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Using curiosity to counter health information avoidance

Samantha Horn[a,1], Yana Litovsky[b,*,1], George Loewenstein[c]

[a] Department of Economics, University of Chicago, USA
[b] Department of Banking and Finance, University of Innsbruck, Austria
[c] Department of Social and Decision Sciences, Carnegie Mellon University, USA

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ABSTRACT

Objective: Information that is beneficial for health decision-making is often ignored or actively avoided. Countering information avoidance can increase knowledge of disease risk factors and symptoms, aiding early diagnoses and reducing disease transmission. We examine whether curiosity can be a useful tool in increasing demand for, and engagement with, potentially aversive but useful health information.

Methods: Four pre-registered randomized online studies were conducted with 5795 participants recruited from online survey platforms. Curiosity for aversive health information was manipulated by providing a 'curiosity incentive' – identity-related information alongside aversive information – (Study 1), obscuring information (Studies 2 and 3), and eliciting guesses about the information (Studies 2 and 4). Willingness to view four types of aversive health information was elicited: alcohol consumption screening scores (Study 1), colon cancer risk scores (Study 2), cancer risk factors (Study 3), and the sugar content of drinks (Study 4).

Results: In Study 1, the curiosity manipulation increased the likelihood that participants viewed information about the riskiness of their drinking. Studies 2 and 3 show that curiosity prompts can counter people's reluctance to learn about and assess their cancer risk. And Study 4 shows that using curiosity prompts to encourage engagement with aversive information (sugar content of drinks) also improves health-related choices (opting for a sugar-free drink alternative).

Conclusion: Curiosity prompts provide an effective and simple way to increase engagement with aversive health information.

1. Introduction

Many public health initiatives rely on individuals attending to potentially aversive health information, including cigarette packet warnings, calorie information, and cancer screenings. Yet the potential benefits of such information is often lost because people ignore or even actively avoid it. Curiosity, the psychological state of wanting information, offers a potentially useful and easy to use tool for countering information avoidance. Across four studies, we show that increasing curiosity for potentially aversive health information helps counter information avoidance and ultimately improves health-related choices.

Information avoidance is a well-documented phenomenon (e.g., Sharot and Sunstein, 2020; Ho et al., 2021; Kelly and Sharot, 2021), observed for financial information (Karlsson et al., 2009; Sicherman et al., 2016), personal attributes (Howell et al., 2019), and the ethicality of one's purchases (Ehrich and Irwin, 2005). Information avoidance refers to the choice to prevent or delay the acquisition of available but potentially aversive information, and this choice can be active (asking to not receive information) or passive (failing to ask for information) (Sweeny et al., 2010).

In the health domain, engaging with information can improve knowledge of disease risk factors and symptoms (e.g., Hammond, 2011), increase early diagnosis (e.g., Cohen et al., 2015), and prevent further disease transmission (e.g., Dupas, 2011). Despite these potential benefits, researchers have documented the existence of health information avoidance in a variety of settings, including tests for sexually transmitted diseases (Ganguly and Tasoff, 2017; Thornton, 2008), cancer (Emanuel et al., 2015; Melnyk and Shepperd, 2012), diabetes (Li et al., 2021), and genetic disorders (Oster et al., 2013). Information tends to be avoided more for diseases that require invasive testing (Howell and Shepperd, 2013a), are incurable (Ganguly and Tasoff, 2017), and when negative information is more likely (Li et al., 2021). Central to most theoretical explanations of information avoidance is that avoidance helps individuals maintain a positive outlook (Golman et al., 2017;

* Corresponding author. Department of Banking and Finance, University of Innsbruck, Innsbruck, 6020, Austria.
E-mail address: yana.litovsky@uibk.ac.at (Y. Litovsky).
[1] Joint first authors.

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Howell et al., 2016). In the context of health, this would mean a positive assessment of their health.

As the information available to individuals via at-home tests and online risk assessments increases, interventions that can reduce information avoidance have an expanding potential to improve individual health. Although there is a relatively wide body of work on interventions to increase cancer screenings (e.g., Goldzahl et al., 2018; Wardle et al., 2016), evidence on interventions directly targeting information avoidance is relatively scant, and those harnessing curiosity are, as far as we know, nonexistent.

Most relevant to the current work are three papers which evaluate psychological interventions to tackle the reluctance to learn health risk information. First, Howell and Shepperd (2012) show that a positive affirmation exercise increased the likelihood that participants viewed the results from a risk calculator for a fictitious disease. Second, asking participants to contemplate the consequences of obtaining a risk evaluation for Type II diabetes and cardiovascular disease was shown to decrease avoidance of the information (Howell and Shepperd, 2013b), perhaps suggesting that people do not spontaneously engage in such an exercise. Third, Melnyk and Shepperd (2012), building on work showing a relationship between the willingness to test for a disease and its treatability (Dawson et al., 2006; Shiloh et al., 1999; Yaniv et al., 2004), find that focusing participants on controllable risk factors led to a large decrease in information avoidance compared to a group of participants whose attention was focused on uncontrollable risk factors.

We take a different approach by exploiting a natural psychological need — curiosity — to counter information avoidance. Researchers have proposed that curiosity — the desire to know or experience something new — arises from a desire to achieve optimal stimulation (Berlyne, 1966; Leuba, 1955; Steenkamp and Baumgartner, 1992), a need to address an aversive feeling of uncertainty by filling a salient information gap (Loewenstein, 1994) or from the experience of positive emotional reactions that personality researchers describe as a “feeling of interest” (Litman and Jimerson, 2004). From an evolutionary perspective, curiosity is a beneficial tool that encourages humans and animals to learn about their environment (see Kidd and Hayden, 2015, for review), and, akin to physiological drives (like thirst or hunger), it is thought to operate by making uncertainty aversive and the act of reducing uncertainty rewarding (Kang et al., 2009; Loewenstein, 1994). Curiosity is therefore in direct opposition to information avoidance, in that it promotes the acquisition of new information.

Although curiosity is generally stronger for information that is expected to be positively-valenced (Charpentier et al., 2018), there is some evidence that curiosity may work to counter information avoidance by attracting people to (seemingly) unpleasant information. For example, we know that curiosity can motivate people to expose themselves to painful (e.g., electric shocks (Hsee and Ruan, 2016)) and even dangerous experiences (e.g., illicit drug use (Green, 1990)) and that it attracts people to frightening (Harrison and Frederick, 2020) and harmful information that they are likely to regret having learned (Kruger and Evans, 2009).

There is also evidence that it is possible to increase curiosity for information based on the way it is provided to individuals. Allowing people to choose which information to seek rather than selecting it for them, for example, can increase the desire to learn that information, even when controlling for information preference (Romero Verdugo et al., 2020). Another effective strategy for stimulating curiosity is through the act of guessing, as supported by both self-report studies (Brod and Breitwieser, 2019; Potts et al., 2019) and fMRI data (Kang et al., 2009). This approach operates in alignment with the information-gap theory (Loewenstein, 1994) by drawing attention to a knowledge gap that is soon to be filled (Brod and Breitwieser, 2019; Golman et al., 2021). There is also evidence that stimulating curiosity for information by guessing it before it is learned improves recall of the information (Berlyne, 1954; Brod et al., 2018; Kang et al., 2009; Potts et al., 2019). However, all of the research on the benefits of guessing as a curiosity-inducing and memory-improving strategy have been conducted using trivia — non-personal and non-aversive facts related to general knowledge (Brod and Breitwieser, 2019; Brod et al., 2018; Kang et al., 2009; Potts et al., 2019). No studies have, to the best of our knowledge, tested if guessing, or, for that matter, any curiosity-enhancing manipulation can counter information avoidance.

The present research tests whether simple curiosity-stimulating strategies can overcome not just a lack of interest but an *aversion* to information, and encourage people to learn facts that may improve consequential decision-making. This paper makes four contributions. First, we examine if curiosity inductions can counter information avoidance across three health domains: alcohol consumption, cancer risk, and food choice. Second, we examine if greater attention induced by curiosity can trigger better health-related decisions based on that information. Third, we use ways to induce curiosity that were theorized as increasing curiosity in earlier literature (Loewenstein, 1994), but that have either been untested or untested in the health domain. Finally, we test if encouraging people to choose to learn health information by stimulating their curiosity, rather than just giving them the information, leads to better recall of the information.

2. Overall methods

All studies were pre-registered with AsPredicted (study IDs on AsPredicted.org: Study 1 = 58381; Study 2 = 69282, Study 3 = 75361, Study 4 = 90073). Sample sizes were determined prior to data collection based on power calculations. All power calculations relied on chi-squared tests of proportions with 80% power and $\alpha = 0.05$. The control and treatment group means used for power analysis are detailed in the Methods sections below, with Studies 2–4 informed by pilot data. Participants who failed attention checks were excluded from the analysis. All datasets and study materials are available on OSF (OSF link: https://tinyurl.com/2s42swvu). The research was approved by Carnegie Mellon University’s Institutional Review Board (IRB) and all participants were asked for informed consent at the start of each study.

All participants were recruited from either Amazon’s Mechanical Turk (MTurk) (Study 1) or Prolific Academic (Studies 2–4). MTurk and Prolific Academic are commonly used crowdsourcing platforms for behavioral and psychological research (Crump et al., 2013; Peer et al., 2017; Stewart et al., 2017). These platforms are well-suited to evaluate the efficacy of curiosity prompts in a general population but we discuss potential limits to external validity in the General Discussion.

In Study 1, we use a curiosity reward as an incentive to learn personalized risk information about alcohol consumption. In Studies 2–3, we use a curiosity prompt to make the health information itself more interesting, by asking people to make a guess about the information (i.e., a specific health metric) or by obscuring the information. And, in Study 4, we examine if using a curiosity prompt to stimulate interest in nutritional information leads to healthier choices based on that information.

3. Study 1

Curiosity “lures” — piquing people’s curiosity and then only satisfying it if they make a certain choice — have been shown to increase willingness to choose healthier alternatives (Polman et al., 2022). The first study uses a similar approach and examines if bundling curiosity-inducing information with aversive-information can increase people’s willingness to learn the latter.

3.1. Methods

3.1.1. Participants

United States-based participants who report consuming alcohol at least occasionally were recruited through Amazon’s Mechanical Turk (MTurk) to complete a 4-min survey for $0.60 in 2021. The target sample size was 2000, derived from power analyses designed to detect a small effect size (0.10 Cohen's w) between conditions. Of the 2044 recruited participants, 2008 passed the attention check (51% female, 65% college educated, mean age of 42 (SD: 12.9)).

3.1.2. Procedure

All participants were asked to answer questions about their alcohol use, most of which were taken from the World Health Organization's Alcohol Use Disorders Identification Test (AUDIT), an established tool for identifying hazardous or dependent alcohol use (Saunders et al., 1993). The tool includes questions about the frequency and nature of alcohol use (e.g., "*How often do you have a drink containing alcohol?*") and the ways in which alcohol use interferes with daily life (e.g., "*Have you or someone else been injured as a result of your drinking?*"). Additionally, participants answered questions about the alcoholic beverage they consume most often.

Participants were randomized at the individual level in a 2 × 2 design in which we varied the aversiveness of information offered, and whether participants received a curiosity incentive to view the information. Specifically, participants either received an offer to view a score indicating how harmful their drinking was for their health (*Aversive*), or how many ounces of alcohol they consume per month (*Neutral*), and were either told that the information would be revealed alongside information on which nationality their drinking habits most resemble (*Curiosity*) or were given no additional information (*Control*). We hypothesized that the information about drinking habits would pique people's curiosity based on evidence that people exhibit curiosity about their identity (Litman et al., 2017) and have a demand for social comparison information (Corcoran et al., 2011). The ask to view information varied by condition as follows: *Aversive* + *Control*: *"Would you like to see how dangerous your drinking is for your health?"*; *Aversive* + *Curiosity*: *"Would you like to see how dangerous your drinking is for your health as well as which country your drinking is most like?"*; *Neutral* + *Control*: *"Would you like to see how many ounces of alcohol you drink a month?"*. *Neutral* + *Curiosity*: *"Would you like to see how many ounces of alcohol you drink a month as well as which country your drinking is most like?"*.

Participants who chose to view the information were presented with it immediately on the next screen. Participants in the *Aversive* conditions were provided with the AUDIT score indicating how harmful their drinking was for their health along with the threshold for identifying harmful drinking, while participants in the *Neutral* conditions were told how much alcohol they consumed per month. The AUDIT score was calculated based on responses to questions taken from the AUDIT tool embedded in the survey and was provided accurately to participants. An estimate of the number of ounces of alcohol consumed per month was calculated based on weekly consumption of wine, beer, and spirits and provided to participants as an estimate with the following text: *"Our estimate is that you drink [] ounces of alcohol a month."* Participants in the *Curiosity* conditions were also told which nationality their drinking habits most resembled.

Finally, after four demographic questions, participants in the *Aversive* condition who chose to view the information were asked if they could remember their score as a test of both attention to and recall of the information.

3.2. Results

The primary dependent variable of interest was whether participants opted to view information about their drinking behavior. In the *Neutral* conditions (N = 1001), 77% of participants opted to view the information, compared to 66% in the *Aversive* conditions (N = 1007). In the *Curiosity* conditions (N = 1000), 81% of participants viewed the information compared to 63% in the *Control* conditions (N = 1008). Looking at the individual cells within the 2 × 2 design, 70% of participants opted to view the information in the *Neutral* + *No Curiosity* arm (N = 502), compared to 84% in the *Neutral* + *Curiosity* arm (N = 499), 55% in the *Aversive* + *No Curiosity* arm (N = 506), and 77% in the *Aversive* + *Curiosity* arm (N = 501).

The first two columns of Table 1 present results from a logistic regression of our dependent variable on dummy indicators for treatment assignment with *Neutral* + *No Curiosity* as the omitted category. In line with the group averages, absent any curiosity intervention, there was a statistically significant impact of providing participants with the option to view aversive rather than neutral information with an odds ratio of 0.53 ($p < 0.001$) for the *Aversive* + *No Curiosity* arm.

The curiosity condition led to statistically significant increases in participants' likelihood of viewing the information: Participants in the *Neutral* + *Curiosity* condition were more likely than participants in the *Neutral* + *No Curiosity* condition (OR: 2.32, $p < 0.001$) to choose to see the information. Postestimation tests also show a statistically significant difference between the *Aversive* + *Curiosity* and *Aversive* + *No Curiosity* arms ($p < 0.001$). A test of whether the impact of the curiosity intervention differs in effect size for the *Neutral* and *Aversive* information conditions yields a *p*-value of 0.504, indicating that the curiosity treatment had no statistically distinguishable differential impact for participants in the two different information conditions.

Accurate recall of viewed information (coded as 1 if a participant accurately recalled their AUDIT score and 0 otherwise) was the second dependent variable. The sample for this analysis is restricted to participants in the *Aversive* conditions who opted to view the information. Thus, this is a selected sample to test whether the *Curiosity* treatment altered attention to, and recall of, the information. A concern with using curiosity prompts might be that participants are tempted to agree to view the aversive health information in order to view the interesting information related to their drinking habits, but fail to attend to the aversive information. To investigate this possibility, we used a logistic regression to regress accurate recall on a dummy indicator for assignment to the *Aversive* + *Curiosity* condition. We found that the *Curiosity* intervention had no statistically identifiable impact on recall for those opting to see the information (OR: 1.24, $p = 0.455$) though our confidence intervals include a relatively large range of values (95% CI: 0.70:2.21). Recall rates for the *Aversive* + *Curiosity* and *Aversive* + *No Curiosity* arms were similarly high at 93% and 91% respectively. As preregistered, we ran all analyses with and without demographic controls for age, gender and college education. The inclusion of these controls did not meaningfully change our results (see second and fourth column in Table 1).

Table 1
Logistic regressions of treatment effects with odds ratios and standard errors (study 1).

	Viewed Information (1/0)		Accurately Recalled Information (1/0)	
Controls Included	No	Yes	No	Yes
Neutral + Curiosity (A)	2.32***	2.33***	–	–
	(0.36)	(0.37)	–	–
Aversive + No Curiosity (B)	0.53***	0.52***	–	–
	(0.07)	(0.07)	–	–
Aversive + Curiosity (C)	1.41**	1.41**	1.24	1.25
	(0.20)	(0.21)	(0.36)	(0.37)
Postestimation Tests				
p-value: (B) =(C)	<0.001	<0.001	–	–
p-value: (C)-(B) = (A)	0.504	0.460	–	–
Omitted Variable Mean	0.70	0.70	0.91	0.91
N	2008	2008	663	663

Notes: Each column reports results for a single logistic regression of the dependent variable listed in the column heading on the treatment variables listed in the row headings. Controls include year of birth and dummy indicators for female and college educated. For Columns 3–4, the sample is restricted to only include participants who chose to see the information. ***p < 0.01, **p < 0.05, *p < 0.1. Omitted variables as follows: Neutral + No Curiosity for Columns 1–2, Aversive + No Curiosity for Columns 3–4.

3.3. Discussion

Study 1 provides initial evidence that giving people information which prompts curiosity can increase engagement with health-related information, both aversive and

Non-aversive. Offering a trivial, and arguably useless, fun fact served as an effective reward for learning potentially useful but aversive information about one's drinking habits.

Although the triviality of the reward attests to the power of curiosity, it may also limit the applicability of this approach since, in many settings, it may seem inappropriate to provide trivial information alongside important health information. In the remaining studies, therefore, we evaluate whether curiosity interventions can make aversive information itself more compelling.

4. Study 2

In Study 1, we found that providing curiosity-provoking information alongside potentially aversive information increases the willingness to engage with the information. In Study 2, we examined whether prompts designed to increase integral curiosity about the aversive information itself can also increase information engagement. Previous studies have documented a strong preference for avoiding cancer risk information (Emanuel et al., 2015), and so, in this study, we examined if a curiosity prompt can increase willingness to learn one's risk of developing colorectal cancer.

4.1. Methods

4.1.1. Participants

Participants for the study were recruited via Prolific Academic (an online survey platform) in 2021. Based on a pilot study and power analysis assuming a control group mean of 70% and a treatment effect of 7 percentage points, we targeted a total sample of 2250 participants. Participants were asked to complete a 4-min study for $0.64. A total of 2252 participants consented to the study and 2113 participants passed the initial attention checks (49% female, 66% college educated, mean age of 36.6 (SD: 12.9)).

4.1.2. Procedure

We asked participants questions from the YourDiseaseRisk tool designed to assess colorectal cancer risk. The tool relies on risk estimates from the Harvard Report on Cancer Prevention (Colditz et al., 2000) with questions covering the main risk factors and preventative activities for colon cancer, such as medication and vitamin use, colon cancer screenings, family history of cancer, diet and exercise habits.

After answering the questionnaire, we informed participants that based on their responses, it would be possible to compute their relative risk of developing colorectal cancer according to a 0–100 score, which maps onto seven distinct risk categories: 0–30: Very much below average risk; 30–35: Much below average risk; 35–39: Below average risk; 39–41: About average risk; 41–50: Above average risk; 50–80: Much above average risk; 80–100: Very much above average risk. The tool is not designed to calculate the risk of anyone with a previous history of cancer. Participants for whom this was the case (N = 83) who requested the information were informed that the questionnaire was unable to provide an accurate risk estimate and that they should contact their doctor with any questions about their cancer risk.

To ensure that participants were aware of the prevalence and nature of colorectal cancer, we provided them with a brief description of the number of deaths from colorectal cancer each year in the United States, as well as typical treatment approaches. Pilot tests revealed that younger participants incorrectly assumed that colorectal cancer only affects older people. To counter this misconception, we informed participants that, although colorectal cancer is most often diagnosed in people over 60, it can affect people of all ages. We then asked participants to read a short description of a young mother's experience of colon cancer based on a campaign from Bowel Cancer UK.

Next, participants were randomized equally to a *Control* condition, or one of two treatment conditions designed to pique curiosity: *Blur* or *Guess*. In the *Blur* condition, participants were shown their risk level, but it was blurred, making it illegible. In the *Guess* condition, participants guessed which risk category their risk level fell into. All participants were then asked to choose between learning their risk level or skipping ahead to the demographic questions. We informed participants that their decision would have no impact on their study payment. Participants choosing to learn their risk score were then shown the information. All participants then answered demographic questions about their education level and employment status. Other demographic information used to describe the sample was collected within the risk assessment.

4.2. Results

The main dependent variable was whether participants chose to view their risk score (see Fig. 1 for the results). In the *Control* condition, 69% of participants viewed their risk score. This rate was significantly higher in both of the treatment groups: 80% in the *Blur* condition (χ^2 (1, N = 1406) = 25.81, $p < 0.001$) and 76% in the *Guess* condition (χ^2 (1, N = 1412) = 10.18, $p = 0.001$). The impact of *Blur* was not statistically significantly different from that of *Guess* (χ^2 (1, N = 1408) = 3.69, $p = 0.055$). As preregistered, we ran a logistic regression of the dependent variable on dummy indicators for treatment assignment and demographic variables, and found that treatment effects were robust to inclusion of these controls: Both the *Blur* (OR: 1.88, 95% CI: 1.47:2.41) and *Guess* (OR: 1.48, 95% CI: 1.17:1.87) treatments increase the likelihood of viewing the risk score (see Online Appendix Table A1).

4.3. Discussion

Study 2 demonstrates that curiosity prompts can increase engagement with potentially aversive health information by piquing curiosity about the actual information and not through the provision of additional unrelated information, as with Study 1.

5. Study 3

The primary aim of Study 3 was to test whether curiosity prompts could be used to increase engagement with information in a different informational context: reading an article discussing lifestyle risk factors for developing cancer. Additionally, we evaluated the efficacy of another type of curiosity prompt – blacking out information.

5.1. Methods

5.1.1. Participants

United States-based participants were recruited via Prolific Academic for a 4-min survey for $0.64 in 2021. The target sample size was 1000 participants based on a pilot study and power analysis assuming a control group mean of 82% and a treatment effect of 6 percentage points. A total of 999 participants consented to the study and 916 participants passed the initial attention checks (67% female, 61% college educated, mean age of 29.6 (SD: 9.6)).

5.1.2. Procedure

All participants were told about a study (Islami et al., 2018) which estimated that 42% of newly diagnosed cancers are potentially preventable by avoiding common activities or lifestyle choices, such as cigarette smoking, eating red meat, drinking alcohol, sun exposure and physical inactivity. Participants were also informed that the study examined the percentage of new cancers each year that can be attributed to these factors.

Participants were randomized equally to a *Control* or a *Curiosity*

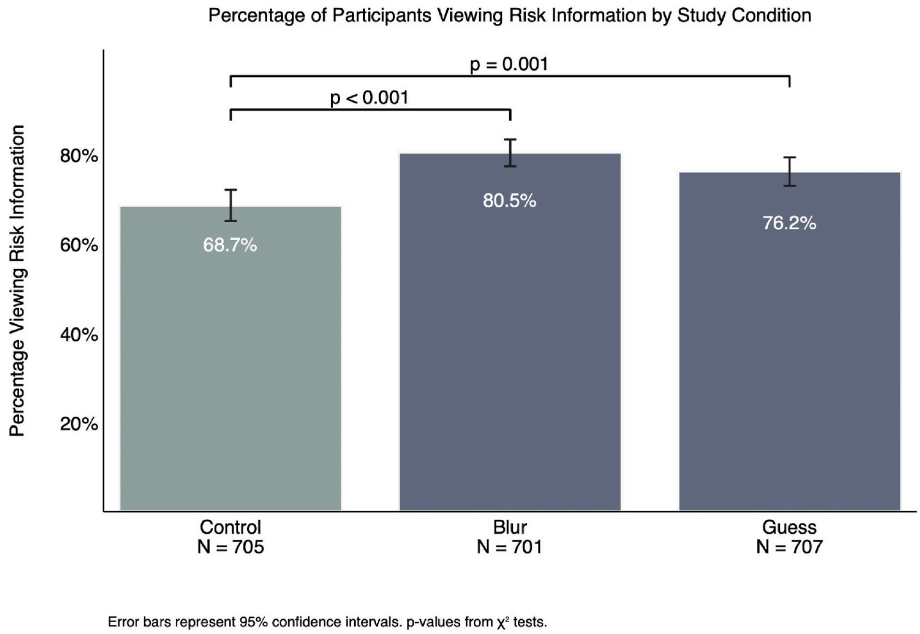

Fig. 1. Percentage of Participants viewing Risk Information by Condition in Study 2.

condition. In the *Curiosity* condition, we informed participants about an article that contains information on the three potentially preventable factors responsible for the highest rates of newly diagnosed cancers. Participants were shown the top three factors but the factors were blacked out and unreadable. All participants then faced the choice of whether to read the article about cancer (Mendes, 2017) or a less aversive article about medical records (and told that their choice would have no bearing on their study payment). We then displayed the chosen article to participants before asking a series of demographic questions.

5.2. Results

In the *Control* condition, 82% of participants opted to read the article about potentially preventable cancer risks compared to 88% in the *Curiosity* condition, χ^2 (1, N = 916) = 5.62, $p = 0.018$. A logistic regression (see Online Appendix Table A2) which controlled for basic participant demographics showed that the impact of the curiosity induction was robust to the inclusion of controls (OR = 1.55, 95% CI: 1.07:2.24; $p =$ 0.02).

5.3. Discussion

Study 3 demonstrates the effectiveness of a different curiosity-piquing strategy from the previous studies: fully obscuring information. This method is similar to the blurring effect used in Study 2 and so the two studies show that curiosity can be generated using methods which do not require the active participation of a person, as is the case when we elicit a guess about information. Study 3 also shows that a subtle curiosity prompt can be compelling enough to encourage people to agree to invest time to discover information (by reading an article) rather than just quickly view a single health metric.

6. Study 4

Studies 1 to 3 demonstrate that using curiosity incentives and prompts changes people's willingness to view valuable but potentially aversive health information. In Study 4, we examined whether increasing curiosity can alter the health-related decisions that people make. Study 4 also involved a different category of health information from the prior three studies. Specifically, we examined if curiosity about the sugar content of a well-liked beverage can increase people's willingness to choose a sugar-free beverage alternative. We also tested whether curiosity improves recall of the learned information.

6.1. Methods

6.1.1. Participants

Participants based in the United States were recruited via Prolific Academic for a 2-min survey for $0.30 in 2022. Based on a pilot study and power analysis assuming a control group mean of 49% and a treatment effect of 10 percentage points, we targeted a total sample of 800 participants. A total of 810 participants consented to the study and 758 participants passed the initial attention checks (50% female, 55% college educated, mean age of 33.4 (SD: 12.3)).

6.1.2. Procedure

All participants were first asked which of four beverages they most like to drink (Coca Cola Classic, Pepsi, Snapple Lemon Tea or Vitamin Water) and were assigned to one of four groups corresponding to their preference. If participants indicated that they never drink any of these, they were randomly assigned to one of the beverage groups.

Everyone was then told that they would have a chance to receive six bottles of either a regular or sugar-free version of the beverage (e.g., Coca-Cola Classic or Coca-Cola Zero).

We then randomly assigned everyone to one of two conditions. In the *Information* condition, participants were told what percent of the daily recommended sugar intake was in one bottle of the regular (i.e., not sugar-free) beverage. The percent of daily recommended sugar provided in the respective conditions is as follows: Coca-Cola Classic (20 oz): 130%, Pepsi (20 oz): 138%, Snapple Lemon Tea (16 oz): 73%, Vitamin Water Power-C (20 oz): 54%. In the *Curiosity* condition, rather than just revealing this information, we asked participants to guess it, before asking them if they wanted to learn it. The information was given only if they agreed. Participants in all conditions then indicated if they would prefer to receive the regular or sugar-free version of the beverage, and told that some participants would be randomly chosen to receive six bottles of their choice by mail. The bottles participants were eligible to receive matched the size of the bottle about which they were given/guessing the sugar content: 20oz in all conditions except *Snapple Iced Tea*, which was 16oz. To be eligible, participants needed to provide their mailing address; it was explained that no identifying personal information would be stored after the study was complete.

Immediately after learning the sugar content or—for those participants in the *Curiosity* condition who chose not to learn it—immediately after declining the option to learn it, participants were asked the same four basic demographic questions described in previous studies. These were followed by two additional questions about sugar-consumption habits asking (1) how often they check the sugar content of the food and drinks that they consume and (2) how often they try to avoid food and drinks that are high in sugar, on a scale from (1) Never to (5) Always. Then, we asked everyone who learned the sugar content of the regular beverage to recall (in an open-ended format) that information.

6.2. Results

The curiosity prompt stimulated interest in a large majority of participants: 86% of participants in the *Curiosity* condition chose to learn the sugar content of the regular drink. But the main dependent variable was the choice of beverage. Table 2 reports results from logistic regressions of choice of diet drink on assignment to the *Curiosity* condition with and without baseline controls and with sample restrictions for: (1) the unrestricted sample, and, as exploratory analyses, (2) only participants who preferred soda, and (3) only those who had a preferred drink option in the choice set (and so were choosing between a *well-liked* sugary beverage and a diet alternative). In every case except for the unrestricted sample without any controls, the curiosity induction significantly increased the likelihood of choosing the diet beverage relative to the *Information* condition. Although participants were not significantly more likely to choose the diet drink in the *Curiosity* condition (55%) versus the *Information* (49%) condition (OR: 1.25, p = 0.128) for the unrestricted sample (without controls) (first column of Table 2), we found heterogeneity in the treatment effect by participants' drink preferences. Specifically, the treatment effect was not evident for participants who preferred Snapple Lemon Tea and Vitamin Water (the two least sugary drinks). But, for participants who preferred soda (Coca-Cola or Pepsi), the curiosity treatment led to a 12 percentage point increase in choice of the sugar-free alternative (OR: 1.68, p = 0.015 (third column in Table 2 and see Online Appendix Table A3 for chi-square results and breakdown by drink). Among people who reported a preference for one of the four beverages (and so were considering a liked beverage), 50% chose the diet drink in the *Curiosity* versus 42% in the *Information* condition (OR: 1:36, p = 0.073) (fifth column in Table 2).

Table 2
Logistic regressions of treatment effects with odds ratios and standard errors (study 4) dependent variable: Chose diet drink (1/0).

Sample Restriction:	No restriction		Prefers soda		Has preferred drink option in choice set	
Controls Included:	No	Yes	No	Yes	No	Yes
Curiosity	1.25	1.39**	1.68**	1.67**	1.36*	1.47**
	(0.18)	(0.22)	(0.36)	(0.38)	(0.23)	(0.28)
Constant	0.97	0.09***	0.49***	0.06***	0.73**	0.06***
	(0.10)	(0.07)	(0.08)	(0.06)	(0.09)	(0.05)
Control Mean	0.49	0.49	0.33	0.33	0.42	0.42
Treatment Mean	0.55	0.55	0.45	0.45	0.50	0.50
N	758	758	379	379	555	555
Postestimation tests						
p-value: Curiosity = 0	0.129	0.039	0.015	0.026	0.073	0.041

Notes: Each column reports results for a single logistic regression of the dependent variable (Chose Diet Drink Option (1/0)) on an indicator for treatment status (Curiosity = 1 if participants were in the *Curiosity* condition, and 0 otherwise), and for Columns 2, 4 & 6, baseline controls including female (1/0), age, dummy indicators for education level, and the level of sugar concern a participant reported at baseline. Coefficients represent odds ratios with standard errors in parentheses. Sample restrictions indicated in Column headings as follows: Columns 1–2: no sample restriction, Columns 3–4: participants who prefer soda (i.e., Pepsi or Coca-Cola), and Columns 5–6: participants whose preferred drink option was in the list of options.***p < 0.01, **p < 0.05, *p < 0.1.

Table 3
Logistic regressions of treatment effects with odds ratios and standard errors (study 4) dependent variable: Recalled sugar information (1/0).

	Accurately Recalled Sugar Information (1/0)	
Controls Included:	No	Yes
Curiosity	1.27	1.28
	(0.21)	(0.21)
Constant	2.34***	1.72
	(0.26)	(1.30)
Control Mean	0.70	0.70
Treatment Mean	0.75	0.75
N	758	758
Postestimation tests		
p-value: Curiosity = 0	0.142	0.135

Notes: Each column reports results for a single logistic regression of the dependent variable (Accurately Recalled Sugary Informa-tion (1/0)) on an indicator for treatment status (Curiosity = 1 if participants were in the *Curiosity* condition, and 0 otherwise), and for Columns 2, baseline controls including female (1/0), age, dummy indicators for education level, and the level of sugar con-cern a participant reported at baseline. Coefficients represent odds ratios with standard errors in parentheses. ***p < 0.01.
**p < 0.05, *p < 0.1.

Our second dependent variable was the recall of the sugar content of the regular beverage, coded as 1 for a correct response and 0 for an incorrect response or no response (this included everyone in the *Curiosity* condition who choose not to learn the information). Participants in the *Curiosity* condition were not statistically significantly more likely to accurately recall the sugar content (75%) than those in the *Information* condition (70%). It should be noted, however, that this intention-to-treat approach is a conservative test of the memory effects of the curiosity intervention, since *everyone* in the *Information* condition saw (and were asked to recall) the sugar information, while those in the *Curiosity* condition who chose not to learn this information were not asked the recall question and were coded as providing an incorrect response. See Table 3 for the results of logistic regressions testing the effect of the curiosity prompt on this recall variable with and without baseline controls.

6.3. Discussion

Study 4 has the most relevant implications for public health policy. For one, it demonstrates that curiosity prompts can influence health-related decisions, the ultimate benchmark for the success of a health intervention. And, perhaps as importantly, it shows that the standard approach to influencing such health decisions – passively providing everyone with information – may not be as effective as encouraging people to *voluntarily choose* to learn the information by piquing their curiosity. This study also suggests that people might be more likely to recall the information they choose to learn if their curiosity is first piqued than if they are simply presented with that information, meaning that curiosity-enhancing interventions may impact future health decisions as well. Finally, this study extends our findings to another domain: nutritional information.

7. General discussion

Across four experiments, three distinct health domains and two information formats (a numeric health metric and an article), we show that interventions designed to increase curiosity led to meaningful increases in attention to aversive health information and impacted consequent health choices. In Study 1, participants provided with curiosity rewards were more likely to view information about how risky their alcohol consumption is. In Studies 2–3, visual cues and guessing prompts, designed to make the aversive information itself more demanded, increased the rates at which participants opt to view cancer risk information. Finally, Study 4 provides evidence that curiosity prompts can impact health choices. By using different methods to spark curiosity across the studies, we demonstrate that our results are robust to different curiosity manipulations including curiosity rewards, the use of visual cues, and prompting guessing.

Our findings add to the literature on interventions that increase engagement with information, by providing evidence that easy-to-use curiosity prompts can be effective in increasing attention to, and decreasing avoidance of, aversive health information. Prior work has shown that more involved interventions, including positive affirmation exercises (Howell and Shepperd, 2012) and thinking through the pros and cons of knowing risk information (Howell and Shepperd, 2013b), are effective tools to increase engagement with risk information. Perhaps closest to our intervention in terms of effort on the part of participants is Melnyk and Shepperd (2012), who, as discussed earlier, showed that participants were more interested in obtaining disease risk information after focusing on controllable versus uncontrollable disease risk factors. Curiosity prompts could potentially be used in combination with these other techniques to increase attention to health-related information. The abundance of online health information resources, including tools that allow self-diagnosis and health assessment, as well as the expanding use of electronic patient health portals (Pagliari et al., 2007), also means that there are increasing opportunities to employ these simple curiosity prompts when people are engaging with health information online.

7.1. Limitations

Some limitations of this investigation are worth highlighting. First, our study methodologies cannot conclusively establish that participants are exhibiting information avoidance rather than simply a lack of interest in the information. However previous research has established that people do avoid the kind of medical information offered in our studies (Emanuel et al., 2015). Moreover, researchers routinely use the same design (giving people a choice of whether or not to learn information) as a test for information avoidance (Dawson et al., 2006) and have found similarity in responses to questions about information that is not sought versus avoided (Lipsey and Shepperd, 2019). Regardless of this interpretation, however, our studies show that curiosity can be used to increase individuals' attention to useful medical information that they otherwise might not assimilate. This is the key practical implication of the studies.

Secondly, all studies were run with online populations, and the demographic characteristics of our study samples are not completely representative of the broader US population. Our study samples are also not representative of sub-populations in particular need of health information, such as individuals at high risk of colon cancer, with high-risk drinking habits or with health concerns like diabetes. These conditions may make the relevant health-related information both more aversive and more valuable, and so it is important to consider if our interventions will remain effective for these populations. In studying different health domains and examining actual health choices, we have tried to increase the external validity of our studies, however, we cannot say if our findings will translate to various other contexts. For example, we do not know if these curiosity prompts work in offline settings such as in-person cancer screenings, by encouraging people to accept receiving a recommended screening or to learn the results. We can also not say if the interventions will increase engagement with information about other health concerns.

For particularly sensitive health outcomes, such as a diagnosis of a sexually transmitted disease, or particularly devastating ones, such as a diagnosis of Huntington's disease, these prompts may seem inappropriate and may be easy to ignore.

In addition to addressing these limitations, future research should also consider the longevity of the effect of curiosity prompts on health choices. While we observed that curiosity prompts may improve recall of the learned information, we do not know how long this information will be retained and influence decisions. It would also be valuable to determine which type of curiosity prompt is most effective and why. While two recent papers speculate that guessing stimulates interest in the guessed information by drawing attention to a knowledge gap (Brod and Breitwieser, 2019; Potts et al., 2019), it is possible that people want to learn the information they just guessed also (or primarily) to determine if they were right. Blurring or obscuring information may pique curiosity by triggering people to guess the information and therefore work via similar mechanisms, but the exact mechanism(s) should be empirically determined. Finally, it would be valuable to test the extent to which frequent exposure to such curiosity prompts might diminish their impact.

8. Conclusions

In conclusion, we find that curiosity-prompting interventions can enhance engagement with a variety of valuable health information, including both personalized risk assessments and general health-related information. Moreover, and perhaps more importantly, we find that curiosity prompts not only encourage learning, but also improve health choices based on what is learned.

With the increase in at-home tests and self-delivered health assessments, as well as the widespread availability of medical results via online patient portals, people face an increasing number of choices about whether to attend to information about their health. Health information can help people make informed health choices and detect diseases when they are more easily treated, but a wide literature has documented that people not only overlook but actively avoid such information. Our findings suggest that curiosity prompts provide an effective and easy to implement tool to decrease health information avoidance and, as a result, help people make better health choices.

Author note

Samantha Horn, Yana Litovsky, and George Loewenstein were involved in the conceptualization and methodology; Samantha Horn took the lead for the investigation and formal analysis for Studies 1, 2 and 3, and Yana Litovsky for Study 4; Samantha Horn, Yana Litovsky, and George Loewenstein contributed to the writing, review and editing.

All studies were pre-registered with AsPredicted. Study IDs on AsPredicted.org as folows: Study 1: 58381; Study 2: 69282, Study 3: 75361, Study 4: 90073. Sample sizes were determined prior to data collection based on power calculations identifying the required sample to detect meaningful effect sizes. All datasets and study materials are available on OSF: https://osf.io/4pgzj/?view_only=b5beeb48d84643e88fe1ee774d79f552. The authors report no relevant or material financial interests that relate to the research described in this paper.

Data availability

All datasets and study materials are available on OSF: https://osf.io/4pgzj/?view_only%20=%20b5beeb48d84643e88fe1ee774d79f552.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.socscimed.2023.116383.

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