Meal Patterns in Middle-aged Men in Southern Germany: Results from the MONICA Augsburg Dietary Survey 1984/85

G. WINKLER

Fachhochschule Albstadt-Sigmaringen, Sigmaringen

A. DÖRING

GSF-Institute of Epidemiology, Neuherberg

U. KEIL

Institute of Epidemiology and Social Medicine, Westfälische Wilhelms-Universität, Münster

Seven-day food records of the MONICA project Augsburg dietary survey, which were collected in 1984/85 from 899 men aged 45–64 years (random sample), were used to analyse meal patterns. The combination of the three traditional meals (breakfast, lunch, dinner) with one eating event between was most frequent, followed by two meals with two eating events between and three main meals without any other eating event (31·4 vs. 31·0 vs. 15·6% of all reported days). Breakfast delivered 17, lunch 29 and dinner 33% of the total daily energy intake; all other eating events delivered 21%. The mean contribution of the three meals, breakfast, lunch and dinner to daily protein intake was 14, 36 and 36%, to fat intake 17, 33 and 35% and to carbohydrate intake 23, 25 and 29%, respectively. Data on meal patterns are important in a comprehensive description of dietary habits of a population for a variety of reasons. © 1999 Academic Press

INTRODUCTION

For a variety of reasons, meal patterns are important variables when comprehensively describing dietary habits in a population. Nevertheless, meal patterns have received little attention in studies to date. To our knowledge, data on meal patterns in Germany are generally scarce. Therefore, it is our aim to provide detailed data on meal patterns in a South German population.

METHOD

Sample and Dietary Assessment Procedure

The present analysis is based on the first dietary survey which was carried out in the framework of the MONICA[1] project Augsburg in 1984/85. Methodology and results on food and nutrient intake have been previously described elsewhere (Keil *et al*., 1985; Winter *et al*., 1991; Winkler *et al*., 1991, 1992); here only a brief summary is given: the study area is located in the south of Germany and comprises the city of Augsburg and two surrounding counties. Dietary intake was assessed in a randomly selected sample of 1284 (eligible) men aged 45–64 years by 7-day records with a combination of weighing with scales and portion size measurement by household measures. The response was 70% ($N = 899$). The German food composition file BLS 2·1 was used to code the records and to calculate nutrient intake.

Definition of Meals and Variables to Describe Meal Patterns

The definition of eating events is based as close as possible on how participants named these events in their records and is independent of how many and which foods and drinks were taken. Therefore, a meal or an event between the meals does not necessarily involve a solid food but may contain beverages only. However, since the primary aim of the dietary survey concerned nutritional aspects of eating (food and nutrient intake) and not behaviour such as meal patterns, the coding of the records had to fit into a predefined scheme with a maximum of six eating events per day: the three "classic" meals "breakfast", "lunch" and "dinner" and three eating events between these meals, "mid-morning event", "afternoon event" and "late event". The variables presented refer either to the number of participants ($N = 899$), the number of reported days ($N = 6293$) or to the number of reported eating events ($N = 27\ 521$). A more comprehensive description showing further variables of meal patterns was previously published in German (Winkler *et al*., 1995).

RESULTS

Frequencies of Eating/drinking Events

Breakfast and dinner were the most frequent meals (22·5 and 22·4% of all eating events), followed by lunch (21·7%). Distinct differences between weekdays and weekends were not found. The mid-morning event, however, was markedly more common on weekdays, while the afternoon event was more popular on weekends. Breakfast (95·1% of all breakfasts), dinner (90·7% of all dinners) and late event (87·5% of all late events) were mostly taken at home, whereas out-of-home consumption was more common for mid-morning events (69·1% of all mid-morning events), lunches (35·4% of all lunches) and afternoon snacks (35·6% of all afternoon snacks). Naturally, the percentage of out-of-home eating events was higher in working men than in men who were out of work or retired. Most of the breakfasts were eaten between 6·00 and 9·00 a.m., about two thirds of lunches between 12·00 a.m. and 1·00 p.m., and the favourite time for dinners was between 6·00 and 7·00 p.m.

TABLE 1
Frequencies of numbers of eating events per day

| Number per day | Frequency | | | | | |
| | Complete week | | Weekdays | | Weekend days | |
	N	%	N	%	N	%
1	7	—	5	—	2	—
2	71	1·1	45	1·0	26	1·4
3	1194	19·0	826	18·4	368	20·5
4	2162	34·4	1485	33·0	677	37·7
5	2012	32·0	1441	32·1	571	31·8
6	847	13·5	693	15·4	154	8·6
Σ reported days	6293		4495		1798	

(MONICA Project Augsburg. Dietary Survey 1984/85).

TABLE 2
Daily occurrence of intake at different eating events (N=899 men)

| Eating event | Occurrence of eating events | | | | | |
| | Every day | | On 1–6 days | | Never | |
	N	%	N	%	N	%
Breakfast	846	94·1	51	5·7	2	0·2
Mid-morning event	56	6·2	631	70·2	212	23·6
Lunch	731	81·3	167	18·6	1	0·1
Afternoon event	144	16·0	665	74·0	90	10·0
Dinner	802	89·2	95	10·6	2	0·2
Late event	97	10·8	640	71·2	162	18·0

(MONICA Project Augsburg. Dietary Survey 1984/85).

On more than 75% of the reported days four or more eating events took place (Table 1), with four eating events being slightly more frequent than five per day (34·4 vs. 32·0% of the reported days).

Regularity of Each Event

Breakfast was the meal most regularly eaten, followed by dinner and lunch (Table 2): nearly all the men had breakfast every day during the seven reported days, a great proportion ate a dinner and about four-fifths ate lunch regularly every day. The afternoon event was the most common event between mealtimes followed by the late event and the mid-morning event (Table 2). Additionally, differences between men working and those unemployed were small: only the mid-morning event seemed to be a typical eating event in working men.

Combinations of Eating Events

The most frequent combinations of eating events were the three meals breakfast, lunch and dinner with one event between and the combination of the three meals

TABLE 3

Frequency of combinations of eating events

Combination of eating events	Days with the combination					
	Complete week		Weekdays		Weekend days	
	N	%	N	%	N	%
Two meals only	64	1·0	41	0·9	23	1·3
Three meals only	983	15·6	695	15·5	288	16·0
Three meals + one other event	1979	31·4	1358	30·2	621	34·5
Three meals + two other events	1953	31·0	1392	31·0	561	31·2
Three meals + three other events	847	13·5	693	15·4	154	8·6
Other combinations[a]	467	7·4	316	7·0	151	8·4
Σ reported days	6293	100·0	4495	100·0	1798	100·0

(MONICA Project Augsburg. Dietary Survey 1984/85).

[a] All other possible combinations, for instance one meal and one other event.

TABLE 4

Distribution of intake of energy and selected nutrients among different eating events
(N=899 men)

Nutrient (mean intake/day)	Eating event					
	Breakfast	Morning snack	Lunch	Afternoon snack	Dinner	Late snack
	(%)	(%)	(%)	(%)	(%)	(%)
Energy						
Energy (2609 kcal)	17·2	7·4	29·2	6·8	33·1	6·4
Selected nutrients						
Protein (91·1 g)	13·6	7·2	36·3	4·1	35·5	3·3
Fat (107·2 g)	16·9	7·0	32·5	5·5	35·1	3·1
Carbohydrates (225·6 g)	22·9	7·7	25·1	8·8	28·5	7·0
Fibre (20·3 g)	19·9	7·4	29·4	5·2	32·7	5·3
Calcium (663 mg)	21·3	7·5	24·3	7·8	32·1	7·1
Alcohol (36 g)[a]	2·1	7·6	21·0	8·9	39·8	20·5

(MONICA Project Augsburg. Dietary Survey 1984/85).

[a] Mean daily intake in all 899 men; distribution only given for men, who drank alcoholic beverages during their reporting period (N=875).

with two events between. Only three meals without any event between were eaten on less than a sixth of the reported days.

Distribution of Nutrient Intake Among Eating Events

On 85·2% of all reported days, dinner was the eating event which provided most of the energy. The late event provided most of the energy only on 7·2%, lunch on 3·7%, the afternoon event on 3·6%, the mid-morning event on 0·3% and breakfast on none of the reported days. Differences between employed and unemployed men were small. At weekends, however, lunch and afternoon events were more often the eating events delivering most of the energy.

About one-third of the energy was eaten at dinner, slightly less at lunch and little over one-sixth at breakfast (Table 4). The events between the meals delivered distinctly less energy. In parallel, macronutrient intake was mostly at the meals. Alcohol was mostly drunk at dinner (39·8% of the mean daily alcohol intake), at lunch (21·0%) and at or as the late event (20·5%).

DISCUSSION

Meal patterns should be part of a comprehensive description of dietary habits in a population because of their importance for the development and improvement of dietary assessment tools and for health promotion and preventive programmes. Also, meal patterns have recently begun to gain some attention as potential determinants of health and disease (Schlettwein-Gsell, unpubl.).

To our knowledge, the present analysis provides for the first time an overview of meal patterns based on individual dietary survey data obtained from a random sample of men in southern Germany.

A similar pattern concerning the energy distribution over the various daily eating events, with dinner providing most of the energy, was found in a survey with 3000 adults in the former German Democratic Republic in the late 1970s (Ulbricht & Räke, 1978, 1979).

Our results indicate that the three classical meals breakfast, lunch and dinner still dominated the meal pattern structure and delivered most of the energy and most of the macronutrients in the population under investigation in the middle of the 1980s. Breakfast and dinner seemed to be the most stable and fixed eating events: they were eaten regularly and nearly always at home. Lunch and the events between the meals in contrast seemed to be handled more flexible, they were eaten less regularly, at different places and with more pronounced differences between weekdays and weekends.

REFERENCES

Keil, U., Cairns, C., Döring, A., Härtel, U., Jorzic, J., Perz, S. & Stieber, J. (1985). Manual of operations, survey. MONICA Projekt Region Augsburg. GSF-National Center for Environment and Health, Neuherberg (20/85).

Schlettwein-Gsell, D. (In press). *Impact of meal patterns*. Nutrition/Ernährung.

Ulbricht, G. & Räke, I. (1978). Ernährungsunterschiede zwischen Werktagen und Wochenenden. *Zeitschrift für die gesamte Hygiene und ihre Grenzgebiete*, *24*, 199–200.

Ulbricht, G. & Räke, I. (1979). Werktags- und Wochenendernährung von Normalgewichtigen und Adipösen. *Ernährungsforschung*, *24*, 26–28.

Winter, A., Döring, A. & Winkler, G. (1991). MONICA Projekt Augsburg. Ernährungserhebung 1984/85. Methodik und Durchführung. GSF-National Center for Environment and Health, Neuherberg (17/93).

Winkler, G., Döring, A. & Keil, U. (1991). Selected nutrient intakes of middle aged men in Southern Germany: results from the WHO MONICA Augsburg dietary survey 1984/85. *Annals of Nutrition & Metabolism*, *35*, 184–191.

Winkler, G., Döring, A. & Keil, U. (1992). Food intake and nutrient sources in the diet of middle-aged men in Southern Germany: Results from the WHO MONICA Augsburg dietary survey 1984/85. *Annals of Nutrition & Metabolism*, *36*, 12–22.

Winkler, G., Döring, A. & Keil, U. (1995). Mahlzeitenmuster in einer süddeutschen Bevölkerung. Ergebnisse der Ernährungserhebung 1984/85 des MONICA-Projektes Augsburg. *Zeitschrift Ernährungswissenschaft*, *34*, 2–9.