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Decision Research Strategies

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Cancer poses many, often difficult choices. Studying these choices poses several strategic decisions for researchers, including (a) whether to conduct formal analyses of the choices being studied, (b) whether to adopt a persuasive stance (or only facilitate independent decision making), (c) whether to focus on optimizing specific choices or securing broader mastery, and (d) which individual differences to address. Behavioral decision research's strategic approach is demonstrated in 4 contexts relevant to cancer-related decisions: (a) informed consent, (b) prevention, (c) infectious disease, and (d) medical emergencies. Each example contains interacting elements of *normative* analysis, identifying optimal choices; *descriptive* research, characterizing actual behavior; and *prescriptive* interventions, seeking to bridge the gap between the normative ideal and the descriptive reality.

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Preventing, treating, and surviving cancer pose many decisions. These include what diet to eat, whether to smoke, how to try quitting, which screening tests to take, which symptoms to report to physicians, whether to report genetic test results to family members (and employers), when to get a second opinion (and how to reconcile conflicting ones), how to evaluate Web-based medical information, how aggressive treatment should be, how to ask for antiemetics (if they are not offered), how to help sick family members, whether to support controversial medical research (e.g., using stem cells or primates), and how much to worry about cancer altogether.

Individuals' personal and collective welfare depends, in part, on how well they make such decisions. Effective decision making requires understanding the facts of a choice and the implications of one's own values for it—well enough to identify the option in one's own best interests and to implement it faithfully. In decision theory, choices are described in terms of their *options* (actions that an individual might take, including inaction), *outcomes* (valued consequences that might follow from those actions), *values* (the relative importance of those outcomes), *uncertainties* (regarding which outcomes will be experienced), and *decision rules* (integrating these elements in order to make a choice). Called a *normative analysis*, this description seeks to capture the reality of a decision as it would be seen by a fully informed decision maker.

Two Examples: Translating Typical Cancer-Related Choices Into Decision Theory Terms

Tanning poses a familiar decision, with implications for cancer prevention. Its options include ways to regulate ultraviolet exposures and to create a tanned appearance artificially. Its outcomes include one's outward appearance, others' responses to that appearance, health effects, emotional effects, and costs. Its value issues include the weights to place on social approval and long-term health effects. Uncertainty might surround how tanning affects popularity, how well sun block works after swimming, how well tanning salons maintain their equipment, how susceptible one is to skin cancer, and how much one will worry after a bad burn. If these outcomes can be traded off against one another, an *expected utility* decision rule can be used; it leads to adopting the option with the most attractive outcomes (expressed in terms of *utility*), weighted by their probabilities. One alternative decision rule screens out options with unacceptable amounts of key outcomes (e.g., any chance of cancer or persistent worry); another focuses on options with high amounts of key outcomes (e.g., a knock-'em-dead look).

Individuals with advanced cancer often face choices in which the options include conventional, alternative, and palliative treatments. Key outcomes might include effects of the choice on longevity, pain, functionality, costs, and personal relations. Key values are the relative weights assigned to these outcomes. Key uncertainties might surround the treatments' effectiveness, family members' responses, and the patient's capacity for pain and tranquility. An expected utility rule could be used. Or, one might simplify the choice by screening for options that satisfy a holistic goal such as "death with dignity" or "every fighting chance." Within that screened set, an expected utility rule might be applied to the remaining options (e.g., how to use palliative caregivers).

Characterizing choices in decision theory terms helps to describe them clearly and comprehensively. It can show when individuals' best interest choices differ because they face different outcomes or have different values. It can reveal structures common to otherwise diverse choices. For example, a normative analysis forces one to look not only at the *direct costs* of choosing an option, but also at the *opportunity costs* of forgoing one. It ignores the *sunk costs* associated with prior investments (e.g., subscriptions to a tanning salon, promises to avoid pain killers), unless honoring them affects future outcomes (e.g., saving face, claiming infallibility). Normative analysis can clarify the structure of complex choices. For example, decision theory distinguishes between

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uncertainty about how one will experience an outcome and uncertainty about what one really wants. It distinguishes between whether one really cares less about future outcomes or discounts them because of uncertainty about living long enough to experience them. A normative analysis is needed to define *context effects*, in the sense of cases in which formally equivalent choices lead to different choices because of how they are presented.

Describing choices in these terms does not mean assuming that individuals follow decision theory. Indeed, psychologists have focused on identifying and explaining disparities between the normative ideal and the descriptive reality, then designing *prescriptive* interventions, helping people to make better (i.e., more normative) choices. Those interventions could encourage better choices by changing people (e.g., through education) or their environment (e.g., better disclosures). They could also entail discouraging or even curtailing freedom of choice, when effective decision making seems unlikely (e.g., banning products likely to be misrepresented or misused).

Decision theory's formal representation of individuals' decisions also frames researchers' strategic choices regarding how to study (and aid) them. The next section poses these strategic choices. It is followed by a brief description of how the field of behavioral decision research makes them. Its strategy is then illustrated in four case studies of decisions raising issues analogous to those faced in decisions related to cancer prevention and control. The article concludes with a behavioral decision research strategy for studying and improving cancer choices.

Four Strategic Choices

Any decision-making research program faces several strategic choices.

1. *Do research projects begin with a normative analysis of the focal decision*? That is, do they explicitly characterize options, outcomes, values, and uncertainties, then identify the best interest choices arising from them? Researchers who do not perform such analyses must assume that they intuitively know how people's choices will affect their lives and how people will feel about those effects. Some cancer decisions pose very familiar choices, hence they need little formal analysis; others are novel, complex, and uncertain. Decisions falling in the latter category should challenge researchers' intuitions, meaning that, without analysis they risk misunderstanding the choices.

2. *Do interventions adopt a persuasive stance?* That is, do they try to induce a particular choice or leave that to their target audience? A persuasive stance assumes that the researcher has mastered the facts, learned the targets' values, and been entrusted with manipulating them. If those assumptions are invalid, then the intervention can give bad advice, create undue confidence, or violate recipients' autonomy. A nonpersuasive stance assumes that people can make better choices, if their options are made clearer. It can fail if people cannot grasp the situation, do not know what they want, or do not want responsibility for the choice. Cancer decisions often involve complex, uncertain, unfamiliar, and dissimilar outcomes. If decision makers cannot grasp and weigh the outcomes that they face, then they may want a trusted advisor to tell them what to do, even if they generally prefer autonomous decision making. Whether that is the case is an empirical question, the answer to which shows the feasibility of a nonpersuasive stance.

3. *Do interventions seek to improve specific choices or to confer general mastery of the decision-making domain?* That is, do they set the specific choice in a broader context? Any (nonfatal) choice is but one in a sequence. It may be revisited (e.g., "Should I stay the course [with a lifestyle change or drug treatment]?"). It may create new choices (e.g., "Should I reveal my test result?"). It may change the person involved (e.g., facing future choices with regret or pain). Broadening the context can make a decision clearer (by showing how each option affects the processes creating and controlling the outcomes) and more meaningful (by showing it is embedded in people's lives). Context can also increase decision makers' cognitive load. Cancer often poses choices in which context is critical, but individuals have limited absorptive capacity.

4. *Which individual differences should be considered?* That is, in what ways do researchers consider how (superficially) the same decision varies across the individuals who face it? They may have different options (e.g., as a function of their health, social support, financial resources). They may have different values (e.g., in terms of their time horizon, tolerance for ambiguity, concern for impacts on other people). They may favor different decision-making processes (e.g., given their need for cognition or their emotional resilience). They may face different social contexts (e.g., cultural expectations, decision-making partners). As a result, a given decision (e.g., tanning, cancer treatment) may be quite different to different individuals, as might the effects of any intervention. As much as the disease itself can be a great leveler, any given cancer can confront a variety of different people at widely varying times in their lives. Many prevention decisions face most people at most life stages. Researchers must decide which of these potentially relevant variations to consider.

A Behavioral Decision Research Strategy

Behavioral decision research emerged as psychology's response to decision theory's normative analyses. The theory underlying these analyses showed how *rational* choices follow from a few simple and intuitively appealing rules (e.g., consistency). While economists have tended to believe that normative accounts are descriptively valid, psychologists have seen how difficult it is to achieve rationality, especially when people bring limited cognitive resources to complex, unfamiliar, and uncertain situations. As a result, psychologists' descriptive research has focused on understanding behavior in terms of departures from the normative ideal as a basis for prescriptive interventions (Hastie & Dawes, 2002; von Winterfeldt & Edwards, 1986; Yates, 1990).

In practice, this seemingly orderly progression often requires an iterative process. Descriptive research may reveal outcomes that were missing from normative analyses or facts that eluded the analysts (e.g., how people actually take their medications or experience side effects). Designing an intervention often prompts additional descriptive research, how people interact with it, or normative analysis, regarding which topics to emphasize. New research (e.g., clinical trial results) can require revisiting the research, as can external events (e.g., a disease scare, a celebrity recovery). Seeing how much interventions can accomplish shows the limits to informed choices.

Thus, behavioral decision research takes a clear position on each of the strategic choices described above.

1. *Behavioral decision research begins with a normative analysis*. Performing those analyses recognizes that researchers cannot count on intuiting the choices that optimize a decision maker's goals. Rather, they must elicit those goals from the decision maker, consult with subject-matter experts in order to predict the outcomes following each option, and then apply a decision rule in order to identify the choice in the decision maker's best interests.

2. *Behavioral decision researchers' default stance is nonpersuasive*. They try to help people choose for themselves. Philosophically, behavioral decision researchers hope to increase autonomous decision making, a predisposition that they share with neoclassical economics. Pragmatically, they often work with clients who do not want to be told what to do (e.g., officials, executives, many patients). Comparing optimal choices (as identified by normative analysis) with actual choices (identified by descriptive research) shows how much is lost by deferring to independent decision making—with or without the benefit of prescriptive interventions. Whether that sacrifice (of optimality for autonomy) is justified is an ethical question; the research can frame, but not answer it.

3. *Behavioral decision researchers typically define decision problems narrowly*. It is often difficult enough to make well-defined specific choices well. Focusing on them uses behavioral decision researchers' core skills: eliciting summary beliefs and values, combining them with a decision rule. However, a narrow focus can obscure a choice's full impact, including the consequences of making it repeatedly. It can obscure the context needed to make choices meaningful (e.g., why the risks are as high, or low, as the experts claim; how a health change will really feel). Creating that context requires analyses of the processes creating and controlling its outcomes (Fischhoff, Downs, & Bruine de Bruin, 1998).

4. *Behavioral decision researchers must consider differences in decision makers' circumstances and values*. Different choices might be best for people who face different prospects or have different goals. As a result, behavioral decision researchers cannot conduct their normative analyses without considering individual differences in decision makers' options, values, and expected consequences. Whether they consider other differences depends on the expected yield. For example, looking for (cross-situational) differences in risk aversion has not been that productive (Yates, 1990). As with many other personality traits, such behavior turns out to be situation dependent (e.g., someone who takes career risks may be a cautious investor or traveler). Looking at differences in decision-making competence (Parker & Fischhoff, 2005; Stanovich & West, 1998) and affective states (Loewenstein & Lerner, 2003) might prove more productive. Here, practical and theoretical concerns may diverge. A reliable, informative phenomenon may still have too small an effect size to affect many choices.

The next section summarizes four application domains of the behavioral decision research strategy, with analogies to cancer-related decisions. When successful, these applications not only produce better decisions but also advance the science through the interplay of *applied basic* and *basic applied* research (Baddeley, 1979). On the one hand, they test the ecological validity of basic research by its ability to guide practice. On the other, they identify new basic research issues from the confrontation with applied problems.

Behavioral Decision Research Applications

Medical Informed Consent

Medical procedures often promise one uncertain benefit in return for assuming many uncertain risks. Telling candidates about every possible side effect of a procedure can drown them in detail at an already stressful time. What people need are the few facts most critical to their choices. In normative terms, that need is formalized as *value-of-information analysis*. Merz, Fischhoff, Mazur, and Fischbeck (1993) performed such an analysis with carotid endarterectomy, in which the risks and benefits are typical of many surgeries. Scraping out the major artery to the brain can reduce stroke risk. However, it can also cause problems, ranging from death and stroke to broken teeth and headaches. According to Merz et al.'s analyses, only three of these many risks—death, stroke, and facial paralysis—are large enough to dissuade more than a few potential patients. Although nothing should be hidden, patients must understand these three risks in order to provide informed consent. That means grasping both how likely each event is and what it means to experience it.

Merz et al. (1993) undertook no descriptive research into surgery candidates' existing beliefs, recognizing that few could know the probabilities of such unusual events without being told. Regarding the meanings of these three events, the prospect of death should be familiar to all patients and that of stroke to most (which some surgery candidates have experienced and all fear). Facial paralysis might need some explaining. The prescriptive work of conveying these critical facts can draw on all relevant basic and applied research. For example, many studies suggest that it is better to use numerical probabilities rather than verbal quantifiers (e.g., likely, rare), whose interpretations can vary across individual and context. If these probabilities were very small, then it would be

a challenge to convey them; fortunately (for communicators), all three are fairly frequent. If the surgery were a repeated event, then it would be a challenge to convey how risks accumulate through repeated exposure; fortunately (for patients and communicators), it is a one-time event (Fischhoff, Bostrom, & Quadrel, 2002).

With carotid endarterectomy, it seems as though the critical facts are simple enough that a nonpersuasive intervention could work—in the sense of helping most patients to identify the best option. However, that remains to be demonstrated empirically. Evaluating an intervention requires choosing a performance measure: Is it "just" knowing the critical facts, weighted by the value of the information that they contain? Or, must patients also be able to draw inferences from those facts, assess the extent of their knowledge, and feel enough self-efficacy to act on their beliefs? Must patients reach the rational choices identified by the normative analysis? Must they be satisfied with the decision-making process, even when it presents difficult choices in stark relief?

Most cancer treatments have laundry lists of possible side effects. Arguably, the patients facing them are entitled to a normative analysis, identifying the facts that matter most, followed by descriptive and prescriptive research needed to ensure—and demonstrate—informed consent. Although this behavioral decision research approach requires additional analytical and empirical work, it operationalizes the materiality standard of informed consent, perhaps allowing a physician to demonstrate that patients have understood the facts material to their choices.

Personal Protection Advice

People facing major medical procedures often receive personal decision counseling. People facing many other life risks often do not. Rather, they get general advice that is directed to a wide audience. Normatively, general advice assumes that all recipients face similar situations and have similar goals. For example, women hoping to reduce their risk of sexual assault often find confident, universal, and contradictory advice regarding whether to resist their attacker physically (i.e., whether to fight or not). As a result, well-meaning advisors may add confusion to an already difficult situation. They also make it easier to blame victims: Whatever a woman did to protect herself violated the advice of some "expert." The choices that women face are not unlike those faced by someone trying to sort through the many claims regarding ways to reduce the risk of cancer (get screened, lose weight, use particular herbs, etc.).

The foundations for any normative analysis are options, outcomes, and the probabilities connecting them. In a project (summarized in Fischhoff, 1992), my colleagues and I identified options and outcomes for preventing sexual assault by interviewing diverse women and experts, as well as reviewing published advice. The interviews revealed many options (1,200 plus), sufficiently different to have different effects on outcomes that research participants said were important. The many options and outcomes show the complexity of the decision-making task facing women. Women in different groups saw different options and valued different outcomes; so did a sample of sexual assault experts. As a result, members of these groups face different choices, meaning that advice that is right for some women might be wrong for others.

A meta-analysis of studies of the effectiveness of self-defense strategies found very imperfect information, meaning that any confident advice is misplaced. However, the research did reveal a modest signal: Completed rapes are less likely after physical resistance than after other forms of resistance. A survey of beliefs about these probabilities found that both lay and expert respondents exaggerated the overall value of strategies with a limited range of application (e.g., always checking a car's backseat).

Properly tailored and qualified advice must respect the complexity, uncertainty, and heterogeneity of the decisions facing women. Unfortunately, by the time we (see Fischhoff, 1992) were ready to begin such prescriptive research, our funding agency—the National Institute of Mental Health—had disbanded its Center for the Prevention and Treatment of Rape. Not only did our project stop, but so did research into the effectiveness of self-defense measures. Without it, one must be cautious in offering women advice or criticizing those who follow (or reject) it.

Advice regarding cancer prevention decisions is sometimes supported by a stronger research base than that for sexual-assault prevention decisions. Nonetheless, it, too, often presents a confusing picture. Clearly, one should avoid smoking, sunburns, and heavily polluted workplaces. However, the picture is murkier for many putatively protective foods or dietary supplements and for the benefits of avoiding some allegedly carcinogenic places and practices (e.g., fluoridation, dry cleaning). There, the advice can be confident and conflicting, unless it clearly states the size of the effects or the quality of the research, as well as the credentials and motivations of the advisors (Woloshin et al., 2000). One can only hope that market share accrues to those experts who most diligently analyze the effects of prevention strategies and present them in responsible, comprehensible ways.

Adolescents' Sexually Transmitted Infections

Young people hear a lot about how to reduce their risk from sexually transmitted infections (STIs), especially HIV/AIDS. Nonetheless, the rates of STIs (and unplanned pregnancies) are still high. As a result, some adults have despaired of informational approaches, favoring more manipulative ones. However, these "failed" messages have seldom been based on normative analyses of teens' choices and informational needs. Rather, educators decided what teens needed to know, then tried to present it engagingly. A common criticism of campaigns like "Just Say 'No,'" however, is that they oversimplify the normative analysis by ignoring teens' other concerns.

More broadly conceived programs try to teach teens the "facts of life" needed to make effective choices. In a normative analysis of those facts, Fischhoff et al. (1998) summarize the intertwined cognitive, affective, social, and physiological processes shaping STI risks. However, most current messages focus on just a few of these factors. That focus has been rewarded: Teens know many of those facts. However, their mastery of some of them is shaky while other critical facts are missing from their mental models. Some of these omissions are deliberate. For example, although it is not difficult to explain why oral or anal sex is risky, few U.S. schools allow such "explicit" explanations. Social constraints also account for many teens' confusion about how to use condoms or terms, like *safe sex*, that many teachers and parents are uncomfortable talking about. Other omissions reflect topics outside health educators'

usual concerns. For example, teens (like adults) tend to think about the outcomes of single actions rather than the results of repeating those actions (e.g., having sex, driving fast). When asked to think long term, they underestimate how quickly small risks mount up through repeated exposure (Morgan, Fischhoff, Bostrom, & Atman, 2001; Shaklee & Fischhoff, 1990).

The prescriptive work that my colleagues and I (e.g., Downs et al., 2004) have conducted has focused on filling such gaps in teens' mental models. We have also sought to give teens a more realistic feeling for how much they know. When messages repeat only some of the facts that teens need, they risk creating an unwarranted feeling of "knowing it all." In addition, even the best information means little unless teens feel empowered to act on it. In one project (Downs et al., 2004), the prescriptive response involved creating an interactive DVD for young women, conveying critical facts (about STIs, condoms, etc.) and showing how to identify opportunities to make choices about sexual relations and to assert control over them. Although the DVD's content was determined by behavioral decision research, its implementation draws broadly on behavioral research (e.g., self-efficacy theory). In a randomized control trial, it increased STI knowledge and self-reported condom use while decreasing condom problems and chlamydia reinfection rates (Downs et al., 2004).

This prescriptive intervention seeks to help users create usable mental models of facts identified through a normative analysis of the processes creating and controlling STI risks and not found to be common knowledge, in descriptive studies of current beliefs. It complements approaches focusing on summary risk and benefit estimates. With cancer, too, summary statistics may not speak for themselves, without an accompanying mental model of the underlying processes. For example, controlling ultraviolet exposure means knowing when the issue arises (e.g., season, time of day), how to manage social processes, and how to improvise solutions (e.g., when sun block runs out). It means knowing enough to prevent special pleading, whereby people convince themselves that they are not really at risk.

Vaccination

People may knowingly make choices that are bad for one aspect of their health, if they care more about other goals. For example, teens may have unsafe sex in order to have fun or preserve a relationship. One form of seemingly suboptimal health behavior arises when people refuse recommended vaccinations for their children (e.g., measles, mumps, rubella, diphtheria, pertussis, tetanus) or themselves (e.g., anthrax for military personnel, smallpox for first responders).

One narrow framing of such choices is that only someone especially averse to a vaccine's side effects should reject it. The normative analysis of that framing compares statistics on disease rates and side effects, weighted by their disutility. Although serious side effects are rare, some descriptive research suggests that parents are especially averse to causing their children such harm (Ritov & Baron, 1995). Prescriptive responses, in a persuasive mode, might include showing parents the relevant statistics and encouraging them to feel equally responsible for the results of both vaccinating and not vaccinating.

A broader normative analysis considers nonhealth effects—guided by descriptive research into what else matters to people. For example, some people value contributing to the overall (herd) immunity level, especially when it protects individuals who cannot be vaccinated (e.g., the immunocompromised). Some people value preparing themselves for missions with a disease threat. Some people value avoiding the penalties imposed on the unvaccinated (e.g., being barred from school). Some people resent the coerciveness of vaccination programs, perhaps enough to avoid using public schools. Persuasive communications miss an opportunity, if they ignore a vaccine's benefits. They may, however, aggravate tensions, if they ignore reasons for opposing the vaccine—even if they cannot accept them. (In the course of a peer review of a normative analysis of the effects of anthrax vaccine, a military medicine official suggested the goal of "informed assent": Soldiers had a duty to be vaccinated, but also a right to be told why the vaccine was needed and what its risks were.)

An even broader normative analysis considers the sources of risk and benefit estimates. Well-focused messages may misfire, or even antagonize, if their content is not credible. In the case of vaccines, some skeptics doubt the benefits because they see little disease risk or question claims of vaccine effectiveness. Skeptics may also doubt the claims of vaccine safety. They may distrust the source perhaps because of perceived past wrongs (e.g., Gulf War syndrome, swine flu). They may fault the system (e.g., for relying on passive reporting of side effects). A shadow of doubt is difficult to erase and may be inflamed by ignoring critics' concerns. A broad normative analysis would identify the factors that underlie experts' faith in a vaccine and might convince skeptics.

Cancer decisions are no strangers to controversy (e.g., over competing treatments, alternative medicine, new screening procedures). They might benefit from using these behavioral decision research approaches, which evolved in response to controversies over environmental and technology risks, in which failure to engage critics constructively has often aggravated suspicions and missed finding common ground (Fischhoff, 1995).

Infectious Disease Risks

When preventive measures fail, emergency responses are needed. The normative analysis may recommend (belated) adoption of the same measures or entirely different ones. For example, the 2003 U.S. smallpox vaccination campaign achieved a fraction of its goal. Were a terrorist attack to happen, vaccination is still possible (even after exposure), so is quarantine. Setting such policies requires planning models that make realistic assumptions about the behaviors involved (e.g., Will people hear an emergency message, understand its content, trust its instructions, execute them?). Being in the news does not guarantee being understood. For example, in late 2002, despite extensive media coverage, most Americans had not learned that anthrax is not contagious, that West Nile Virus is rarely fatal, or that smallpox vaccine works after exposure (Fischhoff, Gonzalez, Small, & Lerner, 2003).

Cryptosporidium is a waterborne parasite that public health officials understand well and plan for extensively. Shed through mammalian feces, it can enter a water supply after a heavy rain (e.g., downstream from feedlots). A 1993 Milwaukee outbreak sickened 400,000 people and killed 100. People with AIDS face special risks. The impact of emergency communications depends on their reach and persuasiveness. Those effects depend on such factors as *Cryptosporidium* intrusion risk, surveillance procedures,

testing capacity, remediation technology, media response, population sensitivity, and institutional coordination (between water utilities, public health authorities, pharmacies, etc.). In modeling these processes, Casman, Fischhoff, Palmgren, Small, and Wu (2000) found that emergency warnings would, typically, have no effect, even if they reached every consumer and achieved perfect compliance. Current tests cannot detect *Cryptosporidium* in time for people to respond effectively. The same system might protect people for pathogens with fast, cheap tests (e.g., *Escherichia coli*)—if the other elements of the system work as planned (e.g., engineers notify health officials). However, explicit modeling is needed to discipline planners' intuitions.

In descriptive research, using in-depth interviews, Casman et al. (2000) found good awareness of *Cryptosporidium* risks among HIV positive individuals and none among residents of two communities that had experienced intrusions. However, members of neither group could afford to use bottled water routinely. If *Cryptosporidium* intrusions cannot be prevented, then providing bottled water to vulnerable citizens is a better investment than warning systems: When individuals have no good options, the prescriptive "solution" should not pretend that they have choices.

One class of cancer decisions with similar properties involves the use of approved drugs. How well drugs achieve the benefits (and minimize the risks) found in clinical trials depends on how patients use them. Do they follow the full course? Do they avoid concurrent use of other drugs and foods with known interactions? Do they notice symptoms suggesting counterindications? Do they notice and understand warnings, arising from postlicensing surveillance? Normative analyses, making descriptively realistic assumptions, are needed to estimate the effectiveness of prescriptive systems for helping patients (and physicians) make sound decisions about cancer drugs.[1]

Barriers to a Behavioral Decision Research Strategy

Although one might hope to complete the normative, descriptive, and prescriptive elements of every project, even modestly addressing each element can significantly inform the others: Doing some normative analysis can organize the science regarding the processes creating risks and benefits. Doing some descriptive research can focus a project on the issues that matter most to people while determining what they already know (and need not have repeated). Doing some prescriptive work can test the robustness of descriptive theories while identifying the research gaps critical to practical concerns.

Nonetheless, integrated research programs face natural barriers. Some reside in the professional community, others in the institutions that support (and partially control) it. Over time, normative, descriptive, and prescriptive behavioral decision research programs have evolved as separate specialties. It is challenging enough to get training, stay current, and maintain professional status in any one. In principle, communication among the three should be facilitated by their having utility theory in common. In practice, though, the routines of professional life restrict the opportunities and incentives for doing so. Indeed, there may even be disincentives for interaction: To render its task tractable, each approach makes simplifying assumptions about the others. For example, descriptive researchers must assume that their tasks capture essential features of real-world decision making. Performing a normative analysis not only complicates the work but also implicitly criticizes any study that has defined the decision problem intuitively.

Similar barriers arise from a research program's other strategic choices. When researchers consider a dimension of individual difference, they threaten any study that has ignored it. Although science progresses by adding features ("What if we vary . . . ?"), its rhetoric often treats omissions as sins ("How could you neglect . . . ?"). Behavioral decision research can provide balance here. A normative analysis shows the practical importance of descriptive results, as when a finding is statistically significant and theoretically revealing, without affecting the optimality of many choices. Indeed, a bias may survive because its effects are usually too small to provide the clear feedback needed to prompt learning, leaving it intact, for those occasional situations when it is critical.

Adopting a persuasive or nonpersuasive stance can also create barriers. That choice may reflect researchers' personal preferences: Some people like to direct others' lives, others hate manipulation. The choice may reflect funding priorities: Some agencies have a mandate to persuade, some can only advise. The choice may reflect the need for evaluation: It is easier to observe changes in the rates of a focal behavior than changes in the optimality of individual choices. The choice may reflect perceived necessity: Feeling that (non)persuasive methods cannot work. Defining a decision narrowly encourages persuasive communications (trying to change a focal behavior). Ignoring people's other goals makes them seem less rational. When an agency can consider only its focal goal (e.g., better diet) and must ignore other concerns (e.g., taste, cost, convenience), it may be setting itself up for frustration and the public up for unwarranted criticism ("We told them, but they did not listen"). Whatever the reason, adopting one stance may complicate communicating, and comparing results, with researchers adopting the other.

A final barrier to behavioral decision research is that, in many substantive areas, the decision-making research niche is occupied by other paradigms. Perhaps the most common "competition" uses computational approaches such as the health belief model. Such models have largely been absent from behavioral decision research since the 1970s when it was realized that they can have predictive value, even when their details are only weakly related to the underlying psychological processes—as long as the models include variables correlated with those processes. Measurement problems also make it difficult to distinguish alternative computational models (Dawes, 1979). As a result, researchers with some insight into a class of choices should be able to create models with some predictive validity. However, there will be limits to the predictive and explanatory ability of those models. Recognizing these limits, behavioral decision researchers have focused on understanding the component processes in decision making (e.g., judging probabilities, constructing values), then bolstering those processes in interventions. This clash between research paradigms is difficult to resolve, or even to confront, when researchers go to different meetings, publish in different journals, and interact

[1] At the time of the *Cryptosporidium* project, I happened to read communications for chemotherapy patients. These messages said little about waterborne pathogens. A normative analysis could tell whether those risks are more important than the issues that were addressed.

through the limited channel of proposal review (wherein the writers of proposals cannot explain, or defend, their paradigm to reviewers subscribing to other paradigms).

A Behavioral Decision Research Approach to Cancer Decision Making

In terms of strategic choices, a behavioral decision research approach to cancer decision making requires a commitment to normative analysis. That means explicitly assembling decision-relevant facts, determining their importance to decision makers, and identifying the choices in their best interests by using utility theory or an efficient heuristic (Simon, 1957). Although the details differ, the same normative logic applies to decisions about alternative medicine, genetic testing, tanning, and threats to chemotherapy patients (e.g., waterborne parasites, dietary deficiencies). The analysis might be directed at setting communication priorities for informed consent, identifying potentially legitimate reasons for rejecting a health behavior, or estimating the effectiveness of instructions for handling carcinogenic chemicals (Riley, Fischhoff, Small, & Fischbeck, 2001).

The other strategic choices (breadth, individual differences, persuasiveness) can reflect both researchers' personal preferences and their practical concerns. A narrowly focused message might be right if the window of opportunity for communicating is small. It might be wrong if the message is too brief for recipients to understand its rationale. A broadband intervention (e.g., a radio message or doctor's office brochure) might be appropriate if individual differences are small enough that one size fits all. It might be wrong if it misleads recipients with atypical circumstances or consumes resources that could have gone to targeted interventions. Critical individual differences might be in recipients' decision-making competence (Is the task too hard a task for them or needlessly simplified?), values (Does the intervention neglect issues that really matter to them?), or affect (Does it evoke emotions that they want to put aside?).

When people's values and circumstances vary greatly, no single message may be justified. If tailored messages are impossible, the intervention should be nonpersuasive, allowing recipients to do their own tailoring. A nonpersuasive stance is also needed when the uncertainty is so great that choices should depend on which gambles individuals want to take. A persuasive stance assumes that the expert either knows the situation better than recipients can hope to know it or knows them better than they know themselves. Such situations do arise, as when patients ask, "Doctor, what do I want to do?" However, sharing control requires trust. Recipients must see an expert as competent and honest, someone who possesses skills that they lack (or cannot exercise) and who acts in their best interest. Inappropriately persuasive interventions can alienate recipients by usurping their authority and denying them the chance to achieve mastery. Inappropriately nonpersuasive interventions can deny recipients needed protections, leaving them with "impossible choices" given their personal resources for understanding them.

Research program design would be simpler if one could assume a general level of decision-making competence. Sweeping generalizations about that level are common. However, those summaries can reflect motivated cognition (or even strategic posturing): Seeing an incompetent public justifies paternalistic institutions (e.g., strong regulation, technocratic control), and seeing a competent public justifies libertarian institutions (e.g., market-based solutions, participatory processes). A behavioral decision research strategy holds that the adequacy of decision-making processes (of both experts and lay people) depends on the choice, the individuals, and the context. Looking at the legacy of basic research and applications suggests the following complex working hypothesis:

> People often make sensible choices if they (a) get key facts in a clear and credible form, (b) are judged by their own goals, (c) have some control over themselves and their environment, and (d) have some minimal decision-making competence.

A comprehensive research program for improving cancer decisions requires a practical commitment to providing the resources needed for analytical and empirical research. It requires a philosophical commitment to expanding the envelope of autonomous decision making, as far as possible, while recognizing its limits (and the need for persuasive interventions). It requires a political commitment to creating and sharing candid estimates of the effects of prevention and treatment options so that individuals have ready access to the inputs needed for their choices.

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