The Influence of Caregivers and Meal Decision Makers on the Nutritional Content of Fast Foods Purchased for Children

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Contents

A. Abstract

Background: Fast food consumption has been shown to contribute to excess caloric intake and the development of obesity. Interventions that target key contributors to meal decisions have been suggested as a means for improving the foods that children select. Research suggests important points of intervention may be accompanying caregivers or meal decision makers. However, little is known about which caregivers accompany children to fast food restaurants and to what extent they influence meal purchases.

Objective: To determine whether there are differences in the caloric and nutritional content of foods purchased for children at fast food restaurants by categories of caregiver (e.g., mother, father, grandparent) or their characteristics (e.g., gender, BMI) or by meal decision makers (i.e., child, caregiver, or joint).

Design: Natural experiment: At three different time points, survey and receipt data were cross-sectionally collected from caregiver-child dyads at McDonalds and Burger King Restaurants in San Francisco County. Surveys inquired about their food purchases, demographic and anthropometrics, and relationship of the caregiver to the child. Nutritional content of fast food purchases were obtained from the companies' corporate websites, announcements, and press releases. Differences in nutritional content by different caregiver categories and characteristics and by meal decision makers were analyzed by multiple linear regression.

Results: Data from 761 caregiver-child dyads were analyzed. No statistically significant differences were found in the caloric content of fast food purchased for children by different caregiver categories or characteristics or by different meal decision makers.

Conclusion: This analysis has found no evidence that different caregivers or different meal decision makers influence calories purchased at fast food restaurants.

B. Introduction

The obesity epidemic and fast food as a major contributing factor

Over one-third of all children and adolescents in the United States are either overweight or obese.[1] Childhood obesity is linked to obesity in adulthood, as well as the development of metabolic syndrome, type II diabetes, cardiovascular disease, and other chronic diseases.[2]

The development of obesity is thought to be the result of complex interactions between genetics, lifestyle behaviors such as physical activity and dietary intake, environmental exposures, and other factors.[2-3] In terms of dietary factors, according to the Institute of Medicine,[4] increasing pressures to lower food costs and preparation time coupled with the increasing costs of fruits, vegetables, and other healthful foods leads to a rise in consumption of convenience foods. Convenience foods, such as fast food, are laden with calories and fat. These trends, compounded with the increasingly sedentary lifestyle of Americans, leads to an overall increase in energy intake and decrease in energy expenditure. This contributes to excessive weight gain that may lead to obesity. Results from several studies support a positive association between fast food consumption, excess caloric intake, and development of obesity.[5,6,7]

The contribution of fast food in children's diet

Throughout recent decades, there has been a rise in fast food intake among children in the United States.[8] In 1977, children consumed 23.4% of calories away from home; by 2006, that proportion has increased to 33.9%. Recent publications reveal that fast food currently comprises approximately 14.1% of children's total energy consumption[9] and 35% of empty calorie intake.[10] From 1977 to 2006, the contribution of fast food to total caloric intake of children and adolescents increased from 2% to 13%.[7] Fast food also became the predominant contributor to foods prepared away from home, eclipsing the amount of calories children consumed at school.[8] Fast food is currently the largest contributor of food purchased away-

from-home in children's diet.[11] About 33% of children under the age of 13 in the United States consume fast food every day;[12] 45% of those children consume foods from the kids' menu.[7]

From an analysis of NHANES data, [13] no associations were observed between children's ethnicity and fast food consumption. However, children with parents who had a college education were 36% less likely to consume fast food than those whose parents had less than a high school education. Compared with high-income families, children from a low-income family were 59% more likely to eat fast food. When compared with trends in obesity prevalence in the United States, children with parents in the low-income, low-education bracket are at a higher risk of obesity.[14]

The nutritional quality of children's meals at fast food restaurants

According to a report published by the Rudd Center for Food Policy and Obesity, less than 1% of 5,427 combinations of kids' meals from the 18 most popular fast food restaurants meet the Institute of Medicine's nutrition recommendations for healthy children's meals.[15,16] Kids' menus have also been compared against the Healthy Eating Index-2005 (HEI-2005), a tool used to assess nutritional quality of foods based on the USDA's *Dietary Guidelines for Americans.*[17] The HEI is comprised of various scoring categories, such as total fruit, whole grains, dairy, fatty acids, refined grains, and empty calories.[18] The maximum score is 100; a higher score is indicative of greater conformity to federal dietary guidelines. Kids' menus from five popular fast food restaurants scored an average of 56 out of 100 on the HEI-2005, denoting that these popular kids' menus significantly fall short of federal dietary guidelines.[19]

The association between fast food intake and diet quality along with its ramifications

On the days that children eat fast food, their diets are generally poorer[4] and they consume an average of 126 more calories than days without eating out.[7] Fast food intake is also associated with higher consumption of fat, saturated fat, sodium, and added sugars through sugar-sweetened beverages, along with lower consumption of vitamins A and C, milk, fruits and vegetables.[20] The likelihood of meeting the federal recommendations for dairy, fruits, and vegetables is lower in youth who consumed fast food.[21] Therefore a dietary pattern

characterized by frequent fast food and sugary drink consumption is an important factor implicated in the development of the metabolic syndrome,[22] type II diabetes,[23] and obesity[24,25] among children.

Establishment of healthy eating behaviors in childhood is important in the prevention of obesity because of its significant influence on eating patterns in adolescence[26] and adulthood.[27] Based on these findings, coupled with estimates of a high prevalence of fast food consumption among youth,[7] it is important for public health interventions to promote the purchase of healthy kids' menu items when children do eat out. This could help combat the high prevalence of childhood obesity[1] and decrease the enormous health care costs associated with the treatment of obesity and associated comorbidities.[28]

Nutritional gatekeepers: the key to changing children's fast food intake?

Due to limited resources, public health interventions should be aimed toward those who have the greatest influence on the eating behaviors of children. To improve the healthfulness of foods purchased for children in fast food restaurants, targeting the nutritional gatekeepers of the family is a more effective approach than attempting to reach the entire family.[13] Nutritional gatekeepers are those responsible for the majority of the acquisition and preparation of food for the entire family. It is estimated that they control 72% of all foods consumed by children, both within and outside the home.[29] Thus, interventions that can influence the nutritional gatekeeper to purchase healthier foods will impact a significant portion of the food that children consume.

Traditionally, mothers serve as the gatekeepers of foods served in the home.[30,31,32,33,34] However, little is known about who controls the foods that children consume outside of the home, specifically at fast food restaurants, and how the decision maker affects the nutritional quality of the foods chosen for the child in these settings. Elbel et al.[35] found that more calories were consumed at a fast food restaurant by unaccompanied children and adolescents, compared to those that were accompanied by a caretaker, who was predominantly a female. Information regarding the age of the unaccompanied children was not reported in the study. However, since the sampled unaccompanied children have the independence to visit fast food

restaurants on their own, the children in this category may generally be higher in age, thus consume more calories than younger ones. Elbel also found that children who visited fast food restaurants chose the meal 31% of the time; caregivers chose 57% of the time, whereas caregivers were involved in the purchasing decision 6% of the time. However, there is insufficient information available in the published literature regarding the dominant type of caregiver and the differences in foods ordered for children between different categories of caregivers. Some studies suggest that men purchase less healthful foods at fast food restaurants than women,[36,37] however, there is no evidence available on whether this purchasing pattern carries over to foods purchased for a child. Parents (not distinguished by gender) report that factors which affect fast food purchases for their children include convenience, habit, value, promotional products (e.g., a toy giveaway), healthfulness of the food, and the food preference of the child.[38] On the other hand, the major reasons that a child desires to visit a certain fast food restaurant are taste preferences and the toy giveaway. However, the finding regarding factors that affect purchasing decisions for children[38] is from a retrospective study that collected information from online surveys and is thus subject to measurement biases.

Contribution of this study to the gaps in published literature

This secondary data analysis fills a gap in existing knowledge about the determinants of the choice of foods that children eat at fast food restaurants. This study examines data from a study[39] which collected information outside of fast food restaurants from caregiver-child dyads immediately after they purchased food from the restaurant. Participants were asked to give their receipt to the data collector and answer survey questions. This type of natural experiment conducted in real-time eliminates some of the reporting and selection biases associated with data gathered retrospectively in other studies. This analysis describes whether a difference exists in nutritional content of foods purchased for children by various caregiver characteristics. Differences in nutritional content of foods purchased for children were also analyzed by who made the meal decision (i.e. caregiver, child, or joint). Knowledge of differences among nutritional content of these variables will inform and enable increased effectiveness in the

tailoring of future public health interventions that endeavor to increase the healthfulness of fast food purchased for children.[40]

C. Aims and Hypotheses

Aims

1) To describe the relevant characteristics of caregiver-child dyads who visit fast food restaurants in a sample of fast-food restaurant consumers in terms of caregiver type (such as mother, grandparent, or nanny); BMI, gender, race, and age of both caregiver and child; decision maker of the meal purchased for the child; association of child and adult BMI; and frequency of visits to fast food restaurants. Children who are 12 years old and under were the focus of recruitment in the original study design and thus in this analysis.
2) Based on select caregiver characteristics identified in aim 1, determine if there are differences in the nutritional content (i.e., calories, saturated fat, sodium, and fiber) of foods purchased for children.
3) Determine whether a difference exists in nutritional content of foods purchased for children among various decision makers (i.e. caregiver, child, or joint).

Hypotheses

1) It is hypothesized that meals purchased for children who were accompanied by female caregivers will be lower in calories, saturated fat, and sodium, and higher in fiber than children who were accompanied by male caregivers.
2) It is hypothesized that meals purchased for children who were accompanied by mothers will be lower in calories, saturated fat, and sodium, and higher in fiber than children who were accompanied by fathers or other caregivers.

3) It is hypothesized that meals purchased for children who were accompanied by caregivers who were not obese will be lower in calories, saturated fat, and sodium, and higher in fiber than children who were accompanied by caregivers who were obese.
4) It is hypothesized that meals purchased for children that were chosen by a parent or jointly between parent and child will be lower in calories, saturated fat, and sodium, and higher in fiber, than meals for children that were chosen by children themselves.

D. Implications of Research

If specific characteristics or type of caregiver is associated with the nutritional content of meals purchased for children, and/or if meal decision-making differentially affects purchases, then public health messages and interventions created to promote the purchase of healthier meals for children in fast food restaurants can be more effectively tailored and targeted.

E. Methods

Study Background

This secondary analysis examines data collected from 863 parent-child dyads at all McDonald's (MD; n=19) and Burger King (BK; n=11) restaurants in San Francisco County from 2011-2012. The primary purpose of the data collection was to assess the effects of the San Francisco Healthy Meals Incentive Ordinance (Ordinance #290-10, also known as the "toy ordinance") on fast food meal purchases and on restaurant food environments before and after the ordinance was passed. Briefly, the "toy ordinance"[41] prohibits giving away toys and other incentives with kids' meals that do not meet the nutrition criteria based on the nutrition recommendations for children's meals set by the Institute of Medicine of the National Academies[42] and the 2005 *Dietary Guidelines for Americans.*[11] The sampling was limited to MD and BK restaurants because of budgetary limits and results from research by Otten et al.[43] regarding a similar "toy ordinance" in Santa Clara County (Ordinance #NS-300-820)[44] that

suggested that children were most likely to request toys from these two specific national chains. Two MD restaurants were excluded from the first set of data collected because data collection was initially not permitted at those locations; data was, however, collected from all other locations.

The "toy ordinance" was enacted on December 1, 2011. The data was collected twice (January to March 2011; and October to November 2011) before the ordinance went into effect, and once afterwards (January to March 2012). The first pre-ordinance data collection matched the post-ordinance collection in terms of season. The study protocol was approved by the Stanford University Institutional Review Board; verbal consent was obtained from caregivers who participated in the survey.

Surveys

Each set of data was collected on weekends to minimize the differences of school being in or out of session during the lunch hour (approximately 11 AM - 3 PM). During each set of data collection that lasted for eight weekends, 4-6 trained data collectors were randomly assigned a set of restaurants and were asked to either collect ten surveys at each restaurant or stay until five hours of data collection had been completed at each particular restaurant, whichever occurred first. After data was collected at all restaurants using this protocol, locations in which fewer than 5 hours of data collection had been completed were revisited until 5 hours of surveying were completed at each restaurant.

The data was collected via interviewer-administered street intercept surveys, in which interviewers approached those from the target population and asked for their participation in a survey. The target population was the caregivers of 0-12 year-old children who purchased fast food at these restaurants. Data collectors who were stationed near the entrance of the restaurant at the designated survey period approached child-caregiver dyads who came to the restaurant and offered a $5 restaurant gift card to complete a 10-15 minute interviewer-administered survey after the dyad completed their purchases.

During the interview, participants were informed that the purpose of the study was related to child food purchasing decisions and were asked to provide their receipt. For

caregivers present with more than one child, the interviewer requested that the caregiver answer the survey questions regarding the child with the closest birthday to the current date.

The survey was conducted in both English and Spanish as appropriate. Questions on the survey inquired about the participants' habits related to fast food restaurant visits, attitudes and behaviors regarding the promotional products offered with kids' meals, knowledge of the "toy ordinance", details of the food order of the caregiver and the child, and self-reported age, anthropometrics and demographical information for both caregiver and child. When a receipt was available, food purchase responses were verified with the receipt.

Questions from the surveys were derived from relevant questions of other surveys conducted with similar topics such as the ones used by the Rudd Center for Food Policy & Obesity,[26] which had been tested multiple times for reliability. Reliability of the surveys was also established by alternate-form reliability, as some of the questions were asked two to three times in different forms. No criterion validity was measured because of a lack of a "gold standard" for comparison. The survey was piloted several times for face validity and was also analyzed by a team of project consultants for content validity.

Nutritional Information

Using information obtained from the corporate websites, announcements, and press releases from MD and BK, a nutritional database was synthesized. Surveys with items that did not have adequate and verifiable information available on the web were excluded from the sample. If there was no indication of the size of an item purchased, the smallest size available on the menu was assumed. For items with unclear indications of customization, such as dipping sauce used, then an average energy and nutrient value for all variations of that item was used. For participants who expressed that they shared an item, the item was divided equally among the number of people who shared it. The nutritional information calculated for each item included calories and grams of fat, saturated fat, trans fat, sodium, sugar, fiber, and protein. Entries in the database were based on self-report instead of the receipt because results from Otten et al.'s pilot work in Santa Clara County indicated that receipts either were incorrect (in 50% of their pilot purchases) or contained insufficient information regarding customization and

sizes of items purchased. Data from the surveys were double-data entered by two different research team members, and a data manager cross-checked and reconciled all errors. One staff member inputted all nutritional data, and a data manager double-checked the entries.

Statistical Analysis

Descriptive statistics were calculated to characterize the caregiver-child dyads. The primary outcomes of interest were: differences in nutrient content of foods purchased for children between (1) different caregiver characteristics, and (2) different meal decision makers.

Multiple linear regression analysis was applied to investigate whether there was significance in the total calories, grams of saturated fat, sodium, and fiber in the foods purchased for children by caregivers with differing characteristics. These analyses controlled for race, age, BMI, and gender of the child along with time point surveyed. Multiple linear regression analysis controlling for the same variables was also performed to analyze the nutritional differences in meals purchased for the child with differing decision makers. Table 1 details the significance of differences in sample characteristics among the various time points published by Otten et al.,[39] who performed the analyses utilizing the same dataset. The variables selected for Table 1 are those that are controlled for in the linear regression analyses performed.

Robust standard errors were used for all linear regression analyses conducted to account for the presence of heteroscadasticity in the data. The pre-determined alpha value was 0.05. However, due to the multiple number of hypotheses tested in the data analysis, the Bonferroni-corrected alpha value of 0.0125 was used to establish statistical significance.

Table 1. Significance of differences among survey time points[a] in selected variables[b] (from Otten et al.[39])

Differences in Characteristics of Sampled Children	**p-value**
Race	<0.001
Age group	0.03
BMI category	0.85
Gender	0.28
Differences in Total Calories	
All children's orders	0.2
Children's meals only	<0.001

[a] The time points are: pre-ordinance 1 (Jan-Mar 2011), pre-ordinance 2 (Oct-Nov 2011), and post-ordinance (Jan-Mar 2012)

[b] Variables selected are those controlled for in linear regression analyses performed for this study

Because children consume more calories,[4] saturated fat, and sodium, while consuming less fiber[13] on days that they eat fast food, a statistically significant difference found in calories among the various variables investigated the analysis in this study may be linked with a significant difference in saturated fat, sodium, and fiber as well. Therefore, an a priori decision was made to only further probe for differences in nutritional content (i.e. saturated fat, sodium, and fiber) in foods purchased among variables in which there was a statistical difference in calories. Otherwise, for analyses in which the calories did not significantly differ among the variables of interest, other nutritional content of the meals purchased were not analyzed. In addition, the menu labeling that was mandated in fast food restaurants over the study time period only included the amount of calories for the items, thus calories are expected to be the sole nutrient value considered in those who utilize the menu labeling information to inform purchasing decisions since information regarding other nutrients was not readily available.

F. Results

There were a total of 863 caregiver-child dyads surveyed at MD and BK restaurants in this study across all three time points. This analysis merges data on all caregiver-child dyads from all time points into one set and will not distinguish between the time points. Out of the 863 dyads surveyed, there were 761 dyads included in the analysis. Children who were older than 12 years old were excluded (n=9), since they are considered to be adolescents and thus not the focus of this study. The exclusion of other dyads was due to factors that included incomplete or incorrect food orders or other information, along with participants' refusal to answer certain survey questions (n=93) such as those regarding anthropometrics, age, and race.

In terms of the study population, about 85% of the children in the study sample were accompanied by a parent to the restaurant, while the remaining 15% came with other types of caregivers such as a nanny, grandparent, or other relative. While the proportions of male and female children were almost equal, there were significantly more female (64%) than male caregivers (36%).

Based on calculated BMI from self-reported height and weight measurements, approximately 17% of caregivers are in the obese category whereas 34% of children are overweight or obese, which is similar to San Francisco county statistics: 27% of San Francisco adults are overweight and 17% are obese;[45] 32% of children are either overweight or obese.[46] In this dataset, there is no correlation between caregiver and child BMI (Figure 1).

Approximately 20% of participants were white, 13% were black, 32% were Hispanic, 21% were Asian, and the remaining 10% of participants identified themselves as distinct from the above categories. The racial makeup of the children in the sample is similar to the adults. San Francisco's racial composition comprises of 58% white, 7% black, 14% Hispanic, and 31% Asian.[47] Thus, compared with county data, there is a lower proportion of white participants and a higher proportion of black, Hispanic and Asian participants in this dataset. Per the results from publication by Otten et al.,[39] although there were no differences observed between time points in the children's age, BMI, and gender, there was a significant difference? between the racial/ethnic composition among children from the different time points (Table 1). Despite this,

there were no differences in calories purchased for children across race/ethnicity groups or between time points by race/ethnicity category.

Almost half of the caregivers were between the ages of 30 and 39, while 22% of caregivers are ages 18 to 29, another 22% are between ages 40 and 49, and 10% are at least 50 years old. The majority (67%) of children in the sample are between the ages of 3 and 8, approximately a quarter of children are 9 to 12 years old, and about 8% are ages 0 to 2.

More than half (55%) of the children sampled made the purchasing decision for their meals; about 27% of the caregivers were the decision maker, whereas 18% of the sample dyads decided jointly.

The average frequency of visits to fast food restaurants is 5 times per month, with a range of 0 to 60.

Further details of descriptive statistics characterizing the caregiver-child dyads who participated in the study are provided in Table 2.

Table 2. Caregiver-child dyad characteristics[a]

	%	**N**
Caregiver Characteristics		
Type of Caregiver		
Mother	54	418
Father	31	240
Other	15	110
Gender		
Male	36	279
Female	64	493

BMI		
<30	83	554
>=30	17	111
Race/Ethnicity		
White	19	149
Black	13	98
Hispanic	33	252
Asian	21	165
Other	10	74
Age		
18-29	22	173
30-39	46	356
40-49	55	169
>=50	10	78
Characteristics of Child		
Gender		
Male	51	386
Female	49	370
BMI[b]		
<5th percentile (Underweight)	3	26

5-85th percentile (Normal)	63	169
>/=85th percentile (Overweight or obese)	34	262
Race/Ethnicity		
White	18	134
Black	12	91
Hispanic	32	234
Asian	22	159
Other	17	123
Age[c]		
0-2	8	64
3-8	67	523
9-12	24	189
Decision Maker of Child's Meal Choice		
Child	55	410
Caregiver	27	206
Joint[d]	18	137
	Mean (SD)	***Range***
Frequency of visits to fast food restaurants per month	5 (5.5) Median = 4	[0, 60]

[a] Not all survey responses reflect the full sample size because parents/caregivers either declined to answer or (more often) did not know answer to question.

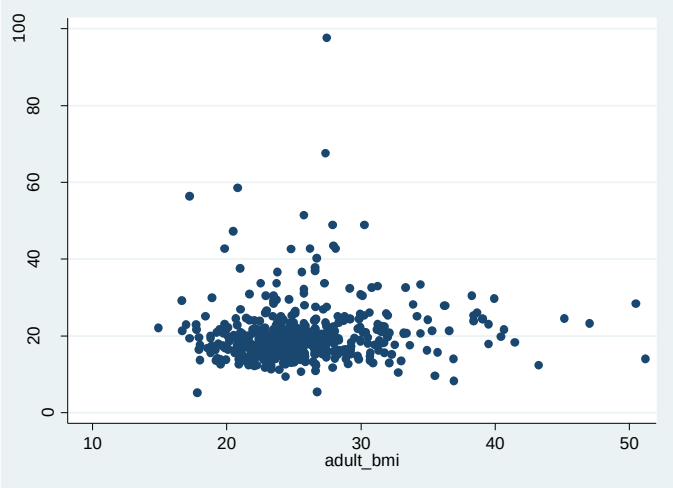
[b] BMI was not reported for children younger than 3 years. BMI values (kg/m^2) calculated on the basis of self-reported height and weight; BMI categorized according to age- and gender-specific percentiles.

[c] Ages >12 excluded due to limited data points and original recruitment strategy that aimed to target a population 0-12 year old children.

[d] A joint decision between child and the caregiver.

Figure 1. Correlation Between Child and Adult BMI

Correlation coefficient = 0.0796



There was no significant difference found in the total calories of the meals purchased for the child by various caregiver characteristics. All of the *p*-values obtained were above the Bonferroni-corrected alpha value of 0.0125. A similar result was found for the total calories purchased by different decision makers of the child's meal. The results from the regression analyses are shown in Table 3. Average calories in meal purchased for child by different variables are also graphically displayed in Figures 2–5.

Table 3. Differences in Nutritional Content among Foods Purchased For Children by Different Categories of Caregivers

Caregiver Characteristics	**Calories** Mean	**Robust standard error**	***p*-value**
Mother	649	50	0.056
Father	665	51	0.204
Other[a]	746	Omitted	Omitted due to collinearity
Male	681	30	0.254
Female	660		
BMI <30	678	37	0.229
BMI >=30	598		
Decision Maker of Child's Meal Choice	**Calories** Mean	**Robust standard error**	**p-value**
Caregiver	612	45	0.140
Child	676	40	0.160
Joint[b]	715	Omitted	Omitted due to collinearity

[a]Other types of caregivers include grandparent, aunt, uncle, older sibling, stepparent, godmother, nanny, niece, nephew, cousin, and guardian.

[b]A joint decision between child and the caregiver.

Figures 2-5: Average calories in meal purchased for child by different variables, with robust standard errors

Figure 2: Average Calories in Meal Purchased for Child by Caregiver Type

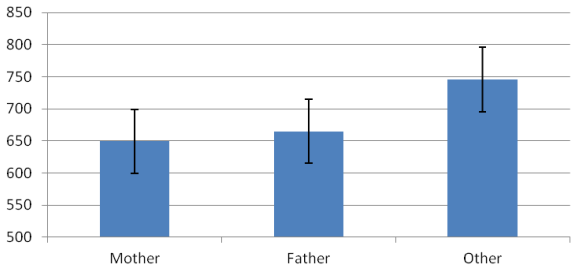


Figure 3: Average Calories in Meal Purchased for Child by Caregiver Gender

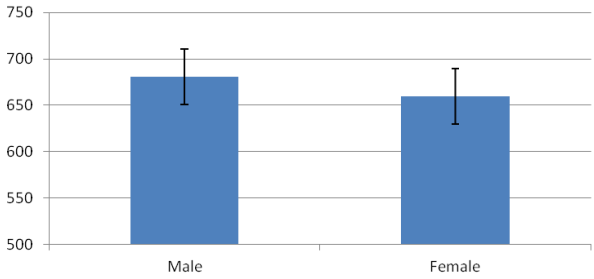


Figure 4: Average Calories in Meal Purchased for Child by Caregiver BMI

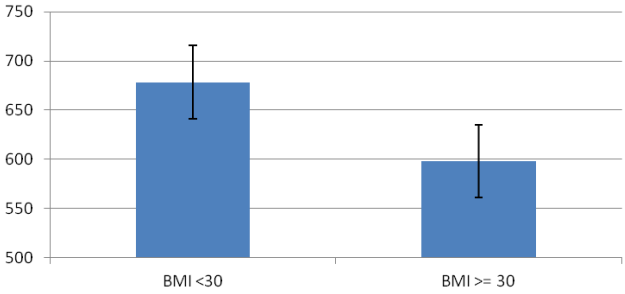
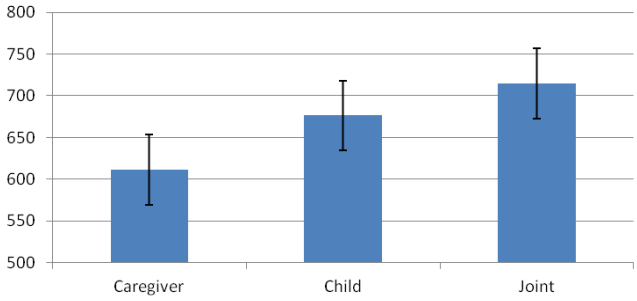


Figure 5: Average Calories in Meal Purchased for Child by Meal Decision Maker



G. Discussion

The main purpose of this secondary analysis was to investigate whether various caregiver characteristics and/or meal decision makers were associated with a difference in calories in meals purchased for children at fast food restaurants. This analysis of responses obtained from 761 child-caregiver dyads in San Francisco County found no statistically significant differences in calories purchased in meals for children across various caregiver characteristic categories (relationship to child, gender, and BMI category) or by meal decision maker (i.e., caregiver, child, joint). Thus, the a priori hypotheses are not supported by the analyzed data.

Although some studies indicate that men purchase less healthful fast food meals than women,[31,32] and that menu labeling information decreases the amount of calories in food purchased by women but not men[48], this difference between the genders does not affect the calories in food that is purchased for children by their caregivers. This result is also contrary to the findings of Elbel et al.[30], who found a difference in the average calories purchased by different decision makers: child (501 calories; n=57), caretaker/parent (630 calories; n=103), and together (555 calories; n=10) (ANOVA *p*-value=0.04). However, the results that were obtained in this analysis may be more accurate due to a higher sample size (n=761) than the Elbel study (n=181) or findings may differ based on geographical location and/or fast food locations: MD and BK in San Francisco in this study versus MD, BK, Wendy's, and Kentucky Fried Chicken in New York City and Newark in Elbel's study.

These results may be explained by the following factors: unavailability of caloric information, a lack of skill in the interpretation of caloric information, the importance of taste in the purchasing decision, the lack of healthy options available, and unanalyzed complexities and interactions among variables in the data set.

The first proposed factor was that caloric information could have been unavailable in some or all the restaurants included in this analysis and so caregivers were unable to use that information to inform their purchasing decision. However, the state of California had already instituted the menu labeling policy[49] prior to the start of data collection and thus information regarding calories was posted on menu boards in all the restaurants surveyed. Although information regarding calorie content was posted in all sampled restaurants during data collection, this likely did not impact purchasing decisions as Tandon et al.[50] found that menu labeling did not alter the caloric content in foods purchased at fast food restaurants for children. In cases where children chose the meal for themselves, they may lack the ability and interest to interpret and utilize the menu labeling information in their decision making process. Due to the relatively new implementation of menu labels in fast food restaurants at the time of data collection, the caregivers themselves may not be accustomed to and/or be skilled at utilizing calorie information in a manner that positively influences the calorie content of the meal chosen.

The absence of differences in the results among various caregiver characteristics and decision makers may also be due to the strong influence on taste in the meal decision making process.[26, 33, 42] Studies on development of taste preferences note that children prefer sweet and salty foods,[51] and repeated exposure to certain foods reinforces preferences.[52] Those who frequent fast food restaurants and repeatedly consume foods high in salt, fat, and sugar have a trained palate to prefer those types of foods.[53] However, foods that are high in salt, fat, and sugar also tend to be more calorically dense. Therefore, if taste is the main factor determining the meal chosen by the dyads in this study, it is unsurprising that no differences were seen in calories in the meal purchased for the child when comparing various caregiver characteristics and decision maker combinations. In addition, because the vast majority of menu options are

homogenously poor in nutritional quality,[19] this absence of healthful choices coupled with the domineering factor of taste considerably elevates the difficulty in choosing a tasty, low-calorie meal. Hence, the need for a tasty choice coupled with the unavailability of low calorie menu items may have also lead to the lack of difference of calories in meals chosen. Because of the significant proportion of children who participate in choosing their meals (55% of children chose their meal alone and another 18% chose along with their caregiver), this may suggest that public health interventions which target menu offerings in fast food restaurants along with children's meal preferences may have a more notable impact than those that target caregivers.

Furthermore, the failure to identify an association between caregiver characteristics/decision makers and calories purchased in meals for children seen in this analysis may also be due to the many complexities associated with and interactions among the characteristics examined, such as BMI. Further sub-categorization of specific caregiver characteristics (e.g. comparing the differences among obese male, obese female, non-obese male, and non-obese female) may need to be differentiated in order to see differences of calories in meals purchased for children.

H. Strengths and limitations

Strengths of this study include collection of real-time data from a racially/ethnically diverse population instead of retrospective surveys or data collected from a laboratory setting. Sampling across multiple time points throughout 2011 and 2012 also diminishes seasonal effects on the data whereas data collection from all (except two) restaurants from two major fast food restaurant chains in San Francisco County further increases generalizability of the results. Statistical control of potential confounders also lowers the potential biases seen in results.

Due to the inclusion of data collected from only one county in California, this data may not be applicable to other geographic locations with different demographic makeup, environmental factors etc. Self-report bias may also be present and influence the data,

especially in responses sensitive to social desirability such as anthropometric information.[54] Other biases include the use of the street-intercept method, which may cause some dyads to decline participating in the survey and may also introduce reporting bias since participants may alter their answers to be more socially desirable. Because of a low proportion of dyads with certain characteristics (e.g. there were many more female than male caregivers), these factors may also lead to biases present in the results.

Despite these limitations, this analysis contributes to the existing research on the amount of influence that various caregiver characteristics and meal decision makers have on the caloric content of children's fast food meals.

I. Conclusion and public health implications

The results from this study, in conjunction with other studies investigating children's fast food intake, can be useful when designing public health interventions aimed at changing the fast food consumption habits of children. Due to the lack of association seen in this analysis, it should not be assumed that certain caregivers (e.g. mothers or female caregivers) will be more conscious of caloric content in fast foods purchased for children or that children or adults as meal decision makers will make different choices that impact the amount of calories purchased. Because of the prevalent and significant role that children play in choosing their meal in fast food restaurants in conjunction with the dominance of taste in meal selections and the limited availability of healthful menu items, interventions such as modifications in marketing targeted to children, changes in menu offerings (e.g. reformulations of existing items, substitution of healthier meal items, elimination of less healthy meal items) at fast food restaurants, along with increased exposure to more healthful foods (e.g. at home or in school) might be appropriate interventions to test to see if they alter meal preferences and lead to a desire for healthier fast food purchases.

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