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Promoting Healthy Choices: Information versus Convenience[†]

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Success in slowing obesity trends would benefit from policies aimed at reducing calorie consumption. In a field experiment at a fast-food sandwich chain, we address the effects of providing calorie information, mimicking recent legislation, and test an alternative approach that makes ordering healthier slightly more convenient. We find that calorie information reduces calorie intake. Providing a daily calorie target does as well, but only for non-overweight individuals. Making healthy choices convenient reduces intake when the intervention is strong. However, a milder implementation reduces sandwich calories, but does not reduce total calories due to compensatory effects on side orders and drinks. (*JEL* I12, I18, L81)

During the past 20 years, the United States has seen a dramatic increase in obesity. In 1991, only four states had obesity prevalence rates as high as 15 percent, and not a single state had a rate above 20 percent. By 2005, only five states reported rates *below* 20 percent, with 17 states registering rates equal to or above 25 percent (H. M. Blanck et al. 2006). Economic analyses of this trend have implicated a variety of potential causal factors (e.g., Shin-Yi Chou, Michael Grossman, and Henry Saffer 2004; Eric A. Finkelstein, Christopher J. Ruhm, and Katherine M. Kosa 2005), but much of the rise in obesity can be attributed to an increase in caloric intake as opposed to a change in energy expenditure (David M. Cutler, Edward L. Glaeser, and Jesse M. Shapiro 2003).

In this paper, we compare the efficacy of two different types of interventions intended to change the food intake of fast food restaurant patrons. The first intervention provides calorie information to consumers and is intended to mimic recent legislation requiring chain restaurants to display calorie information prominently on their menus, as recommended by the Center for Science in the Public Interest (2003). The other intervention is based on insights from the field of behavioral economics

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and strives to make healthier meal choices marginally more convenient. We find that providing either calorie information for menu items or a recommendation for daily caloric intake decreases total calories ordered. We also find suggestive evidence that daily calorie recommendations may not be effective for overweight people who, arguably, could benefit most from reduced calorie intake. Results for convenience are mixed. A relatively heavy-handed intervention that makes unhealthy sandwiches harder to choose reduces total caloric intake, but a milder version of the intervention does not. Additional analyses reveal the importance of addressing compensatory behavior, as the milder version of the convenience intervention did lead to increased choice of lower calorie sandwiches, but the effect was undermined by an increase in the caloric content of side dishes and drinks. Overall, neither approach (providing calorie information or making lower calorie sandwiches more convenient) appeared to interfere with the other, so an additive approach of both classes of intervention may be promising for future policy consideration.

I. Prior Attempts to Encourage Healthy Behavior

A. *Information Provision*

The Nutrition Labeling and Education Act (NLEA), requiring consistent nutritional information for packaged foods, was implemented in 1994 (USDA 1994). Research on the impact of the NLEA suggests that it had some beneficial effects, including directing consumers' attention to negative nutrition attributes such as sodium levels (Siva K. Balasubramanian and Catherine Cole 2002); reducing fat intake (Marian L. Neuhouser, Alan R. Kristal, and Ruth E. Patterson 1999; Alan D. Mathios 2000); reducing fat calories, cholesterol, and sodium intake (Sung-Yong Kim, Rodolfo M. Nayga, Jr., and Oral Capps, Jr. 2000); and even decreasing body weight—albeit only among some groups (Jayachandran N. Variyam and John Cawley 2006). However, these beneficial effects vary according to individual characteristics, such as age and cognitive ability (Cole and Gary J. Gaeth 1990), motivation (Christine Moorman 1996), and self-control (Finkelstein, Ruhm, and Kosa 2005).

One reason for the limited effects of labeling may be that information alone cannot overcome other forces, such as the high cost of healthy foods (Kelli K. Garcia 2007) or the delayed and intangible nature of benefits from dieting (John G. Lynch, Jr. and Gal Zauberman 2006; Scott Rick and Loewenstein 2008). Furthermore, choices made in restaurants may be even less amenable to informational interventions. Restaurant consumers tend to be hungry and in a hurry, and thus may be more short-sighted and less motivated to process nutritional information. Our studies explore whether a similar pattern of partially beneficial effects, as found for the NLEA, results from providing calorie information on a fast-food menu, and examine how these effects interact with demographic characteristics.

B. *Asymmetric Paternalism*

The second class of approach we test is what behavioral economists refer to as an "asymmetrically paternalistic" intervention (Colin Camerer et al. 2003;

Richard H. Thaler and Cass R. Sunstein 2003), which seeks to steer consumers toward "better" behaviors without limiting their freedom of choice. Many such interventions exploit biases that usually detract from the quality of decision making to, instead, change behavior in beneficial ways (Peter Kooreman and Henriëtte Prast 2007; Loewenstein, Troyen Brennen, and Kevin G. Volpp 2007; Rebecca K. Ratner et al. 2008). The intervention in our studies plays on two such biases. The first is present-biased preferences, whereby individuals place disproportionate weight on immediate costs and benefits at the expense of delayed outcomes (David Laibson 1997; Ted O'Donoghue and Matthew Rabin 1999). To offset the immediate, calorie-promoting allure of a large and tasty meal, our intervention aimed to make healthier options slightly more convenient, thereby introducing an immediate cost—the cost of the extra effort required to order a less healthy meal—to choosing the unhealthy option. Avoidance of this small immediate cost, accentuated by present-biased preferences, weighed in favor of healthy selections. The second bias is the tendency for people to stick with the default option, even if superior options are available (William Samuelson and Richard Zeckhauser 1988). Policies that set the desired behavior as the default have been shown to increase retirement put-asides (Brigitte C. Madrian and Dennis F. Shea 2001) and organ donation (Eric J. Johnson and Daniel Goldstein 2003). The default bias was invoked in our experiment by making healthy options the implicit default.

Biases such as these have been explored in interventions aimed at diet. For example, changes in convenience have been shown to reduce snacking (James E. Painter, Brian Wansink, and Julie B. Hieggelke 2002) and alter decisions about peripheral meal items such as chips and candy (Herbert L. Meiselman et al. 1994), typically without consumer awareness (Brian Wansink 2006). The intervention in this paper examines the effectiveness of a similar strategy exploiting such biases applied to the main entrée of a fast-food meal.

II. The Current Studies

This paper reports findings from two studies designed to assess the effects of informational and asymmetrically paternalistic approaches to encouraging low-calorie meal choices. The two studies included identical informational manipulations, but differed in the implementation of the asymmetrically paternalistic manipulation, with the second study employing a somewhat weaker intervention than the first.

The informational manipulations were: (1) providing a daily calorie recommendation, and (2) providing specific information about the caloric content of menu options (so as to mimic much recent legislation). The asymmetrically paternalistic intervention in both studies made healthy sandwich options slightly more convenient. Based on the mixed effects of information provision observed in prior research, coupled with the great success of default manipulations applied to savings behavior, we anticipated that the convenience manipulation would have more robust effects than the informational manipulations. Although the main dependent measure in the two studies is the caloric content of diners' selections, we also had subjects complete a short survey that elicited items that we thought might interact with the experimental interventions or help to explain variance in food choice that was unrelated to the interventions.

A. *Methods*

During lunch hours, we approached customers entering a fast-food sandwich restaurant and offered them a free meal of their choice in exchange for completing a survey. Patrons who agreed to participate were instructed to pick their meal from the provided menu, first selecting a sandwich, then a side dish and drink. Next, participants completed the survey, after which they were handed a gift card and a coupon with their order to give to the restaurant. To minimize subjects' concern that they would be judged on the basis of their food choice, the setup was designed to give the impression that the meal choice was incidental—merely compensation for completing the survey.

The menus varied in a 2 (daily calorie recommendation offered or not) $\times$ 2 (calorie information for menu items shown or not) $\times$ 3 (convenience of healthy options) design. Daily calorie recommendations, when offered, were presented for men and women with sedentary versus active lifestyles. Calorie information, when provided, was listed prominently next to each menu item, including sandwiches, side dishes, and drinks. The two informational interventions were identical in both studies, which permits us to aggregate the data from both studies in analyzing their impact, maximizing statistical power.

The convenience intervention was implemented only for choice of sandwiches, not for side dishes or drinks, with two slightly different manipulations in each of the studies. In both studies, the first page after the instructions listed five of the ten sandwich options as "featured" sandwiches. This page contained either the five most caloric, least caloric, or a mix of high- and low-calorie sandwich options, as presumably would be seen in a real-world eating environment. Study 1 implemented a stronger version of the manipulation. Participants were informed that they could choose from the featured menu page or, as noted in large print at the bottom of the page, that they could choose from the complete menu by opening a packet with additional options. That packet listed the five remaining, non-featured, sandwiches and was sealed with a small round paper sticker. Participants were asked to indicate their sandwich choice, whether from the featured or non-featured list. Using the paper seal in Study 1 enabled us to record whether the second menu had been opened, providing insight into the mechanism driving any effect of the manipulation but added a small extra component of difficulty to choosing a sandwich off the featured menu page, thus making the intervention slightly more heavy-handed.

Study 2 implemented the convenience manipulation in a subtler manner by listing the second set of sandwiches on the next page. To request a sandwich from the first page, the participants merely checked their choice on a form. To request a sandwich from the second page, the participant was required to write it out, similar to some sushi restaurants, where ordering something other than a standard combination platter requires writing down one's specific selection of sushi.

In both studies, after indicating their sandwich choice, participants chose their drink (e.g., diet or non-diet soda, juice, or water) and side dish (e.g., potato chips or fruit), with calorie information listed for each option in the conditions in which calorie information was provided. The presentation of drinks and side dishes was identical across convenience manipulation treatments.

The survey, which was completed following meal selection, asked subjects to estimate the caloric content of their chosen meal as well as their recommended daily calorie intake. In addition, the survey asked subjects to rate, on a seven-point scale, their hunger, anticipated enjoyment of the meal, the extent to which they carefully considered what to order, whether they ordered less than usual, ordered healthier than usual, were usually careful about what they ate, considered calories when ordering, how often they ate at that fast-food chain, whether they were currently dieting, their height and weight, and other demographic information.

B. *Participants*

A total of 638 diners participated (292 in Study 1 and 346 in Study 2). Across both studies more than half of the customers who were approached agreed to participate. The sample was 61 percent male, 54 percent white, 11 percent African American, 30 percent Indian/Asian, 2 percent Hispanic, and 3 percent other. Participants were 29 years old on average (range 18 to 86). The average body mass index (BMI, calculated as the ratio of self-reported weight in kilograms to squared height in meters) was 25 (range 16 to 44). Forty-one percent of participants were overweight by conventional standards (BMI $\geq$ 25). Twenty-one percent of participants reported that they were currently dieting. Participants reported a mean hunger level of 5.1 and a mean anticipated meal enjoyment of 5.7 (both on 1-to-7 scales). On average, participants reported that they visited the restaurant chain where the study was conducted about twice a month.

III. Results

A. *Informational Effects on Total Meal Calories*

The impact of the manipulations on total calorie intake was estimated with OLS regression, with controls for demographic characteristics (Table 1). Aggregating the data from the two studies (column 3), providing specific calorie information led participants to order significantly fewer calories ($B = -60.7$, $t(621) = -3.20$, $p < 0.001$), as did the daily calorie recommendation ($B = -37.8$, $t(621) = -2.01$, $p < 0.05$). Although we had anticipated that the recommendation might help people to use the specific information more effectively, the interaction between these variables did not approach significance. Rather, the effects of the informational interventions appear to be additive, with the combination of the two reducing meals by almost 100 calories (Figure 1).

B. *Asymmetrically Paternalistic Effects on Total Meal Calories*

Two dummy variables were included in the regression (Table 1) to test for the effects of the convenient menu comprising healthy or unhealthy sandwiches, both compared to a convenient menu with a mix of both types of sandwiches. In Study 1 (column 1), the healthy featured menu had a large and significant negative impact on total meal calories ($B = -76.65$, $t(282) = -2.25$, $p < 0.03$), despite being applied

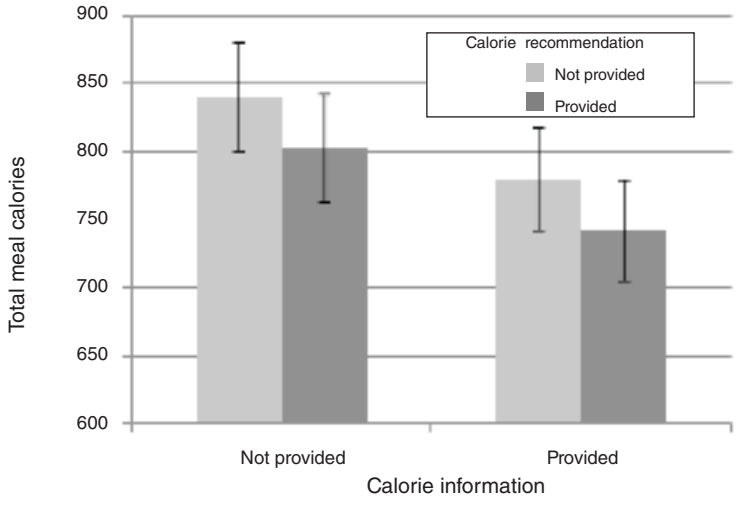

FIGURE 1. ESTIMATED MARGINAL MEANS FOR TOTAL MEAL CALORIES CONSUMED, ACROSS BOTH STUDIES, AS A FUNCTION OF PROVIDING SPECIFIC CALORIE INFORMATION AND A DAILY CALORIE RECOMMENDATION

Note: Bars indicate two standard errors.

only to the sandwich menu and not to the side dishes or drinks. In Study 2 (column 2), however, the subtler convenience manipulation did not reduce total meal calories ($B = 22.23$, $t(334) = 0.72$, $p = 0.47$). Column 3 of Table 1 allows for an explicit comparison of the impact of the two interventions. The significant positive interaction between the dummy for Study 2 and convenience indicates that Study 1's stronger manipulation had a significantly larger impact on total calories than did Study 2's weaker manipulation.

C. *Mechanisms*

Sandwich versus Non-Sandwich Calories and Compensatory Behavior.— Clues about how and why the different interventions did or did not reduce total meal calories are provided in separate OLS regressions examining the determinants of sandwich choice (Table 2) and non-sandwich (i.e., side dish and drink) calories (Table 3).

The informational manipulations achieved their effects purely through lowering non-sandwich calories. Table 2 shows that there was no significant impact of the informational interventions on sandwich choice, and Table 3 shows that a significant decrease in non-sandwich calories resulted from both the specific calorie information ($B = -48.57$, $t(621) = -3.25$, $p < 0.001$) and the daily calorie recommendation ($B = -35.91$, $t(621) = -2.42$, $p < 0.02$). Although participants randomized to receive information had seen it at the time when they made their sandwich decision, their choice of sandwich does not seem to have been affected. This suggests that participants may have found it easier to cut calories by changing side dishes or drinks, or that doing so detracted less from their anticipated enjoyment of the meal than changing the sandwich would have.

The convenience manipulation, on the other hand, had its strongest effect on sandwich choice (Figure 2), which is not surprising since this manipulation changed

Table 1—Total Calorie Consumption

	Study 1	Study 2	Combined studies
Constant	843.62**	902.88**	850.85**
	(46.13)	(41.82)	(35.67)
Calorie information provided	−48.05	−71.73**	−60.69**
	(28.82)	(25.29)	(18.95)
Daily calorie recommendation provided	−37.46	−38.94	−37.81*
	(28.61)	(25.14)	(18.83)
Healthy featured menu[a]	−76.65*	22.23	−76.66*
	(34.00)	(30.70)	(33.19)
Unhealthy featured menu	16.00	4.40	15.11
	(35.62)	(30.84)	(34.73)
Female	−69.47*	−88.37**	−79.90**
	(30.06)	(26.06)	(19.64)
Age (in years)	−0.75	−0.36	−0.54
	(1.12)	(1.07)	(0.77)
African American	130.47**	93.04*	112.07**
	(49.09)	(44.14)	(32.67)
Study 2			46.00
			(32.50)
Study 2 × healthy menu			98.65*
			(45.53)
Study 2 × unhealthy menu			−10.98
			(46.71)
	$N = 290$	$N = 342$	$N = 632$
	$F(7, 282) = 3.12$, $p = 0.003$	$F(7, 334) = 3.64$, $p = 0.001$	$F(10, 621) = 6.42$, $p < 0.001$
	$R^2 = 0.07$	$R^2 = 0.07$	$R^2 = 0.09$

Note: Standard errors in parentheses.

[a] Combined effect of the healthy menu across studies without interaction effects: $B = -24.63$, $t(623) = -1.08$, $p = 0.28$.

** Significant at the 1 percent level.

* Significant at the 5 percent level.

only the convenience of ordering different types of sandwiches, but not drinks or side orders. The effect of the convenience manipulation was stronger in Study 1, where participants were 44 percent more likely (an increase of 23 percentage points) to choose a low-calorie sandwich when the healthy menu was made convenient ($B = 0.23$, $t(282) = 3.47$, $p < 0.001$), and 44 percent less likely to do so when the unhealthy menu was convenient ($B = -0.23$, $t(282) = -3.35$, $p < 0.001$) (Table 2). The weaker manipulation of Study 2 resulted in a smaller but still significant impact of the healthy menu on sandwich choice. When healthy sandwiches were made more convenient, subjects were 35 percent more likely to order a low-calorie sandwich ($B = 0.15$, $t(335) = 2.22$, $p < 0.03$), but making unhealthy sandwiches more convenient had no effect. However, in Study 2, the convenience manipulation appeared to produce a compensatory effect on non-sandwich calories (Table 3), which increased sufficiently in the healthy sandwich condition ($B = 57.81$, $t(334) = 2.40$, $p < 0.02$)

TABLE 2—CHOICE OF A LOW-CALORIE SANDWICH

	Study 1	Study 2	Combined studies
Constant	0.52**	0.43**	0.52**
	(0.09)	(0.09)	(0.07)
Calorie information provided (versus not)	0.08	0.03	0.05
	(0.06)	(0.05)	(0.04)
Daily calorie recommendation provided (versus not)	0.01	0.04	0.02
	(0.06)	(0.05)	(0.04)
Healthy featured menu[a]	0.23**	0.15*	0.23**
	(0.07)	(0.07)	(0.07)
Unhealthy featured menu	−0.23**	0.00	−0.23**
	(0.07)	(0.07)	(0.07)
Female	0.01	0.07	0.05
	(0.06)	(0.06)	(0.04)
Age (in years)	−0.001	−0.002	−0.002
	(0.002)	(0.002)	(0.002)
African American	−0.17	−0.20*	−0.18**
	(0.10)	(0.10)	(0.07)
Study 2			−0.09
			(0.07)
Study 2 × healthy menu			−0.08
			(0.09)
Study 2 × unhealthy menu			0.23*
			(0.10)
	$N = 290$	$N = 343$	$N = 633$
	$F(7, 282) = 7.12$, $p < 0.001$	$F(7, 335) = 1.99$, $p = 0.06$	$F(10, 622) = 6.25$, $p < 0.001$
	$R^2 = 0.15$	$R^2 = 0.04$	$R^2 = 0.09$

Notes: Standard errors in parentheses. OLS regressions; logistic regression produced virtually identical results.

[a] Combined effect of the healthy menu across studies without interaction effects: $B = 0.19$, $t(624) = 4.00$, $p < 0.001$.

** Significant at the 1 percent level.

* Significant at the 5 percent level.

to completely offset the impact of the manipulation on sandwich calories, leaving no effect of the convenience manipulation on total calorie consumption (Table 1, column 2).

This compensatory effect may result from the attention drawn to the forgone items, which was heightened in the second study. In Study 1, only 38 percent of people (similar in all three conditions, $\chi^2 = 0.08$, $p = 0.96$) opened the packet to see alternative options. In the second study, however, all subjects are likely to have seen the additional options when turning the menu page, before choosing their side dish and drink. Choosing from the healthy menu may have led to a sense of deservingness upon seeing the unhealthy sandwiches that were passed up, leading people to reward themselves with higher-calorie side dishes and drinks. Regardless of the mechanism driving these results, they point to the fact that compensatory behavior can be critical in determining the overall impact of interventions aimed at behavior change.

Perceptions of Caloric Content.—A likely mechanism for the effect of information on eating behavior is improved knowledge about, and consideration of, caloric content and guidelines. To explore these effects, we performed a series of regressions

Table 3—Non-Sandwich (*Side Dish and Drink*) Calorie Consumption

	Study 1	Study 2	Combined studies
Constant	445.59**	472.55**	447.30**
	(36.54)	(32.87)	(28.17)
Calorie information provided (versus not)	−34.13	−61.79**	−48.57**
	(22.83)	(19.88)	(14.97)
Daily calorie recommendation provided (versus not)	−40.52	−33.60	−35.91*
	(22.66)	(19.76)	(14.87)
Healthy featured menu[a]	−22.58	57.81*	−22.70
	(26.93)	(24.13)	(26.21)
Unhealthy featured menu	−37.13	4.21	−38.72
	(28.21)	(24.24)	(27.43)
Female	−68.97**	−63.53**	−65.85**
	(23.81)	(20.48)	(15.51)
Age (in years)	−1.19	−0.78	−0.98
	(0.89)	(0.84)	(0.61)
African American	90.06*	29.93	58.96*
	(38.89)	(34.69)	(25.80)
Study 2			23.72
			(25.67)
Study 2 × healthy menu			80.54*
			(35.96)
Study 2 × unhealthy menu			42.55
			(36.88)
	$N = 290$	$N = 342$	$N = 632$
	$F(7, 282) = 2.73$, $p < 0.01$	$F(7, 334) = 4.48$, $p < 0.001$	$F(10, 621) = 6.79$, $p < 0.001$
	$R^2 = 0.06$	$R^2 = 0.09$	$R^2 = 0.10$

Note: Standard errors in parentheses.

[a] Combined effect of the healthy menu across studies without interaction effects: $B = 20.13$, $t(623) = 1.12$, $p = 0.26$

** Significant at the 1 percent level.

* Significant at the 5 percent level.

predicting the difference between participants' estimates of recommended daily calories and actual recommended values (Table 4, column 1), the absolute value of this difference (column 2), the difference between participants' estimates of the calories in their chosen meal and their meal's actual calories (column 3), the absolute value of this estimation error (column 4), and the extent to which participants reported considering calories when deciding on their meal (column 5).

Participants' knowledge of recommended daily caloric intake and of the caloric content of their meal choices was relatively poor. Overall, participants greatly underestimated daily recommended calorie intake (mean difference between estimated and actual recommendation $= -547.2$, $p < 0.001$) and the calories in their meal (mean difference between estimate and actual meal calories $= -119.2$, $p < 0.001$). Receiving calorie information significantly reduced the magnitude of the absolute error in estimating meal calories (Table 4, column 4; $B = -67.70$, $t(595) = -2.82$, $p < 0.01$). The daily calorie recommendation marginally increased estimates of

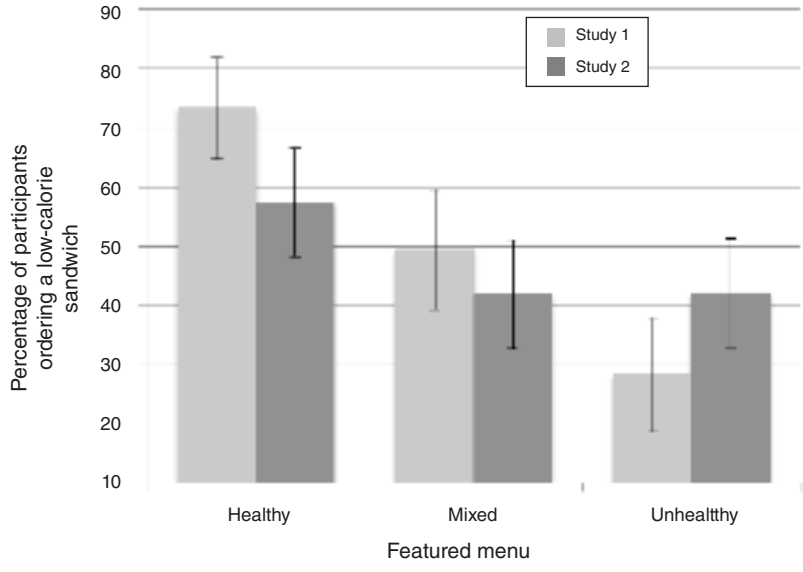

FIGURE 2. THE PERCENTAGE OF PARTICIPANTS WHO CHOSE A LOW-CALORIE SANDWICH IN EACH STUDY AS A FUNCTION OF THE "FEATURED" MENU

Note: Bars indicate two standard errors.

recommended daily allowance of calories, moving them closer to the recommendations that we provided (from 1,680 to 1,838 for women, and from 2,072 to 2,090 for men; Table 4, column 1; $B = 127.45$, $p = 0.056$), and significantly increased estimates of meal calories to a corresponding degree (Table 4, column 3), but did not reduce error.

It may seem contradictory that the daily calorie recommendation would increase estimates of how much one should eat but reduce the actual amount that one does eat. These results suggest that the daily recommendation worked not by improving knowledge, but, perhaps, by raising the salience of calorie considerations. This account is supported by the fact that those who received the recommendation were more likely to report that they considered calories when ordering (Table 4, column 5), even though they were no more accurate in reporting the calories in their meal (Table 4, column 4).

Effects among Overweight Participants.—The analyses above assess the degree to which these three interventions reduce calorie intake among the population as a whole. However, people who are not overweight are not the intended audience of such campaigns because they have no special reason to reduce their calories. Thus, it is of particular importance to measure the impact of these interventions on the people who most need to change behavior—those who are overweight or obese. Table 5 presents regressions including only the subsample of overweight (BMI ≥ 25) participants ($n = 262$; 41 percent of sample), predicting total meal calories (column 1), choice of a low-calorie sandwich (column 2), and non-sandwich calories (column 3) using the same independent variables as the main analyses.

TABLE 4—EFFECTS OF INFORMATIONAL AND CONVENIENCE MANIPULATIONS ON KNOWLEDGE AND PERCEPTIONS

	Dependent variable				
	Estimated–actual recommendation	Absolute recommendation error	Estimated–actual meal calories[a]	Absolute meal calorie error[a]	Considered calories[b]
Constant	–280.38**	507.99**	–277.70**	324.28**	1.79**
	(127.19)	(105.39)	(63.06)	(45.25)	(0.28)
Calorie information	–74.47	–17.76	47.66	–67.70**	0.28
	(67.10)	(55.60)	(33.49)	(24.03)	(0.15)
Calorie recommendation	127.45†	–67.31	143.14**	0.85	0.39**
	(66.62)	(55.20)	(33.28)	(23.88)	(0.15)
Healthy featured menu	–131.67	25.57	35.70	1.62	0.29
	(117.45)	(97.32)	(58.10)	(41.69)	(0.26)
Unhealthy featured menu	42.94	–48.66	35.83	13.10	0.08
	(123.39)	(102.24)	(61.26)	(43.96)	(0.27)
Female	–288.57**	–148.07**	47.89	–55.17*	0.41**
	(69.49)	(57.58)	(34.63)	(24.85)	(0.15)
Age	–8.53**	7.52**	1.81	1.39	0.03**
	(2.77)	(2.30)	(1.34)	(0.99)	(0.01)
African American	–362.60**	368.22**	–220.54**	186.95**	–0.51*
	(116.45)	(96.49)	(57.84)	(41.51)	(0.26)
Study 2	–180.18	73.01	–44.67	–10.12	0.03
	(114.99)	(95.28)	(57.70)	(41.41)	(0.25)
Study 2 × healthy featured menu	252.15	108.23	–66.52	53.10	–0.43
	(161.21)	(133.58)	(80.62)	(57.85)	(0.36)
Study 2 × unhealthy featured menu	147.54	60.11	–49.51	–27.23	–0.10
	(165.32)	(136.99)	(82.45)	(59.16)	(0.36)
	$N = 622$	$N = 622$	$N = 606$	$N = 606$	$N = 621$
	$F(10, 611) = 6.75$, $p < 0.001$	$F(10, 611) = 4.37$, $p < 0.001$	$F(10, 595) = 4.13$, $p < 0.001$	$F(10, 595) = 3.66$, $p < 0.001$	$F(10, 610) = 5.48$, $p < 0.001$
	$R^2 = 0.10$	$R^2 = 0.07$	$R^2 = 0.07$	$R^2 = 0.06$	$R^2 = 0.08$

Note: Standard errors in parentheses.

[a] Eight extreme outliers (with estimate errors > 1700) were removed from these analyses.

[b] Endorsement of "I considered calories when ordering", on a 1-to-7 scale.

** Significant at the 1 percent level.

* Significant at the 5 percent level.

† Significant at the 10 percent level.

Although the smaller sample size diminishes statistical power and reduces most effects to being non-significant, comparison of effect sizes reveals no evidence that provision of specific calorie information, or the convenience manipulation, has a different effect on total calories consumed among overweight individuals compared to the broader sample. The calorie recommendation, on the other hand, seems to have no benefit for this population (indeed, the direction of the effect for total calories is reversed from that found in the full sample, although it is not significantly different from zero). If the effect in the overall population is due to increasing salience of calorie information rather than providing usable information, as proposed above, perhaps this finding speaks to the greater attention already paid to calorie considerations by overweight people. Although this analysis is merely exploratory, it speaks

TABLE 5—EFFECTS OF INFORMATIONAL AND CONVENIENCE MANIPULATIONS ON OVERWEIGHT ($BMI \geq 25$) POPULATION

Dependent variable	Total calories	Choice of a low-calorie sandwich	Non-sandwich calories
Constant	779.31**	0.56**	379.51**
	(54.96)	(0.11)	(42.98)
Calorie information provided (versus not)	–41.27	0.04	–33.78
	(29.71)	(0.06)	(23.24)
Daily calorie recommendation provided (versus not)	8.48	–0.10	–19.17
	(29.36)	(0.06)	(22.96)
Healthy featured menu	–93.37	0.18	–50.74
	(48.97)	(0.10)	(38.30)
Unhealthy featured menu	–16.94	–0.17	–52.97
	(50.79)	(0.11)	(39.72)
Female	–43.37	0.06	–29.26
	(32.64)	(0.07)	(25.53)
Age (in years)	–0.26	0.00	–0.12
	(1.04)	(0.002)	(0.81)
African American	126.48**	–0.30**	46.67
	(43.03)	(0.09)	(33.65)
Study 2	73.12	–0.16	35.29
	(49.31)	(0.10)	(38.57)
Study 2 × healthy menu	80.56	0.14	111.66*
	(69.62)	(0.14)	(54.45)
Study 2 × unhealthy menu	2.92	0.32*	70.80
	(72.04)	(0.15)	(56.34)
	$N = 259$	$N = 260$	$N = 259$
	$F(10, 248) = 2.61$, $p < 0.01$	$F(10, 249) = 3.27$, $p = 0.001$	$F(10, 248) = 2.80$ $p < 0.01$
	$R^2 = 0.10$	$R^2 = 0.12$	$R^2 = 0.10$

Note: Standard errors are in parentheses.
** Significant at the 1 percent level.
* Significant at the 5 percent level.

to the need to examine target populations more closely, so as to ensure that the intended effects are affecting the behavior of those most in need of behavior change.

IV. Discussion

The results of this study indicate that both information and convenience can affect the food choices of fast-food restaurant patrons. Averaging across all participants, both calorie information and a calorie recommendation decreased total calories ordered. The more heavy-handed convenience manipulation also reduced total calories significantly, whereas the lighter intervention of Study 2 influenced sandwich choice but not total calories.

Although the daily calorie recommendation appears, on average, to decrease calorie intake, there is a disturbing suggestion in the data that it may not be helpful for those who need to cut back on calories—those who are overweight. The potentially different, and less impressive, results for people who are overweight have important implications for policies targeted at restaurant, and specifically fast food, dining. Before expanding the implementation of policies that involve provision of information, it would be very helpful to understand more about when information helps and

when it does not, and why these patterns emerge. In addition, although the provision of calorie information reduced non-sandwich calories, it appeared to have no effect on the choice between high- and low-calorie sandwiches, which was the first choice made by participants, and is arguably the main course of the meal. Further research is needed to understand this pattern, and specifically to determine whether calorie information might have differential effects on central versus peripheral components of a meal, or whether its effects might be greater in a situation in which sandwich calories were not bimodally distributed, as they were constructed to be for this study.

Because informational strategies do not appear to be a panacea for the obesity epidemic, future interventions should consider additional methods for changing eating behavior. In these studies, simply making it easier for consumers to choose a low-calorie option significantly reduced sandwich calories. However, the impact of the weaker convenience manipulation was undermined by compensatory choices of drinks and side orders. This raises the question of whether a similarly weak convenience manipulation would have been more effective if it had encompassed drinks and side orders (e.g., made bottled water and fruit part of the featured menu).

The compensatory effect on non-sandwich items highlights the importance of including and analyzing choices that are not directly targeted by interventions. The convenience manipulation was applied only to sandwich choice, allowing us the opportunity to measure compensatory effects on nontargeted choices within the entire meal, and these proved to be important. However, all participants had the option of purchasing additional items (e.g., cookies) when they collected their meal, or purchasing other items at nearby establishments selling food, and were also likely to make further food choices later in the day. Those who choose lower calorie meals, whether due to information or convenience, may feel hungrier later in the day, or more entitled to indulge, and may end up consuming more calories later. We were unable to measure such purchases, so we cannot rule out that they occurred or, if so, assess what impact they had on total calories consumed in the different conditions. Note that a similar criticism applies to the studies examining the impact of changing defaults on retirement contributions. Although these studies have revealed uniformly positive effects of high defaults, without information about other financial activities there is no way of knowing whether the net impact of such changes increases saving. It is possible, for example, that those contributing more to retirement plans may incur credit card debt, or even take out payday loans to compensate for their lower paychecks.

It is, moreover, unclear whether either type of intervention could produce sustained changes in behavior. People might learn to work around the interventions, for example, if they discover that their preferred options were always reserved for later in the menu, or they might come to ignore calorie information. Conversely, and more optimistically, if either of these kinds of manipulations work for some period, they might prove to be habit-forming, thereby creating long-term changes in diet even if the interventions were removed. In addition, restaurants may change their menu options and nutritional content, for better or worse, as a result of the legislation, thus either aiding or undermining individual behavior.

In this study, we aimed to test for effects of information and convenience independently. However, it is possible that our subjects interpreted the composition of the

featured menu as conveying information, and even more likely that this would be true in real-world settings. People could assume that items made more convenient were selected based on health concerns, as would likely be the case if such a presentation were mandated by legislation. Alternatively, selection for menu prominence might be interpreted as conveying other information about the selected options, such as that they are more popular, fresher, or tastier. Thus, the context in which consumers understand the menu may lead them to glean different kinds of information from the fact that some options are made especially prominent, potentially affecting their behavioral response.

The current study explores the promise of different kinds of interventions, including both the standard approach of providing more information, as well as subtler attempts to nudge people in a healthier direction. Both kinds of intervention showed some promise, and they did not interact with one another, suggesting that there would be no downside to applying them simultaneously. However, before implementing either type of interventions on a broader scale, more research is needed to understand and guard against both the potential for perverse effects on subsets of the population and the possibility of compensatory behaviors.

REFERENCES

Balasubramanian, Siva K., and Catherine Cole. 2002. "Consumers' Search and Use of Nutrition Information: The Challenge and Promise of the Nutrition Labeling and Education Act." *Journal of Marketing*, 66(3): 112–27.

Blanck, H. M., W. H. Dietz, D. A. Galuska, C. Gillespie, R. Hamre, L. Kettel Khan, M. K. Serdula, et al. 2006. "State-Specific Prevalence of Obesity among Adults—United States, 2005." *Morbidity and Mortality Weekly Report* (*MMWR*), 55(36): 985–88.

Camerer, Colin, Samuel Issacharoff, George Loewenstein, Ted O'Donoghue, and Matthew Rabin. 2003. "Regulation for Conservatives: Behavioral Economics and the Case for 'Asymmetric Paternalism.'" *University of Pennsylvania Law Review*, 151(3): 1211–54.

Center for Science in Public Interest. 2003. "Anyone's Guess: The Need for Nutrition Labeling at Fast-Food and Other Chain Restaurants." http://www.cspinet.org/new/pdf/anyone_s_guess_final_web.pdf. (accessed June 28, 2008).

Chou, Shin-Yi, Michael Grossman, and Henry Saffer. 2004. "An Economic Analysis of Adult Obesity: Results from the Behavioral Risk Factor Surveillance System." *Journal of Health Economics*, 23(3): 565–87.

Cole, Catherine A., and Gary J. Gaeth. 1990. "Cognitive and Age-Related Differences in the Ability to Use Nutritional Information in a Complex Environment." *Journal of Marketing Research*, 27(2): 175–84.

Cutler, David M., Edward L. Glaeser, and Jesse M. Shapiro. 2003. "Why Have Americans Become More Obese?" *Journal of Economic Perspectives*, 17(3): 93–118.

Finkelstein, Eric A., Christopher J. Ruhm, and Katherine M. Kosa. 2005. "Economic Causes and Consequences of Obesity." *Annual Review of Public Health*, 26: 239–57.

Garcia, Kelli K. 2007. "The Fat Fight: The Risks and Consequences of the Federal Government's Failing Public Health Campaign." *Penn State Law Review*, 112(2): 529–86.

Johnson, Eric J., and Daniel Goldstein. 2003. "Do Defaults Save Lives?" *Science*, 302(5649): 1338–39.

Kim, Sung-Yong, Rodolfo M. Nayga, Jr., and Oral Capps, Jr. 2000. "The Effect of Food Label Use on Nutrient Intakes: An Endogenous Switching Regression Analysis." *Journal of Agricultural and Resource Economics*, 25(1): 215–31.

Kooreman, Peter, and Henriëtte Prast. 2007. "What Does Behavioral Economics Mean for Policy? Challenges to Savings and Health Policies in the Netherlands." http://members.ziggo.nl/peter-kooreman/pibe.pdf.

Laibson, David. 1997. "Golden Eggs and Hyperbolic Discounting." *Quarterly Journal of Economics*, 112(2): 443–77.

Loewenstein, George, Troyen Brennan, and Kevin G. Volpp. 2007. "Asymmetric Paternalism to Improve Health Behaviors." *Journal of the American Medical Association*, 298(20): 2415–17.

Lynch, John G., Jr., and Gal Zauberman. 2006. "When Do You Want It? Time, Decisions, and Public Policy." *Journal of Public Policy and Marketing*, 25(1): 67–78.

Madrian, Brigitte C., and Dennis F. Shea. 2001. "The Power of Suggestion: Inertia in 401(K) Participation and Savings Behavior." *Quarterly Journal of Economics*, 116(4): 1149–87.

Mathios, Alan D. 2000. "The Impact of Mandatory Disclosure Laws on Product Choices: An Analysis of the Salad Dressing Market." *Journal of Law and Economics*, 43(2): 651–77.

Meiselman, Herbert L., Duncan Hedderley, Sarah L. Staddon, Barry J. Pierson, and Catherine R. Symonds. 1994. "Effect of Effort on Meal Selection and Meal Acceptability in a Student Cafeteria." *Appetite*, 23(1): 43–55.

Moorman, Christine. 1996. "A Quasi Exeperiment to Assess the Consumer and Informational Determinants of Nutrition Information Processing Activities: The Case of the Nutrition Labeling and Education Act." *Journal of Public Policy and Marketing*, 15(1): 28–44.

Neuhouser, Marian L., Alan R. Kristal, and Ruth E. Patterson. 1999. "Use of Food Labels Is Associated with Lower Fat Intake." *Journal of the American Dietetic Association*, 99(1): 45–53.

O'Donoghue, Ted, and Matthew Rabin. 1999. "Doing It Now or Later." *American Economic Review*, 89(1): 103–24.

Painter, James E., Brian Wansink, and Julie B. Hieggelke. 2002. "How Visibility and Convenience Influence Candy Consumption." *Appetite*, 38(3): 237–38.

Ratner, Rebecca K., Dilip Soman, Gal Zauberman, Dan Ariely, Ziv Carmon, Punam A. Keller, B. Kyu Kim, et al. 2008. "How Behavioral Decision Research Can Enhance Consumer Welfare: From Freedom of Choice to Paternalistic Intervention." *Marketing Letters*, 19(3–4): 383–97.

Rick, Scott, and George Loewenstein. 2008. "Intangibility in Intertemporal Choice." *Philosophical Transactions of the Royal Society B: Biological Sciences*, 363(1511): 3813–24.

Samuelson, William, and Richard Zeckhauser. 1988. "Status Quo Bias in Decision Making." *Journal of Risk and Uncertainty*, 1(1): 7–59.

Thaler, Richard H., and Cass R. Sunstein. 2003. "Libertarian Paternalism." *American Economic Review*, 93(2): 175–79.

United States Food and Drug Administration. 1994. "Food Labeling Guide." http://www.fda.gov/Food/GuidanceComplianceRegulatoryInformation/GuidanceDocuments/FoodLabelingNutrition/FoodLabelingGuide/default.htm.

Variyam, Jayachandran N., and John Cawley. 2006. "Nutrition Labels and Obesity." National Bureau of Economic Research Working Paper 11956.

Wansink, Brian. 2006. *Mindless Eating: Why We Eat More Than We Think*. New York: Bantam Books.