Appetite, 1999, *32*, 23–32
Article No. appe.1998.0192, available online at http://www.idealibrary.com on IDEAL

The Significance of Eating Patterns: An Elderly Greek Case Study

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Eating patterns are a relatively neglected area of nutrition assessment with considerable potential health importance. Cross-cultural and socio-anthropological studies provide insight into the great range of food patterns which are related to health, biochemical measurements and anthropometry. The International Union of Nutritional Sciences (IUNS) study of aged folk in food-culturally disparate communities has provided opportunities to explore these issues. This paper uses cross-sectional data from the Greek arms of the IUNS study to explore associations between eating pattern variables (number of meals, time of meals, main meal for lunch and/or dinner, meal plus alcohol) and with the prevalence of self-reported heart disease and diabetes, body fatness, blood lipids, blood glucose and the overall variety of foods consumed. The eating pattern variables were not associated with blood lipids, self-reported heart disease or diabetes. Body fatness was negatively associated with the consumption of a greater number of meals/snacks daily ($p<0{\cdot}01$), with the consumption of two cooked meals daily ($p<0{\cdot}05$) or when the main meal was consumed at lunch time ($p<0{\cdot}05$) and when breakfast was consumed earlier rather than later in the morning ($p<0{\cdot}01$). Later dinner times were positively correlated with a higher fasting blood glucose in non-diabetic elderly Greeks ($p<0{\cdot}0005$). A more varied diet was positively associated with the consumption of alcohol with dinner ($p<0{\cdot}0001$) and with a greater number of meals/snacks daily ($p<0{\cdot}0001$). These findings suggest that adherence to the traditional Greek eating pattern may be protective against obesity and appears to promote greater food variety.

Introduction

The type of foods eaten throughout the day, their distribution, as well as the size of meals (e.g. main meal in the middle of the day as opposed to the evening) may influence biochemical indices such as cholesterol and blood sugar levels as well as weight control (Jenkins *et al.*, 1994). Eating patterns which include cooked meals for lunch and/or dinner may influence body fatness or certain eating patterns which include alcohol may promote greater food variety but these questions have been inadequately investigated.

Contribution to the IUNS Committee II/2 Symposium on "Methodology to Identify and to Assess Eating Patterns".
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0195–6663/99/010023+10 $30.00/0

On the basis of various studies on metabolic changes and meal frequency (nibbling vs. gorging), several advantages have been ascribed to increased meal frequency with constant energy intake. An infrequent eating pattern was associated with a tendency toward obesity (Bray, 1972; Fabry *et al.*, 1964), hypercholesterolaemia (Jones *et al.*, 1993; Fabry *et al.*, 1964), impaired glucose tolerance (Bertelsen *et al.*, 1993; Fabry *et al.*, 1964) and also toward ischaemic heart disease (Fabry & Tepperman, 1970). The greatest differences were found in people who consumed only one major meal a day compared with those who consumed three meals daily. The beneficial effects of nibbling on serum lipid levels and glucose intolerance have been related to a reduction in serum insulin levels (Jenkins *et al.*, 1994). The long-term effects of nibbling on body weight remain in question (Verboeket-van de Venne & Westerterp, 1993). The effect that time of meals have on body fatness (Keim *et al.*, 1997) and the effect that eating patterns have on the variety of foods consumed have been inadequately studied.

This paper uses data from the Greek arm of the International Union of Nutritional Sciences (IUNS) study to explore associations between eating pattern variables (number of meals, time of meals, main meal for lunch and/or dinner, meal plus alcohol) with the prevalence of self-reported heart disease and diabetes, body fatness, blood lipids and glucose and the propensity to have a more varied diet. Descriptive data, survey instruments utilized, methodology and validation of the food frequency questionnaires have been reported elsewhere (Wahlqvist *et al.*, 1995a; Wahlqvist *et al.*, 1995b; Kouris-Blazos *et al.*, 1996).

Methods

Sample Selection

The study of elderly Greeks in Greece and Australia is part of a wider international elderly study and the methodology and survey instruments have been reported elsewhere (Wahlqvist *et al.*, 1995b; Kouris-Blazos *et al.*, 1996). This study was approved by the Monash University ethics committee. All study subjects were randomly selected (from the telephone directory in Melbourne and electoral rolls in Greece) and were interviewed in their home using an interviewer administered questionnaire. All interviews and anthropometric measurements were performed by a single observer. Subjects in psycho-geriatric homes were excluded. In 1988, a total of 104 (51 male, 53 female) subjects from rural Greece (Spata) were included in the study (mean age 77 years; 60% 70–79; 40% 80+; response rate 89%). Between 1990 and 1992 a total of 189 (94 male, 95 female) Greeks from urban Melbourne were included in the study (mean age 78 years; 65% 70–79; 35% 80+; response rate 84%).

Eating Patterns (Qualitative)

The diet history method was modified so that it highlighted only the type of foods and beverages normally consumed across the day, including the time of eating, to establish the pattern of eating. There was no attempt to quantify foods. Study subjects were asked to recall "on average" or on "most days of the week" what the type of breakfast was normally eaten (cereal, bread, fruit), whether a cooked meal was eaten for lunch and dinner, the number of cooked meals per day or week,

TABLE 1
Variables used in univariate analyses

Outcome variables		Eating pattern variables	
(a)	Body mass index	(i)	Episodes of eating (average daily number of episodes)
(b)	Waist hip ratio	(ii)	Time of episodes of eating
(c)	Percentage body fat	(iii)	Cooked meal consumed for lunch and dinner
(d)	Blood lipids	(iv)	Cooked meal consumed only for lunch (not dinner)
(e)	Blood glucose in diabetics	(v)	Cooked meal consumed only for dinner (not lunch)
(f)	Blood glucose in non-diabetics	(vi)	Alcohol with lunch and/or dinner
(g)	Obesity		
(h)	Heart trouble		
(i)	Diabetes		
(j)	Food variety		

TABLE 2
Average daily episodes of eating of Greek elderly in Melbourne and Spata

	Average daily episodes of eating[a]				
	2 (%)	3 (%)	4 (%)	5 (%)	6 (%)
Melbourne					
Men $N=94$	4·3	6·4	20·2	33·0	36·2
Women $N=95$	1·0	15·8	28·4	32·6	22·1
Spata					
Men $N=51$	2·0	17·6	45·1	35·3	0·0
Women $N=53$	0·0	26·4	37·7	35·8	0·0

Chi-Square test: $p<0·001$

[a] Whenever a food/meal/snack/beverage was consumed it was recorded as an "episode of eating"

whether fruit was eaten with or after meals, whether bread was eaten with meals, whether coffee, tea, milk, other beverages, alcohol were drunk between or after meals etc. These foods/meals were coded as "Y" (=Yes) if consumed or "N" (=No) if not consumed in a data management programme (Dbase 3). It was then possible for example to calculate percentage of subjects who consumed a cooked meal for lunch and/or dinner. The composition of the cooked meal was not investigated or quantified in the diet history as this was investigated in the interviewer administered quantitative food frequency questionnaire (FFQ) which was used to obtain a detailed description of food intake over the past 12 months.

The term "episodes of eating" and "time of eating" in Table 1 included all foods (snacks/meals) and beverages consumed on average throughout the day. Whenever a food/snack/meal/beverage was consumed it was recorded as an "episode of eating" and the "time of eating" was also recorded. It was then possible to tally the number of episodes of eating for each study subject. All subjects had at least two episodes of eating (see Table 2).

In the traditional Greek culture, cooked meals are normally consumed for lunch and sometimes dinner, but rarely for breakfast (Girkinezis *et al.*, 1970) (see Fig. 2). Cooked meals tend to be the main meals of the day (providing more than 300 kcal), as opposed to uncooked foods/dishes which are consumed as snacks (fruit, bread, biscuits, cheese, olives, tomatoes). The definition of cooked meals included cooked dishes of meat, fish, chicken, egg, vegetables, rice and pasta. Cooked dishes which were eaten cold, for example boiled wildgreens, were included in the definition.

Total Food Variety

The variety of foods consumed over a month were scored from the food frequency questionnaire used on Greeks, which contained a total of 238 foods and thus giving a final score ranging from 1 to 238. If a food was eaten at least once in a month, then that food would score.

Self-reported Heart Disease and Diabetes

Self-reported heart disease and diabetes were cross-checked by the interviewer with prescribed medications to ensure complaints were not self-perceived but diagnosed by their doctor. Self-reported heart disease reported here does not include hypertension.

Anthropometry and Biochemistry

Anthropometry included height, weight, circumferences at the level of the umbilicus (waist) and gluteal maximus (hip). Percentage body fat was calculated using Deurenberg equation (Deurenberg *et al.*, 1991): fat free mass (FFM kg) = $0{\cdot}282*H + 0{\cdot}395*W + 8{\cdot}4*sex - 0{\cdot}144*age - 23{\cdot}6$ [H = height (cm); W = weight (kg); sex = 1 men and 0 women; age $\overline{m}$ (years)]. Fasting venous blood was collected for the following tests: total cholesterol, LDL-cholesterol, HDL-cholesterol, triglycerides, LDL:HDL, glucose.

Statistics

The Statistical Analysis System (SAS, 1993) was used for statistical analyses. Non-parametric statistics Wilcoxon rank sum test (continuous variables) and Chi-Square (discrete variables) were used to investigate the following univariate associations between the outcome variables and the eating pattern variables (see Table 1).

Results

Description of Eating Patterns

Episodes of eating

Breakfast, lunch and dinner were consumed by all subjects. Supper was not consumed by Spata elderly (see Table 4). The episodes of eating were significantly greater in Melbourne than in Spata (see Table 2).

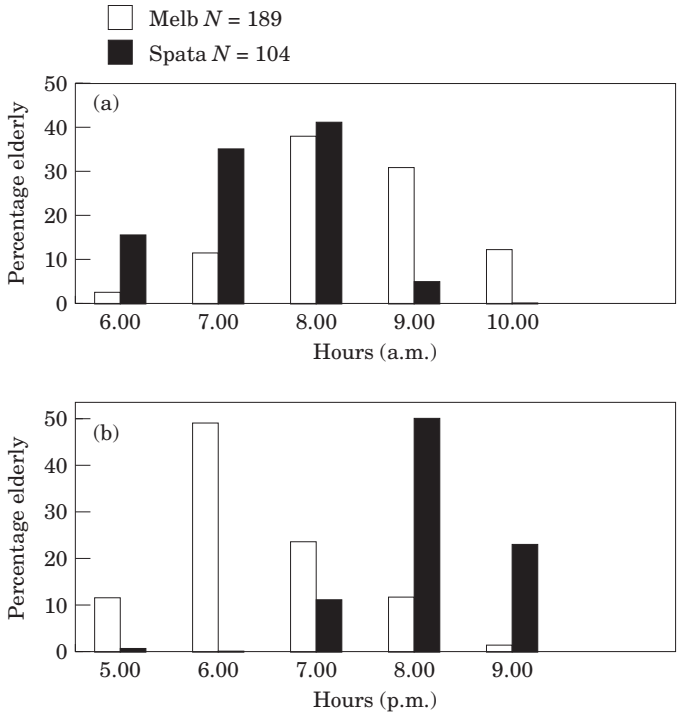

FIGURE 1. Percentage elderly consuming (a) breakfast between 6.00 and 10.00 a.m. ($p<0{\cdot}05$ Wilcoxon) and (b) lunch between 5.00 and 9.00 p.m. ($p<0{\cdot}05$ Wilcoxon).

Time of eating

In Spata, 80% of the elderly had breakfast between 7.00 and 8.00 a.m. In contrast, 80% of Melbourne elderly had breakfast between 8.00 and 10.00 a.m. (see Fig. 1). The majority of the elderly in both Spata and Melbourne had lunch at 12 noon (50%), 33% at 1.00 p.m. and 12% at 2.00 p.m. Spata elderly tended to have afternoon tea later (5.00 p.m.) than Melbourne elderly (3–4.00 p.m.). Melbourne elderly tended to have their dinner earlier (6–7.00 p.m.) than Spata elderly (8–9.00 p.m.) (see Fig. 1). This may explain why Spata elderly did not tend to have supper because of their later dinner time.

Number of cooked meals per day

All study subjects had at least one cooked meal daily and about 50% had two cooked meals daily (see Table 3).

Foods eaten

The types of foods eaten at meal and snack times are described in Table 4. Food patterns were significantly different between urban migrant Greeks in Melbourne and rural Greeks in Spata (see Fig. 2). Spata elderly were consuming the traditional rusk and milk beverage for breakfast compared with breakfast cereal, cheese, egg, sweet biscuits in Melbourne Greeks. Similarly, all of the Spata elderly had their main meal for lunch (i.e. 100% had cooked meal) compared with less than 75% of the Melbourne Greeks. Fruit, bread and alcohol accompaniments to the lunch meal

TABLE 3
Percentage Greek elderly in Melbourne and Spata who had a cooked meal for lunch and/or dinner

	No cooked meal	Cooked lunch only	Cooked dinner only	Cooked lunch and dinner
Melbourne $N=189$	0·5	29·1	26·5	43·9
Spata $N=104$	0	43·3	1·0	55·8

Chi-Square $p<0·001$

were also less common in migrant Greeks. Furthermore, Melbourne Greeks tended to have their main meal for dinner (70% cooked meal) compared with <50% of the Spata elderly. This is also reflected in the alcohol consumption, with a greater proportion of the Melbourne men drinking alcohol with dinner compared with Spata men. Spata elderly tended to have yoghurt for dinner.

Alcohol with meals

Spata elderly were more inclined to have alcohol with lunch whereas Melbourne Greeks tended to have alcohol with dinner (see Table 4).

Univariate Analyses

Blood lipids, self-reported heart trouble and diabetes were not correlated with any of the meal pattern variables.

Episodes of eating

Episodes of eating were found to be significantly correlated with the following variables: (1) percentage body fat in the Melbourne Greeks only, $r_s=-0·15$, $p<0·03$, $N=186$; (2) body mass index in all subjects, $r_s=-0·01$, $p<0·01$, $N=256$; (3) total food variety score in all subjects, $r_s=0·26$, $p<0·0001$, $N=293$, and Melbourne Greeks, $r_s=0·18$, $p<0·01$, $N=189$.

Time of eating

Earlier breakfast times were associated with lower body mass indices and waist-hip ratios in all subjects (see Table 5) and later dinner times were positively correlated with higher fasting blood glucose in the non-diabetic subjects at both sites, Spearman $r_s=0·2$, $p<0·0005$, $N=257$.

Number of cooked meals per day

Greek elderly who had one cooked meal daily had a higher percentage body fat (40%) compared to those who had two cooked meals (38%), $p<0·05$, Wilcoxon. Body fatness and total food variety were significantly greater in subjects consuming their main meal for dinner (see Table 6).

TABLE 4
"Episodes of eating" and types of foods consumed by elderly Greeks (%)

	Melbourne ($N=189$)	Spata ($N=104$)
Breakfast	90	100
Milk	50	65
Bread	55	40
Cereal/porridge	40	0
Cheese	30	0
Crisp bread	15	45
Coffee	45	50
Black tea	30	0
Herb tea	0	15
Morning tea	45	35
Fruit	10	10
Tomato/cheese/bread	0	20
Sweet biscuits	3	0
Bread	2	0
Crisp bread	2	3
Coffee	30	15
Lunch		
Cooked meal	75	100
+bread	80	90
+fruit	15	60
+alcohol	15*, 30**	13*, 50**
OR		
Sandwich, cheese, olives	25	0
Afternoon tea	80	80
Fruit	25	25
Crisp bread	7	7
Coffee	60	60
Black tea	15	0
Dinner		
Cooked meal	70	50
+alcohol	15*, 27**	5*, 13**
Yoghurt only	10	30
Soup only	15	0
Bread/cheese/tomato/olives	20	20
Fruit only	40	40
Milk only	0	25
Supper	45	0
Fruit	30	0
Coffee	20	0
Tea (black or herb)	20	0
Milk	7	0

*% women (Melbourne $N=95$; Spata $N=53$) consuming alcohol
**% men (Melbourne $N=94$; Spata $N=51$) consuming alcohol

Alcohol with meals

Alcohol with meals was found to be significantly associated with a higher monthly food variety score, lunch $p<0{\cdot}01$, dinner $p<0{\cdot}0001$ (see Table 7).

FIGURE 2. Traditional Greek food pattern[a]

Breakfast (early)	Crisp bread/rusk, milk, Greek coffee or herb tea
Morning tea	Crisp bread or bread with tomato and cheese or spinach/cheese pie, Greek coffee
Lunch/afternoon	Main meal (cooked), with bread (sometimes cheese and olives), 1–2 glasses wine, followed by fruit (dessert)
Siesta	Nap for 1–2 h
Afternoon tea	Greek coffee, crisp bread, fruit
Evening	Light snack, e.g. yoghurt or soup with bread, cheese, olives or cooked meal with 1–2 glasses wine
Supper	Herb tea (e.g. sage)

[a] Modified from Girkinezis *et al.*, 1970.

TABLE 5
Does time of eating breakfast influence body fatness?

Elderly Greeks (Spata + Melbourne)	Breakfast time 7.00 a.m. $N=76$	9.00 a.m. $N=78$
Body mass index	27·2	28·5**
Waist hip ratio	0·97	0·99**

** $p<0{\cdot}01$ *F* test

TABLE 6
Is body fatness and food variety greater if main (cooked) meal is consumed for dinner?

Elderly Greeks (Spata + Melbourne)	Cooked meal Lunch only $N=85$	Dinner only $N=50$	Lunch and dinner $N=121$
Body mass index	27·9*	29·8*,**	27·9**
Waist hip ratio	0·97*	1·01*	0·98
% body fat[a]	39·3*	42·3*,**	37·7**
Food variety	46·4*	53·8*,**	51·6**

*,** $p<0{\cdot}05$ *F* test; the same superscript indicate significant differences

[a] Calculated using Deurenberg equation (Deurenberg *et al.*, 1991): fat free mass (FFM kg) = 0·282*H + 0·395*W + 8·4*sex − 0·144*age − 23·6 [H = height (cm); W = weight (kg); sex = 1 men and 0 women, age in (years)]

DISCUSSION

The common belief that the elderly live on "tea and toast" was not observed in this study of 293 elderly Greeks. More than 90% of the subjects had a cooked meal daily and in Spata, Greece, a greater proportion of elderly had two cooked meals a day. The high prevalence of cooked meals amongst elderly people have also been found in other studies (Horwath, 1989). Clinically, there is growing awareness that distribution of food across the day has much to do with the expression of chronic non-communicable diseases like obesity, diabetes and cardiovascular disease. Contrary to

TABLE 7
The effect of alcohol, when consumed with meals, on the overall variety of foods consumed in the diet of elderly Greeks[a]

Alcohol with meal	Total food variety score (1–238 over a month)		
	N	Mean	
No alcohol with meals	224	48	
Alcohol with one meal/day	38	53	
Alcohol with two meals/day	31	58	$p<0{\cdot}001$[b]
No alcohol with lunch	242	49	
Alcohol with lunch	51	56	$p<0{\cdot}01$
No alcohol with dinner	244	49	
Alcohol with dinner	49	56	$p<0{\cdot}0001$

[a] $N=293$, Greek subjects in Melbourne and Spata, Greece were pooled for this analysis
[b] Wilcoxon rank sum test

what many think, it appears that as long as snacks are not fatty, or otherwise energy dense, more rather than less frequent occasions of eating may be preferred. The elderly Greek subjects who had two cooked meals daily or more episodes of eating daily tended to have a lower body mass index and total percent body fat; their snacks included mainly fruit, bread or crisp bread (see Table 4). Studies by Bray (1972) indicated that enzymes of fatty acid and triglyceride synthesis were increased in adipose tissue of individuals who ate one meal per day vs. three or more meals per day. However, a study on free-living humans of all ages was unable to find a relationship between feeding pattern (nibbling and distribution of energy intake across the day) and body mass index (Summerbell *et al.*, 1996).

The time of meals and their effect on body fatness has not been extensively studied. In a study by Keim *et al.* (1997) greater weight loss was achieved in women consuming two large meals during the day as opposed to late afternoon and evening. In this study, total body fatness and abdominal fatness was higher in those subjects consuming a late breakfast, light (uncooked) lunch and their main meal (cooked) for dinner. This type of eating pattern was mainly seen amongst Melbourne Greeks which is typical of eating patterns in Australia. In contrast, the traditional Greek eating pattern is characterized by early breakfasts, main meal for lunch followed by a siesta and then a light (uncooked) meal for dinner. In Spata elderly about 90% had a siesta after lunch compared with less than 50% of Melbourne Greeks. These findings suggest that deviations from the traditional Greek eating pattern may have adverse effects on body fatness (see Fig. 2).

Having a wide variety of foods has been reported to be protective against cardiovascular diseases and total mortality, but the effect that eating patterns have on the variety of foods consumed have not been adequately studied. For example, do certain eating patterns promote food variety? In this study a more varied diet was positively associated with the consumption of alcohol with dinner ($p<0{\cdot}0001$) and with a greater number of meals/snacks daily ($p<0{\cdot}0001$). A study (de Castro & Orozco, 1990) that investigated the effects of alcohol on food patterns reported an association between prolonged meal duration and alcohol ingestion, but there was

no association with meal size and food variety was not reported. The traditional Greek eating pattern includes a couple of glasses of wine with cooked meals, which appears to encourage the consumption of a wider variety of foods. The association between number of meals/snacks and food variety has not been reported elsewhere. These findings suggest that adherence to the traditional Greek eating pattern may be protective against obesity and may promote the consumption of a greater variety of foods.

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