CHAPTER 9

BEHAVIORAL ECONOMICS AND OBESITY

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INTRODUCTION

IN the last 30 years, under the undisputed leadership of Gary Becker, economists have extended the application of the rational choice perspective of economics to an ever-widening range of behaviors, including those that are commonly seen as self-destructive, such as suicide, addiction and, most recently, obesity—the focus of this handbook. The rational choice perspective provides potentially useful insights, particularly in its focus on the role of prices in determining behavior. Indeed, changes in prices seem to have played a role in the "obesity epidemic" that emerged in the 1980s and has been growing in recent decades (Cutler, Glaeser, and Shapiro 2003). The price of energy-dense food has decreased overall and especially relative to less energy-dense foods such as fruits and vegetables (Finkelstein et al. 2005; Monsivais and Drewnowski 2007). Other cultural and institutional changes that might have contributed to growing waistlines include increases in television viewing and in female labor force participation, although these trends began long before rates of obesity began their ascent.

Although the rational choice perspective sheds light on important aspects of obesity, it falls short of explaining many dimensions of the phenomenon. Most obviously, the rational choice perspective fails to explain the large amount of time, effort and money that people invest, often in vain, to lose weight. Whether for

good reasons or bad, Americans want to be thinner but have difficulty achieving this goal, an observation supported not only by representative surveys, but also by the large amounts that Americans collectively spend on weight loss products and programs ($55 billion in 2007, according to one study).[1] The rational choice perspective also fails to account for a wide range of situational factors that have been shown to affect eating, from emotional influences (surprisingly, both positive and negative emotions seem to encourage eating among dieters) to the presence of food or of other people who are eating.

In part due to its failure to take account of the less rational side of obesity, we argue in this chapter, the rational choice perspective also falls short when it comes to offering policies to deal with the obesity epidemic. The conventional economic approach assumes that obese people are obese by choice; they have made a deliberate decision favoring the pleasures of eating over the advantages of lower body weight.[2] An important implication of such a perspective is that, barring externalities (costs that obese people impose on others), there is no reason for policy makers to intervene.

Of course, obese people do impose externalities on others, with high health care costs being a primary consideration (Wang et al. 2008), but these are probably not the primary reasons that policy intervention makes sense. The main rationale for intervention is that, beyond the externalities that it produces, obesity also generates what have been called *internalities* (Herrnstein et al. 1993; Gruber and Koszegi 2001)—costs that people impose on *themselves* but fail to fully internalize. Why people fail to internalize such costs and what can be done about it are the central topics of this chapter.

We begin by discussing different phenomena identified by behavioral economists that can shed light on the problem of obesity. Not everyone has a problem with excessive weight; some people can eat as much as they like without becoming obese, and some even have trouble maintaining adequate body weight. However, for those prone to becoming obese, there are several concepts from behavioral economics that help to explain why people would fail to adequately internalize the costs that they impose on themselves—that is, why weight loss is more difficult than the standard economic perspective recognizes. We then discuss limitations of the information-based approach to combating obesity offered by conventional economics, and review empirical research suggesting that the benefits of information provision for the population at large are minimal, at best. Finally, we discuss research examining two categories of alternative approaches to policies aimed at obesity, both of them inspired by ideas from behavioral economists: (1) environmental "nudges" to tip the balance of small decisions against weight-gaining behaviors; and (2) ways of "supercharging" incentive programs for weight loss.

1 Marketdata Enterprises, Inc. has released a new 393-page study entitled: "The U.S. Weight Loss and Diet Control Market (9th edition)."

2 Kevin Murphy, for example, argued that obesity could be viewed as a matter of rational choice, by which he meant that people who are obese have made a deliberate decision that the costs of cutting back on eating or increasing exercise would not justify the benefits of any resulting weight loss (Murphy, 2006).

Why Obesity Is Such an Intractable Problem; Insights from Behavioral Economics

Whatever one's metabolism, there is a simple formula for preventing or reversing obesity: burn more calories or take in fewer calories.[3] Both of these are difficult for the same reason: they require, at least for those who don't find exercise enjoyable, exposing oneself to immediate misery. Eating involves an additional complexity. For many other activities that are associated with problems of self-control, such as smoking and sex with unsuitable partners, it is possible to desist from the activity altogether, which constitutes a natural "bright line" to avoid crossing in attempts to exert self-control. Eating, in contrast, is a biological imperative. One has to eat; the only question is what and how much.

As we show in this section, there are many decision phenomena that encourage overeating or, perhaps more importantly, stand in the way of attempts to cut back by those prone to overeat. Indeed, given the length of the list, it is remarkable that anyone who is vulnerable to weight gain manages to avoid it.

Present-Biased Preferences

People tend to put disproportionate weight on immediate costs and benefits relative to those that are even slightly delayed. However, they also tend to be relatively even-handed toward costs and benefits occurring at different points in the future. The combination of such impatience in the present and patience toward the future has been dubbed "present-biased preferences" (see Ainslie 1975 and Strotz 1955, for seminal discussions). Present-biased preferences (also known as "hyperbolic time discounting") contribute to obesity because the benefits of eating (and the costs of exercising) are immediate, but the consequences of overeating and failing to exercise are delayed. Present-biased preferences help to explain not only why people fail to diet or exercise, but also why they are quite willing to resolve to do so in the future: because future benefits and costs are evaluated in a much more evenhanded fashion. When the future becomes the present, however, people often end up not going through with their resolutions, a pattern known as "impulsivity" or "dynamic inconsistency."

An important innovation in research and theorizing about present-bias is the observation, by O'Donoghue and Rabin (e.g., 1999, 2008), that people's self-awareness of their own patterns of time discounting are critical for understanding patterns of behavior. O'Donoghue and Rabin draw a continuum between complete "naivete"—where people fail to appreciate that their current evenhanded treatment

3 Actually, the problem is somewhat more complicated due to homeostatic and feedback processes (see, e.g., Katan & Ludwig, 2010).

of different future times will vanish when the future becomes the present, and they will come to overvalue that present—and "sophistication"—in which people recognize that they will overvalue the future when it becomes the present. The distinction between naivete and sophistication matters because, for example, if people are naive and so fail to anticipate that they will be impatient in the future, they may be perfectly willing to commit to going on a diet or exercising in the future, but they will see no need to do so at the moment because they will assume that they are not going to be impatient in the future. In contrast, someone who is sophisticated will both be willing to, and recognize the need to, commit to a plan for future diet or exercise.

Although the application of present-biased preferences to eating seems obvious, and diet is the paradigmatic domain of behavior used to illustrate present-biased preferences, the evidence supporting a link between the rise in obesity and either steep time discounting or present-biased preferences is mixed. Between individuals, there is correlational evidence that obesity is related to a higher discounting rate, especially among men (Smith et al. 2005; Zhang and Rashad 2008). Time series analyses of national data likewise show weak connections between changes in obesity over time and changes in some proxies for time discounting, such as private debt and savings rates, suggesting the possibility of a causal link (Komlos et al. 2004). However, in a careful analysis of a rich data set, the two proxies of discount rates that were most closely related to BMI (managing income and controlling expenditures), both remained unchanged during a decade of skyrocketing rates of obesity. Interestingly, these increases in obesity were concentrated among individuals with high discount rates as assessed by these measures, suggesting that a changing discount rate is not responsible for the obesity epidemic, but that high discounters are the ones gaining weight (Borghans and Golsteyn 2006).

Visceral Factors

Present-biased preferences predict that things become especially tempting when they are immediately available, but they fail to explain why food is especially prone to such effects, or to shed light on a wide range of other situational factors that lead to (over)eating, including various forms of sensory contact with food. As dieting researchers Herman and Polivy (2004, 462) note, "physical proximity is likely to be more powerful than is temporal proximity in inflaming desire. Knowing that it's 'time for dessert' is nowhere near as powerful an influence on desire (and eating) as is the actual presence of the dessert." An alternative account of impatience, proposed by Loewenstein (1996) holds that it is not immediacy, per se, that leads to a shortened time perspective, in which the pleasure from eating comes to dominate considerations of long-term well-being, but rather the action of "visceral factors"—emotions and drives (including hunger)—that are designed by evolution to make us attend to immediate needs.

According to this perspective, temporal immediacy is only one of many factors that activate the visceral drive to eat. Others include the sight or smell of a food item, or, unsurprisingly, hunger resulting from not having eaten in the recent past.

There is diverse empirical support for such a perspective. For example, when people are hungry, they show a particular impatience for consumption of a liked food (chocolate), relative to their impatience for money (Reuben, Sapienza, and Zingales 2010). Likewise, research by Mischel and his colleagues (e.g., Mischel and Ebbesen 1970) found that children given a choice between smaller snacks earlier and larger snacks later were less able to wait when put in the presence of the snacks. However, when the same children were shown photographs of the snacks, they were more able to wait; apparently the photographs helped them keep in mind what they were waiting for without activating visceral drives. Finally, in a recent study (McClure et al. 2007), people were given intertemporal choices between earlier smaller or larger later money amounts, while their brains were scanned with fMRI. Supporting the idea that immediacy leads to extreme time discounting because it activates emotions, emotional systems of the brain were only activated when one of the two choice options was available immediately; in those cases, activation of emotion systems predicted choice of the immediate reward.

Willpower

When economists use a term differently from the way it is used in popular language, it is often a clue to deficiencies in economic theory. One of the best examples of this is the term "impatience," which, to an economist, means a tendency to discount—that is, care less about—the future. Random House, in contrast, defines impatience as "eager desire for relief or change; restlessness;" or as "intolerance of anything that thwarts, delays, or hinders." Impatience, as the term is employed in popular language, is an aversive feeling. Modern research in psychology supports the popular interpretation of the construct. This research shows that resisting the motivational impetus of impatience requires the exertion of willpower, which is a scarce resource that—much like a muscle—is used up in the short run when exerted, but replenishes (and may even strengthen from use) in the long run. The notion of willpower can help to explain a wide range of phenomena, such as the greater difficulty of resisting eating when food is continuously available (e.g., when working at home instead of at the office) as well as the common failure of excessively ambitious diets (which leave one with severely depleted willpower). Indeed, sheer complexity of a diet can discourage adherence, if the dieter perceives the rules to be complex (Mata et al. 2010).

The "Peanuts Effect" and Intangibility

If one examines the most common situations in which people exhibit self-control problems, many have in common another property: in many situations, the costs are not only delayed but also intangible (Rick and Loewenstein 2008). This is true of smoking; it is extremely unlikely that any one cigarette will have a marked effect on one's health. It is also true of eating. Any one act of eating—even a huge meal—will not have much of an impact on one's weight.

Marketers seem to be aware of, and even play on, this effect. People who are trying to reduce their consumption (restrained eaters) seem to be susceptible to the allure of small packaging; they eat more when snacks are offered in "snack" packages. Unrestrained eaters succumb to the typical effect of eating more when packages are larger; but restrained eaters seem to be more vulnerable to a lapse in self-control when the temptation is small, but then they succumb repeatedly, leading to greater overall consumption (Scott et al. 2008). In effect, people who are more sensitive to overall gains and losses (those keeping track of what they eat) appear to be more susceptible to the "peanuts effect" of discounting very small single losses, and neglecting the cumulative effect of multiple losses.

Projection Bias

When people are in one visceral state, they have difficulty imagining how they would feel—and mispredict how they would behave—in a different visceral state. For hunger, as for other states, this bias can work in both directions. When not hungry, people have difficulty imagining how it would feel to be hungry or what they might do to procure food. When hungry, people find it difficult to imagine not being hungry. Both of these types of biases have implications for eating behavior.

The tendency, when not hungry, to underestimate the motivational force of hunger leads to a greater willingness to commit to diets, and a greater confidence that one will be able to stick with them, by people who are not—at the moment they commit—hungry. This can be beneficial if people are able to truly commit in a binding fashion, but it can lead to wasted resources, as evidenced by the many subscription to diets that aren't ultimately followed, as well as health club memberships and exercise equipment that go unused.

The tendency for those who are hungry to exaggerate the extent to which their hunger will persist leads to the opposite type of problem—over-ordering food at a restaurant (because one generally orders when in a state of hunger), and overbuying when shopping on an empty stomach (e.g., Gilbert et al. 2002; Read and van Leeuwen 1998). If we didn't end up eating all that food because it turned out that we weren't as hungry as anticipated, then overshopping on an empty stomach wouldn't be that much of a problem. However, consistent with points discussed above, once we have the food, it is difficult to resist (Rowland et al. 2008).

Narrow Decision Bracketing

Ideal rational decision makers make each individual decision while taking account of its interactions with all other decisions, both past and future. However, the reality is that people tend to make decisions largely one at a time, or in very thin slices. When it comes to dieting (as well as other activities; see, e.g., Camerer et al. 1997), people seem to "bracket" their decisions at the one-day level. Lowe (1982) has proposed, and Urbszat, Herman, and Polivy (2002) provided support for, the contention that anticipating a diet tomorrow disinhibits eating today. Khan and Dhar (2007)

have shown a similar pattern not only for diet, but a wide range of self-control problems; informing people that they will have additional opportunities for exerting self-control in the future tends to disinhibit control in the present.

Note, however, that this effect could easily go in either direction. On the one hand, people might feel freer to indulge in the present, relying on the (typically mistaken) belief that they will have an opportunity to atone in the future. On the other hand, as argued by Ainslie (2009) and Elster (1989), if people believe that slipping today will inevitably lead to similar behavior in the future, then the knowledge that they will face similar future decisions could aid rather than impede self-control. Indeed, Khan and Dhar (2007) found that when dieters were explicitly informed that current behavior was a strong predictor of future behavior, the effect of learning about future, similar, opportunities to exert self-control was attenuated.

Extending the time over which weight loss is planned decreases the probability that it will occur at all, suggesting that behavior on each day is exempted from the overall plan to change behavior; in a study of people betting on their own weight loss (some with very high stakes), the more days they had to achieve the same daily planned weight loss, the less likely they were to achieve their planned loss and win their bet (Burger and Lynham 2008).

Diminishing Sensitivity

People don't judge the magnitude of things at an absolute level, but almost always relative to some relevant point(s) of comparison (Kahneman and Miller 1986). Thus one can refer to a giant mouse and a tiny elephant without anyone mistaking the correct ranking of their sizes. However, although people make appropriate adjustments for conversational norms, the tendency to judge relative rather than absolute magnitudes can influence decision making, sometimes in non-normative ways. Thus, for example, people will report that they would be willing to travel across town to get a $5 discount on a $20 calculator, but not on a $100 jacket, even though both would involve a certain expenditure of time in exchange for a saving of $5. This tendency toward "diminishing sensitivity" can explain a wide range of decision phenomena, from the widespread tendency to avoid risks for gains but seek them for losses, to the tendency for people to "throw good money after bad"—investing in a losing proposition in a desperate attempt to recoup a loss.

One consequence of diminishing sensitivity is that losing a particular amount of weight is likely to be far less motivating for those at higher levels of weight. Losing 10 pounds is likely to seem very desirable to a 130-pound woman who by doing so could achieve the weight she optimally desires, but a decline from 270 pounds to 260 pounds is likely to be much less inspiring, and hence not worth the effort. Diminishing sensitivity can also interact with narrow bracketing in producing a "what the heck" effect, whereby incremental increases are seen as less threatening once an initial cost is incurred. Believing that a diet is blown on a particular day leads to more subsequent eating for the remainder of that day (Knight and Boland 1989).

Motivated Information Processing

The mind is not a neutral information processor; desires exert a powerful influence on beliefs. Dieting researchers have observed myriad instances of desire-distorted beliefs, such as the many exceptions that dieters permit themselves—food from another person's plate, on holidays, while traveling, and so on. The influence of desires on beliefs is especially important for diet because, as already noted, not eating is not an option. A successful diet requires consumers to track their food intake over the course of days, weeks, and longer, which is a cognitively taxing, and inevitably unreliable, process. Thus, it is not surprising that researchers have observed systematic biases in the recording and recall of food consumption. For instance, people tend to underreport dietary consumption throughout the day, particularly of snacks (Poppitt et al. 1998). Even the task of ascertaining what research participants have eaten in a 24-hour period is difficult, requiring trained personnel to lead people to recall what they ate using a multiple-pass method to ensure that they mention such details as sauces, extra helpings, and details that may seem trivial to the eater but add a considerable number of extra calories throughout the course of the day. If such a high degree of training and care is required for professionals to ascertain how much someone has eaten, imagine how difficult it is for the eater to make such an assessment accurately, without expert help. Dieters and overeaters are particularly vulnerable to this underreporting, especially regarding their fat consumption (Ard et al. 2006; Lissner et al. 2000), perhaps in part due to the guilt associated with thoughts of dietary indiscretions.

Policy Limitations of Conventional Approaches

The rational choice perspective offers two generic types of policy interventions: provide people with better information, or change relative prices (e.g., through taxes) in a fashion that changes eating patterns or encourages exercise. The former can be justified even in the absence of externalities; if people have imperfect information, then giving them more information should improve their welfare. The latter can only be justified on the basis of externalities; in the absence of externalities, changing relative prices will only decrease economic welfare.

Providing Information

If lack of information were the only problem contributing to obesity, one could expect that providing better information would improve the quality of decision making. In a situation in which many factors contribute to overeating, however, the problem is somewhat more complicated. Inevitably, some people will overestimate

the caloric content of the food they consume and some will underestimate. The former group would theoretically respond to better information by increasing their food intake, the latter by decreasing it; thus, the overall impact of accurate information on obesity is ambiguous, and depends on the size of the groups and the magnitude of impacts. Moreover, if there is a systematic tendency among those who are trying to lose weight to overestimate the caloric content of food, as might be the case if people who want to lose weight exaggerate calories as a strategy for motivating themselves, then providing better information would be especially likely to backfire.

In light of these observations, it is perhaps not surprising that research examining the impact of providing diners with calorie information has generally found small or even null effects. For example, perhaps the best-known and most carefully studied effort at improving nutritional (including calorie) information was the Nutrition Labeling and Education Act (NLEA) of 1994, which required consistent nutritional information for packaged foods (USDA 1994). Empirical investigations of the NLEA's impact found that it helped consumers avoid food with high sodium, fat, and cholesterol, and even helped some groups lose weight (Kim et al. 2000; Mathios 2000; Neuhouser et al. 1999; Variyam and Cawley 2006). However, these beneficial effects were generally small in magnitude and limited to narrow segments of the population (Cole and Gaeth 1990; Finkelstein et al. 2005; Moorman 1996). Certainly, the NLEA did not lead a widespread, or even measurable, reduction in population obesity. Generally, availability of nutrition information has been linked to better knowledge, but much less strongly to better diet quality or health (Drichoutis et al. 2009).

Despite the small impact of the NLEA, recently there has been a new wave of enthusiasm about food labeling. New York City led the way, with regulations that mandated posting of calorie information at fast food restaurants, in the same size font as the food items themselves. The NYC regulations were met with optimism, based in part on a study conducted at Subway, a restaurant chain that, before the regulations were passed, started posting calorie information on the display case housing the sandwich ingredients. The research found that those leaving the restaurant who reported having noticed the calorie information consumed, on average, 50 fewer calories than those who did not (Bassett et al. 2008). Despite the fact that one cannot infer from this result that the calorie posting *led* to the difference in calorie consumption (it is equally, or possibly more, likely that those interested in cutting calories paid attention to the information), in a classic case of confusing correlation with causation, or perhaps wishful thinking, the study was widely interpreted in such a fashion.

More rigorous before-after comparisons of the New York City experience have generally tended to vindicate the more pessimistic interpretation of the Subway study. A study examining 14 different fast food chain restaurants in low-income New York neighborhoods before and after menu labeling went into effect found that patrons reported noticing and responding to the labels, but that there were no apparent effects on purchases compared to the period before labeling or to data

from a comparison city (Elbel et al. 2009). Another study used internal register data from over 100 million transactions at Starbucks to examine purchases over time, allowing for a very sensitive evaluation, powered to find extremely small effects. This study found that customers purchased lower-calorie foods after labeling, about 14 fewer calories per transaction, but not lower-calorie drinks (Bollinger et al. 2010). Data from the same study examining individual cardholders suggest that those who had made larger purchases prior to menu labeling were more affected by labeling, and that individual consumers' changed purchasing behavior within New York City maintained when they ate at locations outside the city, relative to consumers in a control city. These findings reveal systematic—but very small—desirable effects of menu labeling among customers purchasing drinks and snacks, but these finding cannot necessarily be generalized to meals. In our own research (Downs et al. 2009), which involved a before-after comparison at two branches of McDonalds, one in Brooklyn and one in Manhattan, we not only measured the impact of calorie posting, but also gave diners information to help them make sense of the information. This study was powered to detect a difference of approximately 50 calories before versus after menu labeling, collapsing across locations, corresponding to one meal's worth of the 150 extra daily calories estimated to be responsible for the increase in obesity in recent decades (Cutler et al. 2003). We randomly selected some diners to receive information about how many calories it is recommended to eat per day, others how many calories it is recommended to eat at lunch (which is when the data were collected), and also collected a control condition in which diners did not receive calorie recommendations. Similar to the other studies, we did not observe a systematic reduction in calories following posting (calories increased at one branch and declined at the other); nor did we observe any impact of providing the calorie recommendations.

Experimental studies of calorie posting have been more likely to find promising results than field studies. Likewise, measures of intentions have tended to show stronger effects than actual behaviors, possibly reflecting that intentions correspond to high-level preferences to lose weight that may be activated by the presence of calorie information but undermined by lower-level visceral motivations that come into play in actual choice. For example, consumers who were informed that their existing food choices were a lot higher in calories and fat than they had believed reported willingness to switch to more healthful options (Burton et al. 2006). But in a review of six studies experimentally manipulating menu labeling, Harnack and French (2008) found the effects of labeling on actual food choices to be weak or inconsistent. The lack of impact of food labeling may be due, in part, to a, perhaps justifiable, lack of confidence in the nutritional information being provided; a recent analysis of restaurant meals revealed that healthier meal options averaged 18 percent more calories than reported on labels (Urban et al. 2010).

Other studies have more rigorously manipulated both specific information about how many calories each menu item contains, and whether a recommendation of overall caloric consumptions was provided, both of which, in laboratory studies, tend to reliably decrease consumption. For example, Roberto and her

colleagues (2010) found that providing calorie information on menu items reduced consumption at that meal, but that consumption later in the day completely compensated for the earlier benefits, whereas adding a recommendation wiped out the compensation. Wisdom and the authors of this review (2010) manipulated calorie information and recommendations orthogonally and found additive effects of these two types of information on meal purchases with no interactions, suggesting that providing calorie recommendations may act more as a cue to eat less rather than a true information source.

Changing Prices

As noted earlier, there have been some studies by economists that have at least suggested a link between changes in relative food prices and changes in diet. However, given the long-term nature of both trends, and the multiplicity of other changes that occurred over the same interval, it is difficult to draw confident conclusions about causality. In laboratory studies, increasing the prices of energy-dense foods decreased their sales relative to less energy dense foods (Epstein et al. 2006), though, unfortunately, the impact of such price changes is smaller for overweight and obese consumers (Epstein et al. 2007).

In contrast to the case of calorie labeling, where there have been large-scale abrupt changes (nationwide for packaged foods and in several cities and states across the country thus far for restaurant menus), there have not been any comparable policies to shift food choice through changes in prices. There has been extensive discussion of the potential effects of taxing high calorie foods (Dodd et al. 2008), and proposals are currently under consideration across the country, but we have much less information about the likely impact of such policies. Price decreases in low-fat foods have been found to lead consumers to switch their choices (e.g., French et al. 1997), suggesting that moderate subsidization of more healthful foods may increase their consumption. But whether positively taxing less healthful options would have an equivalent effect is unclear, as controlled studies have generally subsidized "better" choices (e.g., lower-calorie, lower-fat items) rather than taxing worse ones (Faith et al. 2007).

In sum, available studies of food labeling and changes in relative prices have produced mixed results. Field studies have not generally documented large, or even reliable, effects of food labeling. More controlled randomized experiments have found such effects, but these studies have left important questions unanswered. One important question is whether observed effects will persist, weaken, or strengthen over time. Any of these patterns are possible. For example, once people get used to seeing the calorie information, they might begin to ignore it, in which case the impact on calorie intake would decline over time. Alternatively, it is possible that eating habits might take time to change, or that restaurants will eventually change their offerings once the information is posted, either of which could lead to larger long-term than short-term effects. A second important question is whether any changes in the food consumption that are observed in studies might be offset

by changes in consumption occurring at other times. For example, someone induced by calorie labeling to eat a lower-calorie lunch might be more likely to snack later in the day, or might eat more, or higher-calorie, food for dinner.

Behavioral Economics: Using Decision Errors to Help People

By recognizing that people make systematic errors in decision making and suffer from self-control problems, behavioral economics opens the door to a wider range of interventions than those that naturally stem from the rational choice perspective of conventional economics. Many of these interventions use the same decision errors that usually hurt people to, instead, help them (see Loewenstein et al. 2007, 2010).

The "theory of the second best" (Lipsey and Lancaster 1956) states that when one of the conditions for economic optimality is not met, it may not be optimal to adhere to other optimality conditions. This theory applies to decision making: if decision makers make one type of error, it is not necessarily in their interest to avoid all others, because errors can in some cases at least partially cancel out. Thus, for example, if people smoke cigarettes in part because they tend to choose immediate gratification over their long-term health, it might benefit them to exaggerate the health risks of smoking (though we would, nonetheless, strongly oppose such a policy). If people were smoking at the optimal level, however, then exaggerating the risks to them would not make sense.

Behavioral economists have been using decision errors to help people in two ways. The first approach plays on people's natural laziness when it comes to either physical or mental effort. Thaler and Sunstein (2008), in a book so titled, refer to such interventions as "nudges."

Behavioral "Nudges"

One potential trick to shifting behaviors in healthier directions is to structure choices in such a way that people make more optimal choices for reasons unrelated to obesity concerns. One approach is to play on the natural human proclivity toward laziness—to take the path of least resistance when one is available. Many of the most successful policy interventions by behavioral economists have involved such an approach. For example, in the modern world of defined contribution retirement plans, one of the most important decisions that employees make is the amount of money to put aside into tax-protected retirement accounts. Until recently, the default at most companies was to not put aside such funds unless it was requested by employees (typically through a phone call or other trivial communication); despite the importance of the decision, many employees failed to put money aside, even with generous matches from their employer. Simply changing the default to a

positive fraction of salary led to a very substantial change in retirement savings (Madrian and Shea 2001), and the success of field demonstrations of this effect led to national legislation efforts such as the Pension Protection Act of 2006, allowing employers to enroll workers automatically into default investment plans.

A similar approach that plays on people's laziness could be used to lead people toward lower-calorie meal options, by structuring menus, cookbooks, or buffet lines to make lower-calorie options more convenient. The portion size served onto people's plates is a great predictor of how much they'll end up eating (Wansink and Kim 2005; Wansink 1996, 2004). Even subtle environmental cues such as smaller plates and smaller serving spoons have been show to lead people to take less food and eat smaller meals (Wansink 2006; this volume). Historically, however, the opposite of these trends have generally occurred; food portions in restaurants have been growing larger and more energy-dense over time (Patrick and Nicklas 2005; Popkin et al. 2005), exemplified by the ubiquity of the option of "supersizing" combination meals in fast food restaurants. Indeed, the steady increase in restaurant portion sizes over recent decades has closely paralleled the rise in obesity (Young and Nestle 2002). Even portion sizes in the iconic *Joy of Cooking* cookbooks have been following a trend of increasing calories (Wansink and Payne 2009). Nevertheless, the food industry has shown some interest in these findings, with a very recent, but perhaps ineffective, trend toward marketing snacks in 100-calorie "snack pack" sizes.

To examine the potential impact of convenience on food choice, we conducted a pair of studies at a Subway sandwich shop, which we have already mentioned in connection with calorie labeling (Wisdom et al. 2010). We approached people entering Subway and asked them if they would complete a short survey in exchange for receiving a free "meal deal" consisting of a submarine sandwich, a side order, and a drink. We gave all diners an "express menu" on the front page of the materials that they used to order their free meal. For one-third of diners, the convenience menu contained only low-calorie subs; for one-third it contained a mix; and for the remaining third it contained only higher calorie subs.

In both of the studies we conducted, diners had the option of ordering from the full menu if they chose to, at a trivial extra effort. In one study, they had to open the full menu, which meant breaking a tiny seal (that allowed us to record whether they had done so); in the other, they simply had to turn the page. In both studies, the express menu had a significant impact on sandwich calories, but only in the study with the more difficult-to-access full menu did this translate into reduced total meal calories (77 fewer, on average). In the other study, diners did order lower-calorie subs when confronted with the low-calorie express menu, but they had to pass by their forgone (higher-calorie) options before making the rest of their selections. Perhaps seeing the options that they had forgone made them feel virtuous and entitled to reward themselves. In any case, in this study, they fully compensated for this reduction of calories in their choice of sides and drinks. Although we only examined diners' choices of a single meal (their lunch at Subway), this compensatory effect within the meal reinforces the important need for research that examines the consumption choices that follow—for example, snacks and at dinner.

Another example of using biases to nudge people toward healthier behavior involves the use of pre-commitment devices to disarm the ability of short-term urges to undermine long-term goals—for example, by asking consumers to make decisions in advance about what they want to eat later (Lynch and Zauberman 2006). As predicted by present-biased preferences, people are more likely to choose healthier foods when they select them in advance than when they select them at the moment when they will be consumed (Read and van Leeuwen 1998). Although their efficacy has yet to be evaluated systematically, web sites such as StickK.com give individuals the ability to make such commitments and the tools to make them "stick."

In sum, attempts to "nudge" consumers to make healthier food choices have shown some potential, but the true success of such measures will remain unclear until researchers are able to measure an individual's total food intake—not only calories at a single meal or in a single episode of snacking.

Supercharging Economic Incentives

One of the major trends in health care in recent years has been the use of economic incentives to improve health behaviors. The logic of such programs is compelling. A very large fraction of health problems result from "lifestyle" diseases caused by poor health behaviors such as smoking, lack of exercise, and poor diet. Policy makers, insurance companies, and employers have all begun to ask themselves whether, for example, it does not make more sense to spend money incentivizing a smoker to quit than to spend large amounts of money on ineffective treatments after the smoker has been diagnosed with lung cancer or heart disease. Incentives have been found to be effective for promoting healthier behavior in some cases and among some people (Charness and Gneezy 2009), but a better understanding of how people understand these incentives is needed.

Behavioral economists have been part of this new trend. A central insight of behavioral economics is that, contrary to the standard view that a dollar equals a dollar regardless of how it is delivered, the manner in which incentives are delivered can make a huge difference in whether, and to what degree, they alter behavior. The same dollar values of incentives that are often delivered in a fashion that is so ineffective that one might as well burn the money (e.g., by lumping small incentive payments with other large money amounts in year-end pay checks), could instead be delivered in ways that maximize their effectiveness.

In a variety of research projects conducted with Kevin Volpp and others, the second author of this chapter has been using ideas from behavioral economics to "supercharge" economic incentives in programs designed to improve health behaviors, including weight loss. In one study, Volpp, Loewenstein, and coauthors (Volpp et al. 2008) provided economic incentives for overweight veterans to lose one pound per week for 16 weeks. Some participants were randomly assigned to a "deposit contract" condition in which they deposited their own money (from $.01 to $3.00 a day), which was matched 1:1 by the experimenters. Those who remained

under the target weight goal implied by losing one pound per week, and called in their weight by phone each day, received the money they had deposited back, plus the match (and a fixed payment of $3.00 per day); those who exceeded the target lost the money they had deposited and received no other payments. Like the nudge interventions, which play on natural laziness, the deposit contract plays on two decision errors: overconfidence (which leads people to be overly optimistic about their chances of losing weight, and hence to be willing to deposit substantial sums) and loss aversion (which makes them highly averse to losing the money once they have deposited it).

Other participants were assigned to a "regret lottery" condition in which they were given a two-digit number (e.g., 27), and each night experimenters drew a random two-digit number. If either of the two digits matched (e.g., the experimenters drew a 25 or a 57), then the participant was eligible for a $10 reward, and if both digits matched, the participant was eligible for a $100 reward. Participants were informed if they had matched each day, but only received payment if they had called in their weight earlier during the day and had been under the target weight. If they matched but were above their target weight, they were informed of the money they could have won but did not. The regret lottery again plays on decision errors, including the tendency to overvalue small probabilities, which contributes to the popularity of lotteries and, although arguably not an "error," the aversion most people have toward experiencing regret.

The program was highly successful, when measured by its success in achieving its goals. Forty-seven percent of those in the deposit contract condition achieved the target of losing 16 pounds (mean weight loss of 14 pounds in this condition), and 53 percent of those in the lottery condition achieved the goal (mean loss of 13 pounds). However, by three months after the termination of the study, participants in the two incentive conditions had gained back most of the weight they had lost. A subsequent study involving only deposit contracts (with no $3 fixed payment) was similarly successful in inducing participants to lose weight over an eight-month (as opposed to four-month) period, but again, after incentives were removed, participants regained most of the weight they had lost.

These findings, and others in domains other than weight loss, suggest that ideas from behavioral economics can, indeed, be used to enhance the effectiveness of economic incentives. However, many questions remain to be resolved by future research, and there is a pressing need for interventions that help people achieve lasting change that extends after the cessation of incentives.

Conclusions

In sum, behavioral economics can contribute to solutions to the problem of obesity both by providing a better understanding of the phenomenon than is offered by

conventional economics and by suggesting new approaches to policies designed to combat the problem. Much research is still needed on both of these dimensions. For example, while it seems likely that some combination of "peanuts effects" and present-biased preferences plays a role in obesity, the relative importance of each of these factors, and of other decision errors, is unclear. Research is also needed to further fine-tune the effectiveness of behavior change programs that incorporate ideas from behavioral economics. Figuring out ways to develop habits that persist when rewards are withdrawn is an especially pressing priority.

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