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Short Communication

Is frequency of fast food and sit-down restaurant eating occasions differentially associated with less healthful eating habits?

Michael A. Close, MSDoctoral Student [a,*],
Leslie A. Lytle, PhDProfessor and Chair [a], Anthony J. Viera, MD, MPHProfessor [b]

[a] Department of Health Behavior, University of North Carolina at Chapel Hill, United States
[b] Department of Family Medicine, University of North Carolina at Chapel Hill, United States

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ABSTRACT

Studies have shown that frequency of fast food restaurant eating and sit-down restaurant eating is differentially associated with nutrient intakes and biometric outcomes. The objective of this study was to examine whether frequency of fast food and sit-down restaurant eating occasions was differentially associated with less healthful eating habits, independent of demographic characteristics. Data were collected from participants in 2015 enrolled in a worksite nutrition intervention trial ($n = 388$) in North Carolina who completed self-administered questionnaires at baseline. We used multiple logistic regressions to estimate associations between frequency of restaurant eating occasions and four less healthful eating habits, controlling for age, sex, race, education, marital status, and worksite. On average, participants in the highest tertile of fast food restaurant eating (vs. lowest tertile) had increased odds of usual intake of processed meat (OR = 3.00, 95% CI = 1.71, 5.28), red meat (OR = 2.30, 95% CI = 1.33, 4.00), refined grain bread (OR = 2.25, 95% CI = 1.23, 4.10), and sweet baked goods and candy (OR = 3.50, 95% CI = 2.00, 6.12). No associations were found between frequency of sit-down restaurant eating and less healthful eating habits. We conclude that greater frequency of fast food restaurant eating is associated with less healthful eating habits. Our findings suggest that taste preferences or other factors, independent of demographic characteristics, might explain the decision to eat at fast food or sit-down restaurants.

1. Introduction

In recent years, the proportion of United States adults' calorie intake from food prepared away from home has steadily risen (Lin and Guthrie, 2012). Fast food restaurants and sit-down restaurants (also referred to as "table-service" and "full-service" restaurants) are the two major contributors of away-from-home calories in the United States. Fast food restaurants typically offer inexpensive food catering to price-sensitive individuals (Kim and Leigh, 2011). In contrast, sit-down restaurants range from lower-priced casual dining to higher-priced upscale fine dining establishments. On average, an individual's daily energy intake increases by 134 cal for every meal prepared away from home (Todd et al., 2010). The increasing popularity of away-from-home food sources may have contributed to the rapid growth of overweight and obesity nationally.

An emerging body of research suggests that regularly eating meals from fast food restaurants is more adversely associated with obesity-related outcomes than regularly eating meals from sit-down restaurants. Longitudinal data from the National Health and Nutrition Examination Survey (NHANES) 2003–2010 found that consumption of fast food and full-service restaurant food was differentially associated with daily nutrient intakes (An, 2016). For example, fast food consumption was associated with greater amounts of daily sugar intake and lesser amounts of fiber intake while full-service restaurant food consumption did not show similar associations. Daily intake of calories, total fat, and saturated fat, however, was comparable between fast food and full-service restaurant types.

In cross-sectional and longitudinal analyses of Coronary Artery Risk Development in Young Adults (CARDIA) data, Duffey and colleagues found that frequency of fast food restaurant eating was prospectively associated with higher levels of poorer metabolic outcomes as compared with sit-down restaurant eating (Duffey et al., 2007, 2009). Compared to people in the lowest quartile of baseline fast food eating, those in the highest quartile had higher weight, waist circumference, and plasma triglycerides concentrations, and lower HDL cholesterol concentrations after 13 years of follow-up. In contrast, baseline sit-down restaurant food consumption was not associated with weight or metabolic outcomes after 13 years of follow-up.

The present study uses baseline cross-sectional data from a worksite nutrition intervention to evaluate whether frequency of eating at fast

* Corresponding author at: Department of Health Behavior, University of North Carolina at Chapel Hill, 135 Dauer Dr., CB 7440, Chapel Hill, NC 27599, United States.
E-mail address: mclose@email.unc.edu (M.A. Close).

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food or sit-down restaurants is differentially associated with four less healthful eating habits associated with chronic disease outcomes: usual intake of processed meat (Micha et al., 2010), red meat (Micha et al., 2012), refined grain bread (Liu, 2002), and sweet baked goods and candy (Johnson et al., 2009). We hypothesized that frequency of eating at fast food restaurants would be associated with higher odds of all four less healthful eating habits, whereas sit-down restaurant frequency would not. Additionally, we hypothesized that socioeconomic status, using educational attainment as a proxy measure, would moderate the relationship between frequency of restaurant eating occasions and less healthful eating habits in order to evaluate the differential impact that economic conditions may have on eating out options.

2. Methods

2.1. Sample

We used baseline cross-sectional data from the Physical Activity Calorie Expenditure (PACE) study conducted in three worksites of a health insurer in North Carolina. The study is testing the effectiveness of PACE food labeling in changing calorie purchasing and physical activity among workers regularly purchasing meals from a worksite cafeteria. The eligibility criteria included employees who were 18 years or older and reported purchasing lunch or were willing to purchase lunch from the cafeteria at least three times per week. At the time of this analysis, 388 participants were enrolled in the study and constitute the sample. All aspects of the study were approved by the Institutional Review Board of University of North Carolina at Chapel Hill.

2.2. Measures

We collected baseline demographic and eating behavior data using a self-administered questionnaire. The demographic questions included age, sex, race/ethnicity, marital status and educational attainment. Educational attainment was used in this analysis as a proxy for socioeconomic status (Shavers, 2007). The questionnaire also included questions on frequency of eating breakfast, lunch, and dinner purchased from fast food restaurants ("such as McDonald's or Domino's") and sit-down restaurants ("such as Applebee's or Olive Garden"), whether dine-in or carry-out in the past month. The response options were: 1) 0–2 times/month; 2) 3–5 times/month; 3) 6–10 times/month; 4) 11–20 times/month, and 5) more than 20 times/month. We created a continuous variable representing overall frequency of fast food and sit-down restaurant eating occasions by collapsing breakfast, lunch, and dinner responses into a measure of overall frequency of eating occasions per restaurant type. We then calculated tertiles of each continuous variable. We used the categorical tertile variables in our modeling with the lowest tertile as the referent.

A 26-item food frequency questionnaire was used to measure usual intake of foods including processed meat, sweet baked goods and candy, red meat, and refined grain bread. The food frequency questionnaire was a modified version of a Dietary Risk Assessment for southern United States populations created by Ammerman et al. (1991) and revised by Jilcott et al. (2007). The reference period and response options for each food category varied (see Supplementary material). Based on the distribution of responses, we generated dichotomous dependent variables of processed meat (1 = ≥3 servings/week; 0 = 0–2 servings/week), red meat (1 = ≥2 servings/day; 0 = 0–1 serving/day), refined grain bread (1 = ≥2 servings/day; 0 = 0–1 serving/day), and sweet baked goods and candy (1 = ≥2 servings/week; 0 = 0–1 servings/week).

2.3. Data analysis

We examined univariate statistics, multicollinearity, and presence of outliers. Data for one participant were excluded for an implausibly low age value. Logistic regression was used to evaluate associations between frequency of fast food and sit-down restaurant eating occasions (independent variables) with usual intake of processed meat, red meat, refined grain bread, and sweet baked goods and candy (dependent variables). First, we examined the relationship between fast food and sit-down restaurant eating frequency with each less healthful eating habit (Model 1). Second, we estimated models controlling for demographic characteristics: age in years (continuous), sex (dichotomous; 1 = female, 0 = male), race (dichotomous; 1 = non-white, 0 = white), education (dichotomous; 1 = Bachelor's Degree and Above, 0 = Below Bachelor's Degree), and marital status (categorical) (Model 2). Third, we tested effect modification by educational attainment through inclusion of interaction terms for education-by-fast-food and education-by-sit-down restaurant eating frequency in Model 2. We conducted Wald tests to assess the joint significance of each set of dummy variables representing the categorical-by-categorical variable interactions. Education-by-fast-food and education-by-sit-down restaurant interaction terms were not statistically significant in any of the models (Wald $p = 0.12–0.88$) and consequently removed. We used fixed effects for worksite in all models to control for the clustering of observations in three worksites and used a complete case analysis approach for handling missing data, therefore excluding participants without complete data on all variables in the model. We used Stata version 11.2 (College Park, TX, USA) for all analyses.

3. Results

The analytic sample size was 387 participants. The sample was predominantly female (78%), non-white (55%), and more than one-third had less than a bachelor's degree (Table 1).

Table 2 shows the associations between eating out occasions and the four eating behaviors in the two models. In Model 1, the highest tertile for fast food restaurant eating frequency was associated with increased odds of all four less healthful eating habits. Compared to employees in the lowest tertile of fast food restaurant eating frequency, those in the

Table 1
Demographic and eating habit characteristics (North Carolina, United States, 2015) ($n = 387$).

	n (%)
Demographic characteristics	
Age[a]	42.4 (10.3)
Female	301 (77.8)
Non-white	211 (54.5)
Education	
Less than Bachelor's degree	145 (37.5)
Bachelor's degree and above	242 (62.5)
Marital status	
Single, never married	111 (28.7)
Married/domestic partnership	200 (51.7)
Divorced/separated/widowed	76 (19.6)
Fast food restaurant frequency, by tertile	
Low tertile	144 (37.2)
Mid tertile	130 (33.6)
High tertile	113 (29.2)
Sit-down restaurant frequency, by tertile	
Low tertile	170 (43.9)
Mid tertile	133 (34.4)
High tertile	84 (21.7)
Less healthful eating habits	
Processed meat, (≥3 servings/week)	140 (36.2)
Red meat, (≥2 servings/day)	155 (40.1)
Refined grain bread, (≥2 servings/day)	110 (28.4)
Sweet baked goods and candy, (≥2 servings/week)	157 (40.6)

[a] Mean (SD).

Table 2
Associations between frequency of restaurant eating occasions and less healthful eating habits (North Carolina, United States, 2015) ($n = 387$).

	Processed meat		Red meat		Refined grain bread		Sweet baked goods and candy	
	Model 1 OR [CI]	Model 2 OR [CI]	Model 1 OR [CI]	Model 2 OR [CI]	Model 1 OR [CI]	Model 2 OR [CI]	Model 1 OR [CI]	Model 2 OR [CI]
Fast food restaurant								
Low tertile	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref
Mid tertile	1.93* [1.14, 3.28]	1.86* [1.09, 3.19]	2.38*** [1.43, 3.96]	2.46*** [1.46, 4.16]	1.37 [0.77, 2.41]	1.28 [0.71, 2.31]	1.86* [1.11, 3.12]	1.82* [1.07, 3.08]
High tertile	3.24*** [1.87, 5.63]	3.00*** [1.71, 5.28]	2.40** [1.40, 4.11]	2.30** [1.33, 4.00]	2.42** [1.37, 4.27]	2.25** [1.23, 4.10]	3.60*** [2.08, 6.23]	3.50*** [2.00, 6.12]
Sit-down restaurant								
Low tertile	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref
Mid tertile	0.86 [0.52, 1.41]	0.87 [0.52, 1.44]	1.35 [0.83, 2.18]	1.35 [0.83, 2.21]	1.03 [0.61, 1.74]	1.17 [0.67, 2.03]	1.04 [0.63, 1.70]	1.04 [0.63, 1.73]
High tertile	0.97 [0.55, 1.70]	1.02 [0.57, 1.83]	1.10 [0.63, 1.92]	1.17 [0.66, 2.09]	1.18 [0.65, 2.14]	1.37 [0.73, 2.58]	1.74 [1.00, 3.04]	1.70 [0.96, 3.02]
Age		1.00 [0.98, 1.03]		1.01 [0.99, 1.03]		1.00 [0.98, 1.03]		0.99 [0.96, 1.01]
Female		0.65 [0.38, 1.10]		0.97 [0.57, 1.65]		0.70 [0.39, 1.25]		1.08 [0.63, 1.84]
Non-white		1.26 [0.79, 2.03]		1.39 [0.87, 2.21]		2.61*** [1.54, 4.44]		0.99 [0.62, 1.58]
Education								
Bachelor's degree or above		0.64 [0.40, 1.01]		0.66 [0.42, 1.04]		0.58* [0.35, 0.94]		0.62* [0.39, 0.98]
Marital status								
Single, never married		Ref		Ref		Ref		Ref
Married/domestic partnership		0.62 [0.36, 1.07]		1.10 [0.65, 1.88]		1.15 [0.63, 2.08]		0.84 [0.49, 1.45]
Divorced/separated/widowed		0.69 [0.36, 1.34]		0.69 [0.35, 1.34]		1.99 [0.98, 4.01]		0.91 [0.47, 1.77]

OR, odds ratio.
CI, 95% confidence interval.
Worksite fixed effects not shown.
* $p < 0.05$.
** $p < 0.01$.
*** $p < 0.001$.

highest tertile had increased odds of usual intake of processed meat (OR = 3.24, 95% CI = 1.87, 5.63), red meat (OR = 2.40, 95% CI = 1.40, 4.11), refined grain bread (OR = 2.42, 95% CI = 1.37, 4.27), and sweet baked goods and candy (OR = 3.60, 95% CI = 2.08, 6.23). No statistically significant relationships were seen between eating at a sit-down restaurant and eating behaviors.

After adjusting for age, sex, race, educational attainment, and marital status (Model 2), greater frequency of eating at fast food restaurants, as compared to less frequency of fast food restaurant eating, remained significantly associated with a higher usual intake of processed meat (OR = 3.00, 95% CI = 1.71, 5.28), red meat (OR = 2.30, 95% CI = 1.33, 4.00), refined grain bread (OR = 2.25, 95% CI = 1.23, 4.10), and sweet baked goods and candy (OR = 3.50, 95% CI = 2.00, 6.12). After adjusting for demographic covariates, there were no significant relationships between frequency of eating at sit-down restaurants and the four less healthful eating habits examined.

4. Discussion

Our findings suggest that higher frequencies of eating at fast food restaurants are associated with increased odds of eating behaviors that are less healthful, independent of demographic characteristics. There were no significant associations between those who frequently visit sit-down restaurants, as compared to those who do not, and any of the less healthful eating habit studies, controlling for all demographic characteristics. Given the typical offerings at fast food restaurants (e.g., hamburgers, desserts) (Kirkpatrick et al., 2014), a taste preference for meat, refined grain bread, and sweets may explain the strong association between reporting more frequent visits to fast food restaurants and less healthful eating habits. While it is reasonable to expect that demographic characteristics might play an important role in explaining the choice of eating-out establishments more commonly frequented, our data showed no significant effect based on educational attainment, a proxy measure for socioeconomic status. Our results suggest that taste preferences, convenience, or some other factor might explain the choices between visiting fast food or sit-down restaurants; frequent fast food consumers may choose to eat fast food because they prefer the foods commonly offered at fast food restaurants.

Our findings are at odds with the rationale behind policy interventions that seek to restrict establishment of fast food restaurants in order to improve the dietary behavior of consumers (Nixon et al., 2015). This rationale posits that restriction of fast food restaurants would reduce intake of unhealthy foods, and understates the importance of underlying taste preferences that drive overall eating behavior. However, we were not able to assess in this research the possibility that taste preferences for fast food fare may be conditioned by an obesogenic food environment where fast food is easily accessible and available (Birch, 1999).

The present study must be considered with its limitations. The data are cross-sectional in nature and preclude causal inference of associations. It is possible that less healthful eating habits increase the odds of fast food eating, and vice-versa. However, the temporal ordering of the models does not affect the key finding that fast food eating occasions and less healthful eating habits are significantly related, controlling for demographic characteristics. We did not collect data on the specific foods purchased at fast food and sit-down restaurants, and consequently cannot infer whether restaurant foods purchased were specifically linked to less healthful eating habits. The parent study of the present analysis is a nutrition intervention trial, which was not powered for effects considered in this analysis. Therefore, the null associations between frequency of sit-down restaurant eating and less healthful eating habits must be interpreted cautiously. We could not control for all potential confounding from individual (e.g., taste preferences) and environmental (e.g., neighborhood fast food restaurant availability)

factors. The external validity of findings may be limited to adults employed in sedentary occupations in the southeastern United States.

5. Conclusions

Frequent fast food consumers appear to regularly consume red meat, processed meat, refined grain bread, and sweet baked goods and candy. In comparison, sit-down restaurant eating frequency does not appear associated with less healthful eating habits. A taste preference for foods commonly offered at fast food restaurants may explain these findings; however, further research is needed. Nutrition education interventions such as menu labeling (e.g., physical activity calorie expenditure food labeling) may help effectively communicate the health impact of less healthful foods and modify food purchasing decisions among fast food customers (Antonelli and Viera, 2015). Policy interventions such as targeted unhealthy food taxes (Mytton et al., 2007) and advertising restrictions for unhealthy foods (Sonneville et al., 2015) may also be necessary to encourage development of positive food preferences and promote healthful eating. Future research should investigate effective health education approaches that encourage consumption of healthful food among fast food consumers and discourage younger consumers from developing a taste for fast food offerings.

Appendix A. Supplementary data

Supplementary data to this article can be found online at doi:10.1016/j.pmedr.2016.10.011.

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