The Biasing Health Halos of Fast-Food Restaurant Health Claims: Lower Calorie Estimates and Higher Side-Dish Consumption Intentions

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Why is America a land of low-calorie food claims yet high-calorie food intake? Four studies show that people are more likely to underestimate the caloric content of main dishes and to choose higher-calorie side dishes, drinks, or desserts when fast-food restaurants claim to be healthy (e.g., Subway) compared to when they do not (e.g., McDonald's). We also find that the effect of these health halos can be eliminated by simply asking people to consider whether the opposite of such health claims may be true. These studies help explain why the success of fast-food restaurants serving lower-calorie foods has not led to the expected reduction in total calorie intake and in obesity rates. They also suggest innovative strategies for consumers, marketers, and policy makers searching for ways to fight obesity.

As the popularity of healthier menus increases, so does the weight of many Americans. Between 1991 and 2001, the proportion of obese U.S. adults has grown from 23% to 31% of the population, a 3% annual compound rate (National Center for Health Statistics 2002). In the same period, the proportion of U.S. adults consuming low-calorie food and beverages grew from 48% to 60% of the population (a 2.3% annual compound rate), and the proportion of U.S. consumers trying to eat a healthy diet grew at a 6% annual rate (Barrett 2003; Calorie Control Council National Consumer Surveys 2004; Food Marketing Institute 2005). In the past 5 years, fast-food restaurants positioned as healthy (e.g., Subway) have grown at a much faster rate than those not making these claims (e.g., McDonald's). For example, Subway's television commercial starring Jared Fogle showing that Subway's turkey sandwich has only 280 calories, half the 560 calories of a Big Mac, was the most recalled television commercial during the 2004 holidays (*Advertising Age* 2005). This parallel increase in obesity rates and in the popularity of healthier foods with lower calorie and fat density has been noted in consumer research (Seiders and Petty 2004) and in health sciences as "the American obesity paradox" (Heini and Weinsier 1997).

The original explanation of the American obesity paradox was that people burn fewer calories than they used to because of technological progress and changing lifestyles (Heini and Weinsier 1997). However, this explanation is now contested. First, the last 4 decades have actually seen an increase in leisure-time physical activity and a decline in the proportion of sedentary people (Talbot, Fleg, and Metter 2003). Second, Heini and Weinsier relied on self-reported data, which strongly underestimate increases in actual calorie intake (Chandon and Wansink 2007; Livingstone and Black 2003). In fact, the U.S. Department of Agriculture data on food supply (Putnam, Allshouse, and Kantor 2002) show that calorie supply and calorie intake (computed by subtracting food losses at home and at all levels of the supply chain) have both increased by 18% since 1983 (reaching, respectively, 3,900 and 2,800 calories per person and per day in 2000). As a result, most recent reviews of obesity research, from fields as diverse as economics and epidemiology, attribute rising obesity rates to increased calorie

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intake and not to decreased calorie expenditures (Cutler, Glaeser, and Shapiro 2003; Kopelman 2000).

In this article, we propose and test a halo-based explanation for a specific facet of the American obesity paradox: the simultaneous increase in obesity and in the popularity of restaurants serving lower-calorie foods and claiming to be healthier. We argue that the health claims made by these restaurants lead consumers to (1) underestimate the number of calories contained in their main dishes and (2) order higher-calorie side dishes, drinks, or desserts. Taken together, these two effects can lead to more overeating (defined as undetected excessive calorie intake) when ordering from restaurants positioned as healthy than from restaurants not making this claim. Health halos can therefore explain why the increased popularity of healthier fast-food restaurants has not led to the expected reduction in total calorie intake and in obesity rates.

Studying how health claims influence calorie estimations and the choice of side dishes helps bridge the multidisciplinary obesity research efforts in health sciences and consumer research. The Food and Drug Administration has singled out away-from-home consumption as a critical contributor to overeating (Food and Drug Administration 2006). Still, biased calorie estimations of restaurant foods are less frequently noted in health sciences than the other factors contributing to overeating, such as the increase in portion size (Ledikwe, Ello-Martin, and Rolls 2005; Nielsen and Popkin 2003), the higher availability of ready-made foods (Cutler et al. 2003), or the lower prices of calorie-rich, nutrient-poor foods (Hill et al. 2003).

Consumer researchers have extensively studied biased nutrition inferences (e.g., Andrews, Netemeyer, and Burton 1998; Moorman et al. 2004), but they have focused on nutrition evaluation and purchase decisions rather than calorie estimations or consumption decisions. Our health halo results also contribute to the literature on consumer trade-offs between vice and virtue goals by providing evidence (based on real choices rather than on scenarios) that people balance health and taste goals in single consumption episodes (e.g., Dhar and Wertenbroch 2000; Kivetz and Simonson 2002; Okada 2005; Osselaer et al. 2005). More generally, our findings that healthy eaters underestimate calories more than unhealthy eaters show the limits of a purely motivational perspective, which would instead predict the opposite based on guilt or self-presentation goals.

In this article, we start by reviewing the various inferential and self-regulatory mechanisms that may explain how health claims influence calorie estimations and a consumer's choice of complementary food and beverages. In one field study, we show that calorie estimations are significantly lower for Subway meals than for comparable meals eaten at McDonald's. These results are confirmed in a within-subjects laboratory study, which also shows that nutrition involvement improves the accuracy of calorie estimations but does not reduce the halo effects of health claims. A third study shows that health claims lead consumers to unknowingly order beverages and side dishes containing more calories. Although it does not elucidate which specific mechanism is responsible for health halos, the fourth study demonstrates how asking a consumer to "consider the opposite" eliminates the biasing effects of health halos on calorie estimation and on side-dish orders. Finally, we discuss the implications of our findings for research and for reducing the negative effects of health claims in away-from-home and in-home consumption.

CONCEPTUAL FRAMEWORK

How Health Claims Influence Calorie Estimations

Restaurants are exempted from the U.S. 1990 Nutrition Labeling and Education Act, which made calorie and other nutrition information mandatory for packaged goods. In the absence of nutrition information, it is very difficult to estimate calorie content through visual inspection or sensory satiation (Chandon and Wansink 2007; Livingstone and Black 2003). Even when consumers know the list of ingredients included in a meal, they have difficulty estimating portion sizes (Nestle 2003). Consumers asked to estimate the number of calories contained in a meal must therefore make inferences based on internal and external cues, such as the health positioning of the restaurant's brand. The ambiguity of sensory experience also increases the chances that calorie estimations are influenced by the activation of specific consumption goals, by feelings of guilt, or by self-presentation motives (Wansink and Chandon 2006).

Inferential Mechanisms. Consumers frequently draw inferences about missing attributes from the brand positioning or from the attributes of comparable products (for a review, see Kardes, Posavac, and Cronley [2004]). For example, Ross and Creyer (1992) found that, if an attribute is missing, consumers rely on the same attribute information from other brands in the same category. This suggests that consumers may make inferences about the number of calories in a particular food from the health positioning of the restaurant brand or from other food items on the restaurant's menu.

Selective accessibility is one of the models that can explain the assimilation of calorie estimations to the health claims of the restaurant. Selective accessibility contends that, unless consumers are specifically asked to consider the opposite, they will spontaneously test whether the target food is similar to the healthy standards or to the specific calorie anchor advertised by the restaurant. This increases the accessibility of standard-consistent information, leading to the assimilation of calorie estimations to the anchor (for a review, see Mussweiler [2003]). Another explanation is provided by a Brunswikian model (e.g., Fiedler 1996), which assumes that consumers normatively aggregate the information provided by the intrinsic and extrinsic cues available. In a noisy environment, extrinsic cues such as quantity anchors can bias estimations even if a consumer is not directly influenced by motivational or memory-based biases (Chandon and Wansink 2006). Conversational norms

can also contribute to the influence of health claims because consumers typically assume that the advertised information is required by law to be truthful and would therefore see no reason not to draw inferences from it (Johar 1995).

Self-Regulatory Mechanisms. Two conflicting goals are salient when making food consumption decisions: the hedonic goal of taste enjoyment and the more utilitarian goal of maintaining good health (Dhar and Simonson 1999; Fishbach, Friedman, and Kruglanski 2003). Many studies have shown that health primes can activate different consumption goals. Priming hedonic goals and concepts, such as sweetness, increases the intensity of desire for hedonic food (such as cookies) and leads consumers to choose this better-tasting but less healthy option over a less tasty but healthier option (e.g., Ramanathan and Menon 2006; Shiv and Fedorikhin 1999). Health primes can also influence guilt and self-presentation goals. Okada (2005) found that restaurant diners were more likely to order "Cheesecake deLite," a relatively healthy dessert, than "Bailey's Irish Cream Cheesecake," a relatively unhealthy dessert, when they were presented side by side on the menu but preferred the unhealthy dessert to the healthy one when each was presented alone. She attributes these findings to the fact that joint presentation increases guilt and the difficulty of social justification.

The effects of health primes on goal activation and guilt predict a contrast effect for calorie estimation rather than the assimilation effect predicted by inferential mechanisms. To reduce their feelings of guilt and to justify their activated hedonic goal, consumers should report lower calorie estimations in the unhealthy prime condition than in the healthy prime condition. Supporting this argument, studies in nutrition and epidemiology have found that the individual trait of fear of attracting a negative evaluation is correlated with the tendency to underreport calories (Tooze et al. 2004).

Hypotheses. Support for the inferential arguments can be found in the many studies showing that consumers generalize health claims inappropriately (Balasubramanian and Cole 2002; Garretson and Burton 2000; Keller et al. 1997; Moorman 1996). For example, Andrews et al. (1998) found that consumers believe that foods low in cholesterol are also low in fat, and consumers eating an energy bar they believed to contain soy rated it higher in nutritional value but lower in taste (Wansink 2003). These halo effects also apply to restaurant menus. Kozup, Creyer, and Burton (2003) found that adding a "heart-healthy" sign on a menu reduced the perceived risk of heart disease when objective nutritional information was absent, even though it was placed next to an objectively unhealthy menu item (lasagna).

In contrast, the few studies attempting to manipulate motivational factors have found little impact on calorie estimations. Muhlheim et al. (1998) directly manipulated guilt and self-presentation motives through a "bogus pipeline" procedure, which consisted of warning some of the study participants that the accuracy of their calorie estimations would be objectively assessed. They found that the bogus pipeline manipulation only slightly increased self-reported consumption, from 55% to 61% of actual food intake. McKenzie et al. (2002) manipulated guilt and self-presentation motives by using either an obese interviewer or one with a normal weight to conduct in-person food intake interviews. They found that the body mass of the interviewer had no impact on food intake estimations. Given these results, we expect that calorie estimations are primarily driven by inferential mechanisms and are thus assimilated toward the health claims made by the restaurant.

How Health Claims Influence Complementary Food Decisions

Complementary food decisions are those pertaining to the choice of side orders, drinks, or desserts ordered following one's choice of a main course (Dhar and Simonson 1999). Existing research has only examined the effects of health claims on the choice and consumption of the advertised food, and its evidence is mixed. Kozup et al. (2003) found that adding a "heart-healthy" claim to a menu increased consumers' intentions to order the food. However, Raghunathan, Naylor, and Hoyer (2006) found that labeling food as "healthy" reduced the likelihood that it would be chosen because of negative taste inferences. Other studies have found that the preference for healthy foods depends on the degree of ego depletion (Baumeister 2002), cognitive load (Shiv and Fedorikhin 1999), guilt and the need for justification (Okada 2005), individual differences in body mass (Wansink and Chandon 2006), comparison frames (Wansink 1994), and the accessibility of chronic hedonic goals (Ramanathan and Menon 2006; Ramanathan and Williams 2007).

In contrast, the evidence regarding the effects of health claims on complementary food decisions is more consistent. In a series of vignette studies, Dhar and Simonson (1999) found that consumers predict that people prefer to balance an unhealthy main course with a healthy dessert, or a healthy main course with an unhealthy dessert, rather than choosing two healthy or unhealthy main courses and desserts. Fishbach and Dhar (2005) found that increasing perceived progress toward the goal of losing weight activates the hedonic taste goals and increases the likelihood that people choose a chocolate bar over an apple. Guilt is one of the explanations why consumers tend to balance health and taste goals within a single consumption episode. Ramanathan and Williams (2007) found that some consumers are able to launder the guilt created by their choice of an indulgent cookie by choosing the utilitarian option in a subsequent choice. We therefore expect that, once the choice of the main course has been made, consumers will choose side orders, desserts, and beverages containing more calories if the main course is positioned as healthy than if it is not.

Moderating Factors

Clearly, not all consumers base their food consumption decisions on health or nutrition considerations. One might expect that consumers highly involved in nutrition would

be more knowledgeable about it and less likely to be influenced by health claims (Wansink 2005). Yet, past research suggests that nutrition involvement may not moderate the effects of health claims. Moorman (1990) found that nutrition involvement increases the self-assessed ability to process nutrition information but does not improve nutrition comprehension or the nutrition quality of food choices in two product categories. Two studies (Andrews, Burton, and Netemeyer 2000; Andrews et al. 1998) found that objective nutrition knowledge improves the accuracy of some nutrition evaluations but does not significantly reduce erroneous inferences across nutrients or the effectiveness of objective nutrient information in reducing these overgeneralizations.

More generally, studies have found that association-based errors, such as those resulting from priming, cannot be corrected by increasing incentives and the degree of elaboration (Arkes 1991). In fact, Johar (1995) found that highly involved consumers are more likely to be deceived by implied advertising claims because involvement increases the likelihood of making invalid inferences from incomplete-comparison claims, such as "this brand's sound quality is better." Chapman and Johnson (1999) showed that cognitive elaboration, one of the consequences of involvement, actually enhances anchoring effects because it facilitates the selective retrieval of anchor-consistent information. For these reasons, we expect that nutrition involvement increases the overall accuracy of calorie estimations but does not moderate the effects of health claims on calorie estimations and on complementary food decisions.

How can health halos be reduced? If calorie inferences are partly caused by priming and selective activation, one solution is to encourage consumers to question the validity of the health prime. Drawing attention to the priming source reduces priming effect even if the activation of information in memory occurred nonconsciously (Strack et al. 1993). The effectiveness of the debiasing strategy is enhanced if people are asked to consider evidence inconsistent with the prime. Mussweiler, Strack, and Pfeiffer (2000), working on the estimation of the value of a used car, showed that instructing people to consider whether a claim opposite to the one primed may be true increases the accessibility of claim-inconsistent knowledge and therefore reduces selective-accessibility biases.

In summary, we predict that health claims reduce calorie estimations for the main dishes served by fast-food restaurants and lead consumers to order high-calorie complementary food or drinks. We also expect that asking consumers to consider whether opposite health claims may be equally valid eliminates the effects of health halos on main-dish calorie estimation and side-dish choices. We test these predictions in one field study and in three laboratory experiments.

STUDY 1: CALORIE ESTIMATIONS BY SUBWAY AND MCDONALD'S DINERS

Method

We asked consumers who had just finished eating at McDonald's or Subway to estimate the number of calories contained in their meal, and we then compared their estimates to the actual calorie content of the meals. Study 1 was conducted on 9 weekdays in three medium-sized Midwestern U.S. cities. As they completed their meal, every fourth person was systematically approached and asked if they would answer some brief questions for a survey. No mention was made of food at that point. During this process, the interviewer unobtrusively recorded the type and size of the food and drinks from the wrappings left on the person's tray. In case of uncertainty (e.g., to determine if the beverage was diet or regular), the interviewer asked for clarification from the respondents.

Nutrition information provided by the restaurants was then used to compute the actual number of calories of each person's meal. Of the 392 people who were approached while they were finishing a Subway meal, 253 (65%) agreed to participate. Of the 379 people who were approached while they were finishing a McDonald's meal, 265 (70%) agreed to participate.

To pretest the health positioning of McDonald's and Subway, we asked 49 regular customers of both restaurants who were eating at Subway or McDonald's to indicate their agreement with the sentence: "The food served here is healthy" on a nine-point scale anchored at 1 = strongly disagree and 9 = strongly agree. As expected, Subway meals were rated as significantly more healthy ($M = 6.2$) than McDonald's meals ($M = 2.4$; $F(1, 49) = 80$, $p < .001$).

Results

To increase the comparability of McDonald's and Subway meals, we restricted the analysis to the meals consisting of a sandwich, a soft drink, and a side order. This yielded a total of 320 meals (193 for McDonald's and 127 for Subway). To test the hypothesis that calorie estimations are lower for Subway than for McDonald's meals containing the same number of calories, we estimated the following regression via ordinary least squares:

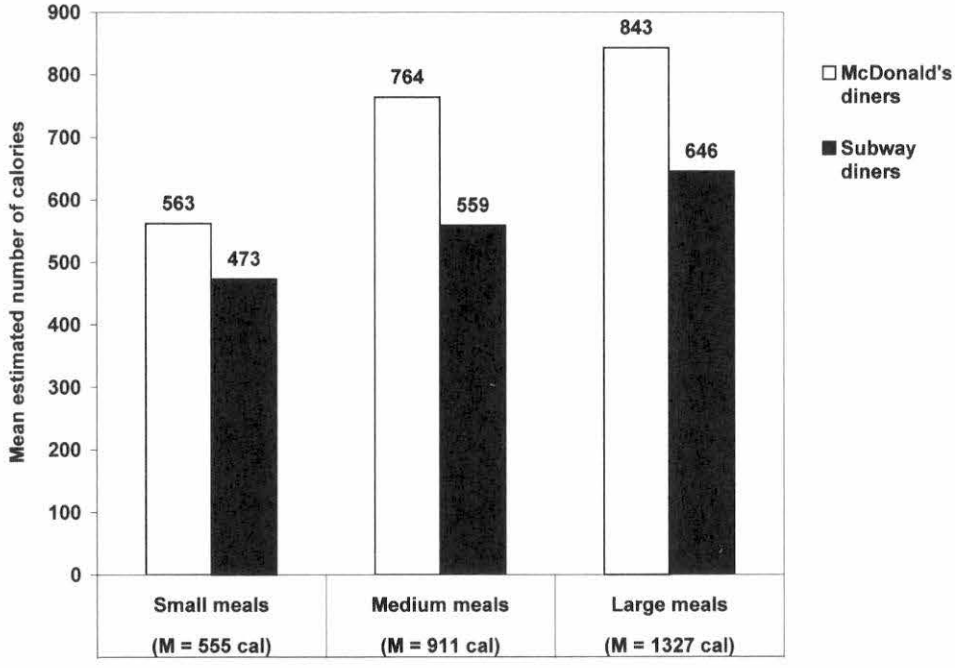
$$\begin{aligned}\text{ESTCAL} = {} & \alpha + \beta \times \text{HEALTHCLAIM} + \delta \times \text{ACTCAL} \\ & + \lambda \times \text{HEALTHCLAIM} \times \text{ACTCAL} + \varepsilon,\end{aligned} \tag{1}$$

where ESTCAL is the estimated number of calories, HEALTHCLAIM is a binary variable taking the value of 1/2 for Subway meals and −1/2 for McDonald's meals, ACTCAL is the mean-centered actual number of calories of the meals, and ε is the error term. We included ACTCAL as a covariate because consumers tend to underestimate the calories of large meals (Chandon and Wansink 2007) and because McDonald's meals tend to be bigger than Subway meals.

As expected, the coefficient for HEALTHCLAIM was negative and statistically significant ($\beta = -151$, $t = -3.6$, $p < .001$). These participants believed that the meals from Subway contained an average of 151 fewer calories than a same-calorie

FIGURE 1

STUDY 1: CALORIE ESTIMATIONS OF SUBWAY AND MCDONALD'S DINERS



meal at McDonald's. The regression parameters enable us to predict that, for a meal containing 1,000 calories, the mean calorie estimation will be 744 calories for someone eating at McDonald's and only 585 calories (21.3% lower) for someone eating at Subway. The coefficient for ACTCAL and for the interaction (respectively, $\delta = .29$, $t = 4.7$, $p < .001$ and $\lambda = -.12$, $t = -.9$, $p = .34$) indicated that consumers tended to underestimate calories more significantly for large meals than for small meals but that the effect of meal size is similar for both Subway and McDonald's meals. The same results were obtained when using the percentage deviation ([estimated − actual]/actual) as the dependent variable ($\beta = -19.2$, $t = -3.9$, $p < .001$; $\delta = -.06$, $t = -7.8$, $p < .001$; and $\lambda = -.03$, $t = -1.8$, $p = .07$), indicating that the mean percentage deviation is more negative (more biased) for Subway meals than for McDonald's meals containing the same number of calories.

To illustrate the effects of health claims on calorie estimations for comparable meals, we computed the mean calorie estimate for small, medium, and large meals (categorized on the basis of actual number of calories). As shown in figure 1, mean calorie estimates were lower for Subway meals than for comparable McDonald's meals in each size tier (for small meals, 473 vs. 563 calories, $F(1, 106) = 4.0$, $p < .05$; for medium meals, 559 vs. 764 calories, $F(1, 105) = 9.1$, $p < .01$; and for large meals, 646 vs. 843 calories, $F(1, 103) = 4.1$, $p < .05$).

Discussion

Study 1 examines the general health halo that leads people to believe that a 1,000-calorie Subway meal contains 21.3% fewer calories than same-calorie McDonald's meals. It also shows that calorie estimations are not primarily driven by guilt or by self-presentation goals, as this would have predicted lower-calorie estimations by McDonald's customers than by Subway customers. These results nonetheless raise two important questions that need to be addressed in subsequent studies. First, the results of study 1 might be caused by intrinsic differences between self-selected Subway and McDonald's diners.[1] A second issue is that participants in study 1 evaluated only one McDonald's or Subway meal. Their estimations might have been better calibrated if they had been asked to make multiple estimates or asked to compare meals instead of estimating a single meal. This is because consumers pay more attention to hard-to-evaluate attributes (such as calories) in joint evaluations than in separate evaluations (Hsee 1996).

We address these issues in study 2 by using a within-

[1]To explore this issue, we recontacted 58 participants who provided their telephone numbers and asked them to report their height and weight, which we used to compute their body mass index (BMI). Although we found no difference in body mass ($M = 23.4 kg/m^2$ for McDonald's customers vs. $M = 23.6 kg/m^2$ for Subway customers, $F(1, 56) = .1$, $p = .76$), we cannot rule out that the groups may be different on other dimensions, such as involvement in nutrition.

subjects design in which respondents estimate the calories contained in two small and large Subway and McDonald's sandwiches containing the same number of calories. Study 2 also enables us to examine whether nutrition involvement can mitigate the biasing effects of health claims on calorie estimations.

STUDY 2: CAN NUTRITION INVOLVEMENT MITIGATE THE HALO EFFECTS OF HEALTH CLAIMS ON CALORIE ESTIMATIONS?

Method

Study 2 used a 2 (health claims: Subway vs. McDonald's) × 2 (actual number of calories: 330 vs. 600) within-subjects design. It was conducted among University of Illinois students and staff members, who were given the opportunity to win a series of raffle prizes in exchange for their participation. We asked 316 of these consumers who had eaten at least three times at Subway and McDonald's in the previous year to estimate the number of calories contained in two Subway sandwiches (a 6-inch ham and cheese sandwich containing 330 calories and a 12-inch turkey sandwich containing 600 calories) and in two McDonald's burgers (a cheeseburger containing 330 calories and a Big Mac containing 600 calories). The ordering of the restaurants was counterbalanced across participants. Unlike in study 1, in which participants had ordered and consumed the food, participants in study 2 knew that they would not consume the food.

To measure their nutrition involvement, we used a five-item scale and asked respondents to indicate their agreement with these statements: "I pay close attention to nutrition information," "It is important to me that nutrition information is available," "I ignore nutrition information" (reverse coded), "I actively seek out nutrition information," and "Calorie levels influence what I eat" on a nine-point scale anchored at 1 = strongly disagree and 9 = strongly agree. The mean, median, and standard deviation of the scale were, respectively, 4.6, 4.5, and 2.1. After verifying the reliability ($\alpha = .85$) and unidimensionality of the scale (62% of the variance was extracted by the first principal component), we averaged the responses to the five items and categorized respondents into a low or high nutrition involvement group via a median split.

Results

We analyzed the data using a repeated-measures ANOVA with two within-subjects factors and one between-subject factor. The two within-subject factors were HEALTHCLAIM (which indicates whether food was from Subway or McDonald's) and ACTCAL (which measured the actual number of calories of the food—330 or 600 calories). The between-subject factor was NUTINV, which indicates whether respondents belonged to the high or low nutrition involvement group (similar results were obtained when using the continuous scale). We included all two-way and three-way interactions. Because the order of estimations had no effect on calorie estimations and did not interact with any of the other factors, we excluded this factor from the analysis reported here.

The main effects of HEALTHCLAIM and ACTCAL and their interactions were all statistically significant (respectively, $F(1, 314) = 158$, $p < .001$; $F(1, 314) = 468$, $p < .001$; and $F(1, 314) = 72.5$, $p < .001$). As shown in figure 2, calorie estimations were lower for Subway sandwiches than for McDonald's sandwiches that contained the same number of calories. Furthermore, the halo effects of health claims were stronger for the sandwiches containing 600 calories ($M = -200$ calories, a 33% underestimation) than for smaller sandwiches containing 330 calories ($M = -80$ calories, a 24% underestimation). In addition, the main effect of nutrition involvement and its interaction with ACTCAL were both statistically significant (respectively, $F(1, 314) = 9.8$, $p < .01$ and $F(1, 314) = 6.1$, $p < .05$), indicating that respondents highly involved in nutrition had higher (more accurate) calorie estimations, especially for the larger sandwiches. As also expected, the interaction between NUTINV and HEALTHCLAIM and the three-way interaction were not statistically significant (respectively, $F(1, 314) = .9$, $p = .34$ and $F(1, 314) = .4$, $p = .55$). This indicates that nutrition involvement did not reduce the biasing effects of the restaurant brands' health positioning on consumers' calorie estimations.

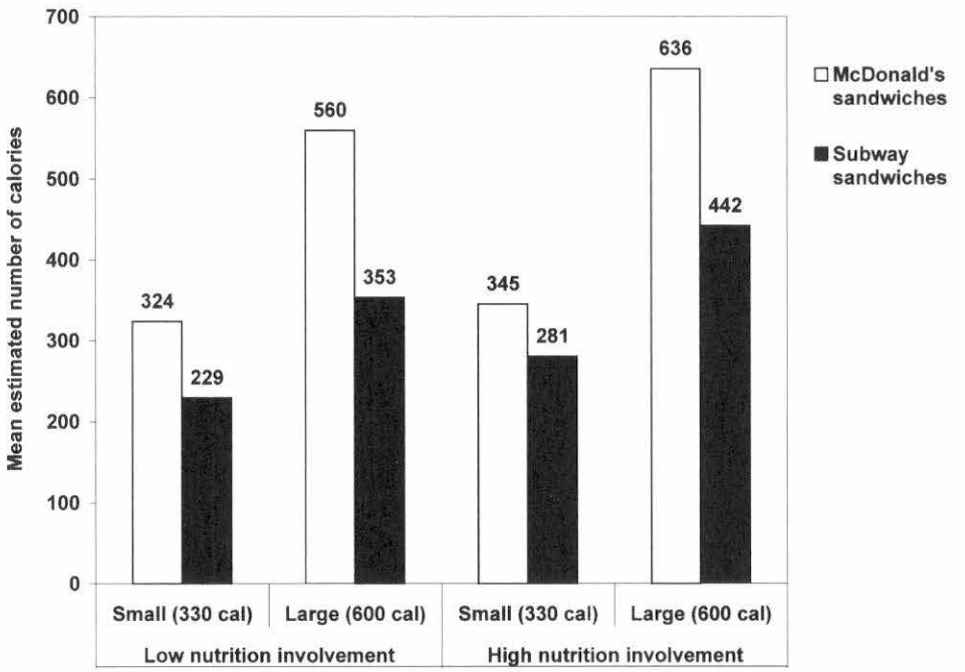
Discussion

Study 2 shows that even consumers familiar with both restaurants estimate that Subway sandwiches contain significantly fewer calories than McDonald's sandwiches containing the same number of calories. Study 2 therefore replicates the findings from study 1 in a repeated-measures context. The within-subjects design of study 2 allows us to rule out the alternative explanation that the results of study 1 were caused by self-selection or by unobserved differences in the type of meals consumed in the two restaurants. Study 2 also shows that, although nutrition involvement improves the quality of calorie estimations, it does not reduce the halo effects of the restaurant brand's health positioning.

Taken together, studies 1 and 2 provide converging evidence that Subway and McDonald's health claims bias consumers' calorie estimations. In study 3, we examine the effects of these claims on consumers' complementary food decisions. This also allows us to test the alternative explanation that the results of studies 1 and 2 are caused by simple response scaling biases, that is, that the health positioning of Subway and McDonald's influenced only consumers' calorie ratings, not their general estimation of the healthiness of the food. This would predict that health claims would have no impact on the decision to choose low- or high-calorie side orders and drinks. Finally, by collecting calorie estimation data after the consumption decision task, study 3 tests whether health claims influence side-dish purchase

FIGURE 2

STUDY 2: HOW NUTRITION INVOLVEMENT INFLUENCES CALORIE ESTIMATIONS FOR SUBWAY AND MCDONALD'S SANDWICHES



intentions even when people are not explicitly asked to estimate the caloric content of their main dishes.

STUDY 3: CAN HEALTH CLAIMS LEAD CONSUMERS TO UNKNOWINGLY CHOOSE HIGHER-CALORIE SIDE ORDERS AND DRINKS?

Method

Forty-six undergraduate students were recruited on the campus of Northwestern University and were paid $2 to participate in this and another unrelated study. Half were given a coupon for a McDonald's Big Mac sandwich, and the other half were given a coupon for a Subway 12-inch Italian BMT sandwich. To provide a more conservative test of the effects of health claims on consumption decisions, the "healthy" food used in study 3 has actually 50% more calories than the "unhealthy" food (a 12-inch Subway Italian BMT sandwich has 900 calories, and a Big Mac has 600 calories).

We then gave the participants a menu and asked them to indicate what they would like to order with their sandwich, if anything. The menu included a small, medium, or large regular fountain drink (containing 155, 205, and 310 calories, respectively); a small, medium, or large diet fountain drink containing no calories; and one or two chocolate chip cookies (containing 220 calories per cookie). These items were chosen because they are the only side orders common to both McDonald's and Subway. We then asked participants to estimate the number of calories contained in their sandwich, beverage, and cookies. Finally, we measured how important eating healthily is to them by asking them to indicate their agreement with three sentences ("Eating healthily is important to me," "I watch how much I eat," and "I pay attention to calorie information") on a nine-point scale anchored at 1 = strongly disagree and 9 = strongly agree.

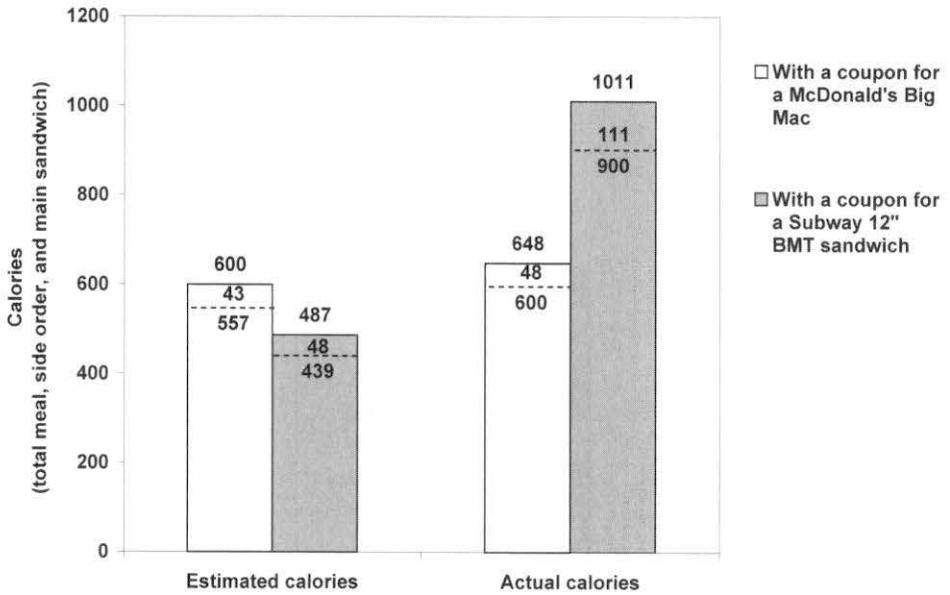
Results

We first examine the total number of calories contained in the beverages and cookies that were ordered in the Subway and McDonald's coupon condition. Compared to those who had received a Big Mac coupon, participants who received the Subway coupon were less likely to order a diet soda, more likely to upgrade to a larger drink, and more likely to order cookies. As a result, participants receiving a Subway coupon ordered side dishes and beverages containing more calories (M = 111 calories) than participants receiving a McDonald's coupon (M = 48 calories; $F(1, 44) = 4.0$, $p < .05$; see fig. 3). Because the Subway sandwich also contained more calories than the McDonald's sandwich, participants ended up with a meal containing 56% more calories (M = 1,011 calories) in the Subway coupon condition than in the McDonald's coupon condition (M = 648 calories; $F(1, 44) = 132.9$, $p < .001$).

We now examine whether participants receiving the Subway coupon realized they were ordering calorie-rich side orders and whether they ended up with a much larger combined meal than those receiving the McDonald's cou-

FIGURE 3

STUDY 3: HOW SUBWAY AND MCDONALD'S COUPONS INFLUENCE THE ESTIMATED AND ACTUAL NUMBER OF CALORIES (FOR THE MAIN SANDWICH, SIDE ORDERS, AND THE WHOLE MEAL)



pon. As shown in figure 3, calorie estimations for the side orders were similar for participants with the Subway coupon (M = 48 calories) and for participants with the Big Mac coupon (M = 43 calories; $F(1, 44) < .1$, $p = .43$). Similarly, calorie estimations for the main sandwich were similar in both conditions (M = 439 calories for the 12-inch Subway sandwich vs. M = 557 calories for the Big Mac; $F(1, 44) = 2.4$, $p = .13$). As a result, calorie estimations for the total meal were similar in the healthy prime condition (M = 487 calories) and in the unhealthy prime condition (M = 600 calories; $F(1, 44) = 1.9$, $p = .17$). Because the actual number of calories of the meal was significantly higher in the Subway (healthy prime) condition than in the McDonald's (unhealthy prime) condition, the calorie underestimation was significantly larger in the healthy prime condition ($M_{(\text{est.}-\text{act. cal.})} = -524$ calories, a 52% underestimation) than in the unhealthy prime condition ($M_{(\text{est.}-\text{act. cal.})} = -48$ calories, a 7% underestimation; $F(1, 44) = 29.9$, $p < .001$). These results indicate that the actual increase in calories between the Subway and McDonald's coupon conditions was not captured by consumers' calorie estimations.

We also examined the relationship between main-dish calorie estimations and side-dish purchase intentions. As expected, the correlation between the calorie estimation bias (measured as the difference between the actual and estimated number of calories in the sandwich) and the actual number of calories of the side dishes is negative and statistically significant ($r = -.36$, $p < .01$). This raises the question of whether the effects of health claims on complementary food decisions are mediated by biases in the estimation of the number of calories of the main sandwich. When entered alone in a regression of the actual number of calories contained in side dishes, the parameter of the binary variable capturing the coupon manipulation was statistically significant ($B = 63.3$, $t = 2.0$, $p < .05$). However, this parameter becomes insignificant when the calorie estimation bias is entered in the regression as a covariate ($B = 23.7$, $t = .6$, $p = .56$). A Sobel test shows that the mediation effect is statistically significant ($z = 2.32$, $p < .05$). Of course, this analysis cannot rule out the opposite causality link, that is, that participants adjusted their main-dish calorie estimations to justify their side-dish orders. In contrast, the analysis of the healthy eating data shows that health claim manipulation did not activate the goal of eating healthily. Respondents were as likely to agree with the three sentences ("Eating healthily is important to me," "I watch how much I eat," and "I pay attention to calorie information") in both conditions (respectively, $F(1, 44) = .4$, $p = .53$; $F(1, 44) < .1$, $p = .94$; and $F(1, 44) < .1$, $p = .86$). This shows that the effects of health claims on complementary food decisions are not mediated by the activation of healthy eating goals.

Discussion

Although the "healthy" Subway sandwich contained 50% more calories than the "unhealthy" Big Mac, consumers ordered higher-calorie drinks and cookies when they received a coupon for the Subway sandwich than when they received a coupon for the Big Mac. Yet, the estimated caloric content of the side dishes was similar in both conditions (48 vs. 43 calories), leading to a 52% underestimation of the

total number of calories contained in the "healthy" meal compared to an insignificant 7% underestimation for the "unhealthy" meal. Study 3 further contributes to studies 1 and 2 by showing that health claims influence side-dish decisions and not just calorie estimations. This rules out the competing explanation that health halos influence calorie estimations only because of simple response biases. Another contribution of study 3 is that consumption effects were found even when consumers were not explicitly asked to estimate calories. This supports the finding of study 2 that health halo effects are robust, regardless of a consumer's nutrition involvement. Third, study 3 shows that the impact that health claims have on side-dish orders is not mediated by the activation of healthy eating goals. Instead, this suggests that it is mediated by the calorie estimations for the main dish.

In study 4, we examine whether instructions to "consider the opposite" can reduce the effects of health halos on calorie estimations and on side-dish choices. Study 4 also addresses some of the remaining issues raised by the results of studies 1–3. First, we manipulate health claims by changing the name of the restaurant and the menu while keeping the target food constant. Second, we test whether the results of studies 1–3 regarding estimations are driven by a lack of familiarity with calories by asking respondents to estimate the amount of meat contained in the sandwiches in ounces, a more familiar unit. Finally, we examine whether the parallel findings of study 3 for calorie estimations and side-dish decisions hold in a between-subjects design in which some participants are asked to choose complementary food while the others are asked to estimate the number of calories of the main dish of the meal.

STUDY 4: CORRECTING THE EFFECTS OF HEALTH CLAIMS ON MAIN-DISH CALORIE ESTIMATIONS AND ON SIDE-DISH CHOICES

Method

Study 4 used a 2 (claims: healthy vs. unhealthy) × 2 (debiasing instructions: none or consider the opposite) × 2 (decision task: calorie estimation for the main dish or choice of side dish) between-subjects design. We recruited 214 University of Illinois students in exchange for class credit and gave them a typical fast-food menu, including the target sandwich and eight other food choices. The menu provided a short description of the food, prices, and calorie content (except for the target food). The target food was described as "our famous classic Italian sandwich, with Genoa salami, pepperoni, and bologna." In the healthy prime condition, the name of the restaurant was "Good Karma Healthy Foods," and the menu included healthy choices such as cream of carrot soup (90 calories) or an organic hummus platter (280 calories). In the unhealthy prime condition, the name of the restaurant was "Jim's Hearty Sandwiches," and the menu included high-calorie foods such as "beef on a Kimmelweck roll" (800 calories) or a "sausage sandwich" (760 calories).

In the questionnaire, we indicated that we were interested in food preferences, and we emphasized that there were no right or wrong answers. To ensure that participants studied the menu, we first asked them to rate the average price of the restaurant's food. The participants then went to a location in the room where a 6-inch Italian bologna sandwich was on a plate along with a 20-ounce glass of Coca-Cola Classic (clearly labeled). This meal contained 660 calories and was presented as having been ordered from "Good Karma Healthy Foods" restaurant or from "Jim's Hearty Sandwiches" restaurant. Participants in the consider-the-opposite estimation strategy were then asked to "write down three reasons why the sandwich is not typical of the restaurant that offers it. That is, write down three reasons why this is a generic meal that could be on any restaurant menu." Participants in the control condition received no further instructions.

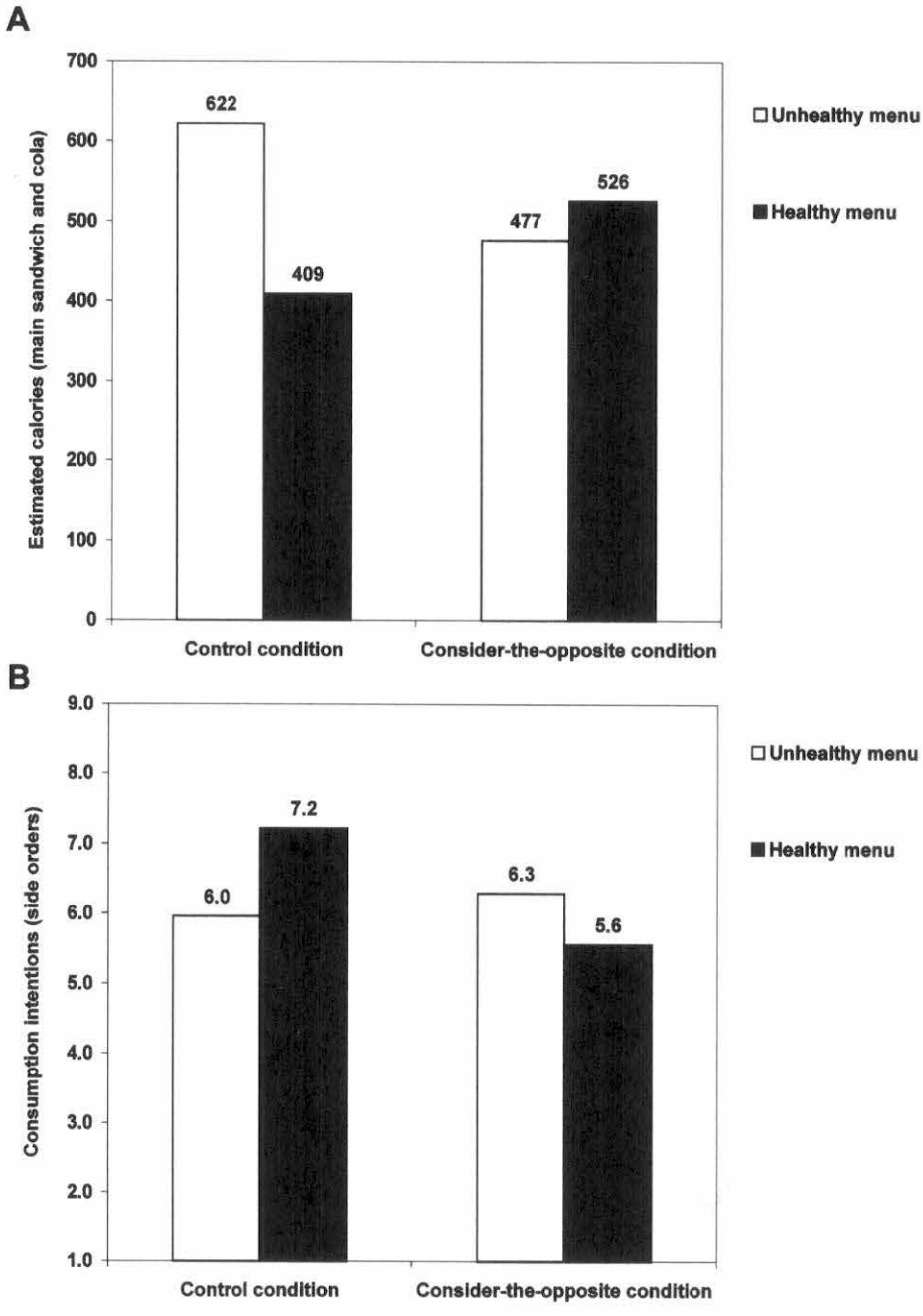
Participants in the estimation condition were then asked to write down the calories contained in this meal (the sandwich and the beverage) and the amount of meat in the sandwich (in ounces). Participants in the consumption condition were not asked to make any estimation but were asked instead to indicate their intention to order potato chips with this meal on a nine-point scale anchored at 1 = I wouldn't want any chips and 9 = I would want some chips. Because we were particularly interested in their consumption intentions, we assigned twice as many people to this condition as to the calorie estimation condition. On the last page of the questionnaire, we asked all the participants to rate how important healthy eating is to them by indicating their agreement with four sentences. Four of the participants guessed the general purpose of the study, and their answers were not included in the analyses reported here.

Results

To examine the effects of health claims and of the consider-the-opposite instructions, we conducted a series of ANOVAs with two independent variables: HEALTHCLAIM, a variable measuring whether participants received the healthy or unhealthy menu, and DEBIAS, a variable measuring whether participants were in the control or the consider-the-opposite condition. Looking at calorie estimations first, we found that the main effects of HEALTHCLAIM and of DEBIAS were not statistically significant (respectively, $F(1, 65) = 2.0, p = .16$ and $F(1, 65) = .1, p = .81$). However, the expected interaction between HEALTHCLAIM and DEBIAS was statistically significant ($F(1, 65) = 5.2, p < .05$). In the control condition, calorie estimations were significantly lower with the healthy menu ($M = 409$ calories, a 38% underestimation) than with the unhealthy menu ($M = 622$ calories, a 6% underestimation; $F(1, 28) = 7.5, p < .01$). In the consider-the-opposite condition, calorie estimations were essentially the same for the healthy menu ($M = 526$ calories, a 20% underestimation)

FIGURE 4

STUDY 4: HOW HEALTH CLAIMS AND DEBIASING INSTRUCTIONS INFLUENCE CALORIE ESTIMATIONS (A) AND SIDE-ORDER CONSUMPTION INTENTIONS (B)



as for the unhealthy menu (M = 477 calories, a 28% underestimation; $F(1, 37) = .4$, $p = .55$; see fig. 4a).

To test whether the effects of health claims persist for familiar units, we conducted the same ANOVA but with respondents' estimates of the amount of meat in the sandwich as the dependent variable. As for calorie estimations, the main effects of MENU and DEBIAS were not significant (respectively, $F(1, 65) = 1.6$, $p = .21$ and $F(1, 65) = .6$, $p = .42$), but their interaction was statistically significant ($F(1, 65) = 6.9$, $p < .05$). In the control condition, the estimated amount of meat was lower with the healthy menu (M = 3.4 ounces) than with the unhealthy menu (M = 5.5 ounces; $F(1, 28) = 4.9$, $p < .05$). In the consider-the-opposite condition, estimated weights were the same in both

conditions ($M = 5.2$ ounces with the healthy menu and $M = 4.8$ ounces with the unhealthy menu; $F(1, 37) = .3$, $p = .60$).

Using the same ANOVA model as that used above, we analyzed the effects of health claims on consumption intentions (measured on a 1–9 scale) and found the same effects but in the expected opposite direction (see fig. 4b). The main effects of HEALTHCLAIM and of DEBIAS were not statistically significant (respectively, $F(1, 141) = .3$, $p = .59$ and $F(1, 141) = 1.9$, $p = .18$), but their interaction was statistically significant ($F(1, 141) = 4.2$, $p < .05$). In the control condition, intentions to consume chips were higher in the healthy menu condition ($M = 7.2$) than in the unhealthy menu condition ($M = 6.0$), although the difference was only marginally statistically significant ($F(1, 54) = 3.6$, $p < .06$). In the consider-the-opposite condition, however, consumption intentions were not statistically different between the healthy ($M = 5.6$) and unhealthy ($M = 6.3$) conditions ($F(1, 83) = 1.3$, $p = .26$).

In the final analysis, we examined whether these results can be mediated by the activation of the goal of eating healthily. The ratings of respondents in the healthy and unhealthy menu conditions were not statistically different on any of the four sentences measuring healthy eating goals ($F(1, 206) = .6$, $p = .42$ for "I watch how much I eat"; $F(1, 206) = 2.0$, $p = .16$ for "Eating healthily is important to me"; $F(1, 206) = .5$, $p = .49$ for "I pay attention to calorie information"; and $F(1, 206) = .4$, $p = .50$ for "Looking thin is very important to me"). These results show that the effects of health claims on calorie estimation and complementary food decisions are not mediated by the activation of healthy eating goals.

Discussion

The most important contribution of study 4 is that the health halo effects on main-dish calorie estimation and side-dish choices disappear when consumers consider arguments contradicting the health claims. In fact, the effects of health claims are slightly reversed when participants consider opposite arguments. Although this reversal is not statistically significant, its robustness for all dependent variables suggests that some overcorrection might be taking place. Study 4 also shows that manipulating the name of the restaurant and the type of food on the menu, while keeping the target meal constant, suffices to influence consumers' choice of side orders and their estimation of the number of calories contained in a familiar meal consisting of a ham sandwich and a cola.

These results show that the health halo effects found in studies 1–3 were not specific to the manipulation used (the Subway and McDonald's brands) and can be relatively easily created from a restaurant name and the choice of other items on the menu. The findings of study 4 also rule out the alternative explanation that the results of studies 1–3 were driven by differences in food type in the healthy and unhealthy conditions or by the choice of unfamiliar units of measurement (calories). Study 4 also supports the findings of study 3 that health claims influence complementary consumption decisions even when people are not explicitly asked to estimate calories. Finally, study 4 provides more evidence on the interrelatedness of main-dish calorie estimation and side-dish choices by showing that they respond similarly, but in opposite directions, to health halos and consider-the-opposite manipulations. Next, we discuss the factors that may underlie these effects and their implications for the obesity debate.

GENERAL DISCUSSION

The goal of our research is to help explain a particular facet of the American obesity paradox—the simultaneous increase in obesity and in the popularity of healthier fast-food restaurants serving lower-calorie foods. The results of four studies show that consumers estimate that familiar sandwiches and burgers contain up to 35% fewer calories when they come from restaurants claiming to be healthy, such as Subway, than when they come from restaurants not making this claim, such as McDonald's. These findings are obtained when estimating single sandwiches as well as entire meals, before and after intake, and for familiar and unknown restaurant brands. Remarkably, the biasing effects of health claims on calorie estimations are as strong for consumers highly involved in nutrition as for consumers with little interest in nutrition or healthy eating. These results also hold when calories are measured in the field, as people are finishing their own meals, a context which should tempt consumers to minimize their calorie estimations in order to reduce their guilt or to look good in the eyes of the interviewers.

Two studies further show that health claims lead people to unknowingly choose side dishes containing more calories and therefore enhance the chances of overeating because of undetected increases in calorie intake. We find that consumers chose beverages, side dishes, and desserts containing up to 131% more calories when the main course was positioned as "healthy" compared to when it was not—even though the "healthy" main course already contained 50% more calories than the "unhealthy" one. As a result, meals ordered from "healthy" restaurants can unknowingly contain more calories than meals ordered from "unhealthy" restaurants. These health claims influence the choice of side dishes even when consumers are not explicitly asked to estimate calories. Fortunately, we find that these biasing influences of health claims can be eliminated by prompting consumers to consider whether the opposite health claims may be true.

Implications for Researchers

These findings have implications for the literature on consumer self-regulation and particularly for studies of the effects of goals on behavioral performance. Polivy and Herman (1985) coined the "what-the-hell" effect to describe the behavior of restrained eaters who overindulge when they exceed their daily calorie goal because they consider that the day is lost. The what-the-hell effect has been shown to

occur for negatively framed goals, such as setting a daily calorie goal (Cochran and Tesser 1996) but not when the goal is framed as a gain or when the goal is distant (such as a weekly calorie goal). Further research could test whether the what-the-hell effect may moderate the effects of health claims on consumption. Because unhealthy meals are perceived to contain more calories than healthy meals, restrained eaters are more likely to think that they have exceeded their calorie goal when the food or restaurant is seen as "unhealthy" than when it is not. Restrained eaters are thus more likely to experience a "virtual what-the-hell" effect and to order more foods in unhealthy restaurants, which is just the opposite of how halo effects influence consumers. The net effect on calorie intake would then depend on the proportion of restrained eaters with violated calorie goals in each type of restaurant.

The success of the consider-the-opposite debiasing strategy suggests that selective activation may underlie the effects of health claims on calorie estimations and consumption decisions. Our results also suggest that the influence that health halos have on one's choice of a side dish may be mediated by main-dish calorie estimates and not by feelings of guilt or by the activation of healthy eating goals. Further research is needed to replicate these findings and to rule out other potential explanations, such as simple priming effects caused by spreading activation, normative updating, or conversational norms. For example, the menus used in study 4 could be modified to include both healthy and unhealthy items. A selective accessibility explanation would predict that consumers will retrieve more healthy items from a restaurant with a healthy name (and more unhealthy items from a restaurant with an unhealthy name) and that the effect of the restaurant name on calorie estimates will be mediated by the frequency of the items retrieved. Incorporating a control (no prime) condition would also help to determine whether people assimilate their calorie estimates only toward the healthy restaurant, only toward the unhealthy restaurant, or both.[2]

More generally, more research is necessary to examine whether health claims have the same effects on prudent and impulsive consumers. Whereas most studies found that food temptations prime hedonic goals, Fishbach et al. (2003) found that they activate the overriding dieting goals among prudent consumers. Prudent and impulsive consumers also differ in how they respond to hedonic primes over time. Ramanathan and Menon (2006) found that hedonic primes increase preferences for unhealthy foods for both groups but that the preference for hedonic food persists only for impulsive consumers. Ramanathan and Williams (2007) further showed that balancing hedonic and utilitarian goals is more common among prudent consumers than impulsive consumers. Finally, it would be interesting to examine whether health halos influence not just single-order consumption intentions but, like product stockpiling, can also influence the frequency of consumption (Chandon and Wansink 2002).

[2]We thank the reviewers for these suggestions.

Implications for Managers, Policy Makers, and Consumers

One focus of health professionals, public policy makers, and responsible marketers is to reduce overeating by proposing healthier meals. This is obviously commendable, and we must emphasize that our results by no means imply that people should avoid restaurants that, like Subway, offer healthier meals than their competitors. As shown in study 1, meals ordered at Subway contain, on average, fewer calories (M = 694 calories) than meals ordered at McDonald's (M = 1,081 calories; $F(1, 318) = 134$, $p < .001$). Still, our findings show that the public health benefits of healthier foods are at least partially negated by the halo effects of health claims that lead people to order calorie-rich side dishes and beverages.

More generally, some strategies to promote healthy eating result in finger-pointing toward food indulgences. This can be counterproductive because temptations abound, and willpower is notoriously fallible. The risk is that this accusatory approach may lead to demotivation and create a backlash. Our findings suggest that another worthy public policy effort may be to help people to better estimate the number of calories they consume. There is nothing wrong with occasionally enjoying a high-calorie meal as long as people recognize that they have had a lot of calories and that they need to adjust their future calorie intake or expenditure accordingly. In fact, countries with a more relaxed and hedonic attitude toward food, like France or Belgium, tend to have less serious obesity problems compared to the United States (Rozin et al. 1999).

Reducing biases in calorie estimation is important because even small calorie underestimations can lead to substantial weight gain over the course of a year (Wansink 2006). For example, study 1 found that the mean estimation of a 1,000 calorie meal was 159 calories less if the meal was bought at Subway than if it was bought at McDonald's. This difference can lead to substantial weight gain if people eating at Subway think that they have earned a 159 calorie credit that they can use toward eating other food. Given that a 3,500-calorie imbalance over a year leads to a 1-pound weight gain (Hill et al. 2003), an extra 159 calories will lead to an extra 4.9-pound weight gain for people eating a 1,000 calorie meal at Subway twice a week compared to those eating a comparable meal at McDonald's with the same frequency.

Our findings regarding the robustness of health halos effects suggest that it is unlikely that consumers will learn to estimate calories from experience. In study 3, for example, meals were 56% larger when participants received a coupon for a Subway sandwich than when they received a coupon for a Big Mac, yet calorie estimations were 19% lower for the Subway meals than for the McDonald's meals. What can be done to improve the accuracy of calorie estimation? Although one suggestion may be to make nutrition information mandatory in all restaurants, this is vigorously opposed by the restaurant industry on the grounds that it is impractical and anticommercial. Our findings on the effec-

tiveness of the consider-the-opposite strategy suggest that a potentially less controversial solution would be to launch educational campaigns encouraging people to examine critically the health claims associated with various restaurants and foods in addition to evaluating the quality and quantity of the ingredients. Still, from a public health perspective, the best result would be achieved when people perceive all restaurants serving large portions of calorie-dense foods, such as McDonald's but also Subway, as an indulgence. Raising the accessibility of unhealthy primes would improve the accuracy of calorie estimations for fast-food meals and would dissuade them from ordering calorie-rich beverages and side dishes.

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