

Consumer Perceptions of Healthy and Natural Food Labels

Prepared for the Corn Refiners Association*

by

Jayson L. Lusk, Ph.D.
jayson.lusk@gmail.com

January 15, 2019

*This report conveys the results of a survey funded by the Corn Refiners Association, but the choice of questions asked and the analysis conducted were solely at the discretion of the author, and the discussion and opinions reported herein only reflect the views of the author and not the Corn Refiners Association.

Table of Contents

Executive Summary	2
List of Figures	4
1. Introduction.....	6
2. Methods and Procedures	8
3. Results.....	12
3.1. Label and Food Preferences.....	12
3.1.1. Open Ended Questions.....	12
3.1.2. Guided Questions.....	15
3.1.3. Food Values.....	16
3.2. Natural Beliefs and Preferences.....	19
3.2.1. Open Ended Questions.....	19
3.2.2. Guided Questions.....	21
3.2.3. Policy Questions	31
3.3. Healthy Beliefs and Preferences	34
3.3.1. Open Ended Questions.....	34
3.3.2. Guided Questions.....	36
3.3.3. Policy Questions	47
3.4. Ingredient Name Preferences.....	49
3.5. Labels, Purchase Intention, and Willingness-to-Pay.....	50
4. Conclusions.....	60
5. References.....	63
6. Appendix	65
6.1. Demographic Characteristics of Respondents	65
6.2. Detailed Analysis of Open-Ended Questions.....	67

Executive Summary

In mid-December 2018, a nationwide survey of over 1,200 U.S. food shoppers was conducted to determine beliefs and preferences related to natural and healthy claims and labels on food products. Some of the key findings are as follows.

Label and Food Preferences

- Only 29.6% of consumers indicated that there is additional information they would like to see on food packages. Of those who wanted more information, the most commonly mentioned issues related to origin, presence of GMOs, and calorie/sugar content. When unaided, “natural” or “health(y)” were rarely mentioned.
- When choosing from pre-defined options, consumers indicated the ingredient list, nutrition facts panel, package weight/volume, and brand name to be most informative. Natural and healthy labels were the least picked of the options provided, chosen by only about 9% of respondents.
- Overall, consumers indicated the factors most important when buying food are taste and price, followed by healthiness, safety, and naturalness. Familiarity, convenience, and environmental impact were the lowest rated food purchase drivers. Younger consumers valued naturalness more highly than older consumers, and higher income consumers valued healthiness more highly than lower income consumers.

Natural

- Overall, results suggested nuanced, and sometimes logically inconsistent, views about the meaning of “natural.” Several lines of evidence reveal that consumers do not perceive “naturalness” as a single unifying construct, but rather a food or process can be seen to be high in one dimension of naturalness and low in another dimension.
 - When asked an open-ended question about what it meant to respondents for a food to be natural, words like artificial, additive, chemical, and organic were most commonly mentioned. Many respondents suggested the word was meaningless or marketing hype.
 - Consumers expressed a strong belief that natural implies “no preservatives,” but when specifically asked about particular types of preservatives, more respondents than not thought various preservation processes like fermentation, canning, and smoking or preservation ingredients like salt, sugar, or vinegar were natural. Artificial- or chemical-sounding preservatives like benzoates, nitrites, and sulphites were considered by more consumers to be unnatural than natural.
 - Finished food products such as sugar, flour, and vegetable oil were often considered more natural than the processes, such as bleaching/decoloring and crystallization, which are used to make them. These findings suggest that it is possible for a final product to be considered natural even if a process used to make the product is not.
 - Consumers are skeptical of the “naturalness” of most modern crop production practices. More consumers considered “hybrid seeds” as unnatural than natural. Crops produced with biotechnology were much more likely to be considered unnatural than natural. Consumers perceived organic production as natural, but not the pesticides used in organic agriculture or crop breeding practices allowable under organic.
 - Almost two-thirds of consumers indicated a desire for the FDA to regulate the use of the term “natural” by requiring companies to follow a uniform, consistent definition. Despite

this policy preference, only about a quarter of respondents correctly knew the USDA definition of natural on meat products, and more than half incorrectly believed the USDA definition of natural implies “no hormones” or “no antibiotics.”

- Two-thirds or more of consumers thought “natural” food is better for the environment, safer, and healthier.

Healthy

- Evidence broadly suggests consumers consider healthiness to be a personal concept that differs across people. There was a high level of agreement that individual needs determine whether a food is healthy for an individual.
 - When asked an open-ended question about what it meant to respondents for a food to be called healthy, words like good, fat, nutrition, natural, sugar, calorie, and organic were most commonly mentioned.
 - Consumers were about evenly split on whether a food can be deemed healthy based solely on the foods’ nutritional content (52.1% believing as such) or whether there were other factors that affect whether a food is healthy (47.9% believing as such). Consumers were also about evenly split on whether an individual food can be considered healthy (believed by 47.9%) or whether this healthiness is instead a characteristic of one’s overall diet (believed by 52.1%).
 - Ratings of individual food products revealed that “healthy” perceptions are comprised of at least three underlying dimensions or factors related to animal origin, preservation, and freshness/processing.
 - Focusing on individual nutrients, perceived healthiness was generally decreasing in a food’s fat, sodium, and carbohydrate content and increasing in protein content. Only about 2% of consumers jointly rated high fat and low carbohydrate as the healthiest nutrient combination.
 - About 40% of consumers thought a healthy label implied they should increase consumption of the type of food bearing the label, and indeed about 15% thought the label meant they could eat all they wanted. About 35% of consumers indicated that a healthy label doesn’t mean anything to them.

Ingredient Names

- In all cases considered, more than 85% of respondents preferred every-day, lay ingredient names to their scientific counterparts (e.g., corn starch vs. maltodextrin) insofar as the word being informative for consumer choice.

Purchase Intention and Willingness-to-Pay

- Simulated purchases of cereal boxes indicated consumers are willing to pay about \$0.62, \$1.28, and \$2.05 premiums for healthy, natural, and organic labels, respectively. Consumers perceived these labels as partial substitutes; when all three labels appeared in combination, the implied willingness-to-pay premium was 36% lower than the sum of the willingness-to-pay values when the three labels appeared in isolation.

List of Figures

Figure 1. Image used to determine which processes consumers perceive as natural	9
Figure 2. Images used in the purchase intention and willingness-to-pay questions	10
Figure 3. Desire for additional information on food packages	12
Figure 4. Word cloud constructed from open-ended responses to question, “What additional information would you like to see on food packages?”	13
Figure 5. Most common words mentioned when asked what additional information is wanted on food packages (among the 29.6% who said they wanted more information).....	14
Figure 6. Relative informativeness of different food package labels	15
Figure 7. Relative importance of nine food values when buying food.....	16
Figure 8. Word cloud constructed from open-ended responses to question, “What does it mean to you for a food to be called ‘natural’?”	19
Figure 9. Most common words mentioned when asked what it means for a food to be called natural	20
Figure 10. Perceived definitions of naturalness.....	21
Figure 11. Perceived naturalness of 12 food processes	22
Figure 12. Dimensions of naturalness.....	23
Figure 13. Heatmap showing areas of figure most commonly clicked as natural	24
Figure 14. Percent of respondents indicating food or process as natural.....	25
Figure 15. Heatmap showing areas of figure most commonly clicked as NOT natural	26
Figure 16. Percent of respondents indicating food or process as NOT natural	27
Figure 17. Net naturalness score. Perceived naturalness of foods and processes as determined by clicks on image of food production process	28
Figure 18. Perceived naturalness of nine crop production practices	29
Figure 19. Beliefs about natural food	30
Figure 20. Preferences for regulation of natural labels.....	31
Figure 21. Trust in FDA to regulate natural labels.....	32
Figure 22. Beliefs about definition of USDA natural labels on meat	33
Figure 23. Word cloud constructed from open-ended responses to question, “What does it mean to you for a food to be called ‘healthy’?”	34
Figure 24. Most common words mentioned when asked what it means for a food to be called healthy.....	35
Figure 25. Factors affecting consumers' perception of a foods' healthiness	36
Figure 26. Is a food's healthiness defined by nutrient content?	37
Figure 27. Is "healthy" best defined on a food-by-food or a whole diet basis?	37
Figure 28. Perceived healthiness of 15 foods	39
Figure 29. Three dimensions of 15 food's healthiness.....	41
Figure 30. Perception of healthiness of sodium, carbohydrates, fat, and protein	42
Figure 31. Joint perception of healthiness of carbohydrates, fat, and protein	43
Figure 32. Relationship between diseases and health conditions and beliefs about healthiness ..	44
Figure 33. Behavioral implications of healthy food labels	45
Figure 34. Beliefs about healthy food.....	46
Figure 35. Preferences for regulation of healthy labels	47
Figure 36. Trust in FDA to regulate healthy labels.....	48
Figure 37. Preferences for scientific vs. lay names in ingredient lists.....	49
Figure 38. Heat maps associated with most attractive area of 10 cereal boxes	52

Figure 39. Heat maps associated with least attractive area of 10 cereal boxes	53
Figure 40. Variation in clicks and purchase intentions across 10 cereal boxes	54
Figure 41. Effect of prices and labels on purchase intention	55
Figure 42. Willingness-to-pay for healthy, natural, and organic labels	56

1. Introduction

In principle, food labels and claims enable consumers to make more informed food choices (Lusk, 2012). However, creating and regulating labels is costly, and labels can sometimes mislead rather than inform (Schuldt and Schwarz, 2010). These competing considerations suggest the need to evaluate the costs and benefits of changes in labeling policy.

Several recent events precipitated the need for the present study. While food companies are allowed to use a “natural” label or claim, the Food and Drug Administration (FDA) has refrained from defining the term. One consequence has been a large number of lawsuits in recent years in which plaintiffs claim to suffer harm from being misled about food product contents or ingredients when accompanied with a natural label (Creswell, 2018). In 2015, the FDA [requested](#) public comment on the use of the term natural in food labeling, signaling a potential move to define the term. Such events suggest the need for more information about how food consumers perceive and define the term natural. Prior research shows that natural labels influence consumer choice and that consumers are willing to pay premiums for natural labels (e.g., Asioli et al., 2017; Lusk, 2019); however, research also shows that consumers are sometimes misled by such claims. For example, Syrengelas et al. (2018) showed that consumers were willing to pay significant premiums for meat products labeled natural, a figure that fell to zero when consumers were informed of the U.S. Department of Agriculture’s definition of the term on meat products, which is primarily that the product is minimally processed.

In addition to natural label claims, there is growing interest in the use of “healthy” as a food product labeling claim. “Healthy” has been defined by the FDA since 1993 by reference to total fat content, with changes made in 2016 to discriminate between different types of fat. Recently, however, the FDA has [begun a process](#) to re-define the term, suggesting the need for more information on consumer’s current perceptions of the term and labeling claim. There is a large academic literature on impacts of health claims and nutritional information on consumer choice (e.g., see Drichoutis et al., 2006 and Williams 2005 for reviews), although much of this literature has focused on issues like how the information is conveyed (e.g., front vs. back of package; traffic light symbol vs. numeric) or impacts of the nutrition facts panel (Teisl et al., 2001). It is clear that consumers are willing to pay more for products they perceive as healthy (e.g., Jo et al., 2016), but more fundamental information is needed on the determinants of health perceptions – i.e., what foods, ingredients, and processes consumers perceive as healthy, particularly considering the fact that consumers often infer product healthiness from other product attributes like taste and expense and vice versa (Jo and Lusk, 2018).

The purpose of this research is to determine beliefs and preferences related to natural and healthy claims and labels. More specific objectives include determining:

- 1) How consumers define “natural” and “healthy” foods, ingredients, and processes;
- 2) What consumers believe “healthy” and “natural” claims on food packages do and should imply (e.g., eat all you want, good for the environment, etc.);
- 3) Beliefs about the usefulness and accuracy of “healthy” and “natural” claims;
- 4) Importance of healthiness and naturalness relative to other factors when making food choices;
- 5) Consumers’ preferences for how labeling claims should be regulated;
- 6) Consumer reactions to ingredient lists that contain chemical vs. lay descriptions (e.g., cyanocobalamin vs. vitamin B12), and preferences for policies surrounding ingredient lists.; and,
- 7) How the presence of natural and healthy labels affects purchase intention and willingness-to-pay.

2. Methods and Procedures

A nationwide, online survey of U.S. food consumers was fielded at the end of 2018 from December 11th to the 17th. The survey was written and programmed by the author and was administered to an online panel maintained by Survey Sampling International.

The survey consisted of several groups or blocks of questions related to: 1) food values and use of food labels, 2) natural, 3) healthy, 4) ingredient lists, 5) purchase intentions, and 6) demographics. The order in which respondents saw the question blocks on natural, healthy, and purchase intention was randomized across respondents; the demographic questions were always presented at the end and the food values and label use questions were always presented at the beginning. Where appropriate, the order of response categories for each question was randomized as were questions within a group/block.

The first question on the survey asked how much of the grocery shopping the respondent did for their household. Anyone who provided an answer indicating that they were responsible for less than half their household's grocery shopping was immediately directed to the end of the survey and were excluded from this analysis. Moreover, for quality control, two "trap" questions were included in the survey, which asked respondents to choose a specific answer (e.g., "somewhat agree") if they were paying attention (see Jones et al., 2015 and Malone and Lusk, 2018 for further discussion on use of trap questions to improve quality of survey responses). Respondents who missed either of the trap questions were also excluded from the analysis. Lastly, as a further quality control measure, responses to three open-ended questions were inspected, and respondents who provided non-sensical answers (e.g., "asdkf") were removed from the sample.

After applying the aforementioned exclusionary criteria, the final sample consists of 1,290 respondents, which yields a sampling error of 2.7%. Thus, if for example, 48% of respondents chose a particular response, we can be 95% confident that if the survey were repeated again, that the percentage of respondents who would choose the same response would be within $48\% \pm 2.7\%$. Responses were weighted to match the U.S. population in terms of region of residence in the U.S., age, education, and gender. Weighted and unweighted demographic characteristics of the respondents are presented in the appendix.

Many of the questions asked respondents to choose multiple items from a list. Rather than asking “choose all that apply”, respondents were asked to choose a limited number, e.g., “choose the three items that most apply” so as to force respondents to prioritize their responses and to induce more careful consideration. The survey also included several images in which respondents were asked to click the image according to a particular criteria. The figure below shows one such image to ascertain which processes consumers perceived as natural, where respondents were asked “Which of the following foods or processes do you consider to be natural? (*click up to 5 items on the image that you believe are natural*).” The question was repeated except “natural” was replaced with “NOT natural.”

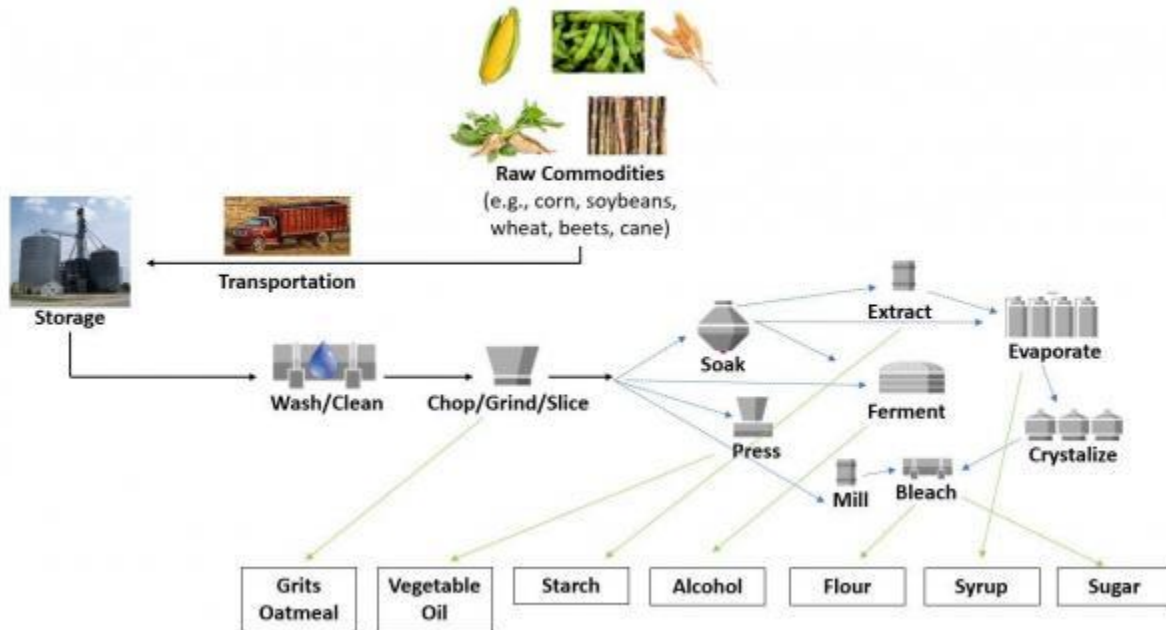


Figure 1. Image used to determine which processes consumers perceive as natural

To determine how labels affect consumers’ purchase intentions and willingness-to-pay, respondents were shown various cereal boxes that differed in terms of prices and labels. Table 1 shows the ten cereal box combinations used in this study, and figure 2 shows how the boxes were visually presented to respondents in the survey.

Figure 2. Images used in the purchase intention and willingness-to-pay questions

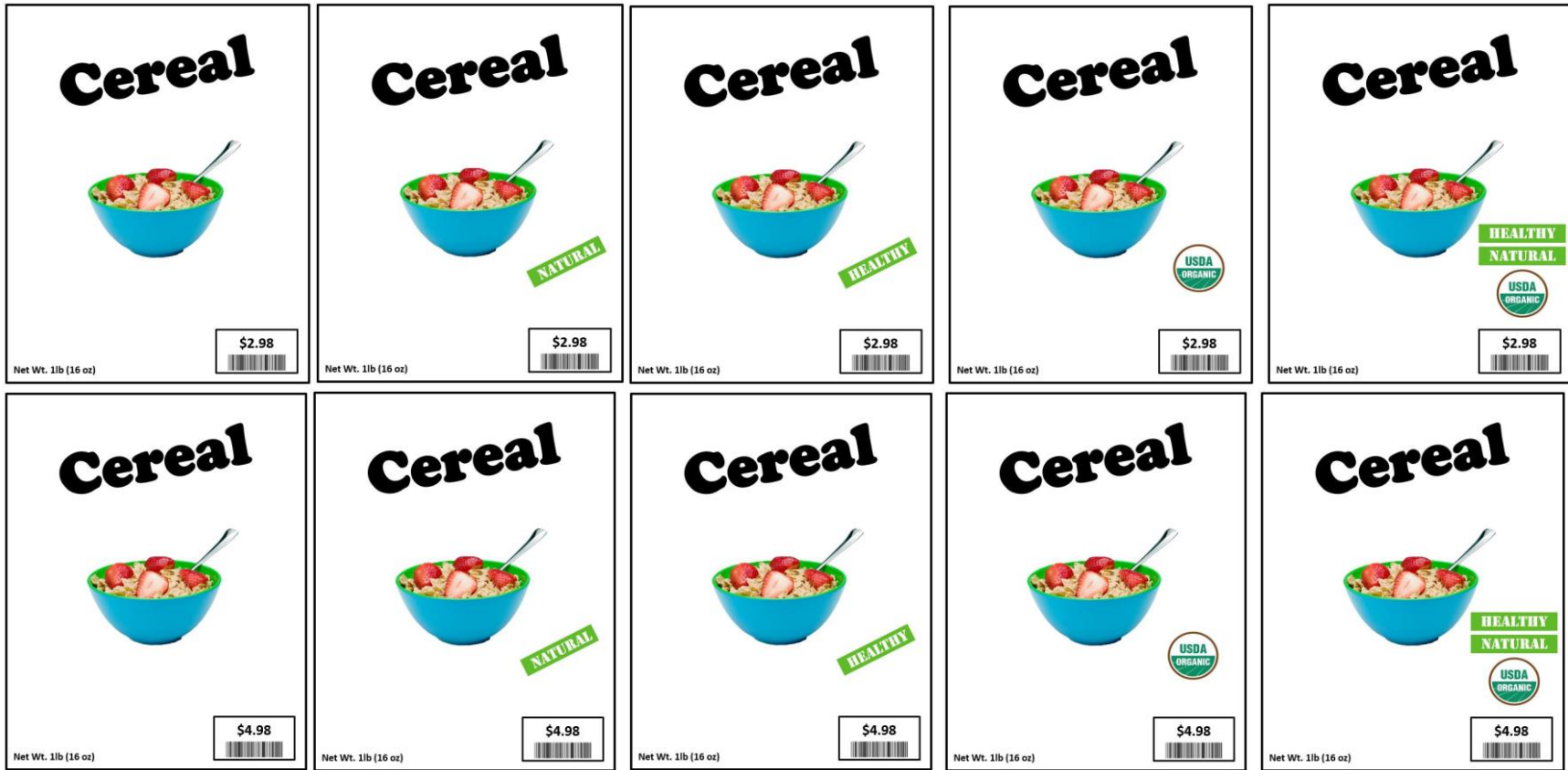


Table 1. Ten Cereal Box Treatments

Cereal Box	Price per box	Label(s)
1	\$2.98	None/Control
2	\$4.98	None/Control
3	\$2.98	Natural
4	\$4.98	Natural
5	\$2.98	Healthy
6	\$4.98	Healthy
7	\$2.98	Organic
8	\$4.98	Organic
9	\$2.98	Natural, Healthy, and Organic
10	\$4.98	Natural, Healthy, and Organic

Respondents were randomly presented with two of the 10 boxes, and for each box, were asked to indicate, “Which part of the cereal box below is most attractive to you? (*please click or touch the image in the most attractive location*)”, “Which part of the cereal box below is least attractive to you? (*please click or touch the image in the least attractive location*)”, and then for each box, they were presented with a slider scale ranging from 0 to 100 in which they were asked, “If you encountered this box of cereal in the grocery store, how likely would you be to purchase it? ($0 =$ no chance of buying; $100 = 100\%$ chance of buying).”

Responses to the purchase intention question can be used to estimate the following linear regression, which included individual-specific fixed effects ($\beta_{0,i}$):

$$\text{Likelihood of Purchase}_{ij} = \beta_{0,i} + \beta_1 * \text{Price}_j + \beta_2 * \text{Natural}_j + \beta_3 * \text{Healthy}_j + \beta_4 * \text{Organic}_j + \beta_5 * \text{Natural}_j * \text{Healthy}_j * \text{Organic}_j$$

where i indicates as subscript for each person and j indicates a particular cereal box, Price is the price of the cereal box (either \$2.98 or \$4.98), Natural_j , Healthy_j , and Organic_j take the value of 1 if box j contains the respective labels and zero otherwise, and β are coefficients to be estimated indicating how purchase intention changes with the various cereal characteristics. The coefficient β_5 reveals whether boxes that contain all three labels are valued more or less than when each of the three labels are viewed in isolation; if $\beta_5 > 0$, then the labels are complements (each label is more highly valued when in the presence of other labels), but if $\beta_5 < 0$, then the labels are substitutes (the value consumers derive from one label is partially subsumed in another label).

The coefficients can be used to infer willingness-to-pay values. In short, willingness-to-pay is determined as the estimated price difference necessary to induce indifference (i.e., equal purchase intention) between a box of cereal that possesses a particular label and one that does not. In practice, this value is determined by taking the ratio of the coefficient for a particular label and the price coefficient multiplied by negative one. For example, the willingness-to-pay for the natural label in isolation relative to no label is: $-\beta_2/\beta_1$.

3. Results

3.1. Label and Food Preferences

3.1.1. Open Ended Questions

One of the initial survey questions asked, “Is there additional information you would like to see on food packages that is not typically there?” As figure 3 shows, only 29.6% responded in the affirmative.

Is there additional information you would like to see on food packages that is not typically there?

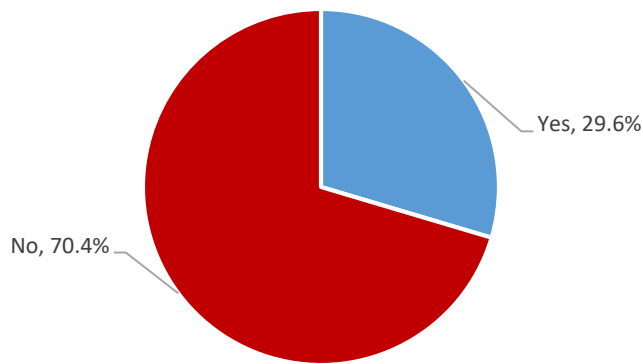


Figure 3. Desire for additional information on food packages

For the 29.6% who indicated that there was more information they wanted to see on food packages, an open-ended follow-up question was provided. In particular, these respondents were asked, “What additional information would you like to see on food packages? (*please type your answer in the blank below*).”

Figure 4 shows a word cloud illustrating the relative frequency with which different words were mentioned by respondents in response to this question. In creation of the word cloud, commonly mentioned non-descript words like “food” and “ingredient” were removed, as were words such as “an,” “the,” “or,” “means,” etc. Words mentioned fewer than five times were also removed.

What additional information would you like to see on food packages?

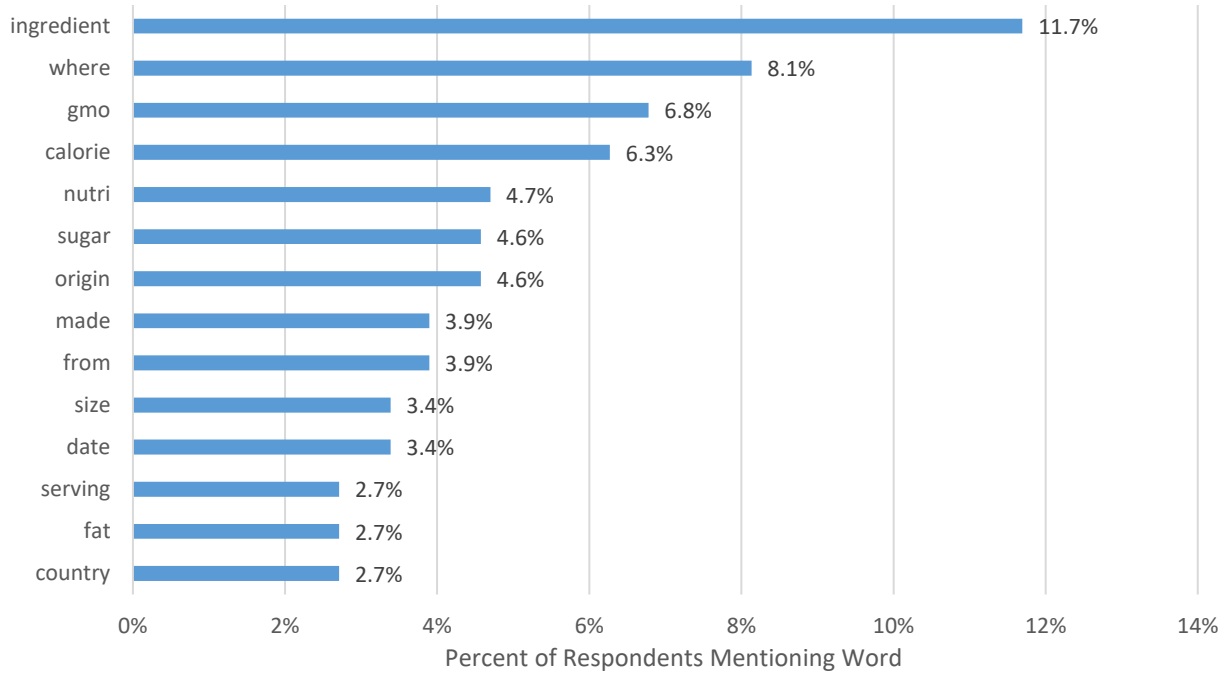


Figure 5. Most common words mentioned when asked what additional information is wanted on food packages (among the 29.6% who said they wanted more information)

Of the 29.6% who said they would like more information, when unaided, the most commonly mentioned issues related to origin (“where” was mentioned by 8.1% of respondents), presence of GMOs or genetic engineering (“gmo” was mentioned by 6.8% of respondents and another 0.5% mentioned “genetic”), or caloric and sugar content (mentioned by 6.3% and 4.6% of respondents, respectively). When unaided, “natural” or “health(y)” were mentioned by fewer than 2% of respondents, among those who said they would like to see more information.

The percent of respondents mentioning words in the seven word categories were as follows: Ingredients/Additives/Processes (31.7%), Nutrients (23.1%), Origin (20.7%), Packaging (17.1%), Nature (14.2%), Other Descriptors (12%), and Skepticism (4.1%). See appendix for a full list of words in each category and additional analysis of responses to this open-ended question.

3.1.2. Guided Questions

Respondents were asked which labels or information is most informative. Ten options were provided in random order, and respondents were asked to pick up to three of the options that most applied. By far, the most commonly chosen options were ingredient list and nutrition facts panel, both of which were picked by more than 60% of respondents as being among the most informative. The next most informative labels were package weight/volume and brand name, which were chosen by 33.3% and 29.5%, respectively, as being among the most informative. Only about 9% of respondents chose the natural label or health claim as being most informative.

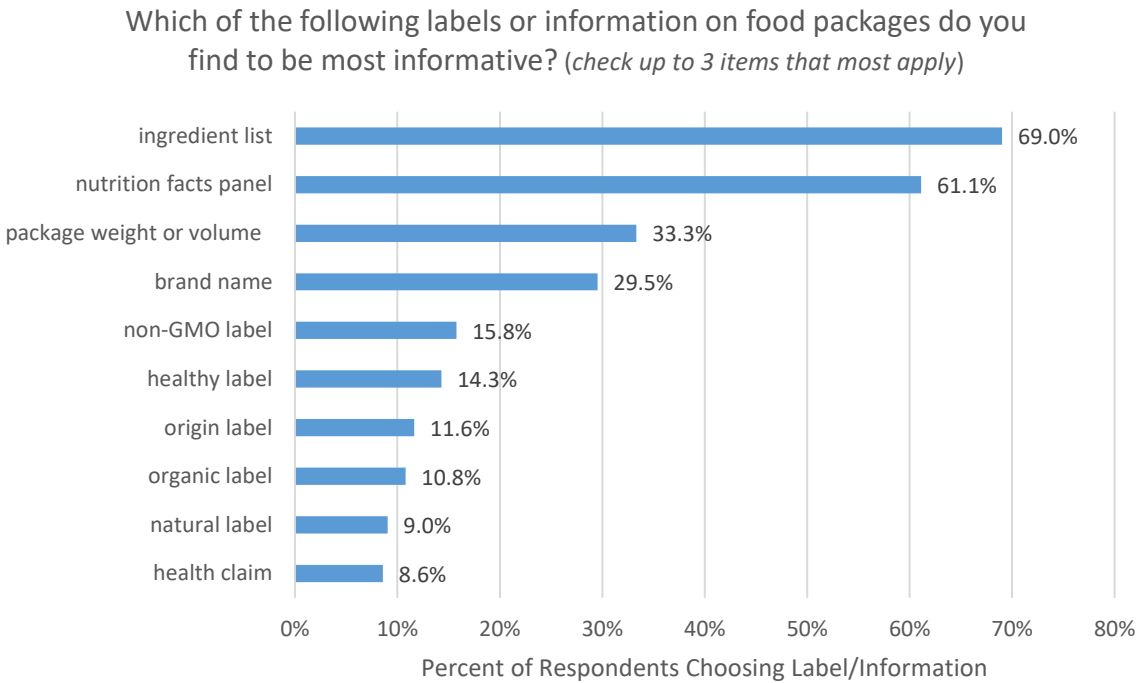


Figure 6. Relative informativeness of different food package labels

3.1.3. Food Values

Following on the work of Lusk and Briggeman (2009) and Lusk (2011), respondents food values were measured. In particular, respondents were shown a list of nine items and they were asked which were most and which were least important when buying food. Respondents had to click and drag three of the items into a “most important” box and also put three in a “least important” box, leaving three in neither box. The advantage of this questioning approach is that it requires a tradeoff. Respondents cannot say all issues are important and they have to indicate some food values as least important.

To create a scale of importance, the percent of times an issue was placed in the least important box was subtracted from the percent of times it was in the most important box, creating a measure that ranges from 100% to -100%. By construction, the sum of the importance score across all nine food values is zero.

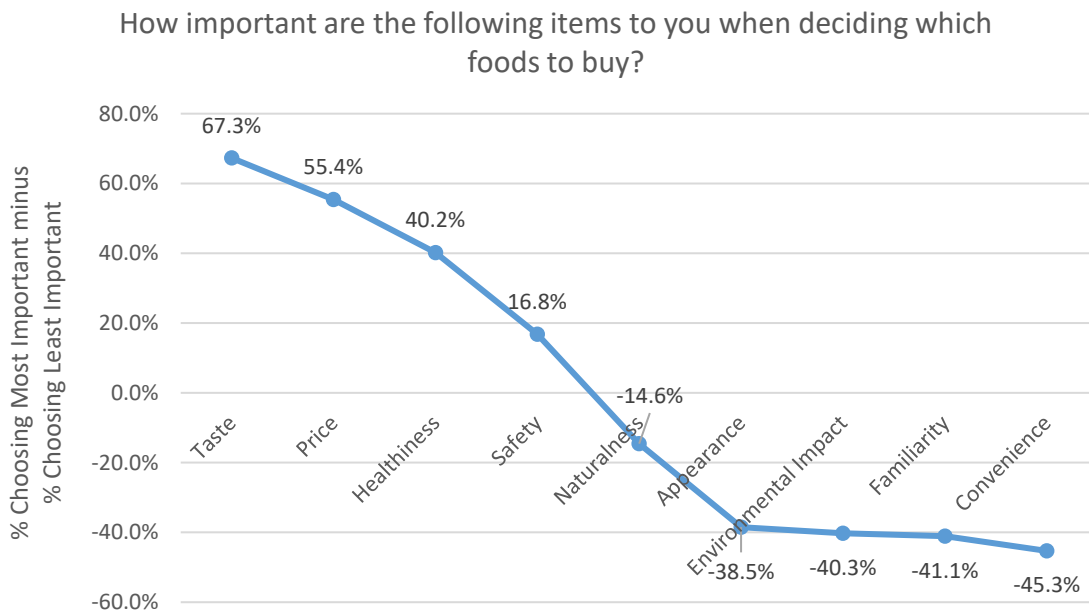


Figure 7. Relative importance of nine food values when buying food

As shown in figure 7, taste and price were the two most important values when consumers buy food. 72.7% of consumers indicated “taste” as most important, and only 5.4% indicated “taste” as least important, creating an importance score of $72.7 - 5.4 = 67.3\%$ for taste. Similarly, 55.4% more consumers indicated price as important than not important. Healthiness and safety were the third and fourth most important food values. Naturalness was viewed as least important more commonly than most important as indicated by the negative importance score of -14.6%. Environmental impact, familiarity, and convenience were the least important food values.

Figure 7 shows the average result across all respondents. Table 2 shows the average food value scores for different demographic groups.

Table 2. Average food value scores by demographic group

Demographic Group	Natural-ness	Health-ness	Taste	Price	Safety	Convenience	Familiarity	Appearance	Environmental Impact
Men	-19.1%	38.7%	65.0%	56.4%	9.7%	-40.0%	-34.4%	-31.7%	-44.5%
Women	-10.2%	41.7%	69.4%	54.5%	23.5%	-50.3%	-47.5%	-44.8%	-36.3%
18≤age≤25	-12.9%	40.1%	64.7%	52.3%	23.6%	-48.3%	-43.5%	-61.3%	-14.8%
25≤age≤34	11.1%	35.9%	49.5%	38.4%	21.4%	-43.7%	-43.4%	-46.4%	-22.8%
35≤age≤44	-15.6%	42.9%	65.3%	48.2%	17.7%	-39.6%	-44.9%	-29.0%	-44.9%
45≤age≤54	-16.6%	41.3%	80.6%	62.0%	17.9%	-44.6%	-55.5%	-39.1%	-46.0%
55≤age≤64	-22.0%	43.0%	72.4%	55.8%	12.5%	-48.9%	-33.6%	-28.5%	-50.7%
65≤age	-29.5%	38.5%	71.0%	72.5%	10.4%	-47.1%	-28.8%	-33.0%	-54.1%
inc<\$60k	-14.4%	35.9%	65.5%	60.7%	20.5%	-47.0%	-41.0%	-40.0%	-40.1%
\$60k≤inc<\$120k	-12.0%	45.6%	70.9%	46.7%	11.3%	-43.8%	-42.1%	-39.4%	-37.2%
inc≤\$120k	-22.1%	48.9%	67.3%	50.6%	11.6%	-40.5%	-39.1%	-27.9%	-48.7%
HS or less	-14.7%	34.7%	68.6%	57.5%	21.3%	-49.0%	-42.5%	-38.2%	-37.8%
Some college	-10.8%	42.3%	65.6%	53.6%	16.2%	-40.6%	-44.6%	-39.5%	-42.1%
BS, BA or higher	-18.3%	45.4%	67.3%	54.7%	11.2%	-45.2%	-35.5%	-37.8%	-41.7%
Northeast	-14.6%	43.1%	62.5%	57.4%	15.2%	-45.6%	-34.9%	-38.2%	-44.9%
Midwest	-19.6%	38.8%	72.5%	62.7%	19.3%	-45.5%	-50.3%	-34.1%	-43.8%
South	-8.9%	39.5%	69.1%	51.7%	19.3%	-51.1%	-41.4%	-43.0%	-35.1%
West	-19.2%	40.4%	63.2%	53.7%	11.7%	-35.6%	-37.0%	-35.1%	-42.2%
Democrat	-12.8%	40.8%	65.2%	52.8%	16.4%	-47.6%	-44.3%	-38.8%	-31.7%
Republican	-18.6%	43.4%	71.7%	57.9%	22.0%	-39.7%	-42.8%	-37.4%	-56.5%
Independent	-11.9%	37.3%	64.9%	55.6%	13.4%	-47.8%	-35.7%	-38.8%	-37.1%
White	-18.0%	37.3%	71.0%	60.7%	11.7%	-41.3%	-38.9%	-37.9%	-44.5%
Black	0.2%	56.7%	51.9%	38.4%	33.8%	-60.8%	-54.3%	-34.7%	-31.4%
Hispanic	-12.8%	32.7%	58.1%	47.0%	24.6%	-38.8%	-42.0%	-42.1%	-26.7%

Note: values sum to zero across each row. Each row presents the same type of information as in figure 7 but for the specific demographic group in question.

As shown in table 2, men placed less value on naturalness than women, and women placed more value on safety than men. Millennials (aged 25 to 34) were the only group to, on net, indicate naturalness as a more important than less important food value. In general, the value of naturalness fell with age. All age groups valued healthiness similarly. Higher income consumers placed more value on healthiness than low income consumers, but the opposite was true with regard to the relationship between income and the importance placed on naturalness.

Not surprisingly, lower income individuals placed a higher importance on the price paid for food than higher income consumers. The oldest age group (65 years and older) was the only group for which taste was not the most important food value; for this group, price was slightly more important than taste. Naturalness was most valued in the Southern U.S., whereas healthiness was most valued in the Western and Northeastern U.S. Republicans placed less value on naturalness, and particularly environmental impacts, as compared to Democrats. Black or African American consumers placed significantly higher values on both naturalness and healthiness relative to white and Hispanic consumers.

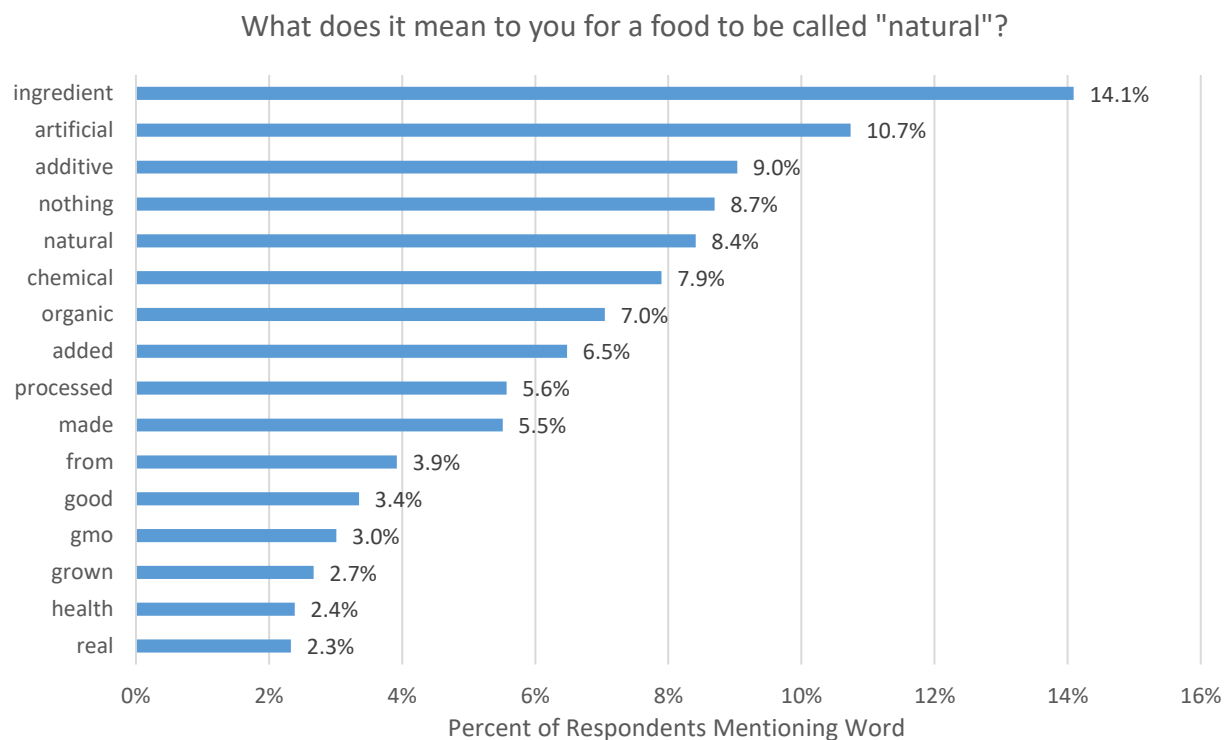


Figure 9. Most common words mentioned when asked what it means for a food to be called natural

Responses were inspected for usage of 120 words or phrases that were placed into one of the aforementioned categories. As shown in figure 9, when asked an open ended question about what it meant to respondents for a food to be called natural, words like artificial, additive, chemical, and organic were most commonly mentioned. More than 10% of respondents specifically mentioned the word artificial. A non-trivial share of respondents suggested the word was meaningless, marketing hype, or that they did not know what the word meant (8.7% said the word meant “nothing”). Many respondents provided tautological-like definitions, for example using the word “natural” to define “natural.”

The percent of respondents mentioning words in the seven word categories were as follows: Ingredients/Additives/Processes (53.2%), Nature (46.4%), Skepticism (13.5%), Other Descriptors (10.1%), Origin (5%), Nutrients (1.2%), and Packaging (0.6%). See appendix for a full list of words in each category and additional analysis of responses to this open-ended question.

3.2.2. Guided Questions

Following the open-ended question of the meaning of natural, respondents were provided with a list of 11 possible definitions and were asked which most applied to the meaning of the word natural. Figure 10 shows that more than half of respondents indicated a food was natural if it had “no preservatives” and “no hormones and antibiotics.” Almost 40% of respondents said “no pesticide residues” was natural. Only 29.4% said “fresh” was indicative of natural, slightly more than the 26% who said the same of organic. Only 22.3% said a food needed “few added ingredients” to be natural, and only 7.1% said only “foods my grandmother would recognize” are natural. Consumers do not seem to associate cooking or localness to relate to naturalness.

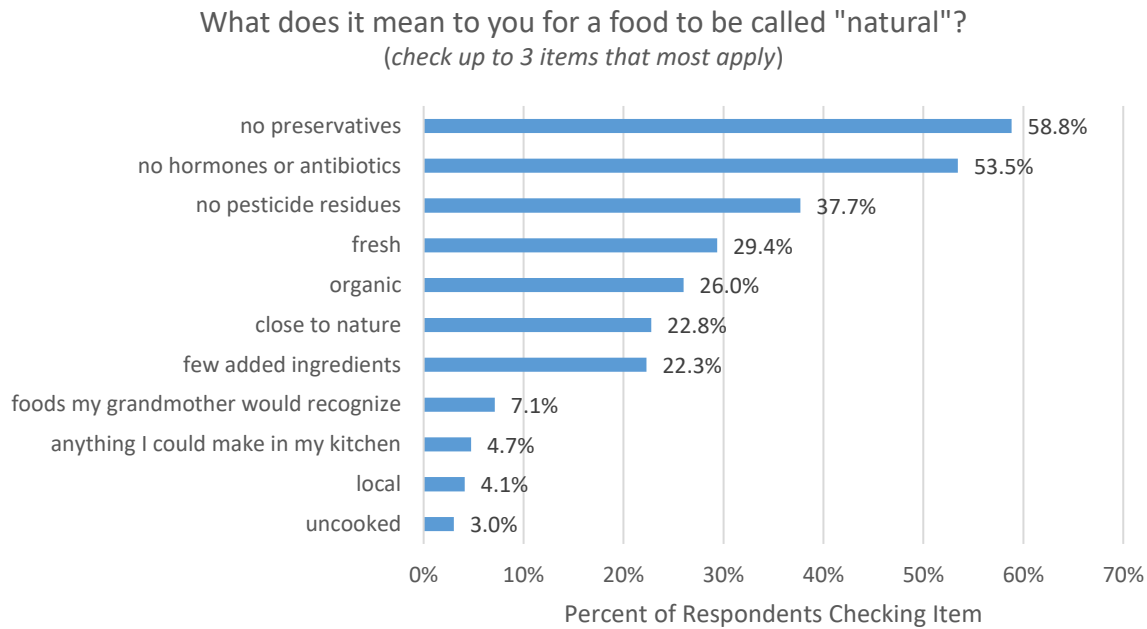


Figure 10. Perceived definitions of naturalness

Respondents were provided a list of 12 food processes in random order and were asked to indicate whether each was natural, not natural, or neither natural or not natural. For each item, a naturalness score was created by subtracting the percent of respondents who considered a process not natural from the percent of respondents who considered a process natural. Figure 11 shows the results.

76.9% of respondents indicated “chopped” was natural, whereas only 5.3% thought this process was not natural, implying $76.9 - 5.3 = 71.7\%$ thought chopping was more natural than not. Thirty percent more respondents thought fermentation and pressing to create vegetable oil was natural as compared to the percentage who found these processes not natural. Preservation by canning and with sugar/salt/vinegar were perceived as net-natural, whereas preservation with benzoates/nitrites/sulphites was not. That “washing” had an only moderately net positive natural score is likely explained by the parenthetical definition provided, which indicated, “(e.g., cleaning grains or fruits and vegetables using organic acids or chlorine).”

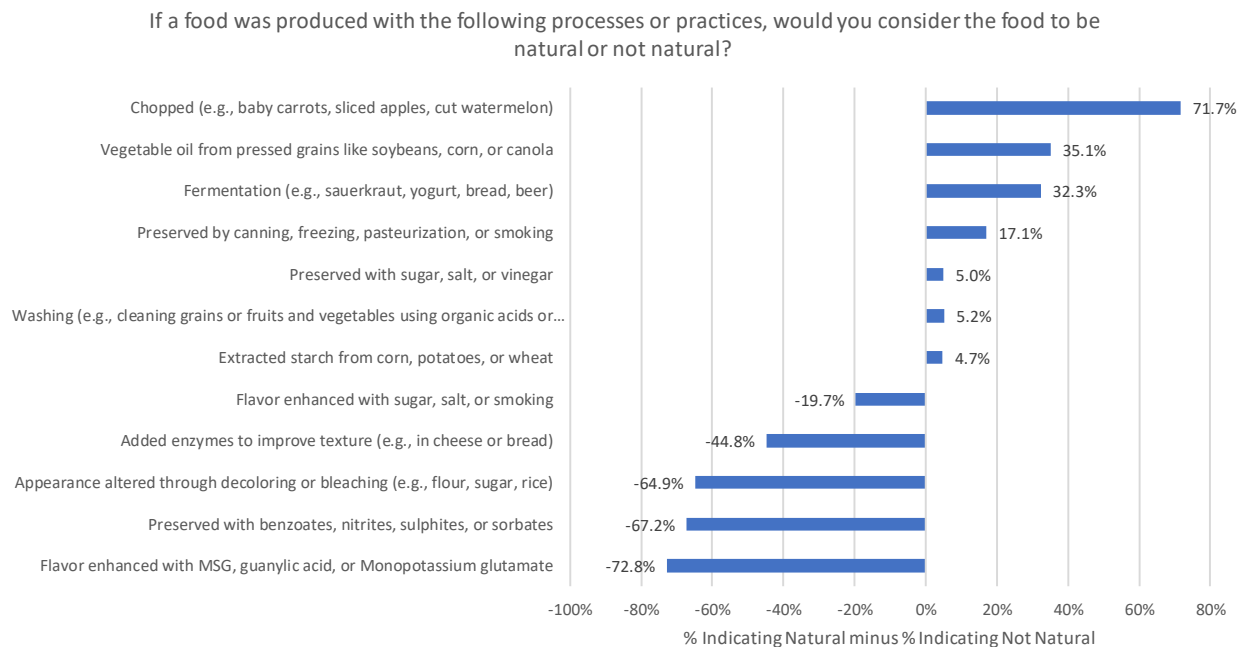


Figure 11. Perceived naturalness of 12 food processes

To further explore how consumers conceptualize the naturalness of different processes, the questions used to create figure 11 were further analyzed using factor analysis. Factor analysis seeks to determine whether there are common forces or factors which caused responses to different questions to correlate with each other. Analysis reveals there are two underlying factors that explain the vast majority of the variance in whether consumers rated a process as natural or not. Figure 12 plots the 12 food processes according to their factor loadings from promax rotation.

Dimensions of Naturalness

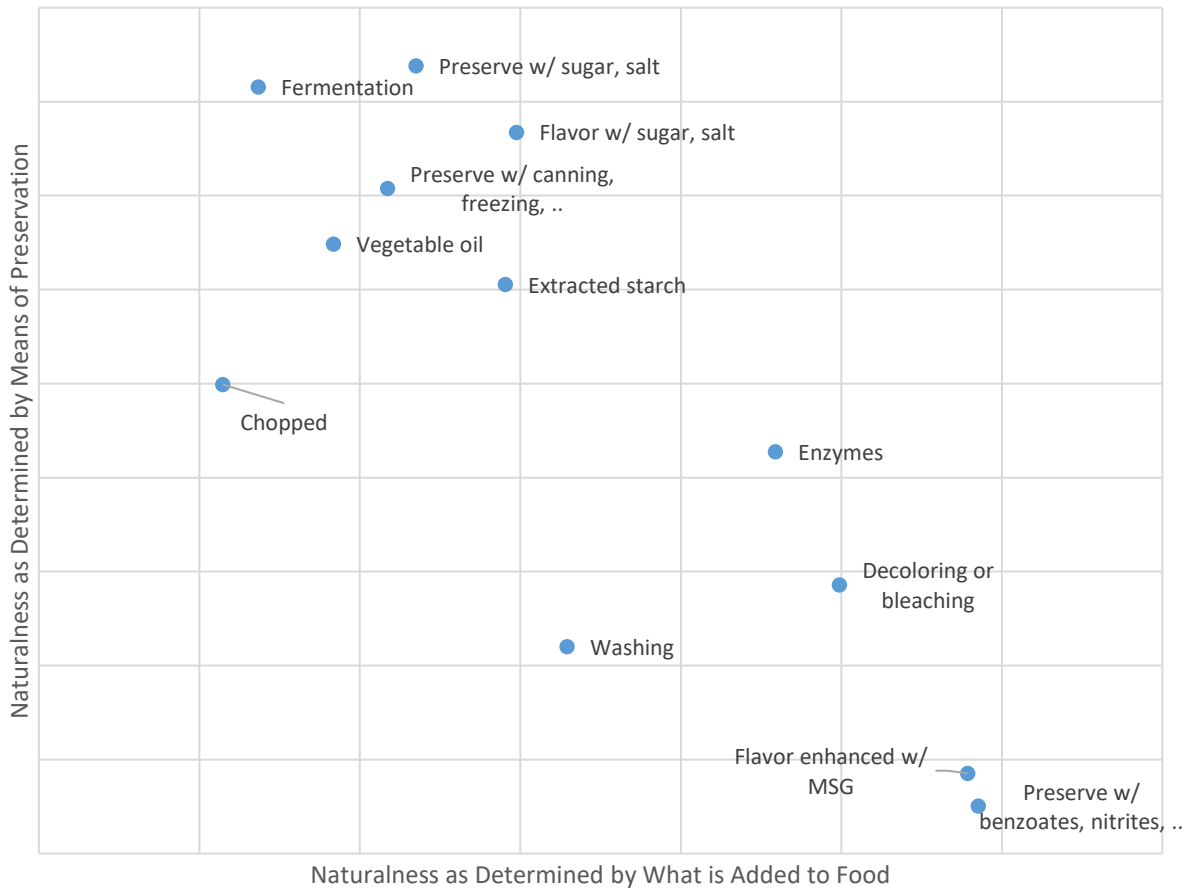


Figure 12. Dimensions of naturalness

The first underlying factor (plotted along the x-axis) seems to relate to whether ingredients perceived as unnatural are believed to be added to the food. Along this dimension, the highest scoring processes are preserved with benzoates, nitrites, etc. and flavor enhanced with MSG, etc., and the lowest-scoring processes are chopped and fermentation. Processes high in this dimension seem to unnaturally affect flavor, taste, or color. The second underlying factor (plotted along the y-axis) seems to relate to whether ingredients used to preserve foods or make them storable are perceived as natural or not. Processes high in this dimension include preservation with sugar/salt, flavor with sugar/salt, and fermentation.

One of the take-home points from figure 12 is that consumers do not perceive “naturalness” as a single unifying construct, but rather a food or process can be seen to be high in one dimension of naturalness but low in another dimension of naturalness.

One challenge with the responses in figure 11 is that it is unclear how much consumers know or care about the underlying processes used to create the ingredients like sugar, salt, or vinegar that are largely viewed as natural preservatives. It is also unclear when during a particular food production process a consumer perceives a food turns from natural to not. As such, respondents were shown the schematic in figure 1 and were asked, “Which of the following foods or processes do you consider to be natural? (click up to 5 items on the image that you believe are natural).”

Figure 13 shows a heatmap indicating the frequency with which respondents clicked on various areas of the figure, and figure 14 shows the exact percent of respondents who clicked on the area associated with each food or process.

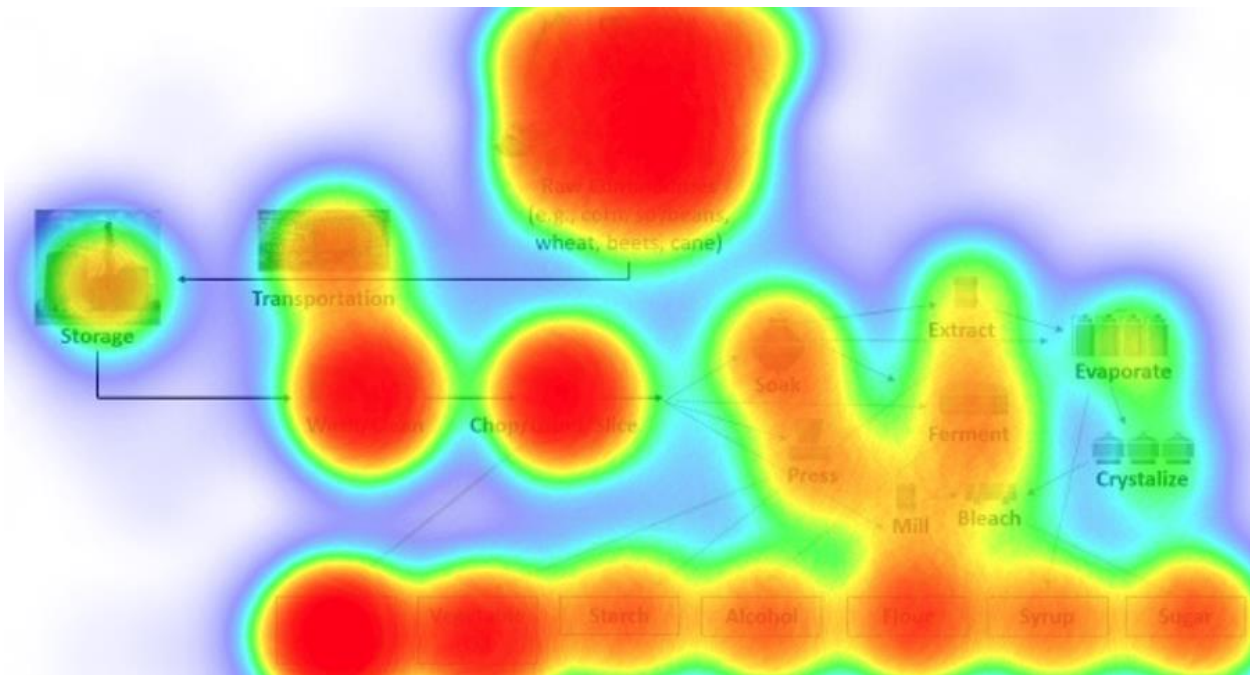


Figure 13. Heatmap showing areas of figure most commonly clicked as natural (note: more intense red color means more clicks on the area deemed natural)

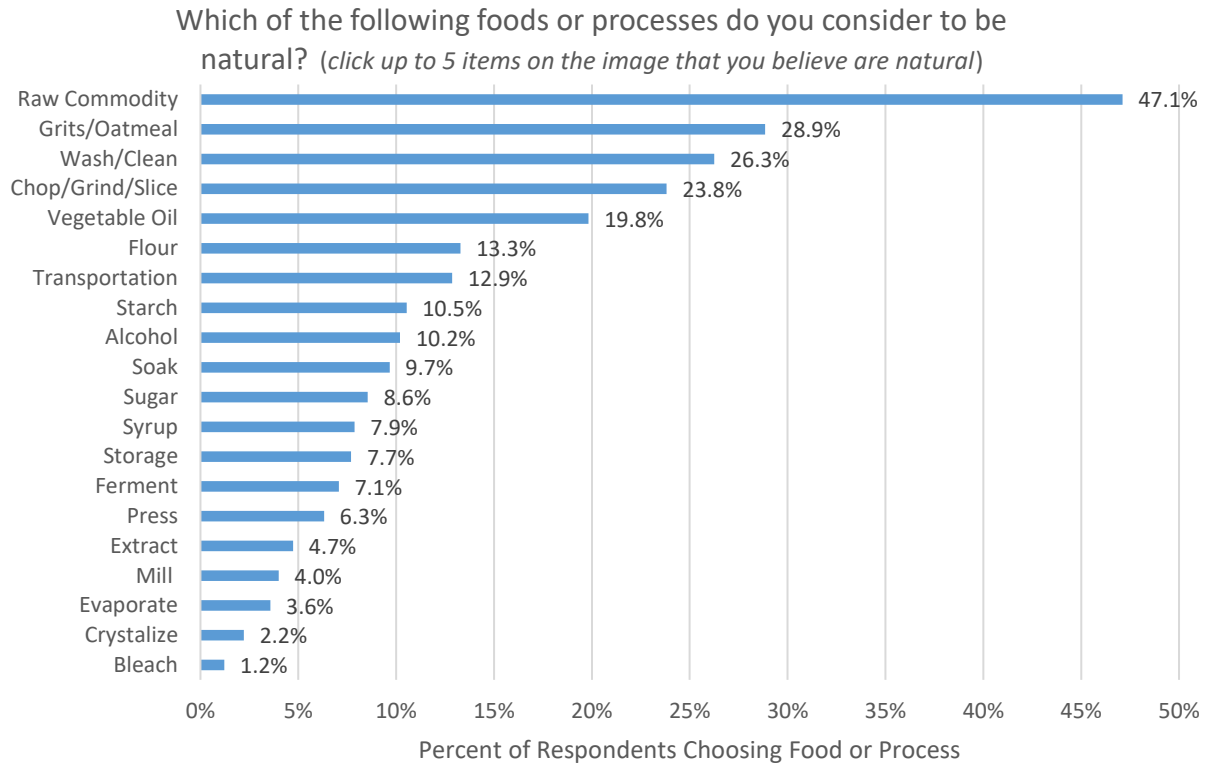


Figure 14. Percent of respondents indicating food or process as natural

Just under half of respondents (47.1%) clicked on the image of the raw commodities as being natural. The next most commonly clicked areas, chosen by between 20% and 30% of respondents, was grits/oatmeal, wash/clean, and wash/grind/slice. Even after showing the processes involved, 19.8% clicked vegetable oil as natural and 13.3% clicked flour as natural.

Respondents were again showed the image in figure 1, but this time were asked to click up to five areas that were NOT natural. Figure 15 shows a heatmap and figure 16 provides the exact percent of respondents clicking each area.

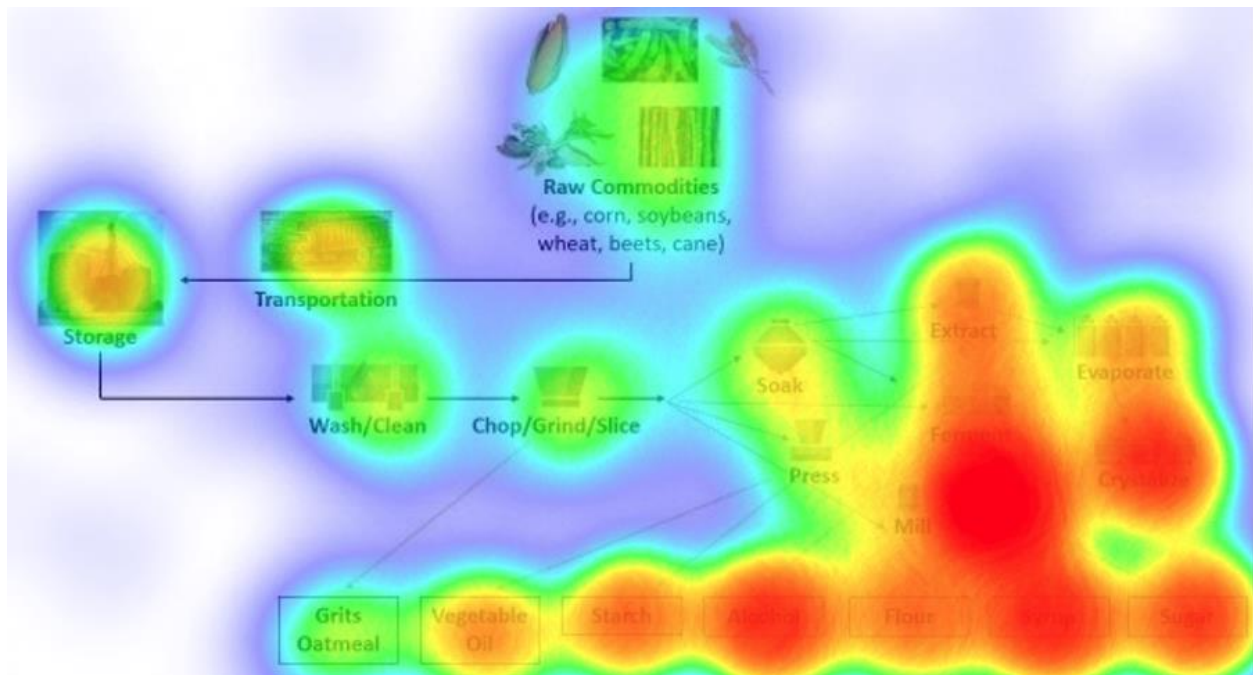


Figure 15. Heatmap showing areas of figure most commonly clicked as NOT natural (note: more intense red color means more clicks on the area deemed NOT natural)

“Bleach” was clicked by 33.8% of respondents as not natural, followed by crystalize, and then alcohol, syrup, and sugar.

Which of the following foods or processes do you consider to be NOT natural? (click up to 5 items on the image that you believe are NOT natural)

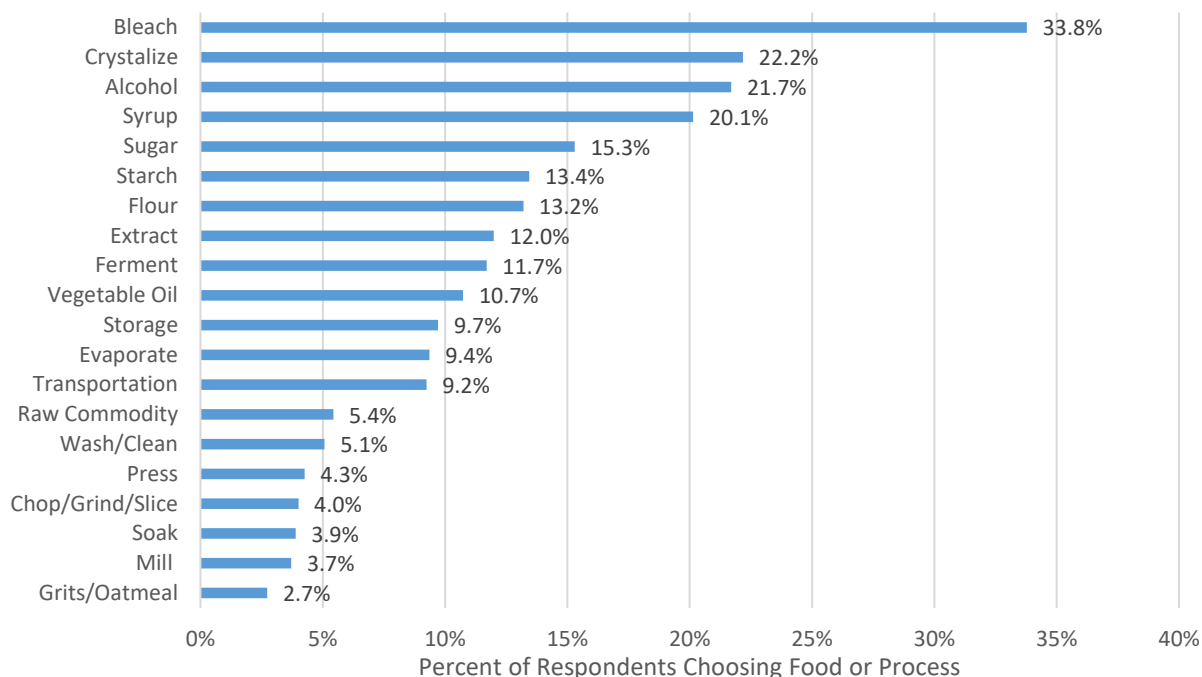


Figure 16. Percent of respondents indicating food or process as NOT natural

Figure 17 combines the data in figures 14 and 16 to create a net natural score by subtracting the percent of times an area of the image was clicked as not natural from the percent of times the same area was clicked as natural. The beginning stages of the food production process are generally perceived as being more natural than not. Grits/oatmeal, vegetable oil, and, by a thin margin, flour, were the only final foods clicked as being more natural than not. Bleach and crystalize were areas of the figure most likely to be clicked as not natural relative to being clicked as natural.

A curious result revealed from these figures is that, in many cases, final foods are often considered more natural than the processes which make them. For example, figure 14 shows more people clicked alcohol as natural than clicked fermentation as natural. Figure 17 shows that vegetable oil has a higher net natural score than pressing or bleaching, both processes which are used to create this final product. Similarly, figure 17 shows sugar has a higher net natural score than crystalize, but of course, the latter is necessary to produce the former. *These findings suggest that it is possible for a final product to be considered natural even if a process used to make the product is not.* To illustrate, of the 33.8% people who considered bleaching NOT natural, 3.9% consider sugar, 4.3% consider flour, and 8.6% consider vegetable oil natural. Conversely, of the 13.3% of people who consider flour natural, 10.9% consider bleaching NOT natural; of the 19.8% who consider vegetable oil natural, 14.7% consider bleaching NOT natural.

Which of the following foods or processes do you consider natural vs. NOT natural?

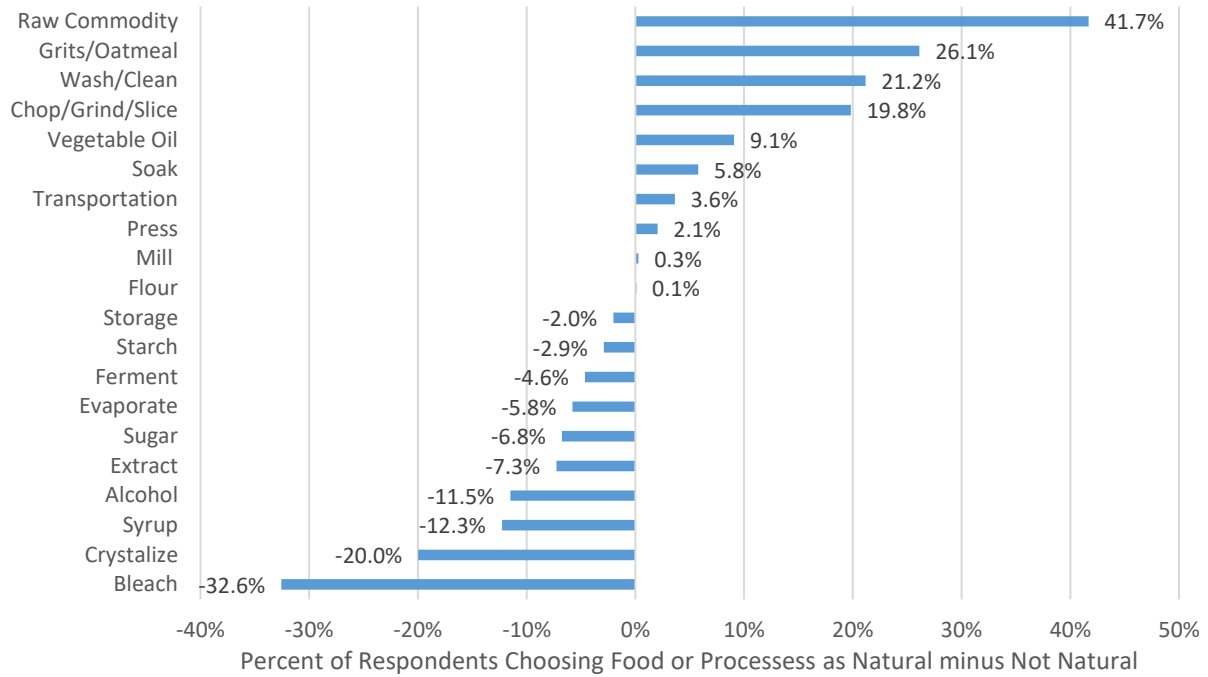


Figure 17. Net naturalness score. Perceived naturalness of foods and processes as determined by clicks on image of food production process

Previous questions focused on final foods or food production processes to determine naturalness; however, as figures 8 and 9 suggest, consumers also consider crop production methods when making a determination of naturalness. To explore this issue, respondents were provided a list of nine crop production practices in random order and were asked to indicate whether each was natural, not natural, or neither natural or not natural. For each item, a naturalness score was created by subtracting the percent of respondents who considered a practice natural from the percent of respondents who considered a practice not natural. Figure 18 shows the results.

About 80% more respondents said organically grown crops were natural as said such crops were not natural. Crops grown indoors and that are hydroponically grown were, on net, seen as more natural than not.

All other crop production practices were rated as not natural by more respondents than were rated as natural. Thus, the results suggest consumers are skeptical of the “naturalness” of most modern crop production practices. Curiously, this is true for use of hybrid seeds. More consumers considered “hybrid seeds” as not natural than did the number of consumers who considered “hybrid seeds” natural. Crops produced with biotechnology were much more likely to be considered not natural than natural. Consumers perceived organic as natural, but not the pesticides used in organic agriculture or the methods (i.e., mutagenesis) used to create many organic seeds. Again, these findings suggest that it is possible for a final product to be considered natural even if a process used to make the product is not; in this case, the finding is likely to result from a lack of knowledge about organic production practices.

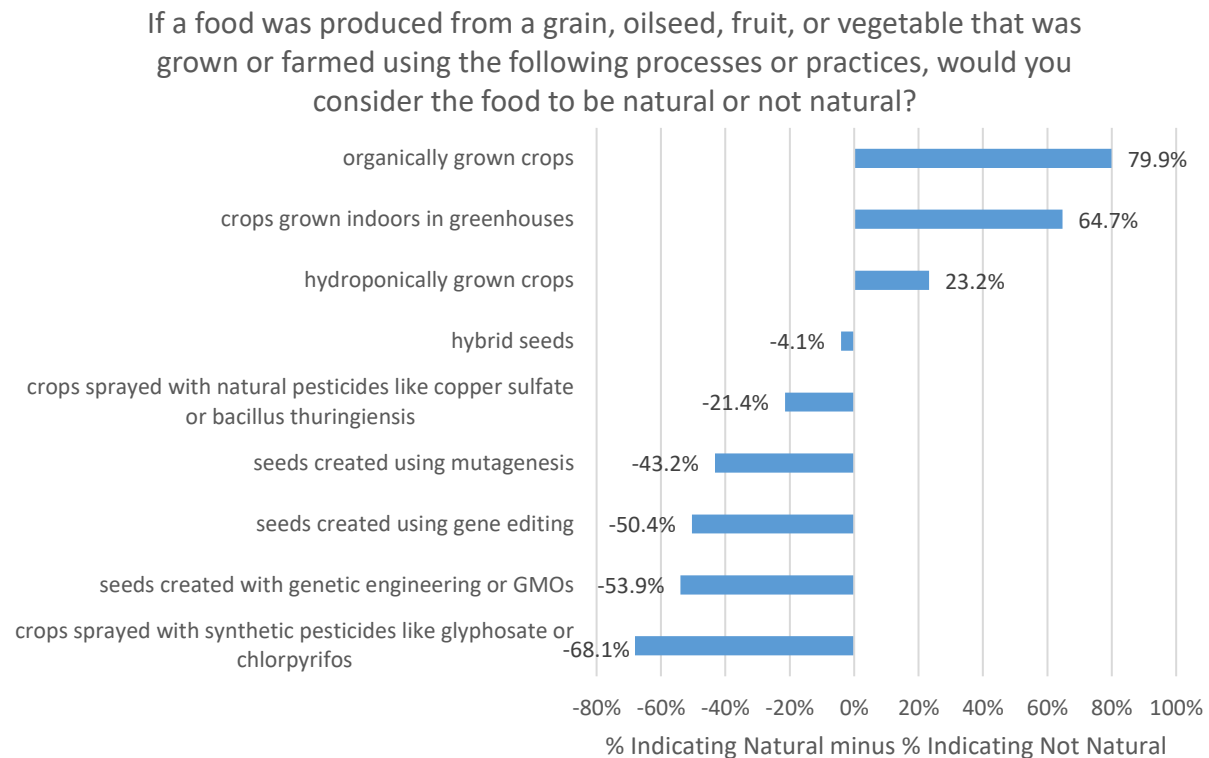


Figure 18. Perceived naturalness of nine crop production practices

Whereas previous questions have aimed to determine the foods, practices, and processes consumers judge to be natural, it has not yet been ascertained why consumers may or may not prefer more natural products. As figure 7 on food values revealed, naturalness is mid-ranked in terms of factors important to consumers when buying food. Figure 19 shows the results of a series of questions in which respondents were asked to indicate their extent of agreement or disagreement with seven statements such as, “Natural food is healthier.” There were five potential response categories: strongly disagree, somewhat disagree, neither agree nor disagree, somewhat agree, and strongly agree, which were coded -1, -0.5, 0, 0.5 and 1, respectively. This coding yields positive means when there is more agreement than not to the statement, and negative means when the opposite is true.

Figure 19 shows high levels of agreement with the notion that natural foods are healthier, safer to eat, and are better for the environment. There was moderate agreement that natural food is more sustainable and tastier, and split opinion about whether natural food is more convenient. There was moderate disagreement with the natural food is more affordable.

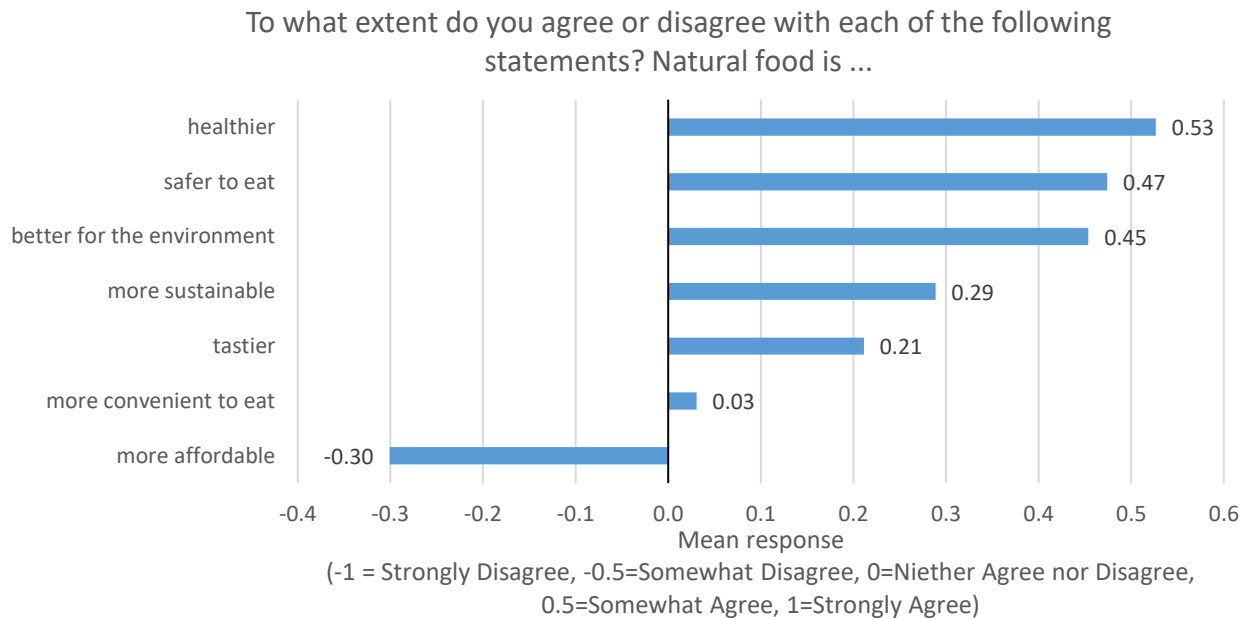


Figure 19. Beliefs about natural food

3.2.3. Policy Questions

Respondents were asked about their preferences for the regulation of natural labels on food. Almost two-thirds of consumers indicated a desire that the FDA regulate the use of the term “natural” by requiring companies to follow a uniform, consistent definition. A little over 20% of respondents thought the FDA should prohibit the use of natural labels.

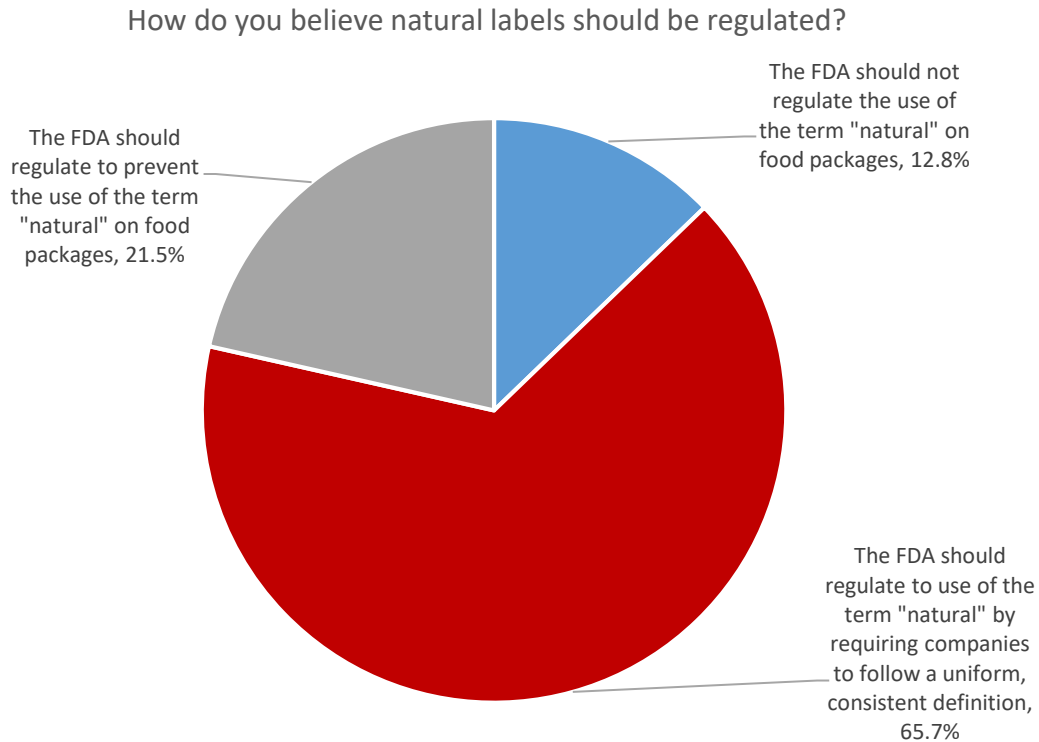


Figure 20. Preferences for regulation of natural labels

Despite this policy preference, figure 21 shows that less than half of respondents (44.4%) either highly or somewhat highly trust the FDA to define the term "natural" in a way that they would find useful in making food choices. A third of respondents said they neither trust nor distrust the FDA to undertake this task.

To what extent do you trust or distrust the FDA to define the term "natural" in a way that you would find useful in making food choices?

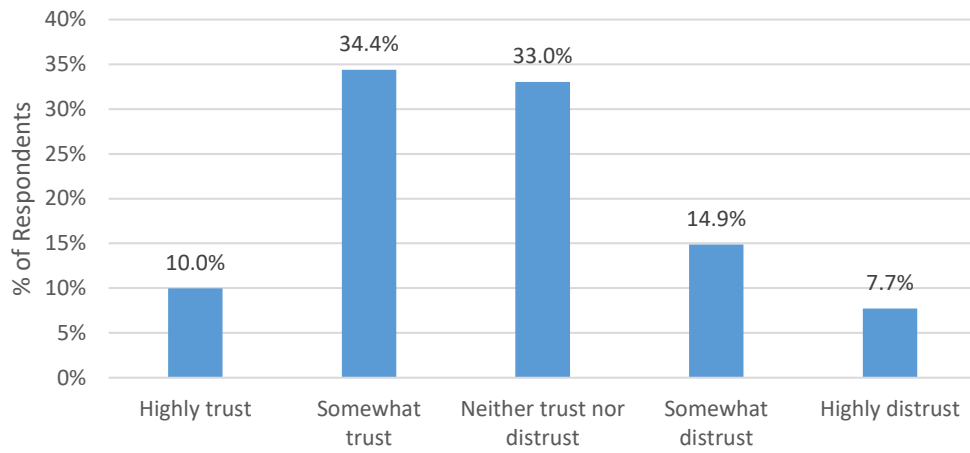


Figure 21. Trust in FDA to regulate natural labels

Just because a federal definition of natural exists does not mean consumers know or understand the definition. Responses in figure 22 illustrate this point. The USDA currently defines “natural” for meat products, and it is primarily defined as “minimally processed.” However, only about a quarter of respondents (26.6%) correctly picked this definition. More than 30% of respondents incorrectly believed the USDA definition of natural implies “no hormones” and 23.8% thought a natural label implies “no antibiotics.” These data suggest more than half of respondents are misled by the USDA definition of natural, a result supported by the findings of Syrengelas et al. (2018).

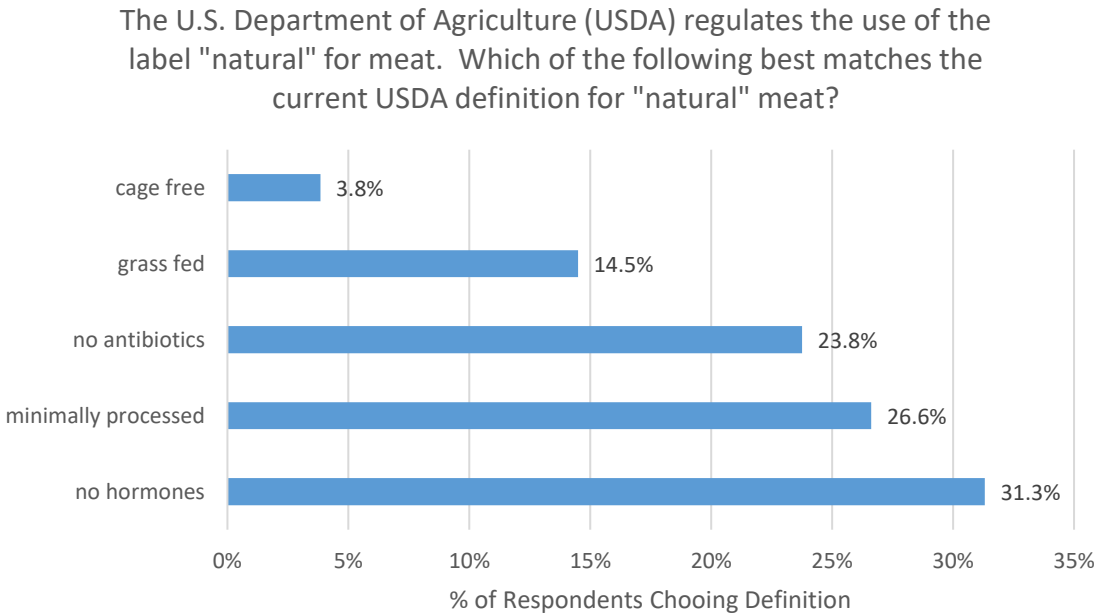


Figure 22. Beliefs about definition of USDA natural labels on meat

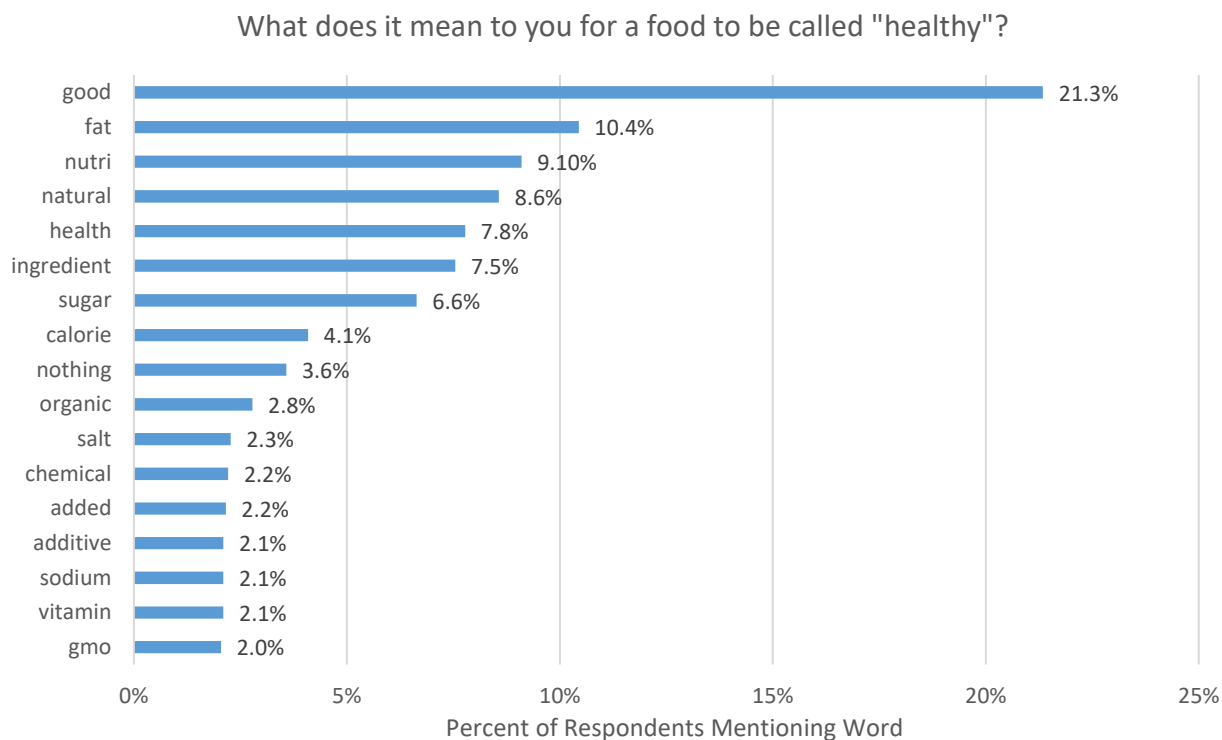


Figure 24. Most common words mentioned when asked what it means for a food to be called healthy

Responses were inspected for usage of 120 words or phrases that were placed into one of the aforementioned categories. As shown in figure 24, when asked an open-ended question about what it meant to respondents for a food to be called healthy, words like good, fat, nutrition/nutrient/nutritional, natural, sugar, calorie, and organic were most commonly mentioned. Responses provided some support for current FDA definition as “fat” is one of the most commonly mentioned words (mentioned by 10.4% of respondents), although nearly as many (6.6%) mentioned sugar. More than a quarter of respondents provided imprecise or tautological-like definitions like “good ingredients,” “good for you,” or “healthy ingredients.”

The percent of respondents mentioning words in the seven-word categories were as follows: Nutrients (41.6%), Other Descriptors (36.5%), Ingredients/Additives/Processes (21.6%), Nature (18.3%), Skepticism (8.6%), Packaging (1.1%), and Origin (0.6%). See appendix for a full list of words in each category and additional analysis of responses to this open-ended question.

3.3.2. Guided Questions

In addition to the open-ended question on the meaning of “healthy”, respondents were provided with a list of 13 factors that consumers might use to judge whether a food is healthy. Figure 25 shows that about a quarter of respondents indicated sugar content and use of hormones or antibiotics, 19.2% pointed to fat content, and 18.4% pointed to pesticide residues. The top four answers included two nutrients (sugar and fat) and two food production processes/ingredients (hormones and pesticides), suggesting consumers consider healthiness to be more than just defined by nutrient content. However, it should be noted that hormones and pesticides were infrequently mentioned (both mentioned by less than half a percent of respondents) when unaided. The data also suggests that when aided as in figure 25, consumers are more likely to point to sugar content than the open-ended responses in figures 23 and 24 would suggest. When listed as an option, use of GMOs was considered as a factor affecting healthiness at about the same rate as caloric content. The least frequently picked items were processing, fiber content, and local.

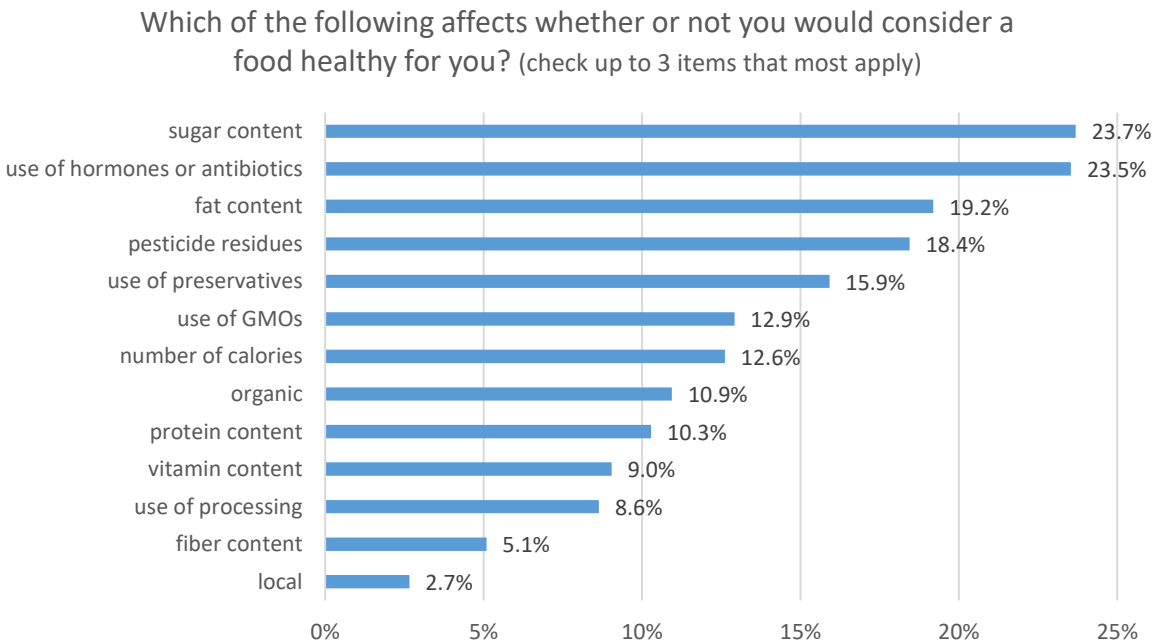


Figure 25. Factors affecting consumers' perception of a foods' healthiness

To further explore how consumers define and think about healthiness, a couple binary choice questions were posed. Figure 26 shows consumers were about evenly split on whether a food can be deemed healthy based solely on the foods' nutritional content (52.1% believing as such) or whether there were other factors that affect whether a food is healthy (47.9% believing as such). Figure 27 shows consumers were also evenly split on whether an individual food can be considered healthy (believed by 47.9%) or whether this healthiness is instead a characteristic of one's overall diet and the combination of foods consumed (believed by 52.1%).

Which of the following statements best matches your view?

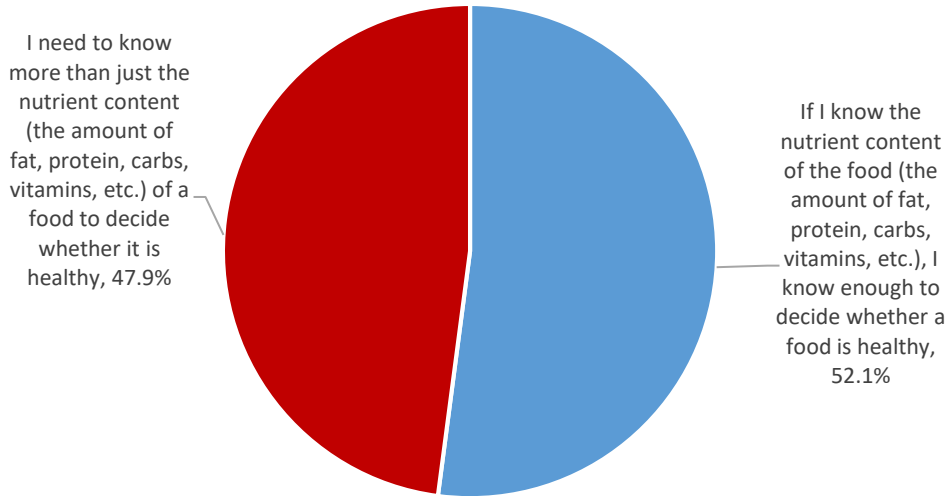


Figure 26. Is a food's healthiness defined by nutrient content?

Which of the following statements best matches your view?

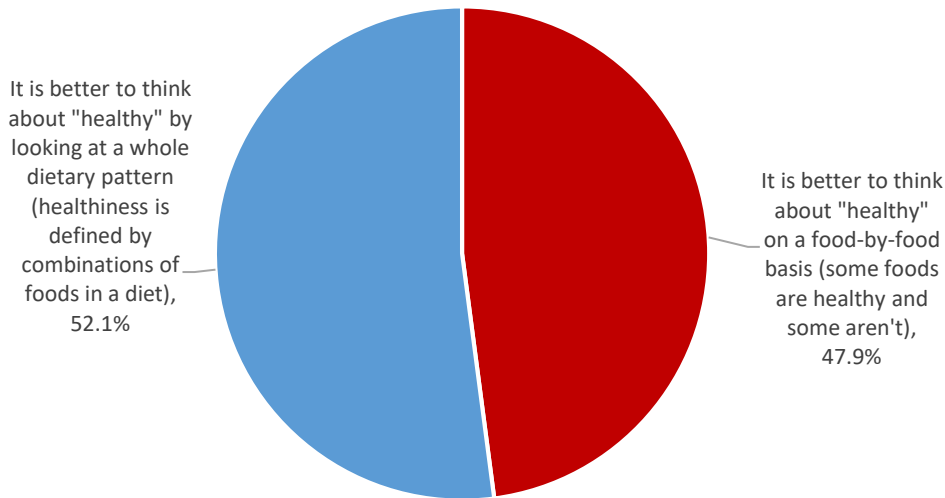


Figure 27. Is "healthy" best defined on a food-by-food or a whole diet basis?

Data in figures 26 and 27 suggests difficulty in creating a definition of “healthy” on food packages that is broadly acceptable to consumers. To further emphasize this point, it should be noted that the answers to these two questions are not determinative of each other, but rather there are four distinct consumer segments with regard to healthy food conceptions. Table 3 shows a cross-tab indicating the percent of respondents who answered these two questions in the four possible manners.

Table 3. Percent of respondents with four different views on how healthy should be defined

	Single foods can be considered healthy or unhealthy	Only a whole diet can be considered healthy or unhealthy
Healthiness based on nutrients alone	26.5% (Food-Nutrient Focus: health based on a food’s nutrients)	25.6% (Diet-Nutrient Focus: health based on nutrients from whole diet)
Healthiness based on more than nutrient content	21.4% (Food-Nonnutritive Focus: health based on a food’s entire composition)	26.5% (Diet-Nonnutritive Focus: health based on holistic consumption pattern)

Respondents were provided a list of 15 foods in random order and were asked to indicate whether each was healthy, unhealthy, or neither healthy nor unhealthy. For each item, a healthiness score was created by subtracting the percent of respondents who considered a process unhealthy from the percent of respondents who considered a process healthy. Figure 28 shows the results.

Almost all respondents (96.2%) considered fresh vegetables to be healthy, and almost none (0.9%) considered them unhealthy, yielding a net healthy score of $96.2 - 0.9 = 95.3\%$ for fresh vegetables. Fresh fruit, fish, eggs, and chicken were likewise broadly considered healthier than not. Frozen vegetables/fruit were considered less healthy than fresh, and canned were considered less healthy than frozen, although even canned was considered, on net, more healthy than unhealthy. Only three of the 15 items listed were considered by more respondents to be unhealthy than healthy: vegetable oil, bakery and cereal items, and particularly candy. A third of respondents thought bakery and cereal items were unhealthy, but 23.3% thought such items were healthy, and 43.7% thought such items were neither healthy nor unhealthy. 49% (the highest for any food considered) said vegetable oil was neither healthy nor unhealthy. Candy was the only item a plurality of respondents thought was unhealthy.

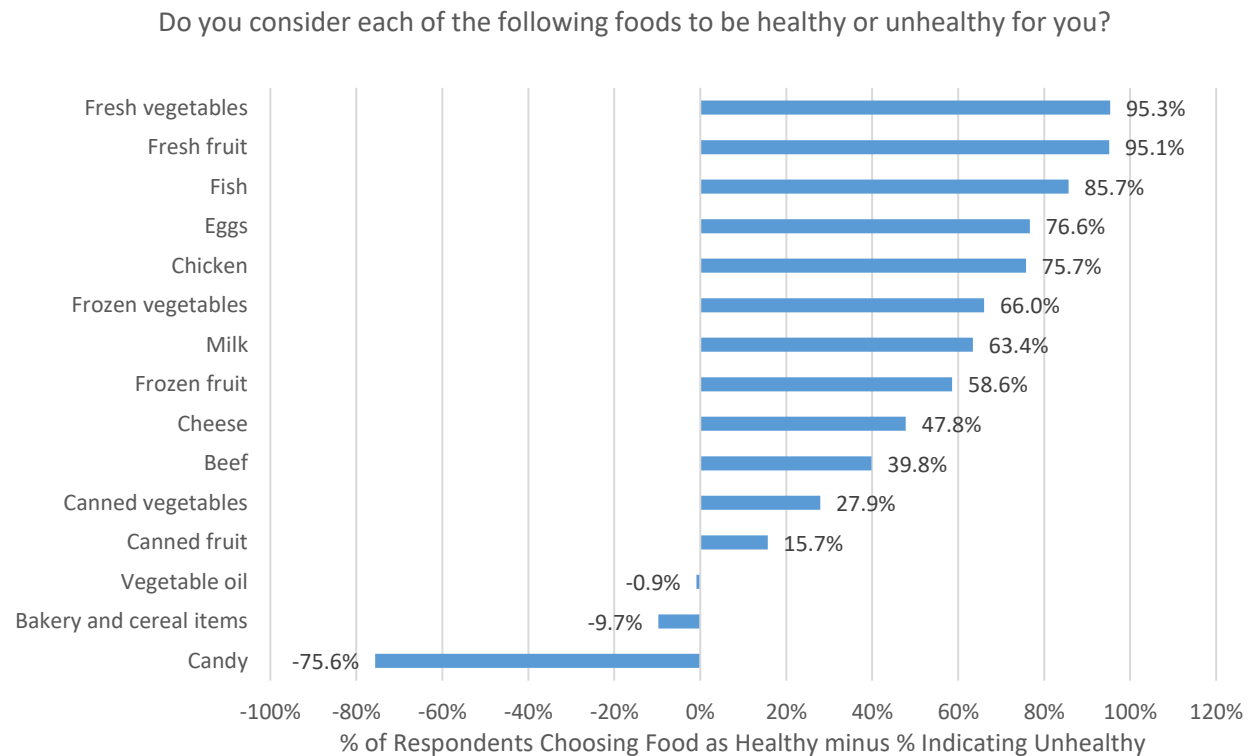


Figure 28. Perceived healthiness of 15 foods

To explore how consumers conceptualized the healthiness of different foods, the questions used to create figure 28 were further analyzed using factor analysis. As previously indicated, factor analysis is a way to group different foods by a few common forces or factors which cause responses to different questions to correlate with each other. Analysis reveals that there are three underlying factors that explain the vast majority of the variance in whether consumers rate a food as healthy or not. Figure 29 plots the 15 foods according to their factor loadings from promax rotation.

The first factor, shown on the vertical axis of the bottom panel of figure 29 shows all animal products with high values and other non-animal products with lower values, suggesting consumers use animal origin as a primary factor in judging whether a food is healthy. A second factor, illustrated on the horizontal axis of the top panel of figure 29, has canned and frozen fruits and vegetables with the highest values, bakery and cereal items, candy, and fresh fruits and vegetables with mid-to-low values, and animal products with the lowest values, which seems to suggest consumers use degree of preservation as another dimension of healthiness. Finally, the third factor, illustrated on the vertical axis of the top panel and the horizontal axis of the bottom panel of figure 29, indicates freshness or degree of processing is another dimension to healthiness evaluations.

These results indicate that healthiness is not a single unifying construct, but rather consumers evaluate healthiness along a number of different dimensions or factors. A food, such as beef or fish, can be seen as scoring high in some dimensions of healthy but low in another.

Dimensions of Food Healthiness

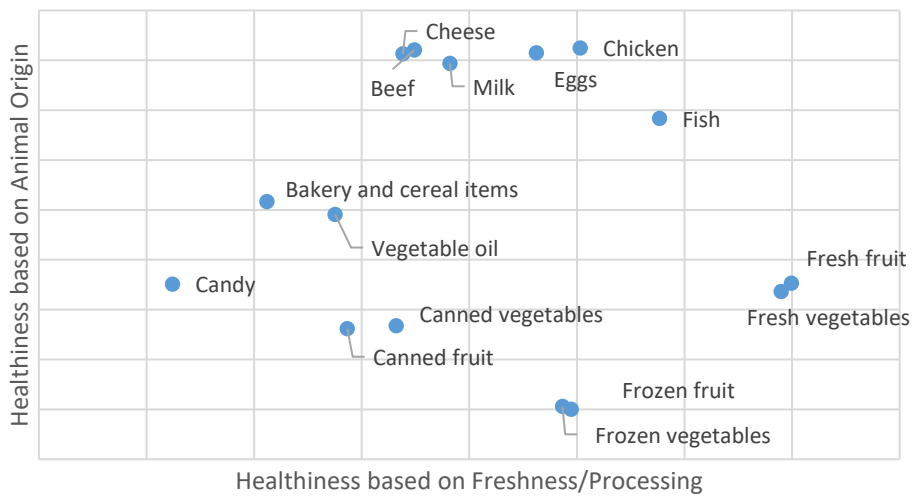
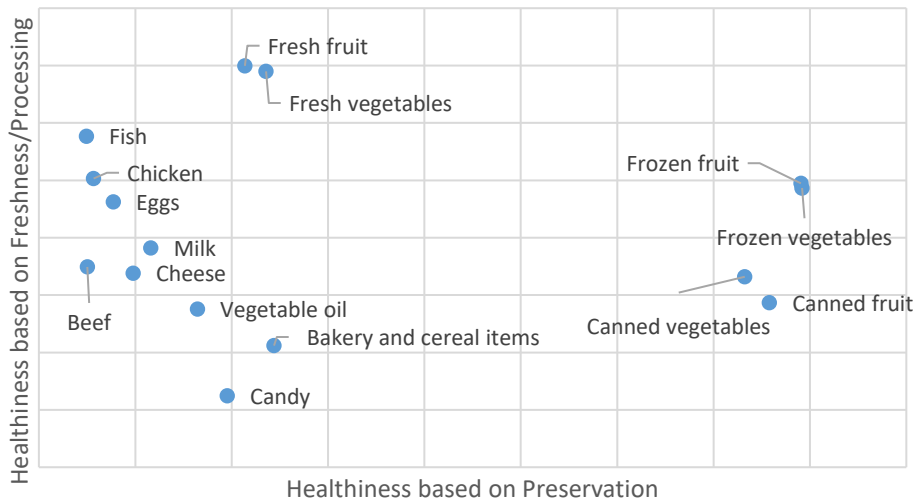


Figure 29. Three dimensions of 15 food's healthiness

A set of four questions was designed to evaluate how consumers perceived the healthiness of different nutrients and minerals. Consumers were asked, “Which of the following do you consider to be most healthy for you”, and indicated low, medium low, medium, medium high, or high levels of sodium, carbohydrates, fat, and protein. Figure 30 shows that about two-thirds of respondents believed low sodium was most healthy for them. There were more disparate views about carbohydrates. A plurality of consumers thought a low amount of carbohydrates was most healthy, but 28.3% considered a medium amount of carbohydrates as most healthy. Low fat diet was considered healthiest by 53.5% of consumers, and another 21.9% thought medium low fat was healthiest. About 6% of respondents thought medium high or high fat diets were healthiest. In general, higher protein diets were considered healthier than lower protein diets.

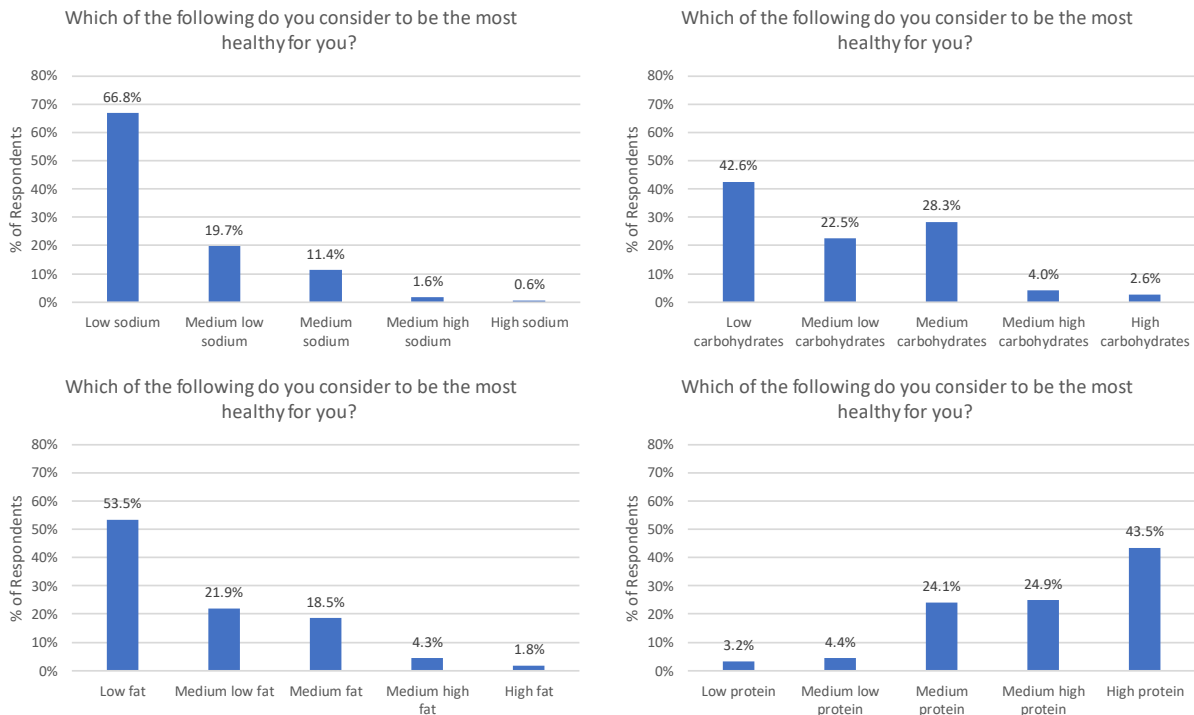
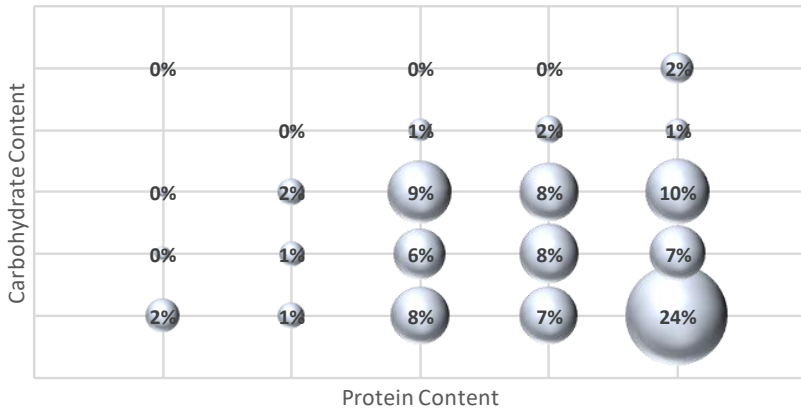


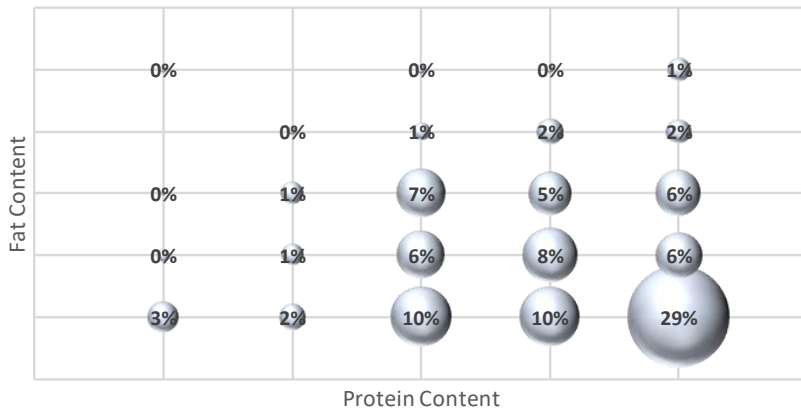
Figure 30. Perception of healthiness of sodium, carbohydrates, fat, and protein

Figure 30 indicates the most common category chosen by respondents in each category is at the extreme (lowest sodium, lowest fat, lowest carbohydrate, and highest protein). However, it is useful to consider how consumers evaluated the healthiness of combinations of these nutrients. Figure 31 illustrates the percent of respondents that indicated the healthiness of joint-combinations of carbohydrates, fat, and protein. As the top panel of figure 31 reveals, 24% of respondents indicated the highest level of protein and lowest level of carbohydrates as healthiest. About 10% of respondents indicated high protein and medium carbohydrates as the next most healthy combination, followed by 9% who picked the medium level of both carbohydrates and protein as healthiest. The middle panel indicates 29% of respondents indicated highest protein and lowest fat levels as healthiest, followed by 20% who indicated low fat and medium or medium high protein as healthiest. The final panel in figure 21 plots carbohydrates against fat. There were very few respondents (about 2%) who consider high fat, low carbohydrate diets as healthiest.

Healthiness of Carbohydrates vs. Protein



Healthiness of Fat vs. Protein



Healthiness of Fat vs. Carbohydrates

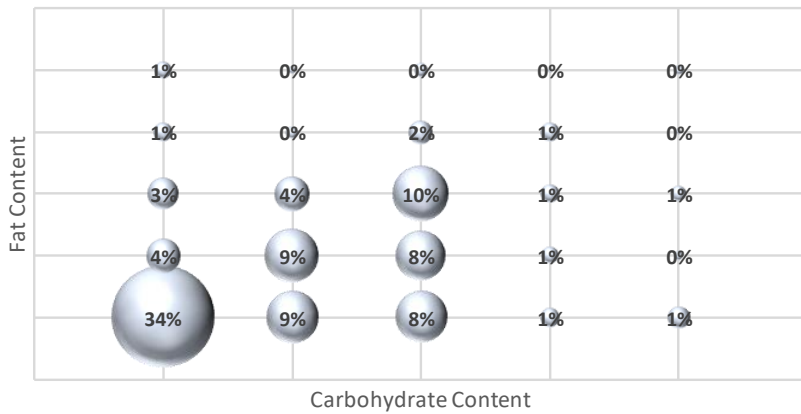


Figure 31. Joint perception of healthiness of carbohydrates, fat, and protein

The aforementioned figures suggest some heterogeneity across people in terms of what is considered healthy. To further explore this issue, respondents were asked whether they thought different diseases or health conditions would influence what they considered to be healthy. As figure 32 shows, there were virtually no respondents who did not think their perceptions of a food’s health would be influenced by the disease or health conditions listed. Diabetes, heart disease, and obesity were the three conditions most likely to affect perceptions of which foods are healthy.

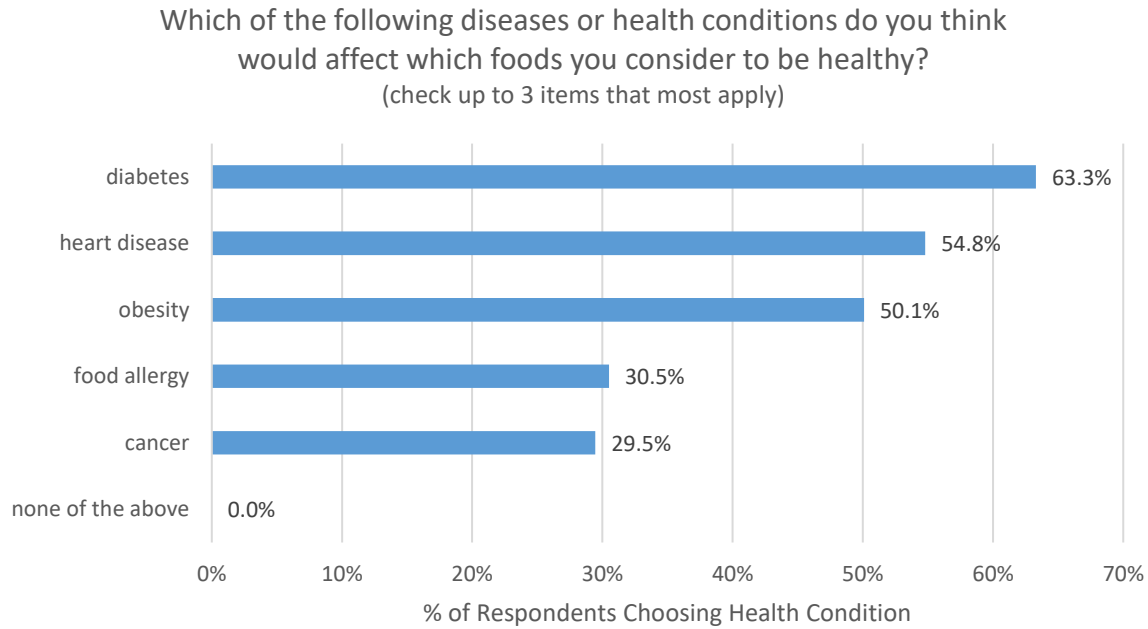


Figure 32. Relationship between diseases and health conditions and beliefs about healthiness

Moving on from consumers' definitions of foods and nutrients that are considered healthy or unhealthy, consumers were asked what they think "healthy" means in terms of behavior (figure 33) and how this moniker affects other food attributes (figure 34). About 40% of consumers thought a healthy label implied they should increase consumption of this type of food (15.5% thought the label meant they could eat all they wanted). A little over a third of respondents (34.7%) indicated that a healthy label would not mean anything to them.

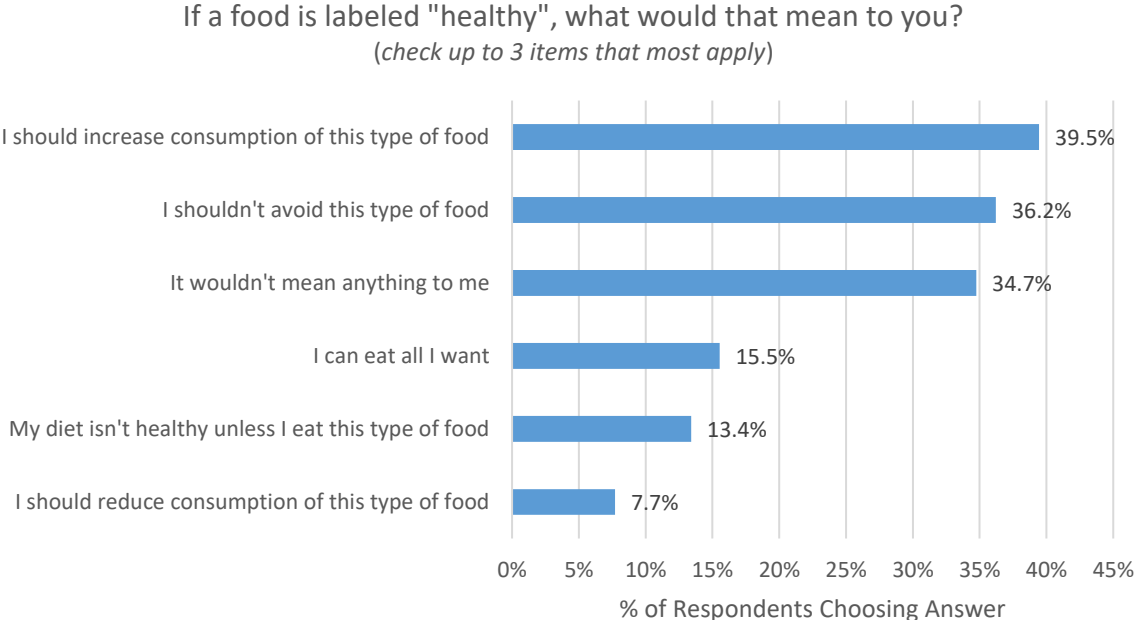


Figure 33. Behavioral implications of healthy food labels

Figure 34 shows the results from questions where respondents were asked to indicate their extent of agreement or disagreement with eight statements. There were five potential response categories: strongly disagree, somewhat disagree, neither agree nor disagree, somewhat agree, and strongly agree, which were coded -1, -0.5, 0, 0.5 and 1, respectively. This coding yields positive means when there is more agreement than not to the statement and negative means when the opposite is true.

Figure 34 shows the highest levels of agreement with the statement, “Individual needs determine whether various foods are healthy for an individual.” Only 7.8% of respondents disagreed with this statement, whereas more than 70% agreed with it. There were also strong beliefs that healthy food is safe to eat and natural. There was only moderate agreement that healthier food is tastier. About 44% of respondents neither agreed nor disagreed with this statement. There was slightly more disagreement than agreement that healthy food is more convenient to eat. A majority of consumers (58%) disagreed that healthy is more affordable.

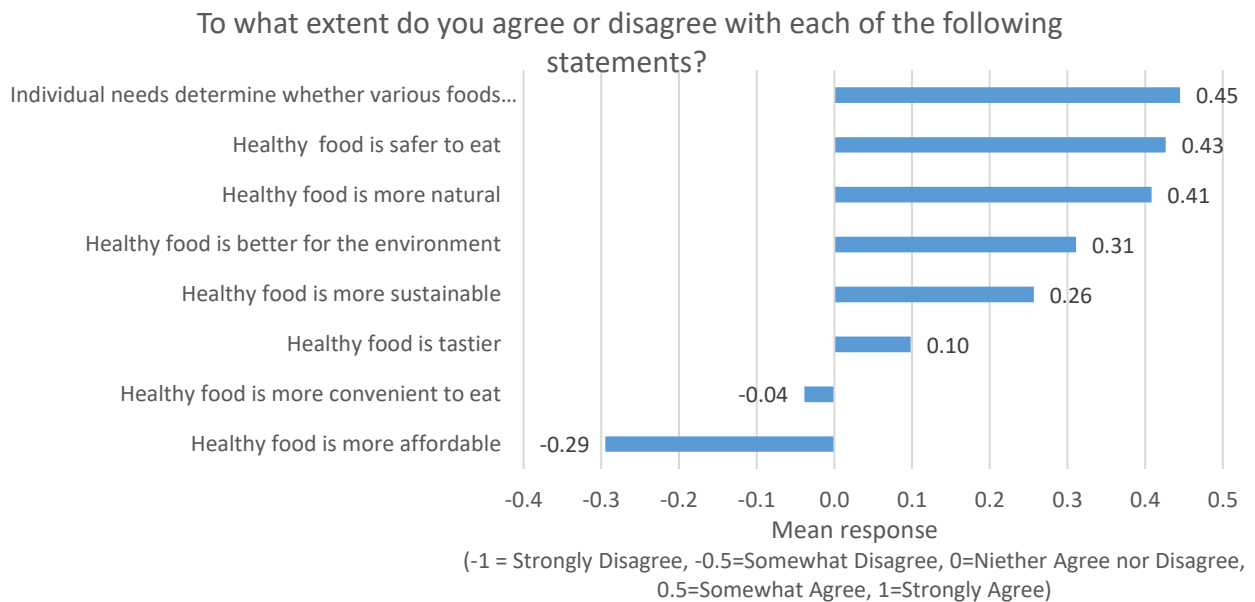


Figure 34. Beliefs about healthy food

3.3.3. Policy Questions

Consumers were asked how they thought healthy labels should be regulated. Figure 35 shows that a majority of consumers (54.2%) felt the FDA should regulate the use of the term by requiring companies to follow a uniform, consistent definition. Thus, consumers want the FDA to define “healthy”; however, it is not clear that consumers agree on the definition. Indeed only 19.3% of respondents believed FDA should keep the current definition.

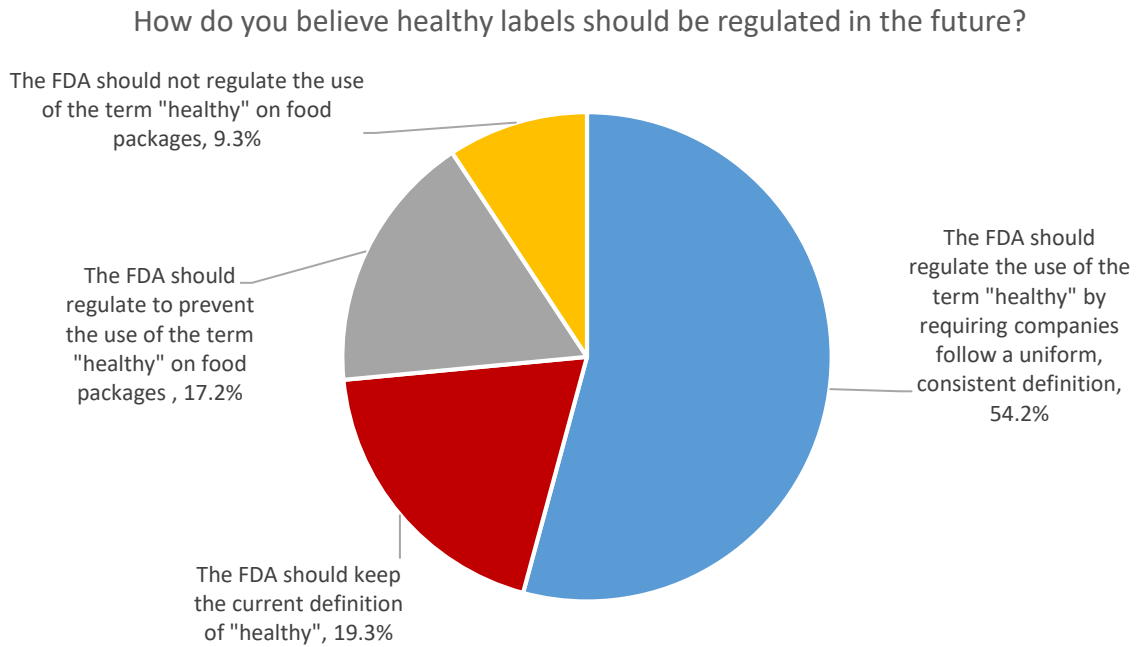


Figure 35. Preferences for regulation of healthy labels

Figure 36 shows consumer trust in the FDA to regulate healthy labels. 46.2% either highly or somewhat trust the FDA to regulate “healthy” in a way that would be useful in making food choices. This total is slightly higher than the 44.4% of consumers who said they trusted the FDA to regulate “natural” (see figure 21).

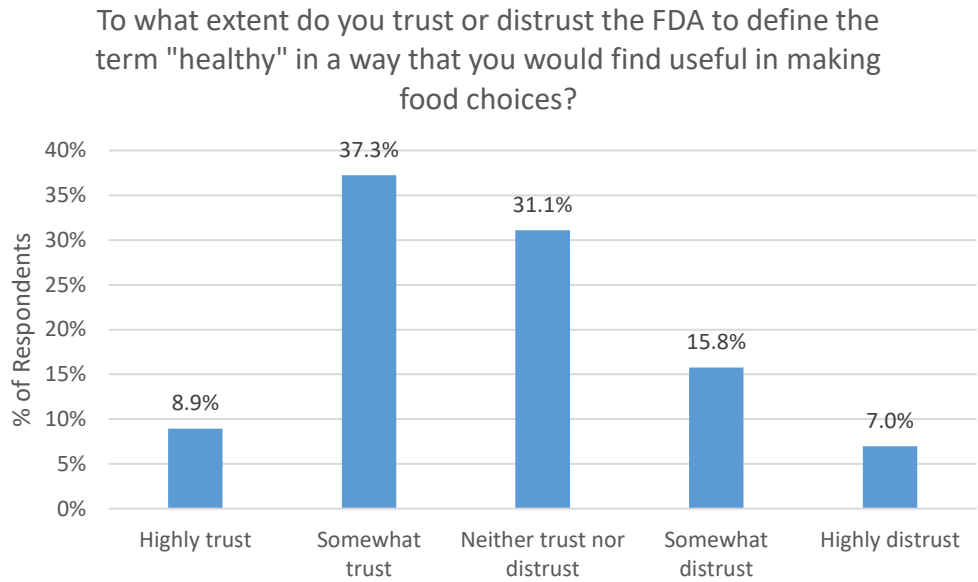


Figure 36. Trust in FDA to regulate healthy labels

3.4. Ingredient Name Preferences

Figure 37 illustrates the results from three different questions that gave consumers a binary choice between two ingredient names that are equivalent except for whether scientific or lay descriptions were used. In all three cases, more than 85% of respondents preferred the everyday, lay name to its scientific counterpart insofar as the word being informative.

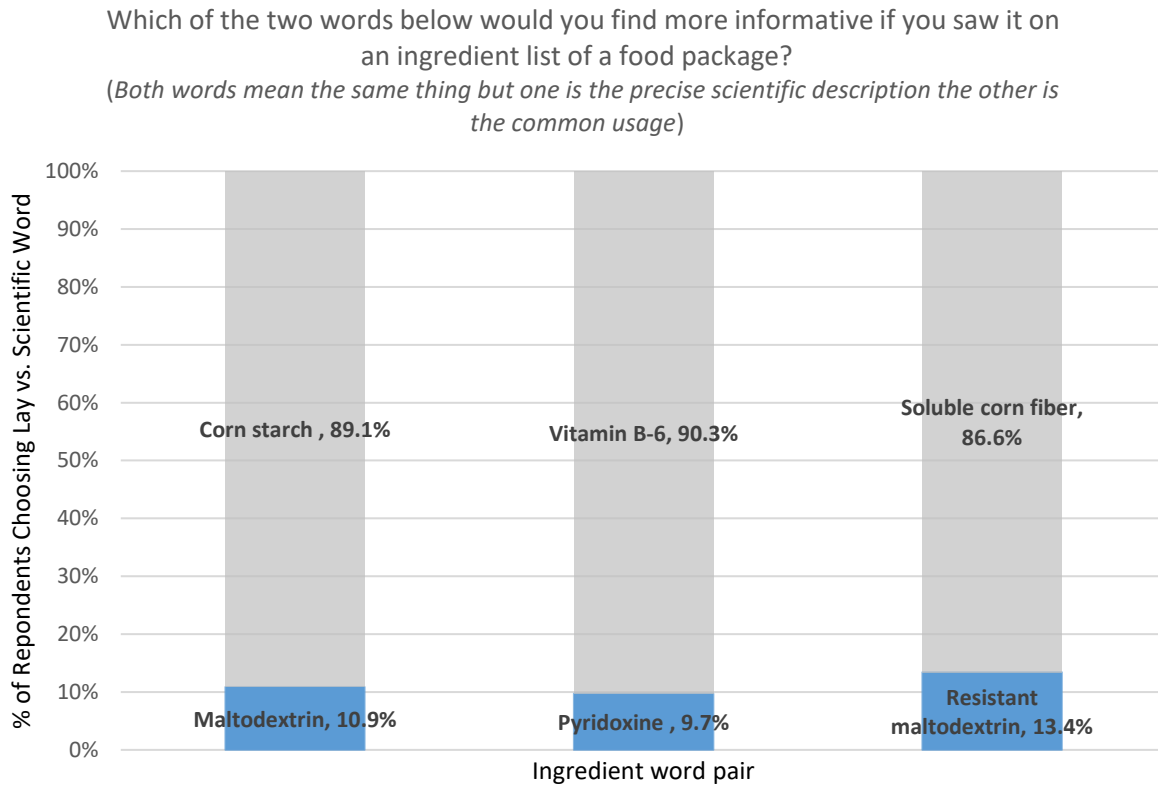


Figure 37. Preferences for scientific vs. lay names in ingredient lists

3.5. Labels, Purchase Intention, and Willingness-to-Pay

As described in the methods section, each consumer was randomly shown two cereal boxes that potentially differed according to price (\$2.98 or \$4.98) and the presence or absence of three labels (natural, healthy, and organic). Prior to asking respondent's likelihood of purchasing each box, they were asked to click on the image of the cereal box to indicate the most and least attractive area of the box.

Figure 38 shows heat maps illustrating the areas of the boxes respondents found most attractive, and figure 39 shows the same for the least attractive areas. Comparing figures 38 to 39, it is clear that the area of the boxes showing price was much more likely to be picked as least than most attractive. Figure 40 reports the share of respondents clicking each area of the box in the least and most attractive conditions. Respondents often picked the healthy, natural, and organic labels as the most attractive area, although these labels were also picked by some consumers as the least attractive area. Figure 40 also shows that, on average, respondents indicated a 41% chance of purchasing a cereal box, but this varied from a low of 34.9% for the box of cereal with no labels priced at \$4.98 to a high of 44.1% for the box of cereal with all three labels priced at \$2.98.

To further summarize the effect of prices and labels on purchase intention, a fixed-effects linear regression was estimated, which indicates the following relationships ($R^2 = 0.88$; $N=2,576$; all coefficients are statistically significant at the 0.05 level):

$$\text{Likelihood of Purchase}_{ij} = \beta_{0,i} - 3.03 * \text{Price}_j + 3.87 * \text{Natural}_j + 1.88 * \text{Healthy}_j + 6.22 * \text{Organic}_j - 4.26 * \text{Natural}_j * \text{Healthy}_j * \text{Organic}_j$$

These effects are illustrated in figure 41. Each one unit increase in price lowers purchase intention by 3.03%, implying a $2 * 3.03 = 6.06\%$ increase in purchase intention when price falls from \$4.98 to \$2.98. Addition of a healthy label increases purchase intention by 1.88% relative to no label being present, whereas addition of a natural label increased purchase intention by 3.87% on average, and addition of an organic label increases purchase intention by 6.22%. The three-way interaction term shows the joint effect when all three labels were present. The estimated coefficient implies that the joint effect of all three labels was to *reduce* purchase intention by 4.26% relative to what would have been expected from the sum of the individual effects. In other words, healthy, natural, and organic labels are partial substitutes for consumers.

Average willingness-to-pay values are reported in figure 42. On average, consumers' choices imply they are willing to pay \$0.62 more per box when a healthy label was present, \$1.28 more per box when a natural label was present, and \$2.05 when an organic label was present.

The willingness-to-pay value when all three labels were present, \$2.54, was \$1.40 lower than the value that would be expected from the individual sum of the three labels ($\$0.62 + \$1.28 + \$2.05 = \3.95). Thus, when all three labels appear in combination, the implied willingness-to-pay premium was 36% lower ($-1.40/3.99=0.355$) than the sum of the willingness-to-pay values when the three labels appeared in isolation. This implies that consumers perceived natural, healthy, and organic labels as partial substitutes for one another. To see this, note that the willingness-to-

pay for organic label alone was \$2.05 but the willingness-to-pay premium when all three labels are present was \$2.54. This leaves $\$2.54 - \$2.05 = \$0.49$ of extra premium resulting from both the natural and healthy labels, but \$0.49 was less than the willingness-to-pay values when either natural alone was labeled (\$1.28) or healthy alone was labeled (\$0.62). Thus, an organic label must signal to a consumer that a product is partially natural and healthy (the organic seal itself was only providing \$0.49 in value above and beyond what was implied by the natural and healthy labels). An alternative interpretation is that a natural label signals to consumers that the product is partially organic and healthy.

The estimates in figures 41 and 42 relate to the average effects across all consumers, but there are likely to be different consumer segments that are unique with respect to how they make tradeoffs between price changes and labels. To explore this possibility, latent class regressions were estimated. The best fitting model was one that included seven consumer segments. Table 4 reports the estimated regression coefficients for each class/segment indicating the relationship between prices/labels and purchase intention. The largest group, representing 34.7% of respondents, consists of a group of consumers who pay attention to prices and all labels and are willing to make tradeoffs between each of these. Group or segment two represents 20.2% of respondents. These consumers have an overall high likelihood of purchasing cereal (intercept is 74.7%), and while they are sensitive to price changes and the presence of the organic label, other labels did not have as significant effect on purchase intention. The third segment (12.9% of respondents) did not significantly alter purchase intentions when healthy labels were present, but were otherwise responsive to other changes. Segments 4 and 6 had overall low likelihoods of buying cereals (only 7.5% and 0.9%) and were relatively unmoved by cereal attributes. By contrast, segment 7 had a high certainty of buying cereal (96.9%) irrespective of the price or presence of labels. Segment 5 consists of consumers whose purchase intentions were only influenced by the presence of the organic label.

Table 5 shows the demographic characteristics of the consumers most likely to belong to each of the seven purchasing segments. Segment 5 (organic watching indifferent buyers) had the highest share of women at 59.5%, whereas segment 7 (non-reactive cereal buyers) was comprised of 43.7% women - the lowest of any segment. Segment 1 was comprised of 33.5% younger consumers (younger than 34 years of age) whereas segment 2 was comprised of only 16.7% consumers under aged 34. Other demographic effects are similarly interpreted.

Figure 38. Heat maps associated with most attractive area of 10 cereal boxes

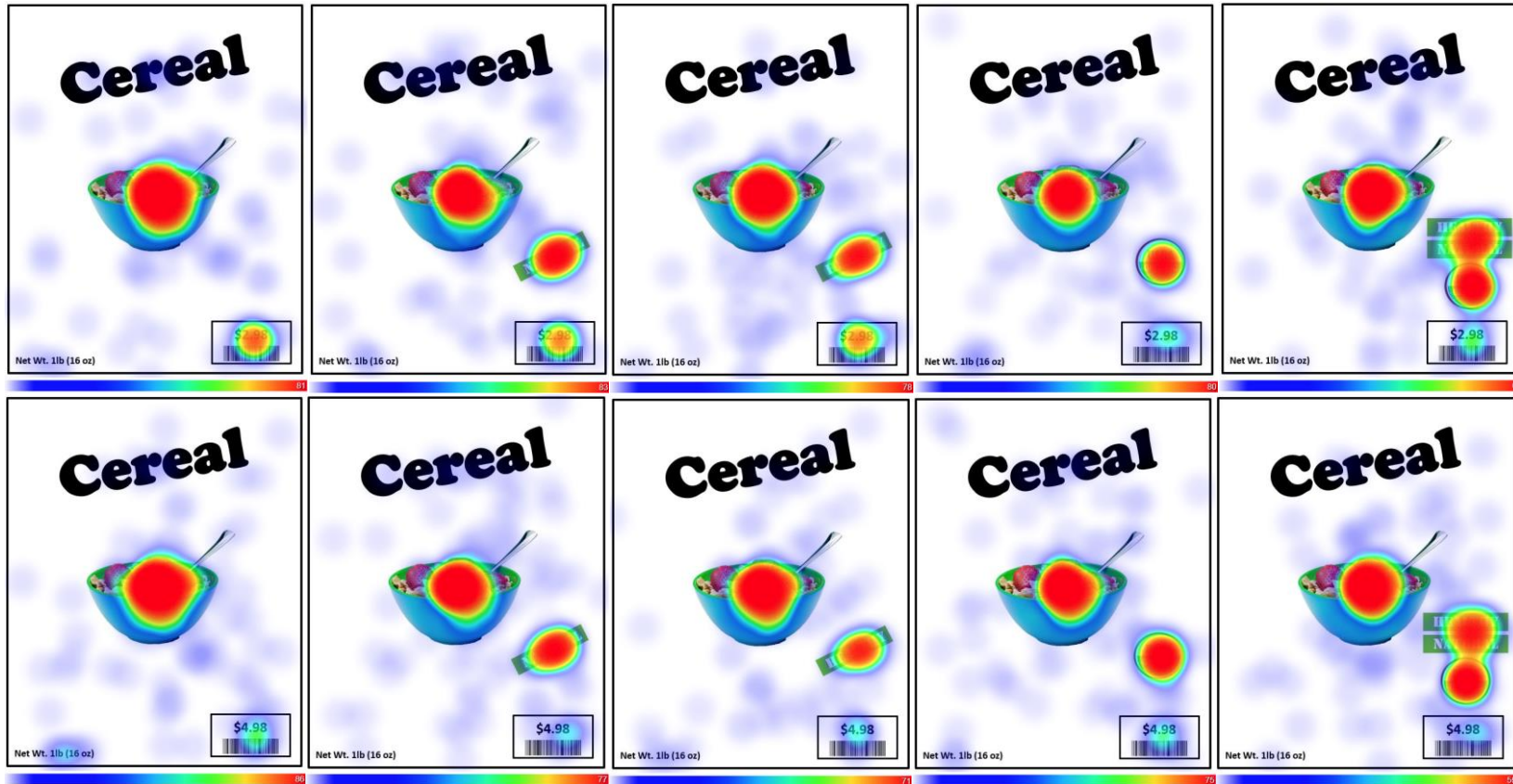


Figure 39. Heat maps associated with least attractive area of 10 cereal boxes

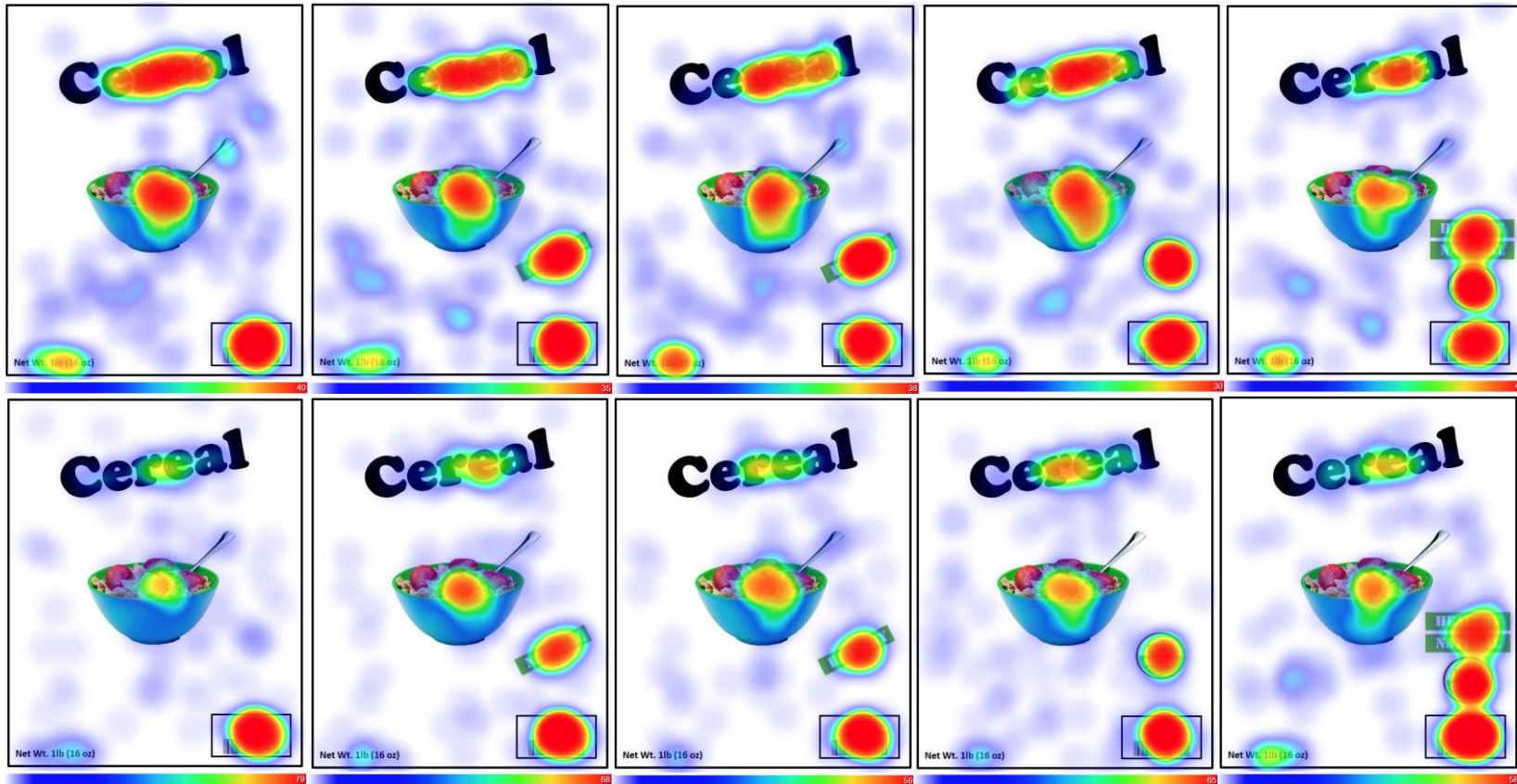


Figure 40. Variation in clicks and purchase intentions across 10 cereal boxes

Description of Cereal Box			% of Respondents Clicking on Areas of Box as Most Attractive			% of Respondents Clicking on Areas of Box as Most Attractive			Likelihood of Purchase (0=0% chance, 100=100% chance)		
Question Set	Price	Label(s)	Label	Price	Other Area	Label	Price	Other Area	Mean	Median	Stdev
1	\$2.98	None	1.3%	27.6%	71.1%	87.7%	1.5%	10.9%	37.8	35	29.1
2	\$4.98	None	0.8%	57.9%	41.3%	98.5%	0.0%	1.6%	34.9	30	27.2
3	\$2.98	Natural	17.7%	29.0%	53.4%	66.0%	24.8%	9.2%	45.3	50	28.6
4	\$4.98	Natural	14.6%	49.4%	36.0%	71.2%	26.5%	2.3%	36.7	39	25.6
5	\$2.98	Healthy	22.6%	21.7%	55.7%	68.4%	21.5%	10.2%	43.1	50	28.0
6	\$4.98	Healthy	19.3%	44.2%	36.4%	76.4%	21.7%	1.9%	38.2	37	28.3
7	\$2.98	Organic	19.3%	27.0%	53.8%	64.8%	28.5%	6.7%	44.1	49	26.9
8	\$4.98	Organic	11.7%	39.8%	48.5%	65.3%	33.0%	1.7%	42.2	49	27.7
9	\$2.98	natural, healthy, and organic	33.4%	23.2%	43.5%	53.2%	43.4%	3.5%	44.0	49	30.3
10	\$4.98	natural, healthy, and organic	27.1%	39.7%	33.2%	55.7%	41.9%	2.4%	41.0	40	27.9

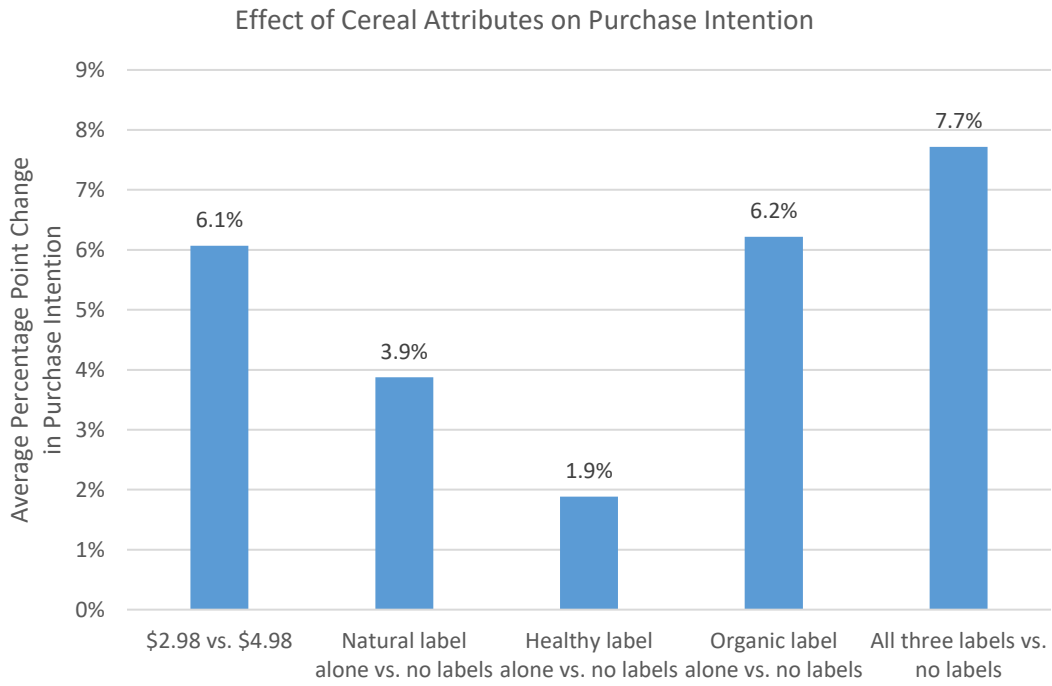


Figure 41. Effect of prices and labels on purchase intention

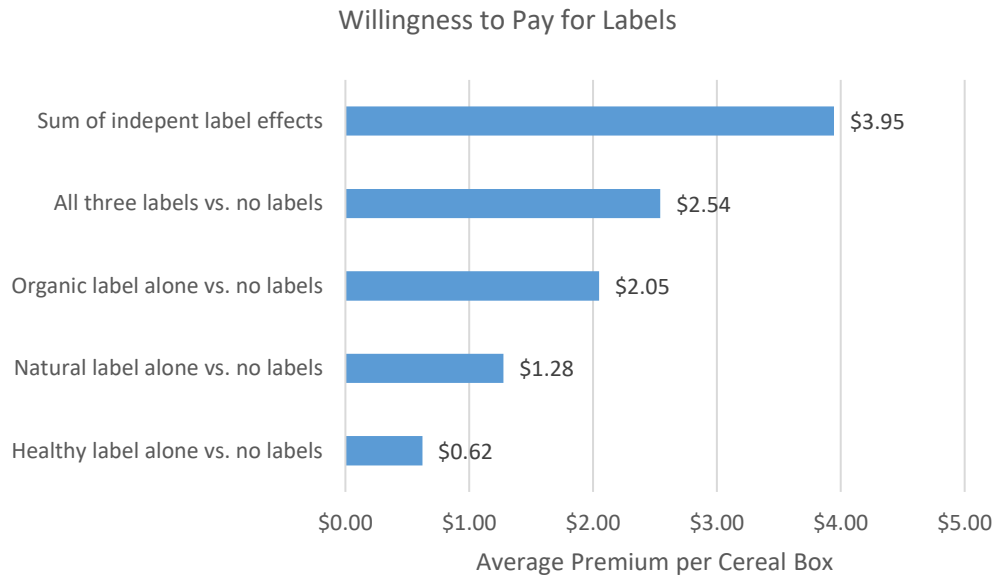


Figure 42. Willingness-to-pay for healthy, natural, and organic labels

Table 4. Relationship between cereal characteristics and purchase intention for seven consumer segments (coefficients in bold are statistically significant at the 0.05 level or lower)

Variable	Segment 1 Balanced Label Watchers	Segment 2 Price Sensitive Cereal and Organic Lovers	Segment 3 Price Sensitive Natural and Organic Lovers	Segment 4 Price Watching Non Cereal Buyers	Segment 5 Organic Watching Indifferent Buyers	Segment 6 Non Cereal Buyers	Segment 7 Non-Reactive Cereal Buyers
Intercept	51.5	74.7	27.5	7.5	50.3	0.9	96.9
Price	-4.2	-2.7	-3.0	-0.3	0.0	0.0	-1.4
Natural (N)	5.7	2.5	3.5	0.6	-0.1	-0.1	-2.7
Healthy (H)	4.7	1.5	0.9	-0.4	0.0	-0.3	1.8
Organic (O)	8.4	5.4	4.0	0.3	0.4	-0.3	-1.2
N*H*O	-8.2	2.8	-3.0	0.7	-0.2	0.5	4.2
Sigma	17.4	11.4	7.0	3.5	0.8	0.9	7.8
Segment Size	34.7%	20.2%	12.9%	11.1%	7.4%	7.1%	6.6%

Table 5. Demographic characteristics of seven consumer segments

Demographic	Segment 1 Balanced Label Watchers	Segment 2 Price Sensitive Cereal and Organic Lovers	Segment 3 Price Sensitive Natural and Organic Lovers	Segment 4 Price Watching Non Cereal Buyers	Segment 5 Organic Watching Indifferent Buyers	Segment 6 Non Cereal Buyers	Segment 7 Non-Reactive Cereal Buyers
Female	52.0%	51.9%	46.7%	49.7%	59.5%	53.2%	43.7%
18≤age≤25	10.7%	7.0%	11.2%	11.4%	6.7%	16.4%	13.6%
25≤age≤34	22.8%	9.7%	26.2%	14.0%	22.2%	16.3%	4.9%
35≤age≤44	32.0%	10.4%	13.9%	21.7%	16.2%	13.7%	16.1%
45≤age≤54	13.8%	21.8%	17.6%	15.6%	14.4%	16.8%	17.7%
55≤age≤64	8.6%	17.8%	17.6%	14.2%	15.9%	17.5%	22.3%
65≤age≤74	10.2%	21.0%	10.8%	19.3%	20.2%	15.6%	21.5%
75≤age	1.9%	12.3%	2.7%	3.8%	4.4%	3.6%	3.8%
inc≤\$19k	24.4%	18.4%	14.4%	17.6%	20.4%	15.3%	16.4%
\$20k≤inc≤\$39K	17.8%	19.6%	27.3%	20.9%	29.9%	28.1%	14.7%
\$40k≤inc≤\$59K	19.9%	24.3%	18.2%	13.0%	14.1%	17.0%	23.1%
\$60k≤inc≤\$79K	19.3%	15.8%	15.4%	14.1%	10.7%	15.3%	13.9%
\$80k≤inc≤\$99K	8.2%	8.3%	8.2%	13.5%	7.8%	7.7%	7.5%
\$100k≤inc≤\$119K	2.8%	5.7%	5.7%	6.2%	5.6%	4.7%	11.9%
\$120k≤inc≤\$139K	0.8%	2.6%	3.9%	5.8%	3.6%	4.7%	3.8%
\$140k≤inc≤\$159K	2.5%	0.7%	3.7%	3.3%	2.5%	3.1%	1.3%
\$160≤inc	4.3%	4.5%	3.1%	5.8%	5.5%	4.1%	7.4%
HS edu	44.0%	42.2%	38.1%	34.9%	33.4%	37.1%	27.4%
some college	14.6%	14.7%	20.5%	18.0%	19.4%	21.7%	17.9%
associates	11.6%	13.9%	11.8%	9.6%	4.9%	12.1%	16.5%
BS or BA	11.0%	19.5%	14.1%	19.9%	23.8%	17.4%	22.1%
MS, MA, etc.	4.9%	7.8%	10.0%	10.6%	11.5%	6.0%	9.7%
PhD, JD, etc	7.1%	0.0%	3.5%	2.9%	5.9%	2.0%	3.3%
Children under 12	55.1%	10.5%	32.8%	28.5%	27.2%	22.8%	11.4%
White	63.6%	81.8%	74.3%	78.3%	82.5%	80.2%	76.9%
Black	16.8%	12.4%	14.0%	13.5%	9.6%	9.7%	11.5%
Other Race	3.3%	0.0%	3.6%	0.8%	1.2%	3.2%	0.0%
Hispanic	21.7%	9.8%	16.3%	13.1%	5.1%	13.3%	10.7%
Northeast	16.7%	15.5%	17.8%	19.3%	12.3%	17.6%	19.4%
Midwest	22.5%	27.8%	15.9%	27.2%	22.9%	20.3%	14.9%
South	41.3%	31.4%	40.2%	33.9%	36.4%	40.4%	36.3%
West	19.5%	25.3%	26.1%	19.6%	28.5%	21.7%	29.4%
HHsize=1	12.8%	22.8%	21.9%	20.7%	24.0%	19.0%	25.6%
HHsize=2	18.3%	52.3%	26.4%	39.1%	43.8%	39.6%	44.3%
HHsize=3	34.8%	11.2%	20.7%	15.4%	12.8%	18.8%	18.4%

HHsize=4	19.6%	7.5%	19.0%	11.3%	8.2%	13.8%	5.2%
HHsize=5	14.5%	6.3%	12.0%	13.4%	11.2%	8.8%	6.5%
On SNAP	17.9%	11.4%	12.5%	15.7%	19.6%	13.1%	20.7%
Vegetarian	8.5%	0.9%	3.4%	9.7%	4.7%	4.2%	7.0%
Democrat	40.7%	32.4%	47.4%	39.2%	35.9%	35.3%	36.5%
Republican	41.5%	28.2%	26.2%	20.2%	23.0%	29.2%	29.7%

4. Conclusions

This report conveys the results of a nationwide survey of 1,290 U.S. food consumers, with primary focus on consumers' perceptions of natural and healthy food. The FDA has signaled efforts to define or re-define these terms for use on food labels, and as such, insights into how consumers define and interpret these terms.

Overall, results suggest nuanced, and sometimes logically inconsistent, views about the meaning of natural. Several lines of evidence reveal that consumers do not perceive "naturalness" as a single unifying construct, but rather a food or process can be seen to be high in one dimension of naturalness but low in another dimension of naturalness.

When unaided, consumers were most likely to associate the meaning of natural food with words like artificial, additive, chemical, and organic. When provided with different response categories, more than half of respondents indicated a food was natural if it had "no preservatives" and "no hormones and antibiotics." Almost 40% of respondents said "no pesticide residues" was natural. These responses were much more common than beliefs that fresh, uncooked, few added ingredients, or localness implied naturalness.

Despite the general belief that natural implies "no preservatives," when specifically asked about particular types of preservatives, more respondents than not thought various processes like fermentation, canning and smoking or preservation ingredients like salt, sugar, or vinegar were natural. Artificial- or chemical-sounding preservatives like benzoates, nitrites, and sulphites were considered by more consumers to be unnatural than natural. Adding further complication, it seems many consumers are unaware of how various "natural" preservatives and foodstuffs are made; when shown processes for the production of oil, flour, sugar, etc., a decline in the perceived naturalness of these final products was revealed. Moreover, results suggest the paradoxical outcome that some consumers find it possible for a final product to be considered natural even if a process used to make the product is not.

Consumers' views on crop production practices leave little room for modern farm methods to be considered natural. On the one hand, more than three quarters of respondents thought organically grown crops were natural. Nonetheless, more consumers than not thought organic pesticides were not natural and the same was true for mutagenesis, a crop breeding method allowable under organic production. The results thus point to misperceptions about the meaning of organic. As for non-organic production, more consumers considered "hybrid seeds" as not natural than did the number of consumers who considered "hybrid seeds" natural. Crops produced with biotechnology were much more likely to be considered not natural than natural. These beliefs would make it very challenging for many modern commodity crops to be considered natural by a majority of food consumers.

Consumers largely support the FDA efforts to regulate the term natural. Almost two-thirds of consumers indicated a desire that the FDA regulate the use of the term natural by requiring companies to follow a uniform, consistent definition. Despite this policy preference, less than half of respondents (44.4%) either highly or somewhat highly trust the FDA to define the term in a way that they would find useful in making food choices. Moreover, analysis of consumers'

understanding of USDA’s definition of natural meat products provides a cautionary tale. In particular, just because a federal definition of natural exists does not mean consumers know or understand the definition. Only about a quarter of respondents correctly knew the USDA definition, and more than half incorrectly believed the USDA definition of natural implies “no hormones” or “no antibiotics.” These data suggest more than half of respondents are misled by the USDA definition of natural.

Consumers were queried about their perceptions of healthy food. When unaided, “healthy” was most commonly associated with good, fat, nutrition/nutrient/nutritional, natural, sugar, and calorie. When aided with a list of factors that might affect whether a food was considered healthy, the most commonly mentioned factors were sugar content, use of hormones or antibiotics, fat content, and pesticide residues.

Slightly more consumers than not thought a food could be deemed healthy based solely on the foods’ nutritional content. However, it was also the case that slightly more consumers than not thought healthiness is a characteristic of one’s overall diet and the combination of foods consumed rather than something that can be determined looking at individual foods. There were four broad types of consumers with about a quarter falling into each of four categories of views about healthy: food-nutrient focus, food-nonnutritive focus, diet-nutrient focus, and diet-nonnutritive focus.

Ratings of individual food products according to healthiness reveals that “healthy” is not a single unifying construct, but rather consumers evaluate healthiness along a number of different dimensions or factors related to animal origin, preservation, and freshness/processing.

Focusing on individual nutrients, perceived healthiness is generally decreasing in a food’s fat, sodium, and carbohydrate content and increasing in protein content. Only about 2% of consumers jointly rated high fat and low carbohydrates as the healthiest nutrient combination.

There was a high level of agreement with the belief that individual needs determine whether various foods are healthy for an individual. This finding was further supported by responses indicating that various diseases and health conditions would affect most consumers’ perceptions of what was healthy for them.

About 40% of consumers thought a healthy label implied they should increase consumption of the type of food bearing the label, and indeed about 15% thought the label meant they could eat all they wanted. A little over a third of respondents (34.7%) indicated that a healthy label would not mean anything to them.

While a slight majority of consumers (54%) felt the FDA should regulate the use of the term “healthy” by requiring companies to follow a uniform, consistent definition, only about 19% believed the FDA should keep the current definition, raising questions about how – exactly – consumers believe the term should be defined.

Evaluation of cereal boxes with different prices and labels shows that inclusion of natural or healthy labels can have a significant influence on choice. Choices imply consumers, on average,

are willing to pay \$0.62 more per box when a healthy label was present, \$1.28 more per box when a natural label was present, and \$2.05 when an organic label was present. The three labels act as partial substitutes for each other as indicated by the fact that a box containing all three labels was valued less than what would be expected from the sum of the values for the individual labels.

That the natural label was valued more highly than the healthy label on cereal boxes might appear at odds with a more general question asked at the beginning of the survey in which “healthiness” was rated much more important when buying food than “naturalness.” These differences have a number of possible interpretations. First, a natural label may do more to imply that a food is healthy, than a healthy label does to imply a food is natural. Indeed, other questions reveal that whereas 37% of respondents strongly agreed “natural food is healthier,” only 26% strongly agreed that “healthy food is more natural.” Second, even if people generally value healthiness more than naturalness, this does not imply that they believe a particular “healthy” label on a food product signals valuable information for their particular conception of healthiness.

Finally, results showed overwhelming support for the notion that using common or “lay” ingredient names is more informative for consumers than scientific counterparts.

5. References

- Asioli, D., Aschemann-Witzel, J., Caputo, V., Vecchio, R., Annunziata, A., Næs, T. and Varela, P., 2017. Making sense of the “clean label” trends: A review of consumer food choice behavior and discussion of industry implications. *Food Research International*, 99, 58-71.
- Creswell, J. “Is It ‘Natural’? Consumers, and Lawyers, Want to Know.” *New York Times*. February 26, 2018. Available online at: <https://www.nytimes.com/2018/02/16/business/natural-food-products.html>
- Drichoutis, A.C., Lazaridis, P. and Nayga Jr, R.M., 2006. Consumers’ use of nutritional labels: a review of research studies and issues. *Academy of Marketing Science Review*, 2006, 1.
- Jo, J. and Lusk, J.L., 2018. If it’s healthy, it’s tasty and expensive: Effects of nutritional labels on price and taste expectations. *Food Quality and Preference*, 68, 332-341.
- Jo, J., Lusk, J.L., Muller, L. and Ruffieux, B., 2016. Value of parsimonious nutritional information in a framed field experiment. *Food Policy*, 63, 124-133.
- Jones, M.S., House, L.A. and Gao, Z., 2015. Respondent screening and revealed preference axioms: Testing quarantining methods for enhanced data quality in web panel surveys. *Public Opinion Quarterly*, 79(3), 687-709.
- Lusk, J.L. “Consumer Preferences for Cage Free Eggs and Impacts of Retailer Cage Free Pledges.” *Agribusiness: An International Journal*. forthcoming, 2019. Available online at: <https://onlinelibrary.wiley.com/doi/abs/10.1002/agr.21580>
- Lusk, J.L. “Consumer Information and Labeling.” in *US Programs Affecting Food and Agricultural Marketing*. W.J. Armbruster and R.D. Knutson (eds). New York: Springer Science + Business Media, 2012.
- Lusk, J.L., 2011. External validity of the food values scale. *Food Quality and Preference*, 22(5), 452-462.
- Lusk, J.L. and Briggeman, B.C., 2009. Food values. *American Journal of Agricultural Economics*, 91(1), 184-196.
- Malone, T. and Lusk, J.L., 2018. Consequences of participant inattention with an application to carbon taxes for meat products. *Ecological Economics*, 145, 218-230.
- Schuldt, J.P. and Schwarz, N., 2010. “The “organic” path to obesity? Organic claims influence calorie judgments and exercise recommendations.” *Judgment and Decision Making*, 5(3), 144-150.

Syrenelas, K.G., DeLong, K.L., Grebitus, C. and Nayga, R.M., 2018. Is the natural label misleading? Examining consumer preferences for natural beef. *Applied Economic Perspectives and Policy*, 40(3), 445–460.

Teisl, M. F., Bockstael, N. E., and Levy, A. S. 2001. Measuring the welfare effects of nutrition information. *American Journal of Agricultural Economics*, 83(1), 133-149.

Williams, P., 2005. Consumer understanding and use of health claims for foods. *Nutrition Reviews*, 63(7), 256-264.

6. Appendix

6.1. Demographic Characteristics of Respondents

Demographic	Unweighted (N=1,290)	Weighted (N=1,290)
inc≤\$19k	13.2%	16.9%
\$20k≤inc≤\$39k	20.5%	24.9%
\$40k≤inc≤\$59k	16.7%	17.5%
\$60k≤inc≤\$79k	16.2%	14.8%
\$80k≤inc≤\$99k	9.9%	8.6%
\$100k≤inc≤\$119k	7.3%	5.7%
\$120k≤inc≤\$139k	5.3%	4.1%
\$140k≤inc≤\$159k	4.0%	2.8%
\$160k≤inc	6.8%	4.6%
18≤age≤25	10.8%	12.3%
25≤age≤34	13.3%	17.8%
35≤age≤44	13.9%	16.3%
45≤age≤54	18.0%	16.8%
55≤age≤64	20.0%	16.7%
65≤age≤74	19.6%	16.1%
75≤age	4.5%	4.1%
HHsize=1	22.2%	20.7%
HHsize=2	41.6%	37.2%
HHsize=3	16.3%	18.5%
HHsize=4	11.4%	13.2%
HHsize=5	8.4%	10.4%
HS edu	18.2%	36.7%
some college	21.2%	19.4%
associates	12.2%	11.4%
BS or BA	28.6%	17.9%
MS, MA, etc.	13.3%	8.4%
PhD, JD, etc	4.8%	3.1%
Female	49.3%	51.3%
White	80.4%	77.8%
Black	10.1%	11.9%
Other Race	2.0%	2.3%
Hispanic	10.2%	13.1%
Northeast	19.0%	17.2%
Midwest	23.6%	20.9%
South	34.3%	38.1%
West	23.0%	23.8%
Children under 12	21.7%	26.5%
Vegetarian	5.7%	5.1%

SNAP participant	11.4%	14.8%
Democrat	38.7%	38.6%
Republican	27.9%	27.5%
Independent	30.2%	31.0%
Other Party	3.2%	3.0%

6.2. Detailed Analysis of Open-Ended Questions

Sum of Percent of Respondents Mentioning Words in Seven Categories

Word Category	More Information	Natural Meaning	Healthy Meaning
Ingredients/Additives/Processes	31.7%	53.2%	21.6%
Origin	20.7%	5.0%	0.6%
Nutrients	23.1%	1.2%	41.6%
Packaging	17.1%	0.6%	1.1%
Other descriptors	12.0%	10.0%	36.5%
Nature	14.2%	46.4%	18.3%
Nothing/Skepticism	4.1%	13.5%	8.6%

Percent of Respondents Mentioning Specific Words by Category

Nutrients

More Information		Natural Meaning		Healthy Meaning	
Word	Conditional Mention Rate	Word	Mention Rate	Word	Mention Rate
calorie	6.3%	sugar	0.3%	fat	10.4%
nutri	4.7%	fat	0.3%	nutri	9.1%
sugar	4.6%	oil	0.2%	sugar	6.6%
fat	2.7%	trans	0.1%	calorie	4.1%
carb	1.5%	salt	0.1%	salt	2.3%
protein	0.7%	calorie	0.1%	vitamin	2.1%
vitamin	0.7%	protein	0.1%	sodium	2.1%
fiber	0.5%	nutrient	0.1%	carb	1.6%
caffeine	0.3%	carb	0.0%	protein	1.1%
mineral	0.3%	vitamin	0.0%	trans	0.6%
trans	0.3%	fiber	0.0%	cholesterol	0.5%
cholesterol	0.2%	caffeine	0.0%	saturated	0.5%
sodium	0.2%	mineral	0.0%	fiber	0.2%
oil	0.0%	cholesterol	0.0%	mineral	0.2%
salt	0.0%	sodium	0.0%	oil	0.2%
saturated	0.0%	saturated	0.0%	caffeine	0.0%

Origin

More Information		Natural Meaning		Healthy Meaning	
Word	Conditional Mention Rate	Word	Mention Rate	Word	Mention Rate
where	8.1%	from	3.9%	from	0.6%
origin	4.6%	origin	1.0%	where	0.0%
from	3.9%	local	0.1%	origin	0.0%
country	2.7%	where	0.0%	country	0.0%
place	0.8%	country	0.0%	place	0.0%
local	0.5%	place	0.0%	local	0.0%

Ingredients/Additives/Processes

More Information		Natural Meaning		Healthy Meaning	
Word	Conditional Mention Rate	Word	Mention Rate	Word	Mention Rate
ingredient	11.7%	ingredient	14.1%	ingredient	7.5%
gmo	6.8%	additive	9.0%	organic	2.8%
added	2.2%	chemical	7.9%	chemical	2.2%
organic	1.7%	organic	7.0%	added	2.2%
gluten	1.5%	added	6.5%	additive	2.1%
chemical	1.5%	gmo	3.0%	gmo	2.0%
meat	1.4%	color	1.0%	color	0.5%
allerg	1.2%	pesticide	1.0%	vegetable	0.5%
color	0.7%	hormone	0.9%	fruit	0.4%
pesticide	0.7%	antibiotic	0.9%	pesticide	0.2%
genetic	0.5%	genetic	0.5%	hormone	0.2%
antibiotic	0.3%	fruit	0.4%	antibiotic	0.2%
hfcs	0.2%	extra	0.4%	msg	0.2%
additive	0.2%	dye	0.4%	corn	0.2%
msg	0.2%	vegetable	0.2%	dye	0.2%
hormone	0.2%	msg	0.1%	extra	0.1%
vegetable	0.2%	wheat	0.1%	meat	0.1%
fruit	0.2%	gluten	0.0%	genetic	0.1%
insecticide	0.2%	meat	0.0%	dairy	0.1%
dairy	0.2%	allerg	0.0%	gluten	0.0%
extra	0.2%	hfcs	0.0%	allerg	0.0%
corn	0.0%	insecticide	0.0%	hfcs	0.0%
wheat	0.0%	dairy	0.0%	insecticide	0.0%
dye	0.0%	corn	0.0%	wheat	0.0%

Nature

More Information		Natural Meaning		Healthy Meaning	
Word	Condi tional Mentio n Rate	Word	Mentio n Rate	Word	Ment ion Rate
made	3.9%	artificial	10.7%	natural	8.6%
lab	2.4%	natural	8.4%	artificial	1.9%
real	1.7%	processed	5.6%	processed	1.8%
grown	1.5%	made	5.5%	fresh	1.2%
manufactured	1.0%	grown	2.7%	made	1.0%
artificial	0.8%	real	2.3%	whole	0.7%
natural	0.7%	nature	1.6%	real	0.5%
processed	0.3%	fresh	1.4%	lab	0.4%
pure	0.3%	fake	0.9%	grown	0.3%
simple	0.3%	original	0.8%	clean	0.3%
pure	0.3%	lab	0.6%	pure	0.3%
original	0.2%	alter	0.6%	farm	0.2%
farm	0.2%	whole	0.6%	fake	0.2%
fake	0.2%	home	0.5%	home	0.1%
original	0.2%	pure	0.5%	simple	0.1%
alter	0.2%	clean	0.5%	land	0.1%
clean	0.0%	manufactured	0.3%	soil	0.1%
earth	0.0%	farm	0.3%	manufactured	0.0%
land	0.0%	synthetic	0.2%	original	0.0%
soil	0.0%	simple	0.2%	original	0.0%
raw	0.0%	raw	0.2%	alter	0.0%
clean	0.0%	foreign	0.2%	earth	0.0%
home	0.0%	soil	0.1%	raw	0.0%
whole	0.0%	god	0.1%	foreign	0.0%
foreign	0.0%	earth	0.0%	god	0.0%
fresh	0.0%	land	0.0%	synthetic	0.0%
god	0.0%			nature	0.0%

Other Descriptors

More Information		Natural Meaning		Healthy Meaning	
Word	Conditional Mention Rate	Word	Mention Rate	Word	Mention Rate
good	2.4%	good	3.4%	good	21.3%
price	2.4%	health	2.4%	health	7.8%
health	2.0%	flavor	1.6%	harm	1.5%
vegan	1.4%	great	0.5%	bad	1.3%
diet	0.8%	plant	0.5%	taste	0.7%
flavor	0.5%	expensive	0.4%	great	0.7%
bad	0.5%	bad	0.3%	junk	0.5%
warning	0.5%	excellent	0.3%	sick	0.5%
taste	0.3%	price	0.2%	diet	0.4%
vegetarian	0.3%	taste	0.2%	kill	0.4%
great	0.2%	harm	0.2%	excellent	0.3%
excellent	0.2%	vegan	0.1%	expensive	0.3%
harm	0.2%	junk	0.1%	heart	0.2%
junk	0.2%	heart	0.1%	vegan	0.1%
diabetes	0.2%	diet	0.0%	flavor	0.1%
kill	0.0%	warning	0.0%	plant	0.1%
sick	0.0%	vegetarian	0.0%	price	0.1%
plant	0.0%	diabetes	0.0%	vegetarian	0.1%
cage	0.0%	kill	0.0%	obesity	0.1%
expensive	0.0%	sick	0.0%	warning	0.0%
obesity	0.0%	cage	0.0%	diabetes	0.0%
heart	0.0%	obesity	0.0%	cage	0.0%

Nothing/Skepticism

More Information		Natural Meaning		Healthy Meaning	
Word	Conditional Mention Rate	Word	Mention Rate	Word	Mention Rate
don't know	1.2%	nothing	8.7%	nothing	3.6%
not sure	1.2%	not sure	1.7%	not sure	1.4%
nothing	0.8%	don't know	1.3%	don't know	1.2%
Bs	0.7%	bs	0.4%	bs	1.2%
vague	0.2%	meaningless	0.3%	marketing	0.4%
meaningless	0.0%	marketing	0.3%	meaningless	0.3%
trick	0.0%	vague	0.2%	vague	0.2%
subjective	0.0%	advertising	0.1%	subjective	0.1%
bull	0.0%	gimmick	0.1%	gimmick	0.1%
scam	0.0%	trick	0.1%	bull	0.1%
marketing	0.0%	subjective	0.1%	advertising	0.1%
advertising	0.0%	bull	0.1%	trick	0.0%
useless	0.0%	scam	0.1%	scam	0.0%
gimmick	0.0%	useless	0.1%	useless	0.0%

Packaging

More Information		Natural Meaning		Healthy Meaning	
Word	Conditional Mention Rate	Word	Mention Rate	Word	Mention Rate
date	3.4%	label	0.3%	when	0.5%
size	3.4%	when	0.2%	label	0.4%
serving	2.7%	expire	0.1%	weight	0.2%
label	2.0%	pic	0.1%	pic	0.1%
when	1.5%	expiration	0.0%	expire	0.0%
expiration	1.2%	print	0.0%	expiration	0.0%
print	1.0%	date	0.0%	print	0.0%
pic	1.0%	best by	0.0%	date	0.0%
best by	0.3%	serving	0.0%	best by	0.0%
weight	0.3%	size	0.0%	serving	0.0%
expire	0.2%	weight	0.0%	size	0.0%