

Behavioral Economics and Health

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Abstract

Behavioral Economics combines the insights of Economics and Psychology to identify how individuals deviate from the standard assumptions of economic theory and to build systematic deviations into improved models of human behavior. These models allow researchers to better describe and predict individual behavior. Lessons from Behavioral Economics can be leveraged to design large-scale public health interventions and achieve policy goals.

This chapter begins with a broad overview of Behavioral Economics and identifies settings in which policy makers may wish to intervene in health decisions. The rest of the chapter explores four major topic areas within Behavioral Economics — reward incentives, information and salience, context and framing, and social forces — and investigates their influence on health behaviors including medication adherence, obesity and weight control, and medical donation.

Within each of the four topic areas we discuss the relevant predictions of standard economic theory, we provide evidence of the behavioral forces that lead individuals to deviate from these predictions, and then we describe various public health interventions that have leveraged the lessons of Behavioral Economics to achieve policy goals.

Keywords: Behavioral Economics, Economics, externalities, interventions, commitment contracts, loss aversion, bounded rationality, default effects, social forces, salience, framing

I. Introduction

Behavioral Economics is a field at the intersection of Economics and Psychology. Standard economic theory is built on the assumption that individuals are fully rational, completely selfish, forward-thinking decision makers. This set of assumptions has allowed economists to predict behavior using simple and tractable analytical models. But research from both Economics and Psychology has demonstrated that individuals regularly deviate from the predictions of standard economic theory and do so in systematic ways. Behavioral Economics aims to (1) explain why individuals deviate from the assumptions of standard economic theory and (2) use these insights to advance our models of individual behavior.

By improving our models, Behavioral Economics allows policy makers to design interventions — like the health interventions that are described in this chapter — to more effectively achieve policy goals. In this way, Behavioral Economics is both descriptive, giving us a better picture of what behavior looks like (and why it looks that way), and prescriptive, suggesting how policy can most effectively impact individual decision-making.

In this chapter, we discuss four major topic areas within Economics and Behavioral Economics: (1) reward incentives, (2) information and salience, (3) context and framing, and (4) social forces. We will address each topic area with a section of the chapter. Within each section, we will highlight some of the topic area's most influential papers — including some from outside the health domain, which we believe provide relevant background.

Throughout the chapter, we describe research on a number of important health behaviors, including: medication adherence, obesity and weight control, and medical donation. While we touch on a number of other health behaviors in the chapter, we describe these three (and the reasons we find them of particular interest) in the following section.

It is worth noting that this chapter is by no means exhaustive in its coverage of the Behavioral Economics insights that might influence health behaviors or of the health behaviors that might be subject to the insights we discuss. Instead, we have picked a few

illustrative settings where we have seen fruitful application of Behavioral Economics research and expect to see more in the coming years.

Externalities

Since many papers described in this chapter analyze interventions that affect health behaviors, it is worth outlining in broad strokes what standard economic theory says about when policy makers should be intervening in the health domain. This exercise provides a baseline for thinking through the additional policy interventions that might be justified by results from Behavioral Economics.

As noted above, standard economic theory models individuals as fully rational, selfish, and forward thinking. Individuals who satisfy these assumptions (who we simply call “rational” throughout) are usually better off when left to their own devices. If a rational individual fails to take his doctor-prescribed medication, his decision is likely best for him, since by assumption he has thought through all the costs and benefits and decided that the costs (e.g. the cost of purchasing his medication and the pain of the side effects) outweigh the potential benefits (e.g. his lower risk of a heart attack).

Under the assumption that individuals are rational, there are generally only two reasons for intervention. First, if the rational individual suffers from a constraint that prevents him from implementing his preferred choice (e.g. he cannot afford to purchase his medication even though he would like to take it) then a policy maker may want to help the individual by loosening those constraints (e.g. providing him with a loan to help pay for his medication). Second, a policy maker may want to intervene if a decision creates *externalities*. Externalities are indirect effects on other agents that an individual does not fully consider when making his decisions. For example, if the patient in the example above cannot afford his cost of care for his heart attack, then when he fails to take his medication he forces society (i.e. the government and thus all tax payers) to cover some of his higher costs. Consequently, his decision about whether or not to take his medication affects people beside himself. That individuals fail to consider the costs imposed on other agents (or the benefits incurred by other agents) generally leads to socially inefficient outcomes.

Externalities are the key rationale for policy interventions across a number of domains both inside and outside of health. The government taxes pollution created by companies and individuals since pollution imposes negative externalities on those exposed to it. Regulation that forbids individuals from blasting music at 3 AM is designed to discourage the negative externality a rowdy party might have on neighbors who want to go to sleep.

As hinted above, a number of activities in the health domain create externalities. Some of the externalities are obvious while others are not. On the obvious end of the spectrum, medical donations (e.g. donations of blood, bone marrow, tissues, and organs) create positive externalities since they clearly benefit other people. Individuals who receive donor kidneys can expect better health outcomes than if they remained on dialysis. Some forms of preventative care are both beneficial to the recipient and create positive externalities for the health of other people. Receiving a flu-shot or a vaccine helps keep the recipient from getting sick but also plays an important role in preventing the spread of disease since inoculated individuals are less likely to spread a virus. At the less obvious end of the spectrum, many activities that make a person healthier (e.g. healthy eating, exercise, medication adherence, and smoking cessation) can generate positive externalities for society since most individuals do not pay the full cost of their medical care and are instead covered in part by health insurance, the government, or a combination of the two. Consequently, requiring less care or staying healthy for longer (and requiring care later in life) makes the individual better off and lessens the cost paid by others in insurance premiums and taxes.

Given that many health activities have positive externalities, it may be socially beneficial to encourage individuals to engage in them. Economics and Behavioral Economics can provide strategies to most effectively encourage people to eat healthy, take their medication, donate their organs, get flu shots, and so on.

Behavioral Biases

When rational individuals do not face constraints that restrict their choice and do not impose externalities with their actions, then there is little scope for intervention, even if we disagree with individuals' choices. An individual who can afford his medication

and pays for all his health costs out of pocket may choose not to take his medication because he simply prefers not to. If he is fully informed about the costs and benefits and he is rational, we can do no better than to trust his judgment.

Behavioral Economics has demonstrated, however, that individuals are not fully rational in the way standard economic theory predicts. Individuals who are not fully rational (who we will call “behavioral”) might suffer from behavioral biases that make it difficult for them to achieve the behavior they actually prefer. This introduces another rationale for intervention: helping individuals achieve their own desired behavior.

For example, one way in which behavioral individuals may make sub-optimal choices is by displaying *present bias*. In particular, individuals often overweight costs and benefits incurred today (i.e. the present) relative to the costs and benefits incurred tomorrow (i.e. the future). This type of bias can lead individuals to forgo healthy behaviors and do so in a way that is inconsistent across time. Imagine an individual deciding whether to go to the gym, which has a cost today in terms of time and fatigue but has health benefits in the future. When considering his choice today, he may overweight the time and fatigue costs — since they are incurred in the present — and so decide to skip the gym. When considering his choice for tomorrow, however, he would not overweight those costs. When considering tomorrow, he may prefer to go to the gym and even believe that he will do so. When tomorrow arrives, however, it has become the present, and he again overweighs the time and fatigue costs and again skips the workout.

This inconsistent behavior is not unique to going to the gym. It can explain why individuals procrastinate about eating health, quitting smoking, or getting a flu shot. Each of these activities features a present cost (e.g. sacrificing something you enjoy, giving up time, incurring physical discomfort) and a delayed benefit (e.g. better health) and so individuals might perpetually wait to incur those costs until a never-arriving tomorrow. If our patient from the medication example earlier in this section were present biased, he might skip taking his pill because he overweighs the small costs he faces today like paying for the prescription and experiencing side effects. We consider these examples mistakes because if the behavioral agent could commit today to force himself to go to the gym (or eat the apple, or quit smoking, or get the flu shot, or take his pill) tomorrow, he

would choose to do so. Behavioral individuals may want help making choices and following through with them.

Present bias is just one of many behavioral phenomena that might make individuals deviate from their own desired behavior. For example, a behavioral individual might forget to take his medication, which a rational agent would not do. A behavioral individual might not attend to all the relevant data needed to make an informed decision about whether to take the pill or might fail to aggregate the data he does consider.

Behavioral Economics can help identify cases where individuals might have trouble (e.g. due to present bias or forgetfulness) and suggest strategies to help individuals achieve their ideal behaviors (e.g. commitment contracts, discussed in Section III; or reminders, discussed in Section IV). As we go through each topic area, we will describe the way individual behavior differs from the predictions of standard economic theory. We will then describe interventions — suggested by Economics and Behavioral Economics — that can encourage individuals to improve their own decision-making and generate better health outcomes for the decision maker and better outcomes for society at large.

II. Health Behaviors

Here we highlight three health behaviors that we reference repeatedly throughout the chapter. We think these behaviors are of particular interest for interventions motivated by Behavioral Economics.

Medication Adherence

The failure of individuals to properly adhere to medication regimens prescribed by their doctors is a major issue in healthcare. Non-adherence can often lead to serious health consequences as well as increased health care costs down the road. Estimates from Osterberg and Blaschke (2005) suggest that around half of all medication-related hospital admissions in the U.S. are a result of failure to adhere properly to medication. These hospital admissions are estimated to cost approximately \$100 billion a year. While medication expense may be part of the explanation, non-adherence is a problem even among patients who face zero copays and so can get their medication for free (see Doshi *et al.* 2009). Cutler and Everett (2010) suggest various reasons why people fail to adhere to medication including: lifestyle, psychological issues, health literacy, support systems, and side effects. Behavioral Economics interventions that help individuals overcome some of the common barriers to adherence can generate better health outcomes and lower cost of care.

Obesity and Weight Control

Obesity is a major problem in health care and is blamed for over 110,000 deaths a year in the United States alone (Flegal *et al.* 2007). Flegal *et al.* (2010) calculate that 68 percent of Americans are overweight or obese. Schroeder (2007) suggests that decreasing obesity — along with decreasing smoking — can lead to substantial improvements in the state of health in the United States. Individuals often have trouble controlling their weight. DellaVigna and Malmendier (2006) find that individuals buy expensive monthly gym memberships but go so infrequently that paying per visit would cost less. This result suggests that individuals have trouble making it to the gym even though they want to and intend to go. Behavioral Economics can help explain the difficulty individuals have in sticking to a weight-loss regimen and can provide strategies or interventions to help

people succeed.

Medical Donation

There are a number of forms of medical donation, including blood and plasma donation, bone marrow donation, and organ and tissue donation. Medical donation is an important area of health research since these donations can have a substantial impact on health outcomes (Schnitzler *et al.* 2005a,b) and cost of care (Dew 1997) and there is often significant need. As of March 2013 over 117,000 individuals in the U.S. were on the waiting list for an organ transplant (UNOS 2013). Registered organ donors make their organs available for transplant upon their death, and one deceased donor can provide up to eight life-saving organs. However, only 43% of Americans over the age of 18 were registered as organ donors (Donate Life America 2012). Behavioral Economics interventions may be particularly relevant in motivating medical donation since monetary incentives are often not allowed in medical donation (Roth 2007).

III. Reward Incentives

Reward incentives are a natural place to start an investigation of how economic and behavioral economic forces impact health behaviors. Reward incentives show how traditional economic interventions work and how these interventions can be improved by insights from Behavioral Economics.

In standard economic theory, individuals value money and other tangible rewards and engage in effort to get them. People go to work to earn money and we expect them to work harder when there is more money at stake. Consequently, standard economic theory suggests that reward incentives — particularly monetary incentives — can motivate individuals to engage in behaviors that they otherwise would avoid. We begin this section by describing interventions that utilize standard reward incentives in the health domain.

Behavioral Economics has made two important advances with regard to reward incentives and how they affect behavior. First, it has suggested that not all incentives are created equal. Individuals overweight small probability events and feel losses more severely than equivalent gains. A reward incentive that leverages these biases might be more effective for the same expected value. Second, and much more troubling for standard economic theory, Behavioral Economics has shown that in certain domains individuals respond in perverse ways to reward incentives. In some settings, monetary incentives lead individuals to respond with *less* effort rather than more.

After describing settings where standard reward incentives motivate health behaviors, we catalogue examples of interventions that leverage behavioral biases in designing reward incentives. Finally, we describe settings where reward incentives backfire.

Standard Reward Incentives

There are a number of health domains where standard reward incentives have been shown to successfully influence health behaviors. Here we highlight their use in three domains: obesity and weight control, smoking cessation, and medical donation.

In the context of obesity and weight control, researchers have used monetary and non-monetary incentives to encourage more frequent gym attendance. Charness and Gneezy (2009) report the results of two such studies on incentives and gym attendance.

In the first study, they compare the gym attendance of three groups of college students participating in a randomized experiment. One group was provided only with information regarding the value of exercise. A second group was provided with the same information and received an additional \$25 if they visited the gym once in the following week. A third group was treated like the second group but received an additional \$100 if they visited the gym 8 more times in the following four weeks. The authors find that individuals respond to monetary incentives. Those who were paid to go to the gym were much more likely to do so, and those who were paid for more visits went more often. The second study took a similar form but included biometric measures to better gauge health improvements. The study found that individuals paid to go to the gym more often had lower body fat, lower BMI, and improved on a number of other health measures. The authors provide evidence that the effects from both studies persist; those who were paid to go to the gym continued to do so at higher rates for a few months after the incentives were removed. This result suggests that these individuals may have formed a habit of gym attendance. As will be seen throughout this section, this potential habit formation is quite rare in the context of reward incentives.

A similar study by Acland and Levy (2011) also finds that individuals were more likely to go to the gym when paid to do so. They also observe that the effect persists in the weeks after the incentive was removed. After a semester break, however, the group that had seemed to form a habit for gym attendance was no longer more likely to attend, suggesting that the habit was short-lived.

In the context of smoking cessation, Volpp *et al.* (2009) report the results from an experiment at a multinational company. Half of the employees in their sample were given information about smoking cessation programs while the other half received the same information plus incentives worth a total of \$750 for enrolling in a program, quitting smoking within 6 months, and staying quit for an additional 6 months. Individuals with the incentives were significantly more likely to complete the program, quit, and stay quit.

In the context of medical donation, the use of monetary incentives is often restricted. For example, the National Organ Transplant Act of 1984 prohibits the use of “valuable consideration” to induce organ donation. Fortunately, standard economic theory does not require that reward incentives be monetary for them to be effective. In the

context of medical donation, a variety of non-monetary reward incentives have been shown to generate increased willingness to donate.

Individuals are more likely to donate blood when provided with coupons for merchandise (Ferrari *et al.* 1985), lottery tickets (Goette and Stutzer 2008), and other incentives (for a summary of blood donation incentives, see Goette, Stutzer and Frey 2010). Lacetera, Macis and Slonim (2012) do an extensive empirical analysis of participation in American Red Cross blood drives and find that drives with non-monetary incentives for blood donation (including blankets, T-shirts, mugs, and coupons to retailers) generate more donors. In addition, the larger the economic value of the incentive, the bigger the increase in donors. They caution, however, that some of the increase in donation may be the result of substitution away from nearby drives that do not have incentives. A review of a variety of blood donation research supports the claim that incentives increase blood donation without affecting quality (Lacetera, Macis and Slonim 2013). Related work has demonstrated that individuals are more likely to become bone marrow donors when legislation that provides donors with paid leave and tax incentives is in place (Lacetera, Macis and Stith 2012).

A particular non-monetary incentive that might motivate individuals to register as organ donors is priority on organ donation waiting lists for those who register but end up needing organs rather than being in a position to provide them. This non-monetary incentive — a higher likelihood of receiving a transplantable organ or receiving a transplantable organ more quickly — can be given to registered donors simply by changing the way organs are allocated. Both Israel and Singapore currently provide priority on organ donor waiting lists to registered donors. Kessler and Roth (2012) investigate the effect of a priority rule on a laboratory game designed to look like organ donor registration and show that it substantially increase likelihood of donation.

Early data from Israel, which implemented the policy fully in 2012, suggests that the policy may have increased the number of deceased organ donors and the organ donation rate (Lavee *et al.* 2013). One quirk of the Israeli policy, however, is that it has the potential for a loophole that allows individuals to receive priority without ever being in a position to donate their organs. A follow-up study (Kessler and Roth 2013) investigates the effect of a loophole and finds that in a laboratory setting, such a loophole

can eliminate the beneficial effect of the priority rule. Allowing individuals to receive the priority without paying the costs of donation completely eliminates the effectiveness of the priority rule. In addition, when subjects receive feedback about the use of the loophole they become less likely to register as donors than when no priority system is available, suggesting that how these priority systems are implemented can be crucial to their success.

Designing Incentives using Behavioral Economics

As noted above, Behavioral Economics has shown that individuals overweight small probability events and feel losses more severely than equivalent gains (called *loss aversion*, see Kahneman and Tversky 1979). In addition, individuals do not like to feel regret (called *regret aversion*).

Lotteries can take advantage of the fact that individuals overweight small probability events. For example, providing a 1% chance of winning \$100 might motivate people more substantially than offering them \$1 directly, even though the two have the same expected value.

Combining probability weighting with loss aversion and regret aversion, some studies have motivated individuals to take health actions using *regret lotteries*. In a regret lottery, all individuals are entered into the lottery and informed about whether their name is picked. If an individual fails to take a required action, however, she fails to earn the lottery prize when picked. Even if a 1% chance of winning \$100 is not enough to motivate an individual to take an action (e.g. going to the gym today), she might go to the gym to avoid the potential distress of knowing she would have won \$100 but lost it by skipping her workout. The regret lottery leverages overweighting of small probabilities through the lottery, loss aversion by framing the earnings as money that is lost, and regret aversion since it threatens individuals who fail to take the rewarded action with feelings of regret.

Regret lotteries have successfully influenced behavior in a variety of health domains. In the context of medication adherence, Volpp *et al.* (2008) find that providing a regret lottery worth either \$3 or \$5 in expected value significantly increases the likelihood that individuals correctly take their prescribed medications. In the context of

weight loss, Volpp *et al.* (2008) find that subjects lose significantly more weight when provided with a regret lottery that pays out an expected \$3 per day (in the form of a 20% chance of winning \$10 plus a 1% chance of winning \$100) if the subject is on track to his or her weight loss goal.

Another way to leverage loss aversion with monetary incentives is to provide individuals the opportunity to make *commitment contracts* (also called *deposit contracts*) in which they put up their own money. This money is then forfeited if they fail to achieve a certain goal, such as reaching a weight loss target or attending the gym a specified number of times in a week or month. This strategy allows individuals to create monetary incentives for themselves and leverage loss aversion simultaneously. Volpp *et al.* (2008) also find that a commitment contract (in which committed funds were matched 1-to-1 by researchers to increase take up) was effective at achieving weight lost by study participants.

One concern with monetary incentives of any form is that they may generate short-term effects. Once the monetary incentives are removed, individuals may backslide into their unhealthy behaviors. In Volpp *et al.* (2008) once the regret lottery or commitment contract was removed, both groups regained a significant amount of the weight they had lost during the study. John *et al.* (2011) run a longer study in which some subjects have a commitment contract to lose weight (also with a 1-to-1 match) for a period of 24 weeks. They find that subjects with the commitment contract lose significantly more weight but much of the weight is regained in the 8 weeks after the incentive is removed. At the end of those 8 weeks, the weight of the group that previously had the contract was no different from the control group that never had the contract.

On the other hand, Giné *et al.* (2010) find that the effects of a six-month commitment contract on smoking cessation can persist over the long run. In particular, they find that smokers who were randomly offered the contract were significantly more likely to pass a urine test for nicotine and cotinine (byproducts of tobacco use), and they remained significantly more likely to pass another (surprise) urine test administered six months after the removal of the incentive.

Box 1: Behavioral Economics in Action

Behavioural Insights Team (BIT)

Established in 2010 by U.K. Prime Minister David Cameron, the BIT (nicknamed the “Nudge Unit”) uses insights from Behavioral Economics and Psychology in developing and testing different public policy measures. For example, inspired in part by Giné *et al.* (2010), the BIT is considering using loss-aversion and commitment contracts in their countrywide efforts to reduce smoking (BIT 2010).

StickK.com

The brainchild of several economists, StickK.com is a website that allows individuals to create and enter into their own commitment contracts to help them achieve personal goals. Common personal goals include losing weight, exercising regularly, and quitting smoking. Individuals determine how much money, if any, to put at stake and designate another individual to verify the goal outcome. Should an individual fail to reach his or her goal, the forfeited money goes to a charity of their choice or to an “anti-charity” that the individual does not want to support, making failure to meet the commitment feel even more costly.

There are other ways in which incentives can be altered to take advantage of forces uncovered by Behavioral Economics. One example is to bundle a something desirable (or addictive) with a behavior you want to encourage. The old adage “a spoonful of sugar helps the medicine go down” can help explain why some vitamins are candy-coated. In this spirit, Milkman *et al.* (2013) developed an incentive for gym attendance using an activity that they deemed to be desirable and possibly addictive. In their study, researchers provided each subject in their treatment groups with a loaner-iPod loaded with popular books-on-tape that were considered relatively addictive (e.g. *The Hunger Games* and *The Da Vinci Code*). For one treatment group, the iPods were stored in lockers at the gym and could only be accessed if the subject was at the gym. The authors found a significant increase in gym attendance in this group over the control group, but also found that the effect deteriorated over time.

Crowding Out

Researchers in a number of disciplines across the social sciences have uncovered some perverse effects of incentives. In particular, financial incentives have been shown at times to decrease effort rather than increase it. This phenomenon has been called

crowding out of intrinsic motivation as the monetary incentive is thought to replace the intrinsic motivation to engage in an action (see Gneezy, Meier, and Rey-Biel 2011 for a summary).

For example, Gneezy and Rustichini (2000a,b) find a number of crowding out results in domains outside of health. They find that paying people a small amount for each correct IQ problem solved can lead to fewer solved problems than if no monetary incentive is in place. They also find that paying money to volunteers (e.g. 1% or 10% of the amount of money collected while door-to-door fundraising) can decrease the amount of money volunteers collect. Finally, imposing a monetary fine for being late to pick up children from daycare led parents to be late more often rather than less. Similarly, it has been shown that paying people for a short while to take a certain action and then removing the incentive can lead individuals to provide less effort than before the incentive was introduced (Deci 1971).

In the context of medical donation, Titmuss (1971) argued that providing a monetary incentive for blood donation might decrease the amount of blood received. Mellstrom and Johannesson (2008) find some weak evidence of this crowding out in blood donation in response to an incentive worth about \$7. In their experiment, they offer the incentive to subjects to complete a health examination that was required to become a blood donor. In one treatment the incentive could only be taken in cash while in another treatment the subjects had the option to have the money donated to charity. They do not see crowding out in response to the incentive on average, but they do see it among women. Interestingly, crowding out is only present when the incentive must be taken in cash and donation rates return to the control treatment levels when the money can be donated to charity.

Discussion

One disadvantage of financial interventions is that pay-for-performance schemes like providing monetary incentives to engage in health behavior are viewed by many as unfair or unethical (see, e.g. Long *et al.* 2008). There may be a way to mitigate this concern by making the incentives non-monetary. In the context of blood donation,

individuals report a larger willingness to donate for a 10-euro voucher (to purchase books or food) rather than for 10 euros in cash (Lacetera and Macis 2010).

As seen throughout this section, another potential disadvantage of reward incentives is that they may fail to build enduring habits. While very effective when in place, monetary incentives regularly fail to motivate continued behavior change after they are removed. Only a few studies we discussed — Volpp *et al.* (2009), Charness and Gneezy (2009), Giné *et al.* (2010), and Acland and Levy (2011) — found evidence that paying subjects to engage in a health behavior had a lasting impact. In addition, Acland and Levy (2011) suggest that an exogenous break in attendance (a semester break for students) eliminated this effect. One solution to this problem is to keep monetary incentives in place indefinitely, a possibility using variation in premiums allowed under the Patient Protection and Affordable Care Act (Volpp *et al.* 2011).

The inability for monetary incentives to lead to sustained behavior change may be in part a function of the potential crowding out effects of such incentives, although there is still much work to be done to better understand crowding out effects and habit formation in health behaviors.

IV. Salience and Information

An assumption made by standard economic theory is that individuals have no limitation in their ability to make decisions, either in terms of the cognitive capacity to solve complex problems or the amount of time needed to do so.

To illustrate, imagine an individual who enters a store to purchase groceries. According to standard economic theory, this individual considers all the goods he expects to be available for purchase in the store (including all their prices or, if the prices are too costly to discover, what he expects their prices to be) and calculates which basket of goods would be best for him to buy. In doing so the individual also considers items in others stores that he could potentially buy instead, factoring in the time and cost it would take to drive to those stores to continue his shopping.

In reality, we have finite mental resources available to make our decisions so we are prone to ignore much of the information available and take shortcuts in aggregating what information we do attend to. An actual individual walking into the grocery store might forget to pick up his vitamins, be distracted by a prominent display of candy, or simply not realize that a healthier snack alternative is available on a bottom shelf.

Another way to put this is that individuals are *boundedly rational*. Simon (1957) suggested that because individuals are limited by their cognitive capacity, as well as by information and time constraints, they lack the resources to make a truly optimal decision. Any decisions made by a boundedly rational individual are at best optimal within his or her constraints.

Bounded rationality can influence individual behavior in several ways. For instance, individuals may exhibit forgetfulness (i.e. limited memory), may fail to pay attention (i.e. inattention), and may make decisions without collecting all the relevant information available (i.e. imperfect information). We address these three phenomena and their applications to health behaviors in turn below.

Limited Memory

No one likes to forget things. During the course of a day, however, many different pieces of information are presented to us, and we must exert mental energy to remember the important ones.

In the health realm, this limited ability to perfectly store and process information can help explain the difficulty many individuals have in adhering to a prescribed course of treatment. One potential explanation for poor medication adherence is that individuals are forgetful. Several studies have investigated interventions designed to remind people to take their medication. In theory, the ideal intervention require no additional cognitive resources.

To this end, electronic reminders are increasingly being used to address poor medication adherence rates. These reminders alert individuals by either providing an audial or visual reminder or by sending an automatic electronic message such as a text message. Electronic reminders present two distinct advantages over other types of reminders. First, these electronic reminders *actively* remind individuals to take their medication. In contrast, passive reminders such as day-of-the-week pillboxes or blister packaging provide information that medication should be taken but are not helpful reminders if they are not seen. Active reminders are better suited for individuals whose main reason for poor adherence is forgetfulness whereas passive reminders assist individuals who need help remembering the correct dosage and combination of medication when it is taken. Second, these reminders can be automated to arrive at a specific time. For example, if an individual is liable to forget to take his medication, a reminder provided when he is not with his pills might also be forgotten and fail to improve adherence. Third, these reminders are relatively inexpensive because they can be automated. Alternative reminders such as personal phone calls can increase adherence but often require costly time investment and commitment by health care providers.

Vervloet *et al.* (2012) review thirteen randomized control trials that test the effectiveness of different electronic reminders on adherence to various types of chronic medication. They find evidence suggesting that electronic reminders encourage medication adherence in the short-run (less than 6 months) but are less effective over the long run. Furthermore, effectiveness can vary across medications for a given type of electronic reminder. While text messages are an effective tool for increasing adherence among adult patients with HIV (Hardy *et al.* 2011, Pop-Eleches *et al.* 2011) or children requiring influenza vaccinations (Stockwell *et al.* 2012), they have mixed effects on adherence for women taking oral contraceptives (Hou *et al.* 2010, Castano *et al.* 2012).

Forgetfulness can influence other health decisions as well. A large number of preventative care measures require individuals to remember not only to set up an appointment but also to follow through with it. The Centers for Disease Control and Prevention recommend numerous preventative screening measures ranging from checks for high blood pressure to diabetes screenings. Many individuals fail to take the recommended preventative care measures, even when the monetary costs of doing so are effectively zero. Forgetfulness may help to explain why individuals fail to take these recommended preventative care measures.

The difficulty in remembering to engage in recommended health behaviors has prompted both individuals and employers to seek out ways to outsource the task of remembering. The company Evive Health, LLC keeps track of when the employees of their clients are due for preventative screenings and sends personalized reminders at the appropriate times, encouraging employees to make appointments and providing information on how to do so. That employers are willing to pay companies such as Evive highlights the importance of these behavioral consequences on health outcomes.

Inattention

The salience of a given piece of information, or the degree to which that piece of information stands out relative to other information, can affect whether an individual considers it in her decision-making process. If a piece of information is not particularly salient, it might be overlooked or more easily forgotten. Consider two individuals who must remember to take their medication. The first individual has a toothache and experiences acute pain when he forgets his medication. The second individual suffers from high cholesterol and does not discern any noticeable difference in discomfort if he forgets. Because the pain of forgetting is more salient for the individual with a toothache, he may more likely to remember his medication than the individual with high cholesterol. In this case, the salience of individual health symptoms can influence whether or not an individual remembers to take his medication.

Salience may also play a role by affecting the actual act of remembering. A person who programs a reminder into their calendar for their next doctor's appointment is effectively making that appointment more salient. Milkman *et al.* (2011) design a field

experiment to test whether suggesting individuals write down when they intend to get an influenza vaccine (i.e. making it more salient) increases rates of vaccination. The authors study the behavior of employees who receive a reminder mailing that provides information on the times and locations of free on-site vaccination clinics. Treated subjects were randomly assigned to receive a prompt to write down either (1) the date the employee plans to get vaccinated or (2) both the date and the time the employee plans to get vaccinated. The authors find that the vaccination rate for employees with the date and time prompt was significantly higher than for the control group that was not prompted to write down anything. The rate for employees with the date only prompt was directionally, but not significantly, higher than the control group. These results suggest that encouraging individuals to make a more concrete plan — making the plan more salient — can increase the likelihood of compliance.

Imperfect Information

Regardless of whether a person is rational or is subject to behavioral biases, information is necessary to make the optimal decision. Consequently, decisions often change as more information becomes available. Bounded rationality can influence this process if it prevents individuals from optimally gathering or aggregating information.

In the past two decades, a growing literature has emerged looking at the effects of providing nutritional or caloric information on nutrient intake, the consumption of food, and other health outcomes. Such information could affect behavior if individuals do not otherwise have all the information they need to make their food consumption decisions.

Several papers have studied the impact of the Nutrition Labeling and Education Act (NLEA), which mandated the nutrition labeling of all pre-packaged foods in the U.S. beginning in 1994. Prior to the NLEA, nutritional labeling was voluntary with the exception of products that contained added nutrients or made nutritional claims. These studies find that the enactment of the NLEA was associated with decreased body weight (for some groups) and lower probability of obesity (Variyam and Cawley 2006), increased fiber and iron intake (Variyam 2007), and lower calorie intake (Abaluck 2011; Kim *et al.* 2000).

Other papers in the literature have instead focused on the provision of information on the calorie content of foods. Several cities in the U.S., such as New York and Philadelphia, currently require chain restaurants to post the caloric content of their menu items. These laws are in part a reaction to the concern that individuals may have imperfect information as to the true nutritional value of the items they purchase, which may in turn lead to sub-optimal food consumption. Wisdom *et al.* (2010) conducted a field experiment at a fast-food sandwich chain to study the effects of providing calorie information. They find that total calorie consumption significantly decreases by sixty calories on average when information on calorie content is provided. Wisdom *et al.* (2012) find that making healthier sandwiches a more convenient choice relative to less healthy sandwiches has significant decreases on total calorie consumption but only when the intervention is relatively heavy-handed. While these findings suggest that consumers do in fact change their consumption decisions when given more information, evidence from other studies is more mixed (Bollinger *et al.* 2011; Elbel *et al.* 2009; Finkelstein *et al.* 2011). In addition, many of these studies are limited by the fact that individuals who are induced to consume less due to an experimental treatment may consume more at a later meal when the experimenter can no longer observe them.

Discussion

The extent to which we care that individuals are boundedly rational depends on whether (and by how much) individuals are made worse off because of their cognitive limitations. In the realm of health care, the cognitive limitations faced by boundedly rational individuals might have important ramifications for health and their overall wellbeing.

Despite the research in this field, a great deal remains unknown about bounded rationality in the health domain and how to best address cognitive resource limitations. We do not yet understand in which settings the behaviors will be most affected by bounded rationality. For example, the likelihood of forgetting (and thus the effectiveness of reminders) may depend on the size of the costs to non-adherence. On one hand, the likelihood of forgetting to take a medication may be higher when a disease is serious and an individual does not want to think about it — suggesting reminders may be most

valuable when the consequences of non-adherence are relatively large. Alternatively, the likelihood of forgetting might be higher when the stakes are lower — suggesting reminders will help most when the consequences of non-adherence are small.

Additionally, it is hard to trace back from a given behavior to a particular behavioral bias or cognitive limitation, which makes it hard to identify what intervention will be most effective. For example, an individual may fail to make mammogram appointment not because she is forgetful but instead because the costs associated with figuring out where to make an appointment are too great, or because she lacks full information on the risks of breast cancer, or because she perpetually plans to do it tomorrow. Knowing how to most successfully impact behavior requires a better understanding of its underlying cause.

V. Context and Framing

According to standard economic theory, rational individuals make the optimal choice given the set of options available and the constraints they face. The way in which options are presented does not influence the decision made by a rational agent. For example, a rational individual choosing between two different types of over-the-counter pain relievers is not influenced by the order in which he sees the pain relievers when walking down the drug store aisle. Likewise, a rational individual deciding whether to enroll in one of three health care plans is not influenced by the fact that his employer defaulted him into one of them.

If an individual behaves as standard economic theory predicts, her choices reflect her true preferences. But Behavioral Economics suggests that context and framing can play an important role in subtly influencing how we make decisions. Evidence of this influence exists across a wide range of domains, including many high-stakes environments where one might think individuals would be properly motivated to implement their optimal choices. In this section, we discuss three examples of how individuals are influenced by context and framing. First, individuals demonstrate a strong tendency to exhibit inertia around default options. Second, individuals are easily influenced by visual cues. Third, individual decisions depend on the manner in which the choice set is presented or *framed*. Understanding the contextual influences to which individuals are susceptible is critical for understanding individual behavior and for effectively designing behavioral interventions.

Default Effects

One example of the effect of context on behavior is the strong tendency of individuals to exhibit inertia around default options. Specifically, individuals tend to remain with their default choice even in cases where the default is randomly assigned. This *default effect* is well documented in empirical work across many different choice settings, from retirement savings decisions (Carroll *et al.* 2009; Choi *et al.* 2004; Madrian and Shea 2001; Samuelson and Zeckhauser 1988) to prescription drug home delivery enrollment (Beshears *et al.* 2012) to Internet privacy agreements (Bellman *et al.* 2001, 2004).

In a classic study on default effects outside of the health domain, Johnson *et al.* (1993) investigate whether individuals remain in the auto insurance plan into which they were defaulted. The authors were motivated by evidence from choices in the 1990s when the states of New Jersey and Pennsylvania introduced auto insurance plans with lower rates but limited rights to sue. Drivers in Pennsylvania were defaulted into the more expensive “full right” plan whereas drivers in the neighboring state of New Jersey were defaulted into the less expensive “limited right” plan. Because the underlying choices — the full right plan or the limited right plan — were the same, whether drivers were defaulted into one plan or the other was not expected to impact behavior. However, a reported 75 percent of Pennsylvania drivers stayed with their “full right” plan whereas only 20 percent of New Jersey drivers switched to the “full right” plan.

Defaults play an important role in many health domains, including insurance plan choice. For example, people who remain eligible for Medicare Part D are defaulted into their prescriptive drug coverage plan from the previous year. Ericson (2012) shows that few enrollees switch from their plan from the previous year, even when relative prices of plans change. Likewise, Handel (2011) looks at the behavior of enrollees in a PPO health insurance plan after relative prices of plans changed significantly. As a result of the price changes, the current plan of some enrollees became strictly dominated by an alternative PPO health insurance plan (that is, for any possible level and type of medical expenditure, their current plan would require higher combined premium and out of pocket costs than the alternative PPO plan). Despite these enrollees’ plans being strictly dominated, Handel finds that 89 percent of the enrollees choose the default: to remain in their current plan. Default effects can similarly be found in employee contributions to health-care flexible spending accounts (Schweitzer *et al.* 1996).

Default rules often affect whether individuals participate in certain programs. Default rules generally either require explicit consent (e.g. an opt-in rule) or presume consent (e.g. an opt-out rule). In the United States, deceased organ donation follows an opt-in rule, requiring explicit consent from the deceased (e.g. having previously joined a state registry) or consent from the deceased’s next-of-kin. But not all countries follow an opt-in rule. A number of European countries follow an opt-out rule where individuals are automatically assumed to be a donor unless they previously chose to remove themselves

from the registry. So long as the costs to opting in or opting out are small, the default rule should have little influence on donor registration rates. Johnson and Goldstein (2003, 2004) show, however, that there is considerable variation in organ donor registration rates by the default rule. They report that at the time of their research the effective consent rate was around 17 percent in the United Kingdom, which followed an opt-in rule, and was 98 percent in Belgium, which followed an opt-out rule. Of the countries surveyed by the authors, the difference in participation rate between the highest opt-in and lowest opt-out countries was nearly 60 percentage points.

In a corresponding hypothetical choice experiment about organ donation, Johnson and Goldstein randomly assigned individuals to one of three default conditions: (1) opt-in, (2) opt-out, and (3) neutral. Under the third condition, individuals were not defaulted into or out of the donor pool but were instead asked to make an “active choice” between either donating or not donating. They find that the average participation rate by individuals under the opt-out condition is significantly higher than that of individuals under the opt-in condition. Johnson and Goldstein also find that the neutral condition is not significantly different from the opt-out condition, suggesting that asking individuals to make an active choice might be more effective at generating organ donor registrations than the opt-in policy. Similar arguments about organ donation are made in the popular press (Thaler 2009). The United Kingdom and a number of U.S. states (including, notably: Illinois, California, and New York) have passed legislation — some of which has already been implemented — to change the request for organ donor registration from opt-in to active choice.

It is too soon to tell whether these changes will increase organ donor registration rates. In addition, experimental evidence on real organ donor registrations finds that the active choice frame does not improve registration rates over an opt-in frame, and may lead to lower consent rates from next-of-kin (Kessler and Roth 2013).

There are a number of explanations for why individuals tend to exhibit inertia around default options. Traditional economic theory suggests that the default effect could be accounted for by the presence of switching or transaction costs. These costs do not have to be monetary in nature but can also include time and effort that individuals have to expend to switch away from the default. If the costs to switching are large enough,

individuals will actually prefer not to switch from their default option. Inertia around default options could also be rational behavior if individuals believe the default option is an implicit recommendation by the person who chose the default. For example, an individual may view a default health plan choice as an implicit recommendation from her employer.

Default effects are often present even when the apparent costs to switching are negligible and the likelihood of the default being viewed as an implicit recommendation is small. An alternative behavioral explanation for such an effect is the bounded rationality of individuals. For example, an individual may be enrolled in the same prescription drug plan as the previous year (the default option) because after the initial enrollment period, he paid little attention to any changes in circumstances that might induce him to switch. Because of this inattention, the individual fails to make a conscious choice and so is automatically enrolled into his plan from the previous year.

Alternatively, people may simply exhibit *status quo bias*, a preference for the current status quo independent of whatever the best option is, or *omission bias*, a preference for inaction over action. Any combination of these explanations could lead to inaction and thus the observed default effect. Regardless of what the true underlying mechanism is, however, it remains that defaults can have a significant influence on individual choices.

Visual Cues

Visual cues and other environmental factors can also play a role in individual decision-making. Bernartzi and Thaler (2007) find that the number of lines displayed on an investment elections form influenced the number of funds into which individuals invested their retirement savings. Individuals were randomly given either a form with eight lines or a form with only four lines (but a nearly costless way to increase the number of lines). Of the individuals given the four-line form, only 10 percent invested in more than four funds. By comparison, approximately 40 percent of individuals given the eight-line form invested in more than four funds.

Within the realm of health, there is an extensive literature looking at how visual cues can affect food consumption and food choices. Everything from the visibility or salience of food to the size and shape of food packaging can influence individual

consumption. For example, people consume more food when they are given larger serving bowls (Wansink and Cheney 2005) or there is greater perceived variety (Rolls *et al.* 1981, Kahn and Wansink 2004). They pour 30 percent more alcohol when using short, wide glasses rather than tall, narrow glasses (Wansink and van Ittersum 2005).

The environment in which we eat can also affect food consumption choices. An individual purchasing groceries may be more likely to buy tempting goods, such as candy bars, if they are located near the register where the effort cost of adding them to the purchase is low than if they are located at the opposite end of the store. In this example, the convenience of the candy bars may influence the likelihood of purchase. Hanks *et al.* (2012) study whether the conversion of a cafeteria lunch line into a “convenience line” that only offered healthy food options influenced the consumption of healthy (versus unhealthy) foods. The authors find that following the introduction of a convenience line, the consumption (measured in grams) of healthy foods chosen did not change but the consumption of unhealthy foods decreased significantly by 27.9 percent. The share of total consumption from healthy foods increased on average while the share from unhealthy foods decreased.

Framing

Another assumption about rational economic actors is that their preferences are consistent. This consistency implies that the way a set of choices is framed or presented does not influence the individual’s decision so long as there is no additional information is conveyed by the frame.

In a famous example, Tversky and Kahneman (1981) demonstrated that framing affects choices using a hypothetical life-or-death scenario. Their study asked participants to consider a scenario where the U.S. is preparing for the outbreak of a disease, which is expected to kill 600 people. There are two proposed programs to combat the disease. The first set of respondents to the survey were told:

- If Program A is adopted, 200 people will be saved
- If Program B is adopted, there is 1/3 probability that 600 people will be saved, and 2/3 probability that no people will be saved.

The second set of respondents were instead told:

- If Program C is adopted, 400 people will die.
- If Program D is adopted, there is 1/3 probability that nobody will die, and 2/3 probability that 600 people will die.

Both groups were then asked which of the two programs they would favor. The first program for each group involves no risk (the outcome is presented with certainty) whereas the second program involves some risk taking. Of the respondents in the first group, 72 percent chose Program A over Program B. Of the respondents in the second group, 78 percent chose Program D over Program C. The authors point out, however, that Program A and Program C are equivalent, as are Program B and Program D.

When the estimates of the consequences of each of the programs were framed in terms of lives saved, respondents preferred the program that offered the certain outcome. Yet when the consequences were instead framed in terms of lives lost, respondents preferred the program that involved risk taking. As it turns out, in situations involving risk individuals often exhibit such preference reversals depending on whether the outcome is framed in terms of gains or losses. Individuals are generally risk averse when facing gains and risk seeking when facing losses (Kahneman and Tversky 1979).

While the proposed scenario of a disease outbreak was hypothetical, such framing effects have been shown to have consequences for individuals making real decisions regarding their health. McNiel *et al.* (1982) find that individuals are more likely to prefer surgery to radiation therapy (which has no risk of death during treatment) when told that surgeries face a 90 percent survival rate as opposed to a 10 percent mortality rate. In another study, women's attitudes towards potential side effects of tamoxifen, a medication taken by high-risk women to help prevent the first-time development of breast cancer, varied depending on whether they were informed that 17 out of 100 women experience cataracts as a side effect versus 170 out of 1000 women (Zikmund-Fisher *et al.* 2008). While the information presented is the same in either case, participants were more concerned about the potential side effects when randomly informed of the risk statistic using the larger denominator. The way in which this information is framed can significantly affect the decision-making process.

Discussion

Recognizing the influence that context and framing can have on individual behavior is important, especially when the choices lead to significantly different outcomes — some of which might make individuals better off. It is often difficult to separately identify the effects of context and framing from other factors that may come into play, and so any estimates of the effects of these cues on behavior and welfare must be considered carefully. Even with this caveat, however, it is clear that context and framing can significantly influence individual choices and outcomes. For example, Handel (2011) finds that, on average, individuals who are defaulted into their health plan choice from the previous year (but are given an option to switch) forgo roughly \$2000 in implied savings by staying in their default plan rather than choosing an alternative option. If individuals choose to stay in the same plan because they were defaulted into it, rather than due to switching costs, the decision can represent a substantial loss to individuals. Furthermore, if defaults lead to low levels of switching, the factors that influence individuals in their initial decision can end up having long-term effects.

One way to reduce the influence of default effects, visual cues, and framing is to help individuals overcome these biases while making their decisions. For example, providing information that lessens the complexity of a decision can decrease default effects. Enrollees in prescription drug plans who are provided with information regarding the relative costs of each of the available plans are much more likely to switch from their current plan (the default) than those who do not receive such information (Kling *et al.* 2012).

Similarly, rather than requiring individuals to either opt in or opt out of participation or enrollment in a program, an alternative solution is to require that these individuals actively consider the decision being made. This can be achieved either by designing the choice environment so that individuals are forced to consider whether they really want to opt in (or out) or by requiring that they make an active choice.

It is sometimes difficult or impossible, however, to design an environment that does not influence behaviors in some way. And in many scenarios involving public health, it may actually be preferable to use behavioral economics to design choice environments so as to encourage certain behaviors. For example, it is extremely difficult to design a cafeteria environment that does not influence food consumption decisions. Food items must be placed in some order and in some location, and so influencing food consumption is unavoidable. Often the current design of an environment is simply one potential design option (just the one into which the policy maker has been defaulted).

Box 2: Behavioral Economics and Lessons for Regulatory Policy

Cass R. Sunstein, co-author of *Nudge* (2008) and Administrator of the White House Office of Information Regulatory Affairs (2009-2012), suggests four promising approaches to regulatory policy based on the insights of Behavioral Economics:

- 1) *Using disclosure as a regulatory tool, especially if disclosure policies are designed with an appreciation of how people process information.*
- 2) *Simplifying and easing choices through appropriate default rules, reduction of complexity and paperwork requirements and related strategies.*
- 3) *Increasing the salience of certain factors or variables.*
- 4) *Promoting social norms through private-public partnerships and other approaches that operate in the service of agreed-upon public goals.*

These approaches address some of the commonly cited behavioral biases studied in Behavioral Economics and mentioned in this chapter.

Source: Sunstein (Forthcoming).

Although contextual influence has long been recognized, Thaler and Sunstein (2008) popularized the topic with their discussion of *choice architecture* — the design of the environments in which individuals make choices. As they note, Behavioral Economics can be a useful tool in nudging individuals towards behaviors that are beneficial while still allowing individuals complete autonomy in making their choice. A choice architect may choose to use an opt-out rule when there is underutilization of something seen as beneficial. For example, influenza vaccinations are often encouraged in part because individuals who do not receive the vaccination impose a negative

externality on other individuals. In such instances, designing a behavioral intervention where individuals must opt-out of receiving a vaccination can increase overall vaccination rates (Chapman *et al.* 2010; Keller *et al.* 2011). Similarly, a school may design the food display in their cafeteria so that salad options are placed before dessert options, and an employer may encourage savings by requiring individuals to opt out of contributing to a savings plan.

VI. Social Forces

Humans are social animals who mirror the actions of others, behave differently when they know that others will learn about their actions, and respond to requests. These features of human behavior suggest three predictions. First, individuals informed about the actions of others will tend to conform to others' behavior. Second, individuals who become aware that they are being observed will take actions that make them appear more favorably in the eyes of others (e.g. they will take actions that make them look more generous or more responsible). Third, individuals will be more likely to take an action when asked to do so by someone else. These social forces — which can be partially justified by the rational model and which we think of partially as behavioral — influence a wide variety of behaviors, including a number in the health domain. For each of the three sections below, we provide evidence from health and non-health settings. As will be discussed at the end of this section, we believe social forces to be an area of behavioral health economics that has the opportunity to grow in the coming years.

Responding to the Actions of Others

It has been well documented that individuals informed about the actions of others tend to conform to others' behavior. One way in which researchers have established this fact is to provide experimental subjects with *social information*: specific information about the actions of other people. Individuals who are provided with such information respond by taking actions that are more similar to the behavior of others.

Outside of the health domain, this effect of social information has been observed in settings including charitable giving, environmental protection, and job choice. Individuals are more likely to donate to charity when they are told that others also donate. Frey and Meier (2004) find that students are more likely to make charitable donations to student funds at the University of Zurich when they are told that 64 percent of students donate to the funds (64 percent was a recent semester's average) rather than being told that 46 percent of students donate to the funds (where 46 percent was a 10-year average). Individuals also donate more money to a charity when they are told that others donated larger amounts. Shang and Croson (2009) find that the amount of money donated to a public radio campaign increases when donors who have called in to make a gift are told

of a large recent donation of \$300 rather than being told of a smaller donation of \$75 or being told no information about a previous donation. This effect on donation amount works even more strongly in the negative direction; people donated significantly less when the donation amount cited is below what they gave in the previous year (Croson and Shang 2008). Individuals are also more likely to engage in environmental protection when they are told that others engage in environmental protection. In a study on towel reuse, Goldstein, Cialdini and Griskevicius (2008) find that hotel guests are significantly more likely to reuse their towel — saving the water and electricity required to wash it — when they are told that 75 percent of hotel guests reuse their towels rather than being given a generic environmental appeal. As with the charity examples, information can also impact the extent to which an individual engages in environmental protection. Allcott (2011) finds that sending households report cards comparing their electricity use to the electricity use of similarly sized households can decrease electricity usage by as much as an 11 to 20 percent short-run price increase. On job choice, Coffman, Featherstone and Kessler (2013) find that individuals are more likely to accept a job as a teacher in an underfunded public school when they are told that 84 percent of accepted applicants took the job in the previous year.

That individuals respond to the actions of others has been shown to be important in the health domain as well. Here we focus on binge drinking and smoking, contexts in which individuals have been shown to conform to the behaviors of those around them.

Most students across the country have beliefs about the drinking habits of other students that are “too high” — they think their peers drink more heavily than their peers actually do. Researchers have shown that beliefs about peer alcohol consumption correlate with own alcohol consumption. Perkins, Haines and Rice (2005) perform a multivariate analysis of survey data from 130 schools and find overestimates of alcohol consumption among peers and a strong statistical relationship between those beliefs and own alcohol consumption, controlling for all available demographic variables. A similar approach has found a correlation between the smoking behavior of adolescents and their perceptions of other teens smoking (Eisenberg and Forster 2003).

This correlational evidence is suggestive of a causal link in which individuals respond directly to their beliefs about other’s drinking or smoking habits when making

their own decision of whether or not to drink or smoke. This correlational evidence, however, is far from conclusive. It is quite possible that the causal link goes in the opposite direction. For example, teens may drink or smoke in groups; those who smoke may be more likely to observe others drinking and smoking and thus generate estimates about the prevalence of those behaviors among the rest of their peers that are too high. Similarly reported beliefs about others' drinking may be influenced by own drinking and the assumption that others are similar to oneself, leading those who drink or smoke more to believe that others drink or smoke more as well.

A true experiment that manipulates the information provided to individuals could more successfully show a causal link. For the case of alcohol consumption, DeJong *et al.* (2006) provide this experimental demonstration in a study involving 18 institutions of higher learning across which they randomized whether the schools ran a three-year social norms marketing campaign (SNMC). These SNMCs educated college students about the actual alcohol consumption of students at the school. Many colleges and universities had previously implemented these types of SNMCs to inform students of the actual drinking behaviors of their students and so one aim of the research was to experimentally test their effectiveness.

The authors gathered self-reported beliefs about the alcohol consumption of other students and the self-reported own consumption from the Survey of College Alcohol Norms and Behavior conducted before and after the three-year SNMCs. Students surveyed at schools that were randomly selected to have a campaign reported larger decreases in drinking from pre-survey to post-survey on a number of dimensions (including a composite drinking scale, recent maximum consumption, and drinks consumed when partying). This decrease was associated with a decrease in reported beliefs about the drinking of others at the school. The authors also note that the decrease in drinking was more pronounced at schools with more intensive SNMCs.

When others are watching

Both inside and outside the health domain, individuals take actions that make them look more generous and more responsible when they believe that they are being

observed. These effects are stronger when individuals care more about the person or persons observing them.

Outside of the health domain, being observed affects voting, charitable giving, and providing other public goods (i.e. taking costly actions that benefit others). On voting, Gerber *et al.* (2008) show that informing individuals that whether or not they vote is public record (and that their voting is being watched by researchers) increases the likelihood of voting over a standard message. Voting rates are even higher when individuals are told that their voting records will be sent to their neighbors after the upcoming election. In charitable giving, Harbaugh (1998) demonstrates that individuals care about what others learn about their donations. When a prestigious law school switches reporting all donations to reporting donations by category, donations become significantly more clustered at the lowest amount that achieves a certain level of recognition (e.g. many more donations at \$500 when the reported category is \$500-\$999).

In the health domain, image concerns affect individuals' willingness to engage in charitable health donation behaviors, including donating blood. Lacetera and Macis (2010) look at donation records from an Italian town; they find an increase in likelihood of blood donation as individuals approach the threshold for a symbolic prize (a medal) for their donations, but only if the winners of the medals are announced in the local newspaper and awarded publicly.

Combining social forces with monetary incentives can potentially strength the effect of an intervention. Haisley *et al.* (2012) increase the percentage of employees who complete a health risk assessment by combining a regret lottery (described in Section III) with a social component where individuals could earn more if other employees — whose identities they knew — also completed the assessment. This treatment worked better than a standard reward incentive of a similar expected value.

Requests from others

Individuals are more likely to take an action when asked by some else to do so. Encouragement or discouragement from others (also known as *peer pressure*) is a powerful social force that can influence individual behavior inside and outside of health contexts.

Outside of the health domain, Meer and Rosen (2011) show that being more likely to be called on the phone in a university fundraising campaign makes donors much more likely to make a donation. Similarly, DellaVigna *et al.* (2011) show that individuals are less likely to answer to the door and less likely to make a donation in a door-to-door fundraising campaign when they are warned that an individual is coming to make a request. They interpret this result as individuals being worried about facing peer pressure and choosing to opt out when they know they will be asked to donate. Freeman (1997) reports that people are much more likely to volunteer when asked by a friend.

A number of health interventions attempt to leverage individuals' favorable responses to requests from others. Campbell *et al.* (2008) report on the results of a randomized controlled trial on teen smoking using 59 schools and 10,730 students aged 12-13 in Wales. Control schools received the standard smoking education. Treated schools had a special program that included peer mentors: students who were trained to have informal conversations with their peers in which they discouraged smoking. Treated schools showed a decrease in the likelihood that students smoked one year later. By the second year after the intervention, the effect is attenuated (and no longer statistically significant), although students at the treated schools are still directionally less likely to smoke.

Kelly *et al.* (1991) report that training individuals identified as opinion leaders in their communities to endorse safe sex among gay men at risk of HIV drastically decreased the extent to which gay men engaged in unprotected anal intercourse (as measured by surveys before and after the intervention). Control cities that did not have individuals trained to endorse behavior change did not show a decrease in unsafe sex during the same time period.

Long *et al.* (2012) investigate a peer mentoring treatment on glucose control for individuals with diabetes. In one treatment, subjects with poor diabetes control are paired with mentors who previously had poor control but have since improved. On average the mentor-mentee pairs talk once a week at the start of the study and once every two weeks at the end of the study 6 months later. The peer mentor group shows a large and significant improvement in glucose control. The authors found that this group also outperformed a financial incentive treatment where individuals were paid \$100 or \$200

for decreasing their glucose level. Similarly, the Geisinger Health System has been able to achieve better patient outcomes by having nurses follow-up with patients to monitor medication use and address possible questions and concerns (Cutler and Everett 2010).

Discussion

Social forces have been shown to have a powerful effect on behavior in a number of domains outside of health, including charitable giving, environmental protection, voting, and job choice. The growing evidence on how social forces impact behavior in health domains suggests that these forces may be particularly effective in affecting health behaviors as well.

If shown to be effective, social forces have a number of particular benefits in the health domain. First, leveraging social forces can be significantly less expensive than monetary incentives and thus may provide a very cost-effective way to affect behavior (Hollingworth *et al.* 2012). Second, while we have yet to see many studies with long follow-up periods to test for the effectiveness of social treatments in the long term, there is reason to believe that social forces might build sustaining habits for healthy behavior. Unlike a monetary incentive, which is either on or off, social incentives might have lingering effects. Once someone has been told that fewer people drink than he suspected, he may hold onto that information and it may still affect him months or years later. A peer mentor might continue to provide mentorship even after a study intervention period is over. In this way, social forces have the potential to provide longer-lasting effects. Additional research is needed to investigate the sustainability of these forces — research that we hope to see conducted in the coming years.

VII. Conclusion

This chapter outlines findings from Behavioral Economics, highlighting four topic areas: reward incentives, salience and information, context and framing, and social forces. Results from each of these topic areas suggest interventions that can affect health behaviors.

As emphasized in the introduction, policy makers must be responsible with when and how they use available interventions to affect health behaviors. Policy makers must look for constraints, externalities, or behavioral biases to justify intervention. Fortunately, some individuals with behavioral biases may explicitly ask for interventions. They may recognize that they need help to engage in certain desirable behaviors like going to the gym, eating healthy, or taking their medications. In these cases, individuals will happily sign up for studies designed to test ways to impact behavior, allowing us to conduct more research. In addition, they will happily opt into programs policy makers design to effectively encourage behavior change.

Previous research has provided us with some insights into how to motivate behavior, but exciting work remains to be done. One open question of particular importance — the proverbial holy grail of Behavioral Economics research in health behavior — is how to create habit formation among individuals who want to engage in healthy behaviors and have trouble doing so. In this chapter, we saw examples in which a treatment that was in place for a while and then removed might have created a habit for visiting the gym, at least for a short while (Charness and Gneezy 2009, Acland and Levy 2011). In addition, we saw success in breaking the hold of an addictive behavior like smoking (Volpp *et al.* 2009, Giné *et al.* 2010). But there are many more examples of interventions failing to help subjects form healthy habits that persist after the intervention is removed. By better understanding habit formation we can develop interventions that can be cost effective and have significant policy appeal.

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