The Relationship between Consumers' Beliefs about Product Price, Taste, and Health and Product Consideration

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Abstract

Models of rational inattention show that consumers who are facing an abundance of options to choose from rely heavily on their beliefs to rationally determine which set of options to consider. The set of options that the consumer actively considers is frequently called the consumer's *consideration set*. However, consumers may hold inaccurate beliefs, which can lead them to omit items from consideration that they would have optimally considered. Consumer food choices are a prime arena for mistaken beliefs to influence attention to choices. We examine how consumers' beliefs on the price, taste, and healthiness of food products affect their choice of consideration sets. The set of options that the consumer actively considers is called *consideration set*. We use data generated on participants' selections of the consideration set (less healthy, medium healthy, healthier, and all-options) that they wished to choose a box of cereal from and their responses on healthiness, taste, and cost that they believed the cereals from each consideration set were on average. Our findings show that beliefs make a difference in people's choices. Expectations that cereals are expensive or tastier or healthier led people to choose different consideration sets. The findings suggest that models of rational incomplete consideration depend importantly on people's expectations/beliefs. If individuals hold inaccurately negative health beliefs about a product, they may omit that product from consideration, preventing them from correcting their beliefs. Finding ways to prompt individuals to challenge prior beliefs particularly on healthiness may promote healthier food choices.

1. Introduction

Rational inattention theory assumes that a decision-maker has a limited capacity to process all available information, but she can choose which pieces of information to pay attention to (Mackowiak et al. 2021). Models of rational inattention show that consumers who are facing an abundance of options to choose from rely heavily on their beliefs to rationally determine which set of options to consider (Caplin et al. 2019; Matějka and McKay, 2015; Mackowiak et al. 2021). The set of options that the consumer actively considers is frequently called the consumer's *consideration set*. However, consumers may hold inaccurate beliefs and misinterpret new information to make sense of previously held beliefs (Rabin and Schrag, 1999), which can lead consumers to omit items from their consideration set that they would have wanted to consider.

Consumer food choices are a prime arena for mistaken beliefs to influence attention to choices. For instance, nutritional attributes such as sugar, fat, sodium, and fiber content impact taste and health outcomes but also shape consumers' views of healthfulness of food, with potentially influence what products they consider when making food choices (Stanley and Tschirhart, 1991; Lusk, 2019). In other words, they rely on their preferences and healthiness related utility to judge their future food choices. There is also evidence that individuals hold biased views of foods' nutrition content. On average, they underestimate calories or sodium content of the foods they choose ((Block et al., 2013; Moran et al., 2017; Gustafson and Zeballos, 2019) or hold differing views of the impact of attributes—like gluten content—on the healthfulness of foods (Arslain et al., 2021). Inaccurate beliefs may lead consumers to mistakenly exclude (include) items from the set of products they consider—items that they would want to have considered (omitted) had their beliefs been accurate.

The price of food is another variable about which consumers hold inaccurate beliefs. Consumers believe that healthier foods are more expensive and unhealthy foods are cheaper (ERS 2016; Haws et al. 2017; Jo and Lusk 2018), although research does not unilaterally support this (Carlson & Frazão, 2014; Nansel et al. 2016; Haws et al. 2017). Given the centrality of relative prices in consumer theory, inaccurate perceptions of the relative costs of healthy and unhealthy foods may affect the expected benefits of expanding the consideration set, resulting, potentially, in items being omitted that should be considered. Haws et al. (2017) document that the widespread belief that healthier foods are more expensive influences information search and processing. Any of these inaccurately held beliefs may influence consumers' perceptions of the benefits and costs of expanding the consideration set, potentially leading to suboptimal consideration and choice.

This paper examines how consumers' beliefs on the price, taste, and healthiness of food products affect their choice of consideration sets. This paper uses data from a novel experiment design that collected choice process variables along with participants' ultimate product choices. These choice process variables document the set of products, or the consideration set, the individual considered during the choice process. We use the documented consideration set to understand how consumers' health, taste, and price expectations of products in each set influenced the consideration set they selected to examine. The overall objective is to establish the relationship between consumers' beliefs about product price, taste, and health and product consideration in a complex choice environment. Our hypotheses: 1) inaccurate beliefs/ expectations may lead consumers to choose sub-optimal consideration set 2) High food price expectation is associated more with healthier consideration set 3) Tastier food expectation is

associated more with less heathy consideration set, and 4) Healthier food expectation is associated more with healthier consideration set.

Contributions of this study include 1) more insights into consumers behavior and decisions-making by understanding how their beliefs/ expectations influence their choices 2) to understand how to challenge prior and inaccurate beliefs about health, in particular, to promote healthier food choices 3) to understand contribution of beliefs in formation of consideration sets. These insights may help companies to develop new marketing strategies that may correct inaccurate consumers' beliefs or biased nutrition beliefs which may lead to changes in behavior and to optimal consideration and choice.

2. Data

2.1. Survey design

Data are generated from an online food choice experiment that featured dozens of product options—as in real-world retail markets—and allowed participants to determine the set of products they wanted to view. In this experiment, individuals make choices of ready-to-eat breakfast cereals when their consideration set is documented. To document consideration sets, we built several novel features into an experiment on consumer choice. Given that consumers face an abundance of breakfast cereal alternatives in average US supermarkets, we increased the number of product alternatives (33) that individuals could choose from in the experiment. Second, we clustered products into subsets to allow consumers to easily identify groups of products they want to consider/not consider. While multiple real-world retailers use language like "Kids Cereals", "Family Favorites," and "Healthy Cereals" to identify subsets that differ in multiple nutritional attributes, we used neutral language that provided a three-item sample of

products included in the subset, such as “Cereals like Cheerios, Grape Nuts, and Frosted Mini-Wheats” to reduce concerns about social desirability biases.

Motivated by real-world subsets, we based the inclusion of cereals in the three different subsets on the rating received by the cereal in the Guiding Stars nutritional rating system (www.guidingstars.com). We divided the 33 breakfast cereals into less healthy (no Guiding Stars; N=11), medium healthy (one Guiding Stars; N=11), and healthier (two to three Guiding Stars; N=11) subsets. Additionally, participants could select to view all-available options, which featured all 33 cereals. Participants selected the product set they wished to choose a box of cereal from. This choice documented the set of products the individual considered. Participants later were asked how healthy and tasty that they believed the cereals from each consideration set (less healthy, medium healthy, and healthier) were on average on a scale of 0 to 100. They completed the same task for price on scale of $0 to $6.

The product options were presented with a photograph and the name of each cereal product (See Figure 1 as an example). Underneath each cereal product name, the nutrient contents per serving for calories, fat, sodium, fiber, and sugar, as well as the price per unit (see Table 1). The prices were based on retail prices at the time at which the survey was conducted, but variation in relative prices was introduced by ranking products from highest to lowest GS and alternately increasing/decreasing prices by 10 percent. The cereal brands included in the experiment were real brands that are widely available at regional and national supermarket chains in the US and represent a range of taste and nutrient profiles. Store brands were excluded to avoid differences in regional familiarity with products. After making cereal product choices, participants answered survey questions about their choice experiences (i.e., reflections questions and typical shopping practices) and demographics

2.2. Participant Characteristics and their Statistic Summary

A sample of 2,309 participants (≥19 years old) was distributed to a nationally representative sample of the US (for the demographic characteristic age, sex, and income) by IRi (Information Resources, Inc.). Table 2 reports the participants demographic characteristics. A total sample size of 2,309 of participants completed the experiment and survey. Table 2 reports selected participant demographic characteristics. Out of 2,309 participants, 46.2% were male, 73.5% had completed a college education and above (bachelor's degree or advanced degree like master's level or higher). On average, participants were around 45 years old, and the mean household income was $77,787 per year—the average household income was $67,521 per year in 2020 reported by U.S. Census bureau (Shrider et al., 2021).

3. Method

3.1.Theoretical Framework

Using Random Utility model, individuals *n*, is assumed to select a choice alternative (option) *i* that yields the greatest expected utility for them. This can be expressed by indirect utility function as:

$$\boldsymbol{U_{ni}=\beta X_{ni}+\varepsilon_{ni}} \quad \textbf{(1)}$$

Where X_{ni} is a vector of all attributes of choice option *i,* β is a vector of structural parameters to be estimated for all attributes, which shows how the observed attributes relate to the unobserved utility (U_{ni}), and ε_{ni} is an option specific error term assumed to be independent and identically distributed type I extreme value distribution. Additionally, βX_{ni} represents the representative utility (V_{ni})—a function of the observed attributes and it is assumed to be a linear function $V_{ni}=\beta X_{ni}$. We also assume that the respondent *n* chooses their utility-maximizing option out of a

choice set j=1,….., J (i.e., the set of all available alternatives consist of J elements $A_1, \ldots\ldots, A_J$). The choice probability by multinomial logit model (McFadden, 1974) is

$$\boldsymbol{P_r(A_1|x_{ni}) = \frac{\exp(\beta X_{ni})}{\sum_{j=1}^{J} \exp(\beta X_{ni})}} \quad \textbf{(2)}$$

Where $P_r(A_1|x_{ni})$ is the marginal probability of choosing alternative A_1.

3.2. Model Estimation

We estimate a multinomial logistic model or the choice probability for the consideration sets. The dependent variable is the consideration set selected by each participant, taking the value of less healthy, medium healthy, healthier, and all-options. The predictor variables are expected price, expected taste, and expected health for medium healthy or healthier consideration sets relative to less healthy consideration set to control for different range of rating numbers that participants used. Eq. (1) becomes:

$$U_{ni} = \beta_{oi} - \beta_1 (Price_{2-1})_{ni} + \beta_2 (Price_{3-1})_{ni} + \beta_3 (Health_{2-1})_{ni} + \beta_4 (Health_{3-1})_{ni}$$
$$+\beta_5 (Taste_{2-1})_{ni} + \beta_6 (Taste_{3-1})_{ni} + \varepsilon_{ni} \quad \textbf{(3)}$$

Where:

$Price_{2-1}$: expected price for medium healthy relative to less healthy consideration set;

$Price_{3-1}$: expected price for healthier consideration set relative to less healthy consideration set;

$Health_{2-1}$:expected health for medium healthy relative to less healthy consideration set;

$Health_{3-1}$: expected health for healthier consideration set relative to less healthy consideration set;

$Taste_{2-1}$: expected taste for medium healthy relative to less healthy consideration set; and

$Taste_{3-1}$: expected taste for healthier consideration set relative to less healthy consideration set.

To analyze cereal choice experiment data, using the open-source statistical analysis software, R (https://www.r-project.org/, accessed on 2 January 2022) To test significance, we calculate p-values using Wald tests (Z-tests) at 5 percent significance level.

4. Estimated Results

Estimation results on how consumers' beliefs/expectations about ready-to-eat breakfast cereals price, taste, and health influence the consideration set (less healthy, medium healthy, healthier, and all-options) they selected to examine are presented in Table 3. Participants who expect that cereals from medium healthy consideration set are more expensive than cereals from less healthy consideration set ($Price_{2-1}$) are 0.9308 times less likely to choose from medium healthy consideration set and are 1.0750 times more likely to choose from healthier consideration set. Participants who expect that cereals from healthier consideration set are more expensive than cereals from less healthy consideration set ($Price_{3-1}$) are 0.9063 times less likely to choose from healthier consideration set and are 0.9483 times less likely to choose from all-options set.

Participants who expect that cereals from medium healthy consideration set are healthier than cereals from less healthy consideration set ($Health_{2-1}$) are 1.0109 times more likely to choose from medium healthy consideration set and are 1.0750 times more likely to choose from medium healthy consideration set, 1.0038 times more likely to choose from healthier consideration set, and 1.0021 times more likely to choose from all-option set. Participants who expect that cereals from healthier consideration set are healthier than cereals from less healthy consideration set ($Health_{3-1}$) are 0.9963 times less likely to choose from medium healthy consideration set, 1.0080 times more likely to choose from healthier consideration set, 1.0029 times more likely to choose from choose from all-option set.

Participants who expect that cereals from medium healthy consideration set are tastier than cereals from less healthy consideration set ($Taste_{2-1}$) are 1.0228 times more likely to choose from medium healthy consideration set and are 1.0021 times more likely to choose from all-option set. Participants who expect that cereals from healthier consideration set are tastier than cereals from less healthy consideration set ($Taste_{3-1}$) are 1.0058 times more likely to choose from medium healthy consideration set, 1.0297 times more likely to choose from healthier consideration set, 1.0122 times more likely to choose from choose from all-option set.

5. Results Discussion

Our findings show that beliefs make a difference in people's choices. Expectations that cereals are expensive or tastier or healthier led people to choose different consideration sets. An expectation that the healthier cereals were more expensive led participants to choose to view the less heathy consideration set; expectations that a particular set of cereals was relatively heathy increased the probability that the individual chose to view that set of cereal. Unsurprisingly, taste had a similar effect. Believing that a cereal set was tastier than others increased the likelihood that they respondent chose to view that set of cereals. The findings suggest that models of rational incomplete consideration depend importantly on people's expectations/beliefs. If individuals hold inaccurately negative health beliefs about a product, they may omit that product from consideration, preventing them from correcting their beliefs.

6. Conclusion

This paper examines how consumers' beliefs on the price, taste, and healthiness of food products affect their choice of consideration sets. We use data generated on participants' selections of the consideration set (less healthy, medium healthy, healthier, and all-options) that they wished to choose a box of cereal from and participants' response about healthiness, taste,

and cost that they believed the cereals from each subset were on average. We find that beliefs play an important role in people's choices. Individuals who perceive greater health differences between the healthier and less healthy sets of cereals are more likely to choose to view the healthy set than individuals who do not believe the sets of cereals differ much in terms of healthiness. We find similar effects in terms of beliefs about tastes and prices. The findings suggest believes about relative differences in nutritional quality of foods importantly influence consideration of products, potentially perpetuating misconceptions about relative healthiness of products. An individual who chooses only to view low-nutritional quality products because they believe they are appropriately as healthy as high-quality products will not be exposed to nutrition information on the healthier products that could correct their beliefs. Finding ways to prompt individuals to challenge prior beliefs about health, in particular, may promote healthier food choices.

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Table1. Cereal products, nutritional and price information, and subsets in the experiment

Cereals	*Calories*	*Fat (g)*	*Sodium (mg)*	*Fiber (g)*	*Sugar (g)*	*Price/Unit1*	*Price/Unit2*	*Subsets*
Apple Jacks	150	1.5	210	2	13	3.68	3.31	Low
Cap'n Crunch's Crunch Berries	150	2	270	0.5	16	2.79	3.07	Low
Cookie Crisp	155	3	170	2	13	3.49	3.84	Low
Corn Pops	150	0.5	140	0	12	3.68	3.31	Low
Froot Loops	152	1.5	210	4	14	2.99	3.29	Low
Frosted Flakes	140	0	200	0.5	14	3.29	2.96	Low
Fruity Pebbles	155	2	210	0	13	2.99	2.69	Low
Honeycombs	160	1	190	1	13	3.19	2.87	Low
Lucky Charms	155	2	255	2	13	3.99	4.39	Low
Reese's Puffs	170	4.5	210	2	12	3.49	3.84	Low
Trix	160	2	180	1	12	3.48	3.14	Low
Alpha-bits	110	1.5	140	2	6	3.19	2.87	Medium
Corn Flakes	150	0	300	1	4	3.29	3.62	Medium
Crispix	150	0	260	0	5	3.68	3.31	Medium
Golden Grahams	160	1	300	2	12	3.49	3.84	Medium
Honey Bunches of Oats	170	3	180	2	9	3.38	3.04	Medium
Honey Nut Cheerios	140	2	210	3	12	3.19	3.51	Medium
Kellogg's Low-Fat Granola with Raisins	230	3	150	4	17	3.68	4.05	Medium
Quaker Oatmeal Squares	150	2	136	4	6	4.48	4.03	Medium
Raisin Bran Crunch	190	1	200	4	19	3.29	3.62	Medium
Rice Chex	160	1	330	2	3	3.39	3.73	Medium
Special K Red Berries	140	0.5	250	3	11	3.29	2.96	Medium
All-Bran Buds	120	2	95	12	9	4.49	4.04	High
Cheerios	140	2.5	190	4	2	3.49	3.84	High
Fiber One Original	90	1.5	140	14	0	4.97	4.47	High
Frosted Mini-Wheats Original	140	1	10	4	6	3.19	3.51	High
Grape-Nuts	138	1	193	5	3	3.12	3.43	High
Great Grains Raisins Dates Pecans	200	1	150	5	13	3.18	2.86	High
Kashi Berry Fruitful	125	1	0	4	6	3.99	3.59	High
Multi-Grain Cheerios	150	2	150	4	8	4.49	4.04	High
Shredded Wheat	140	1	0	5	4	2.88	2.59	High
Wheat Chex	142	1	231	5	4	3.39	3.73	High
Wheaties	144	0.5	267	4	6	4.29	144	High

Table 2. Demographic Characteristics of the Sample Population (*N=2,309*).

Variables	***Mean***	***S.D.***
Age (Years)	45.06	16.15
Male (Yes =1)	0.462	0.499
Household Income ($)	77,787	55,537
College Education and above (Yes =1)	0.735	0.441
White (Yes=1)	0.749	0.434
Black or African American (Yes=1)	0.126	0.332
Asian (Yes=1)	0.063	0.243
Latino (Yes=1)	0.066	0.248
Others (Yes=1)	0.025	0.157

Table 3. Relationship between Expected Price, Taste, and Health for Cereal and Choice of Consideration Sets

	Medium Healthy C.S.		Healthier C.S.		All-options C.S.	
Independent variables	**Coef. (SE)**	**O.R.**	**Coef. (SE)**	**O.R.**	**Coef. (SE)**	**O.R.**
Intercept	-0.45*** (0.02)	0.63741	-0.13*** (0.02)	0.8821	0.84*** (0.02)	2.3131
$Price_{2-1}$	-0.07* (0.03)	0.9308	0.07* (0.03)	1.0750	-0.01 (0.03)	0.9857
$Price_{3-1}$	0.03 (0.03)	1.0321	-0.10** (0.03)	0.9063	-0.05* (0.03)	0.9483
$Health_{2-1}$	0.011*** (0.0009)	1.0109	0.004*** (0.0009)	1.0038	0.002** (0.0007)	1.0021
$Health_{3-1}$	-0.004*** (0.0009)	0.9963	0.008*** (0.0008)	1.0080	0.003*** (0.0007)	1.0029
$Taste_{2-1}$	0.02*** (0.001)	1.0228	0.001 (0.0009)	1.0013	0.002** (0.0007)	1.0021
$Taste_{3-1}$	0.006*** (0.0009)	1.0058	0.03*** (0.0009)	1.0297	0.01*** (0.0007)	1.0122

Coef.: Estimated coefficient, SE: standard error, O.D.: Odds Ratios, Less healthy C.S (0 star) is our refence level from the categorical variable, Medium healthy C.S.: Moderate healthy consideration set (1 star), Healthier C.S: healthier consideration set (2 or3 stars), All option C.S.: all available cereal option consideration set (0,1, and 3 stars) · Significance level of 10%, * Significance level of 5%. **Significance level of 1%. *** Significance level of 0.1%.

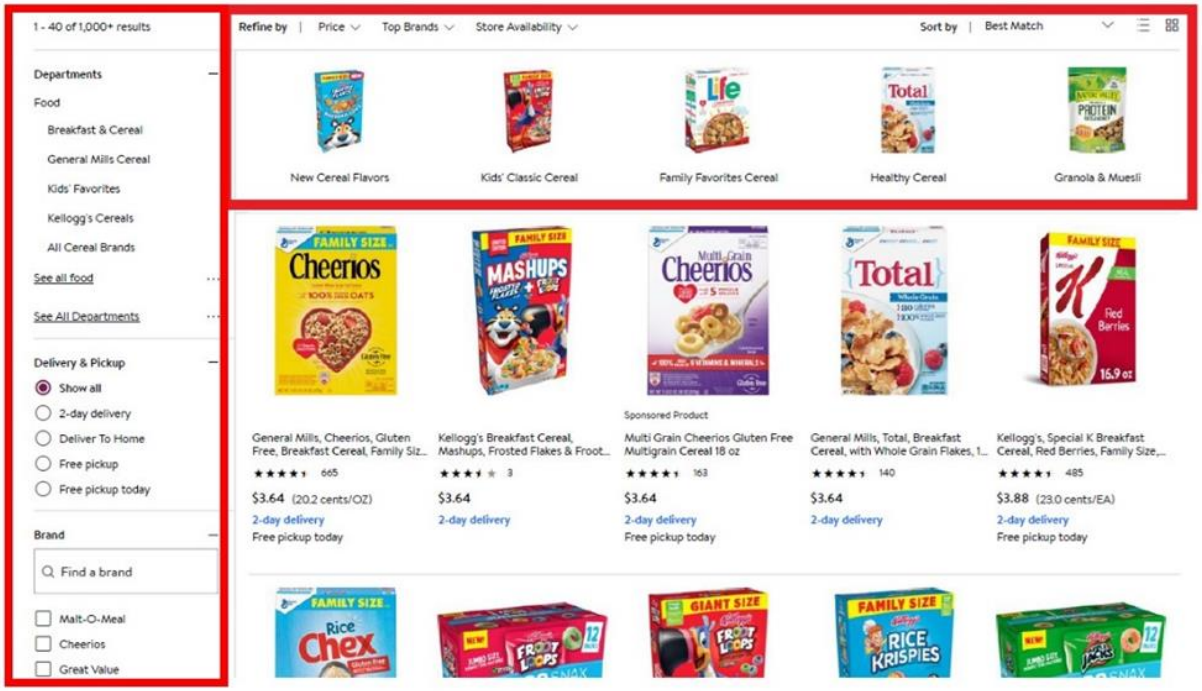

Figure 1. Screenshot of an online grocery shopping page for a large real-world grocery store chain. The red boxes highlight that tools that shoppers can use to modify the set of products that they face (Arslain et al., 2020).