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THE EFFECT OF DECEPTIVE ADVERTISING ON CONSUMPTION OF THE ADVERTISED GOOD AND ITS SUBSTITUTES: THE CASE OF OVER-THE-COUNTER WEIGHT LOSS PRODUCTS

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

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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. We control for the targeting of ads using indicator variables for each unique magazine read and television show watched.

Our estimates indicate that exposure to deceptive advertising is associated with a lower probability that women, and a higher probability that men, consume OTC weight loss products. We find evidence of spillovers; exposure to deceptive print ads is associated with a higher probability of dieting and exercising for both men and women. We also find evidence that better-educated individuals are more sophisticated consumers of advertising and use it to make more health-promoting decisions.

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Introduction

The research question of 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. Byrd-Bredbenner et al., 2001; Sauer and Leffler, 1990). Marketing researchers have conducted lab experiments with small samples to determine how subjects perceive deceptive advertisements constructed by the researcher (e.g. Compeau et al., 2004; Johar, 1995; Burke et al., 1988; Olson and Dover, 1978). 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).

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 an iPhone app that allowed consumers to communicate with each other about the true amount of fresh snowfall. Peltzman (1981) examines FTC cases during 1960-75 and finds that FTC action regarding deceptive advertising tends to depress the market share of the involved brand.

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. Information on the ads that ran in the magazines that respondents report reading, and during the TV shows that respondents report watching, is merged to the individual data. We have coded the advertisements for deceptive content using explicit guidelines that the Federal Trade Commission (FTC) developed for the specific market in question (over-the-counter weight loss products). Each individual's exposure to deception is used to predict consumption, controlling for demographic factors and other variables used by marketers to target their ads.

The Market for Over-the-Counter Weight Loss Products

We examine advertising in the market for over-the-counter (OTC) weight loss products, which is a heterogeneous market, 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 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). 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).

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. Because they are regulated as foods, manufacturers need not show any benefit from the product but also cannot make specific

[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).

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[4]; they are not subject to the far more stringent regulations on the advertising of prescription medications.[5] 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).[6] 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: ephedra in 2005 and phenylpropanolamine (PPA) in 2000. Although these and similar active ingredients have little effect on calorie expenditure and therefore weight loss, 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.[7] 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 these products continue to

[4] 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).
[5] 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.
[6] 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 [twelve] reviewed dietary supplements can be recommended for over-the-counter use" (Pittler et al., 2004).
[7] 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).

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 must be approved for safety and efficacy before being sold to the public (Pillitteri et al., 2008; Harris Interactive, Inc., 2002).[8]

The market failure of imperfect information makes deceptive advertising potentially profitable. In general, deceptive advertising is more advantageous to firms selling experience or credence goods (Nelson, 1974). Whether because of a lack of information or other reasons, "Deceptive weight loss claims have long plagued the supplement industry" (FTC, 2010, p. 9).

[8] 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).

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 abstainers to begin using the products) it still may 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).[9]

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 for public policy and public health.

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; and

[9] The FTC has written, "…if the entire field of weight-loss advertising is subject to widespread 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. Public health suffers as well." (FTC, 2002).

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 body 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).

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 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 benefits of consumption are based in part on the advertisements to which they are

exposed. 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 (cooperative effects), or simply increase market share for the advertised brand without increasing overall consumption (competitive or predatory effects). It is possible that exposure to non-deceptive ads and exposure to deceptive ads could have different effects. Because we consider this to be 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.[10] 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

Our individual-level data are from the Simmons National Consumer Survey from 2001-2007. The NCS provides detailed information on Americans' consumption, magazine reading, and television viewing. The NCS is a repeated cross-sectional survey, in which each wave is an independently drawn multistage stratified probability sample of

[10] Even the advertisements are not consistent on this point. Among the print ad appearances in our sample, 45.8% advise the consumer to use a sensible diet and exercise but 5.5% say that the product can help the consumer lose weight without diet or exercise and 3.2% say that the product can help consumers lose weight no matter how much they eat.

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 I interview, interviewers collect and review with the respondent his/her 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).[11] 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.

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

The entire sample is asked whether they have had specific medical conditions in the past 12 months, including whether they were obese (asked 2001-2002) or 30 or more pounds overweight (2003-2007).

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 asked about their viewing habits for a list of approximately 400 broadcast television programs and nearly 400 cable television programs. For broadcast television programs, the NCS asks respondents 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 pool data from the 2001-2007 cross sections of the NCS. We assign households to Designated Marketing Areas (DMAs) based on their county of residence. Our sample includes only those living in the top 75 DMAs (in 2001) or top 100 DMAs (in 2002-2007) because we can only assign DMAs for those respondents. 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.[12] The PhADS archive contains a digital collection of all print advertisements for medications that appeared

[12] 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).

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*.

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 weight-loss products (OTC and Rx) that appeared in every issue of these 26 magazines between 2000 and 2007 were matched to the NCS data. It amounted to 466 unique magazine ads for OTC weight loss products with a total of 686 ad appearances.

Television Advertisements

The data on television advertisements for OTC weight loss products (OTC and Rx) 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 2000-2007 on national networks, cable, and spot markets identified by Designated Marketing Areas (DMAs). The TNS data cover the largest 75 DMAs in 2001 and the 100 largest Designated Marketing Areas (DMAs) from 2002-2007. The data include 1,115 unique television ads for OTC weight loss products, with a total of 1,151,089 ad appearances.

Definition of Deceptive 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[13];
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[14];
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.

These definitions of deception seem reasonable to us. However, even if one disagrees with them the FTC standards remain policy relevant because they are the official definitions of deception by the relevant governing agency.

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. Our researchers used those FTC instructions to identify which deceptive claims (if any) appear in the sample of 466 unique magazine ads and 1,151 unique television ads for OTC weight loss products. To ensure the accuracy of the coding, a second researcher independently coded the same advertisements and, if a significant number of

[13] 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.
[14] This is deceptive because of the rate of weight loss; the NHLBI (2000) recommends weight loss of 1-2 pounds per week.

discrepancies were found, a third researcher coded them as well and resolved the discrepancy. Thanks to the clarity of the FTC guidelines we obtained inter-coder reliability over 90% for six out of the seven coded dimensions for print ads (with an outlier of 69.6% agreement for the seventh), and agreement over 98% for each of the seven coded dimensions for the television ads.

Measures of Exposure to Advertisements

We construct measures of individual exposure to advertisements for OTC weight loss products in the following manner. 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*.[15] The number of ads for OTC weight loss products that appeared in magazine *m* during year *t* is Ads_{mt} and the number of OTC weight loss advertisements that were shown during television show *v* during year *t* is $Ads_{vt.}$

To estimate potential exposure to print ads for OTC weight loss products, 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 estimate potential exposure to television ads for OTC weight loss products, we 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.

[15] 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).

$$OTC\_Magazine\_Ad\_exposure_{it} = \sum_{m=1}^{M} Ads_{mt} * Read_{im}$$

$$OTC\_TV\_Ad\_exposure_{it} = \sum_{v=1}^{V} Ads_{vt} * Watched_{iv}$$

A similar process was used to estimate potential exposure to advertisements for prescription (Rx) weight loss drugs, in print and on television.

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

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

In these calculations, we assume that reading and television viewing habits in recent months reflect those over the past year. We also assume that most of the impact of an advertisement occurs within a year; consistent with this, Bagwell (2007) describes empirical evidence that the average effect of advertising on sales is mostly depreciated within 6-9 months (Bagwell, 2007).

By matching individual magazine reading and television viewing over specific periods of time to the ads that ran in those magazines and during those television programs at the time that the respondent reported viewing them, our individual-level calculation of advertising exposure is far more accurate than in the previous literature on the effects of advertising which almost exclusively uses market-level (DMA) advertising volume or expenditure, implicitly assuming that all individuals in a large market are exposed to the same advertising (see the review in Bagwell, 2007). The exceptions are Avery et al. (2007), which examines individual-level effects of advertisements for smoking cessation products and Avery et al. (2012), which examines individual-level effects of advertisements for antidepressant medications. Our measures of individual exposure are more accurate than market level analyses, but (as with the previous

literature) they still represent potential exposure 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.

We also calculate the percentage of the 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').

$$Pct\_Deceptive\_OTC\_Magazine\_Ads_{it} = \sum_{m=1}^{M} Deceptive\_Ads_{mt} * Read_{im} \Big/ \sum_{m=1}^{M} Ads_{mt} * Read_{im}$$

$$Pct\_Deceptive\_OTC\_TV\_Ads_{it} = \sum_{v=1}^{V} Deceptive\_Ads_{vt} * Watched_{iv} \Big/ \sum_{v=1}^{V} Ads_{vt} * Watched_{iv}$$

This measure treats all deceptive ads equally, irrespective of whether they contained one or multiple deceptive statements. Although this is a limitation, we chose to use the percent of ads that were deceptive rather than a count of number of deceptive statements, because the latter is highly correlated with other regressors that reflect total ad exposure.

Our deception measures concern only OTC weight loss products. Advertising of prescription weight loss drugs is heavily regulated by the FDA and deceptive statements do not appear in these ads.[16]

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.

[16] Our review of advertisements for Rx weight loss drugs in the sample confirms that they do not contain deceptive statements as defined by the FTC for the OTC weight loss market.

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 use these data to estimate reduced-form logit models of whether the respondent consumes an OTC weight loss drug as a function of exposure to advertising and deception:

$$\Pr(Consume_{it}=1) = F(\alpha_1 + OTC\_Magazine\_Ads_{it}\beta_{OM} + OTC\_TV\_Ads_{it}\beta_{OV} + Rx\_Magazine\_Ads_{it}\beta_{RM} + Rx\_TV\_Ads_{it}\beta_{RV} + Pct\_Deceptive\_OTC\_Magazine\_Ads_{it}\beta_{DM} + Pct\_Deceptive\_OTC\_TV\_Ads_{it}\beta_{DV} + X_{it}\chi)$$

$$\text{where } F(z) = \frac{e^z}{1+e^z}$$

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.

$OTC\_Magazine\_Ads_{it}$ and $OTC\_TV\_Ads_{it}$, controlling for exposure to deceptive advertising, measure potential exposure to non-deceptive advertisements for OTC weight loss products in magazines and on television. $Rx\_Magazine\_Ads_{it}$ and $Rx\_TV\_Ads_{it}$ measure the respondent's potential exposure to advertisements for prescription weight-loss medications in magazines and on television.

$Pct\_Deceptive\_OTC\_Magazine\_Ads_{it}$ and

$Pct\_Deceptive\_OTC\_TV\_Ads_{it}$ are the percent of ads (in magazines and on television, respectively) to which the respondent was potentially exposed that contain at least one deceptive statement (i.e., Red Flag statement as defined by the FTC).[17]

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 (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), 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 (there are two survey waves per year)[18], marital status (single, divorced/separated/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.

[17] We also experimented with other measures of exposure to deceptive and non-deceptive content, such as: a) exposure to non-deceptive ads and number of deceptive ads; and b) exposure to ads and exposure to deceptive statements (there may be more than one per ad). However, in both cases the two measures of exposure were highly collinear (correlation coefficients of .75 in case a and .84 in case b). In contrast, the correlation coefficient for the regressors we use in this paper (exposure to ads and percent of ads that were deceptive) is -0.06.

[18] 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. (2012).

We also control for indicator variables for whether respondents said that in the past 12 months they were obese (2001-2002) or 30 or more pounds overweight (2003-2007); the wording of the question changed from 2002 to 2003.

To control for intensity of reading/watching that implies greater exposure to ads in general, we control for the total number of magazine issues read in the past 12 months, and the average hours of television watched per week. These also are likely control for whether the respondent has a sedentary lifestyle.

A second model adds further controls for targeting; specifically: whether the respondent reads any magazines in specific categories (women's, young adult, African American, or general interest) and whether the respondent watches any television shows in specific categories (including news programs, soap operas, sitcoms, dramas, court TV shows, celebrity news programs, and cartoons).

Our third, and preferred, model drops the indicator variables for categories of magazines and television shows and replaces them with indicator variables for each magazine and television show.

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), 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. Standard errors are clustered at the household level.

The main threat to identification is the non-random nature of exposure to advertisements and deception; in particular, advertisers targeting their ads to people likely to consume the products. We address targeting in the following ways:

1) In our preferred model, we control for indicator variables for each magazine and each television show. Therefore, identification will come from: year-to-year variation in ads and deception in ads that run in each specific magazine and television program; among people who read the same magazine, reading a different number of issues of that magazine controlling for the overall number of magazine issues read; among people who watch the same television shows, watching a different number of episodes of that show controlling for the overall amount of time spent watching television. We control for whether the respondent reports being obese or 30 pounds overweight, in order to address targeting of these ads to overweight or obese individuals.
2) To the extent that ads in general and deceptive ads in particular are targeted to the same individuals, controlling for both reduces any omitted variable bias due to targeting.
3) To the extent that prescription and over-the-counter weight loss products are targeting the same individuals, controlling for both reduces omitted variable bias due to targeting.
4) We use the NCS, the very database 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 due to targeting. As a result, we have the same set of variables as those commercial entities targeting the advertisements. Although nothing is observed by the advertiser that is not observed by the econometrician, we acknowledge that we may use the variables in different ways and thus not fully adjust for targeting.

As an extension, we examine whether results differ for individuals of high and low education. Individuals with higher education tend to be in better health, in part because they make better decisions about their health, i.e., they enjoy allocative efficiency in the production of health (Grossman and Kaestner, 1997; Grossman, 2000). This suggests the possibility that better-educated individuals are more sophisticated consumers; they may be more critical of deceptive advertising, and less influenced by advertising in general for OTC weight loss products (given their lack of efficacy and history of adverse side effects). To investigate this possibility, we estimate models separately by gender for those with a high school diploma or less, and those with some college or more education.

Empirical Results

Use of Weight Loss Methods in the NCS

Table 1 contains summary statistics for the Simmons National Consumer Survey, 2001-2007.[19] 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 1 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 Deceptive Ads

Table 1 also lists the summary statistics for the measures of advertising exposure. Annual exposure to television advertisements for OTC weight loss products averaged 64.0 for women and 49.2 for men; exposure to print advertisements for these products averaged 11.1 for women and 5.4 for men. For both women and men, 25.2% of the television ads to which they were exposed had at least one deceptive statement; the percent of print ads to which they were exposed that contained at least one deceptive statement averaged 16.4% for women and 12.8% for men.

There are considerably fewer ads for prescription weight loss products. In the past year exposure to such ads on television averaged 12.6 for women and 7.8 for men, and exposure to print ads averaged less than one for both women and men.

The Impact of Deceptive Advertising on Consumption of the Advertised Product

[19] Simmons NCS sample weights are used in generating the sample statistics in Table 1 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).

We now examine the impact of exposure to advertising and deception on the probability of using an OTC weight loss product in the past 12 months. An indicator for using an OTC weight loss product in the past 12 months was regressed on exposure to ads for OTC weight loss products (separately for television and print ads), exposure to deception regarding OTC weight loss products (specifically, the percentage of such ads that contained at least one deceptive statement), and exposure to advertising for Rx weight loss drugs (separately for television and print ads), plus controls for demographics, socioeconomic status, and targeting. Results for women are provided in Table 2, and results for men are contained in Table 3. Table cells list the marginal effects associated with the coefficients in a logit regression.

We focus attention on our preferred specification that controls for each individual magazine read and television show watched; column 3 reports results from a logit model and column 4 reports results from a linear probability model (the LPM is reported because for smaller subsamples the logit model would not converge).[20]

Table 2, column 3 indicates that, for women, exposure to ads themselves is not significantly correlated with the probability of use. In models with fewer controls for targeting (reported in columns 1 and 2) exposure to ads was positively correlated with use of the products, but with the strong controls for targeting (columns 3 and 4) the sign flips to negative and is not close to statistically significant. However, even in the model with strong controls for targeting (columns 3 and 4) exposure to deception in television ads for OTC weight loss products is associated with a lower probability of consuming such products. Controlling for one's exposure to television ads for OTC weight loss products,

[20] 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.

increasing the proportion of television ads that are deceptive by 50% is associated with a 1.5 percentage point lower probability of use. One possible explanation is that deceptive television ads may unintentionally send a signal to women that the product cannot possibly deliver the weight loss that is claimed in the ad and thus increase consumer skepticism and deter purchase. The sign of the marginal effect on exposure to deceptive print ads is also negative, but is not close to being statistically significant.

We also estimate models separately by education subgroup; specifically: those with a high school degree or less education, and those with some college or more education. In tables of results that are available upon request, we find that exposure to deceptive advertising on television is associated with a lower probability of using OTC weight loss products among the college educated, but not less educated, women. This is consistent with the hypothesis that better educated women are more sophisticated consumers of the messages in deceptive advertising, and may be suspicious of products that are deceptively advertised.

Table 3 presents results for models estimated for men. For men, the logit model with indicator variables for each magazine and television show would not converge, so column 3 is left blank, and the results of a linear probability model are provided in column 4. No measure of exposure to ads (either television or print) is associated with men using OTC weight loss products. However, exposure to deceptive print ads is associated with a higher probability of use by men. The magnitude of the coefficient suggests that, controlling for number of print ads to which one is exposed, increasing the share that are deceptive by 50% would increase the odds that a man consumes such products by roughly 1.25 percentage points (compared to a base of 8.4 percentage points

of men using the products). These results are in contrast to what was found for women, which raises the question of whether there are gender differences in the response to deceptive advertising in general, or the difference we observe is specific to the market in question. The previous empirical literature on deceptive advertising does not offer much guidance on this question, as there are not studies of individual-level data with models estimated separately by gender.

We also estimate these models separately by education subgroup for men. In tables of results that are available upon request, we find no significant differences in the relationship between exposure to deceptive advertising and consumption of OTC weight loss products. However, among males with some college education, exposure to television ads for Rx weight loss drugs is negatively correlated with the consumption of OTC weight loss products.

So far, we have discussed the associations of using OTC weight loss products with ad exposure and deception separately, controlling for the other. However, one can also use the regression results to investigate the changes in the outcomes associated with exposure to an additional 10 deceptive ads. Specifically, for a given medium (print or television): we sum: a) the OLS coefficient on number of ads (divided by 10); and b) the product of the OLS coefficient on percent deceptive and the change in the percent deceptive that results from seeing 10 additional deceptive ads. We then average that sum (i.e., the total change) across all respondents. The results indicate that exposure to an additional 10 deceptive television ads is associated with women being 0.8 percentage points less likely to consume an OTC weight loss product, and seeing an additional 10

deceptive print ads is associated with men being 1.5 percentage points more likely to consume an OTC weight loss product.

Testing for Spillover Effects: Dieting and Exercise

Exposure to ads for OTC weight loss products may impact the use of substitute or complementary methods of weight loss; specifically: dieting and exercise. 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.

Dieting

Table 4 presents results for dieting among women. Results for our preferred model that control for individual magazine and television show fixed effects (presented in column 3 for logit and column 4 for LPM) indicate that greater exposure to television ads for OTC weight loss products is associated with a lower probability that women diet. Specifically, exposure to an additional 10 such television ads is associated with a 0.04 percentage point in reduction in the probability of dieting (on a base of 45.3%). In contrast, exposure to television ads for prescription weight loss drugs is associated with a higher probability of use; exposure to an additional 10 such ads is associated with a 3.0 percentage point increase in the probability of dieting (column 3). (Subgroup analyses indicate that this correlation exists only for the better educated women.) Moreover, greater exposure to deception in print OTC weight loss ads (controlling for exposure to ads) is associated with a higher probability of dieting. The marginal effect in Table 4,

column 3 suggests that, controlling for number of print ads to which one is exposed, increasing the share that are deceptive by 50% would increase the odds that a woman diets by slightly more than 2 percentage points. One explanation consistent with this pattern is that women are suspicious of deceptive statements, which lead them to seek substitute methods of weight loss such as dieting.

Results of models of dieting for men are presented in Table 5. We find that exposure to print ads for OTC weight loss products is associated with a higher probability of dieting; the marginal effect in column 3 suggests that exposure to an additional 10 such ads is associated with a roughly 4 percentage point increase in the probability of dieting (on a base of 30.1%). Subgroup analyses reveal that it is only for better-educated men that exposure to print ads for OTC weight loss products is associated with a higher probability of dieting. We also find, consistent with the results for women, that exposure to deception in print advertising is associated with a higher probability of dieting.

We also calculate the change in the probability of dieting associated with exposure to an additional 10 deceptive print ads, taking into account the effect through exposure to ads in general and the effect through exposure to deception. The results indicate that exposure to an additional 10 deceptive print ads is associated with a probability of dieting that is 2.2 percentage points higher for women and 2.0 percentage points higher for men.

Exercise

Models examining the impact of exposure to ads and deception on exercise participation are presented in Tables 6 (women) and 7 (men). For both men and women, exposure to print ads for OTC weight loss products is associated with a significantly

lower probability of exercising. Exposure to an additional 10 such ads is associated with a decrease in the probability of dieting by roughly 3.5 percentage points for women (on a base of 59.1%) and 4.8 percentage points for men (on a base of 50.4%).

However, exposure to greater deception in print ads for OTC weight loss products (controlling for exposure to the ads themselves) is associated with a higher probability of exercise. A 50% increase in deception in the ads to which one is exposed is associated with an increase in the probability of exercise of roughly 1.8 percentage points for women and 1.5 percentage points for men.

We calculate the change in the probability of exercising associated with exposure to an additional 10 deceptive print ads, taking into account the effect through exposure to ads in general and the effect through exposure to deception. The results indicate that exposure to an additional 10 deceptive print ads is associated with a probability of exercise that is 1.9 percentage points higher for women and 1.5 percentage points higher for men.

One explanation for these results is that people see OTC weight loss products as substitutes for exercise. When they see more ads for OTC weight loss products, they decrease exercise, but when they see deceptive statements in such ads they are suspicious and switch towards alternate methods of weight loss such as exercise.

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 has examined whether advertising has cooperative effects, expanding the overall market, or competitive (predatory) effects, in which advertising increases market share of the advertised product at the expense of rival products. We find no evidence that exposure to additional ads affects the probability of using OTC weight loss products. We also find evidence that deceptive television advertising of OTC weight loss products is associated with a lower probability that women consume such products. Deceptive advertising that is implausible may unintentionally send a signal to consumers that the product is suspect, discouraging consumption. If advertising in general has no effect on consumption, and deceptive advertising lowers consumption among women, then what incentive do firms have to engage in these practices? Deceptive advertising must do something to increase firm profits or firms would not engage in it so frequently (e.g., in 2001-02, 60.2% of all magazine ads, and 42.3% of all television ads, for OTC weight loss products contained at least one deceptive statement; see Avery et al., 2013). 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. If true, deceptive ads in this market are similar to ads for soda pop, which are also competitive (Gasmi, Laffont, and Vuong, 1992).

We also find a negative spillover of print advertising of OTC weight loss products: greater exposure to such ads is associated with a lower probability of exercise for both men and women. Specifically, exposure to an additional 10 print ads for OTC weight loss products is associated with a decrease in the probability of dieting by roughly 3.5 percentage points for women (on a base of 59.1%) and 4.8 percentage points for men (on a base of 50.4%). One possibility is that consumers see OTC weight loss products as a substitute for exercise. Although 45.7% of print ads in our sample advise consumers to use a sensible diet and exercise in conjunction with their product, 5.5% of them claim that their product will help consumers lose weight without diet or exercise. The latter claim may be more influential on consumer behavior. However, print ads do not have a detectable impact on the probability of consuming OTC weight loss products themselves.

Among women, exposure to television ads for weight loss products is associated with a lower probability of dieting. Better understanding these gender differences should be a priority for future research to determine whether these results are specific to weight loss markets given gender differences in the prevalence, consequence, and interpretation of obesity (e.g. see Puhl, 2011; Granberg, 2011; Cawley, 2004b) or are general to advertising.

We also find some evidence of positive spillovers from advertising of prescription weight-loss medications; exposure to such ads on television is associated with a higher probability that women diet.

Men and women also seem to respond differently to exposure to deceptive advertising. Greater exposure to deception in television ads for OTC weight loss products is associated with a lower probability that women consume such products, but

deception in print ads is associated with a higher probability that men consume such products.

This paper also documents a wide variety of spillover effects from deceptive advertising in this market. Specifically, exposure to deception in print ads is associated with a higher probability of dieting and exercise for both men and women. There are several possible explanations for this finding. Deception may make consumers suspicious of the product, and lead them to attempt substitutes to the advertised product (in this case, dieting, exercise, and getting professional advice). Alternatively, deceptive advertising that makes weight loss seem easy through the advertised product may unintentionally make weight loss in general seem easier (e.g., even through other means). Advertising, and even deceptive advertising, of questionable products apparently has the potential of a beneficial unintended consequence of inspiring people to undertake healthy and responsible approaches to weight loss.

These findings are relevant for public policy. The FTC has targeted deceptive advertising in the market for OTC weight loss products. However, manufacturers may be trapped in a prisoner's dilemma of advertising: the dominant strategy is to advertise deceptively, which shrinks sales to women, because for a firm to refrain from deceptive advertising might mean even greater loss of sales because of erosion of market share. If this is correct, then an FTC initiative that successfully reduced deceptive advertising could unintentionally lead to increased consumption of these ineffective and potentially harmful products by women, and decrease the probability of dieting and exercise for both women and men.

Based on the literature on education and health (see for example, Grossman and Kaestner, 1997), we hypothesized that education may mediate the relationship between advertising and weight loss behaviors; specifically, that better-educated consumers would make more health-promoting decisions in response to advertising and deceptive advertising. Subgroup analyses confirm this hypothesis. It is only among better-educated women that exposure to deceptive television ads is associated with a lower probability of using OTC weight loss products. This suggests that better-educated women are better able to distinguish false claims in advertising and is consistent with allocative efficiency of education in the production of health. Spillovers also vary by education. It is only among better-educated men that exposure to print ads for OTC weight loss products is associated with a higher probability of dieting, and it is only among the better educated that exposure to television ads for Rx weight loss medications is associated with a higher probability of dieting (for women) and a lower probability of using OTC weight loss products (for men).

Our results suggest that exposure to ads in different media (print and television) may have different associations with consumer behavior. Research in communication has found similar 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 should further how the impact of deceptive advertising differs by the medium of the ad.

Our analysis has several limitations. First, although we control for each magazine read and each television show watched in order to address targeting of ads, we do not have exogenous variation in ad exposure. 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. Thus, 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 direct evidence to date on the effect of individual exposure to advertising in general, and deceptive advertising specifically, on consumption of the advertised good and its substitutes.

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Table 1:
Summary Statistics

	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
Currently watching diet	.453	.498	59,482	.301	.459	47,383
Participate in exercise	.591	.492	59,482	.504	.500	47,383
Ad Exposure Variables						
Exposure to TV ads for OTC weight loss products	64.018	127.286	59,482	49.191	107.849	47,383
% of TV ads for OTC weight loss products to which one was exposed that were deceptive	.252	.207	59,482	.252	.224	47,383
Exposure to TV ads for Rx weight loss drugs	12.633	38.758	59,482	7.815	26.230	47,383
Exposure to print ads for OTC weight loss products	11.049	18.492	59,482	5.401	13.231	47,383
% of print ads for OTC weight loss products to which one was exposed that were deceptive	.164	.217	59,482	.128	.245	47,383
Exposure to print ads for Rx weight loss drugs	.718	2.583	59,482	.341	1.799	47,383

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

Table 1 (cont.):
Summary Statistics

	Females			Males		
Other Regressors	**Mean**	**S.D.**	**N**	**Mean**	**S.D.**	**N**
Obese	.056	.230	15,015	.025	.155	11,951
>30 pounds overweight	.155	.362	44,467	.082	.274	35,432
Age 18-24	.098	.298	59,482	.102	.302	47,383
Age 25-34	.155	.361	59,482	.153	.340	47,383
Age 35-44	.204	.403	59,482	.204	.403	47,383
Age 45-54	.204	.403	59,482	.205	.404	47,383
Age 55+	.339	.473	59,482	.337	.473	47,383
White	.634	.482	59,482	.631	.483	47,383
Black	.067	.249	59,482	.055	.229	47,383
Hispanic	.261	.439	59,482	.271	.445	47,383
Asian	.029	.167	59,482	.030	.172	47,383
Other Race	.013	.112	59,482	.015	.121	47,383
Less than High School	.144	.351	59,482	.162	.369	47,383
High School	.281	.449	59,482	.254	.435	47,383
Some College	.244	.429	59,482	.222	.415	47,383
College or more	.332	.459	59,482	.364	.472	47,383
Income < $32,500	.247	.431	59,482	.193	.395	47,383
Income $32,501 - $55,000	.222	.415	59,482	.217	.412	47,383
Income $55,001 - $87,500	.241	.428	59,482	.263	.440	47,383
Income $87,501 - $125,000	.158	.365	59,482	.117	.382	47,383
Income > $125,001	.132	.338	59,482	.149	.356	47,383
Single	.144	.352	59,482	.155	.362	47,383
Married	.650	.477	59,482	.737	.440	47,383
Divorced/Separated/Widowed	.200	.400	59,482	.105	.306	47,383
Number in household	3.400	1.85	59,482	3.514	1.815	47,383
Employed full-time	.406	.491	59,482	.632	.482	47,383
Employed part-time	.161	.368	59,482	.094	.291	47,383
Not employed	.432	.495	59,482	.275	.446	47,383
Work 30 hours or less	.632	.482	59,482	.426	.495	47,383
Work 31-40 hours	.241	.427	59,482	.259	.438	47,383
Work 41+ hours	.128	.335	59,482	.316	.465	47,383
North	.247	.431	59,482	.241	.428	47,383
South	.302	.459	59,482	.298	.457	47,383
Midwest	.223	.416	59,482	.227	.419	47,383
West	.229	.420	59,482	.234	.423	47,383
Total magazine issues read in past 12 months	5.460	5.726	59,482	4.425	5.319	47,383
Average number of hours of TV watched per week	18.359	16.754	59,482	15.366	14.877	47,383

Table 2:
Consumption of OTC Weight Loss Products,
Women

Regressor	(1) Women Logit	(2) Women Logit	(3) Women Logit	(4) Women LPM
OTC TV Ads/10	0.000213	9.39e-05	1.93e-05	-1.37e-05
	(0.000136)	(0.000144)	(0.000154)	(0.000176)
OTC Print Ads/10	0.00323***	0.00215*	-0.000539	-0.000165
	(0.00109)	(0.00111)	(0.00119)	(0.00163)
OTC TV % Deceptive	-0.0320***	-0.0313***	-0.0295***	-0.0296***
	(0.0105)	(0.0104)	(0.0101)	(0.0101)
OTC Print % Deceptive	0.0259***	0.0112	-0.00182	-0.00374
	(0.00989)	(0.0108)	(0.0106)	(0.0130)
Rx TV Ads/10	0.00111	0.000402	0.00106	0.00151
	(0.000707)	(0.000733)	(0.00110)	(0.00148)
Rx Print Ads/10	0.00280	0.00574	0.00922	0.00900
	(0.0102)	(0.0102)	(0.0101)	(0.0128)
Demographic variables	Yes	Yes	Yes	Yes
Socioeconomic variables	Yes	Yes	Yes	Yes
Overweight/obesity variables	Yes	Yes	Yes	Yes
Magazine, TV intensity variables	Yes	Yes	Yes	Yes
Magazine, TV category variables		Yes		
Magazine, TV program dummies			Yes	Yes
Observations	26951	26951	26686	26951
Mean of Dependent Variable	.119	.119	.119	.119

Notes: table lists marginal effects from logit regressions.
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 (2001-2002) or 30 or more pounds overweight (2003-2007).
Magazine, TV intensity variables: total magazine issues read in the past 12 months, average hours of television watched per week.
Magazine, TV category variables: indicator variables for whether the respondent reads any magazines in specific categories (women's, young adult, African American, or general interest) and whether the respondent watches any television shows in specific categories (including news programs, soap operas, sitcoms, dramas, court TV shows, celebrity news programs, and cartoons).

Table 3:
Consumption of OTC Weight Loss Products,
Men

Regressor	(1) Men Logit	(2) Men Logit	(3) Men Logit	(4) Men LPM
OTC TV Ads/10	0.000199	0.000180		0.000173
	(0.000149)	(0.000164)		(0.000231)
OTC Print Ads/10	-0.00114	-0.00116		-0.00319
	(0.00195)	(0.00204)		(0.00255)
OTC TV % Deceptive	-0.00853	-0.00695		-0.00780
	(0.0107)	(0.0106)		(0.0109)
OTC Print % Deceptive	0.0217**	0.0185*		0.0252*
	(0.00944)	(0.0104)		(0.0138)
Rx TV Ads/10	0.000333	-0.000657		-0.00326
	(0.00134)	(0.00144)		(0.00221)
Rx Print Ads/10	-0.0347	-0.0326		-0.0256
	(0.0219)	(0.0221)		(0.0182)
Demographic variables	Yes	Yes	Yes	Yes
Socioeconomic variables	Yes	Yes	Yes	Yes
Overweight/obesity variables	Yes	Yes	Yes	Yes
Magazine, TV intensity variables	Yes	Yes	Yes	Yes
Magazine, TV category variables		Yes		
Magazine, TV program dummies			Yes	Yes
Observations	14275	14275		14275
Mean of Dependent Variable	.084	.084		.084

See Notes to Table 2.

Table 4:
Dieting, Women

Regressor	(1) Women Logit	(2) Women Logit	(3) Women Logit	(4) Women LPM
OTC TV Ads/10	-0.000487**	-0.000607***	-0.000403**	-0.000354**
	(0.000194)	(0.000195)	(0.000205)	(0.000178)
OTC Print Ads/10	0.00239	0.00164	-0.00256	-0.00208
	(0.00152)	(0.00157)	(0.00174)	(0.00139)
OTC TV % Deceptive	0.0103	0.00170	0.00251	0.00445
	(0.0123)	(0.0125)	(0.0130)	(0.0104)
OTC Print % Deceptive	0.0750***	0.0166	0.0433***	0.0389***
	(0.0124)	(0.0137)	(0.0138)	(0.0115)
Rx TV Ads/10	0.00388***	0.00270***	0.00301**	0.00239**
	(0.000849)	(0.000887)	(0.00129)	(0.000992)
Rx Print Ads/10	0.00726	-0.00486	-0.00342	-0.00722
	(0.0121)	(0.0121)	(0.0129)	(0.0107)
Demographic variables	Yes	Yes	Yes	Yes
Socioeconomic variables	Yes	Yes	Yes	Yes
Overweight/obesity variables	Yes	Yes	Yes	Yes
Magazine, TV intensity variables	Yes	Yes	Yes	Yes
Magazine, TV category variables		Yes		
Magazine, TV program dummies			Yes	Yes
Observations	59482	59482	59466	59482
Mean of Dependent Variable	.453	.453	.453	.453

See Notes to Table 2.

Table 5:
Dieting, Men

Regressor	(1) Men Logit	(2) Men Logit	(3) Men Logit	(4) Men LPM
OTC TV Ads/10	2.62e-05	-2.37e-05	4.23e-05	3.00e-05
	(0.000196)	(0.000201)	(0.000208)	(0.000223)
OTC Print Ads/10	0.00535***	0.00901***	0.00393*	0.00551***
	(0.00206)	(0.00218)	(0.00224)	(0.00193)
OTC TV % Deceptive	-0.000838	-0.00921	-0.0108	-0.00465
	(0.0105)	(0.0106)	(0.0109)	(0.0103)
OTC Print % Deceptive	0.0309***	-0.00531	0.0201*	0.0190*
	(0.00941)	(0.0101)	(0.0116)	(0.0105)
Rx TV Ads/10	0.00394***	0.00181	0.00237	0.000935
	(0.00121)	(0.00126)	(0.00185)	(0.00133)
Rx Print Ads/10	-0.00901	-0.0177	-0.0170	-0.0252*
	(0.0147)	(0.0149)	(0.0157)	(0.0134)
Demographic variables	Yes	Yes	Yes	Yes
Socioeconomic variables	Yes	Yes	Yes	Yes
Overweight/obesity variables	Yes	Yes	Yes	Yes
Magazine, TV intensity variables	Yes	Yes	Yes	Yes
Magazine, TV category variables		Yes		
Magazine, TV program dummies			Yes	Yes
Observations	47383	47383	47337	47383
Mean of Dependent Variable	.301	.301	.301	.301

See Notes to Table 2.

Table 6:
Exercising, Women

Regressor	(1) Women Logit	(2) Women Logit	(3) Women Logit	(4) Women LPM
OTC TV Ads/10	-1.79e-05	-0.000105	-6.59e-05	-8.36e-05
	(0.000187)	(0.000191)	(0.000199)	(0.000180)
OTC Print Ads/10	-0.00221	-0.00116	-0.00703***	-0.00651***
	(0.00150)	(0.00151)	(0.00166)	(0.00137)
OTC TV % Deceptive	0.00768	-0.000261	-0.00255	-0.00235
	(0.0116)	(0.0117)	(0.0121)	(0.0107)
OTC Print % Deceptive	0.107***	0.0125	0.0366***	0.0412***
	(0.0122)	(0.0130)	(0.0132)	(0.0115)
Rx TV Ads/10	0.000309	-2.98e-05	-0.00113	-0.00109
	(0.000830)	(0.000859)	(0.00120)	(0.00104)
Rx Print Ads/10	0.00175	-0.0156	-0.0279**	-0.0171
	(0.0121)	(0.0118)	(0.0124)	(0.0111)
Demographic variables	Yes	Yes	Yes	Yes
Socioeconomic variables	Yes	Yes	Yes	Yes
Overweight/obesity variables	Yes	Yes	Yes	Yes
Magazine, TV intensity variables	Yes	Yes	Yes	Yes
Magazine, TV category variables		Yes		
Magazine, TV program dummies			Yes	Yes
Observations	59482	59482	59474	59482
Mean of Dependent Variable	.591	.591	.591	.591

See Notes to Table 2.

Table 7:
Exercising, Men

Regressor	(1) Men Logit	(2) Men Logit	(3) Men Logit	(4) Men LPM
OTC TV Ads/10	3.62e-05	-8.27e-05	2.12e-05	7.03e-06
	(0.000248)	(0.000251)	(0.000260)	(0.000230)
OTC Print Ads/10	-0.0120***	-0.00274	-0.00960***	-0.00893***
	(0.00232)	(0.00243)	(0.00255)	(0.00223)
OTC TV % Deceptive	0.0353***	0.0257**	0.0245*	0.0226**
	(0.0122)	(0.0123)	(0.0128)	(0.0115)
OTC Print % Deceptive	0.0947***	0.0321***	0.0297**	0.0316***
	(0.0117)	(0.0120)	(0.0137)	(0.0120)
Rx TV Ads/10	0.00252**	0.000833	-0.00209	-0.00166
	(0.00127)	(0.00132)	(0.00188)	(0.00157)
Rx Print Ads/10	0.0476***	0.0292*	0.00570	0.00677
	(0.0182)	(0.0174)	(0.0182)	(0.0155)
Demographic variables	Yes	Yes	Yes	Yes
Socioeconomic variables	Yes	Yes	Yes	Yes
Overweight/obesity variables	Yes	Yes	Yes	Yes
Magazine, TV intensity variables	Yes	Yes	Yes	Yes
Magazine, TV category variables		Yes		
Magazine, TV program dummies			Yes	Yes
Observations	47383	47383	47383	47383
Mean of Dependent Variable	.504	.504	.504	.504

See Notes to Table 2.