

Trends in Americans' food-related time use: 1975–2006

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Abstract

Objective: To describe how the time spent in food-related activities by Americans has changed over the past 30 years.

Design: Data from four national time diary surveys, spanning 1975–2006, are used to construct estimates of trends in American adults' time spent in food-related activities. Multivariate Tobits assess how food-related activities have changed over time controlling for sociodemographic and economic covariates.

Results: Both bivariate and multivariate estimates reveal that between 1975 and 2006, American women's time spent in food preparation declined substantially, whereas the time spent in these activities by American men changed very little. On the contrary, grocery shopping time increased modestly for both men and women. The primary eating time (i.e. time when eating/drinking was the respondent's main focus) declined for both men and women over this historical period, and the composition of this time changed with less primary eating time being done alone. Concurrently, secondary eating time (i.e. time when something else had the respondent's primary attention, but eating/drinking simultaneously occurred) rose precipitously for both women and men between 1975 and 1998.

Conclusions: The total time spent in eating (i.e. primary plus secondary eating time) has increased over the past 30 years, and the composition of this time has shifted from situations in which energy intake can be easily monitored to those in which energy intake may be more difficult to gauge. Less time is also being spent in food preparation and clean-up activities. Future research should explore possible links between these trends and Americans' growing obesity risk.

Keywords
Food preparation time
Eating time
Time use

The upward trend in the fraction of American adults who are overweight or obese is one of the foremost public health concerns in the United States today. The National Center for Health Statistics reports that over the past quarter century the prevalence of adult overweight has grown by 40% (increasing from 47 to 66.2%), whereas the prevalence of adult obesity has more than doubled (increasing from 15 to 32.9%)⁽¹⁾. Moreover, forecasts suggest that the trend will not reverse itself in the near future⁽²⁾.

As the risk of being overweight or obese has increased, so has research aimed at identifying its underlying causes. One research stream focuses on factors that affect Americans' energy expenditures, whereas another area of research examines the factors related to Americans' increased consumption of energy-dense foods, large portion sizes, processed foods and foods prepared away from home. For example, one study identified associations between the risk of obesity and a high level of high-fructose corn syrup consumption, an ingredient that is heavily represented in high-energy beverages and processed

snacks⁽³⁾, while another study linked increased snacking to the rise in Americans' energy intake⁽⁴⁾. Similarly, fast food consumption (noted for large portion sizes and high-density food items) has also been linked to consuming more energy^(5–8) and an increased risk of being obese^(5,6,8). Such findings would be of less concern if only a small fraction of American households regularly ate food prepared away from home. But, a recent study found that approximately 40% of American households are in one of three groupings in which food expenditures are dominated by such food-away-from-home purchases⁽⁹⁾.

At the same time when the consumption of foods prepared away from home has increased, researchers have observed that women's time spent in food preparation and clean-up activities has been declining^(4,10–14). For example, Rose and Richards⁽¹³⁾ report that full-time homemakers decreased their meal preparation, clean-up and grocery shopping time by about 7 h per week between 1965 and 1966 and between 1998 and 1999. For employed women, the decline was about 3.5 h per week. This shift away from time spent in food-related activities

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is consistent with the parallel rise in Americans' consumption of processed foods and foods prepared away from home.

Insights about the behavioural mechanisms that underlie the movement away from meals prepared and eaten at home to food prepared away from home can be gleaned by focusing on the factors that influence time use. Using data from the 2003–2006 American Time Use Surveys, Cawley and Liu⁽¹⁰⁾ find that employed women devote less time to cooking and eating with their children than otherwise similar non-employed women. Chou *et al.*⁽¹⁵⁾ examine the link between the growth in fast food and full-service restaurants and BMI, and speculate that the positive association that they observe may be a result of women's expanded labour market opportunities and rising opportunity costs of time. On the other hand, Cutler *et al.*⁽⁴⁾ present evidence suggesting that the decline in women's meal preparation time is more strongly linked to the change in technology that has reduced the costs of prepared foods than to the increase in women's labour force attachment or opportunity costs of time. For instance, over this historical period, the fraction of American households owning automatic dishwashers and microwave ovens has increased dramatically. Although the proliferation of such technologies reduce food preparation time, it is unlikely that they would be associated with eating habits that promote weight gain.

Past research has shown that energy intake is also affected by the eating context. Research has shown that people tend to consume more energy when they are eating with others^(16–18) and when they are simultaneously engaged in other activities (e.g. watching television and working)^(19–22). Indeed, a large fraction of adults report that they eat while simultaneously doing other things. A survey carried out by the American Dietetic Association in 2004 found that 62% of Americans were too busy to sit down and eat most or some of the time, and 35% typically ate lunch at their work desks⁽²³⁾.

In the current paper, we build on earlier work that has examined the processes that underlie Americans' time spent in food-related activities. Specifically, we make use of repeated cross-sectional time diary surveys to describe how Americans' time spent in food-related activities (i.e. grocery shopping, food preparation and clean-up and eating) has changed since the mid-1970s, a time that predates the upward trend in overweight/obesity. The limited work that has looked at Americans' food-related activities typically focuses exclusively on time spent in grocery shopping, food preparation and clean-up^(12,13). Although Cawley and Liu⁽¹⁰⁾ examine the time mothers spend eating with their children, to the best of our knowledge, ours is the first study to assess shifts in time spent eating and drinking beverages more generally. Specifically, we examine trends in time spent eating/drinking alone, time spent eating/drinking with others, time spent where eating/drinking is the primary activity

and time spent where eating/drinking is being done while the individual's primary focus is on something else. In the multivariate analyses, we assess the extent to which the bivariate trends we observe hold once we control for rising opportunity costs of time and shifts in household sociodemographics (e.g. losses in economies of scale that come about with smaller family sizes).

Methods

The data

The data for the current investigation come from four national representative surveys that utilise the same methodology to gather 24h recall time diaries for respondents. Diary-based information is considered to be the most valid and reliable way to measure time use^(24,25). The four data sets are: (i) the 1975–1976 Time Use in Economic and Social Accounts (TUESA75)⁽²⁶⁾; (ii) the Americans' Use of Time, 1985 (ATUS85)⁽²⁷⁾; (iii) the Family Interaction, Social Capital and Trends in Time Use, 1998–1999 (FISCT98)⁽²⁸⁾; and (iv) the 2006 American Time Use Survey linked to the 2006 Eating and Health Module (ATUS06)⁽²⁹⁾. The samples used in the current analysis are limited to respondents who were 25 years of age or older at the time of the survey, so that we might focus on those individuals who are most likely to have completed their schooling and established their own households. Key information about each survey, including sample design, time period, mode of administration and respondent criteria, is summarised in Table 1.

Instruments

The set of sociodemographic covariates are limited to those that are measured in a common fashion in all four surveys. These include gender, marital status, years of education, age and the number of children, who are less than 18 years of age, in the household. Predicted hourly wage rates for each respondent are generated based on wage regressions estimated using corresponding years of the March supplement to the Current Population Survey (CPS). We use individuals aged 25 years and older in the March supplement to estimate wage equations that correct for sample selection bias using the techniques developed by Heckman⁽³⁰⁾. Equations are estimated separately for women and men using the appropriate CPS weights and are available from the authors upon request. Coefficients from these equations are used to generate predicted opportunity costs of time for each individual in the four time-use surveys. Estimates of offered wage rates provide approximate opportunity cost estimates of the value of time for employed individuals and lower-bound estimates of the value of time for non-employed individuals⁽³⁰⁾.

One of the challenges in the time use literature is how to code a respondent's activities in those situations in which the individual is doing two things simultaneously.

Table 1 Time diary data sets used in the analyses

	TUESA75	ATUS85	FISCT98	ATUS06
Sample design	Multistage area probability sample	Simple random sample (telephone and mail-back) and stratified sample (personal interviews)	Simple random sample	Stratified three-stage sample†
Time period	1 October 1975 to 30 November 1975†	1 January 1985 to 30 June 1986	7 March 1998 to 9 December 1999	1 January 2006 to 31 December 2006
Mode of administration	Personal interviews	Telephone, mail-back and personal interview surveys	Telephone	Telephone*
Respondent criteria	Randomly selected individuals in the household at 18 years of age or older plus his/her spouse if s/he was married	Randomly selected adults at 18 years of age or older living in the contiguous USA	Randomly selected individual in the household at the age of 18 years or older	Randomly selected individual in the household at the age of 15 years or older
n	2406	4939	1151	12943

†Respondents in the TUESA75 completed up to four 24 h diaries between 1 October 1975 and 30 November 1975. Following Robinson and Godby⁽³⁶⁾ and Bianchi *et al.*⁽²⁴⁾, we use only the Wave-1 diaries from October and November 1975 in order to maintain comparability with the other surveys where diary data for only 1 d have been gathered.

*Respondents for the ATUS06 were selected from those households that had completed their final interview for the current population survey. All respondents selected to be in the ATUS06 received an advanced mailer notifying them that they have been selected to participate in the ATUS. Respondents having telephones are being told on which day the interviewer will call them. Respondents without telephones (approximately 5 % of the total sample) are asked to call the BLS telephone centre on a specified date to complete the survey⁽²⁹⁾.

The standard approach is to ask about ‘primary’ and ‘secondary’ activities. Primary time spent in activity X is defined to be time where activity X is the respondent’s self-reported main focus of attention. In contrast, secondary activities are those activities that occur simultaneously with the primary activity. For example, an individual may report that from 07.00 to 07.15 h, his/her primary activity was helping children to get ready for school while simultaneously s/he was eating breakfast. In this example, helping children would be coded as the primary activity and eating would be coded as the secondary activity. Differentiating between primary and secondary eating time may provide insights about eating-related processes that potentially put people at greater risk for weight gain, as past studies have found that people are less likely to pick up on satiation cues and consequently eat more when eating is a secondary activity^(19–21).

In the TUESA75 and FISCT98 diaries, respondents were asked to recall both primary and secondary ‘eating and/or drinking beverages’ activities over the preceding 24 h, and who else was present during these activities. For ease of exposition, we refer to these as ‘eating’ activities throughout the remainder of the paper. The publicly available ATUS85 diaries contain reports of primary activities only, and there is no information as to whether or not others were present. Thus, the ATUS85 data are excluded from all analyses that focus on the presence/absence of others and secondary eating time.

The ATUS06 contains comparable information on primary activities and the presence or absence of others, but it makes use of somewhat different questionnaire wording to assess secondary eating activities. In the TUESA75 and FISCT98, at the time when respondents were asked about each of their primary activities and their duration, they were next asked whether they were doing anything else simultaneously. If the answer was ‘yes’, the respondents were then asked about what the secondary activity was and its duration. If respondents reported that their secondary activity was eating a meal or snack and/or drinking a beverage at home, in a restaurant or at some other place, they were given one activity code. Another activity code was used for food and drinks consumed at work. We sum the times in these two activity codes to get total secondary eating time.

In the ATUS06, questions about secondary eating were asked separately from questions about secondary beverage drinking activities, and all of these questions were asked at the end of the diary interview rather than concurrently with each primary activity identified by the respondent. Given the differences in measuring secondary eating and beverage drinking time across the surveys, we elected to omit the ATUS06 secondary eating and beverage drinking data from the analyses presented in the paper.

We sum the primary time spent in preparing food and cleaning up after preparing food into one measure that we

label 'food preparation'. Grocery shopping time is coded as a separate variable. We exclude travel time related to grocery shopping, because in two of the surveys (TUESA75 and ATUS85) we cannot separate travel related to grocery shopping from travel related to other shopping activities. Primary time spent in eating is summed separately. We also look at the amount of primary time spent in eating alone and the amount of primary time spent in eating with others, as earlier research shows that people generally eat more when eating with others. We look at the secondary time spent eating separately from the primary time under the assumption that secondary eating time is more likely to be time when individuals do not adequately monitor their energy intake because their attention is more focused on some other activity (e.g. watching television, driving and working at a desk).

Statistical analyses

Trends in the average time spent in food preparation and eating activities are assessed separately for men and women. Multivariate Tobit models for the various types of food-related time use are estimated in the econometric time series module in the SAS statistical software package version 9.1 (SAS Institute Inc., Cary, NC, USA). Tobit is used to correct for the censoring of time use that occurs at 0 min. As with ordinary least squares regression, use of the Tobit estimation routine assumes normality and homoscedasticity⁽³¹⁾. Covariates include marital status, years of education, age, number of minor children in the household, the respondent's predicted wage rate, a weekday/weekend diary dummy and the survey year dummies. The Tobit coefficients are used to calculate marginal effects for the year dummies that are included in the estimating equations.

With some respondents recording time use for a weekday, while others record time use for a weekend day, we control for the distribution of weekday/weekend diaries in the descriptive tables by applying the sample weights. In the multivariate analyses, we do not apply the weights but rather follow the strategy of controlling for the factors that are used to construct the sampling weights, including a weekday/weekend dummy, as suggested by DuMouchel and Duncan⁽³²⁾.

Results

Figure 1 shows that time spent eating as a primary activity has declined on average for both American women and men from 1975 to 2006. Differences in mean times across years as assessed by *t* tests are all statistically significant for both men and women with the exceptions of the 1975–1985 comparison (for women only) and the 1998–1999 to 2006 comparisons (for both men and women). This suggests that the decline in Americans' primary eating time reached a plateau by the late 1990.

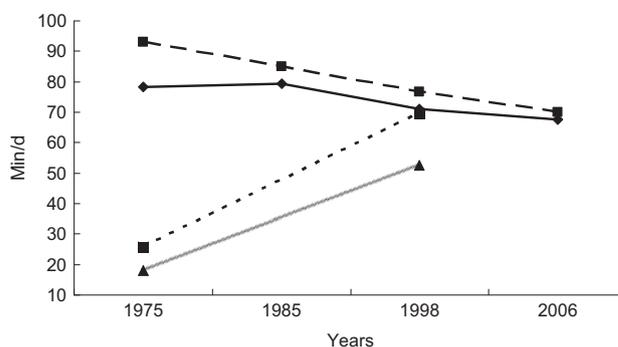


Fig. 1 Trends in mean time spent eating (—■—, men primary time; —◆—, women primary time; - - -■- - , men secondary time; —▲—, women secondary time)

The significant downward trend in primary eating time may appear to be at odds with the rise in Americans' risk of being overweight or obese. However, when it is viewed in conjunction with the dramatic rise in eating as a secondary activity, a more consistent picture of food-related time use emerges. Figure 1 depicts the dramatic rise in secondary eating time that occurred between 1975 and 1998–1999. The *t* tests reveal that the change in secondary eating time is statistically significant for both women and men.

When primary and secondary eating time are assessed together, we see that in 1975, men averaged a total of about 119 min per d eating with only about 22% of the total time spent engaged in eating as a secondary activity. By 1998, men's total time spent in eating had risen on average to 146 min per d with 48% of the total being secondary eating time. Similarly, women's total eating time rose from 96 min per d in 1975 to 123 min per d in 1998, with the fraction of all eating time devoted to secondary eating increasing from 19 to 43%. Thus, the descriptive data suggest that the total time spent eating has been increasing, and the composition of such time has been changing with a downward trend in primary eating time and an upward trend in time spent eating as a secondary activity.

The trend in time spent eating alone and eating with others is shown in Fig. 2. Primary eating time spent with others has remained relatively constant, at about 50 min per d, for women over the past 30 years. On the other hand, men saw a decline of about 13 min per d in time spent eating with others between 1975 and 1998. The associated *t* test shows that this decline is statistically significant.

Both men and women have experienced a statistically significant decline in solitary eating time since 1975. For women, both the 1975 *v.* 1998–1999 and the 1998–1999 *v.* 2006 comparisons are statistically significant. In contrast, for men, the decline from 1975 to 1998–1999 does not reach conventional levels of statistical significance for the *t* test, but the 1998–1999 *v.* 2006 comparison is statistically significant. Viewing Figs 1 and 2 together, it would appear

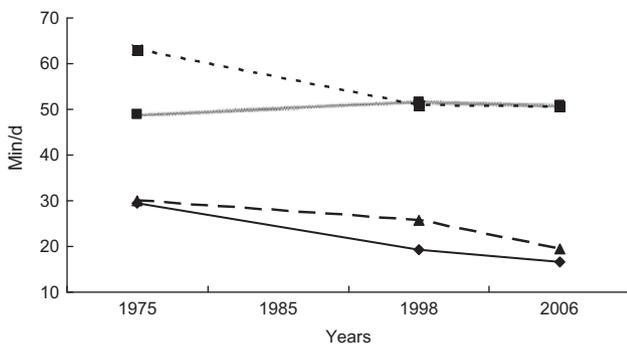


Fig. 2 Trends in mean primary time spent eating alone and eating with others (—■—, men eating with others; - -■-, women eating with others; - -▲-, men eating alone; —◆-, women eating alone)

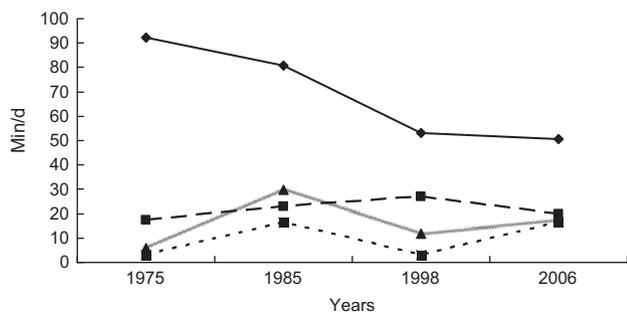


Fig. 3 Trends in mean food preparation and grocery shopping time (—◆-, women food preparation; ····■-, men food preparation; - -▲-, women grocery shopping; - -■-, men grocery shopping)

that the decline in primary eating time is due mainly to a decline in primary time spent eating alone for women, while for men it is a combination of fewer minutes spent eating alone and fewer minutes spent eating with others.

Not surprisingly, we find that the time American women typically spend in food preparation has declined markedly in recent years. Figure 3 shows that the decline in such activities over this 30-year period is 40 min per d for women. In 1975, American women averaged 92 min per d in these activities. But, by 2006, mean time spent in such food preparation activities had declined to 51 min per d. Differences in mean times as assessed by *t* tests are all statistically significant with the exception of the 1998–1999 to 2006 comparison. This suggests that the downward trend in women's food preparation time may have levelled off by the late 1990s.

The decline in women's food preparation activities is not compensated for by a commensurate increase in men's time. Indeed, the mean food preparation and clean-up time for men appears to have risen and then declined over this 30-year period with the net change of only 3 min per d when one compares the 1975 mean to the 2006 mean.

Time spent in grocery shopping also shows no clear trend. Between 1975 and 1985, time spent in grocery

shopping increased significantly for both women and men. Then, between 1985 and 1998–1999, there was a statistically significant decrease for both groups. Finally, between 1998–1999 and 2006, time spent grocery shopping again increased significantly. Taken altogether, the time spent shopping for groceries increased by about 11 min per d for women and 13 min per d for men between 1975 and 2006.

Over this historical period in which Americans' food-related time use has changed, we have also seen shifts in the sociodemographic and economic circumstances of American households. Comparisons across the four samples depicted in Table 2 show that the typical American men and women have grown older and increased their years of schooling over this historical period. Commensurately, their real average hourly wage rate has risen, in percentage terms more so for women than for men, however. In addition, fewer men and women are married in the 2006 sample compared to the 1975 sample, and the typical number of minor children living with both male and female respondents declined across the four surveys. These sociodemographic and economic trends are consistent with patterns observed in historical tables compiled by the US Census Bureau.⁽³³⁾

Following the arguments of Cawley and Liu⁽¹⁰⁾ and Chou *et al.*⁽¹⁵⁾, these changes in sociodemographic and economic factors within the home explain our observed shifts in food-related time use. If this is the case, then once we control for these covariates, the relationship between calendar time and time spent in food-related activities should disappear. To test this proposition, we pool the data across the four surveys and estimate multivariate models of food-related time use. Tables 3 and 4 present the parameter estimates for the survey year dummies adjusted for the respondent's marital status, age, years of education, predicted hourly wage rate, number of minor children in the home and whether or not the diary came from a weekend or weekday. For the secondary eating time equation, the reference group is FISCT98. For all other equations, the reference group is ATUS06.

The bivariate trends observed in Figs 1–3 largely continue to hold in the multivariate analyses. In Table 3, we observe that women in both 1975 and 1985 spent about 13 more min per d in primary eating activities than otherwise similar women in 2006. For men, the decline in primary eating time appears to have occurred over a somewhat longer time frame with a typical man in 1975 spending 26 min more per d in primary eating activities than in 2006. The relative gap shrinks to approximately 14 min per d by 1985 and to only about 6 min per d by 1998.

The composition of primary eating time also shifted over the 30-year period. In 1975, time spent eating alone was >14 min per d for the average woman and >12 min per d for the average man than their 2006 counterparts. Simultaneously, the average male's time spent eating with

Table 2 Descriptive statistics†

Variables	TUESA75	ATUS85	FISCT98	ATUS06
Women				
Mean age (years)	48.59	47.11	49.15	50.08
Mean years of schooling	11.85	12.80	13.08	13.44
Mean hourly wage rate (2006 dollars)	7.44	11.23	12.70	13.74
Percentage of currently married	64	65	64	61
Mean number of children < 18 (≥25 years of age)	1.12	0.73	0.88	0.76
<i>n</i>	1143	2084	563	6539
Men				
Mean age (years)	46.58	45.93	47.90	48.51
Mean years of schooling	12.08	13.18	13.15	13.52
Mean hourly wage rate (2006 dollars)	13.03	20.37	18.09	19.02
Percentage of currently married	80	76	65	68
Mean number of children < 18 (≥25 years of age)	1.06	0.67	0.82	0.71
<i>n</i>	944	1629	438	4768

†Samples used in the analyses exclude respondents who are less than 25 years old. Descriptive statistics are weighted using the appropriate sample weights available in each of the data sets that were designed to allow generalisability to the larger population at that point in time.

others was about 13 min per d greater in 1975 than 2006. These statistically significant shifts in the composition of primary eating time appear to have occurred sometime between 1975 and 1998, as time spent eating alone and with others in 1998 is not statistically different from time spent eating alone and with others in 2006, holding other factors constant.

Although total primary eating time for both American women and men declined over the 30-year period, secondary eating time increased. The average American woman in 1998 spent about 17 min more per d engaged in secondary eating activities relative to her otherwise similar 1975 counterpart. The growth in secondary eating time for men was even greater over this 23-year period, with the average being an increase of about 32 min per d.

In Table 4, we see that the average American women spent roughly 35 min more in the related activities of food preparation each day in 1975 than her counterpart spent in 2006, holding other factors constant. On the other hand, the average American man spent approximately 5 min less in food preparation activities in 1975 than his otherwise similar counterpart in 2006. The relative decline in women's time and the relative increase in men's time appear to have occurred during 1985 to 1998. In 1998, we observe no statistically significant differences in food preparation time for either women or men compared to 2006.

The multivariate results also mirror the bivariate analyses for grocery shopping, depicting first an increase in grocery shopping time and then a decline in 1998 and a rise again in 2006. The net increase between 1975 and 2006 for both women and men is about 10 min per d holding other factors constant.

Discussion

Several trends described in the current study provide insights and suggestions for future research regarding

how Americans' food-related time use may be contributing to the obesity epidemic. Focus first on the issue of time spent in food preparation activities (e.g. preparing foods, cleaning up afterwards). Historically, American women have had primary responsibility for these activities. Using time diary data, Bryant⁽¹⁴⁾ estimates that American women averaged almost 3 h per d in food preparation and clean-up in the mid-1920s. By 1968, he noted that the average had declined to approximately 2 h per d. The current analyses reveal that this downward trend continued through the late 1990s, when American women's time in food preparation activities plateaued at about 50 min per d. Moreover, the decline in women's food preparation time has not been compensated for by a commensurate increase in men's time. This downward trend in women's food preparation time and the absence of a commensurate upward trend in men's food preparation time is consistent with Americans' greater reliance on pre-packaged, processed foods and the increase in meals purchased away from home.

At the same time when food preparation and clean-up time has steadily declined, time spent grocery shopping has fluctuated over this historical period for both women and men. Grocery shopping is a fairly infrequent activity. (In 2006, only 29% of women and 24% of men reported spending any time in grocery shopping on their diary day.) The upward trend from 1998–1999 to 2006 reflects both an increase in the likelihood of grocery shopping on a given day and an increase in the amount of time spent in shopping, if it is done. To the extent that more frequent shopping reflects the purchase of more perishable goods (e.g. fresh fruits and vegetables) this could be a good trend. But, we cannot ascertain this from our time diary data, and thus it is left to future researchers to assess exactly what increased shopping time might mean for Americans' food-related habits.

Americans' time spent eating also shifted over this historical period. Primary eating time declined over the past 30 years and it would appear that a portion of this

Table 3 Adjusted eating-related Tobitt parameter estimates, SE and marginal effects† for dummy variables associated with survey year‡

	Primary time spent eating			Secondary time spent eating			Primary time spent eating alone			Primary time spent eating with others		
	Coefficient	SE	Marginal effect	Coefficient	SE	Marginal effect	Coefficient	SE	Marginal effect	Coefficient	SE	Marginal effect
Women												
TUESA75	14.57*	2.00	13.43	-77.30*	26.44	-17.09	31.02*	2.22	14.21	0.91	2.47	0.69
ATUS85	14.94*	1.32	13.77	-	-	-	-	-	-	-	-	-
FISCT98	1.15	2.20	1.06	-	-	-	0.65	2.46	0.30	0.03	2.66	0.01
Men												
TUESA75	28.56*	2.16	26.17	-133.29*	26.58	-31.68	26.00*	2.41	12.44	17.09*	2.60	12.81
ATUS85	15.23*	1.69	13.96	-	-	-	-	-	-	-	-	-
FISCT98	6.34*	2.79	5.81	-	-	-	3.91	3.06	1.87	3.12	3.37	2.33

* $P < 0.05$.
 †The equations are estimated using the Tobitt routine in the econometric time series module within SAS to account for the fact that the dependent variables are censored at 0 min. The estimates are adjusted for the respondent's marital status, age, years of education, the log of the respondent's predicted wage rate, the number of children under the age of 18 years in the household, and whether or not the diary day came from a weekend or weekday.
 ‡Marginal effects are evaluated at the mean values for all independent variables.
 §The reference year is ATUS06 for all estimates, except for the secondary eating time where the reference year is FISCT98.

trend is attributable to a decline in primary time spent eating alone. At the same time, there has been a shift towards spending much more time eating while simultaneously focusing attention on other things (e.g. watching television, working). In total, time spent eating has risen over the past 30 years and the composition of this time has shifted from eating situations in which energy intake can be easily monitored to eating situations in which Americans are less likely to be conscious of their energy intake⁽¹⁶⁻²²⁾. In particular, the rise in secondary eating time is at odds with some of the recent recommendations to improve Americans' eating habits advocated by national authorities^(34,35).

Although individuals' sociodemographic and economic circumstances are associated with some of the shifts in food-related time use patterns that we observe, large statistically significant secular trends remain even after we control for these factors. Indeed, the estimated upward trend in secondary eating time is even larger once we control for the sociodemographic and economic covariates. Some researchers have suggested that rising opportunity costs of time and increases in labour force attachment may be responsible for Americans' shifting eating habits^(10,15). We find that these factors explain only very modest amounts of the overall shift in Americans' eating behaviours. This leaves unanswered the question of what might be responsible for the observed trends.

We are unable to test the hypothesis that improvements in food processing technology and the subsequent decline in the price of processed foods may be responsible for some of the time-use trends that we observe because data on local food prices were not gathered as part of the time-use surveys. In addition, we are unable to test the proposition that changes in household technology may have played a role in the observed shifts in food-related time use. While the 1975 survey did gather some information about the presence/absence of household food-related technologies within the home, these questions are not asked in any of the subsequent time-use surveys. Both hypotheses merit further study.

Increases in the availability of cheap processed foods and labour-saving technology within the home (e.g. dishwashers and microwave ovens) may explain much of the decline in women's food preparation time over the past century. But, it is less plausible that it could also be responsible for the dramatic rise in the time Americans spend eating while their primary attention is on other activities. Changes in social conventions regarding where it is acceptable to eat (e.g. at work desks rather than in cafeterias or lunch rooms, while driving rather than at a dining room table), and with whom Americans eat (or do not eat) may also be responsible for some of the shifts in Americans' food-related activities. These speculative explanations also merit further investigation.

Table 4 Adjusted grocery shopping and food preparation Tobitt parameter estimates, se and marginal effects‡ for dummy variables associated with survey year§

	Grocery shopping time			Food preparation Time		
	Coefficient	SE	Marginal effect	Coefficient	SE	Marginal effect
Women						
TUESA75	-34.63*	4.94	-10.57	48.38*	3.08	34.81
ATUS85	37.71*	3.06	11.52	37.55*	2.21	27.02
FISCT98	-17.47*	5.51	-5.34	0.73	3.73	0.52
Men						
TUESA75	-44.98*	5.47	-10.41	-12.14*	3.52	-5.06
ATUS85	21.64*	3.37	5.01	9.92*	2.61	4.13
FISCT98	-41.72*	6.93	9.66	4.46	4.36	-1.86

* $P < 0.05$.

†The equations are estimated using the Tobit routine in the econometric time series module within SAS to account for the fact that the dependent variables are censored at 0 min. The estimates are adjusted for the respondent's marital status, age years of education, the log of the respondent's predicted wage rate, the number of children under age 18 in the household, and whether or not the diary day came from a weekend or weekday.

‡Marginal effects are evaluated at the mean values for all independent variables.

§The reference year is ATUS06 for all estimates.

The current analysis raises the question of whether Americans' observed shifts in food-related time use is linked to Americans' growing risk of being overweight or obese. This question can only be definitively answered by analyses that relate individual time-use patterns (both time related to energy inputs and time related to energy output) to BMI. Future research should focus on assessing this potential link in the energy-balance production process.

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References

1. National Center for Health Statistics (2006) *Prevalence of Overweight and Obesity Among Adults: United States, 2003-2004*. Atlanta, GA: National Center for Health Statistics; available at http://www.cdc.gov/nchs/products/pubs/pubd/hestats/overweight/overwght_atult_03.htm
2. Wang YC, Colditz GA & Kuntz KM (2007) Forecasting the obesity epidemic in the aging US population. *Obesity* **15**, 2855-2865.
3. Bray GA, Nielsen SJ & Popkin BM (2004) Consumption of high-fructose corn syrup in beverages may play a role in the epidemic of obesity. *Am J Clin Nutr* **79**, 537-543.
4. Cutler DM, Glaeser EL & Shapiro JM (2003) Why have Americans become more obese? *J Econ Perspect* **17**, 93-118.
5. McCrory MA, Fuss PJ, Hays NP *et al.* (1999) Overeating in America: association between restaurant food consumption

- and body fatness in healthy adult men and women ages 19 to 80. *Obes Res* **7**, 564-571.
6. Bowman SA & Vinyard BT (2004) Fast food consumption of US adults: impact on energy and nutrient intakes and overweight status. *J Am Coll Nutr* **23**, 163-168.
7. Burns C, Jackson M, Gibbons C *et al.* (2002) Foods prepared outside the home: association with selected nutrients and body mass index in adult Australians. *Public Health Nutr* **5**, 441-448.
8. Pereira MA, Kartashov AI, Ebbeling CB *et al.* (2005) Fast-food habits, weight gain, and insulin resistance (the CARDIA study): 15-year prospective analysis. *Lancet* **365**, 36-42.
9. Fan JX, Brown BB, Kowaleski-Jones L *et al.* (2007) Household food expenditure patterns: a cluster analysis. *Mon Labor Rev* **130**, 38-51.
10. Cawley J & Liu F (2007) *Maternal Employment and Childhood Obesity: A Search for Mechanisms in Time Use Data*. NBER Working Paper Series no. 13600. Cambridge, MA: National Bureau of Economic Research.
11. Guthrie JF, Lin BH & Frazao E (2002) Role of food prepared away from home in the American diet, 1977-78 versus 1994-96: changes and consequences. *J Nutr Educ Behav* **34**, 140-150.
12. Mancino L & Newman C (2007) *Who Has Time to Cook? How Family Resources Influence Food Preparation*. Washington, DC: United States Department of Agriculture.
13. Rose D (2007) Food stamps, the thrifty food plan, and meal preparation: the importance of the time dimension for US nutrition policy. *J Nutr Educ Behav* **39**, 226-232.
14. Bryant WK (1996) A comparison of the household work of married females: the mid 1920s and the late 1960s. *Fam Consum Sci Res J* **24**, 358-384.
15. Chou S-Y, Grossman M & Saffer H (2004) An economic analysis of adult obesity: results from the behavioral risk factor surveillance system. *J Health Econ* **23**, 565-587.
16. de Castro JM (1994) Family and friends produce greater social facilitation of food intake than other companions. *Physiol Behav* **56**, 445-445.
17. de Castro JM (2000) Eating behavior: lessons from the real world of humans. *Nutrition* **16**, 800-813.
18. Herman CP, Herman CP, Roth DA *et al.* (2003) Effects of the presence of others on food intake: a normative interpretation. *Psychol Bull* **129**, 873-886.
19. Bellisle F & Dalix AM (2001) Cognitive restraint can be offset by distraction, leading to increased meal intake in women. *Am J Clin Nutr* **74**, 197-200.

20. Stroebele N & De Castro JM (2004) Effect of ambience on food intake and food choice. *Nutrition* **20**, 821–838.
21. Stroebele N & de Castro JM (2004) Television viewing is associated with an increase in meal frequency in humans. *Appetite* **42**, 111–113.
22. Stroebele N & de Castro JM (2006) Listening to music while eating is related to increases in people's food intake and meal duration. *Appetite* **47**, 285–289.
23. Starkey J & Dombrowski J (2004) *Americans Need Help Managing 'Mealtime Multitasking'*. Chicago, IL: American Dietetic Association; available at http://www.eatright.org/cps/rde/xchg/ada/hs.xsl/nutrition_13725_ENU_HTML.htm
24. Bianchi SM, Robinson JP & Milkie MA (editors) (2006) *Changing Rhythms of American Family Life*. New York: Russell Sage Foundation.
25. Robinson JP (1985) The validity and reliability of diaries versus alternative time use measures. In *Time, Goods, and Well-being*, pp. 33–62 [FT Juster and FP Stafford, editors]. Ann Arbor, MI: Institute for Social Research, University of Michigan.
26. Juster FT, Courant P, Duncan GJ *et al.* (2001) *Time Use in Economic and Social Accounts*. Ann Arbor, MI: Interuniversity Consortium for Political and Social Research.
27. Robinson JP (2007) *Americans' Use of Time, 1985*. Ann Arbor, MI: Interuniversity Consortium for Political and Social Research.
28. Robinson JP, Bianchi SM & Presser S (2001) *Family Interaction, Social Capital, and Trends in Time Use, 1998–99*. Ann Arbor, MI: Interuniversity Consortium for Political and Social Research.
29. US Bureau of Labor Statistics (2008) *American Time Use survey Users' Guide*. Washington, DC: US Bureau of Labor Statistics; available at <http://www.bls.gov/tus/atusersguide.pdf>
30. Heckman JJ (1979) Sample selection bias as a specification error. *Econometrica* **47**, 153–161.
31. Pudney S (1989) *Modelling Individual Choice – The Econometrics of Corners, Kinks, and Holes*. New York: Basil Blackwell.
32. DuMouchel WH & Duncan GJ (1983) Using sample survey weights in multiple regression analyses of stratified samples. *J Am Stat Assoc* **78**, 535–543.
33. US Census Bureau (2008) *The 2008 Statistical Abstract*. Washington DC: US Census Bureau; available at <http://www.census.gov/compendia/statab/>
34. Centers for Disease Control and Prevention (2009) *Improving Your Eating Habits*. Atlanta, GA: Centers for Disease Control and Prevention; available at http://www.cdc.gov/healthyweight/losing_weight/eating_habits.html
35. National Institute of Diabetes Digestive and Kidney Diseases (2008) *Healthy Eating and Physical Activity Across Your Life Span*. Washington, DC: National Institutes of Health; available at http://www.win.niddk.nih.gov/publications/better_health.htm#whatis
36. Robinson JP & Godby G (1997) *Time for Life: The Surprising Ways Americans Use their Time*. University Park, PA: The Pennsylvania State University Press.