Behavioral Economics

Subjects: Behavioral Sciences
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Behavioral economics (BE) is a relatively new field within the discipline of economics. It harnesses insights from psychology to improve economic decision making in ways that have the potential to enhance good health and well-being of both individuals and societies, the third of the United Nations Sustainable Development Goals (UNSDG). While some of the psychological principles of economic decision-making were described by Adam Smith as early as the 1700s, BE emerged as a discipline in the 1970s because of the groundbreaking work of psychologists Daniel Kahneman and Amos Tversky.

behavioral economics UNSDG 3 economic decision making in health care

1. Introduction

Behavioral economics (BE) is a relatively new field within the discipline of economics. It harnesses insights from psychology to improve economic decision-making in ways that have the potential to enhance the good health and well-being of both individuals and societies, the third of the United Nations Sustainable Development Goals (UNSDG). While some of the psychological principles of economic decision-making were described by Adam Smith as early as the 1700s, BE emerged as a discipline in the 1970s because of the groundbreaking work of psychologists Daniel Kahneman and Amos Tversky.

Although Aldieri and colleagues [1] find that inequality, inclusive of health inequality, can undermine well-being, Usai and colleagues note that studies over the past thirty years have successively supported that well-being is vital for the development of economies and societies [2]. We describe the basic concepts of BE, how and why decision-makers use heuristics (decision-making shortcuts), the biases entailed, and BE strategies to overcome these biases (framing, incentives, and economic nudging) for improved decision making. We further survey the literature to identify how BE techniques have been employed in individual choice (focusing on childhood obesity), governments' health policy, and patient and healthcare provider decision making. Additionally, we discuss how these BE-based efforts to improve health-related decision-making can lead to sustaining good health and well-being and identify additional health-related areas that may benefit from including principles of BE in decision making.

2. Materials and Methods Review

We first present a basic primer on BE. We then assess the literature that describes how BE is relevant to (1) individual choices, where we draw significantly on earlier work to summarize the literature of the application of BE

to healthy food choice among children; (2) government policy for public health; and (3) patient, provider and health care systems in medical care decisions. We then discuss the application of BE to sustainable development goals [3].

Given that the intent of this study was a general review of behavioral economics and its application to healthcare rather than systematic review, a general search approach of the literature was used. The three authors searched Google Scholar with the search terms “Behavioral Economics” + “Healthcare” from the years 2017 to 2021 (28,800 results) and PubMed with the search term “Behavioral Economics” all years (11,627). The results were then reviewed by the authors for pertinent articles. Additionally, any other pertinent articles that were discovered in analyzing the literature were included.

3. Background and Literature Review

In this section, we discuss how behavioral economics (BE) differs from “traditional” or neoclassical economics, core principles of BE and key strategies of BE relevant to promoting and maintaining good health and well-being.

Neoclassical economics is the study of optimal choice under conditions of scarcity. It adopts a welfare economics framework that assumes that individuals can determine what is best for themselves. Their preferences, as revealed by the choices that they make under the constraints that they face, lead to the best choices as determined by the affected decision makers’ preferences. These revealed preferences exhibit three characteristics: completeness, which means that an individual can judge between two alternatives and rank them; transitivity, which means that the individual’s preferences are non-circular when there are more than two alternatives; and independence, which means that if the options are all altered identically, the original ranking is maintained.

However, welfare-theory-based neoclassical economics maintains a number of underlying assumptions regarding individual rationality in decision making that are hard to maintain in the face of human experience. These include: consistent preferences, subjective expected utility, emotionless deliberation, unlimited cognitive ability, unlimited willpower, unlimited attention, and frame and context independence [4]. For example, the concept of consistent preferences seems to break down in the face of changing context. Attention, willpower and cognitive ability are all known to have distributions within a society, as demonstrated in the “marshmallow experiment” [5], that are rationed like scarce resources and certainly are not unlimited, making the neoclassical “rational person” model assumptions more obviously violable [6].

BE acknowledges the limitations experienced by people navigating complex environments with competing demands as they attempt to make decisions that will optimize their well-being. In particular, BE acknowledges that decisions tend to be suboptimal and prone to error, even from the decision-makers’ own perspectives, when the decision-makers lack experience or have limited information, and/or the consequences of their decisions may not be immediately felt. “System 1 operates automatically and quickly, with little or no effort and no sense of voluntary control while System 2 requires that individuals allocate attention to effortful mental activities, including complex computations [7]”. System 1 requires less cognitive effort; in economic terms, it is less (cognitively) costly and

therefore is more likely to be employed by the decision-maker unless he/she/they exert effort to slow down and activate his/her/their reflective abilities.

Decision-makers often reduce their own cognitive burden (cost) by using heuristics (i.e., rules of thumb) that provide intuitively appealing answers. Although such heuristics are convenient, Kahneman and Tversky have found predictable types of biases leading people to decide sub-optimally that are built into these easy decision rules that emerge when the two thought systems are interacting [8]. These biases are anchoring, availability and representativeness. Examples of these biases are discussed in Section 3.2.2 “Applications of BE in Medicine” below.

A second set of errors that increase decision-makers vulnerability to biases occur when individuals operate in “hot states.” These are periods when cognitive load is already high, the person is tired, hungry and/or the individual is in a distracting environment. All of these conditions reduce willpower, attention, and emotionless deliberation, thereby increasing reliance on System 1 thinking (reflexive) over System 2 thinking (deliberate). Decision-makers operating in hot states are especially prone to accept heuristics and their associated biases.

BE leverages these predictable patterns in human decision-making that yield poor choices to overcome barriers to behavior change in ways that will improve the chances that the expected preferred choice will be the individual’s choice. BE intentionally builds choice frameworks, presentations and deliberate messaging that reduce cognitive load so that the desired choice, from the perspective of the decision-maker, flows from the least costly thought process and is the one that is more likely to be selected [9]. This is how BE differs from the neoclassical economic tradition that assumes that individuals respond rationally to incentives alone and will accordingly make the best choice subject to the constraints they face without acknowledging that the choice framework and structures themselves come with biases and influences.

“Freedom is not a contested value; all the participants in the debate are in favor of it” [7].

Thaler and Sunstein, academic proponents of using BE to influence decision-makers, introduced the concept “libertarian paternalism.” Libertarian paternalism seeks to maintain individual freedom of choice while guiding individual choices to the ones that serve the decision makers’ long-term interests through the use of nudges over mandates [10].

“A nudge is any aspect of the choice architecture that alters people’s behavior in a predictable way without forbidding any options or significantly changing their economic incentives” [10].

These guiding principles mean that those in a position to present choices to individuals and society use what is known about predictable human behavior to make the “better” choice the easier choice. Thus, the architects of choice reduce the cognitive load of the better choice relative to suboptimal choices so that the best choice is associated with the least costly decision path. It employs framing and context to prime automatic reflexes to more closely align with the optimal choice. This includes, for example, making the better choice the default choice,

requiring thought and action to opt out; signaling better choices heuristically (via visual clues) to reduce cognitive load; and reframing information to avoid pitfalls in intuitive reasoning and choice patterns.

Thaler and Sunstein contend that humans respond to incentives but they are influenced by nudges [10]. They provide a useful pneumonic for strategies associated with BE as implemented using libertarian paternalism through the use of nudges:iNcentivesUnderstand mappingDefaultsGive feedbackExpect errorStructure complex choices

iNcentives

Understand mapping

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Give feedback

Expect error

Structure complex choices

Incentives, including prices, taxes and subsidies, are salient heuristics for decision making. BE can strengthen these traditional economic tools by incorporating prospect theory. Therefore, beyond the simple use of taxes and subsidies to favor particular behaviors such as soda taxes, cigarette taxes and employer-sponsored gym membership, these incentives could be structured as losses as opposed to gains. It is likely that many more people will head to the gym in the last week before eligibility is lost.

Understanding mapping requires that we consider the relationship between choice and the decision-makers' ultimate experience with that choice—that is, how does the choice translate (that is, map) to experience? Providing clearer information that compares options on price, quality and what is known about individual experience can enhance the decision-maker's ability to accurately assess the choice set and anticipate his/her/their expected utility more accurately.

Defaults are the outcomes that require no choice on the part of the decision-maker. With limited attention to discern differences in complex alternatives, setting appropriate defaults improves the quality of decisions in the individual's long-term interest by making the best choice the easiest, no-action one. Well-known examples of changing the default include automatic enrollment in health plans or employer-sponsored retirement savings plans while opting out of such plans requires deliberate effort.

"Give Feedback" suggests that visual evidence or confirmation that the decision-maker is on the right path to an appropriate response/outcome can be provided. It can be accomplished by emoticons or other signaling labels.

“Expect error” refers to anticipating errors, as may be possible from the predictable errors associated with different heuristics and then designing choices to sidestep these potential errors.

Structure Complex Choices allows for making choices under uncertainty in two stages: editing and evaluating. Editing reduces the choice set by simplifying information for comparison, detecting and eliminating dominated choices, ignoring identical components across options (focusing on their differences) and assessing gains or losses. Evaluating then identifies and weights the salient characteristics as a gain or loss relative to a reference point rather than the absolute level of the outcomes that generate utility, thus taking into account prospect theory, where a gain generates less positive utility than the same loss would generate negative utility [11].

These sets of interventions offer a set of key strategies for improving decision-making. For example, Pesendorfer writes: “Behavioral economics emphasizes the context-dependence of decision making. A corollary of this observation is that it is difficult to extrapolate from experimental settings to field data or, more generally, economic settings. The question of whether a particular variable is useful or even observable for economics rarely comes up in behavioral models, yet the success or failure of modeling innovations often depends on its answer” [12].

Nonetheless, the next section details application of BE to support healthy choices by individual decision-makers, to government involvement in public health and to medical care settings. It further provides empirical evidence supporting the use of BE to enhance health.

Health offers a number of different potential contexts for BE strategies to be implemented. These include individual lifestyle choices, government policy choices to promote public health and the decisions of physicians, patients and healthcare systems in medical care.

Extensive research has focused on the impact of BE interventions on children’s food choices. Among the techniques that have been explored are messaging, choice and variety, social norms, incentives, convenience and defaults/substitutes to influence food choice in settings such as school cafeterias.

Madden and colleagues [13] argue that while standard educational approaches that use messaging to improve a child’s awareness of nutritional principles are important, they do not produce a sustained improvement in dietary patterns. Messaging prompts such as simple signs encouraging consumption of water or white milk and direct verbal prompts from adult staff also have the power to significantly alter food decision-making at point-of-purchase [14][15][16]. Increasing the availability, variety and portion sizes of fruits and vegetables in relation to less healthy choices have also been shown to increase the selection of healthy items [17][18]. In a systematic review of behavioral economic interventions targeting child decision making in school cafeterias,

Peer modeling of both selection and preference for healthy choices can significantly influence consumption and preferences for these options by peers [19]. For example, when children are exposed to information about the vegetable intake of other children, greater consumption of vegetables is observed [20]. The normative influence of

parental food choice can sway children from an early age. The healthfulness of childhood dietary choices is significantly correlated to the healthfulness of parental choice [21][22][23].

Monetary and small prize incentives have been used to improve food choices in children. Although there is significant debate surrounding the sustainability of monetary or small prize incentives in terms of their long-term cost and waning or negative effect once removed, both have been shown to be effective in increasing children's selection and consumption of healthy foods. Small monetary incentives significantly increase consumption of fruits and vegetables with increasing effect when larger monetary incentives were provided and when rewards were provided immediately [24][25]. Increasing convenience of healthy food purchase by, for example, creating a separate salad bar or healthy food express line, can decrease the purchase of unhealthy foods and increase the purchase of healthy foods but may also increase total food waste [26][27].

Default choices and intentional substitution of healthy for unhealthy options remove the child's ability to make an active choice in favor of a more paternalistic approach. While interventions using default options have been shown to improve the selection of white milk, fruits and vegetables, there is an associated increase in food waste [28][29]. Substitution is a similar technique in which unhealthy options are replaced with healthier options either before the point of purchase or at the point of purchase. Allowing children to consume healthy options (e.g., sampling vegetables in line) before making additional choices is another form of substitution that has been found to increase the total consumption of fruits and vegetables [30].

BE is increasingly recognized as having a role in public health interventions [31]. The World Health Organization in their 2016 report on ending childhood obesity suggest a number of behavioral economic initiatives that could be instituted on a national/regional level [32]:Sugar-Sweetened Beverage Tax (SSBT); A set of recommendations to limit the types of advertising exposure in children and adolescents (specifically, they recommend that advertising of poor-quality foods not be geared to children and the use of cartoon characters be limited to healthy food items); Standardized worldwide nutritional labeling; and interpretive front-of-pack food labeling

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Taxes on sugar-sweetened beverages are now well-studied and typically found to decrease sugary drink purchases and increase government revenue [33]. Taxes on sugar-sweetened beverages have the additive effect of the neoclassical economic element of increasing price leading to decreased purchasing and the behavioral element of loss aversion [34]. After implementing the $0.01 per ounce tax, sugar-sweetened beverage consumption

dropped by 21%, while there was a 4% increase in comparison cities. In addition to a tax on nonessential energy-dense foods, Mexico initiated a nationwide 10% SSBT, which resulted in a 12% decline in sugar-sweetened beverage purchases [35].

Direct advertising of unhealthy food items to children and adolescents leads to increased purchases of these items [36]. Several studies show that there is limited adherence by the food industry to voluntary codes restricting the advertising of unhealthy foods to children and adolescents [37]. Although research on the effects of restrictions is limited, a study on restricted advertising to children in Singapore indicates that restrictions can improve outcomes [38]. Lwin and colleagues find that the restrictions did reduce unhealthy food advertising, the amount of unhealthy food in households decreased, and children's self-reported consumption of unhealthy food decreased modestly [38].

Several countries have introduced front-of-pack food labeling [39]. As expected, front-of-pack labeling that relies on System 1 thinking (identifies the product as healthy or unhealthy) tends to be more effective than labeling that relies on System 2 thinking (provides numerical nutritional information) [40]. An internationally accepted food labeling system as advocated by the World Health Organization has obvious appeal but still needs to be developed [32].

Chile's initiative to end obesity presents an interesting case study of a concerted nationwide effort employing BE. In 1960, Chile implemented a tax on all nonalcoholic beverages. In 2014, the tax was modified so that there was a 5% increase in the tax on sugar-sweetened beverages and a decrease of 3% on soft drinks with low sugar levels [41]. Additionally, in 2016, as noted by Pérez-Escamilla, Lutter et al., Chile began a three-year, stepwise implementation that included [42]:Point-of-purchase food labeling with easy-to-understand information on sugar, saturated fat and calorie content;Restriction on advertising and sales of unhealthy foods to children; andInterpretive front-of-pack food labeling.

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While the health effects of this national intervention are still being evaluated, the food industry is responding with more low-sugar drinks and healthier food options [43].

Although our main focus has been on obesity, BE has also been applied to understanding substance abuse and addiction (hyperbolic discounting) and to offer strategies for recovery. Briefly, the main guidance from BE is to make the desired choice easier by increasing costs associated with the abusive behavior and the rewards of substance-free choices and decreasing potential (legal) penalties for seeking treatment. Work by Nonnemaker and Farrelly found an initiation effect of increasing the cost of cigarettes, especially for Black youths [44]. Similar guidance to curb alcohol abuse on college campuses focuses on increasing the monetary and behavioral cost of such behaviors while increasing the rewards of substance-free activities [45].

Medical decision-making, as well as other decision-making as noted in the BE discussion above, is often influenced by cognitive bias and the use of heuristics. These influences can cause cognitive error by health care users, medical practitioners, and health policy designers [46]. Understanding these pitfalls could potentially lead to correcting negative influences and result in better outcomes [47]. Possible cognitive mishaps include the following [46][47].

Representativeness Heuristic: This occurs when we draw conclusions based on the memory of a prototype, stereotype or average. In this situation, baseline rates of occurrence are often ignored and we defer to something that is less likely but fits an expected pattern [48].

Availability Bias: This is a bias or heuristic in which we make a decision based on recent experiences or other memorable exposures. For example, a doctor may be more prone to make a diagnosis of pulmonary fibrosis if he or she recently saw a case of that disorder [48].

Optimism Bias: People tend to be very optimistic and believe they are less likely to experience a negative event than others. This bias may interfere with individuals seeking medical care or making appropriate health decisions because they minimize their risk [49].

Confirmation Bias: This is the tendency to look for facts or information that confirms a hypothesis or belief and can lead to cognitive errors for medical practitioners, health care workers, and public health planners [50][51][52].

Illusory Correlation: This is viewing two entities as related when they actually may be occurring together merely out of chance and are not related at all [53]. This commonly occurs in patient and medical practitioner decisions when symptoms and disease may be attributed to an irrelevant diagnostic finding.

Ikea Effect: This is a cognitive bias in which we tend to favor things that we create or partially create [54]. This may be cherishing a desk that we assemble, hence the term, “Ikea Effect”, or an idea such as a diagnosis. Thus, we may give undue weight to things we create in decision making.

While these biases often lead to cognitive error, they can at times lead to decisions or actions that improve health. One example is when school-aged children are asked to create a “peacock” with vegetables, they were more likely to eat the vegetables [55]. Still, it is important for us to be aware of these biases in medical and health policy decision-making and look for information that challenges our assumptions [46].

BE in the form of neoclassical incentives and nudging has great potential to improve medical decision-making and health care [31].

Incentives have been used to modify behavior in a variety of settings including healthcare [56]. In a randomized controlled study of isoniazid prophylaxis among the homeless in San Francisco, Tulsky and colleagues showed almost 100% improvement in adherence when a five-dollar incentive was given to participants who took their medication as compared to no incentive [57]. While practitioner bonuses improved childhood immunization rates in

the United Kingdom from 70 to 90%, a systematic review of monetary incentives showed modest to no improvement in immunization and cancer screening rates in the United States [58] It is not surprising, however, that behavior change prompted by incentives does not appear to be longstanding.

This has been used successfully in several countries to improve organ donation rates [59]. Patel and colleagues set generic drugs as the default choice in their electronic health record ordering system. They were able to increase generic drug prescription rate by 75% [60]. One potential downside, however, to opt-out default systems is that they may lead to over-ordering of diagnostic tests when users have limited capacity to override the default options [61].

The “peak end rule” is a heuristic that potentially can lead to a better patient experience. Redelmeier demonstrated that individuals may tolerate a more unpleasant experience if at the end there is less discomfort than another experience with a lower average level of discomfort [62]. Kahneman’s group tested this effect in a randomized trial in which half of the patients undergoing colonoscopy had a short segment at the end of the procedure in which patients experienced less discomfort than under the traditional procedure. Those that had the added interval to their colonoscopy were 10% more likely to return for a follow-up colonoscopy [62].

While anchoring, representativeness and availability heuristics could potentially be used to influence decision-making in a positive manner, most studies have focused on the negative aspects such as decision-making errors by medical practitioners and healthcare users and efforts to recognize and eliminate them [63][64][65]. In addition, efforts to slow down the medical diagnostic process with formal protocols that list diagnostic alternatives may be helpful. Jenkins successfully used an education module to help physicians recognize these biases, which led to fewer diagnostic errors in treating pediatric bipolar disorder [62]. Mamede was able to reduce diagnostic error by internal medicine residents by 15% in first-year residents and 24% in second-year residents with a formal diagnostic protocol to address decision-making bias [66].

Our surveys of the BE intervention in healthcare point to several observations. While previous research has focused on the risk of cognitive error when heuristics and other forms of cognitive bias are used in medical decision-making, there is emerging evidence demonstrating the potential benefit of targeting cognitive biases to optimize choices. Furthermore, healthy decisions can be reinforced by using taxes to alter price signals in pursuit of public health goals. Using bonuses and prices to incentivize choices tends to be less effective and less sustainable due to both the size of needed incentives and the ongoing costs of maintaining the incentives.

In addition, to BE strategies applied directly to the health decisions outlined above, the strategies associated with BE can be employed in support of the objectives identified in the UN statement on sustainable development goals, “Achieving the SDGs requires the partnership of governments, private sector, civil society and citizens alike to make sure we leave a better planet for future generations” (https://www.undp.org/content/undp/en/home/sustainable-development-goals.html (accessed on 1 June 2021)).

BE strategies can support health-related sustainable development goals in several ways. First, by guiding individual choices to avoid unhealthy behaviors, a number of the specific 13 targets associated with UNSDG 3 will

be directly impacted, including (1) ending the epidemics of AIDS, tuberculosis, malaria and neglected tropical diseases; (2) combating hepatitis, waterborne diseases and other communicable diseases; (3) halving the number of global deaths and injuries from road traffic accidents; (4) strengthening the prevention and treatment of substance abuse, including narcotic drug abuse and harmful use of alcohol; and (5) strengthening the implementation of the World Health Organization Framework Convention on Tobacco Control in all countries.

A reduction in the burden of chronic conditions through improved personal choice through BE combined with the reduction in medical errors by application of BE to the practice of medicine will free up resources in the health care system to support additional sustainable development health goals. Among the goals to be achieved by 2030 are (1) the reduction the global maternal mortality ratio to less than 70 per 100,000 live births; (2) the end preventable deaths of newborns and children under five years of age; (3) ensuring universal access to sexual and reproductive health-care services, including for family planning, information and education, and the integration of reproductive health into national strategies and programs; (4) achieving universal health coverage, including financial risk protection, access to quality essential health-care services and access to safe, effective, quality and affordable essential medicines and vaccines for all; (5) substantially reducing the number of deaths and illnesses from hazardous chemicals and air, water and soil pollution and contamination; (6) supporting the research and development of vaccines and medicines for the communicable and noncommunicable diseases that primarily affect developing countries, provide access to affordable essential medicines and vaccines; (7) substantially increasing health financing and the recruitment, development, training and retention of the health workforce in developing countries, especially in least-developed countries and small island developing states; and (8) strengthening the capacity of all countries, in particular developing countries, for early warning, risk reduction and management of national and global health risks (targets from WHO https://www.who.int/health-topics/sustainable-development-goals#tab=tab_2 (accessed on 1 June 2021)).

Since BE interventions are largely based on heuristics and nudging people to make better decisions, they are by their very nature cost-effective and sustainable [34]. Thus, it is not surprising that countries with somewhat limited resources such as many countries in Latin America are instituting policies based on behavioral economic principles such as soda taxes and front-of-pack food labeling [42]. Even interventions with monetary incentives that have significant upfront costs ultimately can be cost-saving through better health outcomes Taxing unhealthy food items, a neoclassical-based intervention, not only leads to healthier lifestyles but very quickly increases revenues which can be used for additional health policy, or other pressing initiatives [67].

The report recognizes that all three global problems are powered by the same drivers: cheap fossil fuels and ultra-processed food [68]. Obesity, undernutrition and climate change also reinforce each other and disproportionally affect poorer nations and the poor within richer nations. It is predicted that over 70 percent of deaths due to non-communicable diseases will occur in lower-income countries [69] (GBD Obesity Collaborators 2017) despite poorer nations contributing less greenhouse gases than more affluent countries. Given that behavioral economic initiatives have been demonstrated to be low in cost and effectively lead to a healthier lifestyle, they may play a key role in battling climate change.

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