



# Applying Behavioral Tools to the Design of Health Projects

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## Applying Behavioral Tools to the Design of Health Projects

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### Abstract

This technical note discusses how behavioral economics insights can be used to enhance the design of health interventions, with emphasis on those addressing non-communicable diseases, by promoting behavioral changes. These interventions are neither sophisticated nor costly, and are particularly suited for cases in which individuals are seemingly not making rational choices about their health. The main contribution of this note is the attempt to orient non-expert practitioners in the analysis of the problem and design of the intervention. For this purpose, we provide a novel framework to map common behavioral biases and barriers that have limited the success of traditional interventions (i.e., bounded rationality, bounded willpower, and bounded selfishness) to the most promising solutions identified in the existing literature (e.g., framing, commitment contracts, and social incentives).

**JEL classification:** D03, I18

**KEYWORDS:** Behavioral economics, nudge policies, libertarian paternalism, health promotion, chronic disease burden, non-communicable diseases (NCDs)

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## 1. Introduction

Chronic non-communicable diseases (NCDs) are the leading cause of death and morbidity both in the Latin America and the Caribbean (LAC) region and globally. The burden of NCDs increased significantly between 1990 and 2010, and the upward trend is expected to continue (The Lancet, 2013). Conditions associated with NCDs include cardiac disease, cerebrovascular accidents, cancer, diabetes, and chronic respiratory diseases. NCDs hinder economic growth by reducing the labor supply (Abegunde et al., 2007) and generate considerable medical costs and a loss of tax revenues. In addition, they have the greatest financial impact on the poor, who are usually more exposed to predisposing factors and have less access to health services (WHO, 2010).

Most NCDs share risk factors associated with physiological and metabolic changes, four of which stand out as particularly pervasive: smoking, eating an unhealthy diet, having a sedentary lifestyle, and harmfully consuming alcohol (WHO, 2009). These factors are associated with increasing rates of obesity, which itself is a major risk factor for NCDs. Strikingly, the burden caused by NCDs could be substantially reduced by changing individual behavior: if people stopped smoking, ate healthier food, exercised moderately, and did not abuse alcohol, the burden of NCDs could fall by 80% (Ezzati et al., 2003).

Historically, most health policies have been designed with the implicit assumption that individual behavior can be explained by the rational-agent (utility-maximization) model. In this framework, people have well-defined and consistent preferences that are represented by a utility function. Utility is maximized based on information about available alternatives and their consequences on welfare. People do not make wrong choices. They choose the best option given their preferences, resources, and information. Economic theory has shown that, under certain conditions—such as complete information, time-consistent preferences, and self-interest of economic agents—the aggregation of rational decisions leads to the social optimum. However, when these conditions are not met (market failures), the combination of optimal individual choices creates a suboptimal level of social wellbeing. For example, an individual's decision may impose a welfare cost on others for which the market does not set a price (e.g., the negative externality of second-hand smoking), or information may be incomplete and unequally distributed, leaving consumers unaware of the negative health consequences of their purchases. Traditional policies to address these problems include direct regulation (or command-and-control

policies; e.g., prohibiting smoking in public places), taxes and subsidies to alter market prices (e.g., taxes on cigarettes), and information campaigns to fill information gaps.

Although traditional policies have achieved impacts (e.g., smoking has decreased significantly in recent decades), market failures cannot explain all suboptimal decisions, and traditional interventions have not been successful across the board. Why are smoking habits still widespread, even where information on their health consequences is available, cigarettes are heavily taxed, and it is difficult to find places where smoking is permitted? Why is obesity so pervasive, even when the growth of the diet industry testifies that people want to lose weight? Behavioral economics attempts to explain these seemingly irrational phenomena and assist in the design of policies and projects that nudge people toward more socially desirable choices without prohibiting any available option. The potential strength of behavioral economics is in the valuable insights it provides for designing programs around people's actual psychology, thus increasing the chances to achieve desired policy goals.

This note is part of the work of the IDB's Social Protection and Health Division to improve the design of health interventions in the LAC region. It is addressed to professionals involved in the design of interventions focused on modifying behavior, in particular those related to behavioral risk factors associated with NCDs. This note summarizes some of the issues discussed at greater length in the "Behavioral Economics Guidelines with Applications for Health Interventions" by Luoto and Carman (2014), which provides specific examples and outlines concrete steps that practitioners can follow to identify and address existing barriers that hold people back from changing their behavior.

The rest of this paper is organized as follows: Section 2 identifies behavioral biases that expose people to NCD risk factors. Section 3 reviews the nudges proposed in the existing literature to overcome these biases. Section 4 explains the process policymakers should use to define a given issue, diagnose which barriers are present, and choose an appropriate nudge to address the issue. It also provides a framework for matching nudges to common biases. Section 5 concludes the paper and poses some policy questions.

## **2. Identification of Existing Biases**

Behavioral economics provides a descriptive framework to explain economic decision-making. It draws on research in psychology that has identified two systems that govern decision-making in

human beings (Kahneman, 2011; Thaler and Sunstein, 2009). The first system is intuitive and automatic (system 1 or automatic system), the second is reflective and rational (system 2 or reflective system). In most cases, people make decisions using the automatic system and achieve positive outcomes. However, this system is prone to systematic and predictable errors that may lead to suboptimal results (e.g., grabbing unhealthy food at the cash register). In some cases, people using the reflective system make decisions but fail to carry through with them, leading to undesired outcomes. This, in the words of Thaler and Sunstein (2009), is the conflict between the planner and the doer. For example, an individual may plan to start an exercise program (acting rationally based on the reflective system), but when it is time to begin exercising, the automatic system may prevail, and the individual may give in to the temptation to postpone starting, a situation that can repeat indefinitely.

Behavioral economics studies common decision-making biases, i.e. systematic deviations from rational behavior. It can help policymakers understand the barriers faced when trying to make people change their behavior—as is commonly needed in health prevention and treatment interventions. Importantly, some of these biases can be harnessed to nudge people toward healthy behaviors. This is an attractive feature of behavioral economics. It is possible to design interventions that lead to better outcomes without restricting the choices available or trying to modify the nature of human behavior, but rather by reframing the context of the choice.

Deviations from perfect rationality can be classified in three groups. The first is *bounded rationality* and includes systematic errors committed when using the automatic system in the process of selecting the optimal behavior. Individuals have the relevant information on available options and their likely consequences, but fail to convert it to a rational decision. For example, individuals tend to purchase items that are readily available near store entrances or cash registers rather than searching for healthier options in the back of the store. The second group of deviations from rationality is *bounded willpower*. It includes cases in which the reflective system is able to select the optimal behavior, but the individual is unable to follow through at the time of acting. This often happens when the decision and the action take place at different times. Finally, the third group of deviations from rationality is *bounded selfishness*, and encompasses situations in which the decision and the action are affected by what others do or think (peer effect).

The following biases can be classified as *bounded rationality*:

- *Optimism and overconfidence.* Even knowing the objective risks associated with a given behavior (e.g., smoking), people are confident that the negative outcome will not happen to them. Examples of this bias are well documented in the literature: “unrealistic optimism can explain a lot of individual risk taking, especially in the domain of risks to life and health...Older people underestimate the likelihood that they will be in a car accident or suffer major diseases... Smokers are aware of the statistical risks, but most believe that they are less likely to be diagnosed with lung cancer and heart disease than most nonsmokers” (Thaler and Sunstein, 2009, 33). This bias may be positive for business creation and innovation, but if people believe that they are immune to health problems, they will not take the necessary preventive actions.
- *Limited attention, vividness, availability heuristic, and priming.* Attention is a limited resource, so people tend to make decisions based on salient events and information (vividness; whether or not they are relevant and representative of the situation at hand), and are influenced by the tendency to assess the likelihood of an event based on the ease with which they can think of an example of that event (availability heuristic). In some cases, subtle influences can radically shift how people act (priming). Because of these biases, people may eat healthily after being reminded of the benefits of good nutrition or experiencing the death of an overweight friend, but over time, such habits dissipate, and the people return to their traditional behavior.
- *Loss and regret aversion.* Individuals are unhappier when losing a certain amount of money than they are happy when winning the same amount (loss aversion). Similarly, they do not like the idea of missing something that they could have won or earned (regret aversion). This may explain why subsidizing healthy food was less effective than taxing unhealthy food. People see a discount as a gain, and value it less than the loss of having to pay higher prices for unhealthy food (Cawley, 2011). Hence, emphasizing the losses linked to not acting may have a stronger effect than focusing on the potential gains from acting.
- *Status quo bias.* Individuals are disproportionately likely to select the default option than to actively choose an alternative. This is probably the most common example of how insights from behavioral economics may explain people’s choices in instances where they otherwise do not seem to make sense. The cases of organ donation and enrollment in

pension plans show that many people, when faced with difficult decisions about the future, fail to actively choose and are likely to stick to the default option. Likewise, people are more likely to order food options that are highlighted on the front of a restaurant menu than those on the back. The default is therefore a key policy variable, particularly in decisions that do not involve frequent actions.

- *Framing*. People often make different choices depending on how a choice is described, or framed. For example, people are probably more inclined to purchase cold cuts advertised as 90% fat free than cold cuts labeled as containing 10% fat (Kahneman, 2011).
- *Anchoring*. When making a decision that involves a range of options, individuals tend to use a reference point that they consider normal. Often, the reference point is placed in the middle of the range (rather than at the bottom or the top). Anchoring can explain why people eat more when served larger portions. People almost always base the amount they eat on the size of their portion, not on the amount of food required to satisfy them (Wansink, 2010).
- *Affect heuristic*. Individuals' decisions are influenced by their emotions, hence the provision of information can be more effective when it has strong emotional content. This motivates, for example, the strong content of television campaigns against drunk driving or the threatening sentences printed on cigarette packages.

Key biases related to *bounded willpower* include:

- *Time inconsistent preferences, hyperbolic discounting, and present bias*. People value the present disproportionately, relative to the future. When the costs of a given action occur today and the benefits accrue at a later date, problems of self-control are likely to arise. People can decide that they will start dieting tomorrow, but when tomorrow comes, they are unable to follow through with the implementation of their plan. The divergence between today's intentions and tomorrow's behaviors is likely to increase with the frequency and effort of the required future actions (effortful and frequent behaviors are more difficult to follow through). These biases is very relevant for health interventions, as healthy behaviors have immediate costs (for most people, exercise and healthy eating do not maximize today's wellbeing) that will translate into benefits down the road.

- *Ego depletion and decision fatigue.* People tend to grow tired from actively making decisions, exerting self-control, and expending other forms of mental and emotional effort. The more their mental energy is depleted, the more difficult it is to act how they intend, resist temptation, and make informed decisions. These biases make it difficult for people to compare complex nutritional information in supermarkets and reduce the chances that people who have undergone emotional stress will be able to resist indulging in unhealthy desserts. This is related to tunneling and the psychology of scarcity (Mullainathan and Shafir, 2013), which shows that when people are faced with pressing needs, they shorten their horizons, limit their perspective, and show less willpower.

The key *bounded selfishness* bias is linked to the perception of *social norms* that make people behave differently than they might if their decisions were made in isolation or privately. This bias is related to the herd-behavior phenomenon, in which observed decisions are explained by the choices and conditions of the peers. Social norms have proven to be relevant for risk factors associated with NCDs. For example, people with obese peers are more likely to become obese themselves (Luoto and Carman, 2014). Conversely, peer pressure can also be used to encourage diet and exercise.

### 3. Possible Interventions/Nudges

As mentioned above, traditional neoclassical economic tools are often used to encourage healthy behaviors when their adoption is prevented by market failures. These interventions include:

- a) *Informational interventions*, increasing the amount of available information, or correcting asymmetric information that may explain low take-up of healthy behaviors;
- b) *Positive financial incentives*, paying individuals as a reward for desired healthy behavior;
- c) *Subsidies and taxes*, changing the relative market prices in order to encourage or discourage selected behaviors;
- d) *Legislation*, restricting the access to certain products.

The distinction between issues that are better addressed through neoclassical or behavioral economics interventions is not clear cut. In certain instances, traditional tools can be used to

address behavioral biases. For example, legislation has been used to ban Happy Meal toys in San Francisco to protect children and parents who overvalue the short term gains of a toy and undervalue the long run implications of a poor diet (Huffington Post, 2011). However, legislation and taxation can take a long time and be politically costly to implement.

Carefully designed behavioral economics interventions can harness the same behavioral biases that influence people to engage in risk factors, nudge them to adopt healthier lifestyles, and potentially reduce their risk of developing chronic NCDs. In the rest of this note, we discuss traditional interventions only as they relate to behavioral economics insights (e.g., financial incentives in the form of lotteries to exploit the overconfidence bias). It must be noted that most research in this area focuses on populations in the United States.

### *Changing the Salience of a Decision through Framing, Anchoring, or Changing the Default*

The tendency of people's choices to be affected by framing, anchoring, and status quo bias gives policymakers the opportunity to influence behavior by reframing choices, changing anchors, and changing default options. Interventions based on this approach alter the presentation of alternatives so that the "desirable" option stands out and is easier to choose.

Some examples of this type of intervention include changing menus to feature healthful options on the front page and unhealthy options at the back (Downs, Loewenstein and Wisdom, 2009) or moving salad bars to the middle of cafeterias (Just and Wansink, 2009). These convenience manipulations add a small and immediate additional cost to finding the unhealthy options (having to open the menu to the back, having to search the cafeteria for unhealthy food), which in theory makes the relative costs and benefits of the healthy and unhealthy options more equal, or makes the healthy options become the implicit default.<sup>2</sup>

Portion control interventions alter the default serving size and create a socially desirable anchor for how much to eat. A study in Canada found that obese diabetes patients who used portion control plates achieved a significantly greater weight loss and needed fewer diabetes medications after six months, relative to a control group that was given usual care through dietary teaching (Pedersen, Kang and Kline, 2007). In this train of thought, Zimmerman (2009) hypothesizes that the power of framing could also work to encourage greater physical activity.

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<sup>2</sup> See "Mindless Eating" at <http://www.mindlesseating.org/>.

Specifically, he suggests framing physical activity as something fun to do instead of an obligation, as is the current practice among doctors and policy-setting bodies.

### *Pre-Commitment Devices*

Pre-commitment devices take advantage of optimism bias and loss and regret aversion to counteract biases related to bounded willpower. Commitment contracts and soft commitments are two types of pre-commitment devices that have been used widely. The former provide individuals with means to follow through on adopting healthy behaviors in the future by “locking themselves in” today. They combat time-inconsistent preferences, hyperbolic discounting, and present bias by restraining the automatic system and forcing an individual to align future actions with today’s intentions. Many commitment contracts also incorporate lottery and financial incentives (discussed in the next section). Individuals enter contracts because they tend to be optimistic about their ability to fulfill them. Once committed, loss or regret aversion kick in, motivating people to maintain their commitment to avoid being penalized or giving up a chance to be rewarded.

Commitment contracts can be simple. For example, they were used to make students pre-commit to a main course rather than selecting while in line at the cafeteria, which led them to make healthier lunch choices (Hanks, Just and Wansink, 2013). Other examples include prepaid exercise programs and the website stickK.com, which allows people to set their own goals and bet their own money that they will achieve them. These types of contracts have increasingly been used to encourage a variety of forward-looking behaviors including savings (Ashraf, Karlan and Yin, 2006), smoking cessation (Giné, Karlan and Zinman, 2010), and weight loss (Volpp et al., 2008).

Soft commitments involve promises to do something in the future without entering a binding contract. If someone fails to abide by a soft commitment, they suffer psychological consequences rather than economic losses (Bryan, Karlan and Nelson, 2010). A meta-analysis of the efficacy of such interventions across a wide variety of health behaviors (from condom use to sunscreen use to breast self-examination) finds that a medium-to-large impact on people’s intentions leads to a small-to-medium change in behaviors (Webb and Sheeran, 2006).

### *Lotteries and Financial Incentives*

Lotteries and financial incentives can also be used to exploit overconfidence and optimism biases (the tendency to overweight small probabilities) and regret aversion to overcome a number of behavioral barriers and promote healthy behavior. Lottery incentives offer a small chance to win a big amount of money in exchange for adopting a certain activity. People are likely to change their behavior in exchange for being entered into a lottery because they overestimate their chances of winning and do not want to regret the loss of the opportunity to win a large prize. Loss aversion can be effectively utilized by interventions that automatically enroll participants in a lottery but only allow them to collect payouts if they achieve their desired health outcomes.

Financial incentives involve payment of a cash reward upon completion of a health goal. Although such incentives fit in well with the rational agent model, their design takes some behavioral economic insights into account. A meta-analysis of their effectiveness found strong evidence that financial incentives can help encourage compliance, with greater effects for immediate (to overcome *present bias* and *time-inconsistent* behaviors) and larger rewards (Lussier et al., 2006). Interventions involving contingency management offers, i.e., incentives offered to addicts to abstain from consuming an addictive substance, have found that incentives of relatively small value (e.g., a few dollars per week) can be effective, possibly suggesting the immediacy of the reward is enough to overcome the urge to use (John, Loewenstein and Volpp, 2012).

In a popular study that used both financial and lottery incentives to encourage weight loss, Volpp et al. (2008) gave obese participants the opportunity to commit up to \$250 per month and have their contribution returned in addition to a one-to-one incentive match if they met their weight loss goal. If they did not achieve their goal, they would lose their initial commitment. A second group was entered into a lottery but only received their winnings if they had met their goal. Both incentives worked, and participants lost more weight on average than those in the control group, but most regained the weight when the incentives were discontinued.

### *Feedback, Reminders, and Self-Monitoring*

Feedback on one's progress toward achieving a goal and personal reminders are other tools suggested by behavioral economics to counteract barriers related to bounded willpower. Feedback and reminders can increase awareness of one's health behaviors, add salience to one's goals for improving those behaviors, and remind people of future benefits of adherence. These

types of interventions can also take advantage of framing to emphasize the gains or losses as appropriate and further motivate individuals.

Self-monitoring is a form of feedback that is commonly used in weight-loss interventions with focus on behavioral self-regulation. A recent randomized trial tested the role of feedback in the form of mHealth phone text messages to encourage greater adherence to self-monitoring in a weight loss regimen. The two-year study found that daily feedback messages resulted in greater adherence to self-monitoring and increased weight loss. The average effect, however, was only around 2% of baseline weight (Burke et al., 2012).

### *Peer Effects and Social Incentives*

The influence of peers on people's behavior is a much-studied subject in the social sciences. Research shows that social norms and interpersonal interactions can have a powerful effect on preferences, actions, and outcomes related to health, such as preferences for the consumption of alcohol (Kremer and Levy, 2008), decision to smoke (Powell, Tauras and Ross, 2005), and likelihood of being obese (Christakis and Fowler, 2007).

Although peers can also have negative effects on one's own behavior, there are many real world instances of peer effects and social norms being harnessed to support personal goals. Social incentives are a behavioral economics mechanism that can potentially substitute financial incentives. The literature shows that social incentives such as peer recognition can be more effective than financial incentives at inducing people to participate in pro-social activities such as promoting and selling female condoms (Ashraf, Bandiera and Jack, 2012) and that social incentives can complement or substitute financial incentives to induce greater effort in the workplace (Bandiera, Barankay and Rasul, 2009). Self-help peer groups, such as Weight Watchers and Alcoholics Anonymous, are examples of how peers can help people overcome barriers related to bounded willpower.

Simply making people aware of how they compare with others can also be an effective mechanism for influencing behavior. Zimmerman (2009) argues that changing people's perceptions about the social norms surrounding an active lifestyle, for example by communicating the average exercise habits of the peers, can encourage people to adopt such lifestyles. In another example, children's school reports were supplemented with an "obesity report" indicating the child's percentage along a body-mass-index distribution of children of the same age attending school. It is important to note that these programs have not been rigorously

evaluated yet, and they have received criticism for having a negative effect on students' self-esteem as well as contradicting other school practices, such as the offering of unhealthy meals (Carman and Kooreman, 2011).

### *Channel Factors*

Channel factors refer to small contextual details that can facilitate or inhibit the means to achieving a desired goal. Behavioral interventions can make use of channel factors to overcome barriers related to bounded willpower and bounded rationality by discretely nudging people to follow through with their intended behaviors. For example, asking people to think about how they will achieve their goals, and not just asking them to state their goals, can lead to higher rates of success. In one study on tetanus vaccination rates, university students who were given a map indicating the health center and asked to make a mental action plan for how to travel there to get the vaccination were nine times more likely to be vaccinated than a group of peers who received messages about the benefits of the vaccination (Leventhal, Singer and Jones, 1965). A similar mechanism could potentially be useful for helping people follow through with their intentions to exercise regularly and adhere to a healthy diet.

## **4. Incorporating Behavioral Economics into Policy Design: Matching Appropriate Nudges to Counteract Biases**

The identification of behavioral bottlenecks (Datta and Mullainathan, 2012) requires the thorough analysis of each step of the chain of decisions and events that may be associated with the undesired outcomes. The process involves formative qualitative work through focus-group discussions and surveys. Focus groups can help identify relevant biases, while surveys can determine if these apply to the population at large. Such formative work investigates people's beliefs and perceptions of the problem, their decision-making process about their actions regarding the problem, how their decisions are converted into actions, and the environment in which these decisions and actions are made. It also helps determine whether a proposed intervention would be likely to work. After determining whether one or more behavioral biases and barriers are relevant for the problem, the formative work may attempt to verify the presence of heuristics, i.e., the rules of thumb followed by the automatic system, that could be exploited to enhance the promotion of desired outcomes.

With reference to obesity interventions in particular, people may not know that the food they eat is unhealthy (imperfect information), may be overconfident that they will not suffer from ill-effects of unhealthy eating (overconfidence/optimism), may value the benefit of a tasty dessert more than the cost of future illness (hyperbolic discounting/present bias), or may intend to eat healthily but are unable to do so because their peers or the surrounding environment make it difficult (social norms, anchoring, status quo). The factors that lead to obesity are likely to differ depending on the target population, so conducting the analysis on target population members is vitally important to addressing different barriers or biases with the appropriate intervention.

Although no set formula exists for designing specific interventions, table 1 attempts to pair the nudges discussed in section 3 with the biases presented in section 2. Based on recommendations from the literature analysis in Luoto and Carman (2014), the table provides practitioners with a tool to generate ideas regarding interventions that have the potential to address each of the biases discussed in this note.

In reference to obesity, for example, if the problem identified through the formative work is limited attention toward the unhealthiness of certain foods, the table shows that people may be able to change their behavior once nutritional facts are made more prominent. On the other hand, if the unhealthy option is chosen for lack of self-control, the solution may require a reduction of standard portion sizes, posting a list of healthy options at the front of restaurant menus, or a prohibition against the sale of unhealthy snacks at cash registers. Finally, if obesity is due to a change in the perception of weight standards, the behavioral intervention may need to focus on redefining the social norms.

## **5. Conclusions and Next Steps**

This technical note discusses how behavioral economics insights can be used to enhance the design of health interventions, particularly to emphasize healthy lifestyles in order to reduce NCD risk factors. This note highlights the importance of focusing on behavioral changes, inviting the reader to think differently about how health policies and projects can promote these changes using behavioral interventions.

The first step in this process is to acknowledge the possibility that seemingly irrational behaviors may be at the center of a given problem and that tools exist to explain such behaviors.

Next, practitioners need to engage in formative work to identify biases, barriers, and promising solutions. As this note shows, behavioral interventions are seldom sophisticated or complex.

To orient practitioners, this note attempts to map behavioral biases and barriers to promising interventions identified in the existing literature. We acknowledge that there is no one-size-fits-all solution, and that each problem needs to be carefully analyzed for the design of a customized intervention. At the same time, we believe that our Mapping Nudges to Biases table is a useful tool in the initial phases of brainstorming and analysis.

Projects applying behavioral economics insights need to be rigorously evaluated in order to test the underlying behavioral hypotheses, the effectiveness of the solution implemented, and the sustainability of the impacts. The last point is critical because the literature has shown that some interventions have positive short-term impacts that are not maintained once interventions end.

The need to evaluate behavioral health interventions is particularly acute in the LAC region, given that most of the literature to date is based on populations in the United States, and its external validity has yet to be proved. Two more policy items should also be placed on the future research agenda. First, studies are needed to identify what set of preconditions must be in place to implement each type of intervention, especially when such interventions focus on poor and vulnerable populations. Second, the relative effectiveness of behavioral economics interventions and of traditional alternatives needs to be assessed. According to the 2011 Lancet Series on Obesity (The Lancet, 2011), taxation and regulatory measures such as banning sodas may have more impact than behavioral interventions. Countries such as Ecuador and Mexico are already adopting these policies, but more research is needed to identify the most efficient interventions.

Finally, it is important to remark that the tools presented in this paper can be applied to other types of health interventions (beyond NCDs), as well as to other programs in the social sector (e.g., in social protection, labor markets and education). We hope that our work will stimulate further research in these areas.

**Table 1. Mapping Nudges to Biases**

Biases, per type of barrier	Example quote demonstrating the bias	Nudges	Increase salience of information (e.g., highlight calorie content)	Framing (e.g., menu design, portion control, choice of default, changing super market or cafeteria environment)	Commitment contracts (e.g., prepaid exercise classes, pre-select healthy lunch options)	Social incentives and peer effects (e.g., weight-watchers, communicate exercise habits of others, obesity report cards)	Lottery and financial incentives (e.g., lottery chance for those meeting weight loss goals, small payouts for healthy behavior)	Self-monitoring, feedback, reminders (e.g., SMS reminders for adherence to weight loss regimen)	Channel factors (e.g., mapping out plan to achieve goal)
Bounded rationality									
Optimism and overconfidence (type I)	I am aware of the issue, but I am confident this does not or will not happen to me		X						
Optimism and overconfidence (type II)	If I make a commitment, I am sure I can achieve the goal I have a good chance of winning a lottery				X		X		
Limited attention, vividness, availability heuristic, and priming	I base my choice on the information that is readily available in the moment		X	X				X	X
Commitment consistency principle	I do not like to break a previous commitment				X				
Loss and regret aversion	I really do not like to give up something that is mine (or that I may win) or that I am earning						X		
Status quo bias	I tend to choose the default option			X					
Anchoring	I choose the normal option (middle of range)			X					
Affect heuristic	I am likely to react to information if it is presented in an emotional context		X						
Bounded willpower									
Time inconsistent preferences, hyperbolic discounting, and present bias	I am aware of the problem and I want to do something about it, but I will do it tomorrow			X	X		X (*)		
Ego depletion and decision fatigue	I do not realize that I am not doing anything about the problem (I forget/my willpower has too many conflicting tasks to perform/I have trouble controlling myself)			X	X	X		X	X
Bounded selfishness									
Social norms	I am fine because I am like others around me					X			

Source: Authors, based on the literature analysis in Luoto and Carman (2014).

Note: Promising interventions are marked with the letter “X”; (\*) Effective when conducted with high frequency to counteract present bias.

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