was also narrowed based on whether the article was fully germane to the issue at hand. Thus, an article like Kunkel et al.’s “The Impact of Industry Self-Regulation on Nutritional Quality of Foods Advertised on Television to Children” was not included because the article only examined the nutritional content of the food advertising on television, and did not address the relationship between exposure and obesity. Furthermore, an article like Harris et al.’s “A Crisis in the Marketplace: How Food Marketing Contributes to Childhood Obesity and What Can be Done” was also excluded because it only reviewed existing studies and did not provide any original empirical research.
children between the ages of 2 and 11 there was “strong evidence” that advertising affects short-term food consumption, but that for children between the ages of 12-18 there was “insufficient” evidence.\(^3\) Second, they found “moderate evidence” that advertising affects the “usual dietary intake” of children between the ages of 2 and 5, and “weak evidence” for children between the ages of 6 and 11.\(^4\) They also found, however, “weak evidence” that advertising “does not influence the usual dietary intake of teens ages 12-18.”\(^5\) Third, they concluded, “[s]tatistically there is strong evidence that exposure to television advertising is associated with adiposity in children ages 2-11 and teens ages 12-18.”\(^6\) Fourth, they concluded that despite the consistent relationship between exposure to television viewing and adiposity, “the research does not convincingly rule out other possible explanations for the association; therefore, the current evidence is not sufficient to arrive at any finding about a causal relationship from television advertising to adiposity.”\(^7\)

This article focuses primarily on recent studies that reach conclusions differing from those reached by the IOM panel. Section II reviews these studies critically to determine whether the IOM panel’s conclusions are in need of revision. Section III identifies studies published since the IOM report that corroborate the IOM panel’s conclusions. For each study, it discusses the research methodology and data sources used, briefly summarizes the salient results, and explains why the study is consistent with the IOM framework. A final section offers some conclusions.

The following table summarizes the relationship between the articles surveyed and the four conclusions the IOM panel reached.\(^8\) The first column in the table states the issue under

\(^3\) Id. at 379.
\(^4\) Id.
\(^5\) Id. (emphasis in orig.).
\(^6\) Id.
\(^7\) Id.
\(^8\) All of the articles reviewed are listed in the Works Cited at the end of the report.
consideration, the second column reviews the IOM panel’s conclusion regarding the evidence for the relevant age range, the third column lists the studies reviewed in this survey that relate to the issue (studies are listed by the last name of the first author), and the fourth column indicates whether the IOM panel finding or characterization of the evidence is in need of revision.

<table>
<thead>
<tr>
<th>IOM Panel Issue</th>
<th>IOM Panel Characterization of Evidence (yrs)</th>
<th>Relevant Studies</th>
<th>Revise Finding or Characterization?</th>
</tr>
</thead>
<tbody>
<tr>
<td>TV ads affect short term food consumption.</td>
<td>Strong, ages 2-11 Insufficient, ages 12-18</td>
<td>Anshutz, Halford(a), Halford(b), Harris</td>
<td>No</td>
</tr>
<tr>
<td>TV ads affect usual dietary intake</td>
<td>Moderate, ages 2-5 Weak, ages 6-11 Weak no effect, ages 12-18</td>
<td>Barr-Anderson, Utter, Andreyeva, Buijzen,</td>
<td>No</td>
</tr>
<tr>
<td>Exposure to TV ads associated with adiposity.</td>
<td>Strong, ages 2-18</td>
<td>Epstein, Utter, Zimmerman, Andreyeva, Chou</td>
<td>No</td>
</tr>
<tr>
<td>Causal relationship between TV ads and adiposity</td>
<td>Insufficient, ages 2-18</td>
<td>Barr-Anderson, Epstein, Utter, Zimmerman, Andreyeva, Buijzen, Chou</td>
<td>No</td>
</tr>
</tbody>
</table>

As the table indicates, the literature since the IOM panel report does not change the panel’s conclusions, or its characterization of the strength of the evidence supporting its findings.

II. Studies Reaching Conclusions that are not Consistent with the IOM Panel Conclusions

The studies identified for this review employ several different dependent variables, including various measures of diet and obesity. Most are cross sectional studies, although one experimental and two longitudinal studies were identified. The studies employ two different approaches to determining the relationship between the dietary variable of interest and advertising. Some studies rely on measures of television viewing alone, while others utilize some more direct measure of exposure to advertising. Section A considers studies that use television viewing as an advertising measurement, beginning with a discussion of the issues that are
common to studies using this approach. Section B takes a similar approach to studies that use more direct measures of advertising.

A. Studies Employing Television Viewing as the Independent Variable

It is undoubtedly true that children who watch more television (at least more commercial television) are exposed to more advertising than children who view less television. Thus, the impact of time spent watching television on dietary choices is likely to confound at least in part an examination of any impact of advertising on those choices. As the IOM report noted, numerous studies have found a relationship between television viewing and adiposity.

There are, however, numerous hypotheses about ways in which television viewing might affect diet or obesity. Thus, in assessing these studies, a critical question is how well they control for possible alternative explanations of the relationship. As the IOM noted, it seems clear that the relationship between television viewing and obesity exists, but it is not clear that exposure to advertising causes or contributes to the relationship. Indeed, the panel identified six plausible alternative hypotheses about how television viewing could influence adiposity. Television viewing might:

- Displace physical activity;
- Reflect a preference for a more sedentary lifestyle;
- Be a context for snacking, thereby increasing calorie intake;
- Blunt sensitivity to satiety cues, increasing calorie intake;
- Reduce metabolic level, leading to less efficient processing of calories;
- Indicate exposure to depictions of eating and drinking within the programs watched.9

9. IOM, supra, at 284.
More generally, television viewing and other behaviors related to obesity are jointly determined variables, the result of decisions of both children and their parents. Factors that may lead to more television viewing, such as lenient parental rules or limited parental involvement, may also lead more directly to poor dietary choices, poor choices about how much to exercise, and obesity. In studies using television viewing as the measure of advertising exposure, attempts to control for plausible alternative hypotheses are critical.

Two different strategies to control for alternative causes of the relationship are possible. One approach is to look for different effects of different forms of video entertainment. The advertising hypothesis, for example, implies that watching commercial television should have an effect on obesity, but playing video games or watching DVDs should have a smaller effect. Hypotheses such as displaced physical activity or a sedentary lifestyle preference, imply that there should be no difference in the effect of different forms of video entertainment. The snacking hypothesis implies that commercial television and DVDs should have the same effect, but the effects of playing video games may be different.

A second strategy is to measure factors relevant to each alternative hypothesis and control statistically for the possible influence of that factor. Under this approach, for example, measures of physical activity or snacking can be employed to try to narrow the effects of television viewing to the effects of the advertising it contains.

The two strategies can also be combined, controlling for some measurable factors and seeking different effects of different forms of video to assess impacts that are more difficult to measure. As the IOM panel found, “… the research does not convincingly rule out other possible explanations for the association; therefore, current evidence is not sufficient to arrive at any
finding about a causal relationship from television advertising to adiposity …”\textsuperscript{10} Thus, studies that cannot rule out plausible alternative explanations of the relationship cannot provide reliable evidence that advertising causes changes in adiposity or diet.

1. **Barr-Anderson et al. (2009)**

Barr-Anderson et al. used multivariate regression analysis to examine “whether time spent watching television during middle school and high school is associated with eating behaviors five years later.”\textsuperscript{11} Barr-Anderson et al. relied on survey responses from separate cohorts of students who were in middle school and high school in 1998-1999 (“time 1”). Both cohorts were surveyed again in 2003-2004 (“time 2”). They divided respondents into three categories, “limited television users,” who watched less than 2 hours of television per day, “moderately high television viewers,” who watched between 2 and 5 hours of television per day, and “heavy television users,” who watched more than 5 hours of television per day.\textsuperscript{12} The authors then regressed these television use variables on calorie intake per day, fruit servings per day, vegetable servings per day, whole grains servings per day, calcium-rich foods, percentage total fat, percentage saturated fat, percentage trans fat, fried food servings per day, fast food times per week, snack food servings per day, and sugar-sweetened beverage servings per day. For the younger cohort, the only statistically significant effects were that time 1 heavy television viewers consumed fewer fruit servings per day at time 2 and that heavy viewers consumed more of sugar-sweetened beverage servings per day than moderate viewers.\textsuperscript{13} As for the older cohort:

Time 1 heavy television viewers reported lower intakes of fruits and vegetables, and higher consumption of snack foods, as compared to Time 1 limited and moderately high

\textsuperscript{10} IOM, supra, at 292.
\textsuperscript{11} Daheia J. Barr-Anderson, Nicole I. Larson, Melissa C. Nelson, Dianne Neumark-Sztainer & Mary Story, Does Television Viewing Predict Dietary Intake Five Years Later in High Students and Young Adults, 6 INT. J. BEHAV. NUTR. PHYS. 7 (2009), at *2.
\textsuperscript{12} Id.
\textsuperscript{13} Id. at *4.
television viewers. Time 1 heavy television viewers reported fewer servings of calcium-rich foods, greater percentage of total calories from trans fat, and greater servings of sugar-sweetened beverages at Time 2, as compared to Time 1 limited television viewers. Additionally, participants who watched more than 2 hours of television while in high school reported consuming less servings of whole grains and more servings of fried foods, and ate more times per week at a fast food restaurant than participants who watched <2 hours of television at Time 1.14

Based on these results, Barr-Anderson et al. concluded:

Findings from this study indicate that television viewing during adolescence, especially viewing during the high school years, predicts future eating habits. The research presented in this article begins to explore the television-diet paradigm of adolescents as they transition into young adulthood. However, from the current analyses, it cannot be determined if the relationship is causal and it cannot be determined the extent to which specific mechanism(s) are driving the association.15

Further exploration of the specific mechanisms driving the relationship is particularly important in understanding the implications of this study. Students in the older cohort in particular, who have moved on after high school, will experience substantial, and disparate, changes in their circumstances. Many go to college; but some may live at home and others are away at school. Others get a job or join the armed forces; some may continue to live at home and others move out on their own. Diets are likely to differ significantly among these groups, but there is no control for the respondent’s status at the time of the followup. Different choices may also affect response rates in the different groups, because teens who have moved away from home are likely more difficult to contact for the follow-up survey, and may be less likely to respond.

More important, heavy high school television viewing may well be correlated with an individual’s choices. If there is a relationship between television viewing and academic achievement, for example, then heavy users in high school may be less likely to go on to college, leading to different dietary choices and constraints. Moreover, they may have less knowledge

14. Id.
15. Id. at *6.
about nutrition issues in general. As Barr-Anderson et al. acknowledge, a better understanding of the mechanisms at work is essential to drawing causal inferences.

Just as controlling for life choices that are likely to influence dietary choices is important, it is also important to control for factors that are likely to influence television viewing in the first instance. For example, the amount of time children spend watching television in the baseline time period is likely to be influenced by both parental style and household environment. Because both of these factors would likely affect food consumption as well, the coefficient estimates of Barr-Anderson et al.’s regression analyses reflect both effects. More generally, the same unobserved psychological, biological, and environmental factors that determined children’s television viewership preferences at time one may also create a preference for unhealthy food and a sedentary lifestyle. Obesity and television viewership may be correlated because the preference for a sedentary lifestyle causes both a tendency to watch relatively more television and a tendency towards overweight and obesity.

2. Epstein et al. (2008)

In an experimental study, Epstein et al. (2008) used mixed-effects regressions to examine “the effects of reducing television viewing and computer use on age- and sex-standardized BMI (zBMI) changes in a sample of children aged 4 to 7 who were at or above the 75th BMI percentile.”\(^{16}\) In their experiment, children were either randomly assigned to a treatment group where devices were connected to their televisions and computers to restrict use by 50 percent or a control group where television and computer usage were not restricted. Epstein et al. reported that the average change in BMI from the start of the experiment for children in the treatment group decreased more than the control group, but these between-group differences were only

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statistically significant through the first 12 months of the 24 month experiment. Food consumption, measured by a questionnaire participating parents filled out on a monthly basis, was also lower for the intervention group, but the between-group difference was only statistically significant between 18 and 24 months. Epstein et al. also found that the intervention did not have a statistically significant effect on physical activity as measured by an accelerometer that “recorded in 1-minute epochs on 3 randomly selected weekdays from after school until bedtime and all day for 1 randomly selected weekend day.” Based on their results and other research they conclude “the association of television viewing and eating supports the need to explore the reduction of television advertising as a way to avoid overeating and obesity in youth.”

The authors’ commentary aside, Epstein et al.’s results merely confirm conclusions already reached by the IOM rather than establishing a link between advertising and childhood obesity. Like other studies that use television viewing as a measure of advertising exposure, their analysis does not actually distinguish between the effect of television and the effect of advertising on BMI. Although the study collected data on computer usage and television viewing, the analysis does not examine these activities separately. Moreover, the only alternative hypothesis that they control for is physical activity (not statistically significant), leaving the five other alternative hypotheses postulated by the IOM panel and differing levels of parental involvement as possibilities. Thus, their suggestion that their results pinpoint food advertising as the causal mechanism underlying the connection between television viewership and obesity is unsupported. An experimental intervention like Epstein’s that manipulated

17. *Id.* at 242.
18. *Id.* at 242-243.
19. *Id.* at 241.
20. *Id.* at 244.
commercial television and other forms of video entertainment independently could be useful in
disentangling the alternative hypotheses.

Moreover, it is difficult to square their results with the causal chain that would occur if
advertising is the causal factor. Presumably advertising would have an effect by increasing
consumption of certain foods, resulting in changes in diet that in turn would lead to changes in
obese. Significant dietary changes should therefore precede significant weight changes. At
least in the sense of statistically significant differences, Epstein finds the opposite pattern.
Weight changes occur first, and later disappear as dietary changes become significant. Indeed,
the relationship between the intervention and BMI losses its statistically significance well before
there is a significant difference between the groups’ food consumption. It is hard to imagine how
effects driven by advertising could produce such a pattern.

3. Utter et al. (2006)

Utter et al. used multivariate regression to “examine the association between TV use and
weight status” and “examine how duration of TV viewing is associated with the frequency of
consumption of the most frequently advertised foods on TV.”21 The researchers used data from
the 2002 National Children’s Nutrition Survey in New Zealand.22 Utter et al. divided this sample
into two groups in their study, children between the ages of 5 and 10 and adolescents between
the ages of 11 and 14. Television viewing was measured in three categories of time spent
watching: less than 1 hour, between one hour and two hours, and greater than or equal to two
hours.23

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21. Jennifer Utter, Robert Scragg & David Schaaf, Associations Between Television Viewing and Consumption
of Commonly Advertised Foods Among New Zealand Children and Young Adolescents, 9 PUBLIC HEALTH NUTR.
22. Id.
23. Id.
For the regressions examining the relationship between weight status and time spent watching television, Utter et al. created two dependent variables: a variable indicating whether a child qualified as overweight, and a variable indicating whether a child qualified as obese as measured by BMI. The researchers conducted the weight status analysis using generalized log-linear regression models and controlled for age, sex, ethnicity, socioeconomic status, and physical activity.  

Utter et al. did not find any statistically significant association between time spent watching television and overweight. They did find however, that adolescents who watched 2 or more hours of television were significantly more likely to be obese than adolescents who watched under 1 hour of television; the relationship for children was not significant by the usual standards of scientific research (p = .15).

For the regressions examining the relationship between food consumption and watching television, the researchers created dependent variables to identify respondents with high consumption of the food item in question, “[b]ecause the responses for each food item’s consumption were not normally distributed.” High consumption was defined as consumption at the 75th percentile of the item within the sample. They found that both children and adolescents who watched more television were more likely to consume soft drinks, hamburgers, and French fries. Children who were heavy viewers were also more likely to consume fruit drinks, potato crisps, and biscuits (and marginally, with p = .07, fried chicken) and less likely to consume fruit and vegetables. Teens were likely to consume more chocolate.

Like other studies that rely on TV viewing as an independent variable, Utter et al. rely on the assumption that more viewing means more exposure to advertising, and therefore that

24. Id. at 608.
25. Id.
26. Id. at 607.
27. Id. at 608.
advertising is the causal variable. Their set of control variables, however, intended to rule out alternative explanations, is quite limited. They only control for age, gender, ethnicity, and socioeconomic status (and physical activity in the weight status analysis). Moreover, the heaviest television viewers are disproportionately Maori, followed closely by Pacific islanders, ethnic groups with no clear relevance to the United States. These groups, however, are more than two thirds of the sample. In addition, Utter et al. did not control for the possibility that children who watch more television may simply live in households where parents are more permissive or less attentive to children’s food intake.

The lack of controls for other factors likely to influence the relationship is most problematic in the analysis of consumption of different food groups. There is no control for total calorie intake or calorie demands. There is no control for puberty, for example, which is likely to influence total calories and levels of consumption in numerous food categories. There is no control for BMI of either the child or the parent, or for the child’s physical activity. There is no control for the possibility that heavier television viewers are more likely to eat in front of the TV, where burgers, fries, and a soft drink may be a particularly convenient meal choice. Nor is there any attempt to control for other family variables such as family size or parental education. Furthermore, although Utter et al. often find significant differences between children who watched 2 hours of television or more and children who watched less than one hour, the confidence interval between the intermediate category and 2 hours or more category is always overlapping. If more exposure to advertising were the causal factor, in one would expect significant differences between the middle and highest viewership categories. Indeed, because the less than one hour category will likely include all children whose parents strictly regulate
viewing, the results may be most supportive of the hypothesis that household environment is the main factor driving overconsumption of non-nutritious food.

The IOM reached its conclusion that there was weak evidence advertising does not influence the usual diets of teens aged 12-18 in part because studies with more direct measures of advertising exposure (rather than simply television viewing) found no effect, and because studies that found positive effects were “correlational studies that failed to rule out alternative explanations.”28 Utter et al.’s findings offer no reason to revisit that conclusion.

4. Zimmerman and Bell (2010)

Using multivariate regression, Zimmerman and Bell attempted to distinguish whether the observed link between television and obesity is caused by: (1) the displacement of physical activity; (2) indiscriminate eating while watching television; or (3) the influence of advertising on consumption of unhealthy food. Zimmerman and Bell explained:

These pathways have quite different implications for the ways different kinds of television content might affect obesity. The hypotheses involving displacement of physical activity and eating while viewing suggest that all types of television have an equal and significant effect on obesity. If the advertising hypothesis is more accurate, only commercial television viewing should be associated with obesity and not noncommercial television or DVD viewing.29

Zimmerman and Bell examined these hypotheses using data from the Panel Study of Income Dynamics Child Development Supplement questionnaire administered in 1997 to the primary care-takers of 3,563 children between the ages of 0 and 12 and a follow-up questionnaire administered in 2002. They divided the sample based on age in 1997, and separately analyzed children 0-6 and those 7 and older in 1997. Using regression analyses in the younger children sample, Zimmerman and Bell found that each hour of watching commercial programming in

28. IOM, supra, at 269.
29. Frederick J. Zimmerman & Janice F. Bell, Associations of Television Content Type and Obesity in Children, 100 AM. J. PUB. HEALTH 334, 334 (2010).
1997 was associated with a statistically significant increase in 2002 BMI z-scores, while the effect of each hour of noncommercial programming in 1997 was not statistically significant. Measured in 2002, however, neither viewing variable had a statistically significant effect on BMI z-scores in 2002.\textsuperscript{30} When the same analysis was run on the sample of older children, neither hours spent viewing commercial nor noncommercial programming in 1997 had a statistically significant effect on 2002 BMI z-scores, but commercial viewing hours in 2002 had a statistically significant effect.\textsuperscript{31} Based on these analyses, Zimmerman and Bell concluded: “Television viewing may be a sedentary activity, but it is not for that reason that it is associated with obesity in children. The relationship between television viewing and obesity among children is limited to commercial television viewing and probably operates through the effect of advertising obesogenic foods on television.”\textsuperscript{32}

From a methodological standpoint, using the variations in advertising exposure inherent in different categories of TV programming represents a promising approach to examining the link between advertising and childhood obesity. If advertising is a causal factor in childhood obesity, one would expect viewership of TV programming with more commercials to be associated with higher BMI and viewership of TV programming with fewer commercials to be associated with lower BMI, holding other factors constant. Unfortunately, a number of problems with this particular study render its conclusions unreliable.

First, Zimmerman and Bell conduct the wrong statistical tests. The relevant question is whether there is a difference between the coefficients for commercial and noncommercial television, not whether the coefficients are zero. Given that the reported confidence intervals overlap substantially, it is unlikely that they are significantly different from one another.

\textsuperscript{30} Id. at 337.
\textsuperscript{31} Id. at 338.
\textsuperscript{32} Id.
Moreover, in their sample of older children, the coefficient for contemporaneous noncommercial viewing is actually larger than the coefficient for commercial viewing, a result that is inconsistent with their hypothesis. The problem is compounded because Zimmerman and Bell used only broad categories of commercial versus noncommercial television viewing hours in their analysis, even though they had more detailed data. For example, if advertising matters, there should be a difference between the effects of viewing children’s entertainment programming on television and on video or DVDs. Zimmerman and Bell did not report on this relationship.

Second, the results are anomalous. There is no theoretical reason why viewing in 1997 should be significant for predicting younger children’s weight status in 2002, but viewing in 2002 is what matters for older ones. Indeed, the estimated effect of baseline (1997) viewing in the older sample is negative, albeit not significant. Baseline viewing is theoretically a preferable measure, because the measure of the putative causal factor occurs before the outcome the analysis is seeking to explain. If the two measures are highly correlated, the result may be a statistical artifact.

Third, it is not appropriate to split the sample at age 7. Baseline BMI is a very important variable, as is apparent from the results for children 7 and over in 1997. Adding that variable raises the percentage of explained variation of z-scores from 10 percent to 37 percent. The variable is also available for children who were 2 to 6 in 1997, but the arbitrary sample division means that it cannot be used. For many children in the sample, an important and available variable is omitted, which can bias the estimates of the effects of other variables.

Fourth, BMI z-score is problematic as a dependent variable. Z-score indicates where a particular child falls in the distribution of BMIs in the population. The median BMI in a
particular age-sex population corresponds to a z-score of 0; children with larger BMIs will have positive z-scores, and those with lower BMIs have negative scores. The 95th percentile of BMI, a commonly used criterion for obesity, corresponds to a z-score of 1.645.

The regression equations assume that each additional minute of viewing has a constant marginal effect on z-score. For example, the results for the younger sample imply that each additional hour of watching commercial television raises the z-score by roughly .10. However, the same z-score will represent a substantially different change in BMI depending on where the child lies in the distribution of BMI. For an 8 year old boy, changing the z-score from 0 to 0.10 implies an increase in BMI of .16 (.18 for an 8 year old girl). For an 8 year old boy at the 90th percentile of BMI, however (z = 1.282), the same change in z-score implies a BMI change that is 14 percent larger (16 percent larger for an 8 year old girl); at the 10th percentile (z = -1.282), the implied change in BMI is 15 percent smaller (for both boys and girls) than for the median child. Moreover, the implied BMI changes differ by age and gender. Thus, the measurement approach obscures the meaning of the coefficient estimate.

In the sample with data on baseline BMI, an appropriate test for robustness of the relationship is to examine changes in BMI over time, rather than predicting current BMI z-score. Analyzing changes in actual BMI avoids the problems of z-score as a dependent variable, and is particularly appropriate when a single variable is as important as baseline BMI is in this analysis.

**B. Studies Employing More Direct Measures of Advertising**

Some of the studies published or released since the IOM report have employed more direct measures of advertising exposure. In one form or another, these studies typically use data from standard industry sources, such as Nielsen, to determine the amount of advertising in a particular market or on a particular television network. Direct measures of advertising help to
rule out some of the alternative explanations for a relationship between television viewing and diet or obesity, because they can identify a relationship between advertising exposure itself and the behavior of interest, rather than relying on an assumption that television viewing is acting as a proxy for advertising.

Direct measures of advertising raise two important methodological issues. First, studies must utilize an appropriate measure of advertising. Second, they must take into account the decisions that companies make about how much to advertise and where to air their commercials. Problems in either area can prevent reliable inferences.

The ideal measurement of advertising exposure would consider the number of advertisements (or the advertising time to account for commercials of different length) seen by a particular child. Such data, however, are not available. Instead, researchers must employ market level data and information on the child’s television viewing to construct an estimate of advertising exposure.

Advertisers typically measure the extent of their advertising campaigns in “gross ratings points” (“GRPs”) against a particular audience they wish to reach. A television rating point represents one percent of the desired demographic group in the market watching the program when the advertisement appears; gross ratings points are the total number of rating points generated by the campaign. GRPs reflect both the number of advertisements aired and the size of the audience for each advertisement, and can be defined based on any desired target audience for the campaign. Thus, advertisers might seek to purchase a certain number of GRPs to children 2-6, or adolescents 12-18, or women 18-49. Studies based on GRPs have been relatively

33. Ratings points are “gross” because they make no distinction between showing an additional person the advertisement, and showing the advertisement to a person who has already seen it.
common in considering youth exposure to alcohol advertising, but the approach has been infrequently used in studies of diet and obesity.

Any reliable measure of advertising must reflect both the number of commercials and the size of each commercial’s audience. A commercial on a program that almost no one watches obviously is far less likely to be seen than a commercial in the Super Bowl. Moreover, more competitive outlets with programming designed to appeal to a particular audience will to a large extent simply divide the audience. There will be more total advertisements if we count the number of ads in each program, but there will be no more exposure to advertising than a single advertisement on the only program that appeals to the particular audience. GRPs capture this effect; counting advertisements does not. A closely related measure is gross impressions, which is one advertisement seen by one person in the group of interest. In the aggregate, this measurement is simply the number of advertisements times the audience of the program, summed across all programs that include the advertisement. Because they are based on the percentage of the relevant audience, gross ratings points scale for market size; gross impressions do not.

Given the amount of advertising in a particular market, individual exposure to advertising will vary depending on how much that child watches television. No matter how much advertising is in the market, a child who watches no television will not see it. Similarly, a child who watches twice as much television as another is twice as likely to see the advertising. Thus, television viewing should still matter, because it determines the likelihood that a particular individual has been exposed to the advertising.

The best possible measure of advertising exposure (given the limitations of the aggregate industry data available) would be the number of GRPs against the relevant audience, weighted
by the relative probability that a particular child was watching.\textsuperscript{34} GRPs provide a reasonable measure of how much advertising the average member of the audience may have seen, but in explaining individual outcomes, weighting by the likelihood that a particular individual is part of that audience is also essential.

A second methodological issue in studies that seek to measure advertising more directly is the need to account for the advertiser’s decisions about where to place advertising. Profit maximizing companies will advertise at times and in places where they are most likely to reach their customers. If one network, for example, is more effective in reaching cereal users than another, cereal manufacturers will tend to advertise on that network, and we will observe that viewers of the network are more likely to eat cereal. There will be a relationship between cereal advertising and consumption, but it may be entirely because of the advertiser’s decisions, not because of the effects of advertising. Because advertisers will try to reach their market, we would expect to observe a relationship between advertising and dietary choices of the advertised product. Without controlling for the advertiser’s decisions, however, we have no basis for concluding that this result is a result of the advertising.


Andreyeva and Kelly used multivariate regression analysis to test “the hypothesis that exposure to television advertising of fast food restaurants, soft drinks and cereal affects children’s food consumption behaviors and BMI” in a working paper that builds on analysis that Dr. Kelly presented at the FTC childhood obesity forum.\textsuperscript{35} In their study, Andreyeva and Kelly

\textsuperscript{34} With an appropriate adjustment for market size, gross impressions weighted by viewing would also provide an appropriate measure of advertising exposure. If the goal is to aggregate exposure across different markets, gross impressions are more appropriate, because they take proper account of the relative size of different markets. If, as in the studies discussed below, the goal is to compare advertising intensity in different markets, some adjustment for market size is essential, and GRPs are a more appropriate measure.

combined data from two sources. The first source of data was the 2004 Early Childhood Longitudinal Study-Kindergarten Cohort (“ECLS”); in 2004, the children participating in ECLS Kindergarten cohort were in 5th grade.36 The second source of data was Nielsen Data on spot television cereal, fast-food, and soft drink advertisements from 2002 through 2004 measured in terms of Gross Rating Points (GRPs) for the top 56 designated-market areas (“DMAs”).37

Andreyeva and Kelly used their general regression model to examine four dependent variables: soft-drink consumption, fast-food consumption, soft-drink and fast-food consumption combined, and normalized BMI z-score.38 Their primary independent variables of interest were total advertising GRPs in a given DMA for regular soft-drink advertising, diet soft-drink advertising, fast-food advertising, soft-drink and fast-food advertising combined, cereal advertising, and regular and diet soda advertising combined. For each of the four dependent variables, they presented results from 5 regression specifications. For the advertising variables of interest, the first regression specification controlled for regular soft-drink advertising only, the second regression specification controlled for diet soft-drink advertising only, the third regression specification controlled for fast-food advertising only, the fourth regression specification controlled for soft-drink and fast-food advertising combined, and the fifth regression specification included controls for fast-food advertising, cereal advertising, and all soft-drink advertising.

For the regressions with soft-drink consumption as the dependent variable, the advertising variable in each of the first four specifications was positive and statistically significant; for the fifth specification the fast-food advertising variable was positive, the cereal advertising variable was negative, and the all soft-drink variable was positive, although only the

36. Id.
37. Id.
38. Id. at 8.
all soda variable was statistically significant.\textsuperscript{39} The same pattern held for the regressions with fast-food consumption as the dependent variable and the regressions with soft-drink and fast-food consumption combined as the dependent variables.\textsuperscript{40} For the regressions with BMI z-score as the dependent variable the only statistically significant result was a negative coefficient on the cereal advertising variable in the fifth specification.\textsuperscript{41}

To test the robustness of their advertising specification, Andreyeva and Kelly tested their five advertising specifications on dependent variables for fruit and vegetable consumption, milk consumption, and physical activity. The authors found no statistically significant relationship across the 5 advertising specifications on fruit and vegetable consumption. They found a statistically significant positive relationship between diet soft-drink advertising and milk consumption, and a statistically significant negative relationship between cereal advertising and milk consumption. Finally they found a statistically significant negative relationship between fast-food advertising and physical activity and a statistically significant negative relationship between soft-drink and fast-food advertising combined and physical activity.\textsuperscript{42}

Andreyeva and Kelly’s findings suggests that advertising affects the “usual dietary intake” of 10 to 11 year olds, a proposition the IOM panel found was only supported by “weak evidence,” but their findings do little to further substantiate this relationship. The major flaw in Andreyeva and Kelly’s analysis is its failure to consider the factors that determine the markets in which firms choose to advertise. If firms advertise more in markets that have more of their customers, as profit maximizing firms would choose to do, we would observe that children in markets with more advertising are more likely to buy the advertised product. We cannot,

\begin{itemize}
\item \textsuperscript{39} \textit{Id.} at 18.
\item \textsuperscript{40} \textit{Id.} at 20, 22.
\item \textsuperscript{41} \textit{Id.} at 24.
\item \textsuperscript{42} \textit{Id.} at 26.
\end{itemize}
however, conclude that the advertising caused that demand – it may well be that the existence of higher demand led to more advertising. Curiously, Andreyeva and Kelly do not attempt to distinguish between these two hypotheses by using DMA-level fixed effects, a control that would have been easy to implement given their data.

Consistent with the notion that they are actually observing the effects of advertiser’s choices about which markets to advertise in, the television viewing coefficients are not significant in any of the models explaining soft drink or fast food consumption, and are only significant at the 10 percent level in the models explaining fast food and soft drinks combined. If the authors are really observing an effect of advertising, however, then there should be a positive and significant effect of TV viewing time. Indeed, in the models using BMI z-score as the dependent variable, television viewing is significant, but the advertising measures are not. This result is not consistent with a causal chain claiming that advertising causes consumption changes which in turn increase BMI.

Another serious potential problem with their specification is their use of only local, spot TV advertising data, which is typically a relatively small fraction of total advertising expenditures. Without additional data on national advertising, it is not evident whether their advertising specification measures variations in total exposure to food and beverage marketing in a DMA. This incomplete measurement of advertising may be what is reflected in one of their anomalous results. Cereal is usually thought of as a complement of milk, but in their regressions to explain milk consumption (done as a specification check on the basic model), cereal advertising significantly reduces milk consumption.

Without better controls for the determinants of how much firms decide to advertise in particular markets, and more comprehensive measures of advertising exposure, the evidence that
advertising affects the usual dietary consumption of children 6 to 11 years old remains, as the IOM panel found, weak.

2. Buijzen et al. (2008)

Buijzen et al. used hierarchical regression analysis to examine “the associations between children’s exposure to food advertising and their consumption of (a) advertised food brands, (b) advertised energy-dense food product categories, and (c) food products overall.”43 They conducted their analysis using data from two sources: (1) a diary-survey of 234 households in the Netherlands with children between the ages of 4 and 12 and (2) Nielsen data on all advertisements broadcast in the Netherlands in the month before the survey was conducted.44 Buijzen et al.’s primary independent variable of interest was a measure of food advertising exposure, which for each child “reflected the amount of food commercials broadcast on his or her favorite network.”45 Based on the diary-surveys, the researchers created three dependent variables measuring consumption of advertised brands, energy-dense product categories, and food products overall.46 For each dependent variable, the authors conducted a hierarchical regression analysis. In the first step of each regression, they included controls for age, gender, television viewing time, family income, “concept-oriented consumption-related family communication,” and “socio-oriented consumption-related family communication.”47 They described the latter two variables as follows:

The concept-oriented communication scale consisted of six items measured on a 4-point scale, reflecting a communication style that emphasizes negotiation, individual ideas, and

44. Id. at 233.
45. Id.
46. Id.
47. Id. at 234-235.
opinions (α = .74), while the socio-oriented communication scale consisted of six items reflecting a communication style that stresses harmony and conformity (α = .66). In the second step of each regression, they examined only the food advertising exposure variable, with the hypothesis test being performed on the second step. Buijzen et al. then used an interaction analysis to assess the “moderating effect of the child and family variables.” Six additional regressions were conducted to assess the interactive effects. Each consumption measure was regressed on advertising exposure, one of the six demographic variables, and the interaction term advertising exposure times the relevant demographic variable.

Buijzen et al. reached two salient conclusions. First, they concluded that because food advertising exposure, but not television viewing time, predicted advertised brand consumption and energy dense food product consumption, these effects can be “attributed to food advertising rather than to other factors associated with television viewing.” Second, the researchers found that advertising exposure was not significantly associated with total food consumption for the overall sample, but was significantly negatively associated with television viewing time.

Buijzen et al.’s regression analyses are subject to a number of flaws, which render their results insufficient evidence for drawing conclusions about causality. The primary problem with this study is the measure of advertising exposure Buijzen et al. employed. Using the relative frequency of food advertising on each child’s favorite television network is problematic because this measure of advertising exposure is likely to be a poor proxy for actual exposure. First, the advertising exposure measure does not account for variation in time spent watching television. Suppose, for example, that one network aired 1,500 energy-dense food commercials in the

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48. Id.
49. Id. at 235.
50. Id.
51. Id. at 236.
52. Id.
previous month (an average of 50 per day) and another aired 1,000 (33 per day). If the ads are aired at a constant hourly rate, each hour of viewing will expose the viewer of the “high” advertising network to roughly 2 ads, compared to 1.4 ads for the “low” advertising network. A child who watches one hour on the “high” network will see 2 ads on average, but a child who watches two hours on the “low” advertising network will in fact see more advertising – 2.8 ads. Buijzen et al.’s measure would erroneously indicate that the former child was exposed to more television advertising.

Second, the measure only reflects the network the child watches most often, not the relative amount of time the child spent watching the network. Thus, if a child watched two networks roughly equal amounts of time, one with 500 energy-dense food commercials in the previous month and one with 1,600 energy-dense food commercials in the previous month, the measure would estimate radically different advertising exposure depending on which network the parent reported the child watched most often.

Rather than measuring the effects of advertising, it is far more likely that Buijzen and colleagues are measuring advertisers’ decisions about where to place their advertising. As discussed above, food companies are likely to advertise more on networks that are viewed by people who consume more of their products. If that is the case, the chain of causality would be the opposite of that hypothesized by the researchers, and yet their analysis would incorrectly suggest that advertising exposure causes higher brand consumption, higher energy-dense food consumption, or for the low-income children in sample, higher total food consumption. Consistent with this view is their result that television viewing time is not significantly related to consumption of either the advertised brands or of energy dense product categories. The authors argue that because advertising is significant but viewing is not, they have identified an effect of
advertising. If that were the case, however, viewing would likely have been significant at the first stage, before adding the advertising measure to the model, as other studies have found. That, however, was not the case. Viewing was never a significant predictor of consumption of either the advertised brand or energy dense products. Moreover, once their advertising measure is added to the model, viewing should become significant, because children who watch more are more likely to see the advertising on their favorite network. Again, that was not the case. There was a significant effect on consumption of all food products, but the relationship is negative – the opposite of what one would expect if advertising really has an effect.

The IOM panel found “… weak evidence that [advertising] influences the usual dietary intake of older children ages 6-11 years.”53 Buijzen et al.’s results provide no basis for a stronger conclusion.

3. Chou et al. (2008)

Chou et al. used multivariate regression analysis to estimate the effects of television fast food advertising on obesity among children and teens, and presents specific calculations regarding how much various changes in fast food advertising would reduce obesity.54 The authors used data for children between the ages of 3 and 18 from the 1979 Child-Young Adult National Longitudinal Survey of Youth and the 1997 Longitudinal Study of Youth.55 The authors used two different dependent variables: BMI, and an indicator variable that was equal to one when a child qualified as overweight (defined as having a BMI at or above the 95th percentile based on age/gender growth standards).56 To construct their advertising variable, the authors estimated the total amount of exposure to fast-food advertising for a given child in a given DMA

53. IOM, supra, at 270.
55. Id.
56. Id. at 601, 605-606.
and year, calculated by multiplying the number of hours of fast-food advertising per week in a given DMA by the estimated probability of viewership for a given child. The estimated probability was the total hours per a week that the child watched television divided by 168, the total hours in a week.\textsuperscript{57} In addition the authors controlled for “other factors that might affect caloric intake and caloric expenditure” including “the number of fast-food restaurants, the number of full-service restaurants, the price of a meal in each type of restaurant, an index of food-at-home prices, the price of cigarettes, and clean-indoor-air laws” by state and year.\textsuperscript{58} Chou et al. reported results from 12 different regression specifications. They found “all 12 coefficients of advertising messages aired are positive, but only two of the six coefficients are significant when BMI is the outcome. Five of the six coefficients are, however, significant when overweight is the outcome. As is the case for television-viewing time, the exception pertains to adolescent girls.”\textsuperscript{59}

For a number of reasons, Chou et al.’s results to not establish reasonable or reliable estimates of the relationship between fast food advertising and childhood obesity. First, Chou et al. actually measure the effect of television viewing rather than advertising. In their primary results, their “advertising” measure is actually advertising times television viewing. If television viewing matters, and it does, advertising times television viewing will also matter—whether it is advertising for fast foods or fast cars. That is particularly true when television viewing is measured at the individual level and advertising is only measured for the market as a whole. The primary source of variability in the data is individual viewing, not advertising—and it is the effect of that variability that Chou et al. are measuring.

\textsuperscript{57} Id. at 604.  
\textsuperscript{58} Id. at 605.  
\textsuperscript{59} Id. at 614.
In fact, in the models that let the effects of television viewing and fast food advertising differ, it is television viewing that matters, not advertising. Five of the eight television coefficients estimated are positive and significant at the conventional significance level for scientific research (five percent, using a two-tail test), as other researchers have found. None of the advertising coefficients meet this standard. Two more television coefficients are significant at the weaker 10 percent level, as is one advertising coefficient. Three more advertising coefficients are significant only at the highly relaxed 20 percent level.

The authors argue that their measurement combining advertising and television is appropriate because there is no statistical difference between the coefficients. If we believe their model and their test, however, the only way the advertising and TV viewing coefficients can be the same is if television viewing has no effect on obesity. That conclusion requires us to reject not only a well established body of literature, but also the possibility that any other form of advertising has any effect. If TV viewing has no effect on obesity, then neither does any other form of advertising on television – whether it is advertising for presweetened cereals or soft drinks. Only fast food advertising would matter.

Second, there are a number of problems with Chou et al.’s measurement of advertising, both within markets and across markets. For instance, the analysis excludes national advertising on network and cable television. Although national advertising is constant in any given year, it varies over time, and Chou et al. are combining data from three different years. Moreover, national advertising minutes would be weighted by television viewing, which varies from person to person. Within markets, Chou et al. measure the total number of minutes of advertising aired and argue that the likelihood of seeing each minute is the same. In fact, that is not the case. For example, consider a single advertisement in a single program that appeals to a particular
audience. If we introduce a second program, also with a single advertisement, the two programs will divide the audience. Because each program has a single advertisement, the likelihood of seeing one advertisement is precisely the same, whether there is one program or two. In Chou et al.’s measure, however, the second program doubles the amount of advertising. Furthermore, other things equal, the number of minutes of advertising will increase with the number of television stations in the market. Since there tend to be more stations in larger markets, the advertising measure increases with the size of the market. Viewers in markets with more advertising as Chou et al.’s measure it are less likely to see any given minute of advertising, however, because many of those minutes are in competing programs.

Third, Chou et al. do not account for the fact that fast food chains advertise more where they have more outlets. Businesses advertise where their customers are, and fast food businesses are no different. If, as the authors report in a separate paper, the density of fast food restaurants is correlated with obesity and BMI, then fast food advertising will be correlated as well – because fast food marketers will tend to advertise more where they have more outlets. It does not follow from that correlation, however, that fast food advertising contributes to obesity. Rather, the most relevant causal factor may be that advertisers choose to advertise where demand is greater, and fast food customers are more likely to be obese or overweight. If that is the case, restricting advertising would not affect obesity at all.

III. Studies Reaching Conclusions that are Consistent with the IOM Panel Conclusions

Four studies published since the IOM panel report found results consistent with the panel’s conclusion that there was “strong evidence” that that food advertising affects the short-term food consumption of children between the ages of 2 and 11. The IOM relied on findings of several experimental studies, which typically measured some consumption decision very shortly
after exposure to advertising. This section describes the methods and results of the subsequent studies in this same vein. All of the studies are experiments that measure children’s food intake after exposure to food advertisements at a point in time. Thus, to the extent these studies report a general relationship between food advertising and short term food consumption the results are consistent with conclusions of the IOM panel.

Two studies offer interesting additional insights. Halford et al. (2007b) conclude that the short-term consumption effect is “exaggerated” in overweight children, who may be more sensitive to the effects of advertising than normal weight children. Why that difference in response exists is unclear, but it suggests that controlling for possible differences between overweight and normal weight children may be important. Halford et al.’s (2007a) very similar experiment, however, does not find any difference in response based on the child’s weight. One possible reason for the different results is the age of the children. Obese children aged 9 to 11 exhibited greater sensitivity, but children aged 5 to 7 did not.

The study by Anschutz et al. (2009) among 8 to 12 year olds finds that boys, but not girls, consume more of a snack while watching programming containing food advertisements. This suggests a possible need to revise the panel’s conclusion about gender as a moderating variable. The panel noted that the majority of studies did not find a significant moderating effect of gender, “there was some slight trend for greater effect in girls than in boys.”60 Most of the studies, however, considered the relationship between television viewing and obesity. Only one study “tested gender differences in the influence of television advertising on young children’s food consumption. It found that boys were more influenced by advertising for low-nutrition

60. IOM Panel, supra, at 298.
products than were girls.” Thus, there may be gender differences in the impact of advertising on short term consumption choices, a possibility that deserves further investigation.

1. **Anschutz et al. (2009)**

   Anschutz et al. (2009) conducted a study of the effect of television food commercials on concurrent intake of non-advertised sweet snack food in children between the ages of 8 and 12. The sample consisted of 120 children, 15.1 percent of whom were obese as determined by their BMIs. The children watched a movie that was interrupted by two commercial breaks, both of which either contained three food commercials and two neutral commercials or five neutral commercials. While watching the movie the children could freely eat chocolate-covered peanuts and the total amount consumed was determined by weighing the amount remaining at the end of the movie. The authors reported:

   The main finding of our study was the interaction between commercial type and sex of the child. Food intake in boys was higher when they watched the food commercials than when they watched the neutral commercials, whereas food intake in girls was slightly lower when they watched the food commercials than when they watched the neutral commercials.

2. **Halford et al. (2007a)**

   Halford et al. (2007a) used a repeated-measures experimental design to examine the relationships between food consumption and factors such as advertising exposure and BMI. The sample for the study consisted of 93 children between the ages 5 and 7, 28 of whom were


63. *Id.* at 1329.

64. *Id.*

65. *Id.* at 1328.

either overweight or obese as determined by their BMIs. The children who participated in the experiment were initially classified as either “overweight/obese” or “lean.” Halford et al. used a within subjects, repeated measures, counterbalanced experimental design, where all participants were exposed to both the treatment and the control conditions during one of two sessions spaced two-weeks apart. During both sessions, the children were shown 10 advertisements followed by a 10 minute cartoon. In one session, the children were shown food advertisements. In the other session, the children were shown non-food advertisements. Analysis of variance was then conducted on the pooled results. After the cartoon the children were offered a cheese snack, a jelly candy, Cadbury chocolate buttons, potato chips, and seedless green grapes. They found: “Exposure to the food advertisements produced significant and substantial increases in energy intake in the group as a whole. The increase in caloric intake was roughly of the same magnitude in the two weight status groups.

3. Halford et al. (2007b)

Halford et al. (2007b) used a within-subject, counterbalanced experimental design to “investigate the effect of television food advertising on children’s food intake, specifically whether childhood obesity is related to a greater susceptibility to food promotion.” The authors drew a sample of 59 children, 32 male and 27 female, of children between the ages of 9 and 11 from two school classes in the United Kingdom. The treatment condition in the experiment involved showing the children 10 food related advertisements and then having the children watch a cartoon. The control condition involved showing the children 10 toy related advertisements and

67. Id.
68. Id.
69. Id.
70. Id. at 266.
72. Id. at 898.
then having the children watch the same cartoon. After the experiment children were offered a cheese snack, a jelly candy, Cadbury chocolate buttons, potato chips, and seedless green grapes. The experiment involved exposing each child to both the treatment and the control condition. Approximately half of the sample was exposed to the treatment condition first and the other half was exposed to the control condition first. There was a two week interval between each child’s participation in each condition of the test. They found an “exaggerated intake response to food advert exposure based on weight status.” This finding is also consistent with the IOM panel’s conclusion that advertising affects the short-term food consumption of children between the ages of 2 and 11.

4. **Harris et al. (2009)**

Harris et al. examined whether “exposure to food advertising during TV viewing may also contribute to obesity by triggering automatic snacking of available food.” They conducted two experiments as part of their study: one experiment with children and one experiment with adults. The first experiment involved applying the same treatment and control protocol to two different samples of children between the ages of 7 and 11: a sample of 55 children from a socially and ethnically homogenous school and a sample of 63 children from a socially and ethnically diverse school. All children who participated in the experiment were shown an episode of a cartoon. Children in the treatment group were exposed to 4 food commercials while watching the cartoon, while children in the control group were exposed to 4 nonfood commercials. Harris et al. found that “children who saw the cartoon with food advertising ate

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73. *Id.* at 898-899.
74. *Id.* at 901.
76. *Id.* at 406.
77. *Id.*
considerably more (45%) goldfish crackers while watching (M=28.5 gr.) than did children who saw nonfood advertising M=19.7 gr., t(116)=3.19, p=.01, d=.60." The difference is quite small in absolute terms, amounting to about five Goldfish.

The second experiment involved a sample of 98 university students between 18 and 24 who were categorized as either restrained eaters or unrestrained eaters as determined by the “Eating Restraint Scale.” Participants were shown a television program with three different commercial conditions. The researchers told participants that experiment was intended “to test consumer products” in order to obscure its underlying purpose and bias the results. After viewing the television program, participants were taken to a different room and told to taste and rate different categories of food and then consume as much as they wanted of each. Harris et al. found that exposure to snack food advertisements was associated with significantly higher total food consumption across the different food categories (healthy and unhealthy) as compared to exposure to advertisements for nutritious food. They also found that exposure to snack food advertisements was associated with higher total food consumption compared to exposure to non-food advertisements at the higher and that this difference “approached conventional significance.” In addition, Harris et al. found that exposure to snack food advertisements was associated with greater food consumption in men than women and restrained eaters than unrestrained eaters.

IV. Conclusion

A number of studies have been published since the Institute of Medicine released its report on Food Marketing to Children and Youth in 2006. Some have been consistent with the

78. Id. at 407.
79. Id. at 408.
80. Id.
81. Id. at 409.
82. Id.
conclusions that the IOM panel reached. Other studies, however, report evidence that could call into question two of the panel’s conclusions.

First, the panel concluded that there was weak evidence that television advertising “does not influence the usual dietary intake of teens ages 12-18 years.” 83 Barr-Anderson report a longitudinal study of two different cohorts that were followed over five years. They find few dietary measures five years later are related to baseline viewing (i.e., at the time of the first survey) for the cohort in middle school at the beginning of the study. For the students who were in high school at the beginning of the study, a variety of dietary measures five years later were correlated with their earlier television viewing. Although the longitudinal nature of the study is a strength, the failure to control for the different choices that students make after high school makes it exceedingly difficult to draw causal inferences. Decisions about whether and where to go to college are highly likely to influence dietary choices, and may also be correlated with heavy television viewing during high school. Moreover, the study employs few controls for other explanations of the relationship between diet and TV viewing. The evidence remains weak, and is perhaps weaker, but it remains consistent with the conclusion that advertising does not influence the usual dietary intake of teens.

Utter et al. also considered dietary changes in 11-14 year olds, finding that heavy television viewers were more likely to be heavy users of soft drinks, burgers, and French fries. They were also more likely to be heavy consumers of chocolate. Unfortunately, the study includes minimal controls for other factors that likely influence dietary choices, including the level of physical activity.

Second, the panel concluded that although there is strong statistical evidence that exposure to television advertising (as measured by television viewing) is associated with

83. IOM Report, supra, at 9 (emphasis in original).
adiposity, “the research does not convincingly rule out other possible explanations for the association; therefore, the current evidence is not sufficient to arrive at any finding about a causal relationship from television advertising to adiposity.” 84 Most of the studies reviewed above are relevant to this conclusion.

The studies that attempt to use some relatively direct measure of advertising exposure do not use appropriate measures. Advertising measures must take into account both the number (or time) of advertisements and the size of the audience they reach. Moreover, they must recognize that children who spend more time watching television are more likely to see the advertisements that are there. Of the three studies in this group, two (Chou et al. and Buijzen et al.) essentially ignore the size of the audience. Chou et al. use a measure of television viewing in constructing their advertising variable, but the approach they use would produce essentially the same results with any kind of advertising.

All three studies using advertising measures fail to account adequately for the choices that firms make about where to advertise. Companies will advertise where they are more likely to reach their customers, so their choices will create an apparent relationship between advertising and consumption. Without controlling for that decision, we cannot infer that the relationship is evidence that advertising causes consumption changes. Buijzen et al. and Adreyeva and Kelly are most clearly subject to this problem, as evidenced by the fact that television viewing is not significant in their regressions. If there is really a relationship between advertising and consumption (or obesity), television viewing should be significant, because given the amount of advertising present (which both studies control), kids who watch more television should see more of it.

84. Id.
Studies that seek to explain obesity using television viewing as a measure of advertising are subject to a different set of limitations, because there are numerous alternative hypotheses about why television viewing is related to obesity. Unless analysts include controls to account for these alternatives, it is not possible to conclude that the relationship is a causal one. None of the studies reviewed here include such a complete set of controls.

Probably the most interesting study in this group is Epstein et al.’s experimental intervention to reduce television and computer use by 50 percent. The pattern of their results, however, is very difficult to explain under the advertising hypothesis. BMI changes are significant initially, but the difference between the experimental and control groups declines over time and is no longer significant after the first half of the two year followup. After the differences in BMI are no longer significant, statistically significant differences in diets emerge. If advertising influences BMI, it must do so by changing diets, so the basic notion that a cause must precede its effect requires that diet change first, followed by BMI. That, however, does not appear to be what Epstein et al. find.

Also intriguing is the study by Zimmerman and Bell, which looks for differences in the effects of commercial and noncommercial television viewing. If advertising is the causal factor, viewing commercial television should have a greater effect than noncommercial viewing. Unfortunately, Zimmerman and Bell never test that hypothesis directly, and it appears unlikely that the difference is significant. They also collapse the different viewing categories into two broad groups, rather than examining the differences between more homogenous subsets of programming on broadcasting and on video or DVD.

The other study that examines weight status using television viewing as an advertising measure, Utter et al., has a physical activity measure as a control, but does not control for any of
the other possible explanations of the relationship between television viewing and obesity. The IOM panel reviewed a number of quite similar studies, and concluded that they did not provide sufficient evidence to conclude that television advertising causes obesity.

Thus, the state of the evidence concerning the relationship between television advertising and childhood adiposity remains much as it was at the time of the IOM report. There are, of course, additional studies, some that support and others that arguably undermine the panel’s conclusions. The studies in this review, however, do not significantly change the weight of the evidence, and they do not strengthen the case for concluding that the relationship between television viewing and adiposity is caused by advertising. The evidence remains inadequate to rule out plausible alternative hypotheses.
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