The Effect of Deceptive Advertising on Consumption of the Advertised Good and its Substitutes: The Case of Over-the-Counter Weight Loss Products[1]

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Abstract

This paper is the first to estimate the impact of exposure to deceptive advertising on consumption of the advertised product and its substitutes. We study the market for over-the-counter (OTC) weight-loss products, a market in which deceptive advertising is rampant and products are generally ineffective with potentially serious side effects. Using data from the Simmons National Consumer Survey for 2000-2007, merged with data on advertisements in magazines and on television, we estimate models that control for the targeting of ads using indicator variables for each unique magazine read and television show watched.

Overall, model estimates suggest that advertising of OTC weight loss products does not increase the probability of their use; instead, manufacturers are presumably advertising to increase market share. For women, we find that dieting and exercise are negatively correlated with exposure to non-deceptive advertising but positively correlated with exposure to deceptive advertising. Differences by gender and communication medium (magazine, television) are explored.

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Introduction

The research question examined in this paper is: to what extent does advertising, and deceptive advertising in particular, affect consumption of the advertised good and its substitutes? Deceptive advertising is difficult to define (Peltzman, 1981) but typically consists of a firm misrepresenting the attributes of the advertised product (e.g., Nagler, 1993), and thus the expected utility from using the product. The U.S. Federal Trade Commission Act prohibits "unfair or deceptive acts or practices," including both misstatement of facts and failure to disclose important information that consumers should know (Correia, 2004).

The research literature on deceptive advertising spans economics, marketing, and consumer policy. Much of it focuses on factors that alter firm incentives to engage in deceptive advertising (e.g., Posner, 1973; Darby and Karni, 1973; Nagler, 1993; Kopalle and Lehmann, 2006; Zinman and Zitzewitz, 2012) and the impact of specific regulatory policies on ad content (e.g., Avery et al., 2013; Byrd-Bredbenner et al., 2001; Sauer and Leffler, 1990). The contribution of this study is to estimate the impact of individual-specific exposure to deceptive advertising on consumption of the advertised good and its substitutes.

This study contributes to the larger literature on the impact of advertising and deceptive advertising. Several papers have measured the impact of market-level advertising on purchases of the advertised good; see the review in Bagwell (2007). With respect to deceptive advertising, Zinman and Zitzewitz (2012) find that ski resorts exaggerated fresh snowfall on weekends (when skiers may be more elastic to fresh snowfall) relative to weekdays, but this declined after the introduction of a smartphone application that allowed consumers to communicate with each other about the true amount of fresh snowfall.

Whether and how much deceptive advertising impacts consumption is unclear *a priori* because firms can counter-advertise to reveal deceptive claims by their rivals and consumers

may be sufficiently savvy to disregard exaggerated claims (e.g., Posner, 1973). Moreover, advertising in general and deceptive advertising in particular can be cooperative, increasing total consumption, or competitive (predatory), increasing market share at the expense of rivals, or both (Bagwell, 2007; Dave, 2013).

We study unique individual-level data that include measures of consumption, health-related behaviors, magazine readership, and television viewing. We merge to these individual-level data the ads that ran in the magazines that respondents report reading and that ran during the television shows that respondents report watching. We have coded the advertisements for deceptive content using explicit guidelines developed by the Federal Trade Commission (FTC) for the specific market in question (over-the-counter weight loss products). Each individual's exposure to advertising and deception is used to predict consumption, with the targeting of ads controlled for using indicator variables of each unique magazine read and each unique television show watched.

The market for over-the-counter (OTC) weight loss products is heterogeneous, with products in the form of pills, powders, creams, gels, patches, and jewelry.[2] In the U.S. during 2009-2010, the prevalence of overweight was 64.5% for women and 74.1% for men (Flegal et al., 2012).[3] Given those statistics, it may not be surprising that 60% of American women and 36% of American men are trying to lose weight (Baradel et al., 2009). Safe and effective methods of weight loss involve behavior modification: decreased calorie intake and increased physical activity resulting in weight loss of 1-2 pounds per week (NHLBI, 2000). Such "lifelong effort" (NHLBI, 2000, p. 1) and gradual weight loss are not particularly appealing, and as a result some people consume OTC weight loss products that promise rapid weight loss with little

[2] This category does not include meal replacements.
[3] Overweight is defined as a body mass index (BMI) of greater than or equal to 25, and obesity is defined as a BMI of greater than or equal to 30; NHLBI (2000).

or no effort. OTC weight loss products have been consumed by 20.6% of adult women and 9.7% of adult men (Blanck et al., 2007), and by 14.4% of adolescent females and 7.2% of adolescent males (Wilson et al., 2006).[4]

OTC weight loss products are only loosely regulated and have a history of little efficacy and dangerous side effects. OTC weight loss products are governed by the 1994 Dietary Supplements Health and Education Act (DSHEA) and are treated as foods (Correia, 2004; GAO, 2002). They are sold OTC in supermarkets and pharmacy aisles as well as through the mail and over the Internet. Manufacturers need not show any benefit from the product but also cannot make specific disease claims. Manufacturers bear no responsibility for proving safety before marketing; like food, the product is assumed to be safe. Advertising of OTC weight loss products is subject to the same regulations that govern advertising of food[5]; they are not subject to the far more stringent regulations on the advertising of prescription medications.[6] As a result, manufacturers of OTC weight loss products have considerable latitude in the marketing of their products.

OTC weight loss products are generally ineffective and can have severe, even potentially fatal, side effects (GAO, 2002).[7] Two active ingredients that were common in this class of products have since been banned by the Food and Drug Administration (FDA) for increasing the risk of stroke and cardiac events: phenylpropanolamine or PPA (withdrawn from the market in

[4] These are percentages of the entire U.S. population, not just of the subpopulation that is overweight or trying to lose weight. Among those who have ever made a serious weight-loss attempt, 33.9% used an OTC weight loss product (Pillitteri et al., 2008).

[5] The FDA and FTC have joint authority over the regulation of dietary supplements; the FTC has primary authority over advertising and the FDA has primary authority over labeling (FTC, 2010).

[6] During the period we examine, the OTC weight loss market did not yet include Alli, the OTC version of the prescription weight loss drug Xenical that was introduced June 15, 2007 and is the only weight loss product approved by the FDA for OTC sale.

[7] A review of the evidence on the safety and efficacy of OTC weight loss products concluded, "The evidence for most dietary supplements as aids in reducing body weight is not convincing. None of the reviewed dietary supplements can be recommended for over-the-counter use" (Pittler et al., 2004).

2000) and ephedra (withdrawn in 2005). Although these and similar active ingredients have little effect on calorie expenditure, they do increase heart rate, which could be interpreted by a poorly-informed consumer as an increase in metabolism that will burn fat. In fact, they have little if any impact on weight but do increase the risk of heart attack and stroke.[8] To increase the sensation that metabolism has increased manufacturers often include caffeine that further raises the risk of cardiac events.

Even after the FDA removed PPA and ephedra from the market OTC weight loss products continue to have active ingredients with negligible efficacy and substantial side effects (Dwyer et al., 2005; Pittler and Ernst, 2004; Bouchard et al., 2005). Analysis of a dozen weight-loss supplements sold on the internet in 2007 found that two-thirds contained one or more ingredients associated with multiple incidents of life-threatening cardiac complications or death, but none of the products' advertisements, labels, or accompanying materials warned of such adverse events (Nazeri et al., 2009).

The market for OTC weight loss products is characterized by incomplete information. OTC weight loss products can be experience goods (consumers do not know how well the product will work for them until they consume it) or even credence goods (consumers aren't sure how well it worked even *after* they consume it). Drugs and supplements can have person-specific effects, so even information from friends and family who have consumed the product may be of uncertain relevance. Consumers are also poorly informed about government regulation of these products; roughly half of Americans believe that OTC weight loss products

[8] Awareness of the fatal side effects associated with OTC weight loss products was increased by the highly-publicized deaths of several professional athletes (Korey Stringer of the Minnesota Vikings football team whose death led the NFL to ban players' use of ephedra; Steve Bechler of the Baltimore Orioles baseball team; Rashidi Wheeler, a Northwestern University football player; and Devaughan Darling, a Florida State football player) who were consuming the products to try to lose weight they had gained during the off-season; see Sheinin (2003).

must be approved for safety and efficacy before being sold to the public (Pillitteri et al., 2008; Harris Interactive, Inc., 2002).[9]

Imperfect information makes advertising in general, and deceptive advertising in particular, potentially profitable for firms. For experience goods, advertising can signal quality; for example, an expensive ad (either because of production values or when or where it airs) may signal that the firm can afford the ad because the product works (Ackerberg 2001, 2003; Milgrom and Roberts, 1986). Deceptive advertising in particular is generally more advantageous to firms selling experience or credence goods (Nelson, 1974). Prominent advertising may increase the credibility of deceptive claims; for example, an ad in a high-circulation magazine or on a major television station may signal that the claims made must be true or the advertisement would not be allowed air (either by the magazine/station or by government regulators). Perhaps because of imperfect information, "Deceptive weight loss claims have long plagued the supplement industry" (FTC, 2010, p. 9).

Deceptive advertising of OTC weight loss products could have several negative consequences, the magnitudes of which depend on the effect of deceptive advertising on consumption. If deceptive advertising is cooperative (increases the probability of use) then the negative consequences may be substantial; those induced by the deceptive ads to begin consuming OTC weight loss products face a risk of adverse, even potentially fatal, side effects. Even if deceptive advertising is merely competitive or predatory (causing existing users to change brands but not convincing any new consumers to begin using the product) it still may

[9] Consumers' confusion about regulation of OTC weight loss products could be due in part to similar confusion among physicians; a survey found that 37% of physicians in residency training programs were unaware that OTC dietary supplements do not require FDA approval before sale (Ashar et al., 2007).

create a "lemons market" in which deceptively advertised products drive the more honestly advertised products out of the market (Akerlof, 1970; Carlton and Perloff, 2000).[10]

Given the large number of Americans taking OTC weight loss products, the products' ineffectiveness, history of substantial side effects (including death), and the frequency with which these products have had to be withdrawn from the market for safety reasons, the effect of deceptive advertising on consumption of these products is of considerable interest.

Conceptual Framework

We set aside the decision of the firm to engage in deceptive advertising (Posner 1973; Darby and Karni, 1973; Nagler, 1993; Kopalle and Lehmann, 2006) and focus on how deceptive advertising affects consumer behavior. The conceptual framework for the analysis is based on economic models of body weight (e.g., Cawley, 2004a; Lakdawalla, Philipson, and Bhattacharya, 2005). In these models, utility is a function of food consumption, the allocation of time to various pursuits, body weight, health, and a composite good (all other goods).

One cannot directly choose weight or health – these stocks can be affected only through the following flows: food consumption (caloric intake), the allocation of time (which determines caloric expenditure), and consumption of weight loss products. Individuals are assumed to allocate their time and money in such a way as to maximize their utility subject to constraints on their time, budget, and biology (the biological constraint states that changes in weight are determined by the excess of calories consumed over calories expended).

[10] The FTC has written, "…if the entire field of weight-loss advertising is subject to wide-spread deception, then advertising loses its important role in the efficient allocation of resources in a free-market economy. If the purveyors of the "fast and easy fixes" drive the market place, then others may feel compelled to follow suit or risk losing market share to the hucksters who promise the impossible" (FTC, 2002, p.2).

The demand for weight loss products is a derived demand, derived from the demand for weight and health. Weight loss is produced by combining time and effort (e.g., for exercise) with market goods (such as weight loss products). Factor substitution is possible because there is more than one way to lose weight – one can decrease food consumption, increase exercise, and consume weight loss products, in any combination. The utility-maximizing consumption of weight loss products is characterized by the "last dollar rule": the last dollar spent on each good (including inputs into weight loss such as OTC weight loss products, gym memberships, and so on) provides equal marginal utility. If this were not the case, consumers could rearrange their spending to achieve higher utility with the same budget.

However, because weight loss products are experience or credence goods, consumers do not know with certainty the benefits and costs of consuming OTC weight loss products. We assume that consumers' beliefs regarding the marginal costs and marginal benefits of consumption are based in part on the advertisements to which they are exposed. Specifically, consumers may interpret advertising of these experience goods as evidence of their quality and effectiveness (Ackerberg 2001, 2003; Milgrom and Roberts, 1986). Or, they may assume that the public nature of the advertisement indicates that the claims were approved by government regulators and are thus true (Nelson, 1974). As a result, consumers may over-consume OTC weight loss products (and participate less in substitute weight loss methods such as dieting and exercise) relative to what would maximize the present discounted value of lifetime utility.

It is unclear *a priori* whether advertising in general, and deceptive advertising in particular, increase consumption of OTC weight loss products (i.e., have cooperative effects), or simply increase market share for the advertised brand without increasing overall consumption (i.e., have competitive or predatory effects). It is possible that non-deceptive ads and deceptive

ads could have different effects. This is ultimately an empirical question; we do not have a strong *a priori* hypothesis.

Other methods of weight loss, such as dieting and exercise, could be either complements to, or substitutes for, OTC weight loss products. Thus, it is ambiguous whether exposure to advertising for OTC weight loss products will increase or decrease the probability of dieting and/or exercising. Ultimately, these are empirical questions that can only be answered by examining the data.

Data

National Consumer Survey (NCS)

Our individual-level data are from waves 25 through 49 of the Simmons National Consumer Survey (NCS), which spans October 1, 2000 to May 1, 2007.[11] Table 1 lists the dates that each wave of the NCS was in the field. The NCS provides detailed information on Americans' consumption, magazine reading, and television viewing. It is a repeated cross-sectional survey, in which each wave is an independently drawn multistage stratified probability sample of all telephone households in the United States (excluding Hawaii and Alaska); see Simmons NCS (various years). In order to minimize respondent fatigue, the data are collected in several phases. In Phase I, face-to-face interviewers collect demographic data and data on magazines reading and TV shows watched. During a subsequent part of phase I, respondents report, by filling out a questionnaire, whether they purchase and use specific products, including weight loss products. In Phase II, which is typically conducted about eight weeks after the Phase

[11] At this time, Simmons assigned only odd numbers to its survey waves; thus, although we use waves 25, 27, 29, etc. this represents all the data on adults collected at this time – there are no missing waves with even numbers in between the odd-numbered waves we use.

I interview, interviewers review with respondents their answers to the consumption questionnaire. Survey response rates in the NCS are generally high (approximately 70%).

Respondents provide information about a host of demographic characteristics such as age, gender, race, marital status, number of children, and census region, and socioeconomic characteristics such as education, income, employment status, and work hours.

Respondents are asked a series of questions about weight loss methods, but not everyone in the sample is asked every question. The entire sample is asked, "Are you presently watching your diet?" Those who respond positively to this question are asked whether they used non-prescription weight loss products (e.g., pills).[12] It is an inherent limitation of the data that not every respondent is asked about consumption of weight loss products.

The entire sample is asked whether they engaged in a wide range of activities in the past 12 months; we code a person as having engaged in exercise if they participated in aerobics, fitness walking, jogging/running, used cardio machines, or weight training.

The entire sample is asked whether they have had specific medical conditions in the past 12 months, including whether they were obese (asked 2000-2002) or 30 or more pounds overweight (2003-2007). This wording is problematic because respondents may not know the clinical definition of obesity, or may feel more reluctant to report being obese than to report their weight (even if they are obese). Although the precise reason is unclear, obesity appears to be considerably underreported; only 5.6% of women and 2.5% of men self-report obesity in the NCS, whereas the prevalence of obesity among U.S. adults was 33.3% among women and 27.8% among men in 2001-02 (Ogden et al., 2006).

[12] Respondents are separately asked if they have used meal replacements for weight loss; those are not considered in this analysis.

Respondents are shown copies of the covers of over 100 magazines and are asked, on average, how frequently they read each magazine over the past six months, expressed in terms of how many issues they read out of the last four (i.e., one, two, three, or four).

Respondents were also asked about their television viewing habits. The NCS gives them a list of approximately 400 broadcast television programs and nearly 400 cable television programs. For broadcast television programs, the NCS asks how many episodes of that show they have watched out of the total aired in the past month (for weekly shows) or past week (daily shows). For each cable TV show, respondents indicate whether they have watched it in the past week or in the past month.

We assign households to Designated Marketing Areas (DMAs) based on their county of residence. Our sample includes those living in the top 75 DMAs (for 2000-2001) or top 100 DMAs (for 2002-2007). Our final samples consist of roughly 59,000 women and 47,000 men.

Magazine Advertisements

Images of the magazine advertisements were drawn from the Pharmaceutical Advertising Database (PhADS) archived at Cornell University.[13] The PhADS archive contains a digital collection of all print advertisements for medications that appeared between January 1985 and January 2007 in 26 consumer magazines: *Better Homes & Gardens, Black Enterprise, Business Week, Cosmopolitan, Ebony, Essence, Family Circle, Glamour, Good Housekeeping, Jet, McCall's* (name changed to *Rosie's* on January 1, 2001), *Modern Maturity, Money, National Geographic, Newsweek, People, Playboy, Readers Digest, Rolling Stone, Seventeen, Sports Illustrated, Time, TV Guide, U.S. News &World Report, Vogue,* and *Women's Day*.

[13] The authors thank Donald S. Kenkel, Dean Lillard, and Alan Mathios for their generosity in sharing the PhADS database. For more on this database, see Avery et al., (2007).

The 26 PhADS magazines were selected to include the magazines most frequently read by specific demographic groups (defined by race, education, income, age, and gender). Although 20 demographic groups were defined, members of each group often read the same magazines. Consequently, the final set of magazines used to create the digital archive includes the above 26 magazines.

The 26 magazines in PhADS account for between 30% and 60% of total U.S. magazine circulation, and probably a higher fraction of all magazine advertisements (Avery et al., 2007). Although the PhADS magazines are a substantial portion of the market, the sample of advertisements in PhADS is not a random sample of all magazine advertisements. However, advertising in PhADS closely tracks total national advertising expenditures, and the variation in the PhADS data explains most of the variation in advertising expenditures over the same time period (Avery et al., 2007).

All print advertisements for OTC weight loss products that appeared in every issue of these 26 magazines between 1999 and 2006 were matched to the NCS data. It amounted to 483 unique magazine ads for OTC weight loss products with a total of 700 ad appearances.

Television Advertisements

The data on television advertisements for OTC weight loss products come from a commercial source, Kantar TNS Media Intelligence. The TNS data provide information on the exact time and program during which specific OTC weight loss product ads aired. We use TNS data on advertisements that aired from 1999-2006 on national networks, cable, and spot markets identified by Designated Marketing Areas (DMAs). The TNS data cover the largest 75 DMAs for 1999-2001 and the 100 largest Designated Marketing Areas (DMAs) for 2002-2006. The

data include 1,185 unique television ads for OTC weight loss products, with a total of 1,189,523 ad appearances.

Coding of Deception in Advertising of OTC Weight Loss Products

Undoubtedly, one reason for a lack of previous empirical research on the impact of deceptive advertising on consumption is the difficulty in defining "deception" (Peltzman, 1981). One advantage to studying the market for OTC weight loss products is that the FTC issued specific definitions of deception for this market. Specifically, the FTC issued a list of seven weight-loss claims that it deems "not scientifically feasible," "facially false," "bogus," and "too good to be true" (FTC, 2003, 2005). The FTC calls these claims "red flags" because the claims are so outrageous that they should raise a red flag for magazine publishers and television stations. These seven false claims are that a weight-loss product will:

1) Cause weight loss of two pounds or more a week for a month or more without dieting or exercise[14];
2) Cause substantial weight loss no matter what or how much the consumer eats;
3) Cause permanent weight loss (even when the consumer stops using product);
4) Block the absorption of fat or calories to enable consumers to lose substantial weight;
5) Safely enable consumers to lose more than three pounds per week for more than four weeks[15];
6) Cause substantial weight loss for all users;
7) Cause substantial weight loss by wearing it on the body or rubbing it onto the skin.

[14] This is deceptive not so much because of the rate of weight loss - the NHLBI (2000) recommends weight loss of 1-2 pounds per week - but because of the promise that weight loss can be achieved without dieting or exercise.
[15] This is deceptive because of the rate of weight loss; the NHLBI (2000) recommends weight loss of 1-2 pounds per week.

In the *Reference Guide for Media on Bogus Weight Loss Claim Detection* (FTC, 2003), the FTC provides detailed instructions for identifying each of the above deceptive claims and clear examples so that media can avoid running advertisements that contain them. These instructions were used to code advertisements for their deceptive content.

Precise operational definitions and detailed rules and procedures for coding are needed to facilitate an accurate and reliable content coding process (Kassarjian 1977). The coding instruments were developed by the authors and pretested using a sample of weight loss ads not included in the final sample (occurring before the study period). Intensive pre-coding training was undertaken to increase coder objectivity, familiarity with the coding scheme, and to refine operational definitions, thereby improving inter-judge and intra-judge coding reliability (Kolbe and Burnett 1991; Rust and Cooil 1994).

The most commonly used measure of inter-judge reliability is the simple percent agreement between two or more coders. Measures of percent agreements are, however, influenced by the number of coding categories used for a variable, with a smaller number of categories resulting in a greater likelihood of higher agreement than by chance alone. An additional inter-coder reliability measure, Cohen's kappa (Cohen, 1968), was estimated for all measured variables used in the study. Cohen's kappa explicitly recognizes the likelihood of chance agreement between judges and is thus a more conservative measure of reliability (Perrault and Leigh 1989).

Pretesting of the instrument was undertaken until each measured dimension produced percent agreement scores above 85 percent and Cohen's kappa values greater than .75. Thereafter, two trained coders independently completed the coding protocol for each of the 483 unique magazine ads and two other trained coders completed the coding for each of the 1,185 unique television ads. Coding discrepancies were resolved by the authors.

Reliability measures were estimated for the coding of deception in magazine and television advertisements, and are presented in the Appendix table. For magazine ads, the reliability estimates indicate excellent agreement ($\kappa >= .8$) for four of the seven red flags, good agreement ($.6 <= \kappa < .8$) for two, and moderate agreement ($.4 <= \kappa < .6$) for one.[16] For television ads, the reliability estimates indicate excellent agreement for all red flags.

Empirical Model and Identification

Our ideal research design would be to conduct a randomized experiment, in which thousands of people, in the normal course of their lives, were exposed to randomly varying numbers of advertisements and deception regarding OTC weight loss products. We would then estimate how consumption of OTC weight loss products varied with this exogenously-generated variation in exposure, controlling for all relevant individual characteristics.

Such a randomized experiment is not feasible. Instead, we use opportunistic data in which exposure is not experimentally manipulated but varies based on differences over time in the number and deceptiveness of ads that run in the same magazines or during the same television shows. We estimate two reduced-form logit models of whether the respondent consumes an OTC weight loss drug as a function of exposure to advertising and deception. The first controls for the number of ads to which the respondent was exposed (separately by magazine and television) and the number of deceptive statements to which the respondent was exposed (again, separately by magazine and television):

[16] The generally accepted interpretation of kappa values are: 0=chance agreement; less than .20=poor agreement; .20 to .40=fair agreement; .40 to .60=moderate agreement; .60 to .80=good agreement; >.80=very good/excellent agreement.

$$\Pr(Consume_{it}=1)=F(\alpha_1+$$
$$Magazine\_Ads_{it}\beta_{AM}+TV\_Ads_{it}\beta_{AV}$$
$$+Deceptive\_Statements\_Magazine_{it}\beta_{SM}+Deceptive\_Statements\_TV_{it}\beta_{SV}$$
$$+X_{it}\chi_1)$$
$$\text{where } F(z)=\frac{e^z}{1+e^z}$$

The second model controls for the number of non-deceptive, and the number of deceptive, ads to which the respondent was exposed (separately by magazine and television).

$$\Pr(Consume_{it}=1)=F(\alpha_2+$$
$$+Nondeceptive\_Magazine\_Ads_{it}\beta_{NM}+Nondeceptive\_TV\_Ads_{it}\beta_{NV}$$
$$+Deceptive\_Magazine\_Ads_{it}\beta_{DM}+Deceptive\_TV\_Ads_{it}\beta_{DV}$$
$$+X_{it}\chi_2)$$
$$\text{where } F(z)=\frac{e^z}{1+e^z}$$

The binary outcome $Consume_{it}$ is set equal to one if respondent *i* reports having consumed an OTC weight loss product in the past year *t*. In subsequent models we also test for spillovers to dieting and exercise.

The measures of individual exposure to advertisements for OTC weight loss products are calculated as follows.

$$Magazine\_Ads_{it}=\sum_{m=1}^{M}Ads_{mt}*Read_{im}$$
$$TV\_Ads_{it}=\sum_{v=1}^{V}Ads_{vt}*Watched_{iv}$$

The variable $Read_{im}$ is the fraction of the last four issues of magazine *m* read by person *i*, and $Watched_{iv}$ is the fraction of daily or weekly episodes of television show *v* watched by person *i*.[17] The number of ads for OTC weight loss products that appeared in magazine *m* during year *t* is

[17] Specifically, based on the questions that the Simmons NCS asks about TV viewing, we match ads to network TV shows and to cable TV "day parts" (times of the day respondent reports watching television for each day of the week).

Ads_{mt} and the number of OTC weight loss advertisements that were shown during television show *v* during year *t* is $Ads_{vt.}$ We multiply the fraction of issues read of each magazine by the number of ads that ran in that magazine in the past year and sum across all 26 magazines. To calculate potential exposure to television ads for OTC weight loss products, we likewise multiply the fraction of episodes watched of each television show by the number of ads that ran during that show in the past year and sum across all 700+ shows.

Digital video recorders (DVR), which allow viewers to "timeshift" their television viewing and fast-forward commercials, were not widespread during the time of our data (1999-2007). DVRs were introduced in 1999, and in 2007 they were in just 13.5% of households. In 2006, DVR use represented just 1.6% of TV watching minutes (even in 2012, it accounts for just 8% of TV time) (Nielsen, 2012). Moreover, use of DVRs does not imply that commercials are skipped. The marketing firm Nielsen has concluded that "Viewers do watch commercials on their DVRs," (Nielsen, 2010, p. 1) and that, "Contrary to fears that DVRs would wipe out the value of commercials because of viewers fast-forwarding through ads, DVRs actually contribute significantly to commercial viewing." (Nielsen, 2010, p.3)

Ideally we would know the date the individual was interviewed, but that is unavailable.[18] As a result, we calculate past-year exposure based on the first day of interviewing of that wave of the survey; see Table 1 for the dates that each NCS wave began and ended, and the associated windows for advertising exposure.

In these calculations, we assume that reading and television viewing habits in recent months reflect those over the past year. In setting the length of the exposure window to one year, we assume that most of the impact of an advertisement occurs within that period; consistent with

[18] For the years we examine, Simmons did not collect the respondent-specific date of interview from the firm that conducted the interviews.

this, Bagwell (2007) describes empirical evidence that the average effect of advertising on sales is mostly depreciated within 6-9 months (Bagwell, 2007).

Our counts represent potential, rather than actual, exposure. That is, even though these ads ran in magazines the respondents read and the television shows that they watched, respondents might have missed them while read the magazine issue or watching the TV program. Thus, they are best described as potential ad exposure. On the other hand, they are more specific than the potential exposures used in many previous empirical studies of advertising that rely on variation across markets in advertisements (see the review in Bagwell, 2007).

One option is to sum the exposures to magazine ads and television ads. However, research suggests that the inherent differences in these media (for example, sound and movement in television ads that are absent in print ads) may lead consumers to respond differently to them (see e.g., Liu & Eveland, 2005), so we control separately for ad exposure through magazines and television.

The number of ads for OTC weight loss products to which one was potentially exposed that contained at least one deceptive statement (which we refer to as 'deceptive ads') is calculated as follows.

$$Deceptive\_Magazine\_Ads_{it} = \sum_{m=1}^{M} Deceptive\_Ads_{mt} * Read_{im}$$

$$Deceptive\_TV\_Ads_{it} = \sum_{v=1}^{V} Deceptive\_Ads_{vt} * Watched_{iv}$$

This measure treats all deceptive ads equally, irrespective of whether they contained one or multiple deceptive statements. Alternately, we also calculate the number of deceptive statements to which the respondent was exposed (separately by magazine and television). We also calculate the exposure to non-deceptive ads (separately by magazine and television), defined as ads with zero deceptive statements.

The vector *X* includes the following control variables: age (indicator variables for 18-24, 25-34, 35-44, and 45-54, where 55 and older is the reference category), race/ethnicity (African-American, Hispanic, Asian, and Other, with White the reference category), education (less than high school, some college, college degree or higher, with high school degree the reference category), household income ($32,501-$55,000; $55,001-$87,500; $87,501-$125,000; $125,001 and higher; with $32,500 and under the reference category), survey wave[19], marital status (single, divorced or separated or widowed, with married the reference category), household size, employment status (employed full time, employed part time, with unemployed or out of the labor force the reference category), Census region (Midwest, South, West, with Northeast the reference category), and work hours (31-40 hours, 41+ hours, with 30 hours or less the reference category). We lack data on the price of OTC weight loss products; however, nationwide annual changes in prices will be reflected in the coefficients on the indicator variables for survey wave.

We also control for indicator variables for whether respondents said that in the past 12 months they were obese (2000-2002) or 30 or more pounds overweight (2003-2007); the wording of the question changed starting in the 2003 wave.

To address the issue of targeting of ads, we control for indicator variables for each magazine read and television show watched. To control for intensity of reading/watching that implies greater exposure to ads in general, we control for the average number of magazine issues read per month, and the average hours of television watched per week. These variables may also control to some extent for whether the respondent has a sedentary lifestyle.

All models are estimated separately by gender for several reasons. Women face greater penalties than men for obesity, e.g., in terms of depression and mental health (Granberg, 2011),

[19] Our controls for survey wave also pick up any changes in use due to changes over time in FTC regulation of the OTC weight loss market; see Avery et al. (2013).

stigma and discrimination (Puhl, 2011), lower wages (Cawley, 2004b), and higher health care costs (Cawley and Meyerhoefer, 2012). As a result, women are more likely to engage in weight loss attempts (e.g., Baradel et al., 2009). These gender differences suggest that the relationship between advertising and weight loss practices may differ by gender. Multiple adults in the same household may be surveyed, so standard errors are clustered at the household level.

The main threat to identification is the non-random nature of exposure to advertisements and deception; specifically, that advertisers may target their ads to people likely to consume the products. Table 2 lists the number of ads for OTC weight loss products, by magazine and year. A majority (52.5%) of these ads appear in just 2 of the 26 magazines in the PhAds database: *Cosmopolitan* and *Glamour*. In general, the magazines these ads appear in are targeted primarily to women, such as *Women's Day* (10.7%), *Family Circle* (8.4%), *Vogue* (4.0%), and *Better Homes and Gardens* (3.7%). Only 2.7% appear in magazines targeted primarily to men, such as *Sports Illustrated* and *Playboy*, and only 0.4% of such ads appear in general-interest news magazines such as *U.S. News and World Report*, *Time*, or *Newsweek*. Despite the fact that the prevalence of obesity among African-American females is considerably higher than that among white females (Flegal et al., 2012), only 0.7% of ads for OTC weight loss products appear in the African-American targeted magazines *Ebony*, *Jet*, *Essence*, and *Black Enterprise*. Previous research has found that African-Americans are more accepting of larger body sizes than other racial/ethnic groups (Walker and Kawachi, 2011); thus, they may have a lower demand for weight loss products and manufacturers may respond by targeting their ads to other racial/ethnic groups. We do not know the extent to which publishers may be refusing to accept such ads (in particular, one would think manufacturers could reach their target audience by advertising in *Seventeen*, which ran zero such ads during this period).

The number of ads for OTC weight loss products, by category of television show and year, are listed in Table 3. (We control for indicators of specific television shows, but there are over 400 of those so here we show data for categories of shows.) The highest percentage of ads (13.8%) aired during daytime talk shows, with court TV programs and reality shows each airing 11.5% of the ads. Slightly more than 10% aired during morning news programs and sitcoms. Relatively few ads aired during more serious programs; a total of 2.1% aired during political analysis, history or biography, medical programs, or nature and wildlife programs combined. Perhaps surprisingly, very few such ads aired during health and fitness programming (only 0.2%). These differences may be due in part to differences in hours of programming, but may also reflect differences in audiences being targeted.[20]

Advertisers may be targeting consumers who are heavier, or are concerned about their weight, and thus may be more likely to consume OTC weight loss products even in the absence of any advertising. Failure to control for such targeting will lead to biased estimates of the impact of advertising exposure on behavior.

We address targeting by controlling for indicator variables for each magazine and each television show. Therefore, identification comes from:

a) Variation over time in ads and deception within each specific magazine and television program. Table 2 shows that, even among the magazines that run the most ads for OTC weight loss products, there is considerable variation in the number of such ads in any given year; for example, the number per year in *Cosmopolitan* ranges from 0 in 1999 and 2000 to 35-36 in 2005 and 2006 to 83 in 2004. Likewise, Table 3 shows that the number of such ads aired during daytime talk shows rose from 9,460 to 12,440 from 1999 to 2000, and then fell to 2,737 in 2001

[20] Ideally we would be able to calculate the number of ads for OTC weight loss products aired per hour, but we do not have data on the number of hours of broadcast time per category.

before rising again. Tables 4 and 5 present the percent of ads in that magazine or category of television show that were deceptive (i.e., contained at least one deceptive statement) by year. Table 4 shows that, for *Cosmopolitan*, the magazine that runs the most ads for OTC weight loss products, the percent of the ads that are deceptive ranges from 0% to 68%. Likewise, Table 5 shows that daytime talk shows, the category that airs the most ads for OTC weight loss products, the percent deceptive ranges from 4% to 61%. To some extent this variation by year may be due to FTC action to reduce deceptive advertising in this market, such as its Red Flag initiative that asked the media to voluntarily cease running deceptive ads in this market; see Avery et al. (2013). The substantial year-to-year variation in advertising and deception *within specific magazines and television shows* is useful for identifying the effect of such ads on consumer behavior.

b) Variation across people who, conditional on reading a specific magazine, read different numbers of issues of that magazine, controlling for the overall number of magazine issues read. There is considerable variation in this; for the 26 magazines we examine, 24% of respondents report reading all of the past four issues, 8% read 3 of the past 4 issues, 17% read half, 24% read 1 of the past four issues, and 27% report reading less than one issue per month (which we code as reading 12.5% of issues).

c) Variation across people who, conditional on watching a specific television show, watch different numbers of episodes of that show controlling for the overall amount of time spent watching television. There is considerable variation in this; 30% of respondents report watching all episodes of a given show they watch, 10% report watching three-quarters of episodes, 15% report watching half of episodes, 20% report watching a quarter of episodes, with the remaining 25% reporting other percentages.

To address the likely targeting of such ads to overweight or obese individuals we also control for whether the respondent reports being obese or 30 pounds overweight.

An advantage of using the NCS is that it is the same data used by advertisers to target their ads. The NCS website states: "The product usage, media usage, consumer demographic, psychographic and lifestyle profiles measured and reported by Simmons are the basic building blocks of virtually every major marketing firm and advertising agency in the U.S." (NCS, 2013). The NCS allows us to control for the very variables used by advertisers to target their ads, ensuring that our coefficient estimates suffer from a minimum of omitted variable bias.

Empirical Results

Use of Weight Loss Methods in the NCS

Table 6A contains summary statistics for the Simmons National Consumer Survey, 2000-2007.[21] OTC weight loss products were consumed in the past year by 11.9% of women and 8.4% of men in the sample. These reports are similar to those found in surveys that are not conditional on dieting; e.g., Blanck et al. (2007) found that 11.3% of women and 6.0% of men have used OTC weight loss products in the past year.

Table 6A also contains information about other substitute or complementary behaviors to consuming OTC weight loss products; 45.3% of women and 30.1% of men report that they are currently watching their diet, and 59.1% of women and 50.4% of men report that they exercise.

Exposure to Ads and Deception

Table 6A also lists the summary statistics for the measures of advertising exposure. As one would expect with a weight loss product, women are exposed to a larger number of ads and a

[21] Simmons NCS sample weights are used in generating the summary statistics in Table 6 but are not used in estimating the regressions, on the grounds that the sampling probability is a function of the explanatory variables (Solon et al., 2013).

larger number of deceptive statements. Women's annual exposure to advertisements for OTC weight loss products averaged 64.0 from television (roughly 46 non-deceptive and 18 deceptive) and 11.1 from magazines (roughly 8 non-deceptive and 3 deceptive). In contrast, men's annual exposure to advertisements for such products averaged 49.2 from television (roughly 34 non-deceptive and 15 deceptive) and 5.4 from magazines (roughly 4 non-deceptive and 1 deceptive).

Women were exposed to an annual average of 12 deceptive statements from television and 2 from magazines, whereas men were exposed to an average of 10 from television and less than one from magazines.

Table 6B lists summary statistics for the other regressors.

The Impact of Deceptive Advertising on Consumption of the Advertised Product

Table 7 presents results from the model of whether the respondent used an OTC weight loss product in the past 12 months. Table cells list the marginal effects associated with the coefficients in a logit regression (col. 1-2 for women) or linear probability model coefficients (col. 3-4 for men; the logit models would not converge for men).[22]

The results shown in Table 7 yield no evidence that exposure to either ads or deception affects the probability of using OTC weight loss products. For both men and women, and for both of our models (the first of which controls for number of ads and number of deceptive statements, and the second of which controls for number of non-deceptive ads and number of deceptive ads), no exposure coefficient is statistically significant. Thus, we find no evidence that advertising in this market is cooperative, increasing the size of the market. It is possible that advertising in this market is competitive, encouraging consumers to switch brands. Logically,

[22] In some cases, the sample size for the logit and LPM models that include indicator variables for television shows and magazines differs slightly; this is due to certain shows perfectly predicting the dependent variable in the logit model, which leads STATA to drop the observation.

advertising in this market must do something to increase sales and profits or manufacturers would not engage in it. We are not able to directly test for competitive effects using the NCS because the survey does not include information on the brand of OTC weight loss product used.

Testing for Spillover Effects: Exercise and Dieting

Exposure to ads for OTC weight loss products may impact the use of substitute or complementary methods of weight loss; specifically: exercise and dieting. In this section, we examine whether exposure to ads for OTC weight loss products has such spillover effects. The directions of such spillovers are ambiguous a priori, and depend on whether consumers perceive these practices to be substitutes for, or complements to, OTC weight loss products.

Exercise

Our models of exercising (the results of which are shown in Table 8) exhibit evidence of spillover effects from advertising of OTC weight loss products.

For both men and women, exposure to magazine ads for OTC weight loss products is associated with a significantly lower probability of exercising. Table 8, column 1, shows that for women, exposure to an additional 10 magazine ads for such products (0.54 of a standard deviation) is associated with a 1.12 percentage point lower probability of exercising (on a base of 59.1%). This is driven by non-deceptive magazine ads; in column 2 of Table 8, the results indicate that exposure to an additional 10 such ads (0.73 of a standard deviation) is associated with a 1.22 percentage point lower probability of exercising.

Results are similar for men; exposure to an additional 10 magazine ads (0.75 of a standard deviation) is associated with a 1.08 percentage point lower probability of exercising (on a base of 50.4%). Again, this is driven by the non-deceptive magazine ads; exposure to an

additional 10 of those (0.82 of a standard deviation) is associated with a 1.16 percentage point lower probability of exercising. One explanation for these results is that both men and women see OTC weight loss products as substitutes for exercise.

Among women, exposure to greater deception in magazine ads for OTC weight loss products is associated with a higher probability of exercise. In Table 8, column 1, exposure to an additional 10 deceptive statements in magazine ads (4.4 of a standard deviation) is associated with a 2.98 percentage point increase in the probability of exercise. Alternatively, exposure to an additional 10 deceptive magazine ads (3.2 of a standard deviation) is associated with a 1.25 percentage point increase in the probability of exercise. Savvy consumers may see through deceptive statements and infer that the product is too good to be true, increasing their use of substitute methods of weight loss.

Dieting

Our models of dieting (the results of which are shown in Table 9) also reveal evidence of spillover effects from advertising of OTC weight loss products. However, in contrast to the results for exercise (for which the results for men and women were quite similar), there is a considerable gender difference in the results for dieting.

Results in column 1 of Table 9 indicate that exposure to television ads is associated with a lower probability that women diet; specifically, an additional 100 ads (which is 0.8 of a standard deviation) is associated with a 0.79 percentage point lower probability of dieting (from a base of 45.3%). Results from the second model, shown in column 2 of Table 9, indicate that this is driven by non-deceptive television ads; exposure to an additional 100 non-deceptive ads (which is 1.1 of a standard deviation) is associated with a 0.81 percentage point lower probability of dieting.

Exposure to deceptive statements on television, however, is associated with a higher probability that women diet. Specifically, exposure to an additional 10 deceptive statements on television ads (which is 0.42 of a standard deviation) is associated with a 0.30 percentage point increase in the probability of dieting (see Table 9, col. 1).

Collectively, these results suggest that television ads may provide information to women that there exist alternatives to dieting. Deception, on the other hand, may alert women to the fact that these products are too good to be true, leading them to rely more on dieting for weight loss. (Deception may still pay for the manufacturers, if the gains from stealing consumers from rivals exceed the losses from driving away perceptive consumers.)

The results for men are virtually the opposite of those for women. Column 3 of Table 9 shows that among men exposure to additional television ads is associated with a higher probability of dieting; specifically, an additional 100 ads (0.93 of a standard deviation) is associated with a 0.74 percentage point higher probability of dieting (on a base of 30.1%). This result is driven by non-deceptive ads; in column 4, exposure to an additional 100 of them (1.33 of a standard deviation) is associated with a 0.90 percentage point higher probability of dieting.

For men, exposure to an additional 10 deceptive statements in television ads (0.25 of a standard deviation) is associated with a 0.45 percentage point lower probability of dieting (see Table 9, col. 3), and exposure to an additional 10 deceptive television ads (0.46 of a standard deviation) is associated with a 0.18 percentage point lower probability of dieting (Table 9, col. 4).

Discussion

It has long been recognized that advertising can fulfill two functions: 1) provide information to consumers, and 2) persuade or mislead consumers (Bagwell, 2007; Dave, 2013). This dual nature of advertising led Lester Telser to write that "Hardly any business practice causes economists greater uneasiness than advertising" (Telser, 1964, p. 537). This paper contributes to the empirical economic literature on advertising by producing the first estimates of the effect of individual-level exposure to deceptive advertising on consumption of the advertised good and its substitutes.

Previous literature (e.g., Gasmi et al., 1992) has examined whether advertising has cooperative effects, expanding the overall market, or competitive effects, in which advertising increases market share of the advertised product at the expense of rival products. We find no evidence that ads in this market are cooperative; for neither men nor women does exposure to additional ads increase the probability of using OTC weight loss products. This is true of non-deceptive and deceptive ads, and ads on television as well as those in magazines.

Advertising and deceptive advertising must do something to increase firm profits or firms would not engage in it so frequently in this market. (In our sample, 39.7% of all magazine ads, and 25.4% of all television ads, for OTC weight loss products contained at least one deceptive statement.) Although we cannot test for it directly, we assume that advertising and deceptive advertising must have competitive or predatory effects, increasing market share of the deceptively advertised product at the expense of rivals. (The ads do not tend to compare their product to rival brands, but could be competitive in other ways.)

We also find spillovers of advertising of OTC weight loss products to alternative weight-loss methods. For both men and women, exposure to additional magazine ads for such products is associated with a lower probability of exercising. For women, exposure to television ads for

such products is associated with a lower probability of dieting. The exception to this pattern of results is that exposure to television ads for such products is associated with a higher probability that men diet. Consumers may differ in whether they see OTC weight loss products as a substitute for dieting and exercise. The majority of ads indicate complementarity; 45.7% of magazine ads in our sample advise consumers to use a sensible diet and exercise in conjunction with their product. However, a minority claim substitutability; 5.5% claim that their product will help consumers lose weight without diet or exercise and 3.2% state the product can help consumers lose weight no matter how much they eat.

We find evidence that exposure to deceptive statements and deceptive advertisements is associated with a higher probability that women diet and exercise. Over-the-top claims may lead women to conclude that these products are too good to be true, and to take up healthier methods of weight loss. However, this pattern is not observed among men. Exposure to deception is not associated with the probability that men exercise, and is associated with a lower probability that men diet. One possible explanation is that, men participate less than women in this market and as a result men may be less savvy than women about detecting implausible claims about these products.

Our results suggest that exposure to ads in different media may have different associations with consumer behavior; we find that magazine ads were influential in exercising and television ads were associated with dieting. Research in the field of communication has often found differences by medium of advertising (Liu & Eveland, 2005). An important difference concerns the pace of the message; in television ads, the pacing is dictated by the advertiser, whereas viewers set their own pace of experiencing print ads (Dijkstra, Buijtels, & van Raaji, 2005). Communications researchers also recognize a role of viewer involvement or

interest; television ads are thought to be better for influencing viewers who are less involved (or more distracted); see Salomon & Leight (1984) and Dijkstra & van Raaij (2001). Future research can further explore how the impact of deceptive advertising differs by the medium of the ad.

Another interesting difference by medium is that the targeting of advertisements for OTC weight loss products to women is greater in magazines than on television. Women are exposed to 105% more magazine ads, but only 30% more television ads, than men for these products. Very few such ads run in general-interest news magazines (instead, most run in women's interest magazines), but such ads commonly air during television news programs. Certainly, specific cable TV programs can have narrow audiences, but the influence of such programs may be swamped by network shows with high ratings viewed by individuals across the demographic spectrum. Future research could explore whether magazines or cable television offer better opportunities for targeting ads to specific segments of the population.

These findings are relevant for public policy. The FTC has made it a priority to reduce deceptive advertising in the market for OTC weight loss products (FTC, 2003, 2005, 2010). However, we find that deception does not increase the probability that people consume such products. Instead, manufacturers may be trapped in a prisoner's dilemma of advertising; even though advertising does not increase the size of the market, firms must engage in it in order to avoid losing market share. In fact, deceptive advertising is associated with a higher probability that women diet and exercise. This is not to say that deceptive advertising is beneficial and should be encouraged, but rather that the effect of deceptive advertising on consumers must be examined empirically.

Our analysis has several limitations. First, although we control for each magazine read and each television show watched in order to address the targeting of ads, we do not have exogenous variation in ad exposure. Still, we think that using variation in intensity of viewing and reading specific magazines, and especially variation over time in the ads in specific magazines and television shows, allows for more accurate estimates than ever before of the effect of advertising and deception on consumer behavior. Second, there is measurement error in our estimates of exposure. For example, we are unable to determine if the ad that ran in the magazine the respondent reported reading or during the TV show the respondent reported watching was actually seen by the respondent; thus, they are most accurately described as measures of potential exposure. In this regard, we overestimate actual exposure to ads in the claimed magazines and television shows. There are also factors leading us to underestimate exposure: we do not have ad data for the full universe of magazines, people may underreport their television watching, and we have no information about exposure via the radio or internet. We lack data on the prices of OTC weight loss products; nationwide variation over time is captured by the indicator variables for survey wave, but we cannot control for geographic heterogeneity in prices within years. Our data, while unusually rich, do not contain the exact brand of OTC weight loss product consumed; as a result we are not able to examine brand-competitive effects. Despite these limitations, this paper provides the most accurate estimates to date of the effect of advertising in general, and deceptive advertising specifically, on consumption of the advertised good and its substitutes.

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Table 1:
Interview dates by Wave of the National Consumer Survey,
and the Associated Windows of Ad Exposure

	NCS Survey Window		Ad Exposure Window	
	Start Date	**End Date**	**Start Date**	**End Date**
25	10/1/2000	4/1/2001	10/7/1999	10/1/2000
27	4/1/2001	9/1/2001	4/6/2000	4/1/2001
29	1/1/2002	5/1/2002	1/6/2001	1/1/2002
31	5/1/2002	9/1/2002	5/6/2001	5/1/2002
33	1/1/2003	5/1/2003	1/6/2002	1/1/2003
35	5/1/2003	9/1/2003	5/6/2002	5/1/2003
37	1/1/2004	5/1/2004	1/6/2003	1/1/2004
39	5/1/2004	9/1/2004	5/7/2003	5/1/2004
41	1/1/2005	5/1/2005	1/7/2004	1/1/2005
43	5/1/2005	9/1/2005	5/6/2004	5/1/2005
45	1/1/2006	6/1/2006	1/6/2005	1/1/2006
47	5/1/2006	10/1/2006	5/6/2005	5/1/2006
49	10/15/2006	5/1/2007	10/20/2005	10/15/2006

Table 2:
Number of Ads for Over-the-Counter Weight Loss Products
By Magazine and Year

Magazine	1999	2000	2001	2002	2003	2004	2005	2006	Total	Fraction of Total
Cosmopolitan	0	0	1	44	71	83	35	36	270	0.386
Glamour	18	0	0	19	12	16	15	17	97	0.139
Woman's Day	1	0	1	11	4	11	17	30	75	0.107
TV Guide	0	0	0	16	11	23	8	4	62	0.089
Family Circle	0	0	0	5	10	19	12	13	59	0.084
People	0	0	3	7	14	21	5	1	51	0.073
Vogue	1	0	0	10	3	1	2	11	28	0.040
Better Homes and Gardens	0	0	0	0	4	9	8	5	26	0.037
Sports Illustrated	0	0	1	2	2	7	4	0	16	0.023
Reader's Digest	0	0	0	0	0	0	3	0	3	0.004
Ebony	0	0	0	0	0	0	2	0	2	0.003
Jet	0	0	0	0	0	0	2	0	2	0.003
Playboy	0	0	0	2	0	0	0	0	2	0.003
Rolling Stone	0	0	1	0	0	1	0	0	2	0.003
Newsweek	0	0	0	0	0	0	0	2	2	0.003
Essence	0	0	0	0	1	0	0	0	1	0.001
McCall's	0	1	0	0	0	0	0	0	1	0.001
Time	0	0	0	0	0	0	0	1	1	0.001
Black Enterprise	0	0	0	0	0	0	0	0	0	0
Business Week	0	0	0	0	0	0	0	0	0	0
Good Housekeeping	0	0	0	0	0	0	0	0	0	0
Modern Maturity	0	0	0	0	0	0	0	0	0	0
Money	0	0	0	0	0	0	0	0	0	0
National Geographic	0	0	0	0	0	0	0	0	0	0
Seventeen	0	0	0	0	0	0	0	0	0	0
U.S. News and World Report	0	0	0	0	0	0	0	0	0	0
Total	20	1	7	116	132	191	113	120	700	1.000

Note: In calculating advertising exposure, we use partial years of 1999 and 2006 (based on the timing of the survey waves in 2000 and 2007). For comparison purposes, this table reports data for the full calendar year in all cases.

Table 3:
Number of Ads for Over-the-Counter Weight Loss Products
By Category of Television Show and Year

Category of Show	1999	2000	2001	2002	2003	2004	2005	2006	Total	Fraction of Total
Day Time Talk Shows	9,460	12,440	2,737	8,058	17,054	32,454	27,613	54,711	164,527	0.138
Court TV Programs	2,285	4,413	1,227	2,847	5,066	10,324	30,736	80,465	137,363	0.115
Reality Shows	3,942	2,637	1,050	4,919	4,901	16,389	33,048	69,803	136,689	0.115
Morning News Program	5,685	11,627	6,253	20,904	26,678	23,920	19,867	8,399	123,333	0.104
Sitcoms	3,450	10,581	1,715	6,134	9,673	15,677	27,435	47,238	121,903	0.102
Movie Reruns/Made	1,847	9,011	1,008	4,262	4,362	7,520	13,414	47,618	89,042	0.075
Sports Program	332	4,189	10,004	17,792	18,356	4,096	5,713	3,956	64,438	0.054
Quiz/Competitive Show	1,636	2,908	1,124	4,346	7,638	8,855	11,063	25,930	63,500	0.053
Dramas	2,100	8,265	1,332	4,148	4,560	7,525	9,928	23,298	61,156	0.051
Daytime Soap Operas	2,765	1,997	2,805	4,272	11,439	15,478	6,377	3,554	48,687	0.041
Celebrity News Program	887	1,707	448	1,729	2,295	16,448	10,406	10,280	44,200	0.037
Variety or Music Program	855	1,129	165	1,376	1,409	3,496	6,005	14,078	28,513	0.024
Late Night Talk Show	122	782	182	1,271	2,599	9,693	6,352	407	21,408	0.018
Cooking and Home Show	458	1,122	295	1,166	1,232	1,414	7,605	5,427	18,719	0.016
Science Fiction Program	108	1,382	245	1,006	484	1,073	3,556	7,187	15,041	0.013
Magazine Programs	1,114	702	144	968	1,126	927	2,534	3,974	11,489	0.010
Other	429	460	245	958	898	807	450	4,922	9,169	0.008
Nature and Wildlife	18	239	150	215	123	121	967	5,225	7,058	0.006
Medical Program	3	14	1	102	130	49	73	5,063	5,435	0.005
Evening Late Night	297	189	551	415	1,268	347	607	1,697	5,371	0.005
History or Biography	66	284	136	96	337	339	470	2,203	3,931	0.003
Political Analysis	143	239	197	245	431	269	262	1,168	2,954	0.002
Health and Fitness	371	202	38	349	138	84	556	1,017	2,755	0.002
Cartoons	67	236	27	92	88	226	192	531	1,459	0.001
Awards Show	33	50	16	48	317	290	302	327	1,383	0.001
Total	38,473	76,805	32,095	87,718	122,602	177,821	225,531	428,478	1,189,523	1.000

Note: In calculating advertising exposure, we use partial years of 1999 and 2006 (based on the timing of the survey waves in 2000 and 2007). For comparison purposes, this table reports data for the full calendar year in all cases.

Table 4:
Percent of Magazine Ads that Are Deceptive
By Magazine and Year

Magazine	1999	2000	2001	2002	2003	2004	2005	2006	Total
Sports Illustrated			0.0000	1.0000	1.0000	0.7143	0.5000		0.6875
Playboy				0.5000					0.5000
Rolling Stone			0.0000			1.0000			0.5000
Cosmopolitan			0.0000	0.6818	0.4930	0.3373	0.5429	0.4444	0.4741
Glamour	0.7222			0.6842	0.5833	0.1250	0.1333	0.4706	0.4639
TV Guide				0.5625	0.4545	0.4348	0.1250	0.0000	0.4032
Woman's Day	1.0000		0.0000	0.7273	0.2500	0.0909	0.1765	0.4333	0.3600
Reader's Digest							0.3333		0.3333
Family Circle				0.6000	0.6000	0.2632	0.1667	0.0769	0.2881
Vogue	0.0000			0.5000	0.3333	1.0000	0.0000	0.0000	0.2500
People			0.0000	0.4286	0.0714	0.2857	0.0000	0.0000	0.1961
Better Homes and Gardens					0.2500	0.1111	0.3750	0.0000	0.1923
Ebony							0.0000		0.0000
Essence					0.0000				0.0000
Jet							0.0000		0.0000
McCall's		0.0000							0.0000
Time								0.0000	0.0000
Newsweek								0.0000	0.0000
Total	0.7000	0.0000	0.0000	0.6379	0.4470	0.3141	0.2920	0.3167	0.3971

Note: In calculating advertising exposure, we use partial years of 1999 and 2006 (based on the timing of the survey waves in 2000 and 2007). For comparison purposes, this table reports data for the full calendar year in all cases. Deception defined according to FTC (2003). Magazines in the sample but ran no such ads during this period are: *Black Enterprise, Business Week, Good Housekeeping, Modern Maturity, Money, National Geographic, Seventeen, U.S. News and World Report*.

Table 5:
Percent of Television Ads that Are Deceptive
By Category and Year

Category of Show	1999	2000	2001	2002	2003	2004	2005	2006	Total
Medical Program	0.0000	0.0000	0.0000	0.7647	0.0462	0.0000	0.0822	0.6196	0.5937
Late Night Talk Shows	0.2213	0.0793	0.2363	0.7836	0.2043	0.5374	0.6993	0.3194	0.5344
Other	0.0536	0.0543	0.0449	0.7578	0.1013	0.1190	0.2769	0.6035	0.4373
History or Biography	0.0000	0.0035	0.0294	0.6042	0.5994	0.0383	0.2681	0.5788	0.4271
Awards Show	0.0000	0.0600	0.0000	0.8125	0.2050	0.3345	0.6755	0.3853	0.3861
Cartoons	0.0448	0.3305	0.0000	0.7391	0.1705	0.0531	0.5573	0.5122	0.3804
Dramas	0.0348	0.0557	0.2432	0.7257	0.1195	0.1460	0.2590	0.5553	0.3437
Variety or Music Program	0.0257	0.1010	0.0667	0.4906	0.1199	0.1716	0.2451	0.4579	0.3335
Daytime Soap Operas	0.0228	0.1227	0.1084	0.2280	0.1972	0.4529	0.5485	0.5217	0.3328
Sitcoms	0.0171	0.1285	0.1942	0.7716	0.2487	0.1368	0.2344	0.4756	0.3276
Morning News Programs	0.0197	0.0814	0.2108	0.5930	0.2756	0.5440	0.2420	0.0206	0.3253
Political Analysis or Discussion Program	0.0210	0.0335	0.0558	0.7184	0.0510	0.1004	0.3130	0.5034	0.3104
Celebrity News Programs	0.0113	0.0715	0.2835	0.6298	0.4475	0.3901	0.3871	0.0504	0.3017
Reality Shows	0.0081	0.1217	0.1438	0.5613	0.1959	0.2775	0.2373	0.2795	0.2643
Quiz/Competitive Show	0.0758	0.0856	0.3149	0.7034	0.2430	0.4067	0.2270	0.1843	0.2603
Science Fiction Program	0.0278	0.0145	0.0163	0.7863	0.0930	0.0410	0.0557	0.3709	0.2507
Nature and Wildlife	0.0000	0.0628	0.2267	0.7395	0.2520	0.3306	0.0383	0.2685	0.2436
Day Time Talk Shows	0.0436	0.1967	0.3950	0.6133	0.2466	0.3754	0.1877	0.1491	0.2347
Magazine Programs	0.0368	0.0527	0.1597	0.6209	0.4041	0.1834	0.1867	0.1990	0.2255
Movie Reruns/Made for TV Movies	0.0049	0.0249	0.0139	0.7299	0.1215	0.0737	0.0786	0.2020	0.1698
Health and Fitness Program	0.0000	0.0000	0.4211	0.1347	0.0145	0.0238	0.0324	0.3697	0.1673
Evening Late Night News Programs	0.0135	0.0529	0.0181	0.8265	0.1735	0.2421	0.1746	0.0124	0.1486
Cooking and Home Show	0.0371	0.0856	0.2576	0.7307	0.1672	0.0806	0.0803	0.0418	0.1175
Sports Program	0.0060	0.0105	0.0005	0.1225	0.1143	0.0715	0.2090	0.3766	0.1134
Court TV Programs	0.0127	0.2264	0.3627	0.7366	0.2704	0.2496	0.0443	0.0715	0.1065
Total	0.0278	0.1027	0.1464	0.5239	0.2175	0.3371	0.2150	0.2513	0.2542

Note: In calculating advertising exposure, we use partial years of 1999 and 2006 (based on the timing of the survey waves in 2000 and 2007). For comparison purposes, this table reports data for the full calendar year in all cases. Deception defined according to FTC (2003).

Table 6A:
Summary Statistics
National Consumer Survey, 2000-2007

	Females			Males		
Dependent Variables	**Mean**	**S.D.**	**N**	**Mean**	**S.D.**	**N**
Took OTC weight loss pill in past 12 months	.119	.324	26,951	.084	.277	14,275
Participate in exercise	.591	.492	59,482	.504	.500	47,383
Currently watching diet	.453	.498	59,482	.301	.459	47,383
Ad Exposure Variables						
Exposure to TV ads	64.018	127.286	59,482	49.191	107.849	47,383
Exposure to non-deceptive TV ads	45.846	93.477	59,482	34.396	74.883	47,383
Exposure to deceptive TV ads	18.172	41.545	59,482	14.795	39.626	47,383
Exposure to deceptive statements in TV ads	12.083	23.901	59,482	9.639	21.420	47,383
Exposure to magazine ads	11.049	18.492	59,482	5.401	13.231	47,383
Exposure to non-deceptive magazine ads	7.905	13.690	59,482	4.461	12.135	47,383
Exposure to deceptive magazine ads	3.144	6.965	59,482	0.941	3.125	47,383
Exposure to deceptive statements in magazine ads	2.294	4.676	59,482	0.743	2.248	47,383

Data: Simmons National Consumer Survey 2000-2007 merged with data from Kantar TNS Media Intelligence, 1999-2006. Data are weighted using Simmons NCS sample weights.

Table 6B:
Summary Statistics
National Consumer Survey, 2000-2007

	Females N=59,482		Males N=47,383	
	Mean	**S.D.**	**Mean**	**S.D.**
Obese	.056	.230	.025	.155
>30 pounds overweight	.155	.362	.082	.274
Age 18-24	.098	.298	.102	.302
Age 25-34	.155	.361	.153	.340
Age 35-44	.204	.403	.204	.403
Age 45-54	.204	.403	.205	.404
Age 55+	.339	.473	.337	.473
White	.634	.482	.631	.483
Black	.067	.249	.055	.229
Hispanic	.261	.439	.271	.445
Asian	.029	.167	.030	.172
Other Race	.013	.112	.015	.121
Less than High School	.144	.351	.162	.369
High School	.281	.449	.254	.435
Some College	.244	.429	.222	.415
College or more	.332	.459	.364	.472
Income < $32,500	.247	.431	.193	.395
Income $32,501 - $55,000	.222	.415	.217	.412
Income $55,001 - $87,500	.241	.428	.263	.440
Income $87,501 - $125,000	.158	.365	.117	.382
Income > $125,001	.132	.338	.149	.356
Single	.144	.352	.155	.362
Married	.650	.477	.737	.440
Divorced/Separated/Widowed	.200	.400	.105	.306
Number in household	3.400	1.85	3.514	1.815
Employed full-time	.406	.491	.632	.482
Employed part-time	.161	.368	.094	.291
Not employed	.432	.495	.275	.446
Work 30 hours or less	.632	.482	.426	.495
Work 31-40 hours	.241	.427	.259	.438
Work 41+ hours	.128	.335	.316	.465
North	.247	.431	.241	.428
South	.302	.459	.298	.457
Midwest	.223	.416	.227	.419
West	.229	.420	.234	.423
Average number of magazine issues read per month	5.460	5.726	4.425	5.319
Average number of hours of TV watched per week	18.359	16.754	15.366	14.877

Notes: Because of differences in question wording across waves, there is data on obesity for 15,015 women and 11,951 men, and data on whether 30 or more pounds overweight for the remaining 44,467 women and 35,432 men.

Table 7:
Consumed OTC Weight Loss Products
Logit Marginal Effects (col. 1-2 for Women) or LPM Coefficients (col. 3-4 for Men)

VARIABLES	(1) Women	(2) Women	(3) Men	(4) Men
TV Ads/10	9.58e-05		0.000613	
	(0.000238)		(0.000442)	
Magazine Ads/10	0.000864		-0.00291	
	(0.00185)		(0.00291)	
Deceptive Statements on TV/10	-0.000513		-0.00307	
	(0.00134)		(0.00225)	
Deceptive Statements in Magazines/10	-0.00798		-0.00384	
	(0.00752)		(0.0166)	
TV Ads (Non-Deceptive)/10		0.000262		0.000771
		(0.000276)		(0.000494)
Magazine Ads (Non-Deceptive)/10		0.000204		-0.00273
		(0.00180)		(0.00295)
TV Ads (Deceptive)/10		-0.000588		-0.00121
		(0.000620)		(0.000911)
Magazine Ads (Deceptive)/10		-0.00288		-0.00657
		(0.00370)		(0.0116)
Demographic, SES, and obesity variables	Yes	Yes	Yes	Yes
Magazine, TV intensity variables	Yes	Yes	Yes	Yes
Magazine, TV program indicator variables	Yes	Yes	Yes	Yes
Observations	26,686	26,686	14,275	14,275
Mean of Dependent Variable	.119	.119	0.084	0.084

Standard errors clustered at the household level are listed in parentheses. Asterisks indicate statistical significance: *** p<0.01, ** p<0.05, * p<0.1
Data: Simmons National Consumer Survey merged with data from Kantar TNS Media Intelligence.
Demographic variables: indicator variables for age group, race, marital status, household size, and Census region.
Socioeconomic variables: work hours, indicator variables for education, income category, year, and employment status.
Overweight/obesity variables: indicator variables for whether the respondent said that in the past 12 months they were obese (2000-2002) or 30 or more pounds overweight (2003-2007).
Magazine, TV intensity variables: total magazine issues read in the past month, average hours of television watched per week.

Table 8: Exercising
Logit Marginal Effects

VARIABLES	(1) Women	(2) Women	(3) Men	(4) Men
TV Ads/10	0.000238		-0.000262	
	(0.000301)		(0.000453)	
Magazine Ads/10	-0.0112***		-0.0108***	
	(0.00231)		(0.00271)	
Deceptive Statements on TV/10	-0.00243		0.00183	
	(0.00178)		(0.00246)	
Deceptive Statements in Magazines/10	0.0298***		0.0133	
	(0.0101)		(0.0170)	
TV Ads (Non-Deceptive)/10		0.000284		-0.000188
		(0.000359)		(0.000535)
Magazine Ads (Non-Deceptive)/10		-0.0122***		-0.0116***
		(0.00228)		(0.00275)
TV Ads (Deceptive)/10		-0.00108		0.000461
		(0.000873)		(0.00106)
Magazine Ads (Deceptive)/10		0.0125**		0.00535
		(0.00531)		(0.0115)
Demographic, SES, and obesity variables	Yes	Yes	Yes	Yes
Magazine, TV intensity variables	Yes	Yes	Yes	Yes
Magazine, TV program indicator variables	Yes	Yes	Yes	Yes
Observations	59,474	59,474	47,383	47,383
Mean of Dependent Variable	.591	.591	.504	.504

Standard errors clustered at the household level are listed in parentheses. Asterisks indicate statistical significance: *** p<0.01, ** p<0.05, * p<0.1
Data: Simmons National Consumer Survey merged with data from Kantar TNS Media Intelligence.
Demographic variables: indicator variables for age group, race, marital status, household size, and Census region.
Socioeconomic variables: work hours, indicator variables for education, income category, year, and employment status.
Overweight/obesity variables: indicator variables for whether the respondent said that in the past 12 months they were obese (2000-2002) or 30 or more pounds overweight (2003-2007).
Magazine, TV intensity variables: total magazine issues read in the past month, average hours of television watched per week.

Table 9: Dieting
Logit Marginal Effects

VARIABLES	(1) Women	(2) Women	(3) Men	(4) Men
TV Ads/10	-0.000793**		0.000744**	
	(0.000310)		(0.000365)	
Magazine Ads/10	-0.000383		0.00440*	
	(0.00252)		(0.00244)	
Deceptive Statements on TV/10	0.00304*		-0.00453**	
	(0.00179)		(0.00196)	
Deceptive Statements in Magazines/10	-0.0107		-0.00865	
	(0.0102)		(0.0139)	
TV Ads (Non-Deceptive)/10		-0.000813**		0.000898**
		(0.000361)		(0.000436)
Magazine Ads (Non-Deceptive)/10		-0.00134		0.00380
		(0.00250)		(0.00246)
TV Ads (Deceptive)/10		0.000734		-0.00177**
		(0.000854)		(0.000836)
Magazine Ads (Deceptive)/10		-0.00504		0.00399
		(0.00520)		(0.00967)
Demographic, SES, and obesity variables	Yes	Yes	Yes	Yes
Magazine, TV intensity variables	Yes	Yes	Yes	Yes
Magazine, TV program indicator variables	Yes	Yes	Yes	Yes
Observations	59,466	59,466	47,337	47,337
Mean of Dependent Variable	.453	.453	.301	.301

Standard errors clustered at the household level are listed in parentheses. Asterisks indicate statistical significance: *** p<0.01, ** p<0.05, * p<0.1
Data: Simmons National Consumer Survey merged with data from Kantar TNS Media Intelligence.
Demographic variables: indicator variables for age group, race, marital status, household size, and Census region.
Socioeconomic variables: work hours, indicator variables for education, income category, year, and employment status.
Overweight/obesity variables: indicator variables for whether the respondent said that in the past 12 months they were obese (2000-2002) or 30 or more pounds overweight (2003-2007).
Magazine, TV intensity variables: total magazine issues read in the past month, average hours of television watched per week.

Appendix Table:
Reliability of Coding of Deception (Red Flags)

Red Flag Number	Magazine Ads		Television Ads	
	Percent Agreement	Cohen's kappa	Percent Agreement	Cohen's kappa
1	97.32	0.956	98.79	0.955
2	99.12	0.939	98.94	0.800
3	90.18	0.795	99.57	0.840
4	97.32	0.973	99.22	0.932
5	94.64	0.716	99.65	0.863
6	69.64	0.495	99.08	0.886
7	99.11	0.956	100.00	1.000