Dietary recommendations and prevailing food and nutrient intakes in Germany

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Dietary recommendations on nutrient intakes as published by the German Society of Nutrition are only met by a very small proportion of the adult population in East and in West Germany. Dietary data from the Nutrition Survey and Risk Factor Analysis Study in West Germany and from the National Health Survey in East Germany were used to identify differences in nutrient intakes and in food consumption patterns between subgroups of the study participants that were close to, or failed to meet the dietary guidelines. The subgroups were created by dividing subjects into quartiles on the basis of their daily intakes of total fat (%energy), saturated fatty acids (%energy), fibre (g/d) and the food group fruit and vegetables (g/d). Comparisons of the consumption patterns between subjects in the first and in the fourth quartile of intake of the nutrients under study were performed. Differences in food and nutrient intakes were seen among those more compliant and less compliant with the recommendations. The presented analysis provides first indications for future improvements of the existing food-based dietary guidelines in Germany.

Food-based dietary guidelines: Germany

The nutritional habits of the adult population in East and in West Germany can be characterized by a high intake of energy, fat and saturated fatty acids (SFA). The result of these consumption patterns is a high prevalence of nutrition-related health risks. Some 60 % of German adults are overweight with a Body Mass Index (BMI; kg/m^2) in excess of 25, and 20–25 % are obese with a BMI greater than 30 (Bundesminister für Gesundheit, 1995). Consequently, hypercholesterolaemia and hypertension are widespread in Germany with a prevalence rate of 80 % and 30 % respectively. Although many Germans are conscious of the important role nutrition plays in maintaining health, prevailing nutrient intakes deviate significantly from dietary guidelines. The development of new strategies seems necessary to improve nutrient intakes in the population. One step that might be helpful in minimizing the large disparities between actual and ideal dietary habits could be the formulation of attainable dietary goals, derived from studies of prevailing food intakes. The purpose of the present paper is the identification of differences in consumption patterns between population subgroups, who comply more or less to dietary guidelines. The results might be helpful in formulating attainable dietary goals.

Food-based recommendations of the German Society of Nutrition

The German food-based dietary guidelines, called 'Ten Rules of the German Society of Nutrition' (Deutsche Gesellschaft für Ernährung, 1995) consist of ten general recommendations for wholesome nutrition, like 'Variety but not too much'; 'Less fat and fat-rich food'; 'Fewer sweets'; 'More wholegrain products'; 'Plenty of vegetables, potatoes and fruit'; etc. The rules are supplemented by a 'Nutrition Circle', which shows the types and proportions of foods needed for wholesome nutrition. The circle is composed of seven different food groups and additional explanations are available with proposals for food choices. For example, grain, grain products, potatoes, vegetables and fruit are recommended to be eaten daily. The amounts of daily consumption should be 5–7 slices of bread (approx. 200–350 g) and 250–300 g potatoes or, alternative to potatoes, 200–250 g rice or pasta. The minimal desired intake of fruit is 1–2 portions (200–250 g) a day, and at least one portion of vegetables (approx. 200 g) and salad (approx. 75 g) daily is recommended, whereas the meat and sausage consumption should be limited to one portion

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(meat: max. 150 g; sausage: max. 50 g) two or three times a week.

Methods and study population

Nutritional data for the evaluation of dietary habits are currently available from two population-based cross-sectional studies: the Nutrition Survey and Risk Factor Analysis Study (VERA) in West Germany (Heseker *et al.* 1994) and the National Health Survey in East Germany (Bellach, 1996). VERA was conducted from 1987 to 1988 in the former Federal Republic of Germany (FRG). In total, 1988 adults aged from 18 to 88 years participated in the study. Dietary data were collected by 7 d dietary records using typical household measures and, where possible, accurate weighing to assess the consumed amounts. The dietary records were coded with the actual version of the German food composition database, called 'Bundeslebensmittelschlüssel' (BLS II.2) (Bundesinstitut für gesundheitlichen Verbraucherschutz, 1998). Some subjects were excluded from the analyses as they only filled in 4 or 5 d records. The resulting data set included 747 men and 998 women. The National Health Survey in East Germany was carried out from 1991 to 1992 (Bellach, 1996), and 2617 male and female subjects in the age range from 18 to 80 years took part in this study. In a sub-sample of 72 % (1897 persons), detailed computer-assisted personal dietary history interviews were performed (Hermann-Kunz & Thamm, 1996). The food intake was quantified by using models of typical dishes, and the dietary data were automatically coded with the BLS II.2 (Hermann-Kunz, 1993). The mean age of the study participants was 44 years for men in both studies and 43–45 years for women (West vs. East). The proportion of males to females was 46–54 % in East and 43–57 % in West Germany.

To identify differences in eating patterns the study participants were classified into groups of low or high intakes according to the quartiles of intake for the following nutrients: total fat, SFA, fibre and the food group 'fruit and vegetable'. The dietary patterns of subjects in the lowest and highest quartiles of the mentioned nutrients and food group were compared with respect to their intake of total energy, macronutrients, fibre, cholesterol and alcohol and also with respect to their consumption of various foods. Differences in mean intakes of nutrients and foods between the two consumer groups were tested using t-tests. The statistical differences of the results should be interpreted carefully due to the multiple comparisons.

For the purposes of this presentation, only the data for East German men will be considered in most of the tables, but the results of all subgroups (East and West German men and women) will be mentioned in the text.

Results

Macronutrients, cholesterol and fibre intakes in East and West Germany

The calculated nutrient intakes, as presented in Table 1, confirm the expected differences between East and West. Fat consumption, total fat as well as the different types of fatty acids (except polyunsaturated fatty acids (PUFA) in men) and cholesterol intakes are higher, and the consumption of alcohol and carbohydrates is lower, in East compared to West Germany. Although East Germans eat less carbohydrate, their fruit and vegetables and their fibre intakes are higher. This indicates that the proportion of complex carbohydrates to mono- and disaccharides is higher in the new states of the FRG. For women from both parts of the country it is worth mentioning that the energy percentage derived

Table 1. Mean values and standard deviations (SD) for body mass index (kg/m^2) and for the intakes of energy, selected nutrients and for fruit and vegetables in males and females classified according to residence in former East or West Germany

| | Men | | | | Women | | | | |
	East		West		East		West		Rec.†
Body mass index	26·8	(4·1)***‡	25·5	(3·5)	26·8	(5·4)***	24·5	(4·5)	
Energy MJ/d	10·9	(3·0) NS	10·8	(2·9)	8·2	(2·2) NS	8·3	(2·2)	
Energy/BMR§	1·5	(0·4) NS	1·5	(0·4)	1·4	(0·4)**	1·4	(0·4)	
%Energy									
Protein	14·9	(1·9) NS	14·8	(2·6)	15·6	(2·1)***	14·9	(2·8)	
Carbohydrate	37·4	(4·9)***	39·4	(6·5)	38·5	(4·9)***	41·5	(6·7)	>50 %e
Fat	41·3	(5·3)***	38·4	(6·1)	43·9	(4·8)***	39·2	(6·1)	25–30 %e
Saturated fat	18·3	(3·1)***	15·8	(3·3)	19·3	(3·0)***	16·6	(3·4)	
Monounsaturated fat	14·9	(2·0)***	14·5	(2·7)	15·7	(1·9)***	14·3	(2·6)	
Polyunsaturated fat	5·4	(1·7) NS	5·6	(1·8)	6·0	(1·8)***	5·7	(1·9)	
Fibre									
g/d	24·8	(8·1)***	22·5	(8·2)	21·1	(6·7)***	19·5	(7·3)	⩾30 g
g/MJ per day	2·3	(0·6)***	2·1	(0·7)	2·6	(0·6)***	2·4	(0·8)	⩾3 g/MJ
Cholesterol mg	515·6	(177·3)***	446·6	(173·5)	410·8	(141·1)***	361·0	(132·5)	⩽300 mg
Alcohol									
g/d	21·6	(22·4)*	24·5	(23·4)	3·2	(5·3)***	9·5	(12·3)	
%energy	5·7	(5·4)**	6·6	(6·1)	1·2	(1·9)***	3·4	(4·3)	
Fruit & vegetables†† g/d	337·5	(171·6)***	230·8	(161·2)	358·7	(186·3)***	256·3	(150·8)	

*** $P \leqslant 0.001$; ** $P \leqslant 0.01$; * $P \leqslant 0.05$; NS = not significant.
† Recommendations of the German Society of Nutrition.
‡ Statistical significance (t-tests).
§ Basal metabolic rate.
†† Without processed fruits and vegetables.

Table 2. Mean values and medians for body mass index (kg/m^2) and for the intakes of energy and selected nutrients in East and West German men classified according to the lowest and highest quartile of total fat intake (%energy)

	East					West				
	Low ≤ 38·2 %e			High > 44·7 %e		Low ≤ 34·4 %e			High > 42·1 %e	
	Mean	Med.	Sig.†	Mean	Med.	Mean	Med.	Sig.	Mean	Med.
Body mass index	27·1	27·0	NS	26·4	25·9	25·0	24·6	*	25·9	25·7
Energy MJ/d	10·7	10·3	NS	11·1	10·4	10·5	10·3	NS	10·9	10·6
Energy/BMR‡	1·4	1·4	NS	1·5	1·4	1·4	1·4	NS	1·5	1·5
%Energy										
Protein	14·61	14·3	**	15·1	15·2	14·8	14·6	NS	14·7	14·2
Carbohydrates	39·7	39·6	***	33·5	34·0	43·3	43·8	***	34·6	34·8
Saturated fat	14·9	15·1	***	21·7	21·6	12·5	12·5	***	19·3	19·3
Monounsaturated fat	12·6	12·7	***	17·3	17·2	11·6	11·9	***	17·5	17·2
Polyunsaturated fat	4·8	4·4	***	5·9	5·4	4·6	4·4	***	6·5	6·1
Fibre										
g/d	24·3	23·0	NS	24·9	23·9	22·9	21·4	NS	21·4	20·5
g/MJ per day	2·3	2·2	NS	2·3	2·3	2·2	2·1	**	2·0	1·9
Cholesterol mg	445·4	416·7	***	594·3	556·8	379·9	350·5	***	503·1	483·5
Alcohol										
g/d	38·5	36·8	***	10·9	6·7	36·6	30·9	***	14·7	11·0
%energy	10·2	10·0	***	2·8	1·9	10·3	9·3	***	3·9	3·1

*** $P < 0.001$; ** $P < 0.01$; * $P < 0.05$; NS = not significant.
† Statistical significance (t-tests).
‡ Basal metabolic rate.

from total fat is higher than in men. Despite the differences between East and West, compared to the nutrient recommendations of the German Society of Nutrition (DGE) (Deutsche Gesellschaft für Ernährung 1991), there are large disparities between the prevailing and the recommended dietary intakes in both parts of the country. It is recommended that between 25 and 30 % of the total energy intake is fat intake, but the actual consumption, with mean intakes of 38–44 %energy (Table 1), clearly exceeds these guidelines. The contribution of SFA to total fat should be only one-third, but the intakes of SFA amount to an average of 41–44 %. According to the recommendations, more than 50 % of the total energy intake should derive from carbohydrates; the actual consumption with means of 37–42 % is distinctly below this value. In addition, the average fibre intakes are also below the recommendations. Considering the distribution as a whole it can be observed that only a very small part of the population – less than 5 % – complies to the recommended intakes for fat. Comparable pictures are found in carbohydrate, fibre and cholesterol intakes; only 5–20 % reach the recommendations. In summary, it can be stated that in both

Table 3. Mean values and medians for body mass index (kg/m^2) and for the intakes of energy and selected nutrients in East and West German men classified according to the lowest and highest quartile of saturated fat intake (%energy)

	East					West				
	Low ≤ 16·2 %e			High > 20·4 %e		Low ≤ 13·6 %e			High > 18·0 %e	
	Mean	Med.	Sig.†	Mean	Med.	Mean	Med.	Sig.	Mean	Med.
Body mass index	27·5	27·5	**	26·2	25·7	25·3	25·1	NS	25·6	25·6
Energy MJ/d	10·5	10·0	**	11·3	10·8	10·4	10·1	NS	11·0	10·5
Energy/BMR‡	1·4	1·3	**	1·5	1·5	1·4	1·4	*	1·5	1·5
%Energy										
Protein	15·1	15·0	**	14·6	14·6	15·0	14·7	*	14·4	14·2
Carbohydrates	38·8	38·4	***	34·7	34·9	42·1	42·7	***	35·9	35·9
Fat	35·8	35·9	***	47·1	46·6	32·3	32·6	***	44·6	44·0
Monounsaturated fat	13·0	13·0	***	16·8	16·6	12·5	12·5	***	16·2	15·9
Polyunsaturated fat	6·1	5·6	***	5·0	4·9	5·8	5·3	*	5·3	5·0
Fibre										
g/d	24·8	23·4	NS	24·6	23·8	23·0	21·4	NS	21·9	21·2
g/MJ per day	2·4	2·3	**	2·2	2·1	2·3	2·1	**	2·0	1·9
Cholesterol mg	429·3	397·0	***	600·6	563·5	382·2	347·1	***	508·8	474·2
Alcohol										
g/d	35·5	29·7	***	11·7	8·7	34·7	26·3	***	16·9	13·2
%energy	9·5	9·4	***	3·0	2·3	9·8	8·4	***	4·5	3·5

*** $P < 0.001$; ** $P < 0.01$; * $P < 0.05$; NS = not significant.
† Statistical significance (t-tests).
‡ Basal metabolic rate.

parts of Germany the current dietary habits lead to nutrient intakes that deviate significantly from the recommendations.

Nutrient intake patterns of subjects having low and high intakes of selected nutrients and foods

Total fat and saturated fatty acids. Statistically significant differences were detected between the low- and the high-fat consumption group in nearly all calculated nutrients (Table 2). The intakes of cholesterol, SFA, monounsaturated fatty acids (MUFA) and PUFA are higher in the fourth than in the first quartiles of total fat intakes, whereas the consumption of alcohol and carbohydrate are lower. Subjects with high fat intakes have a 60–70 % lower alcohol consumption (g/d) than study participants with low fat intakes. The variations in carbohydrate are smaller, high-fat consumers eating 10–20 % less carbohydrate. As expected, the intake patterns in subjects with a low versus a high energy intake derived from SFA are almost similar to those of the low and high total fat consumption groups (Table 3), except in PUFA. The PUFA consumption is lower in the high intake groups, but only to a small extent.

Fibre. As already mentioned, more than 75 % of the adult population in Germany do not reach the recommended fibre intake of 30 g/d. The comparisons between the two extreme quartiles of fibre intakes show significant differences in the consumption of alcohol, carbohydrates and cholesterol. The alcohol consumption is lower and the intakes of carbohydrates and of cholesterol are higher in the upper quartiles (Table 4). Differences between East and West were found in protein consumption; East German men with high fibre intakes eat less, West German men more, protein than the corresponding subjects with low fibre intakes.

A problem in interpreting the reported results is the difference in total energy intake between low- and high-fibre consumers. The energy intakes and the ratios of energy intake to basal metabolic rate (energy/BMR) are significantly lower in the first compared to the fourth quartiles. In contrast to that, the BMI is almost equal or slightly higher in the low-intake groups. In this regard it can be assumed that the calculated differences are caused by a greater extent of under-reporting in the 1st quartiles and might not express truly differing intake patterns.

Fruit and vegetables. Since fruit and vegetables are one of the main sources of fibre it is not surprising that subjects with a high consumption of this food group have a high fibre intake too. Eaters of high levels of fruit and vegetables from both parts of Germany reach the recommendations for fibre quite well. Regarding the nutrient density (fibre g/MJ Energy), the fibre intakes are 30–40 % higher in the upper compared to the lower quartiles of fruit and vegetables intake (Table 5). Additionally, in East and West German men the high fruit and vegetable consumption is accompanied by a higher intake of cholesterol and PUFA and a lower energy intake derived from alcohol. West German men eating relatively high amounts of fruit and vegetables have higher carbohydrates (%energy) but lower MUFA and protein intakes than men eating less of this food group, whereas East German men with a high consumption have higher protein intakes. But, as already mentioned in the fibre intake groups, the interpretation of the results has to be done with caution since the total energy intakes are different between the compared groups.

Food intake patterns in subjects with low versus high total fat (%energy) intakes

In East and in West Germany remarkable differences between the two considered levels of fat intake were found in the consumption of sausage, butter and alcoholic and non-alcoholic drinks (Table 6). All high-fat consumers eat at least 30 % more sausages and 80–130 % (East vs. West) more butter than subjects with low fat intakes (Figs 1 and 2). According to the

Table 4. Mean values and medians for body mass index (kg/m^2) and for the intakes of energy and selected nutrients in East and West German men classified according to the lowest and highest quartile of fibre intake (g/d)

	East					West				
	Low ⩽ 19·3 g/d			High > 28·9 g/d		Low ⩽ 16·9 g/d			High > 26·7 g/d	
	Mean	Med.	Sig.†	Mean	Med.	Mean	Med.	Sig.	Mean	Med.
Body mass index	27·2	27·0	NS	27·1	26·6	25·7	25·3	*	24·8	24·8
Energy MJ/d	8·7	8·4	***	13·7	13·1	9·0	8·8	***	13·0	12·5
Energy/BMR‡	1·2	1·1	***	1·8	1·7	1·2	1·2	***	1·8	1·7
%Energy										
Protein	14·8	14·7	*	15·2	15·0	15·6	15·3	***	14·1	14·0
Carbohydrates	36·0	36·0	***	38·1	38·2	36·1	35·1	***	43·2	43·1
Fat	40·6	40·7	NS	41·3	41·5	37·7	37·4	NS	37·7	37·6
Saturated fat	18·0	17·8	NS	18·2	18·4	15·5	15·6	NS	15·8	15·7
Monounsaturated fat	14·7	14·6	NS	14·8	14·7	14·6	14·3	*	13·8	13·5
Polyunsaturated fat	5·2	4·7	NS	5·5	5·0	5·2	4·9	NS	5·6	5·1
Cholesterol mg	402·8	389·6	***	653·0	606·6	386·5	365·7	***	505·9	470·6
Alcohol										
g/d	25·3	19·8	NS	22·5	16·4	32·2	29·0	***	18·9	13·5
%energy	8·0	6·8	***	4·6	4·0	9·9	9·5	***	4·2	3·3

*** $P < 0.001$; ** $P < 0.01$; * $P < 0.05$; NS = not significant.
† Statistical significance (t-tests).
‡ Basal metabolic rate.

Table 5. Mean values and medians for body mass index (kg/m^2) and for the intakes of energy and selected nutrients in East and West German men classified according to the lowest and highest quartile of fruit and vegetables intake (g/d)

	East					West				
	Low ≤ 217·8 g/d			High > 413·1 g/d		Low ≤ 118·6 g/d			High > 296·1 g/d	
	Mean	Med.	Sig.†	Mean	Med.	Mean	Med.	Sig.	Mean	Med.
Body mass index	26·3	26·1	**	27·4	27·2	25·1	24·7	NS	25·7	25·2
Energy MJ/d	9·6	9·4	***	12·9	12·2	10·1	9·7	***	11·7	11·0
Energy/BMR‡	1·3	1·3	***	1·7	1·6	1·4	1·3	***	1·6	1·5
%Energy										
Protein	14·3	14·2	***	15·4	15·3	15·1	14·8	**	14·4	14·4
Carbohydrates	37·4	37·3	NS	37·3	37·2	38·5	38·1	***	40·9	40·7
Fat	40·4	40·3	*	41·4	41·5	38·8	39·2	NS	38·3	38·0
Saturated fat	18·2	18·2	NS	18·0	18·0	16·0	15·8	NS	15·9	15·4
Monounsaturated fat	14·5	14·5	*	15·0	15·0	14·9	14·9	**	14·1	13·9
Polyunsaturated fat	4·9	4·4	***	5·7	5·4	5·3	4·9	*	5·8	5·4
Fibre										
g/d	19·0	18·6	***	32·9	31·6	17·4	16·1	***	28·8	26·7
g/MJ per day	2·0	2·0	***	2·6	2·6	1·8	1·7	***	2·5	2·5
Cholesterol (mg)	451·4	432·3	***	614·4	566·5	422·1	401·4	*	467·7	420·0
Alcohol										
g/d	24·7	19·0	NS	22·9	16·5	24·3	18·3	NS	20·7	13·9
%energy	7·3	5·8	***	5·1	4·1	7·0	5·5	*	5·4	3·6

*** $P \leqslant 0.001$; ** $P \leqslant 0.01$; * $P \leqslant 0.05$; NS = not significant.
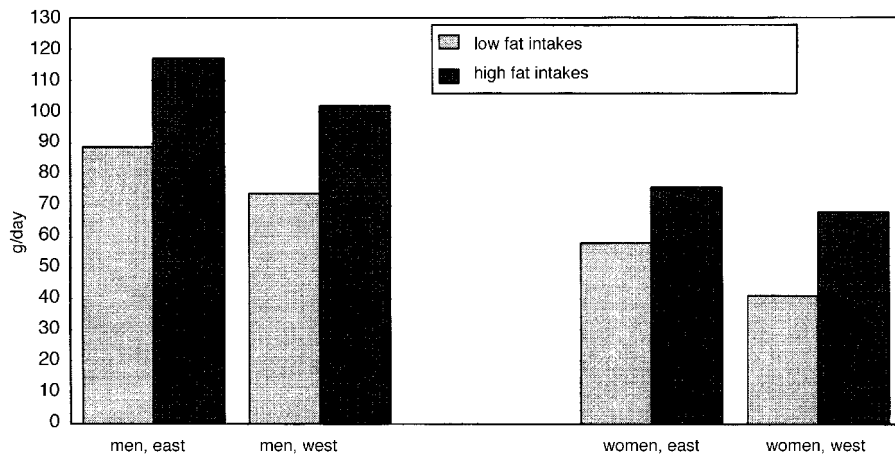† Statistical significance (t-tests).
‡ Basal metabolic rate.

Fig. 1. Intake of sausages and meat products in study participants having low and high fat intakes.
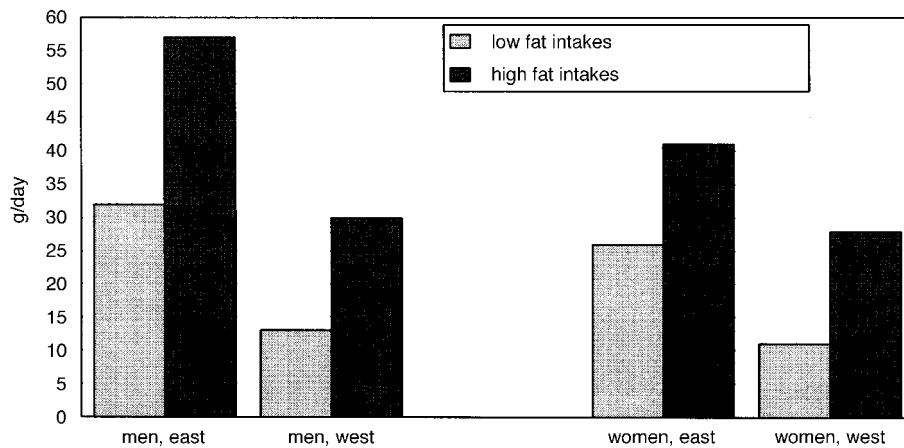

Fig. 2. Intakes of butter in study participants having low and high fat intakes.

Table 6. Mean values and medians for the intakes of selected food groups (g/d) in East German men classified according to the lowest and highest quartile of total fat intake (%e)

| | | Lowest quartile | | | | | Highest quartile | | | | |
| | | Consumers only | | | All subjects | | Consumers only | | | All subjects | |
	Sig.†	%N	Mean	Med.	Mean	Med.	%N	Mean	Med.	Mean	Med.
Milk and milk products	*	99	114	53	113	52	100	156	71	156	71
Cheese	NS	99	42	31	41	31	99	46	37	45	37
Eggs	***	100	32	29	32	29	100	41	38	41	38
Meat	NS	100	97	87	97	87	100	103	100	103	100
Sausage, meat products	***	100	89	81	89	81	100	117	105	117	105
Fish	*	94	23	19	21	18	95	26	21	25	20
Butter	***	100	32	32	32	32	100	57	54	57	54
Margarines	**	100	13	9	13	9	100	17	11	17	11
Vegetable oils	NS	100	4	3	4	3	100	4	3	4	3
Biscuits, cakes, pies	NS	74	58	43	43	28	80	61	41	49	32
Chocolate, sugar products	*	99	10	7	10	7	100	13	10	13	10
Citrus fruits	NS	51	9	7	4	5	42	10	7	4	0
Other fruits	NS	93	123	103	115	91	96	121	107	116	103
Processed fruits	NS	88	30	20	27	20	92	27	20	25	20
Vegetables, pulses	NS	100	204	162	204	162	100	226	195	226	195
Processed vegetables	***	94	27	22	25	21	90	20	16	18	14
Potatoes	NS	100	158	142	158	142	100	159	146	159	146
Cereals, grain products	NS	100	44	38	43	38	100	44	36	44	36
Bread	NS	100	180	175	180	175	100	177	173	177	173
Wholegrain bread	NS	20	99	84	19	0	28	85	57	23	0
Soft drinks	***	100	432	332	432	332	100	303	239	303	239
Coffee	NS	93	478	450	446	429	87	465	450	406	370
Tea	NS	28	137	66	39	0	30	127	77	39	0
Alcoholic beverages	***	99	846	785	839	775	96	255	146	246	130

*** $P \leqslant 0.001$; ** $P \leqslant 0.01$; * $P \leqslant 0.05$; NS = not significant.
† Statistical significance (t-tests between consumers having low and high fat intakes).

Table 7. Mean values and medians for the intakes of selected food groups (g/d) in East German men classified according to the lowest and highest quartile of saturated fat intake (%e)

| | | Lowest quartile | | | | | Highest quartile | | | | |
| | | Consumers only | | | All subjects | | Consumers only | | | All subjects | |
	Sig.†	%N	Mean	Med.	Mean	Med.	%N	Mean	Med.	Mean	Med.
Milk and milk products	***	99	107	50	106	49	100	198	83	198	83
Cheese	NS	100	45	32	44	32	99	44	35	43	35
Eggs	***	100	33	28	33	28	100	40	38	40	38
Meat	NS	100	101	90	101	90	100	96	93	96	93
Sausage, meat products	**	100	95	85	95	85	100	109	96	109	96
Fish	NS	95	25	21	24	20	93	23	18	22	17
Butter	***	100	22	19	22	19	100	63	59	63	59
Margarines	***	100	22	17	22	17	100	11	9	11	9
Vegetable oils	NS	100	4	3	4	3	100	4	3	4	3
Biscuits, cakes, pies	**	70	50	40	35	24	84	66	47	55	39
Chocolate, sugar products	***	99	10	7	9	6	100	14	10	14	10
Citrus fruits	NS	48	10	7	5	0	47	9	7	4	0
Other fruits	NS	94	125	112	117	98	97	115	97	112	95
Processed fruits	*	90	31	20	28	20	93	27	20	25	20
Vegetables, pulses	NS	100	217	178	217	178	100	213	181	213	181
Processed vegetables	***	94	28	22	26	21	92	21	18	19	16
Potatoes	NS	100	159	143	158	142	100	157	144	156	144
Cereals, grain products	NS	99	46	38	45	38	100	42	36	42	36
Bread	NS	100	179	172	179	172	100	189	186	188	186
Wholegrain bread	NS	21	98	76	21	0	24	78	57	19	0
Soft drinks	***	100	421	303	419	298	100	313	257	313	257
Coffee	NS	93	492	450	456	450	90	491	450	440	450
Tea	*	29	172	71	49	0	30	97	69	29	0
Alcoholic beverages	***	100	785	664	782	655	97	266	166	258	157

*** $P \leqslant 0.001$; ** $P \leqslant 0.01$; * $P \leqslant 0.05$; NS = not significant.
† Statistical significance (t-tests between consumers having low and high saturated fat intake).

results for nutrient intake (g alcohol/day), it can be seen that the alcohol consumption is 50–70 % (West vs. East) lower in the high-fat groups. Not only alcoholic beverages but also soft drinks are consumed to a lesser degree by high-fat eaters. In West German participants (data not shown) high fat intakes seem also to be associated with low intakes of cereals and grain products and high intakes of potatoes; the mean daily consumption of cereals is approx. 60 % lower and the consumption of potatoes about 20 % higher in the upper quartiles in both sexes.

Saturated fatty acids. Comparable to the results for total fat, significant differences between the two extreme quartiles of SFA intake were observed in the consumption of butter, alcoholic beverages and soft drinks (Table 7). In both parts of Germany, subjects with a high SFA intake eat on average approx. 200–300 % more butter per day than low-SFA consumers. The mean daily intake of alcoholic drinks is 40–70 %, and of soft drinks 20–40 %, lower in persons with high SFA intake. Differences of 20–85 % were found in consumptions of milk and milk products, where persons of the upper SFA quartiles have higher intakes. Participants from the West have also different cheese-eating habits; high SFA and high cheese intake seem to be associated (data not shown). Further food groups that are eaten more in the high SFA intake groups are e.g. sausage, eggs (both food groups not statistically significant in West men), biscuits, cakes, pies (not statistically significant in West men and women).

Fibre. With regard to fibre intake, the intakes of almost all foods were higher in the upper quartile of fibre intake (Table 8). On average, high-fibre consumers eat 2–2·5 times (West–East) as many 'vegetables and pulses' as low consumers. The intake of other food groups – e.g. the intake of 'milk and milk products', 'cheese', 'other fruit', 'potatoes', 'cereals, grain products' and 'bread' – is at least 1·5 times higher in the high-fibre quartiles. Only the consumption of alcoholic beverages is higher in the low-fibre groups, West Germans with low fibre intakes drink about 1·5 times as much as high-fibre consumers (e.g. West German men: 722 vs. 430 ml/d). In East Germans the differences are much smaller and not statistically significant (Table 8). As was observed for other nutrients, the lower quartile of intake of fibre was associated with a low energy intake to BMR ratio.

Fruit and vegetables. The mean daily amounts of 'fruit and vegetable' consumption in the two compared quartiles differ significantly (Table 9); East Germans of the fourth quartiles eat 3-fold, participants from the West almost 5–6-fold higher amounts per day than subjects of the first quartiles. The comparisons of food intakes between the extreme groups show that most of the calculated food groups are eaten more by East German subjects having high 'fruit and vegetable' intakes (Table 8); in West German participants the differences are generally smaller and not statistically significant. In both parts of the country, the consumption of cheese and potatoes seems to be related to high 'fruit and vegetable' intakes; compared to the 1st quartiles, subjects of all upper quartiles eat more of these food groups. Further statistically significant differences were found, for example, in the consumption of meat,

Table 8. Mean values and medians for the intakes of selected food groups (g/d) in East German men classified according to the lowest and highest quartile of fibre intake (g/d)

| | | Lowest quartile | | | | | Highest quartile | | | | |
| | | Consumers only | | | All subjects | | Consumers only | | | All subjects | |
	Sig.†	%N	Mean	Med.	Mean	Med.	%N	Mean	Med.	Mean	Med.
Milk and milk products	**	99	125	49	123	48	100	192	80	192	80
Cheese	***	99	32	27	31	27	100	60	46	60	46
Eggs	***	100	29	28	29	28	100	44	40	44	40
Meat	***	100	81	78	81	78	100	125	112	125	112
Sausage, meat products	***	100	82	75	82	75	100	126	110	126	110
Fish	***	95	18	16	17	15	95	32	27	30	26
Butter	***	100	33	34	33	34	100	53	53	53	53
Margarines	***	100	12	7	12	7	100	19	13	19	13
Vegetable oils	***	100	3	2	3	2	100	5	4	5	4
Biscuits, cakes, pies	***	75	44	35	33	23	79	83	61	65	43
Chocolate, sugar products	***	99	9	6	9	6	100	16	11	16	11
Citrus fruits	NS	53	9	7	5	5	45	10	7	4	0
Other fruits	***	93	79	71	73	66	96	180	158	173	158
Processed fruits	***	86	22	18	19	17	93	36	25	34	23
Nuts, seeds, kernels	**	10	4	2	0	0	11	10	7	1	0
Vegetables, pulses	***	100	130	124	130	124	100	331	299	331	299
Processed vegetables	*	92	22	21	20	19	95	29	19	27	18
Potatoes	***	100	113	108	112	108	100	212	203	212	203
Cereals, grain products	***	98	33	29	32	29	100	58	49	58	49
Bread	***	100	146	142	146	142	100	225	231	225	231
Wholegrain bread	***	13	24	20	3	0	27	155	157	42	0
Soft drinks	NS	100	360	279	358	278	100	407	308	407	308
Coffee	NS	93	465	386	434	321	91	510	514	466	450
Tea	NS	39	131	64	51	0	22	158	129	35	0
Alcoholic beverages	NS	99	550	436	543	421	98	517	353	505	339

*** $P \leqslant 0.001$; ** $P \leqslant 0.01$; * $P \leqslant 0.05$; NS = not significant.
† Statistical significance (t-tests between consumers having low and high fibre intake).

Table 9. Mean values and medians for the intakes of selected food groups (g/d) in East German men classified according to the lowest and highest quartile of fruit and vegetables intake

| | | Lowest quartile | | | | | Highest quartile | | | | |
| | | Consumers only | | | All subjects | | Consumers only | | | All subjects | |
	Sig.†	%N	Mean	Med.	Mean	Med.	%N	Mean	Med.	Mean	Med.
Milk and milk products	NS	99	146	51	145	51	100	176	72	176	72
Cheese	***	99	33	26	32	26	100	61	53	61	55
Eggs	***	100	33	31	33	31	100	42	37	42	37
Meat	***	100	79	74	79	74	100	123	113	123	113
Sausage, meat products	***	100	91	84	91	84	100	124	111	124	111
Fish	***	91	18	15	17	14	95	32	27	31	26
Butter	***	100	39	42	39	42	100	48	49	48	49
Margarines	***	100	12	7	12	7	100	19	13	19	13
Vegetable oils	***	100	2	2	2	2	100	6	5	6	5
Biscuits, cakes, pies	*	81	56	43	45	35	74	73	52	54	31
Chocolate, sugar products	***	98	10	7	10	7	100	15	11	15	11
Fruit, vegetables and pulses	***	100	166	174	166	174	100	565	513	565	513
Processed fruits	***	88	23	18	20	17	95	36	25	34	25
Processed vegetables	NS	92	26	23	24	22	93	28	20	26	19
Potatoes	***	100	126	123	126	123	100	192	172	192	172
Cereals, grain products	***	100	35	29	35	29	100	56	48	56	48
Bread	***	100	172	168	172	168	100	207	199	207	199
Wholegrain bread	NS	18	87	61	16	0	20	109	86	21	0
Soft drinks	NS	100	357	282	357	282	100	374	296	374	296
Coffee	NS	93	524	450	488	450	90	462	450	414	349
Tea	NS	36	131	49	47	0	26	136	129	36	0
Alcoholic beverages	NS	98	553	438	540	429	98	512	346	503	327

*** $P \leqslant 0.001$; ** $P \leqslant 0.01$; * $P \leqslant 0.05$; NS = not significant.
† Statistical significance (t-tests between consumers having low and high intake of fruit and vegetables).

sausage and cereals in East Germans, where the consumed amounts are 40–70 % higher in the 4th quartiles; West Germans of both quartiles eat nearly the same amounts of these food groups. Again, the limitations in interpreting the data due to the different energy intakes in the considered extreme quartiles have to be mentioned.

Discussion

One of the main nutritional problems in both parts of Germany is the extremely high consumption of fat. The percentages of consumers of the various foods between persons having high and low fat intakes do not differ remarkably, but relevant differences were found in the amounts of butter, sausage, cereals, potatoes, milk and milk products as well as in biscuits and cakes consumed, with respect to the intake of SFA. To reduce fat intake, a reduction in sausage and butter consumption seems to be required. Butter is mainly used as spread with bread; regarding this fact the guidelines of the DGE concerning daily bread intake (5–7 slices) might have to be reconsidered. With regard to milk and milk products more fat-reduced products should be eaten; however, the results presented in this paper may not reflect the present-day pattern, since there has been a significant increase in the availability of low-fat products in Germany since this study was carried out. The same can be expected for East Germany. The supply of low-fat products was minimal in the former German Democratic Republic, and only since unification have the people of East Germany become acquainted with the great variety of foods having low-fat

contents. The consumption of cereals should be promoted, since the mean intakes are very low, especially in the new states, and a high intake of these foods is related to a low fat and a high fibre intake. The data for potato consumption are conflicting: on the one hand, a high potato intake is associated with high fat intakes; but on the other hand, potatoes are recommended foods from various dietary aspects. It is likely that the high fat intake related to the consumption of potatoes is an expression of traditional eating habits: meat, gravy, potatoes and a small amount of vegetables or salads. Changing the amounts of the individual components of the meals is desirable, so that vegetables or salads become the main components. An aspect that needs research is the difference in the consumption of beverages (alcoholic as well as non-alcoholic drinks). Low-fat eaters drink remarkably more of the considered drinks; further analyses are necessary to find out whether the total fluid intake is associated with a low fat intake.

In summary, it can be said that the results presented in this paper confirm the recommendations of the DGE in general. Statements like 'More wholegrain products', 'Plenty of vegetables and fruit', 'Fewer sweets' and 'Less fat and fat-rich food' are suited to achieve the desired fat and fibre intakes. It seems, though, that among others the recommendations for bread and potato intake need to be supplemented with more detailed and practical information. This first attempt to explore differences in dietary patterns between subjects who are close to, or who don't comply with, the recommendations is limited by the fact that the relevant nutrients have not been considered together. Therefore, there is not sufficient information on the

underlying complex dietary patterns on which to draw to reach conclusions.

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