Weekend Eating in the United States Is Linked with Greater Energy, Fat, and Alcohol Intake

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Abstract

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Objectives: To determine if macronutrient consumption for the U.S. population is greater on weekend days than weekdays.

Research Methods and Procedures: The nationally representative 1994 to 1996 Continuing Survey of Food Intakes by Individuals was used for this analysis. Dietary intake was assessed using two independent days of dietary recall data. Ordinary least squares multivariate analysis was used to analyze dietary outcome variables to explore the effect of weekend day vs. weekday intake.

Results: This study's results indicate that statistically significant dietary intake differences occur for different days of the week but not for all age groups—nor for all nutrients. The average American, 2 years and older, consumes 82 kcal more per day on each weekend day (Friday through Sunday) than they do on weekdays (Monday through Thursday). These overall increases in dietary intake are significant for the overall sample and are largest for the 19- to 50-year-old age group; among this age group, the weekend day increase (vs. weekday) is 115 kcal/d. The increased proportions of energy from fat and alcohol consumed on weekends are greater for this adult age group by 0.7% and 1.4%, respectively, whereas the proportion of energy from carbohydrate decreases 1.6%.

Discussion: The effects of weekend days on nutrient intake are substantial and should be considered in future clinical and population-based interventions and in dietary monitoring and research in the U.S.

Key words: caloric intake, weekend-weekday, dietary intake determinants

Introduction

A study by Yanovski et al. showed that a small selected sample of suburbanites had a smaller than expected holiday weight gain during the Thanksgiving Day to New Year's Day holiday season (1). They found a net weight gain of only 0.37 kg in their sample of 195 free living adults; over an entire year, they found a 0.62-kg weight gain in 165 subjects. Their results, however, suggested that overweight and obese individuals were at greater risk than leaner individuals for a significant (>5 pounds) weight gain over this holiday period. Although such studies have partially focused attention away from the timing of dietary intake behavior, some earlier small studies suggested that snacking and other daily patterns of eating—in particular, weekend day vs. weekday eating pattern differences—may be important (2–5). This study focuses on macronutrient pattern intake differences between weekend days and weekdays in a nationally representative sample of U.S. residents (6,7).

Research on the timing of weekend day vs. weekday dietary intake is important, not only for guiding clinical and population-based interventions, but also for monitoring the diet of Americans. There are differences in the manner in which survey systems, such as the National Health and Nutrition Examination Survey (NHANES)[1] and the Continuing Survey of Food Intakes by Individuals (CSFII), have sampled and surveyed individuals. For example, through use of a mobile examination center, the NHANES has proportionally studied more participants in the northern areas of the U.S. in the summer months and more southern participants in the winter months. Moreover, NHANES has

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[1] Nonstandard abbreviations: NHANES, National Health and Nutrition Examination Survey; CSFII, Continuing Survey of Food Intakes by Individuals; CSFII94-96, 1994 to 1996 Continuing Survey of Food Intake by Individuals.

not staggered its sample equally in a systematic way across the days of the week or weekends vs. weekdays. In contrast, the CSFII conducted in-home surveys throughout the year in all areas of the country. One of the goals of dietary assessment methods is to estimate "usual" dietary intake patterns. To the extent that seasons of the year and weekdays vs. weekend days influence the estimation of "usual" food and nutrient intakes, surveys that monitor diets in the U.S. must address such influences. Accurate estimates are needed to monitor trends in the quality of U.S. diets and to estimate dietary intakes of foods and nutrients; sufficient precision is needed for use in nutrition epidemiology studies, where dietary data are used to assess exposure to environmental contaminants for food safety monitoring or to explain differences in chronic disease conditions.

This study explores whether weekend days had a larger influence on dietary intake among U.S. consumers, 2 years of age and older, than weekdays during the 1996 period. The project was designed to examine variations in key macronutrient intakes.

Research Methods and Procedures

Survey Data

This study used data for subjects, 2 years of age and older, surveyed in the 1994 to 1996 Continuing Survey of Food Intake by Individuals (CSFII94-96). The CSFII94-96 is a self-weighting, multistage, stratified area sample of the U.S. population; detailed information on the methodology pertaining to the survey has been published previously (8). The sample was stratified into six age groups to examine possible differences in season and weekend day-weekday effects across different age groups; nutritional impacts among children and older adults were expected to differ from other adults. We also examined differences of season and weekend-weekdays for the entire aggregated sample of individuals, 2 years of age and older.

Dietary Data

The analyses used two independent days of dietary recall data per person. The number of days per age group was 4200 days for 2 to 5 years old, 2846 for 6 to 11 years old, 2498 for 12 to 18 years old, 9900 for 19 to 50 years old, 6182 for 51 to 70 years old, and 2530 for 70 years and older. The CSFII94-96 collected two nonconsecutive, interviewer-administered, 24-hour recalls. For children under the age of 12, information was obtained from the child's caregiver. The two days of data collection were occasionally in different seasons and on the weekend and weekdays, so each of the two days was logically examined as a separate occurrence.

Dependent Variables

Dependent (outcome) variables initially included calories and macronutrients in absolute and relative forms (e.g., total fat and fat as a percentage of energy).

Explanatory Measures

The primary explanatory variable of interest was "day of the week." In preliminary specification work, we tested the effects of day of the week on dietary intake patterns. Our analyses concluded that intakes on Friday were more similar to those of Saturday and Sunday than they were to other days of the week and that intakes on Monday through Thursday were similar to each other. Therefore, a dichotomous weekday-weekend day variable was defined to examine differences between dietary intakes reported on Monday to Thursday vs. Friday to Sunday.

A number of other variables were controlled in our statistical analysis. These included the traditional measures of season (e.g., winter from December 21 to March 20, spring from March 21 to June 20, and so forth.), race-ethnicity (Hispanic, non-Hispanic African American, non-Hispanic white, and all others), age (within each age grouping), gender, income as a percentage of the poverty line, education (for children, the education of the mother or family head if no mother was present), region, residence (central city, suburb, or rural), household size, receipt of food stamps, and receipt of women's, infants', and children's food coupons. In preliminary specification work, we looked for seasonal dietary intake differences by including dummy variables for 11 months of the year with 1 month used as the excluded reference month. We also tried two alternate measures of seasons—one based on various month combinations and the second based on the traditional seasons. This initial exploratory analysis led us to the use of the traditional 4-season dummy variable categorization in the results presented below.

Statistical Analysis

The dependent variables used in our analysis were continuous (e.g., nutrients consumed). For the continuous variables, we used ordinary least squares. In all cases, sample weights were used in the estimations, so that the parameter estimates were for a nationally representative sample of respondents. Our estimation methods correct the SEs for clustering due to the sample design. The correction also adjusts for multiple observations on the same individual. For continuous outcomes, such as nutrients, statistically significant coefficients on the weekend day-weekday variables identify the impact of these variables on intake practices.

Results

Table 1 presents the sample descriptive characteristics by age group. Table 2 summarizes population-wide and age-specific nutrient ordinary least squares regression results and the coefficient results and their p values. The table presents adjusted results where the weekend day-weekday

Table 1. Sample characteristics

	Age group						
Characteristic variables	**2 to 5**	**6 to 11**	**12 to 18**	**19 to 50**	**51 to 70**	**70+**	**Total**
Sample size	4200	2846	2498	9900	6182	2530	28,156
Friday to Sunday weekend days (%)	39.5	39.8	42.8	42.8	41.0	39.0	41.3
Race-ethnicity (%)							
Non-Hispanic African American	14.8	15.2	15.1	11.0	11.7	10.4	12.4
Non-Hispanic white	63.6	65.0	64.1	72.6	79.8	85.1	72.5
Hispanic	16.4	15.5	16.7	11.9	6.1	3.2	11.3
Income percentage of poverty line (%)							
Less than 185	48.2	42.5	40.1	34.2	31.2	46.7	38.1
More than 350	22.9	26.8	30.7	37.6	43.5	19.8	33.4
Region (%)							
South	34.6	33.2	34.0	37.1	37.3	32.8	35.7
Northeast	18.0	17.9	16.1	16.4	19.5	21.5	17.9
Midwest	24.1	24.0	25.5	22.2	25.5	27.9	24.2
West	23.4	24.9	24.3	24.3	17.8	17.8	22.2
Season (%)							
Winter	22.1	22.6	19.7	20.6	19.6	20.1	20.7
Spring	26.7	27.6	22.4	25.4	25.4	24.7	25.5
Summer	26.2	26.6	30.5	27.4	28.3	29.0	27.7
Fall	25.1	24.2	27.4	26.6	26.7	26.3	26.2

differences refer to Friday to Sunday vs. Monday to Thursday dietary intake differences, respectively. The multivariate results presented in Table 2 suggest that weekend day-weekday differences in nutrient intakes occur in the total sample; dissimilar results are observed in some age groups for some nutrients. When the entire population is consid-

Table 2. The impact of weekend food consumption: the adjusted difference between intake on a weekend day vs. a weekday, CSFII94-96*

			Macronutrient components of total energy			
Age group (years of age)	**Total energy (kcal)**	**Total fat (g)**	**Energy from fat (%)**	**Energy from protein (%)**	**Energy from alcohol (%)**	**Energy from carbohydrate (%)**
2 to 5	17	2.2	+0.9†	−0.3†	0	−0.7
6 to 11	29	1.5	+0.3	−0.6†	0	+0.3
12 to 18	18	1.3	+0.7	−0.3	0.1	−0.5
19 to 50	115†	5.5†	+0.7†	−0.4†	1.4†	−1.6†
51 to 70	74†	4.1†	+1.2†	−0.3†	+0.4†	−1.6†
70+	−13	0.5	+0.2	+0.3†	+0.2	−0.8
Total sample‡	82†	4.4†	+0.7†	−0.3†	+0.9†	−1.2†

* Adjusted for racial-ethnic status, income as a percentage of poverty, education, region, urban/suburban status, household size, and women's, infants', and children's food stamp program enrollment, age and gender within each subpopulation group, and season of the year.
† Statistically significant at levels of $p \leq 0.05$.
‡ The total sample results are the weighted average of results for each age subpopulation.

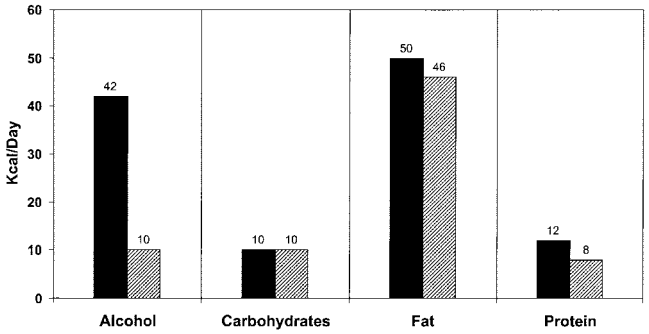

Figure 1: The weekend effects on macronutrient intake composition. ■, 19 to 50 years of age; ▨, 51 to 70 years of age.

ered, intakes of all nutrients differed between weekend days and weekdays.

Weekend Day vs. Weekday

The patterns of dietary consumption on the weekend days and weekdays are different (Table 2). The major differences are in total energy and the macronutrient components of total energy. On weekends, consumption of calories, fat, and alcohol increase, whereas carbohydrate and protein intakes decrease. In the full sample, individuals consumed 82 calories more each weekend day than each weekday.

On a normal Friday to Sunday weekend, the average respondent consumed an additional 82 calories each day (compared with Monday to Thursday), including an additional 4.4 g of fat. The remaining calories came, in part, from increased alcohol intake among adults. In the overall sample, for example, the percentage of energy from alcohol increased 0.9% among those using alcohol on the weekend, with this increased proportion being greatest in adults 19 to 50 years of age (+1.4% of energy).

The overall weekend day energy intake is illustrated for the 19- to 50- and 51- to 70-year-old age groups in Figure 1. We observed weekend day increases in energy intake (compared with weekdays) that resulted from the intake of alcohol, fat, and protein; there was no change in energy intake from carbohydrate on the weekend. Younger adults, 19 to 50 years old, consumed 115 more calories on weekend days than weekdays, with the largest increases coming from alcohol consumption. The 51- to 70-year-old subjects also consumed more alcohol on weekends, but in this age group, the greatest increase in calories came from fat (4.1 more g on weekend days).

It is also important to note that there are smaller day of week dietary intake changes for 1- to 18-year-old children and ≥70-year-old Americans than for the other two age groups (i.e., 19 to 50 and 51 to 70 age groups).

Seasonality Effects

We also briefly explored the yearly seasonality effects on energy intake. Table 3 illustrates the impact of seasons of the year on the age groups' energy intake. We present these results to allow an examination of the seasonal effects found by Yanovski et al. on this representative sample (1). Estimates reflect the predicted unconditional adjusted means in each season, which are compared by estimation of 95% confidence intervals. Despite the lack of variation across seasons in energy intake for the full sample, age group-specific variations ranged from seasonal differences of 54 calories (4%) for 25-year-old subjects, 145 calories (7%) for 12- to 18-year-old subjects, 76 calories (4%) for 19- to 50-year-old subjects, 105 calories (6%) for 51- to 70-year-old subjects, and 139 calories (9%) for those 71 years old and older. The fall season had the largest seasonal differences for those 19 to 50 years old and for the entire sample.

Table 3. The impact of season on nutrient intake: adjusted daily energy intake mean values by season and age group, CSFII94-96*

	Seasonal dietary intake			
Age group	**Winter (kcal)**	**Spring (kcal)**	**Summer (kcal)**	**Fall (kcal)**
2 to 5	1450†‡	1488	1492	1504†‡
6 to 11	1840	1866	1847	1856
12 to 18	2322†	2177§†‡	2229	2304‡
19 to 50	2151	2116§‡	2122‡¶	2192
51 to 70	1752†	1857§†‡	1819¶†	1792‡
71+	1577†‡	1580§‡	1524¶†	1663‡
Total	1993	1975	1970¶†	2021

* Adjusted for racial-ethnic status, income as a percentage of poverty, education, region, urban/suburban status, household size, and women's, infants', and children's food stamp program enrollment, age and gender within each subpopulation group, and season of the year.

†,‡,§,¶ Different row symbols reflect statistically significant mean differences between the designated pair of seasons, as determined by 95% confidence intervals (e.g., mean energy intake in winter was lower than in the fall among 2- to 5-year olds; intakes were lower in the spring than in the winter and fall among 12- to 18-year olds).

Discussion

One of the most important issues facing the U.S. currently is the significant increase in excess weight among all age and ethnic-racial groups. The results of this study indicate that the average American consumes 82 more kcal on weekend days than on weekdays; this is important because ~10 kcal of positive energy imbalance per day increases a person's weight by 1 pound/y. Because the 19- to 50-year-

old age group consumes 115 kcal more each weekend day (Friday to Sunday) than weekdays (Monday to Thursday) in a given year, the weekend impact to this group would total 17,940 additional kcal (or almost 5 pounds). The weekend day-weekday dietary intake differences are particularly important for adults 19 to 50 and 51 to 70 years old but less important for the younger and older age groups; e.g., because the 12- to 18-year-old age group consumed only 18 kcal of additional energy on weekend days, their weight gain would be only ~0.77 pounds.

The seasonal energy intake differences are also important for the overall sample and for 19- to 50-year-old adults. The fall season, in particular, seems to be the key season for the overall sample. Our results did not exactly conform to the hypothesis generated by Yanovski et al. but did show that the fall period (September 21 to December 20) is the key period of greater energy intake (1).

It is also important to note that our results do not conform to the Schofield method for assessing dietary intake levels. An estimate of total energy requirements is obtained by using a factor they developed, multiplied by the weighted average of our sample in each age group to estimate basal metabolic rate, and then multiplied by the physical activity level of each group (9,10). Our results for all seasons and periods of time are approximately the same level below this figure. The estimated energy intakes for each period are below the estimate of total energy requirement, leaving us with some doubt about the biological significance of our findings. However, it is important to note that the trends for dietary intake changes across the seasons and across days of week are not affected by the overall expected underestimation.

Weekend day-weekday differences also become important from the perspective of National Nutrition Monitoring. In the past, the nutrition monitoring system consisted of a series of dietary and nutritional status surveys; this is in the process of merging into one integrated survey. The sampling and data collection of the NHANES and CSFII surveys have differed. The design of the forthcoming merged food survey system has importance for the collection of both dietary and food program data. Results of this study suggest that there are some significant weekend day vs. weekday differences in the intake of macronutrients; thus, it would be desirable to be able to capture these differences for individuals living in the various regions of the country. In the merged survey, the methodology and data collection methods to estimate dietary intakes should also consider season of intake and day of the week to appropriately assess food and nutrient intake patterns in the U.S. diet at the population and individual levels.

Weekend day-weekday dietary intake differences are equally important for clinical and population-based interventions; intervention designs need to sample in a way that clearly captures these differences. Nutrition educators can also use these results in efforts to sensitize younger and older adults to the important weekend day increases in total energy and fat and alcohol intake.

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