

Understanding Spending Habits and Buying Behavior of the American Muslim Community: A Pilot Study

Oral Capps, Jr.,^a Asma Ahad,^b and Peter S. Murano^c

^a*Executive Professor and Regents Professor, Department of Agricultural Economics
Texas A&M University
600 John Kimbrough Blvd, Suite 371, College Station, TX 77843 USA*

^b*Director of Halal Market Development,
Islamic Food and Nutrition Council of America
777 Busse Highway, Park Ridge, IL 60068 USA*

^c*Associate Professor, Department of Nutrition and Food Science
Texas A&M University
188 Cater-Mattil, College Station, TX 77843 USA*

Abstract

This study provides a baseline for the spending habits and buying preferences of American Muslims lacking in the extant literature. We examine American Muslims' food and beverage spending habits and buying behaviors with regard to halal products using a survey of 195 individuals from the Chicago metropolitan area and a discrete choice modeling framework. The chief drivers in the decision to purchase food and beverage items were the purchase of halal beef, the amount spent weekly in grocery stores, the frequency of hosting Ramadan, household income and size, and ethnicity (in that order).

Keywords: American Muslims, food and beverage choices, probit/logit analysis

[®]Corresponding author: Tel: (979) 845-8492
Email: ocapps@tamu.edu

Background

In 2016, U.S. grocery stores realized about \$625 billion in sales (U.S. Census Bureau, 2017). Muslims living in the United States are estimated to spend up to \$20 billion on food and beverage products annually (Dinar Standard, 2015; IFANCA, 2017), just over 3% of total U.S. grocery stores sales. The Pew Research Center estimates the U.S. Muslim population to have been about 3.3 million in 2015 (Mohamed, 2016), roughly 1% of the current total U.S. population. By 2050, the Pew Research Center estimates that the American Muslim population will reach about 8 million, roughly 2% of the U.S. population (Mohamed, 2016).

In 2014, the American Muslim Consumer Market Study (AMCMS) surveyed 973 American Muslims from every major ethnic and geographic segment in the United States, paying special attention to spending and consumption habits. The AMCMS was produced by Dinar Standard in partnership with the American Muslim Consumer Consortium (AMCC). According to the 2014 AMCMS, there is unprecedented opportunity for the retail food industry to target this largely disregarded, untapped demographic. American Muslims wish to see quality halal products in the marketplace that reflect their values and to help them become more integrated into American society. Further, American Muslims are very willing to financially support businesses that meet their demands and openly value them as consumers (AMCMS, 2014). Opportunities exist for businesses—particularly in the food industry (producers, processors, distributors, wholesalers, retailers, and food service purveyors)—that are ready to meet these demands.

According to the 2014 AMCMS, 93% of respondents stated that they purchase halal food products for their homes, a clear indication of demand for such products. Moreover, 86% of respondents were eager to see more halal products available at their local supermarkets. This demand not only creates opportunities for national retailers but also for American Muslims, may be willing to pay a premium to see their values reflected in their shopping choices.

Objectives

The economic and marketing literature dealing with spending habits and buying preferences of American Muslims is sparse. Alam and Sayuti (2011) identified several behavioral predictors—including consumer confidence, intention, and perceived behavior control. Golnaz et al. (2010) focused on non-Muslim awareness of halal principles in reference to food products in Malaysia. Omar et al. (2012) discussed the direct effects of halal product purchases on International Muslim consumers. Additionally, Yunus et al. (2014) studied consumer purchase behavior of halal products produced by non-Muslim manufacturers (Yunus, et al. 2014). Our study builds on this foundation by investigating the predictors of specific halal food and beverage purchasing behaviors among American Muslim consumers residing in the Chicago metropolitan area.

Aside from the 2014 AMCMS, no other economic or marketing studies have examined the American Muslim community. While the 2014 AMCMS provides useful descriptive information, the report does not consider specific food and beverage items. To fill this research void, our objective is to report on a pilot study conducted in the northern suburbs of Chicago in 2016 in order to develop a better understanding of American Muslims' spending habits and buying behavior with regard to selected food and beverage products. The Islamic Food and Nutrition

Council of America (IFANCA) developed and carried out the survey, labeled the Halal Pantry Project, of 195 individuals residing in the Chicago metropolitan area, where IFANCA's headquarters are located.¹

Specific objectives include providing descriptive statistics of survey responses and profiling American Muslims residing in the Chicago metropolitan area. To address the first objective, we tabulate response counts by percentage of respondents for each survey question. We then summarize the responses on a question-by-question basis. To address the second objective, we estimate binary choice models to provide profiles of respondents who purchased the specific items, including dates, fruits, vegetables, chickpeas (high-protein legumes), graham flour (named after Sylvester Graham, 1794-1851), rice, halal lamb, halal beef, halal chicken, pastry sheets, spring roll wrappers, mango pulp (native to South Asia), rooh afza (non-alcoholic beverage concentrate), frozen appetizers, yogurt, tea, bottled water, ready-to-eat desserts, popcorn, and paper goods/disposable servingware. We performed separate analyses for each item in order to develop a profile of U.S. Muslims purchasing them. These profiles are based on the sociodemographic characteristics and purchasing habits of survey respondents.

Our findings help ascertain American Muslims' buying preferences (at least in a particular geographical area). Subsequent research efforts can replicate our methodology in other regions. This pilot study provides a baseline for the spending habits and buying preferences for twenty food and beverage items that had previously been lacking in the literature. As such, given rising interest in and the growing importance of the American Muslim community, we provide information to stakeholders in the U.S. food industry supply chain. In doing so, this research may result in opportunities for stakeholders in the food industry that are ready to meet the demands of the American Muslim community.

Methodology

U.S. Muslims are largely concentrated in key metropolitan areas in the United States. The top five states in terms of Muslim population are: (1) California (Los Angeles and San Francisco Bay area); (2) New York and the surrounding tri-state area; (3) Michigan (Dearborn and Detroit); (4) Illinois (Chicago); and (5) Texas (Houston and Dallas). In some cities, Muslims comprise more than 1% of the community (Mohamed, 2016). Consequently, the findings from this study may not be representative of Muslims residing in the United States. Because this survey focuses on respondents from the Chicago area, this work constitutes essentially a pilot study. However,

¹ Established as a non-profit organization in 1982, IFANCA is an internationally recognized certifying organization active in the United States, Southeast Asia, and parts of the Arabian Peninsula. Their website (www.ifanca.org) provides a database of halal-certified products on that allows users to determine whether items they purchase are certified halal. They also offer generic guidelines on what types of foods can be consumed and what types of foods should be avoided and a list of companies that have had their halal certification removed by IFANCA to help users find grocers and companies that accurately produce halal food products. Their website also has basic information about Islam, halal, and other research-based articles and activities in which IFANCA has participated, particularly in the United States.

this study provides a baseline of information relevant to food and beverage purchasing behaviors in one of the top areas of Muslim Americans residing in the United States.

The Islamic Food and Nutrition Council of America (IFANCA) designed and implemented the survey to address specific retail needs of Muslims residing in the Chicago metropolitan area. The survey was distributed at the Muslim Education Center (MEC) in Morton Grove, Illinois, a private K-8 Islamic school located in the northern suburbs of Chicago. All of the students attending this school are Muslim, and a majority are of South Asian descent. However, other ethnicities are represented, including Arab, African American, and European Muslims. Parents received this survey in a school-to-parent email that provided a link to Survey Monkey. Parental responses to the survey were completely voluntary, and parents were not compensated in any manner for their responses. It was assumed that the respondents, being parents of K-8 students, were adults of or near childbearing age. The final sample consists of 195 responses of families residing in the northern suburbs of Chicago. Survey administration was designed to keep costs manageable.

From a sociodemographic perspective, American Muslims tend to have more children than Americans of other religious faiths. The average age of Muslims tends to be younger than that of the general public (Irfan, 2014). American Muslims also have much higher rates of education than other demographic segments (Irfan, 2014). Roughly 30% of the Muslim community have an undergraduate degree, 25% have attended graduate school, and 5% possess a PhD degree, much higher rates than U.S. national averages (Irfan, 2014).

Design of the Survey Instrument

In order to minimize the time needed to complete the questionnaire, the survey instrument was limited by design to nine questions (see the Appendix). These questions pertained to ethnicity, household size, total weekly spending on groceries, the number of times hosting occurred during Ramadan, openness to trying new food and beverage products, household income, and importantly, food and beverage items purchased in grocery stores as well as food and beverage items purchased in preparation for/during Ramadan. Certain questions were not addressed, including the respondent's gender, age, level of education; and citizenship status. Further research will not only replicate the study across other regions but also address these questions to overcome the limitations of this pilot study.

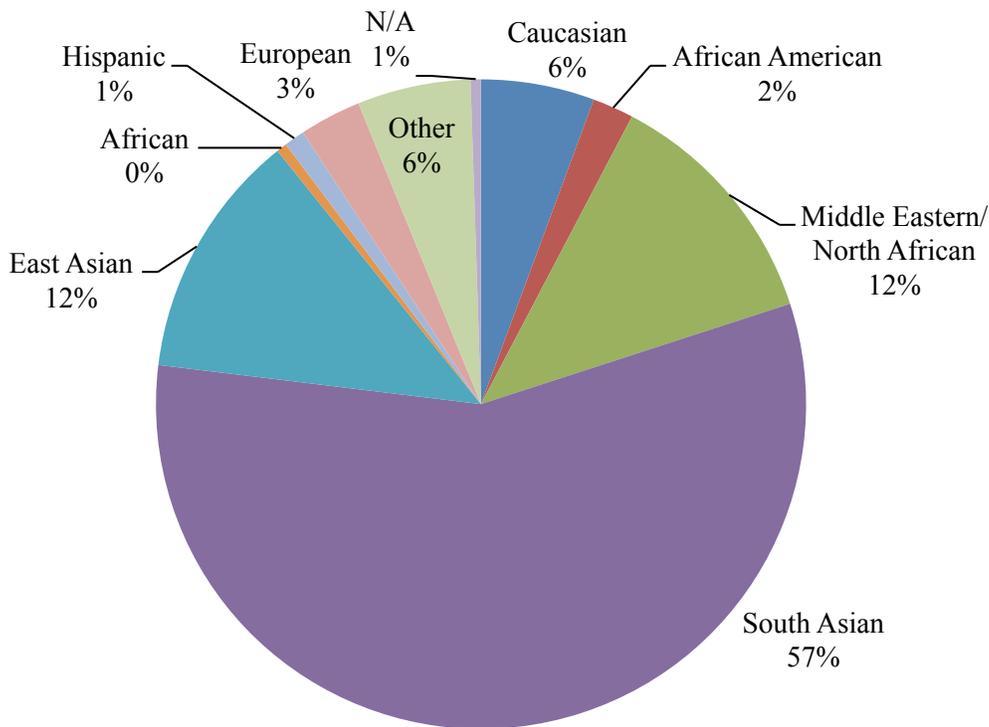
Survey Results Question-by-Question

Key findings from the survey include:

- About 60% of respondents were South Asian, 12% were Middle Eastern/North African, 12% were East Asian, 6% were Caucasian, and 3% were European.
- Median household size was 4.
- Median household income was \$87,500.
- Median total weekly grocery spending was \$200.
- Median weekly grocery spending per person was \$37.50.

- 62% of respondents spent more on groceries during Ramadan than in other months.²
- Among those who spent more on groceries during Ramadan, the median additional amount spent was \$200.²
- Close to 60% of respondents hosted 1 to 4 times during Ramadan, while close to 30% did not host at all.²
- About 95% of respondents were open to trying new food and beverage products.
- The most popular food and beverage items in terms of the percentage of respondents purchasing were (1) fruits (98%); (2) vegetables (97%); (3) rice (93%); (4) halal chicken (92%); (5) yogurt (88%); (6) tea (84%); (7) halal beef (81%); (8) halal lamb (68%); (9) chickpeas (58%); (10) bottled water (54%); and (11) popcorn (53%).
- The least popular food and beverage items in terms of the percentage of respondents purchasing were: (1) rooh afza (15%); (2) spring roll wrappers (27%); (3) mango pulp (28%); (4) pastry sheets (35%); (5) graham flour (37%); (6) frozen appetizers (37%); (7) dates (41%); and (8) ready-to-eat desserts (45%).

Figures 1–10 present survey responses details.



² Ramadan typically falls between late May and late June and lasts approximately 30 days. Fasting during Ramadan, called *sawm*, is one of the five pillars of Islam that are important to Muslims. The physical fast takes place daily from sunrise to sunset. Before dawn, those observing Ramadan will gather for a pre-fast meal called *suhoor*; at dusk, the fast will be broken with a meal called *iftar*. Both meals may be communal, but the *iftar* is an especially social affair when extended families gather to eat and mosques welcome the needy with food. Focusing on Ramadan allows us to capture potential differences in purchases of selected foods and beverages during and outside this period of time.

Figure 1. Question 1: What Is Your Ethnicity?

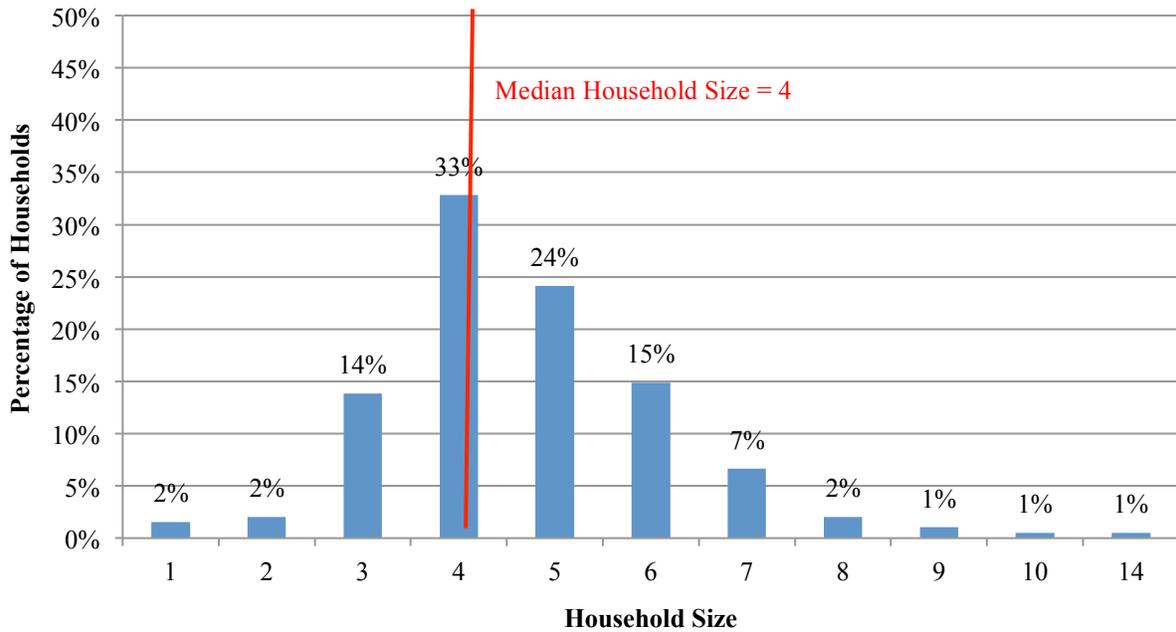


Figure 2. Question 2: How Many People Currently Live in Your Household?

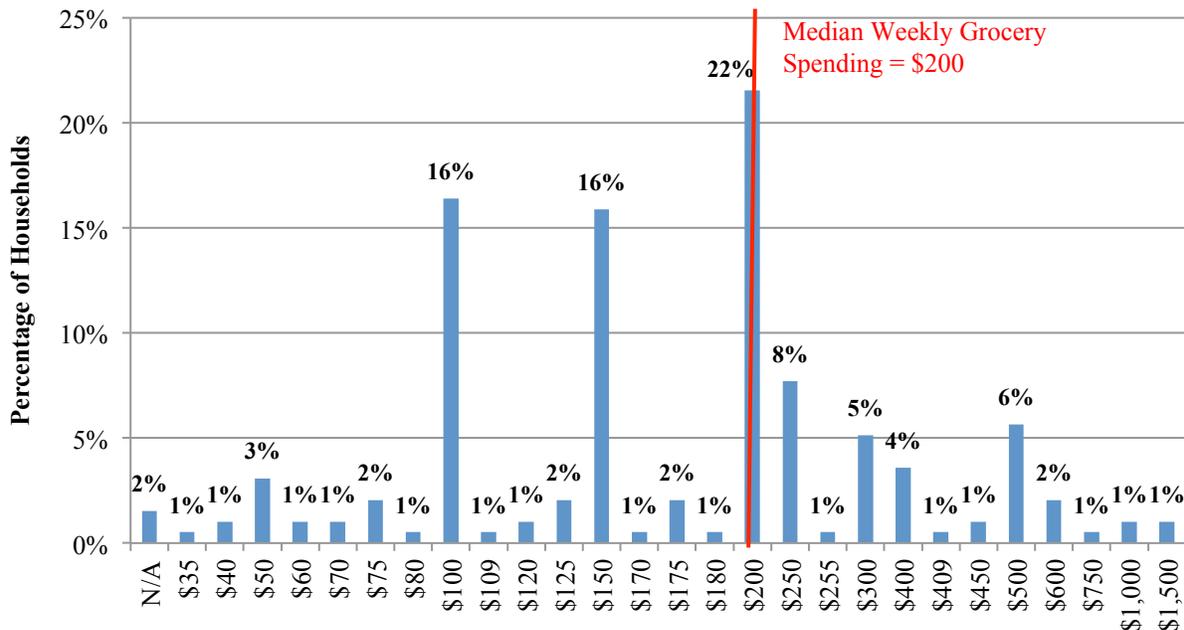


Figure 3. Question 3: What Is Your Total Weekly Spending on Groceries?

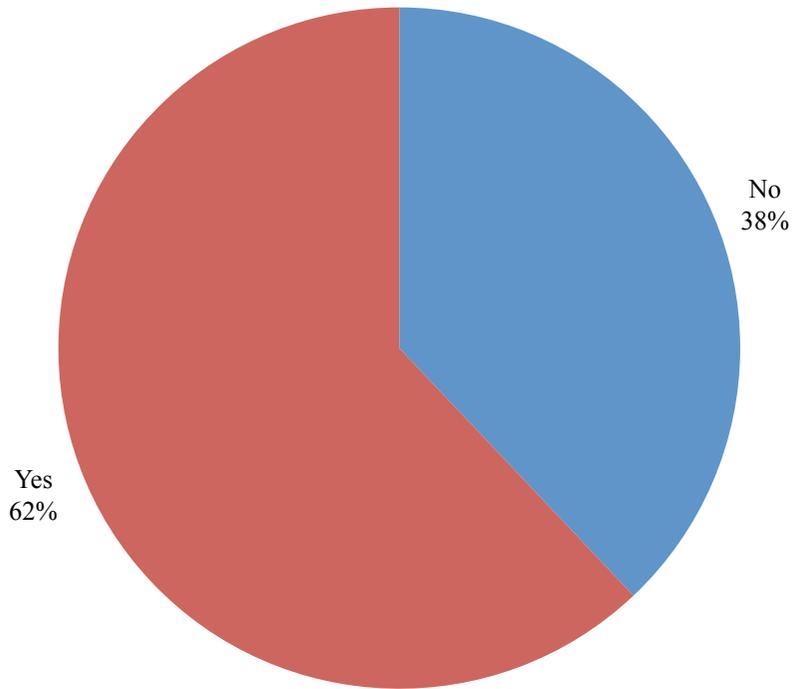


Figure 4A. Question 4A: Do You Spend More on Groceries during Ramadan?

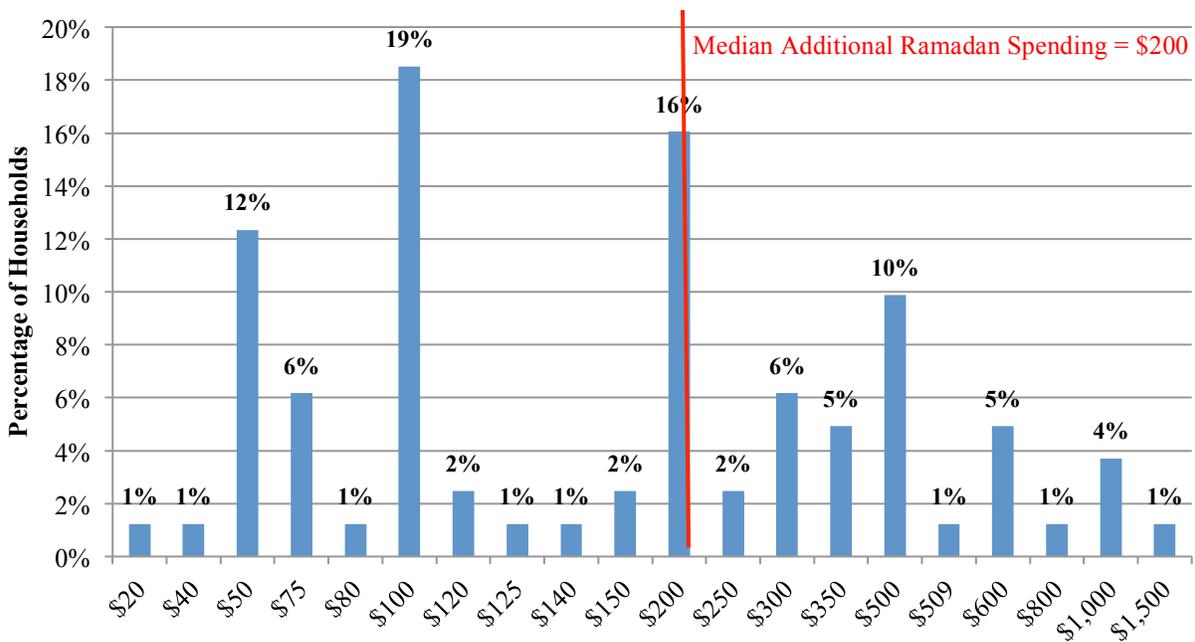


Figure 4B. Question 4B: If Yes, How Much, Please Specify:

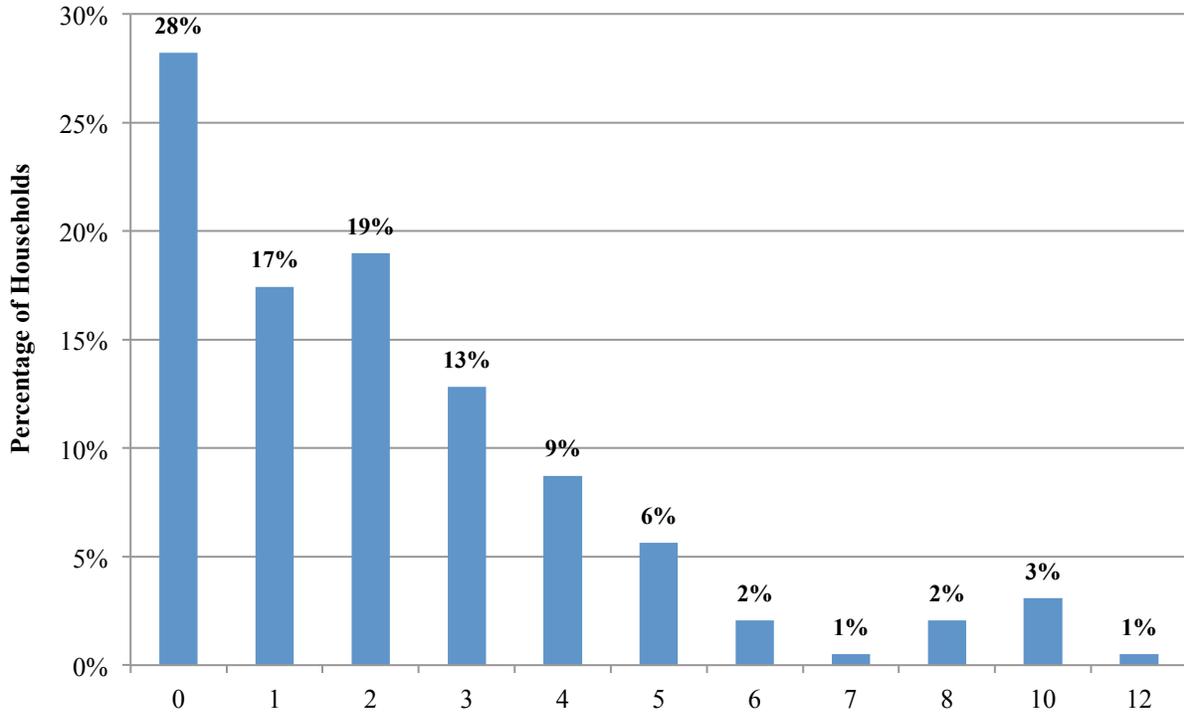


Figure 5. Question 5: How Many Times Do You Host during the Month of Ramadan?

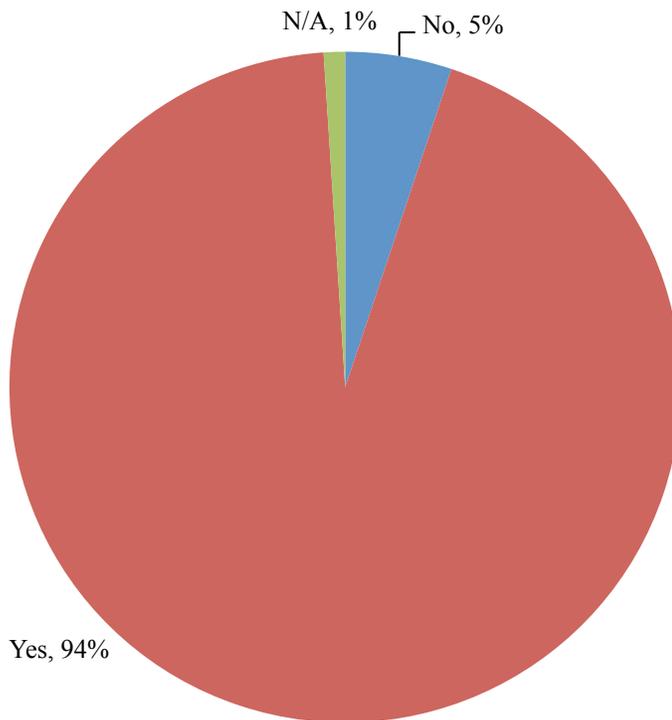


Figure 6. Question 6: I Am Open to Trying New Food and Beverage Items?

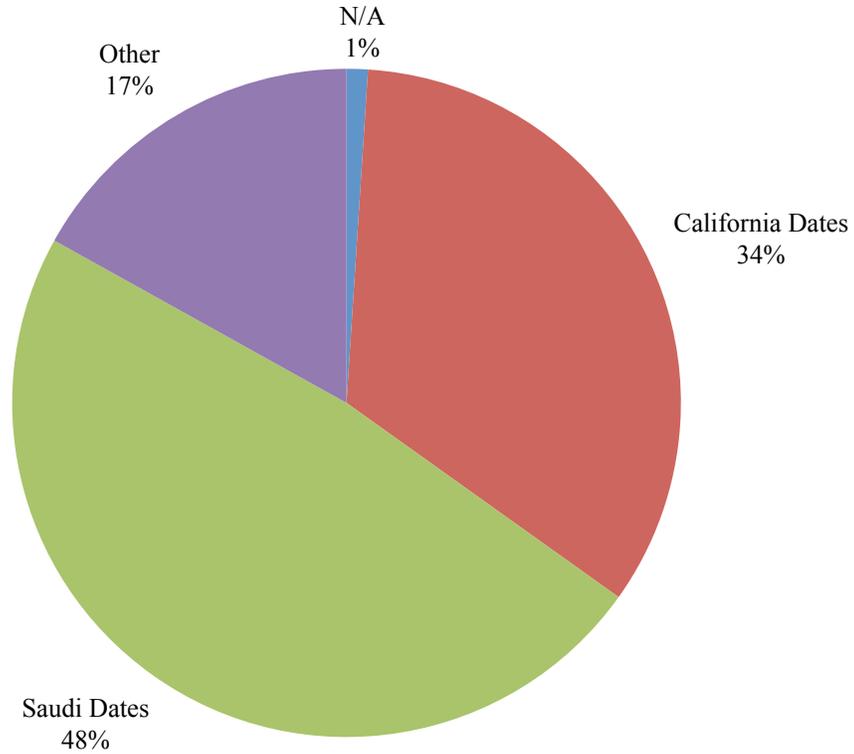


Figure 7. Question 7: What Types of Dates Do You Prefer to Buy/Consume during Ramadan?

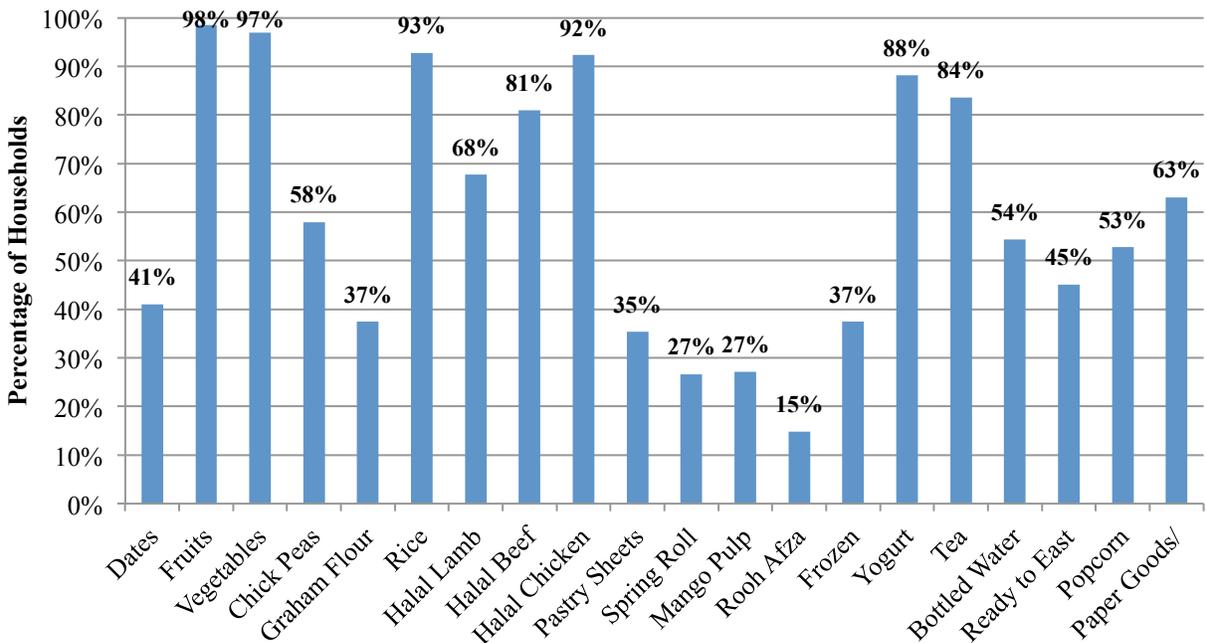
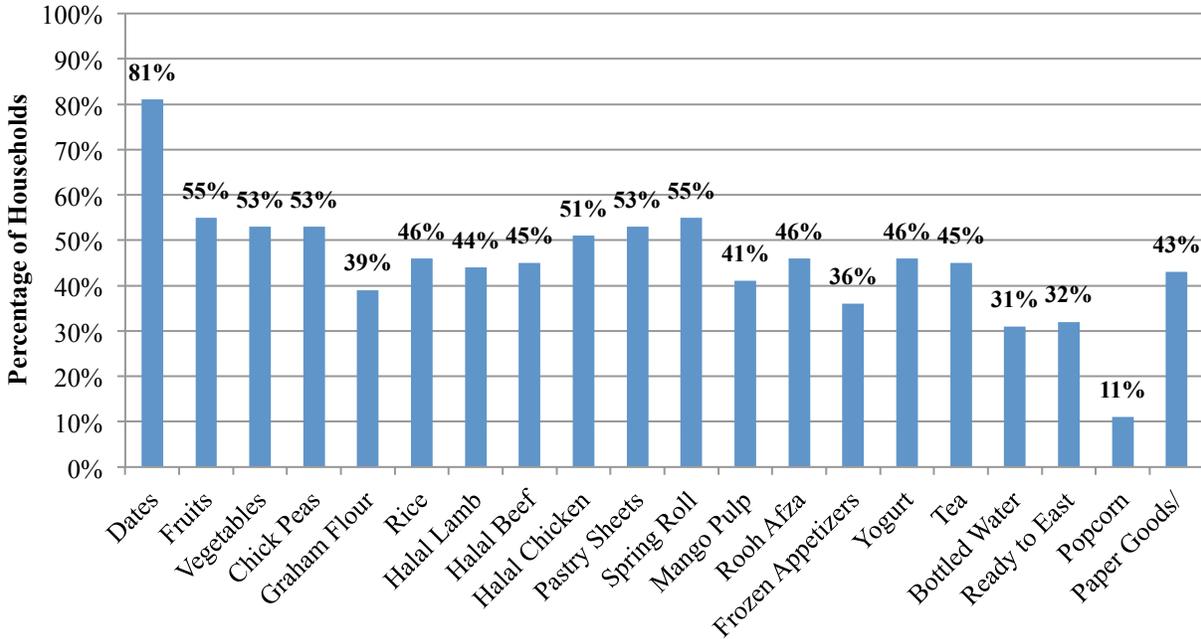


Figure 8A. Question 8A: What Are Some Key Items (Regular Grocery Purchases) You Purchase?



Question 8B: Question 8B: What Are Some Key Items Purchased in Preparation for/during Ramadan?

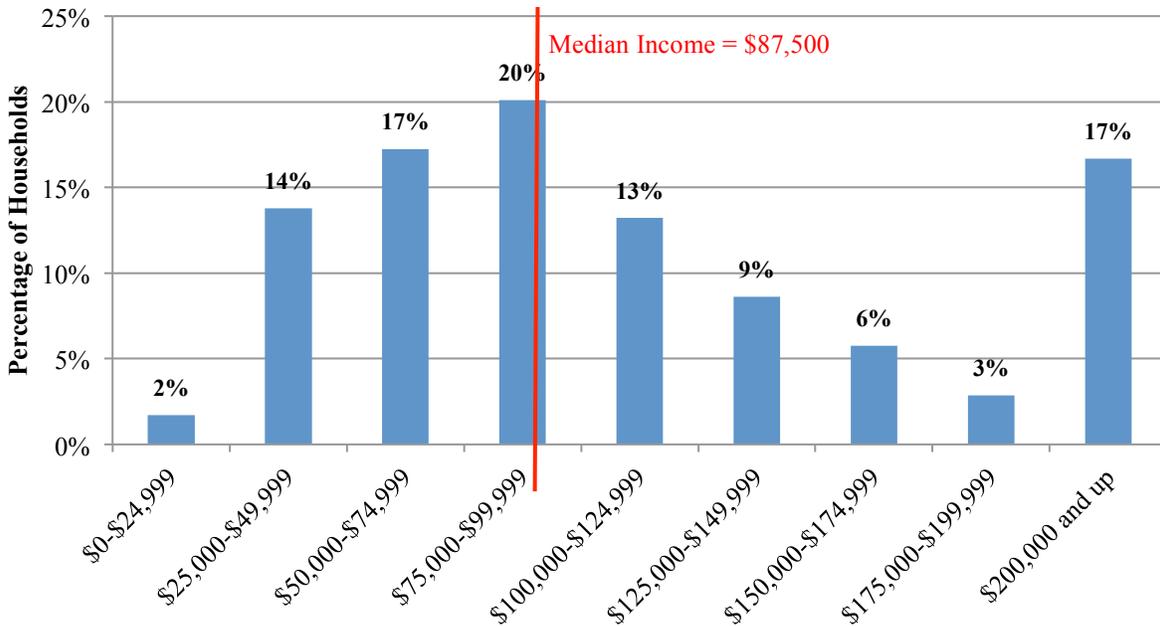


Figure 9. Question 9: What Is Your Approximate Average Household Income?

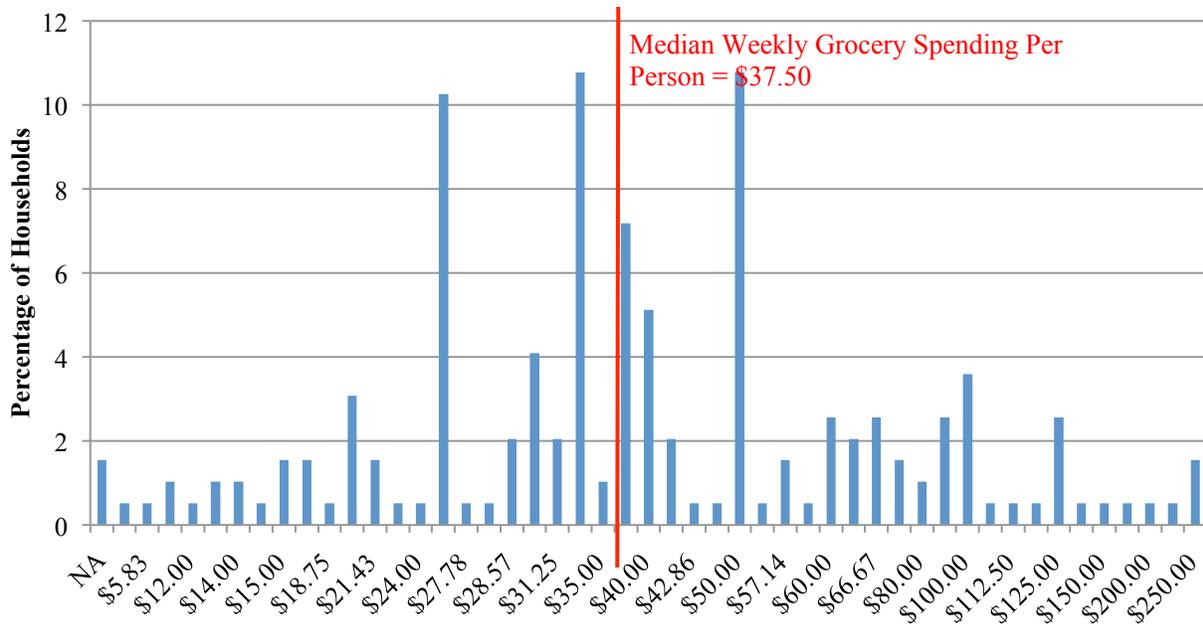


Figure 10. Question 10: What Is Your Weekly Spending on Groceries per Person?
 Notes: This variable is defined as weekly grocery spending divided by household size.

Empirical Results from the Binary Choice Models

In keeping with the second objective, we estimate binary choice models to profile American Muslims residing in the Chicago metropolitan area who purchased dates, fruits, vegetables, chickpeas, graham flour, rice, halal lamb, halal beef, halal chicken, pastry sheets, spring roll wrappers, mango pulp, rooh afza, frozen appetizers, yogurt, tea, bottled water, ready-to-eat desserts, popcorn, and paper goods/disposable servingware.

The binary choice models are used to obtain the likelihood of purchasing or not purchasing a particular food or beverage product. In doing so, we consider a set of explanatory factors that we hypothesize drive the decision to purchase a given food or beverage product. Hence, we are in a position to identify explanatory factors associated with the decision to purchase the selected items. Additionally, we generate a set of predicted probabilities for each respondent associated with the purchase of the respective food and beverage items, and we calculate the marginal effects or changes in probabilities associated with each explanatory factor for each respondent.

The use of the probit/logit analysis, particularly of binary choices, is well established in the economic literature (Maddala 1983; Pindyck and Rubinfeld, 1998). Capps and Kramer (1985) demonstrated that probit and logit models yield similar results in the case of binary choice models. Additionally, since the logistic density function closely resembles the t-distribution with seven degrees of freedom (Hanushek and Jackson, 1977), the logit and probit formulations are quite similar. The only difference is that the logistic density has a slightly heavier tail than the standard normal density.

In this analysis, we fit both models (logit and probit) to the survey data. Additionally, we consider three functional forms associated with the logit/probit models: (1) the quadratic functional form (linear and quadratic terms for weekly grocery spending, household income, and household size as well as the interaction of household income and household size); (2) the linear functional form (only linear terms for the amount of weekly grocery spending, household income, and household size); and (3) the semi-logarithmic functional form (logarithmic transformations of the amount of weekly grocery spending, household income, and household size). These functional forms are not uncommon in the literature (e.g., Prais and Houthakker, 1955). The quadratic and semi-logarithmic functional forms are designed to capture potential non-linear relationships between the amount of weekly grocery spending, household income, and household size and the decision to purchase the various food and beverage items.

Based on model selection criteria—namely AIC (Akaike Information Criterion), SIC (Schwarz Information Criterion), and HQC (Hannan-Quinn Criterion)—as well as log-likelihood and McFadden R^2 statistics, we identified the appropriate functional form and binary choice model. For each food and beverage item the quadratic functional form was judged to be best based on the aforementioned criteria. For six of the food and beverage items (halal chicken, halal beef, bottled water, rice, ready-to-eat desserts, and yogurt) the logit model outperformed the probit model. For twelve of the food and beverage items (halal lamb, chickpeas, dates, frozen appetizers, graham flour, mango pulp, paper goods, pastry sheets, popcorn, rooh afza, spring roll wrappers, and tea), the probit model outperformed the logit model. Because roughly 98% of survey respondents reported purchasing fruits and vegetables, the lack of non-buyers with whom to compare buyers prohibited the estimation of the probit/logit models for these items.

The probit model rests on the standard normal probability density function and the cumulative standard normal distribution function:

$$f(Z_i) = \frac{1}{\sqrt{2\pi}} e^{-Z_i^2/2}$$

$$(1) \quad P_i(y_i = 1) = F(Z_i) = \int_{-\infty}^{Z_i} (2\pi)^{-1/2} e^{-\frac{s^2}{2}} ds$$

$$Z_i = x_i' \beta$$

The logit model rests on the logistic probability density function and the cumulative logistic distribution function:

$$f(Z_i) = e^{Z_i} / (1 + e^{Z_i})^2$$

$$(2) \quad P_i(y_i = 1) = F(Z_i) = e^{Z_i} / (1 + e^{Z_i})$$

$$Z_i = x_i' \beta$$

In the respective binary choice models, the dependent variable y_i corresponds to the choice of purchasing or not purchasing any one of the aforementioned food and beverage products. Hence, y_i can take only two values: 0 (for non-purchase) and 1 (for purchase). The index Z_i is a linear combination of all explanatory variables (x_i) in the model multiplied by their respective estimated coefficients.

The explanatory variables considered in this analysis were: (1) the amount spent weekly in grocery stores; (2) the square of the amount spent weekly in grocery stores; (3) household size; (4) the square of household size; (5) the frequency of Ramadan hosting; (6) household income; (7) the square of household income; (8) the interaction of household income with household size; (9) ethnicity/race (included categories are South Asian, East Asian, European, and Middle Eastern/North African; the reference category was all other ethnicities/races); (10) the amount of additional spending during Ramadan; (11) openness to trying new food and beverage products; (12) whether dates were purchased during Ramadan (yes or no, included categories and California dates and Saudi dates; the reference category is other dates); (13) the purchase of halal beef (yes or no); (14) the purchase of halal chicken (yes or no) and (15) the purchase of halal lamb (yes or no).

Because of missing entries from survey respondents for particular questions, the econometric analysis is conditional on 169 responses. The estimation of the logit/probit models rests on the use of maximum likelihood estimation. We use EVIEWS 8.0 as the software package to estimate the coefficients associated with the set of explanatory variables. Any estimated coefficient is deemed to be statistically different from zero provided the accompanying p-value is <0.10 , the assumed level of significance in this study.

Nearly all pairwise correlations among the explanatory variables from the quadratic functional form had an absolute value of <0.3 . However, notable pairwise correlations were evident for weekly grocery spending and the square of weekly grocery spending (0.8964), household size and the square of household size (0.9472), household income and the square of household income (0.9799), the interaction of household size and household income and household income (0.8449), and the interaction of household size and household income and the square of household income (0.8250). Belsley, Kuh, and Welsch (1980) point out that better diagnostics for collinearity among the explanatory variables include variance inflation factors (VIFs), condition indices, and variance decomposition proportions. On the basis of this information, no degrading collinearity (i.e., lack of redundant variables) was present. Hence, we are in a position to disentangle the impacts of the respective explanatory variables in the decision to purchase the food and beverage items included in the survey.³

Endogeneity may arise due to fact that the set of explanatory factors includes the decision to purchase chicken, lamb, and beef (respectively) in the binary choice models. We attempted to circumvent this issue by using instrument variables. Specifically, we replaced the actual values for the explanatory variables corresponding to the decision to purchase beef, chicken, and lamb (either 0 or 1) with predicted values based on first-stage estimates of all exogenous variables. That is, we estimated three additional binary choice models concerning the decision to purchase beef, chicken, and lamb as a function of all exogenous variables. The ensuing predicted values were probabilities that, by design, must be between 0 and 1. Essentially we used a two-stage estimation procedure in an attempt to combat potential endogeneity.⁴

³ We do not include the correlation matrix or the Belsley-Kuh-Welsh diagnostics due to space limitations. This information is available from the authors upon request.

⁴ Despite this effort, problems were evident with this procedure. First, the goodness-of-fit statistics associated with the first-stage binary choices models were not statistically different from zero. That is, the p-values of the chi-squared likelihood ratio statistics were 0.8497 (for

Once the β coefficients are obtained via the use of maximum likelihood, estimates then are available for each index value, $Z_i = x'_i \beta$. Subsequently, once the index values are calculated, the probability of purchasing any food or beverage product is calculated for each respondent. The marginal effect for any explanatory variable is given by

$$(3) \quad \frac{\partial P_i}{\partial x_{ik}} = f(x'_i \beta) \beta,$$

where $f(x'_i \beta)$ is the probability density function for the respective binary choice model (see equations 1 and 2), β corresponds to the set of estimated coefficients from the maximum likelihood procedure, i refers to the respondent in the sample, and x_{ik} refers to the value of the k th explanatory variable for the i th respondent.

We assess the goodness-of-fit through the use of a chi-squared test and the McFadden R^2 measure (McFadden, 1984). We also rely on prediction-success tables to validate the binary choice models. All of these metrics are standard in the evaluation of binary choice models (Pindyck and Rubinfeld, 1998). To formulate a prediction-success table, it is necessary to employ a decision rule for correct classifications of outcomes. Conventionally, if the predicted probability is ≤ 0.5 , then the predicted outcome is $Y_i = 0$ (the respondent is predicted not to purchase). On the other hand, if the predicted probability is > 0.5 , then the predicted outcome is $Y_i = 1$ (the respondent is predicted to purchase). See Maddala (1983) and Pindyck and Rubinfeld (1998) to support this contention. However, Park and Capps (1997) point out that the appropriate cutoff may not necessarily be 0.5. Arguments have been made for the decision rule to be the ratio of the number of observations (respondent for which $Y_i = 1$) to the total number of observations. We adopt this decision rule in deriving the prediction-success table.

Given space limitations, we report estimation results of the logit model for halal chicken in detail, including parameter estimates, standard errors, t-statistics, and p-values (Table 1). The logit/probit results for the remaining food and beverage items are available from the authors upon request.

The McFadden R^2 metric is 0.5766, indicative of exceptional explanatory power of this binary choice model, especially since the data used in the econometric analysis are cross-sectional. The model explains a statistically significant amount of variation based on the likelihood ratio statistic of 49.94 with 17 degrees-of-freedom. The accompanying p-value of the likelihood ratio statistic, which follows a chi-squared distribution, is 0.000043.

halal chicken), 0.2187 (for halal beef), and 0.3769 (for halal lamb). Consequently, we were not able to identify any of the exogenous variables as instruments. Second, replacing the actual values for the explanatory variables that corresponded to the decision to purchase beef, chicken, and lamb (either 0 or 1) with predicted values based on first-stage estimates of all exogenous variables led to irreconcilable collinearity problems. Because of these problems, we believe the best course of action is to use the actual values for the explanatory variables (either 0 or 1) that correspond to the decision to purchase beef, chicken, and lamb. As such, we recognize the possibility of biased parameter estimates because of potential endogeneity.

Table 1. Parameter Estimates, Standard Errors, z-statistics, and p-values Associated with the Logit Model for Halal Chicken

Variable	Coefficient	Std. Error	z-Statistic	Prob.
Constant	13.28193	10.63879	1.248443	0.2119
WEEKLY_GROCERY_SPEND	0.009032	0.007896	1.143852	0.2527
WEEKLY_GROCERY_SPEND^2	-9.00E-06	6.57E-06	-1.368970	0.1710
HOUSEHOLD_SIZE	-3.510472	3.113176	-1.127618	0.2595
HOUSEHOLD_SIZE^2	0.101009	0.285063	0.354340	0.7231
FREQ_RAMADAN_HOSTING	0.198061	0.299157	0.662063	0.5079
HINCOME	-0.000118	8.99E-05	-1.311014	0.1899
HINCOME^2	-7.88E-11	1.98E-10	-0.398786	0.6901
HINCOME*HOUSEHOLD_SIZE	2.86E-05	1.37E-05	2.081066	0.0374
SOUTH_ASIAN	-0.752647	1.570664	-0.479190	0.6318
EUROPEAN	-2.446454	2.900287	-0.843521	0.3989
MID_EAST_NORTH_AFR	-1.975460	1.905671	-1.036622	0.2999
ADD_RAMADAN_SPENDING	-0.000850	0.002466	-0.344673	0.7303
TRY_NEWFOODBEV	-1.146728	1.971702	-0.581593	0.5608
DATES_CALIF	-0.779661	1.290350	-0.604224	0.5457
DATES_SAUDI	0.134965	1.426625	0.094604	0.9246
REG_PUR_HALAL_LAMB	2.768238	1.202761	2.301569	0.0214
REG_PUR_HALAL_BEEF	5.480276	1.631990	3.358034	0.0008
McFadden R-squared	0.576625	Mean dependent var	0.928994	
S.D. dependent var	0.257598	S.E. of regression	0.170250	
Akaike info criterion	0.429983	Sum squared resid	4.376733	
Schwarz criterion	0.763345	Log likelihood	-18.33360	
Hannan-Quinn criter.	0.565268	Restr. log likelihood	-43.30341	
LR statistic	49.93963			
Prob(LR statistic)	0.000043			
Obs with Dep=0	12	Total obs	169	
Obs with Dep=1	157			

Source: Estimation done by the authors using the software package EVIEWS 8.0.

The key drivers of the decision to purchase halal chicken are the decision to purchase halal beef, the decision to purchase halal lamb, and the interaction of household income with household size. The likelihood of purchasing halal chicken rises with the purchase of halal beef and halal lamb. The likelihood of purchasing halal chicken is also positively associated with the amount spent weekly in grocery stores, although this not statistically significant at the 0.10 level.

Ethnicity/race, frequency of hosting during Ramadan, openness to trying new foods and beverages, and the decision to purchase dates during Ramadan are not statistically significant factors in the decision to purchase halal chicken.

The marginal effects are calculated for each explanatory variable and for each respondent. We report the average of the marginal effects across respondents, highlighting the results for the statistically significant drivers of the decision to purchase halal chicken. The probability of purchasing halal chicken rises by 13.7 basis points if the decision is made to purchase halal lamb. The probability of purchasing halal chicken rises by 27.1 basis points if the decision is made to purchase halal beef. The probability of purchasing halal chicken rises by 3.5 basis points for every unit change in household size. The probability of purchasing halal chicken does not change appreciably due to changes in household income or to changes in the amount spent weekly in grocery stores. Based on the calculated marginal effects, the profile of any Muslim in the Chicago metropolitan area purchasing halal chicken rests primarily on their purchase of halal lamb or halal beef and household size .

Nearly 93% of the survey respondents purchased halal chicken. Hence, in the derivation of the prediction-success table (Table 2), the cutoff probability for classification purposes is 0.93. That is, we predict that the i th respondent will purchase halal chicken if the probability of doing so exceeds 0.93. Within sample, the logit model correctly classifies the decision to not purchase halal chicken 11 out of 12 times, with 91.67% accuracy. Within sample, the logit model correctly classifies the decision to purchase halal chicken 140 out of 157 times, with 89.17% accuracy. Overall, within sample, the model correctly classifies all decisions 151 out of 169 times, with 89.35% accuracy. Thus, we validate that the logit model does extremely well in correctly classifying the decision to purchase halal chicken and the decision not to purchase halal chicken.

Table 2. Prediction-Success Outcomes for the Decision to Purchase Halal Chicken

	Actual y=1	Actual y=0
Predicted y=1	140	1
Predicted y=0	17	11

Source: Calculations by the authors.

Given space limitations, Table 3 summarizes the logit/probit results for the remaining food and beverage items from this survey. Significant coefficients associated with the respective set of explanatory factors are listed along with +/- signs of the estimated coefficients. Key determinants concerning the decision to purchase the remaining food and beverage items were as follows:⁵ Purchase of halal beef was a driver of the decision to purchase halal lamb, graham flour, mango pulp, paper goods, pastry sheets, popcorn, rice, rooh afza, spring roll wrappers, and tea. Purchase of halal lamb was a driver of the decision to purchase mango pulp, rice, ready-to-eat desserts, and yogurt. Purchase of halal chicken was a determinant of the decision to purchase halal beef and halal lamb. The amount spent weekly in grocery stores influenced the decision to purchase halal beef, bottled water, paper goods, pastry sheets, rice, tea, and yogurt. Household size was a driver in the decision to purchase halal beef, dates, rooh afza, and yogurt. Household income was a determinant of the decision to purchase halal beef, chickpeas, graham flour, pastry sheets, rice,

⁵ Recall that it was not possible to estimate binary choice models for fruit and vegetables . Virtually the entire sample from the Chicago metropolitan area purchased these items.

Table 3. Factors Affecting the Decision to Purchase Various Food and Beverage Items in the Consumer Pantry Study

Food/Beverage Item	Binary Choice Model	McFadden R ²	Percent of Sample Purchasing the Item	Statistically Significant Factors (Sign of Estimated Coefficient)
Halal Chicken	Logit	0.5766	92.9	Interaction of household income and household size (-) Decision to purchase of halal lamb (+) Decision to purchase of halal beef (+)
Halal Beef	Logit	0.3376	82.2	Weekly grocery spend (-) Square of weekly grocery spend (+) Household income (+) Interaction of household income and household size (-) Decision to purchase of halal chicken (+)
Halal Lamb	Probit	0.1469	66.3	Ethnicity – South Asian (+) Decision to purchase of halal beef (+) Decision to purchase of halal chicken (+)
Bottled Water	Logit	0.1321	57.4	Weekly grocery spend (+) Square of weekly grocery spend (-) Frequency of Ramadan hosting (+) Ethnicity – Middle Eastern/North African (+)
Chickpeas	Probit	0.1245	59.8	Frequency of Ramadan hosting (+) Household income (+) Ethnicity – Middle Eastern/North African (+)
Dates	Probit	0.1306	41.4	Household size (-) Square of household size (+) Frequency of Ramadan hosting (+) Openness to trying new foods and beverages (+)
Frozen Appetizers	Probit	0.0710	36.1	None
Graham Flour	Probit	0.2380	35.5	Frequency of Ramadan hosting (+) Square of household income (-) Ethnicity – South Asian (+) Additional Ramadan spending (+) Decision to purchase of halal beef (+)
Mango Pulp	Probit	0.1505	28.4	Frequency of Ramadan hosting (+) Decision to purchase of halal lamb (+) Decision to purchases of halal beef (+)
Paper Goods	Probit	0.1617	91.7	Weekly grocery spend (+) Square of weekly grocery spend (-) Frequency of Ramadan hosting (+) Decision to purchase of halal beef (+)
Pastry Sheets	Probit	0.1471	36.1	Weekly grocery spend (+) Frequency of Ramadan hosting (+) Square of household income (-) Ethnicity – South Asian (+) Ethnicity – European (+) Decision to purchase halal beef (+)

Popcorn	Probit	0.1808	53.8	Ethnicity – East Asian (+) Openness to trying new foods and beverages (+) Decision to purchase California dates during Ramadan (-) Decision to purchase Saudi dates during Ramadan (-) Decision to purchase of halal beef (+)
Rice	Logit	0.3755	92.9	Weekly grocery spend (-) Square of weekly grocery spend (+) Household income (+) Square of household income (-) Decision to purchase California dates during Ramadan (-) Decision to purchase of halal beef (+) Decision to purchase of halal lamb (+)
Rooh Afza	Probit	0.1907	14.2	Square of household size (-) Decision to purchase of halal beef (+)
Ready-to-eat-Desserts	Logit	0.0819	46.2	Decision to purchase California dates during Ramadan (-) Decision to purchase Saudi dates during Ramadan (-) Decision to purchase of halal lamb (+)
Spring Roll Wrappers	Probit	0.1492	25.4	Frequency of Ramadan hosting (+) Square of household income (-) Ethnicity – South Asian (+) Ethnicity – Middle Eastern/North African (+) Decision to purchase of halal beef (+)
Tea	Probit	0.1629	84.6	Weekly grocery spend (-) Square of weekly grocery spend (+) Household size (+) Decision to purchase of halal beef (+)
Yogurt	Logit	0.2509	87.6	Weekly grocery spend (-) Household size (+) Ethnicity – South Asian (+) Additional Ramadan spending (+) Decision to purchase of halal lamb (+)

and spring roll wrappers. Ethnicity was important in the decision to purchase halal lamb, bottled water, chickpeas, graham flour, pastry sheets, popcorn, spring roll wrappers, and yogurt. Frequency of hosting Ramadan was a factor in the decision to purchase bottled water, chickpeas, dates, graham flour, mango pulp, paper goods, pastry sheets, and spring roll wrappers. Openness to trying new foods and beverages was a driver of the decision to purchase dates and popcorn, while additional spending for Ramadan was a driver of the decision to purchase graham flour and yogurt. Moreover, purchase of dates during Ramadan was important in the decision to purchase popcorn, rice, and ready-to-eat desserts. No explanatory factors influenced the decision to purchase frozen appetizers.

Concluding Remarks

Although the literature concerning Muslim consumers and halal food purchasing behavior is limited, previous studies have identified several behavioral predictors—including consumer confidence, intention, and perceived behavior control—and subjective norms. Several studies have focused on the international community of Muslims, and one study described consumer purchase behavior of halal products produced by non-Muslim manufacturers. Our study builds on this foundation by investigating sociodemographic factors and habits related to purchases of specific halal food and beverage products by American Muslim consumers residing in the northern suburbs of Chicago.

A majority of respondents in our survey spent more on groceries during Ramadan than in other months; we also observed statistical significance for multiple explanatory factors regarding the decision to purchase the food and beverage items in this study. The chief drivers, in terms of the number of statistically significant coefficients, in the decision to purchase the respective food and beverage items were the purchase of halal beef, the amount spent weekly in grocery stores, the frequency of hosting Ramadan, household income, household size, and ethnicity (in that order). The purchase of halal chicken, openness to trying new foods and beverages, additional grocery spending during Ramadan, and the purchase of dates during Ramadan were influencers for only two or three of the food and beverage items studied.

This study helps ascertain the buying preferences of American Muslims at least for a particular geographical area. Our study was limited in scope, being restricted to one urban geographical location, yet it provides a snapshot of purchasing behavior in a segment of American Muslim consumers. In subsequent research efforts, the methodology should be replicated in other regions to broaden the dataset and achieve greater representation of this population. This pilot study provides a baseline for spending habits and buying preferences for twenty food and beverage items which had been lacking in the extant literature. Given the rise in interest in and the growing importance of the Muslim community in the United States, this information is of value to stakeholders in the U.S. food industry supply chain. Developing business potential in the halal food industry worldwide is currently receiving much attention. Consequently, applications of the results from our research may provide strategic opportunities for stakeholders in the food industry who are poised to meet the demands of the American Muslim community.

Acknowledgments

This research was funded by the Islamic Food and Nutrition Council of America.

References

- Alam, S.S, and N.M. Sayuti. 2011. "Applying the Theory of Planned Behavior (TPB) in Halal Food Purchasing." *International Journal of Commerce and Management* 21(1), 8–20.
- American Muslim Consumer Consortium. 2015. "American Muslim Consumer Market Study – Session I." AMCC 2014 meeting, Newark NJ, 15 November. Available online: <http://2014.americanmuslimconsumer.com/>
- Belsley, D., E. Kuh, and R. Welsch, 1980. *Regression Diagnostics: Identifying Influential Data and Sources of Collinearity*. New York: Wiley.
- Capps Jr., O., and R.A. Kramer. 1985. "Analysis of Food Stamp Participation Using Qualitative Choice Models." *American Journal of Agricultural Economics* 67(1): 49–59.
- Dinar Standard. 2015. "The Muslim Green: American Muslim Market Study 2014/15." New York. Available online: <http://www.dinarstandard.com/american-market-2014/>
- EVIIEWS. Available online: <http://www.eviews.com>
- Golnaz, R., M. Zainalabidin, S. Mad Nasir, and F.C. Eddie Chiew. 2010. "Non-Muslims' Awareness of Halal Principles and Related Food Products in Malaysia." *International Food Research Journal* 17: 667–674.
- Hanushek, J., and E. Jackson. 1977. *Statistical Methods for Social Scientists*. New York: Academic Press.
- Irfan, M. 2014. "Muslim Buying Power." *Muslim Observer*. Available online: <http://muslimobserver.com/muslim-buying-power-new-consumer-survey-highlights-muslim-american-spending-power-increased-demand-for-ethical-islamic-goods/>
- Islamic Food and Nutrition Council of America. Available online: <http://www.ifanca.org/>
- Maddala, G.S. 1983. *Limited Dependent and Qualitative Variables in Econometrics*. Cambridge: Cambridge University Press.
- McFadden, D. 1984. "Econometric Analysis of Qualitative Response Models." in Z. Griliches and M. Intriligator, eds., *Handbook of Econometrics*, Volume 2, Amsterdam: North Holland, pp. 1395–1457.

- Mohamed, B. 2016. "A New Estimate of the U.S. Muslim Population." *Pew Research Center*. Available online: <http://pewrsr.ch/1PfaUs5>
- Omar, K.M, NK.N. Mat, G.A. Imhemed, F.M.A. Ali. 2012. "The Direct Effects of Halal Product Actual Purchase Antecedents among the International Muslim Consumers." *American Journal of Economics Special Issue*: 87–92.
- Park, J.L., and O. Capps Jr. 1997. "The Demand for Prepared Meals by U.S. Households." *American Journal of Agricultural Economics* 79(3): 814–824.
- Pindyck, R.S., and D. L. Rubinfeld. 1998. *Econometric Models and Economic Forecasts*, 4th ed. New York: McGraw-Hill.
- Prais, S.J., and H.S. Houthakker. 1955. *The Analysis of Family Budgets*. Cambridge: Cambridge University Press.
- U.S. Census Bureau. 2017. *Advance Monthly Retail Trade Report*. Washington, DC: U.S. Census Bureau, October 13. Available online: <https://www.census.gov/retail/index.html>
- Yunus, N.S.N.M., W.E.W. Rashid, N.M. Ariffin, and N. M. Rahid. 2014. "Muslim's Purchase Intention towards Non-Muslim's Halal Foods Packaged by Food Manufacturers," *Procedia - Social and Behavioral Sciences* 130:145–154.

Appendix: Survey Instrument

1. What is your ethnicity?

Caucasian

African American

Middle Eastern/North African

South Asian

East Asian

African

Hispanic

European

Other (please specify)

2. How many people currently live in your household?

3. What is your total weekly spending on groceries?

4. Do you spend more on groceries during Ramadan?

Yes

No

If Yes, how much, please specify:

5. How many times do you host during the month of Ramadan?

6. I am open to trying new food and beverage items?

Yes

No

7. What types of dates do you prefer to buy/consume during Ramadan?

- California
- Dates Saudi
- Dates
- Other (please specify)

8. What are some key items you purchase?

	Regular Grocery Purchases	Grocery Purchased in Preparation for/during Ramadan
Dates	<input type="checkbox"/>	<input type="checkbox"/>
Fruits	<input type="checkbox"/>	<input type="checkbox"/>
Vegetables	<input type="checkbox"/>	<input type="checkbox"/>
Chick Peas	<input type="checkbox"/>	<input type="checkbox"/>
Graham Flour	<input type="checkbox"/>	<input type="checkbox"/>
Rice	<input type="checkbox"/>	<input type="checkbox"/>
Halal Lamb	<input type="checkbox"/>	<input type="checkbox"/>
Halal Beef	<input type="checkbox"/>	<input type="checkbox"/>
Halal Chicken	<input type="checkbox"/>	<input type="checkbox"/>
Pastry Sheets	<input type="checkbox"/>	<input type="checkbox"/>
Spring Roll Wrappers	<input type="checkbox"/>	<input type="checkbox"/>
Mango Pulp	<input type="checkbox"/>	<input type="checkbox"/>
Rooh, Atza	<input type="checkbox"/>	<input type="checkbox"/>
Frozen Appetizers	<input type="checkbox"/>	<input type="checkbox"/>
Yogurt	<input type="checkbox"/>	<input type="checkbox"/>
Tea	<input type="checkbox"/>	<input type="checkbox"/>
Bottled Water	<input type="checkbox"/>	<input type="checkbox"/>
Ready to Eat Desserts	<input type="checkbox"/>	<input type="checkbox"/>
Popcorn	<input type="checkbox"/>	<input type="checkbox"/>
Paper Goods/Disposable Serveware	<input type="checkbox"/>	<input type="checkbox"/>

Other (please specify)

9. What is your approximate average household income? (optional)

- \$0-\$24,999
- \$25,000-\$49,999
- \$50,000-\$74,999
- \$75,000-\$99,999
- \$100,000-\$124,999
- \$125,000-\$149,999
- \$150,000-\$174,999
- \$175,000-\$199,999
- \$200,000 and up