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Fantasy and Dread: The Demand for Information and the Consumption Utility of the Future

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Abstract. We present evidence that intrinsic demand for information about the future is increasing in expected future consumption utility. In the first experiment, subjects may resolve a lottery now or later. The information is useless for decision making, but the larger the reward, the more likely subjects are to pay to resolve the lottery early. In the second experiment, subjects may pay to avoid being tested for herpes simplex virus type 1 (HSV-1) and the more highly feared type 2 (HSV-2). Subjects are three times more likely to avoid testing for HSV-2, suggesting that more aversive outcomes lead to more information avoidance. In a third experiment, subjects make choices about when to get tested for a fictional disease. Some subjects behave in a way consistent with expected utility theory, and others exhibit greater delay of information for more severe diseases. We also find that information choice is correlated with positive affect, ambiguity aversion, and time preference, as some theories predict.

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Keywords: anticipatory utility • intrinsic information preferences • information aversion • information avoidance • information–consumption complementarity • information-present consumption substitutability • positive affect • sexually transmitted diseases • ostrich effect • time preferences

1. Introduction

Expected utility theory predicts that the demand for information in a nonstrategic environment depends only on its usefulness. An expected utility maximizer would never incur costs to avoid information since information can only improve decisions from an ex ante perspective. An expected utility maximizer would also never incur costs to obtain information that cannot improve decision making. However, observation suggests that people seek information about enjoyable future experiences such as one's vacations, travel, hobbies, and passions even when the information has no potential use. Likewise, people seem to avoid information about painful future experiences such as the deterioration of their health, expected social conflicts, and financial woes. It appears people obtain information to enrich their fantasies about future delights but avoid information to reduce dread of future pains.

This paper presents evidence from the laboratory on intrinsic information preferences. Models of anticipatory utility have been developed to explain such patterns (Caplin and Leahy 2001, Kőszegi 2010).[1] Our results show that people pay for completely useless information about "happy" high-utility future experiences and pay to avoid information about "unhappy" low-utility future experiences. This paper demonstrates that people have intrinsic information preferences consistent with some forms of anticipatory utility. We provide, to our knowledge, the first evidence that there is an increasing relationship between the expected consumption utility of a future experience and the demand for information about it. We will refer to this as an information–consumption complementarity as in Tasoff and Madarász (2009).

The first two experiments in our study were conducted as two separate individual experiments within a single lab session. The lottery experiment endows subjects with two sealed envelopes. The envelopes each have an independent 10% chance of containing money and a 90% chance of being empty. If the envelope labeled "Small" contains money, the amount is $10, and if the envelope labeled "Big" contains money, the amount is $100. Subjects may only open the envelope either immediately or at the end of the experiment. We test whether subjects forgo 50 cents of their earnings to open the envelope immediately and whether they forgo 50 cents to delay the opening of the envelope. In either case, the delay between "immediately" and the end of the experiment is a mere 20–40 minutes. An expected utility maximizer would never forgo money to either expedite or delay receiving the information since the information is useless. Nonetheless, we find substantial manifestation of intrinsic information preferences: 83.4% of subjects pay to affect the timing of receiving the information. Moreover, the demand to open the Big envelope is 23.5 percentage points higher than the demand to open the Small envelope, consistent with the information–consumption complementarity.

The sexually transmitted disease (STD) experiment tests whether our subjects, mostly college students who are all sexually active and between the ages of 18 and 25 years of age, are willing to forgo $10 to avoid being tested for a STD.[2] We conduct a blood draw and test for the herpes simplex virus, which has a very high prevalence in this demographic. Clearly, such information is useful, and so any demand for this test is consistent with expected utility theory. By contrast, forgoing money to avoid a test cannot be rationalized by expected utility theory. We test for herpes simplex virus type 1 (HSV-1) and herpes simplex virus type 2 (HSV-2). Both infections are incurable, so the information is useful for symptom management and lifestyle decisions, but not so useful that being tested is tantamount to being cured. Furthermore, HSV-2 is widely perceived as a less desirable infection than HSV-1, which allows us to test for the information–consumption complementarity.[3] All questions are for real stakes, and subjects are assured that their test results will remain confidential and be revealed only to them. Even the testing facility remains blinded to the identities of those who provide the blood samples. We find that 5.2% of the sample avoid HSV-1 testing, while about triple that number, at 15.6%, avoid HSV-2 testing. This is again predicted by the information–consumption complementarity.

Although a few early empirical studies explored information preferences, these studies did not control for the usefulness of the information, and the incentives were hypothetical (Ahlbrecht and Weber 1997, Chew and Ho 1994, Lovallo and Kahneman 2000). A preference for information does not indicate intrinsic information preferences if information is potentially useful. More recently, several studies found intrinsic information preferences with real stakes. Experiments have shown that people will pay for confidence-enhancing information even when it cannot improve decisions (Eliaz and Schotter 2007, 2010, Hoffman 2013); they will pay to have two lottery realizations spread out over time instead of having both realized at the same time (Kocher et al. 2014); and they will pay to avoid information about their attractiveness (Eil and Rao 2011) and their IQ (Eil and Rao 2011, Mobius et al. 2010). Zimmermann (2015) tests whether people have a preference for information about the resolution of a lottery in a clumped or piecewise fashion but does not find intrinsic information preference. A recent study by Falk and Zimmermann (2016) tests what kinds of information people want when they face an imminent electric shock.[4] Similarly, Thunström et al. (2016) allow subjects to learn the caloric content of two possible meals before choosing which one they wish to eat, and they find that 58% prefer not to know the caloric content. However, none of these experiments tests for the information–consumption complementarity.

Several studies show that there is much delay for getting health information (for reviews, see Sweeny et al. 2010, Shepperd and Howell 2015). People self-report in surveys that they avoid going to the doctor even when they think they should (Persoskie et al. 2014). Many patients do not want to be genetically tested for Alzheimer's disease (Cutler and Hodgson 2003) or the *BRCA* gene for breast cancer (Thompson et al. 2002), do not return to find out their HIV test results (Hightow et al. 2003), and prefer not to get prenatal genetic testing (Kuppermann et al. 2014).

Notably, Lerman et al. (1999) find a surprisingly low uptake of a genetic test that identifies hereditary nonpolyposis colon cancer. Those with the condition could increase their life spans by an estimated seven years with preventative colonoscopies and treatment, yet only 40% of participants accept the genetic test. Oster et al. (2013) report that genetic testing for Huntington's disease is only 7% even for those who have a 50% chance of developing the disease.[5] Although the disease reduces life span by roughly 10–30 years and there is no cure, the authors point out that the information could be of tremendous use in terms of optimal lifecycle behavior. The optimal career, education, fertility, and savings behavior all should depend on one's life span.

However, in all previous health studies that we have come across, there is at least some nonnegligible cost to information acquisition. The genetic tests require a visit to the healthcare provider, medical insurance coverage or fees (for example, the PHAROS (Prospective Huntington At Risk Observational Study) test for Huntington's disease costs $300 plus the costs of neurologist and genetic counselor), and blood draws. Although the benefits of such information do seem to outweigh the relatively small costs of information acquisition, likely by orders of magnitude, such avoidance behavior could still be rationalized in expected utility theory. Moreover, other nonclassical preferences could induce behavior that is observationally difficult to distinguish from information avoidance. For example, present-biased patients may continually procrastinate on testing because of the immediacy of the costs and the delay of the benefits. This behavior should not be characterized as an intrinsic information aversion since the patient truly would prefer the information if there were no costs. As far as we are aware, we provide the first unconfounded evidence for intrinsic information preferences for medical testing.

The theory predicts that higher present consumption utility will decrease the demand for information about the future (Tasoff and Madarász 2009). Because people have limited attention, they must make a tradeoff between paying attention to the present and paying attention to the future. Keeping the usefulness of attention fixed, people prefer to attend to the higher consumption-utility experience. For example, people prefer to attend to the present when they are eating a delicious meal or listening to a soul-moving song, but they prefer to attend to the future when they are bored standing in a queue. Thus, the theory predicts that those who have higher consumption utility in the present will have a *lower* demand for information about the future. The theory also predicts that when information is useful, but about a low-consumption future experience, those who are less patient (lower discount factors) will be more likely to avoid information. Because information produces anticipatory utility immediately but the benefit of the information is realized in the more distant future, an impatient person is more likely to avoid anxiety-provoking information now at the cost of making worse decisions in the future. Consistent with these two predictions, we find that those with higher positive affect (i.e., higher present consumption utility) are less likely to obtain information early in the lottery experiment and are more likely to avoid getting tested for HSV-2. However, we do not find this relationship with avoidance of an HSV-1 test. The discount factors are also negatively correlated with avoidance behavior, in line with theory.

We also investigate whether information preferences are correlated with subjects' ambiguity aversion and loss aversion. A new theory posits connection between intrinsic information preferences and ambiguity aversion (Golman et al. 2015). We find that ambiguity aversion is positively correlated with information avoidance in the STD experiment. We find no correlation with ambiguity aversion in the lottery experiment, and we find no correlation with loss aversion in either experiment.

The results in the STD experiment are vulnerable to two possible confounds. First, people's beliefs about the probability of being infected for the two diseases cannot be controlled. Second, because of the communicable nature of the disease, people may have a plausible-deniability motive to not get tested. Therefore, we conduct a third experiment with hypothetical noncommunicable diseases in which the probabilities are given, thereby eliminating both confounds. People exhibit delay behavior for when they would like to know their disease status. When we split the sample into information seekers and delayers, we find that the seekers behave much like expected utility theory predicts. They want information immediately, and the worse the disease, the more they want the information. Delayers, on the other hand, if forced to get tested, prefer to get tested for the inconsequential disease over the more severe disease. Thus, there is a sizable fraction who—even with hypothetical choice—admit that they would delay getting tested, and delay more, the more consequential the disease.

We view this paper as having two central contributions. First, it provides evidence for the information–consumption complementarity in both positive and negative domains. Second, it shows unequivocal information avoidance in an important health domain—a highly prevalent STD. The additional findings—that information preferences relate to positive affect, the discount rate, and ambiguity aversion—support existing theories and establish facts that can serve as the basis for future theoretical innovations.

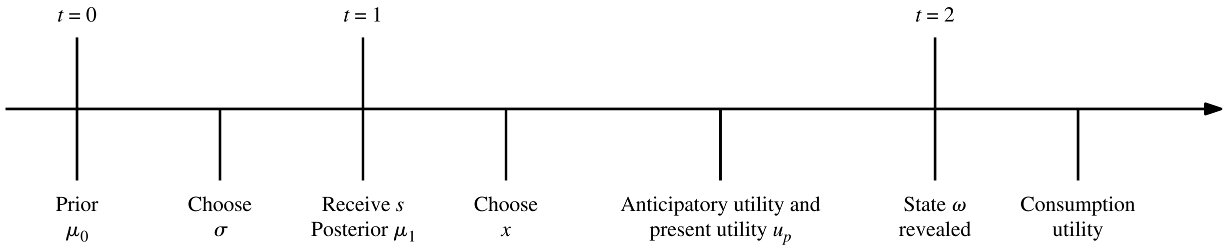
2. Conceptual Framework

We present a simple model for understanding the choice environment. The model primarily follows Tasoff and Madarász (2009), with modifications inspired by Eliaz and Spiegler (2006). The basic decision problem can be captured in a simple three-period timeline, $t \in \{0, 1, 2\}$. At $t = 0$ the person chooses information; at $t = 1$ the person receives information, updates beliefs, experiences $t = 1$ consumption utility (which we will take to be exogenous "present utility"), experiences anticipatory utility, and possibly takes an action; and at $t = 2$ any uncertainty is resolved, and the person experiences $t = 2$ consumption utility.

Let Ω be the nonempty finite state space. A state $\omega \in \Omega$ represents the relevant exogenous characteristics of the world that affect the physical consequence. For example, states may represent a person's disease status. Let $\Delta(\Omega)$ represent the set of probability distributions on the set Ω. Define $\mu_0 \in \Delta(\Omega)$ as the prior beliefs at $t = 0$ before receiving information and $\mu_1 \in \Delta(\Omega)$ as the posterior.

People care not directly about the state, but about consequences. Let Z be the nonempty finite set of possible physical consequences in period 2. Consequences represent future outcomes that a classical decision maker cares about directly. For example, a consequence $z \in Z$ may be eating a \$100 fancy dinner and having infection-free health. Another consequence z' might be eating dinner at the campus dining hall and experiencing bad symptoms from an infection. In the tradition of Savage (1972), the action $x \in X$ maps from states to

Figure 1. Timeline



consequences, x: $\Omega \to Z$. An action is a lottery over consequences.

Figure 1 depicts the timing of the problem. At $t = 0$, the person chooses whether to get information, and the information is subsequently received at $t = 1$. Let S be a finite set of realized signals. A signal is a function that maps from the state to a probability distribution over realized signals σ: $\Omega \to \Delta(S)$. For example, the states of the world are infected or uninfected, getting a blood test is the signal, and the result of the test (testing positive or testing negative) is the realization of the signal. At $t = 0$, the person may choose a signal from the set of signals $\sigma \in \Sigma$. Beliefs are updated in a Bayesian way, μ_1: $\Sigma \times S \to \Delta(\Omega)$.

The classical model for understanding preferences for information is expected utility theory. An agent who has preferences that satisfy the axioms of expected utility cares only about physical prizes. We will refer to standard expected utility here as consumption utility. We make one additional assumption on consumption utility: it is additively separable in I dimensions. Each of the I dimensions is a consumption experience that can be anticipated independently of the others. For example, one dimension might be how one spends this Friday evening, and another might be one's health as it relates to a particular infection. This will be useful later for defining attention-based anticipatory utility. Consumption utility in dimension i is given by the von Neumann–Morgenstern utility function u_i: $Z \to \mathbb{R}$, and total consumption utility is $\sum_{i=1}^{I} u_i(z)$. Prior to the realization of the state, the person's total expected consumption utility is $\sum_{i=1}^{I} E_{\mu_1}[u_i(x(\omega))] = \sum_{i=1}^{I} \sum_{\omega \in \Omega} \Pr_{\mu_t}(\omega) u_i(x(\omega))$.

Despite the assumption about additively separable dimensions, the model specified thus far can still be considered classical. A person who has preferences described above will only choose information insofar as it can improve choices. If the signal provides information on which action yields higher expected consumption utility, then the signal is valuable. However, if the signal does no such thing, as in the case when the action set is degenerate (i.e., there is only one action available), information does not alter expected consumption utility. In this situation, the person will never pay for information (Hirshleifer and Riley 1992). Likewise, since information can never make decision making worse, a person should never pay to avoid information. If a person believes a signal is pure noise, then the person can simply ignore it for free.

We now introduce belief-based anticipatory utility developed by Caplin and Leahy (2001). We use the convenient formulation of Eliaz and Spiegler (2006). Let v: $\Delta(\Omega) \to \mathbb{R}$ be a continuous von Neumann–Morgenstern utility function over posterior beliefs. This component of utility reflects an intrinsic preference for believing certain things. For example, a person may wish to believe that he or she is disease-free because this produces a feeling of calmness in the present, as opposed to the belief that he or she is infected, which produces a feeling of anxiety in the present. When a person gets information, it induces a lottery on the posterior in which the mean of the posterior equals the prior. This analogy to lotteries means that general preferences for information can be accounted for by the curvature of v in a way that is analogous to how preferences for risk are accounted for by the curvature of u. In the case of two states, if v is convex, the person is generally information seeking, and if v is concave, the person is generally information averse. In this way, belief-based anticipatory utility can create an intrinsic demand for information. However, Eliaz and Spiegler (2006) show the belief-based anticipatory utility model is unable to rationalize behaviors that many would consider to be primary motivations for its creation. Consider the information–consumption complementarity in which high future expected utility causes the person to be information seeking but low future expected utility causes the person to be information averse. It would appear that this complementarity cannot be rationalized in a two-state model (e.g., see Eliaz and Spiegler 2006, Example 2 and Proposition 2).

Attention-based anticipatory utility was introduced by Tasoff and Madarász (2009). Instead of anticipatory utility deriving from beliefs about the future, anticipatory utility derives from paying attention to or thinking about different experiences in the future. The key assumption is that information that changes expected consumption utility about a future experience shifts attention away from present consumption to the future experience. This is captured mathematically as a change in the weights of the different components of the utility function. Attention-based anticipatory utility is given as $\sum_{i=1}^{I} a_i(\mu_0, \mu_1)(E_{\mu_1}[u_i(x(\omega))] - u_p)$, where u_p (utility of the present) represents consumption utility at $t = 1$, and a represents the attention function. We take u_p as exogenous to this decision problem for simplicity, but it could be endogenized in a straightforward way. The key assumption regarding the attention function is that $a_i(\mu_0, \mu_1) = \alpha > 0$ if $E_{\mu_1}[u_i(x(\omega))] \neq E_{\mu_0}[u_i(x(\omega))]$ for some $x \in X$; otherwise, $a_i(\mu_0, \mu_1) = 0$.[6] If a person receives information that is utility relevant to future experience i, then a spike of anticipatory utility is felt immediately and is proportional to the expected consumption utility of that future experience, $\alpha E_{\mu_1}[u_i(x(\omega)]$. If the person does not receive information about the future, he or she instead receives a flow of utility from paying attention to the present equal to αu_p. This represents the opportunity cost of attention. For instance, if a person gets no information about his or her medical status, then attention remains on what the person is currently doing, such as watching a Johnny Depp movie. Instead, if a person receives the results of a medical test, the person will shift attention away from the present, away from the most glorious of films, and toward the future experience of the expected disease consequences. The attention-based anticipatory utility leads to several results.

Observation 1 (Information–Consumption Complementarity). There is an information–consumption complementarity in which the value of the information about dimension i is increasing in its expected consumption utility $E_{\mu_1}[u_i(x(\omega)]$. This means, ceteris paribus, that the better the prize, the more one wants to see the results of the lottery, and the worse the disease, the less desirable the medical test.

Observation 2 (Information Aversion). Information will lower utility if $E_{\mu_1}[u_i(x(\omega)] < u_p$. A person may choose to avoid information about low-consumption future experiences.

Observation 3 (Information–Present Consumption Substitutability). There is an information–present consumption substitutability. The greater the present consumption u_p, the greater the opportunity cost of paying attention to the future. Hence, watching a superb Johnny Depp film now relative to currently watching uninspired schlock now increases the opportunity cost of getting information about the future.

To summarize, assuming that these components of utility are additively separable, preferences at $t \in \{0, 1\}$ can be represented by the expression

$$U_t(x, \mu_0, \mu_1) = E_{\mu_t}\Bigg[D(t,1)\underbrace{\left(\sum_{i=1}^{I} a_i(\mu_0, \mu_1)(E_{\mu_1}[u_i(x(\omega))] - u_p)\right)}_{\text{attention-based anticipatory utility}} + D(t,1)\underbrace{v(\mu_1)}_{\substack{\text{belief-based}\\ \text{anticipatory}\\ \text{utility}}} + D(t,2)\underbrace{\left(\sum_{i=1}^{I} E_{\mu_1}[u_1(x_1(\omega))]\right)}_{\text{expected (consumption) utility}}\Bigg], \quad (1)$$

where the function $D(t, \tau)$ represents the period t agent's discounting of period $\tau \geq t$ utility. The decision maker solves her problem backward, choosing the action in $t = 1$ to maximize U_1 and choosing the signal in $t = 0$ to maximize U_0:

$$x^* = \arg\max_{x \in X} U_1(x, \mu_0, \mu_1), \quad (2)$$

$$\sigma^* = \arg\max_{\sigma \in \Sigma} U_0(x^*, \mu_0, \mu_1). \quad (3)$$

The formulation above also leads to an additional prediction.

Observation 4 (Intertemporal Trade-offs). The discount function should be related to information preferences when there is a trade-off between anticipatory utility and $t = 2$ consumption utility. In particular, if the expected consumption utility in a dimension is low but information about the dimension is useful, a person with attention-based anticipatory utility is more likely to avoid the information the greater the discounting. Intuitively, impatient people are more likely to avoid anxiety-provoking information since the harm is immediate and the benefit of higher consumption achieved from having made a better decision occurs in the future.

The primary purpose of this paper is to test for the information–consumption complementarity (Observation 1) as predicted uniquely by attention-based anticipatory utility. There are two other models that can be considered variants of attention-based anticipatory utility and they too predict variations of the information–consumption complementarity. In the model of Karlsson et al. (2009), anticipatory utility is based on gains and losses relative to a reference point. A piece of initial good news (outcomes are better than the reference point) may suggest that more news leads to a gain, and a piece of bad news (outcomes are worse than the reference point) may suggest that more news leads to a loss. Thus, in the Karlsson et al. (2009) model under various parameter restrictions, initial positive news leads to intrinsic information seeking, and initial bad news leads to intrinsic information avoidance. Golman and Loewenstein (2015) construct a model with similar features as Tasoff and Madarász (2009). Their more general model is based on slightly different primitives, but the key relationship between anticipatory utility and information is very similar. They assume that information increases attention on the relevant dimension[7] as a function of its importance, defined as how much the information changes utility, its salience, and the degree of surprise, operationalized as the Kullback–Leibler divergence between the posterior and the prior. The person may consider some dimensions more pleasurable to think about than others and so the model has essentially the same information–consumption complementarity.

We lay out the models to interpret the experimental results in terms of theory. While testing between the many various models of anticipatory utility and intrinsic information preference is important, it is not the purpose of this paper. The primary question in this paper is whether people display an information–consumption complementarity in their intrinsic information preferences and whether people display intrinsic information aversion in the health domain. These behaviors are consistent with attention-based anticipatory utility and related variants (Tasoff and Madarász 2009, Karlsson et al. 2009, Golman and Loewenstein 2015) but are inconsistent with expected utility theory.

3. Lottery Experiment and STD Experiment

3.1. Sample

Subjects were recruited by email through the Center for Neuroeconomic Studies (CNS) at Claremont Graduate University, which maintains a subject database. Participants in the database are all volunteers who expressed interest in participating in experiments. Most participants are students at colleges or universities near Claremont, California.[8] The email solicitations explicitly requested subjects who were between 18 and 25 years of age and had been "sexually active" at some time. Self-reported exit-survey responses indicate that these criteria were satisfied for virtually all our participants. The recruitment email also stated that subjects would possibly have their blood drawn by a certified phlebotomist.

All sessions were conducted at CNS. Subjects received $10 for participation in addition to their earnings and provided informed consent. There was a station in the waiting room with phlebotomy equipment that was clearly visible to all participants. Sessions were run in groups with a variable number of participants ranging from 1 to 14. There were a total of 52 sessions. Our target sample size was 200, and we were able to recruit 194 subjects. The experiment took approximately 30–60 minutes and was conducted using a computer interface using Qualtrics, a survey system that operates through a web browser. Each computer station had privacy partitions. During the experiment, the browser was made full screen, and subjects were instructed not to navigate away nor open or close any software applications. The average payment was $26.35 per subject.

3.2. Design

The lottery experiment and the STD experiment are the main focus of this paper. The order of these two experiments was randomized, with both orders equally likely: 50.5% of participants faced the lottery experiment first, and the remainder faced the STD experiment first. After these two experiments, subjects completed the ambiguity aversion, loss aversion, and time preference elicitations and then an exit survey. Since the experience in the first experiment may affect behavior in the second experiment, we focus our results on behavior in the first experiment. This design has the advantage that we can double the sample for tests that would otherwise be underpowered and also look at within-subject behavior across experiments. The full instrument is available in Online Appendix D.

3.2.1. Lottery Experiment Design. The lottery experiment was designed to test for the information–consumption complementarity for information seeking in the domain of high future consumption. Subjects were seated at computer carrels in which two clearly visible envelopes were taped to the partition wall just behind and to the top of the computer monitor. One envelope was labeled "Small" and the other envelope was labeled "Big." The computer program informed subjects that both of these envelopes belonged to the subject and that each envelope had a 1 in 10 chance of containing money and a 9 in 10 chance of containing blank paper. The possible prize in the envelope labeled "Small" was $10, and the possible prize in the envelope labeled "Big" was $100. Subjects were told that unless the instructions stated otherwise, they had to wait until the end of the experiment to open the envelopes (20–40 minutes). All envelopes used were security envelopes, minimizing subjects' ability to discern the contents. The instructions asked participants first to write three things that they might spend their winnings on should they win money from the Small envelope and the Big envelope, respectively. This was designed to increase the salience of the possible winnings.

Next subjects made a choice in a series of six binary questions. They were told that one of the six questions would be randomly selected to "count." The questions are listed in Table 1. For example, on line 1, subjects read, "Choose: A. Earn $0.75." and then separated by some space "B. Earn $0.25. Open envelope 'Small' now." Only one of the two options could be clicked.[9] After subjects made their choices, the computer randomly selected one line to implement. Subjects were immediately told whether they should open an envelope or whether they would need to wait until the end of the experiment to do so. The series of questions identified whether subjects were willing to forgo $0.50 in earnings to open the envelope immediately and whether they were willing to forgo $0.50 to delay

Table 1. Binary Questions in the Lottery Experiment

1.	A. Earn $0.75.	B. Earn $0.25. Open envelope "Small" now.
2.	A. Earn $0.75. Open envelope "Small" now.	B. Earn $0.25.
3.	A. Earn $0.75.	B. Earn $0.25. Open envelope "Big" now.
4.	A. Earn $0.75. Open envelope "Big" now.	B. Earn $0.25.
5.	A. Earn $0.75. Open envelope "Small" now.	B. Earn $0.25. Open envelope "Big" now.
6.	A. Earn $0.75. Open envelope "Big" now.	B. Earn $0.25. Open envelope "Small" now.

Note. For each line, subjects chose option A or option B.

its opening. It also measured whether subjects valued opening one envelope immediately $0.50 more than they valued opening the other.

An expected utility maximizer would never choose to forgo earnings to receive or avoid useless information. Expected utility theory predicts that all subjects choose A for all six questions. The information–consumption complementarity implies that more subjects choose B for line 3 than for line 1, and more choose B for line 5 than line 6. This would be an exhibition of greater information demand for the big lottery.

The time delay in this experiment is very short; the information is useless and relates to an outcome that is fairly low stakes. Thus, this is a strong test of information preferences. We expect that this minimalist environment will tend to understate the demand for information about pleasurable future experiences that may arise outside the laboratory.

3.2.2. STD Experiment Design. The STD experiment is designed to test for the information–consumption complementarity for information avoidance in the domain of low (aversive) future consumption. Exploring information preferences for STD tests has the advantage of having external validity to healthcare, a domain of great importance. We specifically chose to test for HSV for three reasons: (1) there are two strains of the virus, one of which is widely considered worse than the other, thereby allowing for a test of the information–consumption complementarity; (2) there is a high incidence in the population that we have access to; and (3) the information is useful but not so useful that it can be used to mitigate all negative consequences of the disease.[10] The STD experiment was structured similarly to the lottery experiment but was prefaced with extensive information about the herpes simplex virus. The full description is available in Online Appendix D. About a page of text described the virus broadly, presenting several key facts, all of which were supported with citations. Subjects were told that there are two strains of the virus and the two most common manifestations are oral herpes and genital herpes. The estimated prevalence is 57%, with 39% prevalence for those between 14 and 19 years of age and 54% prevalence for those between 20 and 29 years of age. Most infected individuals are asymptomatic and do not know they have the virus. Subjects were told that transmission is through skin to skin contact via exposure to saliva, semen, vaginal fluid, and herpetic blister fluid. The text emphasized that while there is no cure for herpes, antiviral medication may reduce symptoms.

A second page of text made distinctions between the two strains of the virus, HSV-1 and HSV-2. HSV-1 is more commonly associated with cold sores, and when it does cause genital herpes it tends to be less severe than genital herpes caused by HSV-2. A picture of a cold sore accompanied the text. The section on HSV-2 explained that the virus is more commonly associated with genital herpes. A picture of genital herpes on a female and a picture of genital herpes on a male accompanied the text.

Subjects were told that there was a roughly 1 in 10 chance that a phlebotomist would draw their blood at the end of the experiment. When a blood draw occurred, the phlebotomist drew approximately 10 ml of blood. Randomization was conducted at the session level for logistical reasons. If the session was selected, everyone in the session received a blood draw. Given that there were 52 sessions, having a phlebotomist on hand for all of these would have been cost prohibitive. Of the 194 subjects in the experiment, 18 were selected for blood draws.[11] Depending on the subject's responses to the questions described below, the blood was either discarded or tested for HSV-1 or HSV-2 antibodies. The results of the exam were entirely confidential, identified only by the subject's initials and a randomly assigned code, and even these codes were known only by the lab and by a medical doctor specializing in STDs. The subjects obtained the results from the doctor. The doctor provided advice on potential medical follow-ups and confidential counseling free of charge for those who tested positive. All of this was clearly disclosed to the subjects in the instructions. It was also made clear that neither the researchers nor the participant's regular healthcare providers would ever obtain the results of the test.

As in the case of the lottery experiment, subjects again made a choice in each of six binary questions. Conditional on being selected for a blood draw, one of the six questions was randomly selected to "count." The six questions are listed in Table 2. For the rest of the subjects who did not receive a blood draw, none

Table 2. Binary Questions in the STD Experiment

1.	A. Earn \$11. You will be tested for HSV-1 (commonly associated with cold sores).	B. Earn \$1. You will *not* be tested (you will still do the blood draw but the sample will be discarded).
2.	A. Earn \$11. You will *not* be tested (you will still do the blood draw but the sample will be discarded).	B. Earn \$1. You will be tested for HSV-1 (commonly associated with cold sores).
3.	A. Earn \$11. You will be tested for HSV-2 (commonly associated with genital herpes).	B. Earn \$1. You will *not* be tested (you will still do the blood draw but the sample will be discarded).
4.	A. Earn \$11. You will *not* be tested (you will still do the blood draw but the sample will be discarded).	B. Earn \$1. You will be tested for HSV-2 (commonly associated with genital herpes).
5.	A. Earn \$11. You will be tested for HSV-2 (commonly associated with genital herpes).	B. Earn \$1. You will be tested for HSV-1 (commonly associated with cold sores).
6.	A. Earn \$11. You will be tested for HSV-1 (commonly associated with cold sores).	B. Earn \$1. You will be tested for HSV-2 (commonly associated with genital herpes).

of the questions counted. Since all questions had the potential to count, subjects were advised to treat each question as if they were selected for the blood draw. Subjects did not know whether they were selected for a blood draw until after they responded to these questions. The questions identified whether subjects were willing to forgo \$10 to get tested or not get tested. They also identified whether subjects valued getting tested for one of the strains of HSV by \$10 more than getting tested for the other strain. An expected utility maximizer should never forgo the money to avoid information and therefore would choose A on line 1 and line 3. The information–consumption complementarity implies that more people would choose B on line 3 than on line 1.

Although the structures of the lottery and STD experiments are similar, the STD experiment is not intended to perfectly parallel the lottery experiment. The probabilities of having HSV-1 and HSV-2 are not 10%, nor are they equal. Although we make no distinction between the base rate probabilities in the description, subjective beliefs for the two infections can possibly differ. We cannot induce these beliefs to be equal without using deception, but we can and do elicit them. Although there is no cure, the information should be useful for lifestyle decisions and management of symptoms. Usefulness of information goes against finding information avoidance. Likewise, if HSV-2 information is more useful than HSV-1 information, this goes against finding higher information avoidance for HSV-2 under the null hypothesis (expected utility theory). Given that HSV-2 is perceived to be more serious than HSV-1 by 93.3% of the 193 subjects, we find it likely that people will perceive an HSV-2 test to be more useful than an HSV-1 test.

It may seem that the obvious counterpart design to the lottery experiment for aversive events would be to endow subjects with money and run lotteries in the domain of losses. However, this would not identify the information–consumption complementarity. The subject would still receive money, which is typically associated with higher consumption utility, and so it is not clear that a simple framing manipulation would operationalize aversive future consumption. This would be an interesting design but would address a slightly different research question.

3.2.3. Positive Affect Treatment. Observation 3 from Section 2 says that higher consumption utility in the present should be associated with a lower demand for information. We operationalized this as an increase in positive affect. Some interpret positive affect (i.e., happiness) as a proxy for utility (Kahneman et al. 1997). Others interpret happiness as a good, like any other, that enters into the utility function (Becker and Rayo 2008). Under either interpretation, the model predicts that an increase in positive affect should increase current consumption utility and result in a lower demand for information. Subjects report their level of positive affect through the Positive And Negative Affect Schedule (PANAS).

We conducted a positive affect induction as a between-subjects treatment.[12] We used a standard mood-inducement procedure that has been used extensively in the psychology literature (Gross and Levenson 1995, Rottenberg et al. 2007) and is becoming common in the economic literature on mood (see, for example, Ifcher and Zarghamee 2011, Oswald et al. 2015). The method involves randomly assigning subjects neutral control videos and amusing treatment videos designed to increase positive affect. Immediately after the video, subjects filled out the PANAS as in Ifcher and Zarghamee (2011). Unfortunately, as we show in Section 3.4, the treatment was not effective at significantly increasing positive affect. We report the details of the treatment implementation in Online Appendix A.1.

3.2.4. Preference Elicitation and Exit Survey. Observation 4 from Section 2 implies that people who are more impatient should exhibit more information avoidance on STD tests. To test this claim, we measured subjects' time preferences. Given the dearth of empirical evidence on intrinsic information preferences, we also measured subjects' ambiguity aversion and loss aversion to test associations with information choice. The motivation to use these measures is largely exploratory with the hope that discovery of any associations could lead to future theoretical innovations. A very recent theoretical paper predicted an association between information preferences and ambiguity preferences (Golman et al. 2015).

After the lottery and STD sections, subjects faced a preference elicitation for ambiguity aversion using the method of (Sutter et al. 2013) and loss aversion using the method of Gächter et al. (2010), both for real stakes. We then conducted a preference elicitation using hypothetical choices between sums of money to be received at different points in time. Similar methods have been used in several studies (e.g., Meier and Sprenger 2010). For more details about these elicitations, see Online Appendix A.2.

After these preference elicitations, subjects completed an exit survey. Given that some of the questions were personal in nature, subjects were allowed to skip questions. Subjects answered a 15-question inventory that measured subjects' coping style. Coping styles are scored on three dimensions: problem solving, emotional processing, and avoidance. The questions we used were adapted from Howerton and Gundy (2009).

The rest of the questions were about behaviors, beliefs, and attitudes regarding sexually transmitted infections as well as about general background characteristics. The questions asked for subjects' estimations of how likely it was that they had been infected (for both HSV-1 and HSV-2 separately), whether they had ever been tested before, and whether they had ever been sexually active.[13] Furthermore, subjects were asked how often they worry about contracting STDs, which strain of HSV is worse to contract, and whether they would like to know whether they have an infection. Subjects that stated that they would like to know were then asked to check one or more of the relevant reasons: "to be prepared should I experience symptoms," "to be knowledgeable about my health in general," "to know so that I do not transmit the virus accidentally to others," and "other," which had space for a text entry. Subjects who stated that they did not want to know were asked to check one or more of the relevant reasons: "it will cause me unnecessary stress or anxiety if I test positive," "I'm worried that insurance companies will find out the results," "I'm worried that other people will find out the results," "I'm worried that other people will hold me responsible for them becoming infected," "I don't want to feel responsible for other people becoming infected," and "other," which had space for a text response. We also asked how people would react if a romantic partner revealed that they had HSV-1 or HSV-2. This question measures the intensity of romantic stigma placed on these two viruses. For background characteristics, we asked for SAT scores, sex, age, and year in college. The last question asked whether subjects thought they knew the hypothesis of the experiment and, if so, to state what they thought it was.

3.3. Hypotheses

In summary, the main hypotheses are the following.

Hypothesis 1 (H1). *The fraction of participants who forgo money to open the Big envelope early exceeds the fraction of participants who forgo money to open the Small envelope early.*

Hypothesis 2 (H2). *The fraction of participants who forgo money to avoid an HSV-2 test exceeds the fraction of participants who forgo money to avoid an HSV-1 test.*

The first two hypotheses are manifestations of the information–consumption complementarity. Information demand should be increasing in future consumption utility. In addition, we test two other predictions from attention-based anticipatory utility.

Hypothesis 3 (H3). *Positive affect will decrease the number of participants who forgo money to get lottery information early and increase the fraction of participants who forgo money to avoid an HSV test.*

This is a manifestation of the information-present consumption substitutability (Observation 3 in Section 2).

Hypothesis 4 (H4). *HSV avoidance will be negatively correlated with the discount factors.*

Hypothesis 4 tests the theoretical prediction regarding the discount function in Equation (1) (Observation 4 in Section 2). Because an HSV test provides useful information, any information avoidance is sacrificing future consumption utility for the sake of near-term anticipatory utility.

3.4. Results

Summary statistics for the two experiments are available in Tables B.1 and B.2 in Online Appendix B. All subjects participated in both experiments in sequence. The order had an effect on behavior. Since order was randomized, we mainly conduct our tests using behavior from subjects' first experiment (i.e., data for the lottery experiment come from subjects who did the lottery experiment first, data for the STD experiment come from subjects who did the STD experiment first). Thus, the simple statistical tests reported below use only subjects who were in their first experiment. This provides the cleanest results because it precludes possible spillover effects between the experiments. Full-sample results are available in Online Appendix B. The downside of using only the first presented experiments is that it forces us to drop half of our sample. For the regression analysis, which includes a fairly large set of covariates, we use the full sample for greater statistical power. Online Appendix B also includes, as a robustness check, regression results for subjects who did the relevant experiment first.

3.4.1. Lottery Experiment. The results of the lottery experiment strongly confirm the information–consumption complementarity (H1). Nearly all subjects, 98%, exhibited choices consistent with transitive preferences on this part of the experiment. The sample demonstrates widespread intrinsic information preferences: 83.4% were willing to forgo $0.50 to open an envelope early, delay opening an envelope, or to choose which envelope to open if only one must be opened immediately. These subjects chose B for at least one question from Table 1. Table 3 presents the subjects' choices in the lottery experiment using data from subjects who had the lottery experiment first. The results using the full sample are very similar and are in Table B.3 in Online Appendix B. It is quite surprising that such a large fraction exhibits an information preference given that the information is useless, it provides a resolution of uncertainty only 20–40 minutes sooner, and the rewards are quite small.

Moreover, the revealed choices match the predictions of the information–consumption complementarity. The first column shows that about 18.4% are willing to forgo money to open the Small envelope early, but as many as 41.8% are willing to pay to open the Big envelope early ($p = 0.0002$). This is a 2.3-fold increase in the demand for information as the stakes increase. The second column shows subjects who forgo $0.50 to delay the opening of the envelope. A number of subjects prefer to delay receipt of the information than to receive it immediately. Among these subjects who seem to exhibit a preference for suspense, the results are consistent with the information–consumption complementarity since there is less avoidance for the Big envelope. As the expected future outcome becomes better, the demand for information increases. The most direct comparison can be seen in the third column: subjects reported their choice of which envelope to open immediately in exchange for forgoing $0.50. As many as 59.2% forwent money to open the Big envelope over the Small, compared with only 6.1% who forwent money to open the Small over the Big ($p < 0.0001$).

Table 3. Information Preferences in the Lottery Experiment

	Proportion who forwent $0.50 to get information early	Proportion who forwent $0.50 to avoid information early	Proportion who forwent $0.50 to open preferred envelope
Small: $10 prize	0.184	0.449	0.061
Big: $100 prize	0.418	0.327	0.592
Difference	−0.235***	0.122**	−0.531***
	(0.045)	(0.046)	(0.041)
N	98	98	98

Notes. Standard errors are in parentheses. Significance is determined using a two-sample, one-sided proportions test.
** $p < 0.05$; *** $p < 0.01$.

The strong results may raise some concern that subjects were confused in some way or perhaps suspicious of the real probabilities of winning. However, if subjects had been confused, we would expect transitivity violations. Instead, out of 96 subjects, only 2% exhibited transitivity violations in the lottery experiment (and only 3% in the STD experiment). To be doubly sure, we also ran a more stringent but simpler-to-follow lottery experiment (described in Online Appendix C) as a replication study to rule out confusion or suspicion as an explanation. In this replication, the $100 and $10 prizes were taped to the carrels in full view instead of being hidden in envelopes, and the subjects rolled the dice themselves to determine whether they would win the prize. Before rolling the dice, subjects reported whether they would pay to learn the results early rather than wait until the end of the experiment. The visible and physically touchable prizes and subject-controlled dice rolls, as opposed to computer-generated randomization, together with other relatively minor design changes, were all intended to minimize doubts, suspicions, or confusion of any sort. Last, the experimenters interacted with subjects repeatedly, inquiring at each stage whether subjects followed the procedures. The instrument, including the exact protocol, is provided in Online Appendix D.3. Subjects behaved in a way consistent with the information–consumption complementarity.[14]

3.4.2. STD Experiment. The results of the STD experiment using the sample of subjects who had the STD experiment first are displayed in Table 4. The full sample results are very similar and available in Online Appendix B. Nearly all subjects, 98%, exhibited choices consistent with transitive preferences on this part of the experiment. Demand for information here does not imply intrinsic information preferences since HSV-test results are potentially useful. Thus, demand for information could be rationalized under expected utility theory, although this does not preclude demand for information also stemming from belief-based anticipatory utility.

Consistent with expected utility theory, a sizable minority (36.5%) forgo $10 to get tested for HSV. The fraction who forgo money for an HSV-1 test (29.2%) is not significantly different from the fraction who forgo money for an HSV-2 test (29.2%).

Avoidance cannot be rationalized through expected utility theory. In the aggregate, 15.6% (significantly different from zero at $p = 0.001$) avoid at least one of the HSV tests (i.e., choose B for item 1 or item 3 in Table 2). Even though the usefulness of the information and the pecuniary stakes are much larger in the current

Table 4. Information Preferences in the STD Experiment

	Proportion who forwent $10 to get information	Proportion who forwent $10 to avoid information	Proportion who forwent $10 to get preferred test		
			Seekers	Nonseekers/ nonavoiders	Avoiders
HSV-1	0.292	0.052	0.061	0.04	0.769
HSV-2	0.292	0.156	0.364	0.04	0.154
Difference	0.000	−0.104***	−0.303***	0.000	0.615***
	(0.066)	(0.043)	(0.093)	(0.039)	(0.154)
N	96	96	33	50	13

Notes. The sample is those who had the STD experiment first. Standard errors are in parentheses. Significance is determined using a two-sample, one-sided proportions test. Seekers are defined as those who forwent $10 to get either HSV test, avoiders are defined as those who forwent $10 to avoid either HSV test, and nonseekers/nonavoiders are those who are neither seekers nor avoiders. Five subjects exhibited both avoidance and seeking behavior, and we placed them in the nonseeker/nonavoider category.

***$p < 0.01$.

study, the avoidance is slightly larger than the avoidance found in IQ test results and attractiveness ratings (Mobius et al. 2010, Eil and Rao 2011). The avoidance is particularly conspicuous when we consider that the fee for an HSV test at the university's student health center is $40. In our experiment, students have zero transaction costs since their blood is already drawn, they are offered a test of potential high usefulness that would otherwise cost them $40, they are offered an additional $10, their confidentiality is assured, and yet they still refuse to accept the test.

The key finding is the increase in information avoidance from HSV-1 to HSV-2, consistent with the information–consumption complementarity (H2). Whereas 5.2% avoid an HSV-1 test (i.e., choose B in item 1 on Table 2), 15.6% avoid an HSV-2 test (i.e., choose B on item 3 on Table 2). This threefold increase is significant at $p = 0.009$ (two-sample, one-sided proportions test). Moreover, 100% of those who avoid an HSV-1 test also avoid an HSV-2 test, whereas of those who avoid an HSV-2 test, only 66.7% avoid an HSV-1 test, indicating that all HSV-1 avoiders are HSV-2 avoiders, but not the converse.

The last three columns of Table 4 display the fraction of subjects who must get tested for only one virus (either HSV-1 or HSV-2) and forgo $10 to get their preferred test (i.e., choose A for one item and B for the other on items 5 and 6 on Table 2). Behavior is organized into three mutually exclusive categories based on responses to items 1–4 of Table 2. Seekers are defined as those who forwent $10 to obtain at least one HSV test (i.e., chose B on item 2 or item 4 in Table 2). Avoiders are defined as those who forwent $10 to avoid either HSV test (i.e., chose B on item 1 or item 3 in Table 2). Nonseekers/nonavoiders are defined as those who are not seekers or avoiders. Five subjects forwent $10 to avoid one of the HSV tests and forwent $10 to obtain the other HSV test. We categorized these subjects as nonseekers/nonavoiders as well. We find that the seekers are about six times more likely to forgo $10 to get tested for HSV-2 over HSV-1, while avoiders are about five times more likely to forgo $10 to get tested for HSV-1 over HSV-2. The pattern among avoiders is predicted by the information–consumption complementarity. The fact that seekers prefer to be tested for HSV-2 can be interpreted as evidence that the HSV-2 test is a more useful test than the HSV-1 test. If seekers are expected utility maximizers, then the demand for information is driven solely by its usefulness, and this would be an indication that the HSV-2 test is viewed as more useful than the HSV-1 test. The nonseekers/nonavoiders exhibit no preference for one test over the other, and the difference in their preference for either test is exactly zero.

We checked that subjects do indeed perceive HSV-2 to be worse than HSV-1. In the sample that takes the STD experiment first, 94.8% answered that HSV-2 is worse than HSV-1 on the exit survey. We also asked a multiple-choice question regarding how the subject would feel if his or her romantic partner revealed that he or she had an HSV infection. The options were progressively stronger negative reactions. A t-test shows that romantic stigma for HSV-2 is greater than romantic stigma for HSV-1 at the $p < 0.0001$ level.

In addition to measuring avoidance, in the exit survey we asked subjects directly, "Would you like to know whether you have HSV-1 or HSV-2?" The results are displayed in Table 5. In the full sample, 18.7% said no. Among avoiders, 46.7% said no. Avoidance and a "no" response are significantly correlated ($\rho = 0.326, p = 0.001$), although the correlation is not perfect. One possible interpretation of this gap is that it indicates a difference between what people believe is the socially correct behavior and what people actually do, or a difference between feelings of near-term benefits and costs instead of the total intertem-

Table 5. "Would You Like to Know Whether You Have HSV-1 or HSV-2?"

Response	Reason	All sample	Avoiders
Yes (would like to know)		82.3%	53.3%
	I want to be knowledgeable about my health in general	91.1%	40.0%
	I want to know so that I do not transmit the virus accidentally to others	72.2%	33.3%
	I want to be prepared should I experience symptoms	57.0%	40.0%
	Other	0%	0%
No (would not like to know)		18.7%	46.7%
	It will cause me unnecessary stress or anxiety if I test positive	64.7%	85.7%
	I'm worried that other people will find out the results	35.3%	57.1%
	I'm worried that insurance companies will find out the results	17.6%	42.9%
	I don't want to feel responsible for other people becoming infected	23.5%	28.6%
	I'm worried that other people will hold me responsible for them becoming infected	29.4%	28.6%
	Other	11.7%	0%
	$N =$	96	17

Notes. The sample is those who took the STD experiment first. The table shows the percentage who answered "yes" or "no." Subjects could check multiple reasons. Percentages for "yes" reasons are the number who gave that reason divided by the total number who said "yes." Percentages for "no" reasons are defined in a similar manner.

poral net benefit. The most common reason provided for getting tested was the desire to be knowledgeable about one's health in general (91.1%). For those who did not wish to be tested, the most commonly stated reason was that it would cause stress or anxiety (64.7%), which is a direct admission of anticipatory emotions. This reason was stated at about twice the frequency as the next most commonly stated reason. This anticipatory motivation rose to 85.7% in the subsample that avoided an HSV test.

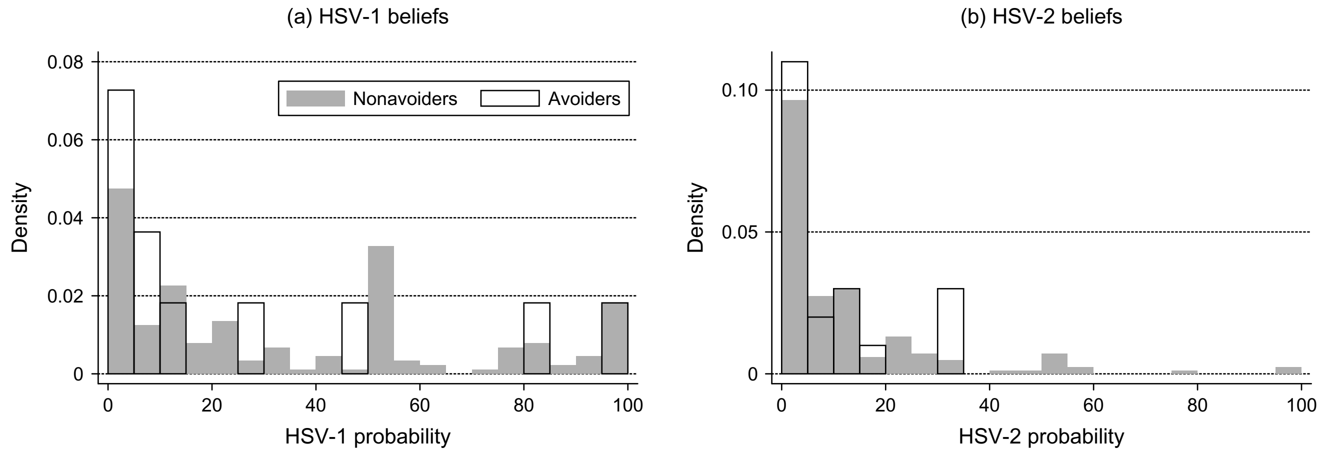
Only 14.6% of the subjects reported having been tested previously for HSV. Having been tested is correlated neither with avoidance behavior nor with beliefs about the likelihood of having an infection. The mean belief for having HSV-1 is 32.2%, and that for having HSV-2 is 12.1%. The distributions of beliefs are presented in Figure 2. Figure 2(a) shows beliefs for having HSV-1 split into those who did not avoid the HSV-1 test and those who did. The same is done in Figure 2(b) for HSV-2. In both panels, we use the full sample (rather than the half of subjects who took the STD experiment first) to get meaningful distributions as we organize the sample into subgroups. The beliefs are not significantly correlated with avoidance behavior.

Only 31% of subjects reported believing they knew the hypothesis of the experiment. Among these subjects, 2.6% correctly observed that the videos were used for mood induction, but no subject reported the correct directional prediction on behavior nor the information–consumption complementarity. This provides reassurance that the results are not being driven by an experimenter demand effect.

Our design allows us to test information preferences across the lottery and STD experiments within subject. We find no correlation of behavior. For example, the correlation between exhibiting some information preference in the lottery experiment and avoidance in the STD experiment is $\rho = 0.073$ ($p = 0.313$).[15] Subjects who exhibit a particular information preference in the lottery experiment are no more or less likely to exhibit any particular information preference in the STD experiment. This should not be surprising. Preferences are often heterogeneous, and there is no ex ante reason we should believe that the people who get most excited about winning money also happen to be the same people who most fear genital herpes. We see a wide range of responses for how frequently people worry about STDs, with 13.5% stating they worry very often or always and 31.6% stating that they never worry. From a theoretical perspective, this suggests that fixed personality characteristics do not determine whether a person has intrinsic information preferences. Rather, how a person behaves may depend more on whether the information is about something that the person cares about.

3.4.3. Correlates of Information Demand. Observation 3 says the more one enjoys the present, the less one wants to be distracted by information about the future. Thus, a positive affect mood induction should

Figure 2. Beliefs That Oneself Is Infected



Notes. The figure uses the full sample. The horizontal axis is a person's believed probability that she has the infection. The vertical axis is the fraction of the population that holds this belief.

reduce the demand for information. The manipulation was only marginally effective, as can be seen in Table B.6 in Online Appendix B. Unfortunately, this means that we cannot conduct a strong causal test for H3. In our regression, we regress on the treatment as we had designed and, in separate regressions, on positive affect directly to measure correlational coefficients.

For the dependent variable, we construct an index of information demand in the lottery experiment. The index adds the number of times that the subject forgoes money to get information early and subtracts the number of times that the subject forgoes money to delay information.[16] The index can take integer values from −2 to 2. As discussed above, we regress the dependent variable index on the treatment and then self-reported positive affect directly. Table 6 displays the results of an ordinary least squares (OLS) regression of lottery information demand.[17] For these regressions, we use the full sample (those who took the lottery experiment first and those who took it second) to increase statistical power. Column (1) includes only variables that are randomly assigned, the positive affect treatment, and the order. Not surprisingly, since the positive affect treatment failed to work, the treatment effect is not significantly different from zero. In columns (2)–(4), we regress the index directly on subjects' self-reported positive affect. Since positive affect is not randomly assigned, our results should be interpreted as correlational associations and not causal effects. Column (2) shows that information demand is weakly negatively correlated with positive affect. Column (3) includes demographic and economic variables. There are no significant associations with gender, age, ambiguity aversion, loss aversion, or time preferences, but the association with positive affect remains robust. Column (4) includes SAT scores, which drops the coefficient on positive affect by about 11%, rendering it no longer significant at conventional levels. Taken as a whole, there is some suggestive evidence that positive affect is negatively correlated with the demand for information in the lottery experiment.

Table 6. Information Preferences for the Lottery

	(1)	(2)	(3)	(4)
Treatment	−0.082			
	(0.185)			
Order (lottery first)	−0.351*	−0.323*	−0.370*	−0.411**
	(0.185)	(0.184)	(0.189)	(0.189)
Positive affect		−0.186**	−0.176*	−0.157
		(0.093)	(0.102)	(0.099)
Female			0.224	0.204
			(0.197)	(0.197)
Age			0.010	−0.003
			(0.029)	(0.033)
Ambiguity tolerance			−0.085	−0.069
			(0.090)	(0.090)
Loss tolerance			0.170	0.150
			(0.106)	(0.109)
β			0.061	0.049
			(0.140)	(0.137)
δ			0.073	0.088
			(0.156)	(0.153)
SAT				0.074
				(0.132)
R^2	0.02	0.04	0.10	0.13
N	194	194	194	194

Notes. The table shows an OLS regression with robust standard errors using the full sample. The dependent variable counts the number of times the person forgoes money to open an envelope minus the number of times the person forgoes money to not open the envelope. Whenever a model includes *female*, *age*, *ambiguity*, *loss*, β, and δ, it also includes indicators for missing values of the respective covariates. *Ambiguity tolerance* reflects the cutoff point chosen in the ambiguity multiple price list, *loss tolerance* reflects the cutoff point chosen in the loss multiple price list, β is short-run patience, and δ is long-run patience. SAT scores are self-reported. *Positive affect*, *ambiguity tolerance*, *loss tolerance*, β, δ, and *SAT* are all standardized.
$^{*}p < 0.1$; $^{**}p < 0.05$.

Table 7. Determinants of HSV Avoidance (Odds Ratios)

	HSV-1					HSV-2				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Treatment	1.180					1.105				
	(0.683)					(0.496)				
Order (STD first)	0.618	0.612	0.402	0.451	0.581	2.084	2.057	2.229	2.701	1.906
	(0.365)	(0.362)	(0.298)	(0.345)	(0.479)	(0.969)	(0.967)	(1.347)	(1.654)	(1.218)
Positive affect		1.185	1.156	1.378	1.308		1.479**	1.500*	1.859**	1.938**
		(0.245)	(0.323)	(0.447)	(0.516)		(0.267)	(0.329)	(0.480)	(0.529)
Female			1.104	1.402	3.151			1.057	1.206	1.923
			(0.719)	(0.811)	(2.795)			(0.576)	(0.636)	(1.334)
Age			1.043	0.986	0.969			0.921	0.877	0.917
			(0.131)	(0.173)	(0.141)			(0.117)	(0.106)	(0.111)
Ambiguity tolerance			0.353***	0.338***	0.201***			0.486***	0.478***	0.426**
			(0.103)	(0.107)	(0.095)			(0.114)	(0.133)	(0.151)
Loss tolerance			1.186	1.238	1.334			1.366	1.490	1.885
			(0.511)	(0.689)	(0.878)			(0.392)	(0.459)	(0.739)
β			0.663	0.530*	0.315**			0.803	0.609*	0.482
			(0.170)	(0.190)	(0.181)			(0.186)	(0.183)	(0.219)
δ			0.627	0.554	0.470			0.478***	0.402***	0.380**
			(0.194)	(0.205)	(0.244)			(0.124)	(0.135)	(0.179)
Worry about STD				1.383	1.348				1.693	1.829
				(0.550)	(0.538)				(0.567)	(0.714)
HSV-1 stigma				0.735	0.913					
				(0.317)	(0.420)					
HSV-1 probability				0.113*	0.056					
				(0.146)	(0.099)					
HSV-2 stigma									0.800	0.769
									(0.254)	(0.239)
HSV-2 probability									0.017	0.002
									(0.045)	(0.008)
SAT					0.449					0.318*
					(0.264)					(0.191)
Coping style—Problem solving					0.497					0.828
					(0.255)					(0.264)
Coping style—Emotion					0.817					0.744
					(0.397)					(0.279)
Coping style—Avoidance					1.999*					0.932
					(0.781)					(0.235)
N	194	194	187	187	186	194	194	187	187	186

Notes. The table shows a logit regression with robust standard errors. Odds ratios are reported. The full sample was used. The dependent variable in columns (1)–(5) takes the value 1 if the subject stated a preference to forgo money to avoid an HSV-1 test. The dependent variable for columns (6)–(10) is defined similarly for the avoidance of an HSV-2 test. Whenever a model includes *female*, *age*, *ambiguity*, *loss*, β, δ, *HSV-1 probability*, and *HSV-2 probability*, it also includes indicators for missing values of the respective covariates. *Ambiguity tolerance* reflects the cutoff point chosen in the ambiguity multiple price list, *loss tolerance* reflects the cutoff point chosen in the loss multiple price list, β is short-run patience, and δ is long-run patience. SAT scores are self-reported. Coping-style variables reflect responses on a psychological assessment about how people deal with stressful events. *Positive affect*, *ambiguity tolerance*, *loss tolerance*, β, δ, *SAT*, and coping-style variables are all standardized.
$^{*}p < 0.1$; $^{**}p < 0.05$; $^{***}p < 0.01$.

We conduct a similar analysis for the STD experiment in Table 7. All models are logit regressions, and we report the odds ratios. Again, we use the full sample (those who took the STD experiment first and those who took it second) in these regressions to increase statistical power. In columns (1)–(5), the dependent variable is forgoing money to avoid getting tested for HSV-1, and in columns (6)–(10), it is defined similarly for HSV-2. Columns (1) and (6) include only variables that are randomly assigned, the positive affect treatment, and the order. As with the lottery analysis, we again find no significant treatment effect. In columns (2) and (7), we regress directly on positive affect while controlling for order. A standard deviation higher in positive affect leads to an 18.5% higher chance of avoiding the HSV-1 test (not significant) and a 47.9% higher chance of avoiding the HSV-2 test ($p = 0.03$). In subsequent columns, we layer in additional control sets: demographics plus economic preference controls, HSV attitudinal controls and perceptions, and other controls (cognitive ability and coping style). The effect of positive affect on HSV-1 avoidance remains at roughly the same magnitude and not significant across these specifications. The coefficient on positive affect remains significant and actually gets larger as more controls are included to increase to an odds ratio near 2 with the full control set. This supports H3, the information–present consumption substitutability, that states that higher consumption in the present reduces demand for information about the future.

The next set of regressions in columns (3) and (8) layer in demographics and preference elicitations: ambiguity, loss, and time. Tolerance for ambiguity has a strikingly large and statistically significant effect on avoidance. Those who are one standard deviation higher in ambiguity tolerance are only about a third as likely to avoid getting tested for HSV-1 and about half as likely to avoid getting tested for HSV-2. These results are quite stable and actually get stronger as more controls are added. With the full control set in columns (5) and (10), a standard deviation in ambiguity tolerance is associated with one-fifth chance of avoiding HSV-1 testing and less than one-half chance of avoiding HSV-2 testing. Loss aversion does not seem to be correlated with avoidance.

As predicted by H4, greater patience via the quasi-hyperbolic discount parameters β and δ (Laibson 1997) leads to less information avoidance. The effect is not significant for HSV-1 in column (3) but highly significant for the effect of δ on HSV-2 avoidance in column (8). A standard deviation in δ is associated with about a one-half decrease in the probability of avoidance. As more controls are added, the effects again become larger. In column (5), β and δ are significant at $p = 0.04$ and $p = 0.15$, respectively, and the joint significance of the two parameters is $p = 0.13$. In column (10), β and δ are significant at $p = 0.11$ and $p = 0.04$, respectively, and the joint significance is $p = 0.12$.

Columns (4) and (9) layer in the attitudinal variables regarding how much people worry about STDs, how much they stigmatize HSV, and their beliefs about having the virus. None of these variables is robustly significant across specifications. In columns (5) and (10), we include SAT scores and people's responses on the coping-style assessment. There is some weak evidence to suggest that those with higher SAT scores are less likely to avoid, but much caution is warranted given that nearly half of participants have missing values because they did not report their SAT scores (see Table B.2 in Online Appendix B). Consistent with our interpretation, an avoidance coping style seems to be correlated with HSV-1 avoidance, but not much credence should be placed on this result, as the relationship does not extend to HSV-2 avoidance.

3.5. Discussion

There are three dimensions of the STD experiment that may possibly confound identification of the information–consumption complementarity. The first is that the usefulness of HSV-1 information, keeping constant the probability of infection, may be greater than the usefulness of HSV-2 information. It is possible that the intrinsic preference to avoid HSV-1 testing is stronger than the intrinsic preference to avoid HSV-2 testing, but the usefulness of the information of HSV-1 testing is greater than that of HSV-2 testing. This could cause HSV-1 avoidance to be less than HSV-2 avoidance even without an information–consumption complementarity. This explanation seems unlikely. HSV-2 is considered by 93.3% of the sample to be the worse infection. Because both HSV-1 and HSV-2 are incurable, the main usefulness of testing relates mainly to mitigating symptoms and the chances of transmitting the disease. Any mitigation of symptoms or actions to prevent transmission is likely to be more impactful for HSV-2. As long as the usefulness of HSV-2 testing is equal to or greater than the usefulness of HSV-1 testing, the results support the information–consumption complementarity. Furthermore, the information–consumption complementarity is a parsimonious explanation since it can explain the pattern of behavior in both the lottery experiment and the STD experiment.

The second potential confound is that the belief of being infected may differ for the two strains. This can also influence the usefulness of the information since the informativeness of the tests will vary. This is not a concern in the lottery experiment, as the priors are controlled and identical; however, in the STD experiment, subjects may have any prior. While we could not ethically control beliefs in the experiment, it is possible to statistically control for them in the analysis. Beliefs are not correlated with avoidance.[18] On a related note, it does not seem that HSV tests prior to the experiment played much role in people's decisions. Only 14.6% reported having previously received a test, and their distribution of beliefs about the probability that they have the disease is not statistically different from the distribution of untested subjects. For HSV-1, the mean beliefs of having the disease for tested and untested subjects are 32.4 and 32.5, respectively (difference is nonsignificant in a two-sample, one-sided t-test), and for HSV-2, the mean beliefs of having the disease for tested and untested subjects are 9.5 and 13.0, respectively (difference is nonsignificant in a two-sample, one-sided t-test). Having previously been tested is uncorrelated with both information seeking and avoiding behavior.

The third potential confound is the possibility of moral preferences, which imply an alternative interpretation of the results. A person may prefer to avoid the information, not to prevent distasteful anticipatory utility, but rather to avoid moral dilemmas regarding future sexual encounters. A person may think that under a state of untested ignorance, sexual behavior is morally permissible, as it is when a person has tested HSV negative. But when a person tests positive, a person may think it a moral obligation to tell sexual partners. This leaves the person either satisfying his or her moral obligation, and possibly hurting the relationship, or not satisfying his or her moral obligation and feeling guilty. A person with such preferences may exhibit information avoidance.[19] Moreover, such a person may exhibit greater information avoidance for HSV-2 over HSV-1 since the moral concerns are greater for the latter. There is some evidence in favor of this interpretation. Table 5 indicates that 28.6% of avoiders check "I don't want to feel responsible for other people becoming infected," and the same fraction check "I'm worried that other people will hold me responsible for them becoming infected" as reasons for not wanting to be tested. However, the primary reason avoiders check is "It will cause me unnecessary stress or anxiety if I test positive," and this dominates other reasons at 85.7%.

While there is evidence suggesting that the probability confound and the morality confound are not driving the results, these confounds cannot be fully eliminated as possible concerns. Therefore, we address these two issues in the next experiment.

4. Terrible Diseases Experiment

Because of the impossibility of controlling the STD infection rates across the two strains and the communicable nature of the disease, the probability confound and the morality confound cannot be fully eliminated in the context of a real-choice STD experiment. These issues are addressed with a third experiment conducted online.

We use a hypothetical choice framework in which subjects are confronted with the possibility of contracting a terrible disease in the distant future. As before, there are two versions of the disease, one egregiously worse than the other. The probabilities of contracting the diseases are the same in each case and independent. Furthermore, the diseases are genetic and hence noncommunicable, thereby eliminating the moral confound. We ask subjects when they would get tested for the diseases, and if they could only get tested for one disease, which one.

A hypothetical choice design has both advantages and disadvantages. The clear advantage is that the nature of the diseases can be freely chosen by the experimenter. By fiat both the probability and moral confounds are eliminated. The disadvantage is the possibility that the results are not externally valid to real information choice. Much literature shows that hypothetical choice is highly correlated with real choice, although hypothetical choice is often biased (List and Gallet 2001). Since we are not concerned with the absolute level of behavior, but instead the relative behavior between the minor disease and the severe disease, an information–consumption complementarity established in this experiment is likely to reflect the same relationship in real choice.

4.1. Sample

Subjects were recruited on Amazon Mechanical Turk.[20] Subjects had to be fluent in English, between 18 and 50 years old, and currently residing in United States. Subjects also had to have completed at least one previous "human intelligence task" (HIT) and had to have HIT approval rating 95% or greater. The experiment took approximately six minutes, and subjects were paid a flat rate of $0.70 for their time. We aimed for 240 subjects and 236 participated.

4.2. Design

Subjects begin by being told that they will be presented with a hypothetical scenario and to behave as they actually would in real life. They are then presented with the following setup:

> Your doctor contacts you to inform you that your distant cousin has just contracted Gangoff disease. It is a rare genetic disease that affects the nervous system. The doctor is contacting you because you are at risk of contracting the disease as well. The disease is not contagious, but there is no cure. There is nothing that can be done to prevent it. If you have the genes for it, then you will certainly get the disease. There are two variants of the disease. Gangoff A is the mild form, and Gangoff B is the severe form.

Subjects are randomly assigned to five disease scenarios summarized in Table 8. The full instrument is available in Online Appendix D. The scenarios span a wide range of possible impairments. The purpose of having multiple types of impairments is to test whether behavior is robust to this variation. In all cases, Gangoff A is relatively mild, while Gangoff B is very severe.

Subjects are then informed that there is a 2% independent chance of contracting each disease and that

Table 8. Disease Scenarios

Domain	Gangoff A	Gangoff B
Vision	Blurred vision	Blindness
Motion	Slowness	Paralysis below the neck
Mental	Forgetfulness	Dementia
Heart	Irregular heartbeat	Sudden death
Pain	Mild headaches	Excruciating migraines (many commit suicide)

the onset is in 11 years. For a random half the sample, the onset time is 29 years. Subjects state how they would feel upon hearing this. This free response is designed to increase the salience of the scenario.

The description continues by explaining that the law requires the doctor to ask whether the subject wants to be tested for Gangoff disease. The tests are separate and perfectly accurate. They are ready in 20 minutes, and because they use existing blood samples at the hospital, only consent is required. Communication is through a perfectly secure and confidential channel, and it is impossible that anyone else will find out without the subject telling them. If subjects wish to be tested, the lab will call them within 20 minutes to tell them of their status.

Before making a choice, there are two more segments designed to increase salience. First, subjects are asked to list three things that they plan to do today before going to sleep. This is designed to increase the salience of possible opportunity costs from being anxious or distraught throughout the day. Then subjects are asked to think about how they would feel if they got tested now, later, or never.

Subjects choose when they would get tested for Gangoff A and B (order randomized): (1) now, (2) tomorrow, (3) later this week, (4) longer than a week but within the year, (5) not this year but some point at least a year before onset, (6) later than one year before onset, or (7) I do not plan to get tested. Then subjects answer a direct comparison question. They must be tested for one disease today and only one disease. The other test could be conducted at any other time in the future. Subjects are asked, "Which form of the disease would you get tested for now?" For all three choices, there is an optional free response that allows subjects to explain why.

The exit survey begins by having subjects check how much they agree or disagree on a seven-point Likert scale with several statements. Subjects express, for each disease, how frightening getting the disease would be, if they would worry frequently if they were not tested, and if they could put it out of their mind if they were not tested. Then subjects respond to a multiple price list (MPL) time preference elicitation of β and δ that is slightly shorter than the one used in the lab experiment. Last, they report their gender.

To ensure that responses are reliable, there are a number of comprehension checks at the end. Subjects must select "which version of the disease was worse" from a list. They state how much they agree, on a five-point Likert scale, with whether they understood the survey, answered honestly, lied on a question, and answered questions truthfully. There is also a decoy question that tells subjects to "'Enter 'Disagree' to show you are paying attention."

4.3. Hypotheses

This design eliminates both the probability confound and the moral confound. However, the design cannot control for the usefulness of the information. Information about disease status is inherently useful. Arguably, the more severe the consequences, the more useful the information. Hence, like in the STD experiment, the choice of information will present a trade-off between (instrumental) expected utility and anticipatory utility. Under expected utility theory, subjects should always get tested immediately, and they should prefer to be tested for Gangoff B today over Gangoff A today, since the Gangoff B test is more useful. An information–consumption complementarity implies that there will be information delay or avoidance, that delay should be greater for Gangoff B, and that people will prefer to be tested for Gangoff A today over Gangoff B today. The presumption underlying the experiment is that anticipatory utility is sufficiently large that some sizable fraction of the population will exhibit the information–consumption complementarity.

Hypothesis 5 (H5). *The fraction of participants who delay or avoid being tested for Gangoff B exceeds the fraction who delay or avoid being tested for Gangoff A.*

As done previously in the STD experiment, we can also split the sample, this time into seekers (those who want information now), delayers (those who want to be tested but with some delay), and avoiders (those who never want to be tested) and analyze how their preferences for a Gangoff A test today over a Gangoff B test today differ. According to the information–consumption complementarity, those who exhibit less demand for information should prefer the less consequential information at a higher rate than those who exhibit a greater demand for information.

Hypothesis 6 (H6). *Those who prefer information later prefer being tested for Gangoff A today over Gangoff B today at a higher fraction than those who prefer information sooner.*

As in the STD experiment, delaying information is trading off future consumption utility for more immediate anticipatory utility. Hence, delay should be negatively correlated with the discount factor.

Hypothesis 7 (H7). *The delay in chosen timing for obtaining the information should be negatively correlated with the discount factor.*

Finally, since anticipatory utility is a theory that predicts mental states, our psychological measures—fear, worry, and the ability to put the disease out of mind—should be correlated with information preferences.[21]

Hypothesis 8 (H8). *Fear of the disease should be positively correlated with delay and avoidance. "Worry if not tested" should be negatively correlated with delay and avoidance. The ability to put the disease "out of mind" if not tested should be positively correlated with delay and avoidance.*

4.4. Results

The sample is mostly male 62.3% and is, on average, 31 years old. Subjects seemed to do very well on the comprehension and attention checks. For example, 95.8% passed the comprehension check, and 99.6% passed the attention check. For what it is worth, average self-reported honesty on a five-point scale was 4.831. The majority of the people prefer information immediately, 58.1% for both Gangoff A and Gangoff B, but there is still substantial delay behavior (25.8% and 27.1%, respectively) and avoidance behavior (16.1% and 14.8%, respectively). Table B.11 in Online Appendix B contains the summary statistics.

The initial test of the information–consumption complementarity (H4) fails to reject the null hypothesis. Table 9 displays people's information preferences. People exhibit very similar information preferences for both versions of the disease. In fact, 92.8% state the exact same response for when they want to test for Gangoff A as they do for Gangoff B. Thus, there is insufficient variation to power a statistical test. This is an unfortunate by-product of the within-subjects design that did not seem to manifest to such a great extent on the STD experiment.[22] In the second and third columns, testing the proportion who delay or avoid information between the two diseases, and the proportion who avoid information between the two diseases, is underpowered.

Lest a hasty first impression label this experiment a null finding, we split the sample by information preferences, leading to a bifurcation of behavior that supports the information–consumption complementarity as expressed by H6. We define "seekers" as those who wanted to be tested for both diseases immediately, "delayers" as those who wanted to delay testing for at least one disease but want testing for both eventually, and "avoiders" as those who never want to be tested for at least one disease. The fourth column shows that delayers are about six to seven times more likely than seekers to prefer a Gangoff A test immediately to a Gangoff B test immediately, going from 6.2% to 40.9%. This is highly significant ($p < 0.0001$). Likewise, avoiders are seven times more likely than seekers to prefer a Gangoff A test immediately to a Gangoff B test immediately ($p < 0.0001$), going from 6.2% to 43.9%. The difference between delayers and avoiders is not significant. Seekers behave according to expected utility theory. They want information immediately, and they prefer more consequential information. By contrast, delayers and avoiders behave in line with attention-based anticipatory utility, exhibiting an information–consumption complementarity. They do not want information immediately but, if forced to learn, they prefer the less consequential information at much higher rates than the seekers.

Interestingly, neither the delayers nor the avoiders show preference for the Gangoff A test over the Gangoff B test at rates greater than 50%. A reasonable interpretation is that the Gangoff B test is substantially more useful. The instrumental utility motivation may be playing an important role in driving information preference. Knowing whether one will suffer from a terrible disease in 11 (or 29) years could cause one to live their life in a very different way. This is a noteworthy reminder that although anticipatory utility may influence behavior, classical expected utility still plays an important role.

This pattern can also be expressed visually as in Figure 3. Panels (a) and (b) in Figure 3 show the distributions of when people wish to be tested. While a majority want to be tested immediately, a sizable minority prefer delays, and a meaningful fraction (17.4%) wish to avoid testing entirely for at least one of the two dis-

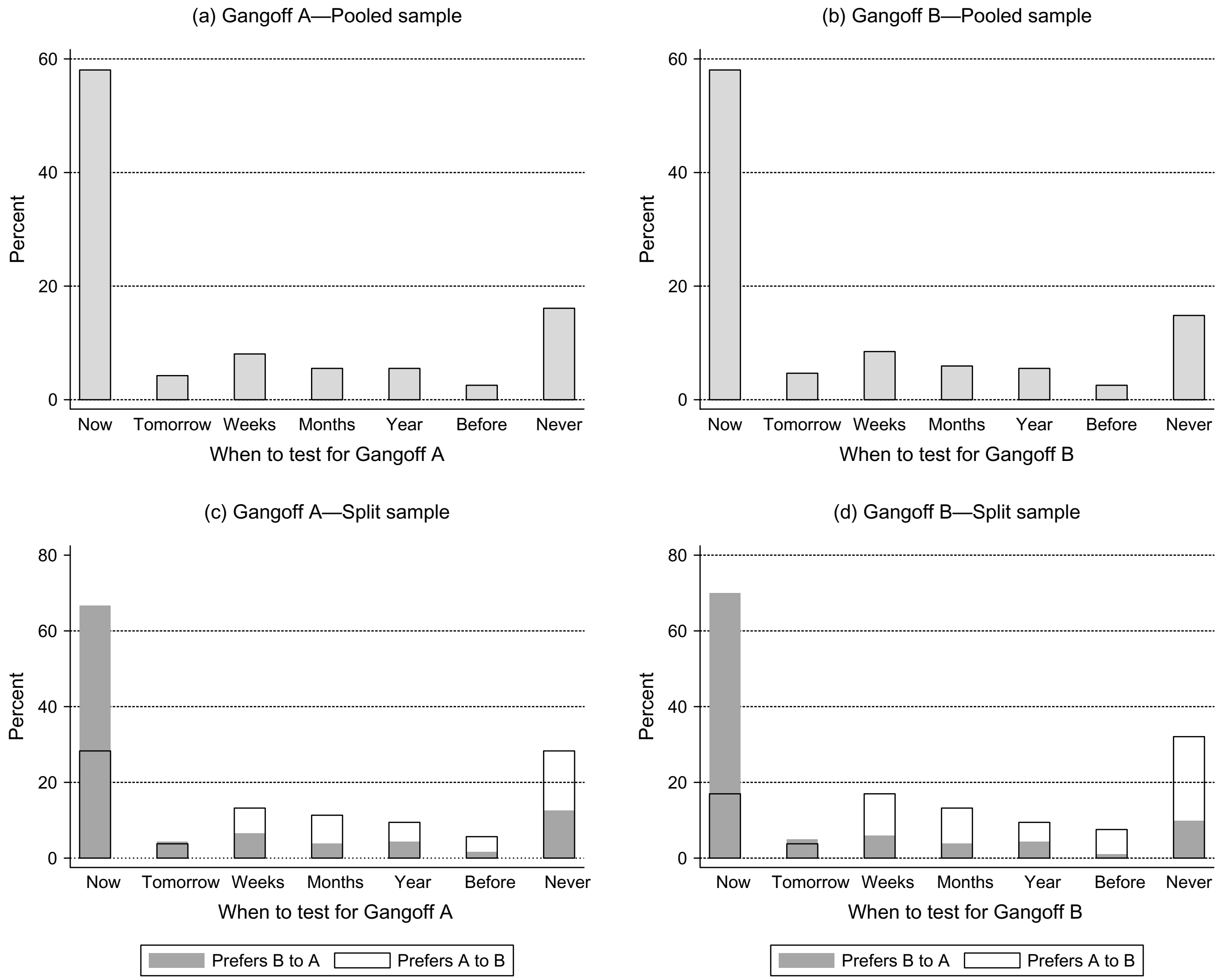
Table 9. Information Preferences in the Terrible Diseases Experiment

	When test (Avg)	Delay or avoid (Prop)	Avoid (Prop)		Proportion who choose Gangoff A test over Gangoff B test			N
Gangoff A	2.682	0.419	0.161	Seekers	0.062		0.062	129
Gangoff B	2.631	0.419	0.148	Delayers	0.409	0.409		66
				Avoiders		0.439	0.439	41
Difference	0.051	0	0.013		−0.347***	−0.030	−0.377***	
	(0.075)	(0.045)	(0.033)		(0.064)	(0.098)	(0.080)	
N	236	236	236					

Notes. Standard errors are in parentheses. "When test" is "When would you get tested for Gangoff (A/B)?." Responses are as follows: (1) now, (2) tomorrow, (3) later this week, (4) longer than a week but within the year, (5) not this year, but at some point before (time of onset minus one) years, (6) after (time of onset minus one) years, and (7) I do not plan to get tested. Significance is determined using a two-sample, one-sided t-test for the "When test" and a two-sample, one-sided proportions test for all other columns. "Seekers" are defined as those who wanted to be tested for both diseases immediately. "Delay" and "Delayers" are defined as those who wanted to delay testing for at least one disease but want testing for both eventually. "Avoid" and "Avoiders" are defined as those who never want to be tested for at least one disease. Prop, Proportion.

***$p < 0.01$.

Figure 3. Distributions of "When to Get Tested"



Notes. "Weeks" represents "later this week," "Months" represents "longer than a week but within the year," "Year" represents "not this year, but at some point before (time of onset minus 1) years," "Before" represents "after (time of onset minus 1) years," and "Never" represents "I do not plan to get tested." Panels (a) and (b) display the pooled sample. Panels (c) and (d) split the sample by those who prefer the Gangoff A test to the Gangoff B test when only one test can be taken immediately. Bars represent the probability mass function of the two samples.

eases. Panels (c) and (d) in Figure 3 split the sample by preference between the Gangoff A test and the Gangoff B test. Those who prefer the less consequential information exhibit much more delay. In fact, the distribution of timing for the subjects who prefer the Gangoff A test first-order stochastic dominates the distribution for the subjects who prefer the Gangoff B test. This holds for both diseases.

To test H7, we use OLS regression in Table 10. The outcome variable is the timing of when the person wishes to get tested (responses (1)–(7)).[23] Table 10 shows the results. Columns (1)–(4) show the outcome for Gangoff A timing, and columns (5)–(8) run the same models with Gangoff B timing. Columns (1) and (5) regress timing on the primary variable of interest, an indicator for preference of the Gangoff A test to the Gangoff B test. The only included controls are variables that were randomly assigned. These regressions support the previous finding that the preference for the Gangoff A test leads to substantially and significantly more delay behavior. Interestingly, the timing of onset does not seem to matter for information preference. The pain scenario is the omitted category. The death scenario seems to accelerate the preference for information, but none of the other scenarios is significant.

The subsequent models sequentially layer in controls for demographics followed by time preferences with attitudinal variables. Columns (2) and (6) layer in gender and age. Females exhibit greater delay behavior than men, and the effect is quite robust across all statistical models. There is no significant effect from age.

Columns (3) and (6) layer in the time-preference variables and attitudinal variables. These regressions also include an indicator for whether the time preference

Table 10. Terrible Diseases—When to Get Tested?

	Gangoff A				Gangoff B			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Gangoff A test > Gangoff B test	1.825***	1.826***	1.209***	1.339***	2.438***	2.428***	1.591***	2.013***
	(0.366)	(0.362)	(0.335)	(0.425)	(0.341)	(0.328)	(0.318)	(0.371)
Order	−0.130	−0.128	−0.248	−0.182	0.014	0.006	0.156	0.320
	(0.290)	(0.291)	(0.261)	(0.297)	(0.270)	(0.267)	(0.221)	(0.246)
Onset in 29 years	0.002	−0.018	−0.062	−0.092	−0.303	−0.313	−0.240	−0.176
	(0.290)	(0.290)	(0.261)	(0.311)	(0.270)	(0.269)	(0.218)	(0.245)
Vision scenario	−0.415	−0.513	−0.098	−0.649	−0.099	−0.245	0.109	−0.200
	(0.487)	(0.481)	(0.440)	(0.525)	(0.460)	(0.441)	(0.351)	(0.405)
Motion scenario	−0.358	−0.417	0.248	−0.613	−0.204	−0.292	0.075	−0.394
	(0.486)	(0.478)	(0.458)	(0.531)	(0.472)	(0.458)	(0.356)	(0.401)
Mind scenario	−0.117	−0.144	0.392	0.088	−0.147	−0.184	−0.021	−0.286
	(0.472)	(0.467)	(0.445)	(0.551)	(0.453)	(0.437)	(0.337)	(0.383)
Death scenario	−1.020**	−1.036**	−0.357	−0.781	−0.908**	−0.922**	−0.442	−0.668*
	(0.448)	(0.438)	(0.442)	(0.535)	(0.407)	(0.388)	(0.344)	(0.374)
Female		0.546*	0.751***	0.719**		0.700**	0.890***	0.889***
		(0.308)	(0.268)	(0.304)		(0.282)	(0.232)	(0.269)
Age		0.011	0.014	0.013		0.024	0.021	0.019
		(0.017)	(0.016)	(0.018)		(0.016)	(0.013)	(0.015)
β			0.117	0.087			0.083	0.136
			(0.171)	(0.193)			(0.147)	(0.201)
δ			0.129	0.215			0.063	0.055
			(0.148)	(0.164)			(0.117)	(0.125)
Gangoff A—Fear			0.348**	0.418**				
			(0.170)	(0.190)				
Gangoff A—Worry			−0.429**	−0.216				
			(0.203)	(0.221)				
Gangoff A—Out of mind			0.975***	1.101***				
			(0.170)	(0.197)				
Gangoff B—Fear							0.125	0.190
							(0.158)	(0.190)
Gangoff B—Worry							−0.465**	−0.409*
							(0.194)	(0.247)
Gangoff B—Out of mind							0.970***	0.985***
							(0.176)	(0.206)
R^2	0.12	0.13	0.36	0.42	0.21	0.24	0.53	0.60
N	236	236	236	170	236	236	235	169
Eliminate questionable subjects	No	No	No	Yes	No	No	No	Yes

Notes. The table shows an OLS regression with robust standard errors. The dependent variable is when to get tested. Responses are (1) now, (2) tomorrow, (3) later this week, (4) longer than a week but within the year, (5) not this year, but at some point before (time of onset minus 1) years, (6) after (time of onset minus 1) years, and (7) I do not plan to get tested. *Order* is an indicator for different order of questions, *Onset in 29 years* is an indicator for longer onset of disease (default is 11 years), β is short-run patience, and δ is long-run patience. Whenever a model includes β and δ, it also includes indicators for missing values of these covariates. *Fear*, *Worry*, *Out of mind*, β, and δ are all standardized.
$^*p < 0.1$; $^{**}p < 0.05$; $^{***}p < 0.01$.

cutoffs are missing (they may be missing if people do not exhibit monotonic preferences on the MPL). In contrast to the HSV analysis, there is no significant relationship with time preference; this goes against H7. Fear of the disease seems to increase delay for the Gangoff A test, as predicted (H8), but not significantly so for the Gangoff B test. Likewise, the extent of worrying if one does not get tested is highly correlated with getting tested sooner for both diseases. But most striking is the effect of being able to put the disease "out of mind" should one not get tested. This is the most significant predictor. People who self-report being able to do this well delay to a far greater extent. These three results all support H8, substantiating attention-based anticipatory utility. The inclusion of these measures impressively increases the R^2 from 0.13 to 0.36 and 0.24 to 0.53 for Gangoff A and B, respectively. The final columns, (4) and (8), test the robustness of the previous columns by dropping any subject that did not self-report maximal understanding, honesty, and lack of lying and did not pass the comprehension check and attention check. With the exception of *Gangoff A—*

Worry, which attenuates by half, the coefficients do not change much.

4.5. Discussion

To summarize, the consistency in preference for the timing of information for Gangoff A and Gangoff B (possibly explained by the within-subjects hypothetical choice design) rendered H5 an underpowered test of the information–consumption complementarity. Hypotheses 6 (that people who prefer inconsequential information are more likely to delay) and 8 (fear, worry, and the ability to put the disease out of mind are predictive of delay) are both strongly supported by the data. That H7 (patience decreases delay and avoidance) is not supported is curious given that its analog, H4, was supported in the STD experiment. There may be a difference stemming from the nature of hypothetical choice, but this is only a speculation. The study establishes an information–consumption complementarity in the health domain, controlling for both the probability confound and the moral confound. Nonetheless, demand for information remains quite high, suggesting that the instrumental value of information plays a very important role and should not be neglected.

5. Economic Implications

The health implications of information avoidance are potentially large. The information–consumption complementarity leads to the possibility of declining health spirals. An unhealthy condition may lead to willful ignorance, which in turn results in an unnecessary rapid progression of the disease. Researchers have noted substantial delays in getting tested for breast, prostate, and colon cancer (Consedine et al. 2004, 2006; Lerman et al. 1999). As genetic tests become more common, knowing one's health proclivities may prove fundamental to preventive care. But much of the literature suggests that people prefer not to get genetic tests (Lerman et al. 1999, Oster et al. 2013).

Lack of testing is particularly pernicious when the disease is infectious because of the presence of negative externalities. In the early days of HIV, when infection typically led to AIDS within 10 years, testing rates were low and late. About one-half of those who were diagnosed with AIDS between 1990 and 1992 were first tested for HIV only one year before the AIDS diagnosis (Chesney and Smith 1999, Wortley et al. 1995). This implies that the median person lived with HIV for nine years before first getting tested. Ignorance of HIV serostatus feeds into transmission, since uninformed infected individuals rarely take adequate precaution in preventing the infection of others. An HIV testing intervention with counseling on condom use greatly lowered HIV transmission in a study conducted in Rwanda (Allen et al. 1992) and Malawi (Thornton 2008). Consequently, designing policies to overcome such information avoidance can have important public health repercussions through both the direct effect of safer behavior and the indirect effect of externality reduction.

Since it is the attention to the information that is hypothesized to cause the discomfort, low-salience routinized tests may overcome information avoidance. For example, if all individuals in the highest risk groups received deemphasized routine tests as part of their annual physical checkup, information avoidance may decrease. This would be a "nudge" that would make use of the power of defaults and salience (Thaler and Sunstein 2008). In addition, destigmatization through influencing beliefs about the disease may reduce the fear associated with testing. Although we find no association between HSV information avoidance and our measures of HSV stigma, the lack of correlation does not imply a lack of a causal relationship. Stigma is viewed as an important contributing factor to the low rates of HIV testing in the 1980s and 1990s (Chesney and Smith 1999). Future work should explore the relationship between beliefs about a disease and information preferences for health tests.

Information avoidance leads to uninformed choice. In 2009, the 6.6% of Medicare patients who died accounted for 22.3% of total hospital expenditures (Adamy and McGinty 2012). Often this money is spent on agonizing procedures to keep people alive who may prefer palliative care but never took the time to consider an advance directive. Silveira et al. (2010) find that in a subsample of decedents that needed a decision made by a surrogate, one-third had no living will and had not appointed durable power of attorney for healthcare. One's own demise may be the ultimate aversive consumption, and obtaining information about that last consumption event may be the most difficult.

The association between positive affect and information avoidance in the STD experiment is strong but correlational as a result of the inefficacy of the treatment. The implications, if the association is causal, are quite important. A causal relationship would imply that there is a "dark side" to happiness: it is not just that ignorance is bliss but also that bliss promotes ignorance. The substitutability also works in reverse. If one's expected future consumption utility is low, then one will wish to attend to and consume more in the present. This is consistent with the many accounts of indulgent consumption in the face of future woes. Indeed, the phrase "bread and circuses" has come to mean a distracting palliative from the poverty of life. There is also accumulating evidence that binge drinking and alcoholism are higher for the unemployed and increases during economic downturns (Dee 2001, Dávalos et al. 2012). And there is an oft-repeated anecdote that the hungry poor in the developing world save to buy entertainment, such as a television, instead of food (Banerjee and Duflo 2011). A causal relationship would explain the demand for distracting pleasurable consumption in the face of adverse future prospects.

6. Conclusion

In this paper, we test for intrinsic information preferences for both desirable and undesirable future experiences. We find that larger-stakes lotteries lead to more information demand, and STD tests about more severe diseases lead to more information avoidance. For robustness, we run an experiment with fictional diseases in which we control for potential confounds and again find evidence for information avoidance and the information–consumption complementarity. We expect that such information avoidance is likely to manifest in other domains, especially those with high stakes such as cancer screenings and financial information regarding one's crippling debts. Cleanly identifying these information preferences in economic environments outside the lab remains a challenge for future work. Our preliminary findings about the correlation with positive affect, time preference, and ambiguity aversion may help to predict when information avoidance is likely to happen.

Does information about aversive future consumption cause as much pain as people expect? Although people's revealed preference indicates that obtaining such information is undesirable, choices do not always reflect "experienced utility" (Kahneman et al. 1997). A large literature indicates that people make affective forecasting errors, mispredicting what will make them happy (Gilbert 2006). One of the most robust findings in this literature is that people systematically underestimate their ability to adapt to new circumstances (Loewenstein et al. 2003). Will people worry less than they think they will? Answering this question is important for devising appropriate institutions and policies in the presence of intrinsic information preferences.

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Endnotes

[1] Loewenstein (1987) introduces the concept of anticipatory utility in a model with certainty. Caplin and Leahy (2001) extend the model to uncertain environments, allowing for anticipatory utility to manifest information preferences. Their model is a dynamically inconsistent form of the information preferences presented by Kreps and Porteus (1978). Kőszegi (2010) extends the framework further to allow beliefs to interact with actions in the utility function.

[2] This is reminiscent of the question theoretically explored by Kőszegi (2003) and Caplin and Eliaz (2003), although the latter considers a more strategic context.

[3] HSV-1 usually manifests as common cold sores, whereas HSV-2 manifests more often as genital herpes. When HSV-1 does manifest as genital herpes, the symptoms tend to be less severe (Workowski and Berman 2010). The usefulness of this information biases the results against our finding of avoidance. Similarly, if information on HSV is useless, neither HSV-1 nor HSV-2 tests should be avoided at a cost.

[4] They test whether people want information sooner versus later, and whether they prefer it clumped versus piecewise. They also test the effect of a distractor and the effect of the prior on information preference. They find several strong patterns. Given that they use a forced choice paradigm, with no variation in costs for obtaining different signals, it is unknown whether people will exhibit these information preferences when they have to pay to get their preferred signal, as they do in our experiments.

[5] Huntington's disease is a hereditary degenerative disorder of the central nervous system related to a dominant genetic mutation. Thus, if a parent has the disease, there is a 50% chance that the child will have it.

[6] To be clear, Tasoff and Madarász (2009) use γ instead of α, and they use α to refer to a different construct.

[7] They refer to these as "questions" instead of "dimensions."

[8] This includes Pomona College, Claremont McKenna College, Scripps College, Harvey Mudd College, Pitzer College, Claremont Graduate University, Keck Graduate Institute, Cal Poly Pomona, Western University, and the University of LaVerne.

[9] To aid comprehension on these binary questions, subjects had to answer a practice question correctly in the instructions phase at the beginning of the experiment.

[10] Many other STDs are easily curable with proper medication. Conditional on receiving the information, the future consumption is not low in such cases, and thus we should not expect much information avoidance.

[11] In all, 16 blood samples were actually tested out of the 194 subjects. Not a single subject rejected having his or her blood drawn when required to do so.

[12] Testing the effects of negative affect is also interesting. Our constraint in this study is sample size. Our power estimates suggested that we only had the power to test one treatment, and, ex post, this proved true. We preferred to test positive affect over negative affect for two reasons. First, the literature on positive affect is larger, and thus we could better tie our results to existing studies. Second, inducing negative affect would increase costs because subjects would require a compensating differential for participation.

[13] For HSV infection to be an important worry, we wanted to limit the subject pool to those who had been sexually active at some time. Although sexual contact is a common means of transmission, it is possible to contract both strains through nonsexual contact, and we make this clear in the descriptions used in the experiment.

[14] Subjects exhibited much less information preference, which may be attributed to various design changes. Most notably, the experiment was conducted entirely with face-to-face interactions, possibly pressuring subjects to conform to normative behavior. Although

results (reported in Online Appendix C.2) were directionally consistent with the original lottery experiment, the lower number of subjects exhibiting information preferences caused the tests to be lower powered. Nonetheless, subjects chose to get information about the big prize over the small prize at a factor of 1.8 times more than they preferred to get the small prize over the big prize, and the willingness to pay was three to four times larger.

[15]The correlation between seeking in the lottery experiment and avoiding in the STD experiment is $\rho = 0.019$ ($p = 0.797$).

[16]This uses the first four of the binary questions in the lottery experiment. The fifth and six questions do not affect the index.

[17]We include an ordered logit version of this in Table B.8 in Online Appendix B.

[18]For HSV-1, $r = -0.067$ and $p = 0.363$. For HSV-2, $r = -0.052$ and $p = 0.481$.

[19]The preferences described here reflect the model of Rabin (1995) applied to STDs and sexual conduct. It is worth noting that information avoidance cannot be generated from preferences over only physical outcomes, even if those preferences are other-regarding. To manifest information avoidance of the moral sort described here, preferences must be defined over other objects, such as beliefs, as they are in Rabin (1995). Thus, this alternative interpretation also requires nonclassical theory to rationalize.

[20]Several studies have shown that this subject population behaves similar to the typical college student samples (e.g., Horton et al. 2011).

[21]A similar approach is exemplified in Kang et al. (2010), in which anxiety is measured physiologically through skin conductance. The premise is that economic theory has empirical content that extends beyond choice: it also makes predictions about subjective emotional states and physiological correlates.

[22]We speculate that this may be a by-product of a hypothetical design. The emotional salience for hypothetical choice is lower than for real choice, and subjects might think it normatively sound to have the same information choice for Gangoff A and Gangoff B.

[23]As a robustness check, we repeat the analysis using ordered logit in Table B.12 in Online Appendix B.

References

Adamy J, McGinty T (2012) The crushing cost of care. *Wall Street Journal* (July 6), http://online.wsj.com/news/articles/SB10001424052702304441404577483050976766184.

Ahlbrecht M, Weber M (1997) Preference for gradual resolution of uncertainty. *Theory Decision* 43(2):167–185.

Allen S, Tice J, Van de Perre P, Serufilira A, Hudes E, Nsengumuremyi F, Bogaerts J, Lindan C, Hulley S (1992) Effect of serotesting with counselling on condom use and seroconversion among HIV discordant couples in Africa. *British Medical J.* 304(6842):1605–1609.

Banerjee A, Duflo E (2011) More than 1 billion people are hungry in the world. *Foreign Policy* (April 25), http://foreignpolicy.com/2011/04/25/more-than-1-billion-people-are-hungry-in-the-world/.

Becker GS, Rayo L (2008) Economic growth and subjective well-being: Reassessing the Easterlin paradox: Comments and discussion. *Brookings Papers Econom. Activity* 2008(1):88–102.

Caplin A, Eliaz K (2003) AIDS policy and psychology: A mechanism-design approach. *RAND J. Econom.* 34(4)631–646.

Caplin A, Leahy J (2001) Psychological expected utility theory and anticipatory feelings. *Quart. J. Econom.* 116(1):55–79.

Chesney MA, Smith AW (1999) Critical delays in HIV testing and care: The potential role of stigma. *Amer. Behav. Sci.* 42(7):1162–1174.

Chew SH, Ho JL (1994) Hope: An empirical study of attitude toward the timing of uncertainty resolution. *J. Risk Uncertainty* 8(3):267–288.

Consedine NS, Magai C, Krivoshekova YS, Ryzewicz L, Neugut AI (2004) Fear, anxiety, worry, and breast cancer screening behavior: A critical review. *Cancer Epidemiol. Biomarkers Prevention* 13(4):501–510.

Consedine NS, Morgenstern AH, Kudadjie-Gyamfi E, Magai C, Neugut AI (2006) Prostate cancer screening behavior in men from seven ethnic groups: The fear factor. *Cancer Epidemiol. Biomarkers Prevention* 15(2):228–237.

Cutler SJ, Hodgson LG (2003) To test or not to test: Interest in genetic testing for Alzheimer's disease among middle-aged adults. *Amer. J. Alzheimer's Disease Other Dementias* 18(1):9–20.

Dávalos ME, Fang H, French MT (2012) Easing the pain of an economic downturn: Macroeconomic conditions and excessive alcohol consumption. *Health Econom.* 21(11):1318–1335.

Dee TS (2001) Alcohol abuse and economic conditions: Evidence from repeated cross-sections of individual-level data. *Health Econom.* 10(3):257–270.

Eil D, Rao JM (2011) The good news-bad news effect: Asymmetric processing of objective information about yourself. *Amer. Econom. J.: Microeconom.* 3(2):114–138.

Eliaz K, Schotter A (2007) Experimental testing of intrinsic preferences for noninstrumental information. *Amer. Econom. Rev.* 97(2):166–169.

Eliaz K, Schotter A (2010) Paying for confidence: An experimental study of the demand for non-instrumental information. *Games Econom. Behav.* 70(2):304–324.

Eliaz K, Spiegler R (2006) Can anticipatory feelings explain anomalous choices of information sources? *Games Econom. Behav.* 56(1):87–104.

Falk A, Zimmermann F (2016) Beliefs and utility: Experimental evidence on preferences for information. Working paper, University of Bonn, Bonn, Germany.

Gächter S, Johnson EJ, Herrmann A (2010) Individual-level loss aversion in riskless and risky choices. Discussion Paper 2010-20, Centre for Decision Research and Experimental Economics, University of Nottingham, Nottingham, UK.

Gilbert D (2006) *Stumbling on Happiness* (Alfred A. Knopf, New York).

Golman R, Loewenstein G (2015) An information-gap framework for capturing preferences about uncertainty. Working paper, Carnegie Mellon University, Pittsburgh.

Golman R, Loewenstein G, Gurney N (2015) Information gaps for risk and ambiguity. Working paper, Carnegie Mellon University, Pittsburgh.

Gross JJ, Levenson RW (1995) Emotion elicitation using films. *Cognition Emotion* 9(1):87–108.

Hightow LB, Miller WC, Leone PA, Wohl D, Smurzynski M, Kaplan AH (2003) Failure to return for HIV posttest counseling in an STD clinic population. *AIDS Ed. Prevention* 15(3):282–290.

Hirshleifer J, Riley JG (1992) *The Analytics of Uncertainty and Information* (Cambridge University Press, Cambridge, UK).

Hoffman M (2013) How is information (under-) valued? Evidence from framed field experiments. Working paper, University of Toronto, Toronto.

Horton JJ, Rand DG, Zeckhauser RJ (2011) The online laboratory: Conducting experiments in a real labor market. *Experiment. Econom.* 14(3):399–425.

Howerton A, Gundy K (2009) Sex differences in coping styles and implications for depressed mood. *Internat. J. Stress Management* 16(4):333–350.

Ifcher J, Zarghamee H (2011) Happiness and time preference: The effect of positive affect in a random-assignment experiment. *Amer. Econom. Rev.* 101(7):3109–3129.

Kahneman D, Wakker PP, Sarin R (1997) Back to Bentham? Explorations of experienced utility. *Quart. J. Econom.* 112(2):375–406.

Kang MJ, Ray D, Camerer C (2010) Anxiety and learning in dynamic and static clock game experiments. Working paper, California Institute of Technology, Pasadena.

Karlsson N, Loewenstein G, Seppi D (2009) The ostrich effect: Selective avoidance of information. *J. Risk Uncertainty* 38(2):95–115.

Kocher MG, Krawczyk M, van Winden F (2014) "Let me dream on!" Anticipatory emotions and preference for timing in lotteries. *J. Econom. Behav. Organ.* 98(February):29–40.

Kőszegi B (2003) Health anxiety and patient behavior. *J. Health Econom.* 22(6):1073–1084.

Kőszegi B (2010) Utility from anticipation and personal equilibrium. *Econom. Theory* 44(3):415–444.

Kreps DM, Porteus EL (1978) Temporal resolution of uncertainty and dynamic choice theory. *Econometrica* 46(1):185–200.

Kuppermann M, Pena S, Bishop JT, Nakagawa S, Gregorich SE, Sit A, Vargas J, et al. (2014) Effect of enhanced information, values clarification, and removal of financial barriers on use of prenatal genetic testing. *J. Amer. Medical Assoc.* 312(12):1210–1217.

Laibson D (1997) Golden eggs and hyperbolic discounting. *Quart. J. Econom.* 112(2):443–478.

Lerman C, Hughes C, Trock BJ, Myers RE, Main D, Bonney A, Abbaszadegan MR, et al. (1999) Genetic testing in families with hereditary nonpolyposis colon cancer. *J. Amer. Medical Assoc.* 281(17):1618–1622.

List JA, Gallet CA (2001) What experimental protocol influence disparities between actual and hypothetical stated values? *Environ. Resource Econom.* 20(3):241–254.

Loewenstein G (1987) Anticipation and the valuation of delayed consumption. *Econom. J.* 97(387):666–684.

Loewenstein G, O'Donoghue T, Rabin M (2003) Projection bias in predicting future utility. *Quart. J. Econom.* 118(4)1209–1248.

Lovallo D, Kahneman D (2000) Living with uncertainty: Attractiveness and resolution timing. *J. Behavioral Decision Making* 13(2):179–190.

Meier S, Sprenger C (2010) Present-biased preferences and credit card borrowing. *Amer. Econom. J.: Appl. Econom.* 2(1)193–210.

Mobius MM, Niederle M, Niehaus P, Rosenblat TS (2010) Managing self-confidence: Theory and experimental evidence. Unpublished manuscript, Iowa State University, Ames.

Oster E, Shoulson I, Dorsey ER (2013) Optimal expectations and limited medical testing: Evidence from Huntington disease. *Amer. Econom. Rev.* 103(2):804–830.

Oswald AJ, Proto E, Sgroi D (2015) Happiness and productivity. *J. Labor Econom.* 33(4):789–822.

Persoskie A, Ferrer RA, Klein WMP (2014) Association of cancer worry and perceived risk with doctor avoidance: An analysis of information avoidance in a nationally representative us sample. *J. Behav. Medicine* 37(5):977–987.

Rabin M (1995) Moral preferences, moral constraints, and self-serving biases. Working Paper 95-241, Department of Economics, University of California, Berkeley, Berkeley.

Rabin M (2000) Risk aversion and expected-utility theory: A calibration theorem. *Econometrica* 68(5):1281–1292.

Rottenberg J, Ray RD, Gross JJ (2007) Emotion elicitation using films. Coan JA, Allen JJB, eds. *Handbook of Emotion Elicitation and Assessment*, Series in Affective Science (Oxford University Press, New York), 9–28.

Savage L (1972) *The Foundations of Statistics* (Dover Publications, New York).

Shepperd JA, Howell JL (2015) Responding to psychological threats with deliberate ignorance: Causes and remedies. Carroll PJ, Arkin RM, Wichman AL, eds. *Handbook of Personal Security* (Psychology Press, New York), 257–274.

Silveira MJ, Kim SY, Langa KM (2010) Advance directives and outcomes of surrogate decision making before death. *New Engl. J. Medicine* 362(13):1211–1218.

Sutter M, Kocher MG, Glätzle-Rützler D, Trautmann ST (2013) Impatience and uncertainty: Experimental decisions predict adolescents' field behavior. *Amer. Econom. Rev.* 103(1):510–531.

Sweeny K, Melnyk D, Miller W, Shepperd JA (2010) Information avoidance: Who, what, when, and why. *Rev. General Psych.* 14(4):340–353.

Tasoff J, Madarász K (2009) A model of attention and anticipation. Working paper, University of California, Berkeley, Berkeley.

Thaler RH, Sunstein CR (2008) *Nudge: Improving Decisions About Health, Wealth, and Happiness* (Yale University Press, New Haven, CT).

Thompson HS, Valdimarsdottir HB, Duteau-Buck C, Guevarra J, Bovbjerg DH, Richmond-Avellaneda C, Amarel D, Godfrey D, Brown K, Offit K (2002) Psychosocial predictors of BRCA counseling and testing decisions among xurban African-American women. *Cancer Epidemiol. Biomarkers Prevention* 11(12):1579–1585.

Thornton RL (2008) The demand for, and impact of, learning HIV status. *Amer. Econom. Rev.* 98(5):1829–1863.

Thunström L, Nordström J, Shogrenc JF, Ehmked M, van't Velde K (2016) Strategic self-ignorance. *J. Risk Uncertainty* 52(2):117–136.

Workowski KA, Berman S (2010) Sexually transmitted diseases treatment guidelines, 2010. *Morbidity Mortality Weekly Rep: Recommendations Rep.* 59(RR-12):20–25.

Wortley PM, Chu SY, Diaz T, Ward JW, Doyle B, Davidson AJ, Checko PJ, et al. (1995) HIV testing patterns: Where, why, and when were persons with AIDS tested for HIV? *AIDS* 9(5):487–492.

Zimmermann F (2015) Clumped or piecewise?—Evidence on preferences for information. *Management Sci.* 61(4):740–753.