

Food-based dietary guidelines for Finland – a staged approach

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The history of recommending certain food composition to the diet of the general public in Finland goes back to the 1950s. Since that time, the food circle with modifications has been the only official, and most widely used, tool for diet composition visualization for nutrition education. Official national dietary recommendations and guidelines have been launched in 1981, 1987 and the newest ones in 1998. Nordic Nutrition Recommendations have been used in Finland as a reference when national dietary guidelines have not been available or up to date. Specific quantitative food-based dietary guidelines have not been given, because dietary guidelines may be reached with a wide range of foods. Data from the 1992 Dietary Survey of Finnish Adults was used to identify differences in dietary intake and food consumption patterns between subgroups of the study population that represented the highest and lowest quartiles of fat, saturated fatty acid (SFA), fibre, and fruit and vegetable intake. The population groups having the lowest fat or SFA intakes or the highest fibre or fruit and vegetable intakes reached the nutrient recommendations of macronutrients and fibre reasonably well. Similarities in food consumption pattern associated with a nutrient profile close to the recommendations were high consumption of fruit, berries, vegetables, roots, legumes and rye. Differences, e.g. in fats used, were also found between diets that were close to the nutrient recommendations. More research is needed to determine the differences in food consumption patterns of different population groups before developing food-based dietary guidelines for these groups.

Dietary guidelines: Dietary intake: Consumption patterns: Finland

The history of recommending certain food composition to the diet of the general public in Finland goes back to the 1950s, when, after the example of the US, Finland adopted the use of a 'food circle' for educational purposes. Originally, the 'Wheel of good eating' (now seven sectors) was to contain only six sectors: Fruit and vegetables were combined to one sector, because the consumption of fruit and vegetables was rather small in Finland in those times (Virtanen & Roine 1951). Since the early 1950s, the food circle with modifications has been the only official, and most widely used, tool for diet consumption visualization for nutrition education. However, especially in commercial consumer education, the food triangle and pyramid models have also been used (Table 1). Official national dietary recommendations and guidelines were launched in 1981 (Ravitsemustoimikunta, 1981), 1987 (State Advisory Board of Nutrition, 1989) and the newest ones in 1998 (Valtion ravitsemusneuvottelukunta, 1998). Nordic Nutrition Recommendations have been used in Finland since the late 1970s as a reference when national dietary guidelines have not been available or up to date (Anon, 1996).

The 1987 dietary guidelines have been most widely

implemented in practice. In 1989 the National Nutrition Council launched a programme for the implementation of nutrition recommendations over a wide range of national activities (Valtion ravitsemusneuvottelukunta, 1989) and this implementation programme was evaluated by the succeeding National Nutrition Council in 1994 (Table 2). The 1987 dietary guidelines have further been modified to dietary guidelines for several specific target groups: for example, guidelines for school catering, military catering, prison catering, catering in child daycare, vocational school catering and university students, the elderly and children have been produced by the Ministry of Social Affairs and Health since 1987 (National Nutrition Council, 1992).

Dietary guidelines have contained two major sections: a scientific basis for recommendation and a recommended nutrient intake. In addition, the 1981, 1987 and 1988 guidelines contained general and food-group-based advice to improve diet. Specific quantitative food-based dietary guidelines have not been given, because dietary guidelines may be reached with a wide range of foods. However, in the 1987 dietary guidelines, daily amounts of foods groups for a 10 MJ diet in the six sectors of the food circle have been given as a rough example of use of the food circle (Table 1).

Dietary guidelines continue to be used as a reference for intake data obtained in dietary surveys. Systematic evaluation of the effects of dietary guidelines on food intake, or of the possibilities of reaching dietary guidelines by food-based recommendations, in different population groups has, however, been lacking in Finland.

Dataset and methods

The analyses of this paper are based on the dietary intake data of Finnish adults that were collected during the national dietary survey in connection with the FINMONICA risk factor survey in spring 1992. The conduct of this survey has

Table 1. Food guides for nutrition education of the general public in Finland

Source	Year of publication	Type of recommendation	Comments
Virtanen & Roine	1951	Food circle: 1/6 circle vegetables and fruit 1/6 circle potatoes and roots 1/6 circle cereal foods 1/6 circle milk products 1/6 circle meat fish and egg 1/6 circle fats	Food circle widely used
National Nutrition Council	1978	Food triangle (three levels): Base bread and other cereals, potatoes, low-cost vegetables (e.g. carrots, cabbage), milk, cheese, table fat Middle vegetables, fruit, berries, fruit juice, legumes Apex meat, fish, egg The food circle (6 sectors, below) was launched at the same time to be used as an alternative to the food triangle	Food triangle not officially implemented; in 1987 the National Nutrition Council decided to discontinue its use
National Nutrition Council	1987	Food circle: Largest sector vegetables and fruit Intermediate sector cereal foods Intermediate sector milk, cheese and yoghurt Somewhat smaller meat, poultry, fish, egg, nuts Smaller sector potatoes Smallest sector oil and fat	Amounts for food groups given as an example for a diet of 10 MJ/d: 450 g 300 g 6–7 dl + 30 g 220 g 250 g 40 g (portions not to be considered as a recommendation) Food circle widely used
Nutrition education organizations	1995–	Food pyramid: Base bread and other cereals Middle (lower) vegetables, fruit, berries, potatoes Middle (upper) meat, fish, egg, milk products, cheese Apex visible fats, sugar	Not officially implemented Amounts for food groups given as an example for a diet of 10 MJ/d: 300 g (740 kcal) 450 g (260 kcal) 250 g (180 kcal) 220 g (470 kcal) 6–7 dl + 30 g (305 kcal) 40 g fats + 60 g sugar (445 kcal)
National Nutrition Council	1998	Food circle: sectors comparable to those published in 1987 Food triangle (four levels): Base bread Middle (lower) vegetables, fruit, berries Middle (upper) meat, fish, milk, dairy products Apex fats, sugar, sweets, sugary beverages Food plate model (three sectors): 50% vegetables 25% potatoes, rice or pasta 25% fish or meat dishes, or those containing legumes and seeds + 1–2 slices of bread + low-fat milk product or water + fruit or berries	

Table 2. Dietary guidelines and their implementation in Finland

Author/publisher	Name of the document	Year of publication	Type of publication/recommendation	Comment
Turpeinen & Roine Turpeinen	Food composition table	1952 1975 (several eds.)	Values for recommended nutrient intake	Not official
National Committee on Diet and Health	Dietary guidelines	1981	Scientific basis for recommendation Recommended nutrient intake per day and per 1 MJ and 1000 kcal General and food-group-based guide to reach the recommendation	Official national recommendation
National Nutrition Council (State Advisory Board on Nutrition)	Dietary guidelines	1987 (in Finnish)	Scientific basis for recommendation Recommended nutrient intake per day and per 1 MJ and 1000 kcal General and food-group-based recommendations for dietary improvement 'Food circle' (with daily portions as an example for a diet of 10 MJ)	Official national recommendation Implemented further to dietary guidelines for several specific target groups (see text)
National Nutrition Council (State Advisory Board on Nutrition)	A programme for implementation of 1987 nutrition recommendations	1989 (in English)	Programme in the areas of: – nutrition political planning – food prices – food labelling – catering – education – health care – research funding a national nutrition surveillance system – national food data bank	Programme evaluated by National Nutrition Council in 1994
National Nutrition Council	Dietary guidelines	1998	Comparable to most parts of the 1987 publication The recommended average and lowest intake levels were presented Food circle, food triangle and food plate models were launched	

been described in detail by Kleemola *et al.* (1994). The dietary survey was carried out in four monitoring areas: (i) North Karelia Province in eastern Finland; (ii) Kuopio Province, also in eastern Finland; (iii) the cities of Turku and Loimaa, and surrounding rural area of Loimaa, in south-western Finland; and (iv) the capital area Helsinki-Vantaa, in southern Finland. For the survey, an independent random sample was drawn from the populations register. The sample included people aged 25–64 years, and the samples were stratified according to the WHO MONICA protocol so that at least 250 subjects of each sex and 10-year group were chosen in each area (Kleemola *et al.* 1994; Pietinen *et al.* 1996).

All subjects born between the 1st and 11th day of each month were chosen for the sub-sample of the dietary survey ($n = 2822$). Of those invited, 76% came to the local health centre for examinations. The subjects of the dietary survey were given instructions on how to keep a 3 d food record, starting the next morning. Completed records were sent back to the National Public Health Institute by mail. Of those who came to the local health centre, 87% returned an acceptable food record. The final response rate in the dietary survey was 66% of those invited ($n = 1861$) (Kleemola *et al.* 1994).

The subjects of the dietary survey were asked to write down everything they consumed during three days. They

were instructed to estimate the portion sizes with a 63-page picture booklet (Pietinen *et al.* 1988) or household measures. Food records were checked and recorded using the computer program developed for this purpose at the National Public Health Institute. The food composition database of the institute (former NUTNET, today FINELI) is based on a file that contains information of nutrient composition of food items. The number of nutrients in FINELI is about 200 and they are mainly based on chemical analyses of Finnish foods (Ovaskainen *et al.* 1996).

Weight and height were measured by trained nurses at the examination. Basal metabolic rate (BMR) was estimated using WHO equations, which take into account weight, age and sex (World Health Organization, 1985). In a separate study (Hirvonen *et al.* 1997), under-reporting in this dietary survey was evaluated using the cut-off value of 1.27 BMR. It was found that, having this cut-off point, 46% of women and 42% of men were considered to have been under-reporters in this dietary survey.

Calculations and statistical analyses of this country paper were made using SAS programs (Statistical Analysis Systems, 1996). Two subgroups of the study population were formed according to the intake of total fat (%energy), saturated fatty acids (%energy), dietary fibre (g/MJ), and consumption of fruit and vegetables (g/d). 'High eaters' were those representing the highest quartile, and 'low

eaters' representing the lowest quartile, of intake of formerly mentioned nutrients or foods. The differences of mean intake of a nutrient or foods in a food group between the two consumer groups in consideration in this paper were tested using Wilcoxon 2-sample test and considered significant when $P < 0.05$. The proportion of consumers of a food group was considered different when the proportion of consumers in the two groups was found to differ by or over 5 %-units.

Results

The daily intake of energy yielding nutrients, fibre and consumption of fruit and vegetables are compared to the Nordic Nutrition Recommendations (Anon, 1996) in Table 3. The data include the mean, median, standard deviation (SD) and 10th and 90th percentile of intakes. The fat intake recommendation (less than about 30 %energy) is reached by about 25 % of adults in Finland, the median and average intakes being about 34 %energy. Saturated fatty acid (SFA) recommendation is reached only by about 10 % of the adult population. The guidelines for fibre intake are reached by about 25 % of the population. While there are no official guidelines for daily fruit, berry and vegetable intakes, closer to 50 % of the Finnish adults reach the rough estimate of recommended consumption of fruit, berries and vegetables on a 10 MJ diet. The energy intake and energy intake/basic metabolic rate (BMR) figures illustrate the problem of under-reporting that is obvious also in the Finnish nutrient intake data. Protein intake tends to be higher than recommended in more than 50 % of the subjects. The guidelines of carbohydrate intake are reached only in the highest intake decile. The average alcohol intake is in accordance with the recommendations, but the distribution is very skewed, the median intake being 0 %energy. The intake of monounsaturated fatty acids follows fairly well the recommended range, while the intake of polyunsaturated fatty acids is under the recommended values in more than half of the adult population in Finland (Table 3).

The daily intake pattern of the previously mentioned nutrients among low- and high-fat and saturated fat (SFA) consumers is compared in Table 4a. A similar comparison according to the intake of fibre and consumption of fruit and vegetables is shown in Table 4b. A low intake of total fat and saturated fatty acids indicated a lower overall energy intake and energy intake : BMR ratio; a higher carbohydrate intake; and a lower monounsaturated (MUFA) and polyunsaturated fatty acid (PUFA) intake compared to those with high intake of fat or SFA (Table 4a). Fibre and fruit and vegetable intakes are higher among those eating a low-fat, low-saturated-fat diet compared to those with a high-fat, high-saturated-fat diet. There was no difference in alcohol consumption between the groups, nor in protein consumption between low-fat and high-fat eaters. Low-SFA eaters had a higher protein intake than high-SFA eaters (Table 4a).

Low fibre intake indicated a higher energy, alcohol, total fat, SFA, MUFA and PUFA intake, and higher energy intake : BMR ratio compared to those with high fibre intake (Table 4b). On the other hand, low fibre intake was associated with lower protein, carbohydrate, fibre, and fruit and vegetable intakes compared to those in the highest quartile of fibre intake. The mean intake of energy, alcohol and fibre was lower in the quartile of population consuming the least fruit and vegetables. In addition, the low eaters of fruit and vegetables had a higher proportion of protein, alcohol, total fat, SFA, MUFA and PUFA than those having a high intake of fruit and vegetables in their diet (Table 4b).

Typical food consumption patterns for eaters of low and high fat (%energy), low and high SFA (%energy), low and high fibre (g/MJ), and low and high fruit and vegetable (g/d) in Finland in 1992 are shown in Table 5. In some cases it is typical for a certain population group to have both a larger mean consumption and more consumers of the food group, and in some cases only either a larger mean consumption of foods in the food group or only more consumers of foods in the food group, contributing to the difference of the consumption pattern.

Table 3. Daily intakes of energy, fat, saturated fatty acids, fibre, and fruit and vegetables by Finnish men and women, aged 25–64 years ($n = 1861$)

Nutrients and foods	Mean	SD	Median	Percentile		Typical Dietary Goals
				10th	90th	
Total Fat (%energy)	33.8	5.9	33.7	26.5	41.2	~30 %
SFAs (%energy)	14.2	3.1	14.2	10.3	18.2	~10 %*
Fibre (total g)	22.2	9.5	20.3	12	34.1	25–35 g/d
Fibre/MJ energy (g/MJ)	2.5	0.8	2.4	1.6	3.5	3 g/MJ
Fruit, berries and vegetables (g)	433	260	397	151	744	(450 g)†
Energy (MJ)	9	2.9	8.6	5.7	12.7	
EI/BMR‡	1.35	0.39	1.32	0.88	1.84	
Protein (%energy)	16.1	2.9	15.8	12.6	19.8	10–15 %
Carbohydrate (%energy)	47.7	7.2	47.7	38.1	56.6	55–60 %
Alcohol (%energy)	2.5	4.7	0	0	8.3	< 5 %
MUFAs (%energy)	11.2	2.4	11.1	8.4	14.2	10–15 %
PUFAs (%energy)	4.7	1.2	4.6	3.3	6.2	5–10 %

* 10% of energy from a combination of SFAs and trans fatty acids.

† In the 1987 dietary guidelines in Finland this amount was shown of vegetables (without potatoes) and fruit as a rough estimate for recommendation of a 10 MJ diet.

‡ EI/BMR = Energy intake/basic metabolic rate.

SFA = Saturated fatty acid; MUFA = Monounsaturated fatty acid; PUFA = Polyunsaturated fatty acid.

Table 4a. Daily nutrient and food intakes of Finnish men and women (aged 25–64 years) classified according to low or high intakes of fat (%energy) and of SFAs (%energy)

Nutrient/food	Subjects having low (< 29.8 %energy) and high (> 37.5 %energy) fat intakes					Low eaters vs. high eaters*	Subjects having low (< 12.1 %energy) and high (> 16.2 %energy) SFA intakes				
	Low eaters		High eaters		Low eaters		High eaters		Low eaters vs. high eaters*		
	Mean	Median	Mean	Median	Mean		Median	Mean		Median	
Energy (MJ)	8.2	7.8	9.7	9.1	↓	8.2	7.8	9.8	9.4	↓	
EI/BMR†	1.24	1.19	1.43	1.42	↓	1.23	1.19	1.44	1.43	↓	
Protein (%energy)	16.1	15.8	15.9	15.7	NS	16.4	16	15.9	15.6	↑	
Carbohydrate (%energy)	54.1	55.3	40.9	41.6	↑	52.7	53.7	42.1	42.9	↑	
Alcohol (%energy)	3.4	0	1.8	0	NS	3.4	0	1.8	0	NS	
Total fat (%energy)	26.3	27.2	41.4	40.5	↓	27.5	27.7	40.2	39.9	↓	
SFA (%energy)	10.9	11.1	17.6	17.5	↓	10.4	10.7	18.2	17.8	↓	
MUFA (%energy)	8.6	8.7	14	13.7	↓	9.5	9.4	13	12.7	↓	
PUFA (%energy)	3.9	3.9	5.4	5.3	↓	4.6	4.5	4.7	4.7	↓	
Fibre (g)	24.1	22.1	19.8	18.2	↑	23.9	21.7	20.5	18.9	↑	
Fibre (g/MJ)	3	3	2.1	2.1	↑	3	3	2.1	2.1	↑	
Fruit, berries & vegetables (g)	508	472	350	315	↑	513	468	339	308	↑	

* Significance of difference ($P < 0.05$) tested by using Wilcoxon 2-sample test; NS ($P > 0.05$).

† EI/BMR = Energy intake/Basic metabolic rate.

SFA, MUFA, PUFA = Saturated fatty acids, monounsaturated fatty acids and polyunsaturated fatty acids, respectively.

Table 4b. Daily nutrient and food intakes of Finnish men and women (aged 25–64 years) classified according to low or high intakes of fibre (g/MJ) and of fruit and vegetable consumption (g/d)

Nutrient/food	Subjects having low (< 1.9 g/MJ) and high (> 3.0 g/MJ) fibre intakes					Low eaters vs. high eaters*	Subjects having low (< 252 g/d) and high (> 557 g/d) fruit and vegetable intakes				
	Low eaters		High eaters		Low eaters		High eaters		Low eaters vs. high eaters*		
	Mean	Median	Mean	Median	Mean		Median	Mean		Median	
Energy (MJ)	9.6	9.1	8.2	7.7	↑	8.6	8.3	10	9.6	↓	
EI/BMR†	1.39	1.36	1.27	1.21	↓	1.25	1.19	1.5	1.47	↓	
Protein (%energy)	15.8	15.5	16.5	16	↓	16.2	15.9	15.5	15.3	↑	
Carbohydrate (%energy)	42.5	42.4	52.5	52.9	↓	44.9	45.2	50.9	51.3	↓	
Alcohol (%energy)	5	2	1.1	0	↑	3.4	0	1.8	0	↑	
Total fat (%energy)	36.6	36.5	29.9	29.9	↑	35.5	36	31.8	31.5	↑	
SFA (%energy)	15.7	15.7	12.3	12.1	↑	15.3	15.4	13.2	13.2	↑	
MUFA (%energy)	12.3	12.2	9.9	9.8	↑	11.7	11.7	10.6	10.4	↑	
PUFA (%energy)	4.8	4.7	4.5	4.4	↑	4.7	4.6	4.6	4.4	NS	
Fibre (g)	15.1	14.8	29.1	27.2	↓	19.1	17.2	25.9	24.2	↓	
Fibre (g/MJ)	1.6	1.7	3.6	3.4	↓	2.3	2.2	2.6	2.6	↓	
Fruit, berries & vegetables (g)	363	311	479	434	↓	163	174	776	695	↓	

* Significance of difference ($P < 0.05$) tested by using Wilcoxon 2-sample test; NS ($P > 0.05$).

† EI/BMR = Energy intake/Basic metabolic rate.

SFA, MUFA, PUFA = Saturated fatty acids, monounsaturated fatty acids and polyunsaturated fatty acids, respectively.

Discussion

The population groups, quartiles of the sample, having the lowest fat or SFA intakes or the highest fibre or fruit and vegetable intakes reached the nutrient recommendations reasonably well. The main problem with the dietary intake data in the examples of diets with low fat or SFA intakes is that they are most probably under-reported.

While the diets of the quartile of lowest fat and SFA intakes had similarities in the most popular foods used (e.g. fruit and berries, roots and rye), it was seen that consumption of soft margarines (containing about 70–80% fat) was connected to low SFA intake, and consumption of low-fat spreads was typical for low-fat intake. In the case of the diets with highest fibre and highest fruit and vegetable

intakes, similarities were found in the popularity of vegetables, fruit and berries, legumes and roots in the diet. The consumption pattern of cereals, however, differed: rye was widely used in diets high in fibre and wheat and other cereals (e.g. oats) in diets high in fruit and vegetables. The high intake of fruit, berries and vegetables was associated, in addition to larger mean consumption of wheat, also with larger mean consumption of sugar and stick margarines. Part of this pattern may indicate a larger popularity of baking in the food preparation habits of this quartile of subjects compared to those with the lowest fruit, berry and vegetable consumption.

The main discrepancies with dietary recommendations in the average diet of the subgroup with the lowest fat intake were the lower than recommended average PUFA and MUFA intakes. On the other hand, the PUFA and MUFA

Table 5. Typical food consumption patterns for eaters of low and high fat (%energy), SFA (%energy), fibre (g/MJ) and fruit and vegetables (g/d) in Finland in 1992

Feature of consumption pattern	Quartiles of fat intake (%energy)		Quartiles of SFA intake (%energy)		Quartiles of fibre intake (g/MJ)		Quartiles of fruit and vegetables intake (g/d)	
	Lowest	Highest	Lowest	Highest	Lowest	Highest	Lowest	Highest
Both a larger mean consumption* and more consumer† of the foods in the food group	Low-fat spreads Berries Fruit Berry juices Sour milk Roots Tea	Other fats Pork Sausages Cheese Cream Ice cream	Soft margarines Fish Fruit Roots	Sugar Egg Pork Sausages Cheese Cream Ice-cream Milk Other fats	Other fats Fruit juices Poultry Sausages Cream Ice-cream Alcohol Soft drinks	Rye Berries Fruit Sour milk Legumes Roots	Coffee	Other cereals Berries Fruit juices Fruit Fruit Berry juices Cheese Cream Ice-cream Legumes Roots
Only a larger mean consumption* of foods in the food group	Rye Other cereals Other foods	Wheat Butter Vegetable oils Soft margarines Stick margarines Eggs Liver and blood Coffee	Rye Other cereals Berries Vegetables Other foods	Wheat Butter Vegetable oils Stick margarines Poultry Coffee	Sugar Wheat Butter Vegetable oils Stick margarines Egg Berry juices Pork Cheese Low-fat milk	Vegetables Other foods	Low-fat spreads Poultry Low-fat milk Sour milk Potatoes	Sugar Wheat Other fats Stick margarines Vegetables Other foods
Only more consumer† of foods in the food group	Beef Liver and blood	Legumes	Poultry	Sour milk Soft drinks	-	-	-	Low-fat spreads Soft margarines

* Differs significantly from the mean consumption of the other group. Wilcoxon 2-sample test, $P < 0.05$.† Difference between the proportions of consumers $> 5\%$ -units. SFA = Saturated fatty acid.

intakes were closer to recommendations in the average diet of the subjects with the lowest SFA intake. Subgroups consuming diets high in fibre or fruit and vegetables had somewhat higher average SFA intakes than recommended. In the case of the average diet of those in the highest fruit and vegetable consumption quartile, it can also be seen that the fibre intake was lower in that diet than in the diet especially high in fibre. The background to this difference is in the food consumption pattern of the subjects in those quartiles: in the Finnish diet, the consumption of rye products is the main indicator of high fibre intake; rye products are, however, not all found in the list of food groups consumed in larger amounts or by more consumers in the group that ate a larger amount of fruit and vegetables (Table 5).

These results show that there are several ways to combine a variety of foods together to reach the recommended nutrient composition of a diet. A deeper knowledge and more research is needed to understand the replacement pattern of foods in diets in general as well as in different population groups, e.g. separately among men and women (Roos & Prättälä, 1996; Roos *et al.* 1997), before further developing food-based dietary guidelines for these groups.

This evaluation of the Finnish diet is based on 3 d food record data with known problems of under-reporting (Hirvonen *et al.* 1997) included in the data as well as uncertainties of its representativeness of individual level intakes in the case of certain nutrients. The pitfalls of data available for evaluation of the effects of food-based dietary guidelines need to be kept in mind when using such data and when planning the collection of new data to be used for this kind of purpose.

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