The Effect of Restaurant Menu Labeling on Consumer's Choice: Evidence from a Choice Experiment Involving Eye-Tracking

Madiha Zaffou

Graduate Research Assistant, Department of Agricultural and Resource Economics, 1376 Storrs Road, University of Connecticut, Storrs, CT 06269-4021

Benjamin Campbell

Assistant Professor and Extension Economist, Department of Agricultural and Resource Economics, 1376 Storrs Road, University of Connecticut, Storrs, CT 06269-4021

Selected Paper prepared for presentation at the Agricultural & Applied Economics Association's 2015 AAEA Annual Meeting, San Francisco, CA, July 26-28, 2015.

The Effect of Restaurant Menu Labeling on Consumer's Choice: Evidence from a Choice Experiment Involving Eye-Tracking

Abstract:

Eating away from home has been noted to be a contributor to the rising obesity epidemic in the U.S. The U.S. Food and Drug Administration has announced plans to require calorie information to certain food retail establishments. However, the effectiveness of such a requirement has been found to be mixed with the literature. The objective of this paper was to understand the role of various nutritional labels (i.e. calorie, percent daily intake, and traffic light signals) on food choice at both sit down and fast food establishments. Our results indicate that participants in the price only treatment chose meals with higher caloric content from both sit down and fast food menus. However, we find that calorie only information provides the largest reduction in calories in a meal from a sit down menu, but percent daily intake in conjunction with calorie information provides the largest reduction in calories for a fast food menu. Further, via eye tracking technology we find that participants looked at the nutritional information similarly across treatments.

American consumers have significantly increased their frequency of eating away from home (EAFH) over the last several decades. As a result, people unconsciously underestimate their calorie intake and usually over-consume when EAFH (Gutherie et al. 2013). This increase in EAFH has contributed to the obesity epidemic within the U.S. whereby one-third of Americans are considered obese. To counteract the upward trend toward unhealthy eating, policy makers and other health advocates have pushed for increased nutritional labeling at restaurants.

The Food and Drug Administration (FDA) is in the process of releasing rules mandating a new national menu-labeling standard for how chain restaurants present calorie and other nutrition information on menus and at the point of sale. Chain restaurants, with 20 or more locations operating under the same brand name, will be impacted by these changes and will soon need to disclose calorie information on menus in order to try to get consumers to make healthier choices (Food and Drug Administration 2014).

Many studies have examined restaurant menu labeling and have reported mixed results. On one hand, it appears that, for some consumers, there are no statistically significant differences in calories purchased before and after labeling because they consider taste the most important factor in their meal selection (Elbel et al. 2011; Finkelstein et al. 2011). However, other research has shown that people who noticed calorie labels ordered 100 fewer calories with the addition of information on the recommended daily caloric intake was also shown to enhance this effect (Moreley et al. 2013; Dumanovsky et al. 2011).

The purpose of this study was to address these concerns by utilizing eye-tracking technology (ETT) in combination with different experimental treatments associated with calorie information display formats. Using ETT we can objectively measure consumer’s visual attention to nutrition information by examining the pattern and duration of attention to them. This analysis looked at the number of fixations and total visit duration as a function of different variables: label formats, calorie content, and consumer' choice (healthy vs. unhealthy)

This study contains several strengths. First, we examine how calorie information on restaurant menus may help reduce the total amount of calories people order and consume for a meal and therefore improve their ability to estimate calories consumed. Second, we test whether the impact of menu labeling is uniform and how a consumer's choice differs by restaurant type. Finally, using ETT we can investigate the extent attention to nutrition labels mediates their effect on choice, and how this differs between different label formats. This research is important for informing possible public health education and marketing campaigns about menu labeling by testing marketing strategies in order to draw consumer attention to the calorie information.

Data Collection and Measures

For this study, a sample of 242 university students with diverse demographic characteristics were presented with two different restaurant menus: a sit-down restaurant menu (Olive Garden) and a fast food restaurant menu (McDonalds). These two restaurants were chosen among others because they are well known franchises throughout the U.S (more than 800 locations for Olive Garden and more than 14,267 locations for McDonald's) and they both possess considerable food variety offerings, with diverse nutritional profiles. Furthermore, their menus are broken down into the following categories: entrees, appetizers, desserts and drinks. Participants were randomly assigned to one of six treatment groups:

1) Menu items, no nutrition information (control group).

2) Menu items plus calories for each item, similar to the FDA proposed guidelines.
3) Menu items, calories, and percent daily intake (% DI) of calories based on a 2,000 calorie diet.
4) Menu items, calories, and traffic light menu labeling. A green symbol represents low calories (<750 calories for entrees, <250 calories for appetizers, sides, or desserts; 0 calories for beverages.) and a red symbol represents high calories (>750 calories for entrée, >250 calories for appetizers, sides, or desserts; >0 calories for beverages). This is similar to traffic light signals used in school systems throughout the nation.
5) Menu items, calories, traffic light, and % DI of calories.
6) Menu items with only green traffic lights to indicate low calorie food.

Respondents within each treatment group were asked to select the food item(s) that they would like to order for dinner from each menu. Table 1 describes our sample characteristics.

To measure consumer's visual attention to nutrition information presented by different types of labelling, we simultaneously incorporated ETT into the experiment. We hypothesized that consumer's choice would be affected by the labelling information only if the latter receives attention. Therefore, we assume that the labeling formats we employed will affect food choices differently given that some formats are more attention capturing than others. In this context, participants eye gaze measures were tracked and collected when viewing different labelling scenarios on a computer screen. For each area of interest (AOI) (i.e., AOI can be calories, price, traffic lights, etc.), ETT data were generated and consisted of time to first fixation (TFF), first fixation duration (FFD), fixation count (FC), and total visit duration (TVD)[1]. At the end of the

[1] Although all these variables are generated using the ETT, however, we will only use fixation count in our analysis.

experiment, participants were presented with a questionnaire regarding their dinning habits and their restaurant layout preferences.

Methodology

The main purpose of this study was to examine the effect of different types of nutritional labelling on consumer purchasing of food at different retail outlets. Using equation 1 we can capture the impact of nutrition labeling on calorie purchasing. In equation 1 the outcome variable (Cal_{ij}) can be defined as total calories ordered by person i in each treatment j and is a function of:

$$Cal_{ij} = f\left(Tr_j, X_i, PB_i\ Position_j, Time_i\right) \quad i = 1, \dots, 242\ and\ \ j = 1, \dots, 6 \quad \textbf{(1)}$$

where, $Tr_j$is a set of dummy variables indicating which treatment is being used, Xi and PB_i are respectively, demographic and purchasing behavior characteristics of each participant i. $Position_j$ is a binary variable that indicates if the menu was seen first or second. $Time_i$ indicates what time of the day every individual i participated in the experiment.

Results

Table 2 indicates the average calories chosen across locations. Consistent with previous research, the prices only treatment indicated they would have purchased the most calories for both the fast food (1282 calories) and sit down (1480 calories) restaurant menus compared to the other treatments. Further, we see that treatment 3 (prices, calorie, and % daily intake) provided the lowest calorie value for the fast food menu only with the average participant choosing a meal with

992 calories. For the sit down restaurant we see that the calorie only information treatment had the largest reduction in calories compared to treatment 1 (1194 vs. 1480). From these results it is clear that adding increased nutritional information to both fast food and sit down restaurant menus can reduce the number of calories chosen in a meal.

Table 3 reports the average fixation count among participants which is an indicator of how many times participants fixated on an area of interest (AOI). Of interest in Table 3 we see that respondents looked at price more at McDonald's than at Olive Garden while looking at the other information a similar number of times. For instance, treatment 1 (price only) the average participant fixated on price 33 times during their fast food decision process while fixating on price only 26 times at the sit down restaurant. We also see this trend hold for calorie information across restaurant types. The % daily intake was almost identical across restaurant types. From these results it is clear that calorie information, % daily intake, and the red/green light labeling will draw attention, but as shown in Table 2, the impacts will vary by restaurant type.

Regression results of equation (1) are reported in table 4. We estimated the effect of different menu labeling treatments by restaurant type. At McDonalds we see that all informational treatments provide a lower calorie purchase compared to treatment 1 (price only). Treatment 2, where we added only calorie information, was found to be the most powerful labeling method. On average, people were likely to order 297 calories less when they were shown calorie information in conjunction with prices. The color-coded labeling whereby only a green traffic light was used provided the second largest reduction at 279 calories. Of interest for the McDonald's menu, the informational treatment with all information provided only a 224 reduction in calorie purchasing. This may suggest that too much information may require a longer time for consumers to process it and understand it; therefore, it is more efficient to focus only on one labeling aspect. With respect to demographics we see that males chosen food options that had 361 more calories compared to females while participants that were on a diet chose 177 fewer calories than participants that were not on a diet.

With respect to the Olive Garden menu, our results show that only treatment 2, where calories are added next to prices, is significant. In this context, consumers focused only on calories associated with each food item and did not care much about health statement or color-coded labeling formats. This may be explained by the fact that people perceive Olive Garden's food healthier and not as "bad" as McDonald's food, and therefore, it is sufficient for them to be aware of food calorie content when making meal selection. In addition, we observed that, on average, White and Asian participants tended to order over 500 calories less from the Olive Garden menu. Further, the introduction of a time trend, when the participant took the survey, did not affect the outcome variable in either model, and the menu position did not affect participants' decision

Conclusion

The purpose of this study was to assess the impact of calorie information presented in different formats on consumers' food choices. In this case, a sample of 242 participants with diverse demographic characteristics were presented with two different restaurant menus: a sit-down restaurant menu (Olive Garden) and a fast food restaurant menu (McDonalds). In addition to our experimental choice task towards food items, we also added an eye tracking experiment to objectively measure consumer's visual attention to nutrition information, by examining the pattern and duration of attention to them.

Results of this study are important for informing possible public health education and marketing campaigns about menu labeling in order to draw consumer attention to the calorie information. Our results indicate that calorie information is effective at reducing caloric choice at sit down and fast food restaurants. However, other types of nutritional information reduced caloric choice at only the fast food restaurant.

References

Hammond, D., S. Goodman, R. Hanning, and S. Daniel. 2013. A Randomized Trial of Calorie Labeling on Menus. *Preventive Medicine* 57(6): 860-866.

Liu, P.J., C.A. Roberto, L.J. Liu, and K.D. Brownell. 2012. A Test of Different Menu Labeling Presentations. *Appetite* 59(3): 770-777.

Bollinger, B., P. Leslie, and A. Sorensen. 2010. Calorie Posting in Chain Restaurants. No. w15648. National Bureau of Economic Research, 2010.

Bleich, S.N., J.A. Wolfson, and M.P. Jarlenski. 2015. Calorie Changes in Chain Restaurant Menu Items: Implications for Obesity and Evaluations of Menu Labeling. *American Journal of Preventive Medicine* 48(1): 70-75.

Cohen, D.A. and S.H. Babey. 2012. Contextual Influences on Eating Behaviours: Heuristic Processing and Dietary Choices. *Obesity Reviews* 13(9): 766-779.

Pang, J. and D. Hammond. 2013. Efficacy and Consumer Preferences for Different Approaches to Calorie Labeling on Menus. *Journal of Nutrition Education and Behavior* 45(6): 669-675.

Roberto, C.A., P.D. Larsen, H. Agnew, J. Baik, and K.D. Brownell. 2010. Evaluating the Impact of Menu Labeling on Food Choices and Intake. *American Journal of Public Health* 100(2): 312-318.

Yang, S.S. 2012. Eye Movements on Restaurant Menus: A Revisitation on Gaze Motion and Consumer Scanpaths. *International Journal of Hospitality Management* 31(3): 1021-1029.

Krieger, J. and B.E. Saelens. 2013. Impact of Menu Labeling on Consumer Behavior: A 2008-2012 Update. Princeton, NJ: Robert Wood Johnson Foundation.

Fitch, R.C., L.J. Harnack, D.R. Neumark-Sztainer, M.T. Story, S.A. French, J.M. Oakes, and S.A. Rydell. 2009. Providing Calorie Information on Fast-Food Restaurant Menu Boards: Consumer Views. *American Journal of Health Promotion* 24(2): 129-132.

Ellison, B.D., J.L. Lusk, and D.W. Davis. 2012. The Value and Cost of Restaurant Calorie Labels: Results from a Field Experiment. *Unpublished Working Paper*.

Sonnenberg, L., E. Gelsomin, D.E. Levy, J. Riis, S. Barraclough, and A.N. Thorndike. 2013. A Traffic Light Food Labeling Intervention Increases Consumer Awareness of Health and Healthy Choices at the Point-of-Purchase. *Preventive medicine* 57(4): 253-257.

Morley, B., M. Scully, J. Martin, P. Niven, H. Dixon, M. Wakefield. 2013. What Types of Nutrition Menu Labelling Lead Consumers to Select Less Energy-Dense Fast Food? An Experimental Study. *Appetite* 67: 8-15.

Elbel, B., J. Gyamfi, and R. Kersh. 2011. Child and Adolescent Fast-Food Choice and the Influence of Calorie Labeling: A Natural Experiment. *International Journal of Obesity* 35(4): 493-500.

Gerend, M.A. 2009. Does Calorie Information Promote Lower Calorie Fast Food Choices Among College Students? *Journal of Adolescent Health* 44(1): 84-86.

Harnack, L.J., S.A. French, J.M. Oakes, M.T. Story, R.W. Jeffery, and S.A. Rydell. 2008. Effects of Calorie Labeling and Value Size Pricing on Fast Food Meal Choices: Results from an Experimental Trial. *International Journal of Behavioral Nutrition and Physical Activity* 5(1): 63.

Tandon, P.S., j. Wright, C. Zhou, C.B. Rogers, D.A. Christakis. 2010. Nutrition Menu Labeling May Lead to Lower-Calorie Restaurant Meal Choices for Children. *Pediatrics* 125(2): 244-248.

Tangari, A.H. S. Burton, E. Howlett, Y. Cho, and A. Thyroff. 2010. Weighing in on Fast Food Consumption: The Effects of Meal and Calorie Disclosures on Consumer Fast Food Evaluations. *Journal of Consumer Affairs* 44(3): 431-462.

U.S. Food and Drug Administration. 2014. Overview of FDA Labeling Requirements for Restaurants, Similar Retail Food Establishments and Vending Machines. Accessed June 3, 2015. Available at:

http://www.fda.gov/Food/IngredientsPackagingLabeling/LabelingNutrition/ucm248732.htm

Table 1: Demographic Profile of Participants by Treatment

	Tr1 Prices only	Tr2 Prices +calories	Tr3 Prices+calories +% DI	Tr4 Prices+calories +TL	Tr5 All info	Tr6 Prices+TL
Male	52%	43%	53%	28%	50%	31%
Age	21.5	21.5	21.8	21.8	21.5	22
White/Caucasian	68%	75%	68%	68%	65%	50%
African American	-	1%	-	5%	5%	17%
Hispanic	13%	3%	5%	-	8%	4%
Asian	18%	13%	25%	27%	22%	21%
Other	3%	-	2%	-	-	7%
On diet	18%	15%	23%	13%	23%	12%

Table 2: Average Calories and Prices of Food Ordered by Treatment and Menu Type

		Tr1 **Prices only**	**Tr2** **Prices+calories**	**Tr3** **Prices+calories +% DI**	**Tr4** **Prices+calories +TL**	**Tr5** **All info**	**Tr6** **Prices+TL**
McDonald's	*Calories*	1282	1163	992	998	1077	999
Olive Garden	*Calories*	1480	1194	1489	1316	1287	1322

Table3: Average Fixation count in Seconds

	McDonald's				*Olive Garden*			
	Price	**Calories**	**% DI**	**TL**	**Price**	**Calories**	**% DI**	**TL**
Tr1	33.3	-	-	-	26.4	-	-	-
Tr2	34.8	23.4	-	-	37	22.4	-	-
Tr3	26.8	22.8	10.2	-	23.2	21.1	10	-
Tr4	32.2	31.8	7.7	-	26.5	21.9	7.1	-
Tr5	34.4	27.8	17.5	8.3	26.2	20.7	17.4	7.4
Tr6	38.5	-	-	7.5	30.7	-	-	7.2

Table 4: Linear Regression Estimates

	Calories ordered from McDonald's	**Calories ordered from Olive Garden**
Treatment:		
Tr2	-144.9	-299.1*
	(-108.6)	(-162.8)
Tr3	-297.4***	46.01
	(-105.5)	(-158.2)
Tr4	-224.1**	-96.15
	(-105.2)	(-157.6)
Tr5	-212.5**	-149.5
	(-104.1)	(-156.1)
Tr6	-279.6***	-203.5
	(-105.1)	(-157.6)
Demographics:		
White	-25.48	-539.2*
	(-213.1)	(-319.4)
African American	310.9	-54.04
	(-241)	(-361.2)
Hispanic	-17.33	-521.9
	(-243.9)	(-365.6)
Asian	-42.5	-562.8*
	(-218.2)	(-327)
Age	-0.703	-9.198
	(-9.505)	(-14.25)
Male	360.8***	242.2***
	(-61.12)	(-91.6)
On diet	-176.8**	-178.9
	(-79.9)	(-119.8)
Time of the day:		
Noon	-24.36	163.9
	(-94.86)	(-142.2)
Afternoon	29.38	130.6
	(-81.32)	(-121.9)
Menu position	-1.808	-129.8
	(-60.37)	(-90.48)
Constant	1,167***	2,047***
	(-322.5)	(-483.3)
Observations	242	242
R-squared	0.223	0.111