Balancing nutrition, luxury, and time constraints in food preparation choices

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Abstract

Purpose – The purpose of this paper is to examine how nutritional concerns, luxurious tastes, and the value of time affect time allocation decisions for food preparation.

Design/methodology/approach – A time allocation model is developed and tested with Tobit and Heckman's sample selection models using the 2003-2007 American Time Use Survey data.

Findings – Individuals concerned more with nutrition or price than luxury devote more time to preparing food-cooked-at-home. High family income and long hours worked increase time allocated to food-away-from-home, indicating that a preference for luxury and the opportunity cost of time outweigh nutritional concerns. High education reduces time spent preparing food-cooked-at-home, yet increases both participation in this activity and time spent obtaining food-away-from-home, suggesting that a preference for luxury and the opportunity cost of time dominate nutritional preference. Time allocation decisions on food preparation vary greatly by race and ethnicity.

Originality/value – The results of this study confirm that the time allocation decisions regarding food preparation are largely affected by an individual's luxury preference, nutritional consciousness, and the value of time, all of which are influenced by education. The findings from this study indicate factors that influence consumers' time allocation decisions regarding food choice and their current food preparation behavior, and thus provide useful insights to nutritionists, dietitians, health practitioners, and policy makers for finding better ways to improve nutritional education, food choices and dietary habits that promote healthier diets and eating habits.

Keywords Individual behaviour, Diet, Cooking, Food products

Paper type Research paper

1. Introduction

Food selection, including food-cooked-at-home, prepared-food, and food-away-from-home, is not only influenced by the value of the homemaker's time (Prochaska and Schrimper, 1973; Becker, 1965) but also by socio-economic factors, such as household income (Glanz *et al.*, 1998; Popkin *et al.*, 1996; Turrell, 1996; Kinsey, 1994). Individuals with long market hours plus a high market wage may spend less time cooking at home or eating out, substituting prepared-foods from retail stores (Carlson *et al.*, 2002; McCracken and Brandt, 1987). The demand for convenience foods is increasing not only in the USA (Martinez and Stewart, 2003) but also in Asian countries, such as China (Curtis *et al.*, 2007; Veeck and Veeck, 2000) and Japan (Campo and Beghin, 2006). High-income households rely more on food-away-from-home (McCracken and Brandt, 1987), while low-income households are likely to depend on

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food-cooked-at-home (Blisard and Stewart, 2007). Recent income growth, for example, has increased the consumption of food-away-from-home in China (Ma *et al.*, 2006).

Concern about nutrition (which relates to health) and a preference for luxury consumption (which reflects wealth) also influence one's food selection and food preparation choices. Nutrition-conscious individuals may trade-off between luxury and nutrition, and are more likely to consume food-cooked-at-home (Stewart *et al.*, 2005), for which they can obtain nutritional information, control ingredients, and manage nutritional values (Nayga *et al.*, 1998), and thus they allocate more time to cooking at home. For example, older people who place a high value on nutrition, spend more time shopping for groceries (Aguiar and Hurst, 2007) and consume more food-cooked-at-home (Binkley, 2006; Blisard *et al.*, 2002; Glanz *et al.*, 1998; Glanz *et al.*, 1994), and thus they spend more time on cooking at home (Aguiar and Hurst, 2007). Luxury-conscious individuals, on the other hand, may trade-off between price (or nutrition) and luxury, and they prefer to consume more food-away-from-home prepared by a restaurant or other food vendor, thereby not only consuming food but also enjoying other services (Ma *et al.*, 2006; Darian and Klein, 1989), and thus they allocate more time to dining outside home. Wealthier people (Blisard and Stewart, 2007; Yen, 1993; Lee and Brown, 1993) and highly educated people (Stewart and Yen, 2004) consume more food-away-from-home and, in turn, they spend more time dining out.

The time that individuals allocate to their food selection is a topic of growing interest among researchers, managers and practitioners in the food and health care industries, as well as among policy makers, because it affects our diet, health and well-being. How do nutritional preferences, luxurious tastes, and the value of time impact the allocation of time to food preparation? How do individuals make trade-offs in food preparation between nutrition, luxury and price? How do socio-economic factors, such as education or family income, influence individuals' nutritional and/or luxury preferences and how do they affect food preparation choices? This paper examines these questions by focusing on the choice between food-cooked-at-home and food-away-from-home. The theoretical framework models the allocation of non-market hours to food preparation choices, and Tobit and Heckman's sample selection models estimate the proposed questions using the 2003-2007 American Time Use Survey (ATUS) data.

First, this study finds that family income and hours worked per day are negatively related not only to the likelihood of selecting food-cooked-at-home but also to the actual time spent on this activity. Both individuals who have a high preference for luxury (as a result of high income) and those who face a high value of time (due to long market hours) are likely to reduce their frequency of preparing food-cooked-at-home as well as their time spent preparing it. Education increases the probability of preparing food-cooked-at-home, but it reduces the actual time spent on this activity. This result indicates that a preference for nutrition increases with education, but a high value of time reduces the allocation of time to food-cooked-at-home. On the other hand, age, female gender, and household size are positively related to both the probability of selecting food-cooked-at-home and the actual time spent on this activity. Both elderly people who are more health conscious and thus value nutritional concerns and large-member households who aim for economies of scale in home production are likely to prepare more food-cooked-at-home and spend more time on this activity. Asians and Hispanics also increase their time spent preparing food-cooked-at-home, which may reflect the fact that they are more cost conscious and/or follow cultural traditions to eat at home with family.

This study also shows that household size, female gender, and Black race are negatively related to both the likelihood of selecting food-away-from-home and the actual time spent on dining out. Time-and/or budget-constrained individuals are likely to reduce their eating-out occasions and to spend less time obtaining food-away-from-home. Conversely, education (that increases market wages) and family income, both of which increase taste for luxury, increase both the frequency of selecting food-away-from-home and the time spent obtaining it. Age reduces one's probability of selecting food-away-from-home, while hours worked per day increase it; however, the relationship between age and the actual time spent obtaining food-away-from-home is rather unclear. Whites, Asians, and Hispanics showed no effect.

This paper extends existing studies on household food consumption by incorporating a time constraint in addition to a budget constraint and shows that both participation and time allocation decisions regarding food preparation are largely affected by nutritional concerns, luxurious tastes, and the value of time, all of which are influenced by education. The results of this study also present factors that influence time allocation decisions regarding food choice, offer additional findings, insights, and implications for understanding our food choices better in the modern era, and thus provides useful insights to assist food manufacturers and retailers, nutritionists, dietitians, health practitioners, and policy makers in identifying ways to improve diets and health. The findings of this study are also useful for developing nutritional education program in any Asian countries, such as China, that are increasingly adopting Western-style food and average caloric intakes.

2. The model

We develop a theoretical model to examine how individuals allocate non-market hours to food preparation, with specific attention to their choice between food-cooked-at-home and food-away-from-home, while facing both time and budget constraints. Assume that the household maximizes utility and that all households have identical preferences, represented by:

$$U = (l_0 + t_k k) + \beta k^{\theta}(n^{\alpha} m^{1-\alpha})^{1-\theta}, \tag{1}$$

where k is the number of food-away-from-home meals, which mainly refers to restaurant meals and those purchased from other food vendors in the market, n is the number of food-cooked-at-home meals, and m is the number of "all other foods", which include prepared-food meals. The parameter β measures the weight that a household places on consumption relative to leisure. Here, we assume that leisure is the sum of recreation hours as $l = l_0 + t_k k$, where l_0 denotes other types of recreation, and t_k denotes the number of hours spent obtaining food-away-from-home. We argue that food-away-from-home not only provides food but also other services to consumers, such as relaxation and socialization (Ma *et al.*, 2006; Darian and Klein, 1989), so that food-away-from-home in this model includes a leisure component.

The parameter α in equation (1) indicates the preference for nutrition, and thus α is larger when the household is more nutrition-conscious. It is feasible to argue that prepared-food is the least nutritious, followed by food-away-from-home and food-cooked-at-home[1]. Further, we use the parameter θ in equation (1) to indicate the preference for luxury or leisure, and the value of θ is larger when the household is more luxury-conscious. It is reasonable to argue that food-cooked-at-home is the

least luxurious (and the least leisurely), followed by prepared-food and food-away-from-home.

The price of meals provided by restaurants (i.e. food-away-from-home) is usually higher than both the price of food-cooked-at-home and the price of "all other foods" (e.g. prepared-food). The price of food-cooked-at-home, on the other hand, is not significantly different from that of prepared-food. Thus, we assume that the trade-off between food-cooked-at-home and "all other foods" is mainly driven by one's nutritional concerns. Contrarily, the trade-off between food-away-from-home and food-cooked-at-home (or "all other foods") is not only driven by one's nutritional concerns but also by luxurious tastes. Given that, the utility function in equation (1) indicates that the marginal rate of substitution between food-cooked-at-home and "all other foods" relies on the preference for nutrition only, while that between food-away-from-home and food-cooked-at-home (or "all other foods") relies on preferences for both nutrition and luxury.

Both preferences for nutrition (α) and for luxury (θ) are largely influenced by one's educational attainment. For example, education increases one's nutritional concern and health knowledge (Rimal, 2002; Ramezani and Roeder, 1995; Carlson and Gould, 1994; Redman, 1980) and has a large positive effect on one's desire for luxury (or taste) in food (Pietrykowski, 2004; Horton and Campbell, 1991). We thus use education as a proxy to measure one's preferences for nutrition (α) and luxury (θ).

The representative household faces this budget constraint:

$$I = l_w w = N(p_n n + p_m m + p_k k), \tag{2}$$

where p_n, p_k, and p_m are the prices of food-cooked-at-home, food-away-from-home, and "all other foods", respectively. Food-cooked-at-home incurs the costs of raw materials (e.g. groceries) and non-market hours to prepare them, while prepared-food incurs the costs (or the wages) of food-preparers and non-market hours to obtain it. We assume that the price of prepared-food is higher than that of food-cooked-at home ($p_n \leq p_m$). Further, food-away-from-home incurs the costs (or the wages) of both food-preparers and servers as well as non-market hours to obtain it, so the price of food-away-from-home is the highest ($p_n \leq p_m < p_k$). Here, l_w denotes the work hours of the household, and w is the exogenous wage rate, which positively relates to an individual's human capital (or education). Further, N in equation (2) denotes family size, and a larger family consumes more meals proportionately than a smaller family.

A representative household is endowed with T amount of time, which is allocated to work, leisure, and food preparation. The time constraint is given by:

$$T = l + l_w + nt_n = l_w + l_0 + t_k k + nt_n(N), \tag{3}$$

where $t_n(N)$ denotes the amount of time required to prepare food-cooked-at-home, which is a function of family size. It is feasible to assume that the time spent preparing food-cooked-at-home is increasing at diminishing rate with respect to family size (i.e. $t_n^{'}(N) > 0$ and $t_n^{''}(N) < 0$). Further, time spent purchasing prepared-food is negligible in comparison to time spent preparing food-cooked-at-home or obtaining food-away-from-home, and thus we neglect the time spent purchasing "all other foods" in equation (3)[2].

With budget constraint (2) and time constraint (3), the Lagrangian function is given by[3]:

$$L = (l_0 + t_k k) + \beta k^{\theta}(n^{\alpha}m^{1-\alpha})^{1-\theta} + \lambda_1[wl_w - N(p_n n + p_m m + p_k k)] + \lambda_2(T - l_w - l_0 - t_k k - t_n n)$$

The first-order conditions of the Lagrangian function with respect to n, m, and k are:

$$\alpha(1-\theta)\beta n^{\alpha-1}m^{1-\alpha}k^{\theta}(n^{\alpha}m^{1-\alpha})^{-\theta} = N\frac{p_n}{w} + t_n(N), \tag{4}$$

$$(1-\alpha)(1-\theta)\beta n^{\alpha}m^{-\alpha}k^{\theta}(n^{\alpha}m^{1-\alpha})^{-\theta} = N\frac{p_m}{w}, \text{ and} \tag{5}$$

$$\theta\beta k^{\theta-1}(n^{\alpha}m^{1-\alpha})^{1-\theta} = N\frac{p_k}{w} + t_k, \text{ respectively.} \tag{6}$$

From equations (4) and (5), we obtain:

$$\frac{m}{n} = \left(\frac{1-\alpha}{\alpha}\right)\left(\frac{p_n}{p_m} + \frac{w}{p_m}\frac{t_n(N)}{N}\right), \tag{7}$$

where $wt_n(N)$ denotes the opportunity cost of preparing food-cooked-at-home, and Np_n denotes the actual cost of preparing food-cooked-at-home. Note that the α in the first bracket of equation (7) represents nutritional preference, and we observe that a household consumes more food-cooked-at-home relative to "all other foods" (e.g. prepared-food) when the household is more nutrition-conscious (i.e. m/n decreases with α). Additionally, the relative demand for "all other foods" compared to food-cooked-at-home decreases with an increase in their relative prices, but increases with the opportunity cost of preparing food-cooked-at-home. Further, the relative demand for "all other foods" compared to food-cooked-at-home decreases with family size, indicating that households spend more time preparing food-cooked-at-home as family size increases[4].

From equations (4) and (6), we obtain:

$$\frac{k}{n} = \left(\frac{\theta}{\alpha(1-\theta)}\right)\left(\frac{Np_n + wt_n(N)}{Np_k + t_k}\right). \tag{8}$$

Similarly, k/n in equation (8) decreases with family size N, implying that households spend more time preparing food-cooked-at-home (rather than obtaining food-away-from-home) as family size increases. Equation (8) also implies that a household that places a high value on luxury or leisure (i.e. a larger θ) and is insensitive about both price of meals and nutrition, and thus consumes more food-away-from-home relative to food-cooked-at-home.

From equations (5) and (6), we obtain:

$$\frac{k}{m} = \left(\frac{\theta}{(1-\alpha)(1-\theta)}\right)\left(\frac{Np_m}{Np_k + wt_k}\right). \tag{9}$$

Equation (9) implies that a household that places more value on luxury or leisure (i.e. a larger θ) and/or that is price-insensitive will consume more food-away-from-home than "all other foods". We also observe that when a household is more nutrition-conscious (i.e. a larger α), it will consume more food-cooked-at-home compared to "all other foods" (i.e. k/m becomes larger).

From equations (8) and (9), we can make the following predictions. First, a household that places a high value on nutrition (i.e. a larger α) and which has a high level of education, will consume more food-cooked-at-home (rather than food-away-from-home and "all other foods") relative to a household that places a low value on nutrition and which has a low level of education. Second, a household that faces a larger opportunity cost of time for food preparation at home, and/or one that has a high preference for luxury or leisure (i.e. a larger θ), will consume more food-away-from-home relative to a household that faces a lower opportunity cost of time for food preparation at home and/or that sets a low value on luxury.

Hence, the time-allocation decision regarding food preparation may depend on the magnitude of preference that the household places on nutrition (α) and luxury (θ), and on which of these two is dominant – reflecting trade-offs between nutrition and taste (Blaylock *et al.*, 1999). We also argue that household income and the value of a homemaker's time affect preferences for both luxury and nutrition, and, in turn, influence the time-allocation decision of individuals regarding food preparation choices.

3. Data

The primary interest of this paper is to examine how individuals allocate non-market hours to food preparation, with specific attention to their choice between food-cooked-at-home and food-away-from-home, while facing both time and budget constraints. We thus use the multi-year ATUS data for the years 2003-2007, which combine microdata from 2003 to 2007[5]. This multi-year ATUS data measure how Americans allocate their time among life's activities. The ATUS respondents are randomly selected from individuals that have completed their eighth and final month of interviews for the Current Population Survey (CPS) and are interviewed only once about how they spent their time.

The multi-year micro data that are used in this paper have three sources:

(1) the 2003-2007 ATUS respondent file;

(2) the 2003-2007 ATUS activity summary file; and

(3) the 2003-2007 ATUS-CPS file.

The ATUS respondent file contains one record per individual with information about the respondents, including their demographic status (such as age, sex, race, ethnicity, educational attainment, marital status, metropolitan living status, wage, weeks worked, occupation, and industry). The ATUS activity summary file has information collected in the ATUS diary, with over 400 categories of time use, and contains ATUS respondents' detailed accounts of the total number of minutes spent on each activity during the diary date for a 24-hour window, starting at 4 a.m. on the day before the interview and ending at 4 a.m. on the day of the interview[6]. The 2003-2007 ATUS-CPS file gathers one record per household member for all households in which an individual participates in the ATUS and contains each household member's demographic status.

The 2003-2007 ATUS data, gathered from three linked ATUS files using information on the ATUS-CPS file, contains 72,922 respondents and includes household members aged 15 and older. In this paper, we focus on individuals aged 18-65 at the survey date. After restrictions, the sample size falls to 57,708 (25,370 men and 32,338 women). In addition to the full respondent sample, we use a data sample separated by the total number of household members:

(1) one-person households;
(2) two-member households; and
(3) more-than-two-member households.

Categories of interest in this paper are time spent preparing food-cooked-at-home, time spent obtaining food-away-from-home, and the socio-demographic status of respondents[7]. Further, we focus on the primary activities of respondents.

4. Descriptive analysis

This section summarizes the data on selected characteristics and the average time spent (in minutes per day) on selected daily activities of survey respondents at both the individual and the household levels. The individual level sample contains information collected from those who completed the survey and is defined as the full respondent sample. The household level sample contains information on the respondents' households, and is divided into three categories:

(1) one-person households;
(2) two-person households; and
(3) more-than-two-person households.

Table I shows selected characteristics of survey respondents. Within the full respondent sample, about 50 percent are in ages 26-45, about 40 percent are 46-65, and the remaining 10 percent are 18-25. Note that standard errors are shown in parentheses. One- and two-person households are concentrated in ages 46-65 and more-than-two-person households are mostly in ages 26-45. In the full respondent sample, 44 percent is male and the remaining 56 percent is female, and the distribution is similar for more-than-two-person households. However, the proportion of males increases to 48 percent and that of females declines to 52 percent for one-person households. Across all samples, approximately 25-30 percent of the population has a high school diploma, followed by 20-22 percent with a Bachelor's degree. About 11-13 percent of the population holds an advanced (Master's, professional, or doctoral) degree and 9-13 percent holds less than a high school diploma. Approximately, 21 percent of the population in the full respondent sample reported household incomes of less than $25,000, while 28, 21, and 18 percent of the population earned $25,000-49,999, $50,000-74,999, and $75,000-99,999, respectively, and the remaining 12 percent earned more than $100,000. The distribution is similar for two-person households; however, one-person households are most likely to earn household incomes of less than $50,000, whereas more-than-two-person households earn higher incomes than other households. About 42 percent of the population in the full respondent sample is unmarried, and the percentage of unmarried respondents increases as the number of household members decreases. Over 80 percent of the population lives in metropolitan areas.

Table II provides the weighted average time spent on selected daily activities for survey respondents at both the individual level and the household level. Note that again standard errors are shown in parentheses. We use the weighted average time spent to analyze how individuals allocate their time across the daily activities since a simple tabulation of unweighted ATUS data produces either upward or downward biased results. The weighted average time spent on each activity is calculated using

Table I.
Selected characteristics of individual respondents

Selected variables	Full respondent sample		Respondents living alone (one-person household)		Respondents living w/ partner (two-person household)		Respondents living w/ family (more-than-two-person household)	
	No.	Total (%)	No.	Total (%)	No.	Total (%)	No.	Total (%)
Age								
18-25	5,850	0.101	650	0.063	1,195	0.080	4,005	0.123
26-45	2,8805	0.499	3,633	0.355	4,748	0.317	2,0424	0.628
46-65	2,3053	0.399	5,961	0.582	9,024	0.603	8,068	0.248
Total	57,708	1.000	10,244	1.000	14,967	1.000	32,497	1.000
Gender								
Male	25,370	0.440	4,900	0.478	6,199	0.414	14,271	0.439
Female	32,338	0.560	5,344	0.522	8,768	0.586	18,226	0.561
Total	57,708	1.000	10,244	1.000	14,967	1.000	32,497	1.000
Education								
Less than HS diploma	6,413	0.111	1,004	0.098	1,359	0.091	4,050	0.125
High school diploma	15,776	0.273	2,537	0.248	4,530	0.303	8,709	0.268
High school diploma plus some college	11,173	0.194	2,072	0.202	2,955	0.197	6,146	0.189
Associate degree	5,728	0.099	999	0.098	1,519	0.101	3,210	0.099
Bachelor's degree	12,048	0.209	2,260	0.221	2,947	0.197	6,841	0.211
Advanced degree	6,570	0.114	1,372	0.134	1,657	0.111	3,541	0.109
Total	57,708	1.000	10,244	1.000	14,967	1.000	32,497	1.000
Family income ($)								
Less than 25,000	10,901	0.214	3,500	0.389	2,775	0.213	4,626	0.160
25,000-49,999	14,293	0.280	3,220	0.358	3,860	0.297	7,213	0.249
50,000-74,999	10,658	0.209	1,335	0.148	2,787	0.214	6,536	0.226
75,000-99,999	9,046	0.177	635	0.071	2,230	0.171	6,181	0.213
More than 100,000	6,073	0.119	305	0.034	1,353	0.104	4,415	0.152
Total	50,971[a]	1.000	8,995[a]	1.000	13,005[a]	1.000	28,971[a]	1.000
Marital status								
Married	33,746	0.585	289	0.028	9,377	0.627	24,080	0.741
Unmarried	23,962	0.415	9,955	0.972	5,590	0.373	8,417	0.259
Total	57,708	1.000	10,244	1.000	14,967	1.000	32,497	1.000

(*continued*)

Selected variables	Full respondent sample		Respondents living alone (one-person household)		Respondents living w/ partner (two-person household)		Respondents living w/ family (more-than-two-person household)	
	No.	Total (%)	No.	Total (%)	No.	Total (%)	No.	Total (%)
Metropolitan living status								
Metropolitan living	28,343	0.823	5,436	0.842	6,662	0.802	16,245	0.8263
Non-metropolitan living	6,075	0.177	1,017	0.158	1,644	0.198	3,414	0.1737
Total	34,418[b]	1.000	6,453[b]	1.000	8,306[b]	1.000	19,659[b]	1.000
Region								
Northeast	10,637	0.184	1,905	0.186	2,566	0.171	6,166	0.190
Midwest	14,568	0.252	2,536	0.248	3,777	0.252	8,255	0.254
South	20,036	0.347	3,757	0.367	5,477	0.366	10,802	0.332
West	12,467	0.216	2,046	0.200	3,147	0.210	7,274	0.224
Total	57,708	1.000	10,244	1.000	14,967	1.000	32,497	1.000

Notes: [a]6,737 (out of 57,708), 1,249 (out of 10,244), 1,962 (out of 14,967) and 3,526 (out of 32,497) respondents reported invalid family income; [b]23,290 (out of 57,708), 3,791 (out of 10,244), 6,661 (out of 14,967) and 12,838 (out of 32,497) respondents reported invalid metropolitan living status

Table I.

	(1) By full population		(2) By participants	
	Obs (*n*)	Weighted average (minutes per day)	Obs (*n*)	Weighted average (minutes per day)
Full respondents (n = 57,708) (Time spent on selected activity)				
Food-cooked-at-home[a]	57,708	34.4	34,677	61.5
Food-away-from-home	57,708	7.5	15,669	28.1
Work[b]	57,708	265.5	26,130	490.3
Family care	57,708	39.2	21,112	127.3
Socializing, relaxing, and leisure	57,708	259.9	54,784	274.4
Respondents living alone (one-person household) (n = 10,244) (Time spent on selected activity)				
Food-cooked-at-home[a]	10,244	24.1	5,729	45.0
Food-away-from-home	10,244	8.2	3,046	26.8
Work[b]	10,244	282.8	4,771	500.7
Family care[c]	–	–	–	–
Socializing, relaxing, and leisure	10244	292.7	9,755	309.2
Respondents living w/partner (two-person household) (n = 14,967) (Time spent on selected activity)				
Food-cooked-at-home[a]	14,967	32.7	8,881	57.9
Food-away-from-home	14,967	8.4	4,257	29.6
Work[b]	14,967	269.3	6,657	493.9
Family care	14,967	10.7	2,378	96.1
Socializing, relaxing, and leisure	14,967	275.3	14,338	288.4
Respondents living w/family (more-than-two-person household) (n = 32,497) (Time spent on selected activity)				
Food-cooked-at-home[a]	32,497	37.3	20,067	66.4
Food-away-from-home	32,497	6.8	8,366	27.5
Work[b]	32,497	260.1	14,702	486.2
Family care	32,497	61.5	18,602	131.1
Socializing, relaxing, and leisure	32,497	245.3	30,691	260.0

Table II.
Time allocation for selected activities by respondents

Notes: [a]Food-cooked-at-home includes: (1) food and drink preparation, (2) food presentation, and (3) kitchen and food clean-up; [b]working hours include Saturday and Sunday; [c]10,112 (out of 10, 244) respondents spent zero on family care

the average-hours-per-day formula to ensure that: each group is correctly represented in the population; each day of the week is correctly represented for the sample month; and groups and days of the week are correctly represented for the sample month[8]. Column (1) in Table II shows the weighted average time spent on each activity by full-population (including those who spent zero minutes), while Column (2) shows the weighted average time spent on each activity by participants (excluding those who spent zero minutes). We focus on the analysis of the weighted average time spent on each activity by participants who engaged in the activity, shown in Column (2), focusing on the household level sample.

Table II shows that, among participants, households spend more time on preparing food-cooked-at-home as the number of the household members increases (45 minutes per day for one-person households, 57.9 minutes per day for two-person households, and 66.4 minutes per day for more-than-two-person households). This implies that households are seeking economies of scale in home cooking. The table further shows that fewer households consume food-away-from-home as the number of household members increases (30 percent of one-person households, 28 percent of two-person households,

and 26 percent of more-than-two-person households). However, two-person households spend the most time on food-away-from-home, followed by more-than-two-person households and one-person households (29.6, 27.5, and 26.8 minutes per day, respectively). These results indicate that household size affects the time spent obtaining food-away-from-home. Further, the percentage of respondents who work is independent of household size, yet hours worked decrease as household size increases. Family care time depends heavily on the number of household members and socializing, relaxing and leisure time is about 260-309 minutes per day.

5. Empirical strategy

The objective of this paper is to examine how a respondent's preferences regarding nutrition (which relates to health) and luxury (which reflects wealth), the value of time, and family income affect that person's time allocation decision regarding the choice between food-cooked-at-home and food-away-from-home.

A substantial portion of respondents did not allocate time to food preparation on the date of the diary interview. Our selected sample is thus censored and consists of both zero value observations, which are generated by respondents who did not spend time on food preparation, and non-zero value observations, which are from those who spent time on this activity. To account for the qualitative differences between zero observations and continuous observations, we estimate the following equation using a Tobit model (Tobin, 1958):

$$T_i^* = X_i\beta + \varepsilon_i, \tag{10}$$

where ε_i is a mean zero individual error term and T_i^* denotes the amount of time spent per day on food preparation. We use T_i^* to represent the consumption of food-away-from-home relative to food-cooked-at-home (i.e. k/n), which is positively related to θ and w, and negatively related to α, as implied in equations (8) and (9). Further, X_i in equation (10) is a vector of exogenous variables of respondent characteristics, which include:

- education;
- family income;
- age;
- gender;
- race;
- ethnicity;
- hours worked per day;
- household size; and
- region.

We also control for marital status, metropolitan living status, and the season that the diary was completed. A detailed description of variables is shown in the Appendix.

One could argue that time allocation for food preparation is determined by the individual choice of whether or not to participate in this activity; in other words, respondents self-select regarding food preparation activity. To account for the nonrandom nature of our dataset, we also estimate the sample selection model (Heckman, 1979)[9].

We consider our random sample of I observations. Equations for respondent i are as follows:

$$\begin{aligned} T_{1i}^{*} &= X_{1i}\beta_1 + \varepsilon_{1i} \\ T_{2i}^{*} &= X_{2i}\beta_2 + \varepsilon_{2i} \end{aligned} \quad (i = 1, \ldots, I). \tag{11}$$

The sample selection model consists of: a participation equation, and a resultant outcome equation as follows:

$$T_{1i} = \begin{cases} 1 & if \;\; T_{1i}^{*} > 0 \\ 0 & if \;\; T_{1i}^{*} \le 0 \end{cases}', \tag{12}$$

where T_{1i}^{*} determines whether or not respondent i has spent time on food preparation:

$$T_{2i} = \begin{cases} 1 & if \;\; T_{1i}^{*} > 0 \\ - & if \;\; T_{1i}^{*} \le 0 \end{cases}', \tag{12'}$$

where T_{2i}^{*} is observed when $T_{1i}^{*} = 1$, whereas T_{2i} need not take on any value when $T_{1i}^{*} \le 0$, and it defines how many minutes per day are allocated to food preparation by respondent i.

The likelihood of time spent on food preparation being observed depends on the respondent's age, gender, race, ethnicity, education, family income, hours worked per day, marital status, household size, region, metropolitan living status, and the season, and thus the explanatory variables (X_{1i}) in the participation equation are the same as in equation (10). The actual time spent on food preparation by the respondent in T_{2i}^{*} is unlikely to depend on the region of residence once a respondent elects to participate in food preparation; hence the explanatory variables (X_{2i}) in the resultant outcome equation are the same as in the participation equation except that it excludes region.

The error terms ε_{1i} and ε_{2i} in equation (11) are assumed to have a joint normal distribution with a mean vector zero and variance-covariance matrix as:

$$\Omega = \begin{bmatrix} \sigma\varepsilon_1\varepsilon_1 & \sigma\varepsilon_1\varepsilon_2 \\ \sigma\varepsilon_2\varepsilon_1 & \sigma\varepsilon_2\varepsilon_2 \end{bmatrix}. \tag{13}$$

The sample selection model has the following likelihood function:

$$L = \Pi\left\{\Pr[T_{1i}^{*} \le 0]\right\}^{1-T_{1i}} \left\{f(T_{2i}|T_{1i}^{*} > 0)^{*}\Pr[T_{1i}^{*} > 0]\right\}^{T_{1i}}, \tag{14}$$

where the first term is the discrete contribution when $T_{1i}^{*} \le 0$, since $T_{1i} = 0$, and the second term is the continuous contribution when $T_{1i}^{*} > 0$. We define T_{1i}^{*} as the unobserved propensity to spend time on food preparation, whereas T_{2i} is the actual time spent on food preparation.

6. Empirical results

This section examines the results of the Tobit and the two-step Heckman's sample selection models to analyze how a respondent's preferences for nutrition (which relates

to health) and luxury (which reflects wealth), both of which are influenced by education, have an impact on food preparation. We also examine the effect of a respondent's value of time and selected socio-economic characteristics on food preparation choices. The analyses of time spent preparing food-cooked-at-home and obtaining food-away-from-home are conducted separately using the estimation results in Tables III and IV, respectively.

6.1 Empirical results for time spent preparing food-cooked-at-home

Table III shows that education is, in general, negatively related to time spent preparing food-cooked-at-home. Estimates also suggest that education increases the probability

Independent variables	Tobit Estimated coefficient	Selection two-step Outcome equation Estimated coefficient	Selection two-step Participation equation Estimated coefficient
Intercept	−44.26*** (3.131)	−51.03*** (15.538)	−0.61*** (0.049)
Education: high school diploma (0/1)	−3.67*** (1.295)	−5.94*** (1.472)	0.029 (0.021)
Education: high school diploma plus some college (0/1)	−4.39*** (1.382)	−6.60*** (1.561)	0.016 (0.022)
Education: associate degree (0/1)	−3.72** (1.596)	−6.70*** (1.837)	0.06** (0.025)
Education: Bachelor's degree (0/1)	−2.165 (1.437)	−5.54*** (1.736)	0.09*** (0.023)
Education: advanced degree (0/1)	−1.440 (1.632)	−4.20** (1.942)	0.09*** (0.026)
Family income: $25,000-49,999 (0/1)	−3.25*** (0.948)	−3.75*** (1.074)	−0.03* (0.015)
Family income: $50,000-74,999 (0/1)	−7.14*** (1.074)	−7.97*** (1.291)	−0.06*** (0.017)
Family income: $75,000-99,999 (0/1)	−5.88*** (1.187)	−5.95*** (1.402)	−0.07*** (0.019)
Family income: more than $100,000 (0/1)	−6.76*** (1.399)	−6.94*** (1.672)	−0.09*** (0.022)
Age: 26-45 (0/1)	39.08*** (1.344)	39.15*** (4.464)	0.55*** (0.020)
Age: 46-65 (0/1)	44.00*** (1.406)	45.58*** (4.820)	0.60*** (0.021)
Gender: female (0/1)	48.37*** (0.732)	48.48*** (5.017)	0.68*** (0.011)
Race: White (0/1)	1.015 (2.309)	−0.748 (2.626)	0.07** (0.036)
Race: Black (0/1)	−2.299 (2.502)	−1.766 (2.870)	−0.08** (0.039)
Race: Asian (0/1)	15.49*** (3.018)	20.94*** (3.407)	0.055 (0.048)
Ethnicity: Hispanic (0/1)	7.80*** (1.133)	12.48*** (1.269)	−0.04** (0.018)
Hours worked per day	−3.71*** (0.121)	−4.12*** (0.312)	−0.04*** (0.002)
Household size: household member = 2 (0/1)	3.74*** (1.205)	7.09*** (1.351)	−0.018 (0.019)
Household size: household member = 3 (0/1)	11.16*** (1.311)	15.42*** (1.574)	0.07*** (0.021)
Household size: household member = 4 (0/1)	15.12*** (1.387)	20.28*** (1.757)	0.11*** (0.022)
Household size: household member = 5 or more (0/1)	21.85*** (1.500)	28.74*** (1.975)	0.15*** (0.024)
Region: Northeast (0/1)	−3.72*** (1.050)	–	−0.05*** (0.017)
Region: Midwest (0/1)	−5.89*** (0.992)	–	−0.08*** (0.016)
Region: South (0/1)	−1.253 (1.099)	–	−0.001 (0.018)
Other control variables	Yes	Yes	Yes
R^2/Sigma/Mills	76.146 (0.243)	77.113 (12.662)	77.113 (12.662)

Notes: $n = 57{,}708$; significance at: *10, **5 and ***1 percent level

Table III. Parameter estimates of Tobit and two-step sample selection models time spent preparing food-cooked-at-home

Independent variables	Tobit Estimated coefficient	Selection two-step Outcome equation Estimated coefficient	Selection two-step Participation equation Estimated coefficient
Intercept	−49.10*** (3.260)	0.84*** (17.982)	−0.70*** (0.051)
Education: high school diploma (0/1)	11.27*** (1.448)	4.47* (2.659)	0.19*** (0.023)
Education: high school diploma plus some college (0/1)	16.11*** (1.504)	6.11* (3.454)	0.27*** (0.024)
Education: associate degree (0/1)	16.09*** (1.729)	5.169 (3.610)	0.28*** (0.027)
Education: Bachelor's degree (0/1)	19.31*** (1.560)	7.39* (3.979)	0.33*** (0.025)
Education: advanced degree (0/1)	20.42*** (1.739)	9.59** (4.009)	0.33*** (0.028)
Family income: $25,000-49,999 (0/1)	4.19*** (1.005)	0.215 (1.425)	0.08*** (0.016)
Family income: $50,000-74,999 (0/1)	9.52*** (1.118)	3.252 (2.152)	0.17*** (0.018)
Family income: $75,000-99,999 (0/1)	12.41*** (1.212)	4.37* (2.614)	0.22*** (0.019)
Family income: more than $100,000 (0/1)	15.43*** (1.406)	6.33** (3.148)	0.27*** (0.022)
Age: 26-45 (0/1)	−12.10*** (1.301)	−3.378 (2.791)	−0.23*** (0.021)
Age: 46-65 (0/1)	−15.72*** (1.378)	−3.696 (3.536)	−0.30*** (0.022)
Gender: female (0/1)	−3.17*** (0.746)	−1.71* (0.964)	−0.05*** (0.012)
Race: White (0/1)	1.058 (2.320)	−3.383 (2.709)	0.053 (0.038)
Race: Black (0/1)	−18.23*** (2.537)	−10.01** (4.216)	−0.28*** (0.042)
Race: Asian (0/1)	−4.055 (3.079)	−2.723 (3.563)	−0.060 (0.050)
Ethnicity: Hispanic (0/1)	−1.065 (1.190)	0.119 (1.304)	−0.019 (0.019)
Hours worked per day	0.56*** (0.127)	−0.059 (0.191)	0.011*** (0.002)
Household size: household member = 2 (0/1)	−3.05** (1.236)	−0.137 (1.525)	−0.07*** (0.020)
Household size: household member = 3 (0/1)	−10.84*** (1.355)	−5.51** (2.421)	−0.18*** (0.021)
Household size: household member = 4 (0/1)	−10.58*** (1.429)	−3.717 (2.582)	−0.20*** (0.023)
Household size: household member = 5 or more (0/1)	−15.97*** (1.569)	−6.61* (3.470)	−0.28*** (0.025)
Region: Northeast (0/1)	1.709 (1.102)	–	0.07*** (0.017)
Region: Midwest (0/1)	4.89*** (1.041)	–	0.11*** (0.017)
Region: South (0/1)	2.43** (1.154)	–	0.06*** (0.018)
Other control variables	Yes	Yes	Yes
R^2/Sigma/Mills	66.244 (0.188)	26.057 (14.145)	26.057 (14.145)

Notes: $n = 57{,}708$; significance at: *10, **5 and ***1 percent level

Table IV.
Parameter estimates of Tobit and two-step sample selection models time spent obtaining food-away-from-home

of one's participating in food-cooked-at-home, while also reducing the time spent on this activity. For example, respondents with at least a bachelor's degree spend less time spent on this activity than those with an associate degree or less. These results reveal two important points. First, a high value of time (due to long working hours) and a high preference for luxury (due to higher education and higher market wages) outweigh nutritional concerns (trading nutrition or price for luxury), leading, overall, to reduced time spent preparing food-cooked-at-home. Second, a high preference for nutrition (related to high education) outweighs luxurious tastes (trading luxury for nutrition), leading less time spent on preparing food-cooked-at-home among those with at least a bachelor's degree relative to those with an associate degree.

Similarly, household income is inversely related to time spent preparing food-cooked-at-home. More precisely, higher income reduces both the probability of one's engaging in food-cooked-at-home and the actual time spent on this activity. For example, households earning more than $50,000 spend less time on this activity (about six to eight minutes) compared to those earning less than $25,000. These results indicate that a higher income increases the value placed on luxury or leisure relative to nutrition, and thus it leads to a reduction in both the likelihood of preparing food-cooked-at-home and the actual time spent on preparing food at home, substituting food-away-from-home. As expected, hours worked per day are inversely related to time spent preparing food-cooked-at-home, indicating that time-constrained respondents allocate less time to cooking at home.

On the other hand, respondents' age had a large and positive effect not only on their decision to engage in food-cooked-at-home but also on their actual time spent on this activity, and the effect becomes larger as age increases (Aguiar and Hurst, 2007). Similarly, larger households are more likely than smaller households to engage in food preparation at home and to spend more time on this activity. This result suggests that a large family is aiming for economies of scale in home production (Floro and Miles, 2003) and that those with children and/or older people might be more nutrition-conscious (trading luxury for nutrition) and thus are likely to consume more food-cooked-at-home (Binkley, 2006; Stewart *et al.*, 2005; Blisard *et al.*, 2002; Glanz *et al.*, 1998; Glanz *et al.*, 1994), which is consistent with our prediction. As expected, women spent more time (about 48 minutes) preparing food-cooked-at-home than men. This result supports the existing notion in which women still make most food-related decisions (Redman, 1980).

Table III further shows that there is a large variation in time spent preparing food-cooked-at-home by race and ethnicity. Estimates indicate that being Black or Hispanic reduces the probability of one's preparing food-cooked-at-home, yet the actual time spent on this activity among Blacks is not significantly different from those of "other" races, while Hispanics spend more time (eight minutes in Tobit and 12 minutes in the Heckman's sample selection model) than their counterparts. On the other hand, White are more likely to spend more time to prepare food-cooked-at-home than "other" races, yet the actual time spent on this activity among Whites is not significantly different from their counterparts. Asians are not more likely to prepare food-cooked-at-home than others, but their time spent on this activity is larger (15 minutes in Tobit and 21 minutes in the Heckman's sample selection model). These results suggest that Asians and Hispanics prefer to allocate more time to food preparation at home and to consume food-cooked-at-home, which may reflect the fact that they place a high value on nutrition (which is related to education) and/or set a low value on luxury (which results from budget consciousness). Alternatively, Asians and Hispanics are likely to follow their particular cultural traditions in which families eat at home, and, in turn, they are likely to spend more time cooking at home (Mancino and Newman, 2007).

6.2 Empirical results for time spent obtaining food-away-from-home

Table IV shows that education not only increases the probability of one's selecting food-away-from-home but also the actual time spent on this activity, and that the effect is more prominent for those with higher education. For example, respondents with an advanced degree spent the most time on this activity (20 minutes in Tobit and ten minutes in the Heckman's sample selection model) relative to those without a high

school diploma. These results highlight the following two points. First, estimates confirm the existing literature in which more educated individuals have larger food-away-from-home expenditures (Angulo *et al.*, 2007; Horton and Campbell, 1991). Second, a high taste for luxury, derived from a higher education plus higher market wages, dominates nutritional concerns, leading to increased time spent obtaining food-away-from-home (and reduced time spent preparing food-cooked-at-home).

Correspondingly, higher family income increases both the probability of one's consuming food-away-from-home and the actual time spent on this activity. Households earning more than $100,000 spent the most time on this activity followed by those earning $75,000-99,999 (15 minutes and 12 minutes, respectively, in Tobit, and six and four minutes, respectively, in the Heckman's sample selection model). These results suggest that high-income households place more value on luxury (trading price for luxury), and, in turn, increase time spent obtaining food-away-from-home. This result supports the existing positive relationship between family income and food consumption outside the home (Blaylock *et al.*, 1999; Redman, 1980).

In contrast, women have a lower probability of selecting food-away-from-home and spend less time on this activity relative to men. Similarly, a large household size reduces both the frequency of selecting food-away-from-home and the actual time spent on this activity. Respondents with families of more than five members, for example, spend less time (16 minutes in Tobit and seven minutes in the Heckman's sample selection model) on food-away-from-home relative to those living alone. These results support the existing negative relationship between household size and food-away-from-home consumption due to the financial burden of dining out (Redman, 1980).

Within race and ethnic groups, Blacks consume less food-away-from-home and spend less time on this activity than those of "other" races (18 minutes in Tobit and ten minutes in the Heckman's sample selection model). These results confirm that Blacks, who have relatively low incomes (Diez-Roux *et al.*, 1999; Turrell, 1996; Williams and Collins, 1995; Kinsey, 1994) and spend less of their income on food (Kinsey, 1994), consume less food-away-from-home, and thus spend less time dining out. Whites, Asians, and Hispanics showed no effect. Further, age reduces the probability of selecting food-away-from-home, while hours worked per day increases it; however, the relationship between age and actual time spent on this activity is rather unclear.

7. Conclusions

This paper examines how an individual's preferences regarding nutrition (which relate to health) and luxury (which reflects wealth) affect their time allocation decisions related to food preparation, especially the choice between food-cooked-at-home and food-away-from-home. A time allocation model is developed and empirically tested with Tobit and Heckman's sample selection models using the 2003-2007 ATUS data to analyze the allocation of non-market hours to food preparation choices.

Estimates reveal several important findings. First, family income and hours worked per day affect the frequency of selecting and the actual time spent preparing or obtain both food-cooked-at-home (negatively) and food-away-from-home with respect to the latter. Luxury-conscious and time-constrained individuals (e.g. those with high wealth and/or long market hours) allocate more time to obtaining food-away-from-home, suggesting that a trade-off exists between nutrition (or price) and luxury.

Second, education reduces the actual time spent on food-cooked-at-home even though it increases the probability of cooking food at home, and it increases both the likelihood of selecting and the actual time spent on food-away-from-home. Highly educated individuals (with high wages and/or long market hours) allocate more time to obtaining food-away-from-home, another confirmation that a trade-off exists between nutrition (or price) and luxury although the effect of nutritional preference cannot be ignored.

Finally, age, female gender, and household size increase not only the probability of preparing food-cooked-at-home but also the actual time spent preparing it, while they reduce the likelihood of selecting food-away-from-home as well as the time spent obtaining it. Nutrition-conscious individuals (e.g. older people) and budget-constrained individuals (e.g. large households and low-income households) allocate more time to food-cooked-at-home, indicating that a trade-off exists between luxury and nutrition (or price). Finally, a large variation in the time allocation decision exists when race and ethnicity are considered.

The results of this study confirm that the time allocation decisions regarding food preparation are largely affected by an individual's luxury preference (θ), nutritional consciousness (α), and the value of time, all of which are influenced by education. The findings from this study indicate factors that influence consumers' time allocation decisions regarding food choice and their current food preparation behavior, and thus provide useful insights to nutritionists, dietitians, health practitioners, and policy makers for finding better ways to improve nutritional education, food choices and dietary habits that promote healthier diets and eating habits for Americans. The findings of this study are also useful for developing nutritional education programs in many Asian countries, such as China, that are increasingly adopting Western-style food and average caloric intakes.

Notes

1. Prepared-food, such as fast food, is less expensive and less nutrient than food-away-from-home (Binkley, 2006). Food-away-from-home is lower nutritional quality than food-cooked-at-home (Schroeter and Lusk, 2008; Lin and Frazao, 1997) because restaurant meals contain higher fat and calories than food-cooked-at-home (Lin *et al.*, 1999; Blaylock *et al.*, 1999). Further, nutrition conscious individuals are likely to use nutritional labels while shopping and at home (Nayga *et al.*, 1998) and consume more food-cooked-at-home.
2. The weighted average daily time spent on purchasing prepared-food in the full sample is 1.2 minutes. About 12.5 percent (or 7,225 out of 57,708) of population is engaged in this activity based on the data sample in this study.
3. Take the first-order conditions of the Lagrangian function with respect to l_w and l_0, and we obtain $\lambda_1 = 1/w$ and $\lambda_2 = 1$.
4. While the amount of time required to prepare food-cooked-at-home ($t_n(N)$) is increasing at a diminishing rate ($(t_n^{'}(N) > 0$ and $t_n^{''}(N) < 0)$, the elasticity of time demand with respect to family size is less than one, implying that $t_n(N)/N$ decrease with family size (N).
5. The *American Time Use Survey Users Guide: Understanding ATUS 2003-2007* is sponsored by the Bureau of Labor Statistics (BLS, 2009), conducted by the US Census Bureau.
6. Time use categories include personal care (1), household activities (2), caring for and helping household and non-household members (3, 4), working and work-related activities (5), education (6), consumer purchases (7), professional and personal care services (8), household

services (9), government services and civic obligations (10), eating and drinking (11), socializing, relaxing and leisure (12), sports, exercise, and recreation (13), religious and spiritual activities (14), volunteer activities (15), telephone calls (16), and traveling (18). A detailed description is available in the *ATUS Activity Lexicon 2003-2007* (BLS, 2009).

7. Time spent purchasing prepared-food (or "all other goods" in equation (3)) is neglected because the weighted average daily time spent on this activity in the full sample is at minimal and only 12.5 percent of the full population is engaged in this activity.
8. A detailed description is available in the *American Time Use Survey Users Guide: Understanding ATUS 2003-2007* (BLS, 2009).
9. The sample selection model is also known as the type 2 Tobit model (Amemiya, 1985), the Probit selection model (Wooldridge, 2002) or the bivariate sample selection model (Cameron and Trivedi, 2005).

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Appendix

Variable description	Notation	Unweighted means	Min.	Max.
Outcome measures				
Total time spent preparing food-cooked-at-home	tfprep1	38.7783	0	975
Total time spent obtaining food-away-at-home	tfprep2	8.2346	0	1220
Explanatory variables				
Age of respondent: 18-25 (0/1)	age1	0.1014	0	1
Age of respondent: 26-45 (0/1)	age2	0.4992	0	1
Age of respondent: 46-65 (0/1)	age3	0.3995	0	1
Gender of respondent: male (0/1)	men	0.4396	0	1
Gender of respondent: female (0/1)	women	0.5604	0	1
Race of respondent: White (0/1)	race1	0.8253	0	1
Race of respondent: Black (0/1)	race2	0.1212	0	1
Race of respondent: Asian (0/1)	race3	0.0304	0	1
Race of respondent: other (0/1)	race4	0.0231	0	1
Ethnicity of respondent: Hispanic (0/1)	ethnic1	0.1308	0	1
Ethnicity of respondent: non-Hispanic (0/1)	ethnic2	0.8692	0	1
Education of respondent: less than HS diploma (0/1)	education0	0.1111	0	1
Education of respondent: HS diploma (0/1)	education1	0.2734	0	1
Education of respondent: HS diploma plus some college (0/1)	education2	0.1936	0	1
Education of respondent: associate degree (0/1)	education3	0.0993	0	1
Education of respondent: Bachelor's degree (0/1)	education4	0.2088	0	1
Education of respondent: advanced degree (0/1)	education5	0.1138	0	1
Hours worked per day	workhour	4.3106	0	22.86
Marital status of respondent: married (0/1)	marital1	0.5848	0	1
Marital status of respondent: unmarried (0/1)	marital 2	0.4152	0	1
Family income of respondent: less than $25,000 (0/1)	faminc0	0.1889	0	1
Family income of respondent: $25,000-49,999 (0/1)	faminc1	0.2477	0	1
Family income of respondent: $50,000-74,999 (0/1)	faminc2	0.1847	0	1
Family income of respondent: more than $100,000 (0/1)	faminc3	0.1568	0	1
Family income of respondent: $50,000-74,999 (0/1)	faminc4	0.1052	0	1
Household size of respondent: member = 1 (0/1)	hhmember1	0.1775	0	1
Household size of respondent: member = 2 (0/1)	hhmember2	0.2594	0	1
Household size of respondent: member = 3 (0/1)	hhmember3	0.2058	0	1
Household size of respondent: member = 4 (0/1)	hhmember4	0.2173	0	1
Household size of respondent: member = 5 or more (0/1)	hhmember5	0.1400	0	1
Metropolitan living status of respondent: Metropolitan (0/1)	metro1	0.4911	0	1
Metropolitan living status of respondent: non-metropolitan (0/1)	metro2	0.1053	0	1
Season: diary day of respondent: winter (0/1)	winter	0.2630	0	1
Season: diary day of respondent: spring (0/1)	spring	0.2489	0	1
Season: diary day of respondent: summer (0/1)	summer	0.2438	0	1
Season: diary day of respondent: fall (0/1)	fall	0.2442	0	1
Region of respondent: Northeast (0/1)	region1	0.1843	0	1
Region of respondent: Midwest (0/1)	region2	0.2524	0	1
Region of respondent: South (0/1)	region3	0.3472	0	1
Region of respondent: West (0/1)	region4	0.2160	0	1

Note: $n = 57{,}708$

Table AI.
Variable description, unweighted mean, and maximum and minimum: 2003-2007