

Eating out in America, 1987–2000: trends and nutritional correlates

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Abstract

Background. Despite widely held beliefs about increasing popularity of eating away-from-home and its possible contribution to increasing adiposity of the US population, there are little published data on this topic. To address this issue, we examined trends in frequency of consumption of commercially prepared (CP) meals reported by Americans aged ≥ 18 years, and its nutritional correlates.

Methods. The data were from the National Health Interview Survey (NHIS) 1987 ($n = 21,731$), NHIS 1992 ($n = 11,718$), and the National Health and Nutrition Examination Survey (NHANES) 1999–2000 ($n = 5,330$). The information on CP meal consumption was obtained from questions included in the three surveys. The independent association of reported CP meal frequency with body mass index (BMI), and intakes of energy and macronutrients was examined using multiple linear regression methods.

Results. The mean reported number of CP meals per week was 2.5 in 1987 and 1992, and 2.8 in 1999–2000. In 1987, approximately 28% of the population reported 0 or < 1 commercially prepared meal per week, decreasing to 24% in 1999–2000 (P for trend < 0.0001). However, the proportion of the population reporting three or more weekly CP meals increased from 36% in 1987 to 41% in 1999–2000 (P for trend ≤ 0.0005). The odds of eating out at least one or more and three or more meals per week were 40% higher (95% CI 1.20–1.70) in 1999–2000 relative to 1987. The reported number of CP meals per week was positively associated with estimates of energy intake ($P \leq 0.0001$) in each survey. Self-reported and measured BMI were modestly associated with the reported number of weekly CP meals in women in 1999–2000 ($P \leq 0.05$).

Conclusion. Our results confirm that in 1999–2000, more Americans ate out, and ate out more frequently than in 1987 and 1992. Higher eating-out frequency was associated with adverse nutritional consequences.

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Keywords: Eating out; Body mass index; Away-from-home eating; Restaurant eating; NHIS; NHANES; Energy intake

Introduction

The decades since 1970 have seen the emergence of an obesity epidemic in the United States [1–3]. Multiple factors that result in positive energy balance are likely contributors to these trends. One of the popular hypotheses about increasing prevalence of adiposity in the US population is speculated to be increased energy intake due to increasing popularity of eating away from home. Indirect evidence suggests that this hypothesis has merits. First, driven by rising incomes, two-income households, and demand for convenience, this period has seen an unprecedented growth in the number of commercial food establishments, with an especially dramatic growth of the fast-

food industry [4,5]. Second, spending on away-from-home foods as a percentage of total food expenditure has been steadily rising by approximately 5–6% per decade over the past four decades and reached over 40% in 2000, a doubling from approximately 20% in 1960 [6]. Finally, USDA data suggest that the energy content of commercially prepared meals may be higher than that of meals prepared at home [7,8]. Surprisingly, however, there is no published information on trends in frequency of eating away from home. Few studies have directly examined the hypothesis of the relation between frequency of eating out and body weight [9–12], but none provide nationally representative estimates.

The purpose of this study was to examine: (1) trends in reported frequency of consuming commercially prepared (CP) meals from 1987 to 2000 using nationally representative data, and (2) the association of eating out with body mass index and nutrient intake.

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Methods

We used data from the National Health Interview Surveys (NHIS) 1987 and 1992, and the National Health and Nutrition Examination Survey (NHANES) 1999–2000, conducted by the National Center for Health Statistics (NCHS).

National Health Interview Survey (NHIS)

The NHIS sample is a stratified, multistage area probability sample of US households [13]. The NHISs fielded from 1982 to 1996 included two parts: (1) a set of basic health and demographic items (core questionnaire), and (2) one or more sets of supplemental questions on topical health issues. The NHIS core questionnaire was unchanged through this period, while the current health topics change based on data needs [13]. For NHIS 1987 and NHIS 1992, the topical or supplement part of the NHIS questionnaire comprised a set of questions on cancer risk factors along with an abbreviated, validated Block/NCI food frequency questionnaire (FFQ). In both surveys, the FFQ included the following question about eating commercially prepared foods: “In a typical week, how many meals do you usually get in restaurants, cafeterias, or fast-food places?” The questionnaire also included questions on current body weight and height of respondents. The response rate for the core questionnaire was 95% in 1987 and 96% in 1992 [14,15]. For the Cancer Control and Epidemiology supplement fielded with NHIS 1987 and 1992, one adult person ≥ 18 years of age was selected randomly from each household. The NHIS 1992 supplement was not fielded after the first half of 1992 due to budgetary constraints. The response rates for the identified eligible respondents for the supplements were 82% in 1987 and 86% in 1992, resulting in overall response rates of 78% and 83%, respectively. Self-

response was required for the supplemental questionnaire [14,15].

NHANES 1999–2000

The NHANES is also a stratified, multistage probability sample of the civilian, noninstitutionalized US population [16]. The NHANES includes a household interview and a complete physical examination conducted in a mobile examination center (MEC). The survey oversampled low-income persons, persons aged 12–19 years and 60+ years, African Americans, and Mexican Americans. In the NHANES 1999–2000, during the household interview, survey respondents were asked the question: “On average, how many times per week do you eat meals that were prepared in a restaurant? Please include eat-in restaurants, carry out restaurants, and restaurants that deliver food to your house” [16]. The household questionnaire also included questions on current body weight and height of respondents. Dietary information was obtained by a trained dietary interviewer in the MEC using an automated, microcomputer-based interview and coding system via a multiple-pass, 24-h dietary recall [16]. Body weight and height were measured during the MEC exam using standardized procedures [16]. The household interview and MEC exam response rates were 81.9% and 76.3%, respectively [17].

Analytic sample

For each survey, all respondents aged ≥ 18 years with information on the eating out variable were eligible for inclusion in the analytic sample ($n = 21,741$ in NHIS 1987; 11,722 in NHIS 1992; 5,330 in NHANES 1999–2000). Because the maximum weekly frequency of eating out in NHANES 1999–2000 was 21, to ensure comparability, we excluded respondents with frequencies of 22 or greater from

Table 1
Percent distribution^a of consuming commercially prepared meals reported by American adults, by gender, in NHIS 1987, NHIS 1992, and NHANES 1999–2000

	Weekly frequency of consuming commercially prepared meals					
	0–<1	1	2	3	4–5	≥ 6
NHIS 1987 ($n = 21,731$)	6,394	4,685	2,993	2,038	3,026	2,595
All (%)	27.9 \pm 0.3	22.1 \pm 0.3	14.2 \pm 0.3	9.5 \pm 0.2	14.5 \pm 0.3	11.8 \pm 0.3
Males (%)	24.2 \pm 0.5	18.9 \pm 0.5	14.0 \pm 0.5	9.9 \pm 0.4	17.0 \pm 0.5	15.9 \pm 0.5
Females (%)	31.3 \pm 0.5	25.0 \pm 0.4	14.3 \pm 0.3	9.2 \pm 1.3	12.2 \pm 1.1	8.1 \pm 0.3
NHIS 1992 ($n = 11,718$)	3,228	2,623	1,717	1,153	1,667	1,330
All (%)	25.8 \pm 0.5	23.0 \pm 0.5	14.9 \pm 0.4	10.2 \pm 0.3	14.8 \pm 0.4	11.3 \pm 0.4
Males (%)	21.5 \pm 0.7	20.8 \pm 0.6	14.6 \pm 0.6	11.1 \pm 0.5	16.6 \pm 0.6	15.3 \pm 0.6
Females (%)	29.7 \pm 0.7	24.9 \pm 0.6	15.2 \pm 0.5	9.4 \pm 0.4	13.1 \pm 0.5	7.7 \pm 0.4
NHANES 1999–2000 ($n = 5,330$)	1,680	1,137	763	561	646	543
All (%)	23.7 \pm 1.0	20.5 \pm 1.0	14.4 \pm 0.8	11.8 \pm 0.8	15.2 \pm 0.8	14.5 \pm 0.9
Males (%)	21.0 \pm 1.1	17.6 \pm 1.2	13.4 \pm 0.9	11.1 \pm 0.8	17.1 \pm 1.1	19.8 \pm 1.3
Females (%)	26.1 \pm 1.1	23.1 \pm 1.2	15.3 \pm 1.1	12.4 \pm 1.1	13.5 \pm 0.9	9.6 \pm 0.9

^a Percent distribution of consuming commercially prepared meals are weighted by the sample weights for their respective survey.

Table 2

Multivariate adjusted odds ratios (OR)^a of reporting one or more and three or more commercially prepared meals per week: NHIS 1987, NHIS 1992, and NHANES 1999–2000

Survey year	OR of reporting ≥ 1 CP meal per week		OR of reporting ≥ 3 CP meals per week	
	Males	Females	Males	Females
NHIS 1987	Reference	Reference	Reference	Reference
NHIS 1992	1.20 (1.09–1.32)	1.09 (1.01–1.19)	1.00 (0.93–1.09)	1.06 (0.98–1.15)
NHANES 1999–2000	1.46 (1.24–1.73)	1.44 (1.28–1.62)	1.40 (1.19–1.65)	1.46 (1.24–1.71)
<i>P</i> for trend	<0.0001	<0.0001	0.0003	<0.0001

^a Odds ratio (95% confidence interval) from logistic regression models adjusted for age, age², education in years (<12, 12, >12, unknown), income (<\$20,000, $\geq 20,000$, unknown), race/ethnicity (non-Hispanic white, non-Hispanic black, Hispanic, other), and survey year (1987, 1992, 1999–2000).

the NHISs 1987 and 1992 (10 persons in 1987 and 4 persons in 1992). With this exclusion, the final analytic samples for NHIS 1987 and NHIS 1992 were 21,731 and 11,718, respectively.

Statistical analyses

All statistical analyses were performed using SAS [18], and software designed for analysis of survey data (SUDAAN) [19]. This software generates variance estimates

that are corrected for multistage stratified probability design of complex surveys. Sample weights provided by the NCHS to correct for differential probabilities of selection, noncoverage, and nonresponse were used in all analyses to obtain point estimates. For the NHIS 1987 and 1992, we used Taylor linearization variance estimation [13]. For NHANES 1999–2000, we used variance estimation methods based on jackknife replicates as recommended [17].

The reported weekly frequency of consuming CP meals for each of the three surveys was categorized based on its weighted distribution. The proportion of the population with various sociodemographic and lifestyle characteristics in each category of reported CP meal consumption was described and mean number of CP meals by categories of various population characteristics was computed. We computed covariate-adjusted mean intakes of energy, macronutrients, and BMI by categories of CP meal consumption for each survey. The covariates included in these models were decided a priori based on known associations of variables related to both nutrient intake, body mass index, and eating away from home.

For trend analysis, we used logistic regression methods to compute odds ratios of consuming at least one weekly CP meal as well as three or more CP meals in the NHIS 1992 and NHANES 1999–2000 compared to the NHIS 1987. Because of sociodemographic changes in the population between 1987 and 2000, we adjusted the trend by including

Table 3

Mean \pm SE of the reported number of commercially prepared meals consumed per week in the NHIS 1987, NHIS 1992, and NHANES 1999–2000, by sex and selected sociodemographic variables

	NHIS 1987		NHIS 1992		NHANES 1999–2000	
	Males	Females	Males	Females	Males	Females
<i>n</i>	9,010	12,721	4,997	6,721	2,486	2,844
All	3.0 \pm 0.05	2.0 \pm 0.03	3.0 \pm 0.06	2.1 \pm 0.04	3.3 \pm 0.1	2.3 \pm 0.1
<i>Age group (years)</i>						
<45	3.5 \pm 0.1	2.5 \pm 0.05	3.5 \pm 0.1	2.5 \pm 0.1	3.8 \pm 0.1	2.7 \pm 0.1
45–64	2.6 \pm 0.1	1.7 \pm 0.05	2.7 \pm 0.1	1.9 \pm 0.1	3.0 \pm 0.2	1.9 \pm 0.1
≥ 65	1.4 \pm 0.1	1.0 \pm 0.04	1.5 \pm 0.1	1.1 \pm 0.05	1.9 \pm 0.2	1.5 \pm 0.1
<i>Race/ethnicity^a</i>						
White, non-Hispanic	3.0 \pm 0.05	2.1 \pm 0.04	3.1 \pm 0.1	2.2 \pm 0.1	3.6 \pm 0.2	2.5 \pm 0.1
Black, non-Hispanic	2.4 \pm 0.1	1.8 \pm 0.1	2.7 \pm 0.2	1.9 \pm 0.1	2.2 \pm 0.1	2.0 \pm 0.2
Hispanic	2.9 \pm 0.2	1.7 \pm 0.1	2.2 \pm 0.2	1.7 \pm 0.1		
Mexican American					2.5 \pm 0.2	1.7 \pm 0.1
Other	2.8 \pm 0.3	2.0 \pm 0.2	2.5 \pm 0.3	1.8 \pm 0.3	2.7 \pm 0.3	1.5 \pm 0.2
<i>Education (years)</i>						
<12	1.9 \pm 0.1	1.1 \pm 0.04	2.0 \pm 0.1	1.3 \pm 0.1	2.3 \pm 0.1	1.5 \pm 0.1
12	2.8 \pm 0.1	2.0 \pm 0.1	3.0 \pm 0.1	2.1 \pm 0.1	3.2 \pm 0.2	2.1 \pm 0.1
>12	3.7 \pm 0.1	2.6 \pm 0.05	3.5 \pm 0.1	2.6 \pm 0.1	3.9 \pm 0.1	2.8 \pm 0.1
<i>Income (\$)^b</i>						
$\geq 20,000$	3.3 \pm 0.05	2.3 \pm 0.04	3.3 \pm 0.1	2.4 \pm 0.05	3.5 \pm 0.1	2.6 \pm 0.1
<20,000	2.4 \pm 0.1	1.8 \pm 0.1	2.4 \pm 0.1	1.7 \pm 0.1	2.3 \pm 0.3	1.6 \pm 0.1
Unknown	2.7 \pm 0.1	1.7 \pm 0.1	2.7 \pm 0.1	1.8 \pm 0.1	3.4 \pm 0.3	2.0 \pm 0.2

^a The other category in NHIS included all race/ethnicity categories other than white, black, and Hispanic, whereas the other category in NHANES 1999–2000 includes race/ethnicity categories other than white, black, and Hispanic of Mexican American origin.

^b The NHANES 1999–2000 public release data provides only these two income categories.

age, race/ethnicity, education, and income as covariates in the model. For these analyses, we combined data from the three surveys. To apply the Taylor linearization method for variance estimation in the combined analyses, we converted the jackknife replicate weights provided in the NHANES 1999–2000 public use data file to pseudo-psu and pseudo-strata codes after consultation with NCHS staff. (Personal communication, Lester R. Curtin, NCHS, 10/02.) We also computed proportional odds of consuming less than or equal to a given frequency of consuming CP meals in NHIS 1987 and 1992 relative to NHANES 1999–2000. The results were similar to those obtained from logistic regression models mentioned above; therefore, we present only the results of logistic regression analysis in this paper.

Results

Table 1 shows the weekly frequency of number of CP meals reported in the three surveys. In 1987, approximately 28% of the population reported 0 or <1 CP meal per week, decreasing to 24% in 1999–2000. Approximately 42% of males and 30% of females reported consuming three or more weekly CP meals in 1987 and 1992. In 1999–2000, three or more weekly CP meals were reported by 48% of

males and 35% of females. The odds of reporting at least one CP meal per week were higher in 1992 and 1999–2000 relative to 1987 in both males and females (P for trend across survey years <0.0001) (Table 2). The odds of reporting three or more weekly CP meals were approximately 40% higher in 1999–2000 in both males and females (P for trend across survey years ≤ 0.0005) (Table 2).

The mean number of weekly CP meals reported in 1987, 1992, and 1999–2000 were 2.48, 2.52, and 2.77, respectively (Table 3). The reported number of weekly CP meals was higher in 1999–2000 relative to 1987 (mean difference \pm SE = 0.40 ± 0.13 in males and 0.27 ± 0.08 in females, $P < 0.005$; P for trend across survey years <0.0001, from multiple regression models). Americans aged ≤ 45 years, non-Hispanic whites, with >12 years of education and higher income reported a higher mean frequency of CP meals in each of the three surveys.

The multiple covariate-adjusted mean estimates of energy and macronutrients by categories of reported frequency of CP meals in each of the three surveys are presented in Table 4. In each survey, the reported weekly frequency of consuming CP meals was positively associated with estimated intakes of energy and percentage of energy from total and saturated fat, but was negatively associated with percentage of energy from carbohydrate.

Table 4

Adjusted^a mean \pm SE of energy^b and percentage of energy from macronutrients^b by reported number of commercially prepared meals consumed per week in NHIS 1987, NHIS 1992, and NHANES 1999–2000

	Weekly frequency of consuming commercially prepared meals						P for trend ^c
	0–<1	1	2	3	4–5	≥ 6	
<i>Energy (kcal)</i>							
NHIS 1987	1,622 \pm 13	1,648 \pm 10	1,703 \pm 15	1,675 \pm 17	1,727 \pm 17	1,788 \pm 18	<0.0001 (+)
NHIS 1992	1,675 \pm 16	1,710 \pm 15	1,756 \pm 19	1,768 \pm 23	1,762 \pm 19	1,872 \pm 23	<0.0001 (+)
NHANES 1999–2000	2,111 \pm 42	2,165 \pm 37	2,126 \pm 42	2,332 \pm 51	2,250 \pm 55	2,382 \pm 57	0.0001 (+)
<i>Percentage of energy from fat</i>							
NHIS 1987	37.8 \pm 0.1	38.3 \pm 0.1	38.9 \pm 0.2	38.8 \pm 0.2	38.5 \pm 0.2	38.7 \pm 0.2	<0.0001 (+)
NHIS 1992	34.7 \pm 0.2	35.8 \pm 0.2	36.3 \pm 0.2	35.8 \pm 0.3	36.1 \pm 0.2	36.4 \pm 0.2	<0.0001 (+)
NHANES 1999–2000	31.4 \pm 0.5	32.4 \pm 0.5	32.1 \pm 0.5	32.4 \pm 0.6	33.3 \pm 0.6	34.8 \pm 0.5	<0.0001 (+)
<i>Percentage of energy from saturated fat</i>							
NHIS 1987	14.1 \pm 0.1	14.2 \pm 0.1	14.3 \pm 0.1	14.3 \pm 0.1	14.4 \pm 0.1	14.5 \pm 0.1	<0.0001 (+)
NHIS 1992	12.2 \pm 0.1	12.5 \pm 0.1	12.6 \pm 0.1	12.4 \pm 0.1	12.7 \pm 0.1	12.8 \pm 0.1	<0.0001 (+)
NHANES 1999–2000	10.5 \pm 0.2	10.9 \pm 0.2	10.7 \pm 0.2	10.8 \pm 0.3	11.2 \pm 0.3	11.3 \pm 0.2	0.02 (+)
<i>Percentage of energy from carbohydrate</i>							
NHIS 1987	43.7 \pm 0.1	43.3 \pm 0.1	43.1 \pm 0.2	42.9 \pm 0.2	42.8 \pm 0.2	42.3 \pm 0.2	<0.0001 (–)
NHIS 1992	47.4 \pm 0.2	47.0 \pm 0.2	46.1 \pm 0.2	45.9 \pm 0.3	45.7 \pm 0.2	45.4 \pm 0.3	<0.0001 (–)
NHANES 1999–2000	51.8 \pm 0.6	51.5 \pm 0.6	50.8 \pm 0.5	51.5 \pm 0.6	49.5 \pm 0.7	48.3 \pm 0.6	0.0007 (–)
<i>Percentage of energy from protein</i>							
NHIS 1987	16.3 \pm 0.1	16.2 \pm 0.1	16.2 \pm 0.1	16.2 \pm 0.1	16.2 \pm 0.1	16.0 \pm 0.1	<0.0001 (–)
NHIS 1992	15.8 \pm 0.1	15.8 \pm 0.1	15.9 \pm 0.1	15.9 \pm 0.1	15.8 \pm 0.1	15.9 \pm 0.1	0.7
NHANES 1999–2000	15.5 \pm 0.2	15.2 \pm 0.2	15.6 \pm 0.2	15.1 \pm 0.3	15.1 \pm 0.2	14.9 \pm 0.2	0.09

^a Estimates were adjusted for gender, age, age², education in years (<12, 12, >12, unknown), income (<\$20,000, >20,000, unknown), race/ethnicity (non-Hispanic White, non-Hispanic Black, Hispanic, other), and self-reported health status (excellent/very good, good, fair, poor). Regression models included 20,418 adults in 1987 and 11,029 adults in 1992 and 4,631 adults in NHANES 1999–2000.

^b Estimated from food frequency questionnaire in NHIS 1987 and 1992, and a 24-h recall in NHANES 1999–2000.

^c P for trend associated with the weekly frequency of eating commercially prepared meals.

Table 5

Adjusted^a mean \pm SE of body mass index (BMI) by reported number of commercially prepared meals consumed per week, by gender, in NHIS 1987, NHIS 1992, and NHANES 1999–2000

	Weekly frequency of consuming commercially prepared meals						<i>P</i> for trend ^b
	0–<1	1	2	3	4–5	≥ 6	
<i>Self-reported BMI (kg/m²)</i>							
Males							
NHIS 1987 (<i>n</i> = 8,828)	25.6 \pm 0.1	25.4 \pm 0.1	25.5 \pm 0.1	25.5 \pm 0.1	25.7 \pm 0.1	25.6 \pm 0.1	0.3
NHIS 1992 (<i>n</i> = 4,938)	25.7 \pm 0.2	26.1 \pm 0.2	26.1 \pm 0.2	26.4 \pm 0.2	26.2 \pm 0.1	26.0 \pm 0.2	0.07
NHANES 1999–2000 (<i>n</i> = 2,406)	26.9 \pm 0.3	27.6 \pm 0.3	27.1 \pm 0.4	27.6 \pm 0.4	27.1 \pm 0.4	27.4 \pm 0.3	0.7
Females							
NHIS 1987 (<i>n</i> = 12,362)	24.6 \pm 0.1	24.4 \pm 0.1	24.2 \pm 0.1	24.2 \pm 0.1	24.3 \pm 0.2	24.5 \pm 0.1	0.1
NHIS 1992 (<i>n</i> = 6,566)	25.1 \pm 0.1	24.9 \pm 0.1	25.1 \pm 0.2	25.1 \pm 0.2	25.0 \pm 0.2	25.1 \pm 0.2	0.9
NHANES 1999–2000 (<i>n</i> = 2,705)	26.8 \pm 0.4	26.9 \pm 0.4	27.2 \pm 0.4	27.8 \pm 0.6	27.5 \pm 0.5	27.8 \pm 0.6	0.05
<i>Measured BMI (kg/m²)</i>							
NHANES 1999–2000							
Males (<i>n</i> = 2,239)	27.2 \pm 0.3	27.7 \pm 0.4	27.6 \pm 0.4	27.8 \pm 0.4	27.5 \pm 0.5	27.7 \pm 0.4	0.4
Females (<i>n</i> = 2,556)	27.7 \pm 0.4	27.7 \pm 0.5	28.4 \pm 0.5	28.6 \pm 0.5	28.3 \pm 0.4	29.1 \pm 0.7	0.04

^a Survey, gender-specific estimates were adjusted for age, age², education in years (<12, 12, >12, unknown), income (<\$20,000, \geq 20,000, unknown), race/ethnicity (non-Hispanic White, non-Hispanic Black, Hispanic, other), self-reported health status (excellent/very good, good, fair, poor), and smoking status (never, former, current smoker, unknown).

^b *P* for trend associated with the weekly frequency of eating commercially prepared meals.

In NHIS 1987 and 1992, self-reported BMI was unrelated with weekly frequency of consuming CP meals (Table 5). In NHANES 1999–2000, self-reported or measured BMI was unrelated with eating out in males (Table 5). However, in females, there was a modest positive association of reported frequency of weekly CP meals with self-reported and measured BMI ($P \leq 0.05$).

Discussion

In 1999–2000, adult Americans reported consuming an average of 2.77 commercially prepared meals per week, an 11% increase from the mean number of CP meals reported in 1987 and 1992. Although a slightly higher frequency of consuming CP meals in 1999–2000 relative to 1987 and 1992 is in the expected direction, we caution about undue emphasis on the absolute magnitude of this increase because the question used to elicit the information on CP meal consumption in 1999–2000 differed somewhat from the one used in 1987 and 1992. The decrease in the proportion of the population reporting no or <1 commercial meal per week but an increase in the proportion reporting three or more commercial meals per week (40% higher odds) in 1999–2000 relative to 1987 and 1992 was noted. These data suggest that in 1999–2000, not only were more Americans eating out but also that they were eating out more frequently than in 1987.

To our knowledge, no other nationally representative estimates of weekly frequency of eating commercially prepared meals are available in the published literature. The National Restaurant Association (NRA) has conducted surveys about individual meal consumption at or away from home in 1981, 1985, 1991, 1996, and 2000 [20]. These

surveys asked one member of the household to recall the number of commercially prepared meals eaten in a 7-day period by all household members aged 8 years or older [20]. For comparison, we chose to examine the NRA estimates reported for 1985, 1991, and 2000 as these years were closest to those of national surveys data used in this study. In 1985, NRA respondents reported that household members aged 8 and older consumed an average of 3.9 CP meals per week [20]. In 1991, the average reported CP meals per week were 3.8, and increased to 4.2 in 2000—an increase of approximately 17% from 1985 to 2000 [20]. It should be noted that not only did the question used by the NRA to elicit information about meal consumption differed from those used in the national surveys, the NRA estimates also include <18 year olds, who had the highest frequency of consuming CP meals of nearly all other age groups, possibly due to provision of lunch by schools. Finally, details of survey design, representativeness of the sample, and analytic methods used in the NRA surveys are not available. However, general trends in the association of frequency of eating CP meals with gender, income, and age were similar to those seen in the present study [20].

Other published estimates of frequency of eating CP meals are from smaller nonrepresentative data and vary due to methodological differences and criteria used to define CP meal consumption. In a study of 129 premenopausal women, nearly 44% reported consuming 6–13 CP meals in 1 week of diet records [9]. Two other studies have examined the frequency of consuming fast-food meals; therefore, the estimates are not directly comparable to national estimates [10,11]. McCrory et al. [10] reported an average monthly frequency of 7.5 mostly fast-food restaurant meals for their 19–80-year-old subjects. Whereas 21% of 20–45-year-old women studied by French et al. [11] reported ≥ 3 fast-food

restaurant meals per week. The nature of questions used for eliciting frequency of consuming CP meals in the present study does not permit differentiation between fast food or other commercially prepared meals.

Consistent with previous reports [9–12], the reported frequency of consuming CP meals was associated with higher energy intake in all three surveys. Whether higher energy intake is due to higher energy density or the trend for increasing portion sizes of CP meals [21] remains to be established. Although the variation in percentage of energy from macronutrients in association with frequency of consuming CP meals was significant, the magnitude of these differences was relatively small. To our knowledge, there is no published information on long-term implications (nutritional or metabolic), if any, of persistent high frequency of consuming CP meals. Nevertheless, these data suggest that the commercial foodservice industry needs to renew its commitment to providing attractive lower-energy alternatives and improving the nutritional quality of their offerings. For health professionals, interventions targeting selection of lower-energy CP meals remains a strategy for moderating energy intake.

In this cross-sectional study, there was no association between self-reported BMI and frequency of consuming CP meals in any of the three surveys (except females in NHANES 1999–2000). The only published study to examine self-reported BMI in relation to CP meal consumption found percentage of total amount of food obtained from commercial sources to be a positive predictor of BMI in men; in women, fast-food consumption was related but not restaurant eating [22]. We were able to examine the association of measured BMI and CP meal frequency in the NHANES 1999–2000 and found frequency of CP meals to be a modest positive predictor of measured BMI in women. Although our results are not directly comparable, others also found a positive association between measured BMI and frequency of fast-food restaurant use in women [11,12], but not men [12]. McCrory et al. [10] have reported a positive association between body fatness and frequency of consuming fast-food restaurant meals. Whether the gender-related difference in the association of frequency of consuming CP meals with measured BMI is real is not known, nor are the possible reasons for this difference. Jeffery and French [12] speculated that male and female differences in occupational or social roles may partially be responsible for lack of an association between BMI and fast-food eating in adult males. Prospective studies of the association of body mass index with frequency of CP meal consumption are needed.

We recognize the following limitations of this study. The question used for eliciting CP meal frequency in the three surveys does not distinguish between the types of eating establishments or the selections made at the various establishments. It is quite likely that the CP meal consumption frequency reported in this paper may be an underestimate because commercially prepared, ready-to-consume foods are increasingly available from supermarkets, convenience

stores, vending machines, and service stations. Whether respondents interpreted the question to include meals obtained from such nontraditional sources is not known. Finally, the NHIS included no measures of physical activity and the NHANES physical activity data are not available at this time. Whether frequency of consuming CP meals varies by physical activity status is not known. Fast food use frequency and physical activity, however, were unrelated in adult women [11] and men [12]. Given the widespread prevalence of this eating behavior, studies using validated questions to determine CP meal frequency are warranted.

In conclusion, our results confirm a trend for more Americans eating out, and a higher frequency of eating out from 1987 to 1999–2000. Given the positive association of frequency of eating out with energy intake, persistence of these trends is likely to increase opportunities for creating positive energy balance and contribute to increasing adiposity of the US population.

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