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Nutrition labeling reduces valuations of food through multiple health and taste channels

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ABSTRACT

One popularized technique to promote healthy dietary choice involves posting calorie or other nutritional information at the time individuals make a consumption decision. While the evidence on the effectiveness of such interventions is mixed, relatively little work has focused on the underlying mechanisms of how such labels alter behavior. In the research reported here, we asked 87 hungry laboratory subjects to make bids over foods with or without nutrition labels present. We found that the presence of a nutrition label reduced bids by an average of 25 cents. Furthermore, we found this reduction was driven by differences in perceptions and the importance individuals placed on health features of the foods, but also by differences in the importance individuals placed on more visceral taste features. These results help explain the various methods in which nutritional information postings or other policy tools can nudge individuals to consume healthier options.

1. Introduction

With the recent growth in obesity levels across much of the developed world, a number of public policy solutions have been suggested with the intention of aiding individuals in choosing to consume healthier meals. One such proposal has involved posting calorie information on restaurant menus as consumers make decisions over which items to order (Burton, Creyer, Kees, & Huggins, 2006; Kiszko et al., 2014). The underlying idea is that by transmitting nutritional information, which individuals may be unaware of, in an easily accessible format at the time of consumption, people will be more likely to use such information and will make more health conscious decisions (Miller & Cassady, 2015). However, the results of such interventions appear to have mixed results in practice, either by nudging decisions to healthier options with a range of effect sizes or by finding null effects (vanEpps, Roberto, Park, Economos, & Bleich, 2016; Auchincloss, Mallya, Leonberg, Glanz, & Schwarz, 2013; Bollinger, Leslie, & Sorensen, 2011; Wisdom, Downs, & Loewenstein, 2010; Elbel, Kersh, Brescoll, & Dixon, 2009, 2013; Cantor, Torres, Abrams, & Elbel, 2015; Finkelstein, Strombotne, Chan, & Krieger, 2011; Ellison, Lusk, & Davis, 2013).

Although techniques aimed at helping consumers make better decisions are important, the mechanisms through which viewing nutritional content can influence food decisions are not clear. If attending to a food's nutritional content does in fact alter its valuation, then what variables about the decision do such scenarios affect? Most of the previous literature assumes that the introduction of health information can affect valuations through reminders or information regarding its calorie content (Miller & Cassady, 2015), but the underlying mechanism in such cases remains unclear. For instance, does nutritional information increase the importance of health content in decision-making or does it lead to changes in the perception of how healthy a food is considered to be?

The current research was designed to address two open questions relevant to this literature. First, does attending to a food's nutrition label change how people value such foods? Second, what are the computational variables that are altered by the inclusion of such nutritional information?

The answers to the above questions are important for several reasons. With respect to the first question, although previous work has shown that posting nutritional content can nudge decisions towards healthier foods in certain contexts (Cioffi, Levitsky, Pacanowski, & Bertz, 2015), it has not established how the underlying valuations of such foods are altered. Studying individual food valuations provides a systematic way to investigate how these labels alter consumption utility. With respect to the second question,

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several possible mechanisms can be responsible for potential changes in valuation and exploring these in more detail allows us to improve public policy interventions to focus on the most impactful channels (Ludwig, Kling, & Mullainathan, 2011).

2. Method

Subjects. Eighty-seven students participated in the study (71% female; mean age = 21.2). We aimed to collect at least forty participants for each of the two experimental conditions, as detailed below. Participants were recruited via an online subject pool platform that informed them they were required to fast for 4 hours before the beginning of the experiment. This requirement was verified via self-report before subjects were permitted to enter the laboratory. Immediately after entering the laboratory, subjects signed an informed consent form. All subjects were paid a total of $25 for their participation over approximately 1 hour and the local institutional review board approved the experiment.

Tasks. Subjects participated in four tasks, each over a set of the same fifty snack foods displayed on a computer screen one at a time in a random order (see Table 1 for a list of high and low calorie foods). Stimuli were selected from Hare, Malmaud, and Rangel (2011). The snack foods were all previously rated as appetitive and included a mix of healthy and unhealthy snacks. Fig. 1 details the timing and design of a typical trial. The experiment was conducted using Psychophysics Toolbox (Brainard, 1997).

First, subjects performed a liking-rating task in which they rated how much they would enjoy eating each of the snacks at the end of the experiment. They entered their ratings on an integer scale with range −3 to 3 in response to the question, “How much would you enjoy that particular food at the end of today's experiment?” Similar scales to this have been used in several previous studies that use a similar set of foods (Hare, Camerer, & Rangel, 2009; Krajbich et al., 2011; Sullivan, Hutcherson, Harris, & Rangel, 2015) This task was designed to both familiarize participants with the set of foods and estimate a baseline level of hunger.

In the following three tasks, subjects were randomly sorted into two groups. The first group contained the experimental treatment where subjects saw each food with its nutrition label directly above it, which we denote as the “nutrition” condition. The second group saw each food without any nutrition information, which we denote the “no label” condition. The nutrition labels that were visible in the “nutrition” condition detailed the total calories as well as the grams of fat, saturated fat, sugar, and sodium. In addition, the guideline daily recommended amount of each nutrient was displayed to subjects at the top of each label.

In the second task, subjects made Becker-DeGroot-Marshack bids over foods to consume at the end of the experiment (Becker, DeGroot, & Marschak, 1964). Briefly, the rules of such an auction are that a subject is allowed to enter a bid, b, for a snack. At the end of the experiment, each subject randomly draws a number, x, from an envelope. If $b \geq x$ then the subject would purchase the snack and pay $x; however, if $b \leq x$ then the subject gets and pays nothing. The bidding mechanism was explained in detail and various examples were given in the instructions. These instructions made clear that the mechanism was incentive compatible, meaning that each subject's optimal strategy was to enter their true valuation for the food. Bids were made from $0 to $4.50 in $0.50 increments and were entered by pressing a button. Subjects placed bids over each food twice in a random order. Furthermore, participants were informed that at the end of the experiment one bidding trial would be chosen at random and implemented. Regardless of whether or not they successfully purchased a snack, subjects would need to remain in the laboratory for an additional 20 minutes after the completion of the experiment. Those who successfully purchased a snack would be able to eat the snack in that 20 minute waiting period.

In the third and fourth tasks, subjects entered health ratings (i.e., “how healthy you believe that food to be, independent of any taste considerations”) and taste ratings (i.e., “how tasty you believe that food to be, independent of any health considerations”) over the individual foods. As in the liking ratings, these ratings were entered on an integer scale from −3 to 3. Critical to the design of the experiment, if the subject was placed in the nutrition condition in the bidding task, they also viewed nutrition labels for each of the snacks as they entered health and taste ratings.

Table 1
Example snacks.

Food	Calories
Low Calorie Snacks	
Celery	6
Carrots	25
Cherry Tomatoes	25
Green Grapes	34
Brussels Sprouts	38
High Calorie Snacks	
3 Musketeers Candy Bar	240
Peanut M&Ms	243
Cinnamon Toast Crunch Cereal	260
Butterfinger Candy Bar	275
Haagen-Dazs Ice Cream Bar	300

Note: Examples of the 5 lowest and highest calorie snacks depicted to subjects. Calories represent the number of calories in the quantity of food depicted in its image.

3. Results

Baseline Levels. We first investigated whether there were baseline differences in food preferences between conditions, either due to differences in hunger or differences in underlying preferences over the individual food items. To do so, we compared the average liking ratings over foods from both groups since this task always appeared first and was identical across conditions as no nutrition labels were included, although the order of the foods was randomized across subjects. We found no differences in mean liking ratings suggesting that subjects found the foods similarly appetitive between conditions ($t(85) = 0.89$, $p = 0.375$).

Bidding Behavior. We next examined how the presence of a nutrition label affected subjects' valuations of the foods. Participants in the no label condition bid $0.96 (SD = $0.54) on average while those in the nutrition condition bid $0.71 (SD = $0.55) indicating that the nutrition label significantly lowered subjects' bids ($t(85) = 2.09$, $p = 0.039$).

Furthermore, subjects in the nutrition condition took significantly longer to enter their bids (M = 2.21s, SD = 0.85s) than those in the no label condition (M = 1.88s, SD = 0.64s; $t(85) = 2.04$, $p = 0.044$), suggesting that although those who saw a nutrition label may not have taken the time to read every attribute on the label, they still spent time attending to a portion of the posted calorie information.

Our next analysis concerned whether the nutrition label differentially affected high versus low calorie foods. Here, we first split the foods into those containing either above or below the median number of calories. The above main effect of differences in bids between treatments replicated in high calorie foods (no label: M = $1.04, SD = $0.61; nutrition: M = $0.72, SD = $0.62; $t(85) = 2.47$, $p = 0.016$), but not low calorie foods (no label: M = $0.87, SD = $0.53; nutrition: M = $0.70, SD = $0.55; $t(85) = 1.43$, $p = 0.156$) although the low-calorie null result was in the same direction as the high-calorie finding. When nutritional