

Trends in food intakes in Swedish adults 1986–1999: findings from the Northern Sweden MONICA (Monitoring of Trends and Determinants in Cardiovascular Disease) Study

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Abstract

Objective: To determine changes in reported food frequency in adults between 1986 and 1999.

Design: Four consecutive cross-sectional surveys.

Setting: Counties of Norrbotten and Västerbotten, Northern Sweden.

Subjects: The Northern Sweden MONICA (Monitoring of Trends and Determinants in Cardiovascular Disease) population, four independent cross-sectional surveys in 1986, 1990, 1994 and 1999. Randomly selected age-stratified samples of the population aged 25–64 years. Analysis is based on 2982 males and 3087 females who completed an 84-item food-frequency questionnaire.

Results: Between 1986 and 1999, average reported consumption of 3%-fat milk decreased from 42 to 7 intakes month⁻¹ in men and from 28 to 4 intakes month⁻¹ in women. Reported use of 1.5%-fat milk increased from 6 to 27 intakes month⁻¹ in men and from 6 to 24 in women. Monthly intakes of potatoes and root vegetables decreased from 38 to 27 in men and from 39 to 32 in women. Consumption of pasta increased from 4 to 7 intakes month⁻¹ in both sexes. Intakes of solid fats with 80% fat content dropped from 92 to 62 per month in men and from 78 to 52 per month in women, whereas use of 40%-fat spread increased from 12 to 22 intakes month⁻¹ in men and from 5 to 26 in women. Monthly intakes of vegetable oil increased from 3 to 12 in men and from 3 to 15 in women. The percentage of overweight or obese individuals (body mass index > 25 kg m⁻²) increased from 52 to 65% in men and from 41 to 52% in women (*P* for linear trend in all these changes, < 0.001).

Conclusions: Our data indicate reduced consumption of foods with a high content of saturated fats. In spite of that, there is an unbroken trend towards increased obesity.

Keywords
Cross-sectional study
Cross-sectional survey
Diet
Dietary intake
Dietary survey
Food consumption
Food frequency
Milk
MONICA
Sweden

The two northernmost counties of Sweden, covering an area of 165 000 km² (four times the size of The Netherlands) and with a combined population of 500 000, have traditionally been an area of lower wealth than the rest of Sweden. A cold climate with growing seasons lasting between 3 and 5 months forced people to subsist on a diet poor in quality and quantity, at least until the first decades of the previous century. Lumber industry, iron mines, hunting, fishing and reindeer herding were the main sources of income. In 1933, a comparative study based on autopsies indicated a lower prevalence of arteriosclerosis in the north compared with both Stockholm and the south of the country¹.

After World War II, the situation changed. Life in northern Sweden became more sedentary and its people

could afford the caloric abundance that previously had been a privilege of the richer south. During the second half of the 20th century, the northern part of the country topped statistics in mortality from cardiovascular disease (CVD). However, since the late 1980s the gap between northern Sweden and the rest of the country has been narrowing. Recent data (1996) show only a slightly elevated risk to die from CVD in northern Sweden, compared with the rest of the country^{2,3}. Another interesting observation is that there was no increase in prevalence of diabetes in northern Sweden among people 25 to 64 years of age, in spite of an unbroken trend of increasing body weight in the population^{4,5}.

The reason for this discrepancy between trends in diabetes and CVD, on the one hand, and body weight, on

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the other, is not known. The public health message from Swedish authorities did not change during the observation period. From the mid-1970s recommendations aimed at, among others, reducing the intake of food items with a high content of saturated fat and increasing the intake of foods rich in starch⁶.

The aim of the present study was to give a comprehensive description of the changes in reported food frequency in the northernmost parts of Sweden.

Method

The MONICA project (Monitoring of Trends and Determinants in Cardiovascular Disease) was initiated by the World Health Organization and included 38 populations in 25 countries. Trends in cardiovascular mortality, coronary heart disease and cerebrovascular morbidity were measured in order to assess the extent to which these trends were related to changes in known risk factors, daily living habits and health care^{7,8}.

Study design

The Northern Sweden MONICA Project was performed in the counties of Västerbotten and Norrbotten described above. A detailed description of the survey procedures has been published elsewhere⁹. Briefly, the first survey took place from January to April 1986. For consistency, the following surveys, performed in 1990, 1994 and 1999, always took place at the same time of the year. The samples for the second, third and fourth surveys were selected irrespective of whether individuals had been selected in previous surveys. From a continuously updated population registry, 250 men and 250 women in each of the age groups 25–34, 35–44, 45–54 and 55–64 years were randomly selected and invited to participate. The target population was approximately 265 000 subjects (Fig. 1). Non-responders got a second letter of invitation

2 weeks after the date for their initial health examination. Those who did not turn up were called by telephone and asked to give basic information on social background, weight, height and smoking. The study was approved by the Research Ethics Committee of Umeå University. All participants signed an informed consent form.

Method of dietary assessment

To perform the surveys, two teams were operating, one in each county. The team members were specially trained and an examination of each MONICA team member was carried out to ensure correctness and uniformity in the collection of information, and to make the surveys comparable. The participants were invited to the closest health centre for measurement of anthropometric variables and to give a blood sample. Participants were also asked to complete a questionnaire on health, socio-economic status and daily living habits. Food habits were assessed by a semi-quantitative food-frequency questionnaire (FFQ). The FFQ contained 81 items in 1986, 49 items in 1990, and 84 items in 1994 and 1999. For solid cheese, coffee and cereals, there was one question in 1986 and two different questions in both 1994 and 1999 (brewed and boiled coffee for coffee, 17%- and 28%-fat solid cheese for solid cheese, corn flakes and bran flakes for cereals). To increase uniformity we combined the separate questions from the later screenings into the original one by adding the respective reported frequencies. Therefore, although screened for 84 items in 1994 and 1999, only 81 are listed. For each of the foods/dishes, participants were asked to indicate if they consumed them never, once a year, 1–3 times per month, once a week, 2–3 times per week, 4–6 times per week, daily, 2–3 times per day, or 4 times per day or more. The answers were converted into numbers of daily intakes. A validation study comparing the FFQ with 24-hour recalls found good reproducibility and

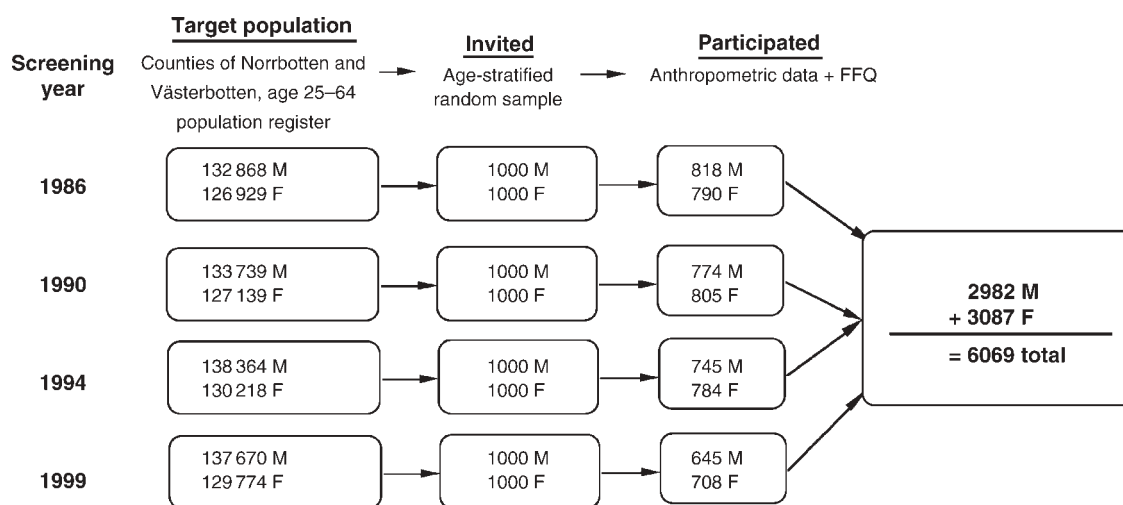


Fig. 1 Study design of this analysis within the Northern Sweden MONICA (Monitoring of Trends and Determinants in Cardiovascular Disease) population. FFQ – food-frequency questionnaire; M – males; F – females

an estimated level of validity similar to that of other FFQ measurements¹⁰.

Estimations of energy and nutrient supplies are based on the Nutrient Database for Standard Reference of the Swedish National Food Administration¹¹. Since participants were asked only for frequency of consumption, not portion sizes, each reported intake was assumed to equal one standard portion size from the reference nutrient database. For most screening questions, there were several corresponding foods or dishes from the reference nutrient database. In these cases, one reported intake was assumed to equal (one) mean standard portion size and the mean nutrient content of all relevant foods and dishes.

Handling of missing values

For analysis of individual food questions, all available observations, even those with an otherwise incomplete FFQ, were considered. Consequently, the number of observations upon which the mean intakes are based is different for every question and each screening year. For simplicity, these numbers are not given. No single question had more than 6.6% missing answers. Mean percentage of missing answers per question varied between the screening years from 0.8% to 2.4%.

For values aggregated from several questions (solid cheese, coffee, cereals, cakes and biscuits), totals of food groups and estimation of nutrients and energy, a three-step imputation procedure was employed:

1. Within the groups bread (crisp, whole-/cracked wheat, white), spreads (butter, margarine–butter blend, 80%-fat margarine, 40%-fat margarine), fats for cooking (butter, margarine, (vegetable) oil), milk (0.5% low-fat, 1.5% reduced-fat, 3% whole) and solid cheese

(10–17% fat, 28% fat), missing answers were considered to be zero intake if at least one other food frequency in the same group was stated.

2. If the remaining missing answers exceeded 10% the observation was deleted.
3. Missing answers in the remaining observations were replaced by the median intake frequency of the same sex in the same 10-year age group of the same screening year.

Statistical analysis

Change in food frequency between 1986 and 1999 was estimated by calculating the difference between mean intakes in the respective years. Linear trend was estimated by linear regression, with number of intakes on the *y*-axis and the screening year on the *x*-axis. Since estimation of energy and nutrient intakes is based on fewer questions and, consequently, a lower reported total energy intake in 1990, this year was excluded from calculation of trends based on aggregated values (nutrient groups, food groups and percentage of total energy intake of individual foods). SAS statistical package version 8.02 (SAS Institute, Cary, NC, USA) was used.

Results

Table 1 shows a population in transition. Between 1986 and 1999 the percentage of subjects with secondary or higher education rose from 40 to 80%. The number of overweight and obese individuals increased over time and, by 1999, 65% of men and 51% of women were overweight or obese. As described elsewhere¹², no clear time trends were found in physical activity, the number

Table 1 Socio-economic, demographic and anthropometric characteristics of participants in the study

	Men (<i>n</i> = 2982, 49%)				Women (<i>n</i> = 3087, 51%)			
	1986	1990	1994	1999	1986	1990	1994	1999
Number of subjects	818	774	745	645	790	805	784	708
Age distribution (%)								
25–34 years	21	22	22	21	23	22	22	22
35–44 years	25	26	24	24	26	25	26	23
45–54 years	28	26	26	25	27	26	27	28
55–64 years	26	27	28	29	25	27	26	27
<i>Total</i>	100	100	100	100	100	100	100	100
Weight status (%)								
Underweight (BMI < 18.5 kg m ⁻²)	1	1	1	0	2	2	2	1
Normal (BMI ≥ 18.5 to < 25 kg m ⁻²)	47	42	40	35	56	58	54	48
Overweight (BMI ≥ 25 to < 30 kg m ⁻²)	42	47	46	51	29	29	31	35
Obese (BMI ≥ 30 kg m ⁻²)	10	11	13	14	12	11	13	16
<i>Total</i>	100	100	100	100	100	100	100	100
Education level (%)								
Primary school	56	36	31	22	53	36	27	18
Secondary school	30	51	52	58	31	43	48	53
University	10	13	17	19	12	21	25	29
No answer	4	1	0	0	4	1	0	0
<i>Total</i>	100	100	100	100	100	100	100	100

BMI – body mass index.

of current smokers decreased and the use of moistened snuff became more common.

Table 2 shows the mean number of intakes per month for all food items in 1986, 1990, 1994 and 1999. Our analysis reveals that the main change was a lower intake of foods high in saturated fats (3%-fat milk, 80%-fat spreads, margarine for cooking). These were substituted by foods with a lower content of saturated fats (1.5%-fat milk, 40%-fat spread) and higher in mono- and polyunsaturated fats (vegetable oil). However, there was also a trend towards more frequent eating of foods such as hamburgers, pizza, potato chips/popcorn and French fried potatoes.

Concerning carbohydrate-rich foods, our analysis shows an increase in the consumption of pasta, rice, cereals and soft drinks and decreased intakes of potatoes and crispbread.

Both men and women reported increased intake of fruits. Regarding vegetables, only women increased their consumption significantly. Consumption of fish decreased in both sexes and intake of alcoholic beverages became more common.

The most important changes in mean number of intakes between 1986 and 1999 were a switch from 3%- to 1.5%-fat milk, reduced use of sugar to sweeten tea or coffee and reduced use of 80%-fat spreads, partly compensated by higher use of low-fat (40%) spread. Crispbread and potatoes were consumed less often, (vegetable) oil for cooking, cereals and bananas more often (Fig. 2).

The largest changes in estimated contribution to total reported energy intake were reduced consumption of 3%-fat milk, increased consumption of 1.5%-fat milk, increased use of vegetable oil for cooking, decreased use of margarine for cooking and reduction in potato consumption.

All major trends were in the same direction in both men and women. A subgroup analysis between the two counties in the study showed no major differences in reported food frequencies over time (data not shown).

The main changes in relative terms coincided with the above-described trends in mean number of intakes. Some foods were consumed infrequently, with marked relative changes. Use of reduced-fat sour-milk products, beer, potato chips/popcorn, French fried potatoes, soft drinks and pasta all doubled in both sexes. Rice was used 50% more often in men and 75% more often in women (Fig. 3).

Estimated intakes of nutrients as a percentage of total energy intake showed a slight decrease in energy from proteins and a decrease for saturated fat. The importance of carbohydrates increased and the reported intake of dietary fibre increased slightly. These trends are in accordance with dietary guidelines. However, between 1994 and 1999 total fat content increased, and the consumption of carbohydrates and dietary fibre decreased or stagnated (Table 3).

Discussion

Between 1986 and 1999, this representative sample of the adult population of northern Sweden switched from 3%-fat milk to 1.5%-fat milk. Solid fats were used less often, low-fat spread and vegetable oil more often. Use of potatoes decreased, rice and pasta increased. The trends were consistent over all survey years and similar in males and females.

This analysis is based on one of the few longitudinal studies conducted so far among representative samples of a geographically defined population. The four repeat surveys used the same methodology, apart from a shortened version of the questionnaire in 1990. Participation rates were high, although slightly lower in the most recent survey. The overall level of reported energy intake does not fit with the fact that more than half of our population is overweight. Part of the difference may be due to misreporting or underreporting, and that the FFQ in the 1990 survey did not cover the whole spectrum of foods used. Unweighted pooling of different food items into one reported intake and use of standard portion sizes are further potential sources of error. Due to these shortcomings, single estimates based on total nutrient or energy intake are to be interpreted with caution, while estimates of trends are likely to be more valid.

National dietary guidelines (Swedish national dietary guidelines, third edition (1992), quoted in reference 6) encourage use of low-fat products and foods low in saturated fat. Although the observed trends follow these recommendations, estimated total energy from saturated fat exceeds recommendations by 50% in both men and women. Regarding consumption of complex carbohydrates, also encouraged by authorities, we found an overall decrease in energy terms (reduced consumption of bread and starchy vegetables but an increase in cereals, pasta and rice). As recommended, the importance of fruits is growing, whereas only women increased their consumption of vegetables.

The main results of the present study are in accordance with those of a number of other studies performed in Sweden and elsewhere.

In Sweden, two nation-wide surveys of food consumption were conducted in 1989 and 1997/98¹³. Compared with our study population there was a slight difference in time interval (1989–98 vs. 1986–99) and age groups (18–74 vs. 25–64 years). Reported total daily energy intake in the national surveys was 6% higher for women and 30% higher for men, probably reflecting a more refined measurement with 30- and 7-day food records including different portion sizes. In both men and women, overall intakes of edible fats and milk were higher in our study population; vegetables, soft drinks and alcoholic beverages were used less often. Trends to reduce intakes of milk and potatoes as well as increase consumption of cereals, soft drinks, alcoholic beverages, pasta and rice

Table 2 Mean number of intakes per month for all food items in 1986, 1990, 1994 and 1999

	Men (<i>n</i> = 2982, 49%)					Women (<i>n</i> = 3087, 51%)						
	1986	1990	1994	1999	Trend	1986	1990	1994	1999	Trend		
Number of subjects												
All participants	818	774	745	645		790	805	784	708			
> 90% answered†	785	761	735	632		764	796	779	698			
% missing answers per question‡												
% missing, mean	2.4	1.4	1.3	1.5		2.0	0.8	0.9	1.4			
% missing, max	6.6	4.5	3.2	4.7		6.1	4.0	2.3	3.2			
1. Bread												
Bread, crisp	55.8	52.9	47.1	40.1	–	***	50.2	46.0	43.1	37.0	–	***
Bread, wholemeal	13.3	17.5	12.2	13.4	–	NS	15.7	18.7	14.5	16.5	+	NS
Bread, white	18.5		19.0	17.0	–	NS	14.5		16.4	12.5	–	NS
Total frequency per month†	86.5	(70.0)	77.0	69.6	–	***	79.9	(64.3)	73.0	65.3	–	***
% of reported energy†	10.2	(9.1)	9.8	8.9	–	***	10.0	(8.8)	9.4	8.2	–	***
2. Grains												
Porridge, home-made oatmeal	5.5	6.0	4.8	4.8	–	NS	6.1	7.5	5.8	5.5	–	NS
Porridge, whole-wheat/rye/cornmeal	2.5		1.5	1.4	–	***	2.8		1.7	1.7	–	***
Cereals†	7.6	9.1	11.4	12.8	+	***	8.3	9.1	11.4	13.8	+	***
Rice	3.1	3.8	4.5	4.6	+	***	3.2	3.7	4.4	5.4	+	***
Pasta	3.3	4.5	5.7	7.0	+	***	3.2	4.1	5.4	7.4	+	***
Total frequency per month†	21.7	(23.3)	27.8	30.4	+	***	23.3	(24.4)	28.7	33.7	+	***
% of reported energy†	6.1	(9.9)	8.2	9.0	+	***	6.9	(10.4)	8.5	10.0	+	***
3. Fats & oils												
Butter, spread	13.3	6.3	4.6	5.0	–	***	9.6	2.9	3.7	2.9	–	***
Butter–oil blend, 80% fat	52.4	29.5	38.3	37.7	–	***	41.5	22.1	33.3	28.3	–	***
Margarine, spread, 40% fat	12.1	33.3	25.9	21.5	+	***	14.9	37.0	26.8	26.0	+	***
Margarine, spread 80% fat	8.9	3.7	2.5	2.1	–	***	8.2	3.1	1.7	2.0	–	***
Butter, cooking	6.2	3.8	5.6	5.4	–	NS	3.8	2.3	4.2	3.8	+	NS
Margarine, cooking	24.9	19.0	18.4	17.0	–	***	24.4	21.9	20.3	17.8	–	***
Oil, cooking	1.3		3.9	8.6	+	***	1.2		4.5	9.9	+	***
Oil, cooking/dressing		3.6						4.2				
Oil, dressing	2.0		2.9	3.8	+	***	1.6		2.7	4.8	+	***
Total frequency per month†	117.8	(97.5)	100.5	98.4	–	***	102.0	(92.2)	96.2	94.1	–	***
% of reported energy†	15.3	(17.6)	13.7	14.5	–	***	14.9	(18.0)	13.9	14.7	–	NS
4. Milk, cheese & eggs												
Milk, 0.5% fat	12.6	13.3	9.8	10.1	–	*	15.1	14.0	10.7	11.5	–	**
Milk, 1.5% fat	5.5	23.5	28.2	26.6	+	***	5.7	19.8	24.3	23.5	+	***
Milk, 3% fat	41.5	11.4	6.4	7.1	–	***	27.5	6.4	5.7	4.1	–	***
Cheese, solid†	29.6	26.6	30.0	27.5	–	NS	31.7	27.8	34.2	27.1	–	*
Cheese, spreadable	2.8		2.3	2.7	–	NS	3.2		2.1	4.1	+	NS
Milk, sour/yoghurt	10.9	10.1	9.3	10.3	–	NS	13.2	11.3	10.9	9.9	–	***
Milk, sour/yoghurt, low fat	2.4	2.7	3.9	3.9	+	***	3.5	5.0	6.0	8.0	+	***
Cream/crème fraîche/sour cream	2.9	3.4	4.1	4.4	+	***	3.5	3.7	4.9	4.9	+	***
Eggs/egg dishes/omelettes	4.4	3.9				***	4.9	4.2				***
Total, excluding eggs†	106.8	(89.1)	93.0	91.2	–	***	102.0	(87.2)	98.1	92.2	–	***
% of reported energy†	17.7	(20.4)	14.2	14.0	–	***	17.4	(19.9)	15.1	14.0	–	***
5. Starchy vegetables												
Root vegetables/carrots	8.3	9.7	6.9	6.8	–	**	12.0	14.3	11.5	11.4	–	NS
Potatoes, boiled/baked	24.5	22.3	18.1	14.6	–	***	23.0	21.3	18.6	15.7	–	***
Potatoes, pan-/oven-fried	3.5	3.0	3.4	2.9	–	*	2.2	1.9	2.2	2.2	–	NS
Potatoes, mashed	2.5		2.7	2.8	+	*	2.2		2.4	2.7	+	***
Total frequency per month	38.2	(34.9)	30.6	27.0	–	***	39.3	(37.5)	34.7	32.0	–	***
% of reported energy†	8.4	(10.7)	6.9	6.0	–	***	8.4	(10.4)	7.1	6.3	–	***
6. Fruits & fruit juices												
Apples/pears/peaches	9.0	12.7	9.7	9.9	+	NS	12.5	17.9	14.5	19.2	+	***
Oranges/grapefruits	12.5	12.6	11.9	8.8	–	***	18.4	18.4	18.0	16.7	–	NS
Bananas	5.3	9.8	10.0	9.5	+	***	6.1	12.6	12.5	12.9	+	***
Berries, fresh/frozen	4.9	5.2	4.3	3.8	–	**	4.2	4.5	3.6	3.9	–	NS
Fruit juice	4.2	5.8	7.9	8.2	+	***	6.9	8.1	9.4	9.0	+	***
Total frequency per month†	35.3	(46.0)	43.4	40.0	+	***	47.5	(61.5)	57.9	61.4	+	***
% of reported energy†	4.1	(8.6)	5.8	5.4	+	***	6.0	(11.7)	7.7	8.1	+	***
7. Vegetables												
Cabbage, white	4.0	4.2	3.1	2.9	–	***	4.9	5.5	4.4	5.0	+	NS
Tomatoes/cucumbers	9.7	11.3	9.8	10.9	+	NS	12.0	14.8	13.6	16.2	+	***
Lettuce	7.0	8.3	7.6	8.1	+	*	10.3	12.9	11.5	12.7	+	***
Spinach/kale	1.5	1.4	1.3	1.1	–	*	2.0	1.9	1.5	1.5	–	**
Vegetables, mixed (frozen)			3.1	3.3	+	NS			3.8	5.0	+	***
Total, excluding mixed vegetables†	21.7	(25.1)	21.7	22.9	+	NS	29.1	(35.0)	31.0	35.1	+	***
% of reported energy†	0.5	(0.8)	0.5	0.5	–	NS	0.7	(1.1)	0.7	0.7	+	NS

Table 2 Continued

	Men (n = 2982, 49%)					Women (n = 3087, 51%)				
	1986	1990	1994	1999	Trend	1986	1990	1994	1999	Trend
8. Beverages										
Fruit drinks/lemonade/nectar	7.5		9.8	10.0	+ **	7.6		6.7	7.2	- NS
Soft drinks	3.4	4.8	5.9	7.3	+ ***	2.0	2.3	3.6	4.0	+ ***
Coffee†	87.6	90.4	84.9	78.6	- ***	80.8	84.8	80.3	74.3	- *
Tea	18.5		17.4	15.6	- *	20.8		19.8	22.8	+ NS
Beer, 1% alcohol	4.9		4.9	3.6	- *	1.8		2.3	1.5	- NS
Beer, 1.5% alcohol	2.2		3.6	3.5	+ ***	0.8		1.4	1.3	+ ***
Beer, 4% alcohol	1.1	1.5	1.7	2.1	+ ***	0.4	0.6	0.8	1.0	+ ***
Wine	1.3	1.3	1.5	2.1	+ ***	1.1	1.3	1.6	1.9	+ ***
Strong liquor/spirits	1.5	1.6	1.7	2.0	+ **	0.7	0.8	0.9	0.9	+ ***
Water	69.0					79.2				
Mineral water	4.1					4.0				
Total, excluding water‡	127.9	(99.5)	130.9	124.4	- NS	116.0	(89.7)	117.0	115.0	- NS
% of reported energy†	3.7	(3.3)	4.6	4.9	+ ***	2.8	(2.2)	3.1	3.1	+ **
9. Fish & shellfish										
Fish, lean (perch, cod)	3.0	3.0	2.2	2.3	- ***	3.6	3.6	2.7	2.7	- ***
Fish, oily (herring, salmon)	2.3	2.5	2.1	2.1	- **	2.3	2.2	2.2	2.4	+ NS
Shellfish (shrimp, mussels)	1.0		1.2	1.3	+ ***	1.1		1.4	1.5	+ ***
Fish, salted (herring)	1.7	1.4	1.2	1.1	- ***	1.4	1.3	1.1	1.1	- ***
Fish/ham, smoked	1.5		1.7	1.6	+ *	1.5		1.5	1.7	+ NS
Total frequency per month‡	9.5	(6.9)	8.5	8.3	- ***	9.7	(7.1)	8.9	9.2	- *
% of reported energy†	3.1	(3.4)	2.8	2.7	- ***	3.3	(3.5)	2.9	2.9	- ***
10. Meat & poultry										
Meat cuts, steak/chop	4.3		3.6	3.4	- ***	3.6		3.1	3.1	- **
Meat stews	3.4		3.3	3.3	- NS	3.3		3.4	3.4	+ NS
Bacon	2.2	2.5	2.2	2.3	+ NS	1.8	1.9	1.8	2.1	+ *
Minced meat dishes	4.4		5.4	5.3	+ ***	4.2		5.1	5.4	+ ***
Sausages whole	3.8	4.0	3.9	3.8	+ NS	3.1	2.9	3.3	3.6	+ **
Meat on bread, spreads/ham	6.7		7.2	8.0	+ *	6.3		6.5	7.6	+ *
Sausage, slices	5.3	5.2	6.6	6.3	+ *	3.5	2.9	3.4	3.1	- NS
Liver paste	3.9		3.7	3.6	- NS	5.0		4.3	4.2	- *
Black/blood pudding	1.8		1.5	1.5	- ***	1.8		1.5	1.4	- ***
Organ meats	1.2		1.0	0.7	- ***	1.3		1.0	0.9	- ***
Chicken	1.9	1.8	2.2	2.5	+ ***	1.9	1.8	2.2	2.8	+ ***
Total frequency per month‡	38.5	(13.4)	40.4	40.5	+ NS	34.8	(9.4)	35.5	37.1	+ *
% of reported energy†	10.8	(6.0)	11.4	11.3	+ **	10.5	(4.7)	10.7	10.8	+ NS
11. Desserts & sweets										
Pancakes/waffles	2.9		2.7	2.4	- ***	2.5		2.4	2.4	- NS
Cakes/biscuits	12.7		19.5	17.4	+ ***	14.0		19.3	17.1	+ ***
Jam/marmalade	6.7		7.7	7.0	+ NS	6.9		7.0	6.4	- NS
Sugar/honey in tea/coffee	55.2		37.9	30.7	- ***	29.3		21.7	18.3	- ***
Sweets	7.2		6.2	7.4	- NS	5.9		6.9	7.8	+ ***
Ice cream	2.9		3.1	2.9	+ NS	2.7		3.0	2.8	+ NS
Total frequency per month‡	86.8		76.6	67.6	- ***	60.8		60.0	54.6	- *
% of reported energy†	11.5		11.9	11.8	+ NS	10.7		11.9	11.6	+ **
12. Traditional local foods/dishes										
Soft whey cheese	1.9		1.4	1.9	- NS	2.1		1.2	1.6	- *
Bread, thin flat unleavened	10.6		8.8	9.2	- *	7.7		7.1	7.4	- NS
Brown beans/pea soup	1.9		1.7	1.7	- *	1.6		1.4	1.5	- NS
Bread & broth	0.9		0.8	0.7	- ***	0.8		0.7	0.7	- *
Potato dumpling, stuffed with chopped pork	2.0	2.1	2.0	1.8	- NS	1.8	1.8	1.7	1.7	- NS
Fruit soups/fruit creams	3.6		2.5	2.8	- ***	3.6		2.3	2.4	- ***
Total frequency per month‡	20.3	(2.1)	16.5	17.6	- **	17.1	(1.8)	14.2	14.8	- ***
% of reported energy†	3.9	(2.1)	3.5	3.5	- ***	3.6	(1.8)	3.1	3.1	- ***
13. Prepared foods/convenience foods										
Pizza		1.6	1.9	2.2	+ **		1.6	1.8	1.8	+ NS
Hamburger	1.4		2.1	2.4	+ ***	1.1		1.7	2.0	+ ***
Potatoes, French fried	1.3	1.7	2.1	2.5	+ ***	0.9	1.1	1.6	1.9	+ ***
Potato chips/popcorn	1.1	1.6	2.3	2.7	+ ***	0.8	1.2	2.1	2.3	+ ***
Potato salad			1.3	1.4	+ NS			1.2	1.2	- NS
Ketchup	3.5					2.4				
Total excluding ketchup‡	(3.8)	(5.0)	9.8	11.3	+ ***	(2.8)	(3.9)	8.3	9.0	+ **
% of reported energy†	(2.1)	(4.8)	6.4	7.3	+ ***	(1.7)	(4.1)	5.5	5.8	+ *

Linear trend in number of monthly intakes for all observations, regression line with slope b , $P(b=0)$: *, $P < 0.05$; **, $P < 0.01$; ***, $P < 0.001$; NS, not significant ($P > 0.05$).

† Values for energy percentage/totals/combination of different questions are based on observations with >90% answered questions, missing values replaced by sex- and age-specific median consumption; values in parentheses are excluded from analysis for linear trend.

‡ Among all returned questionnaires of respective survey years, mean % of missing answers per question and the one question with highest % of missing answers are given.

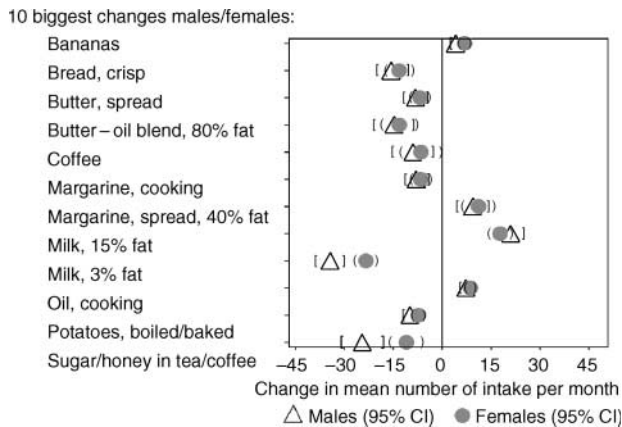


Fig. 2 Difference between mean intakes in 1986 and 1999 for those 10 food items with the largest change, in both males and females. 95% confidence interval (CI) of the mean indicated by ']' for males and '(' for females

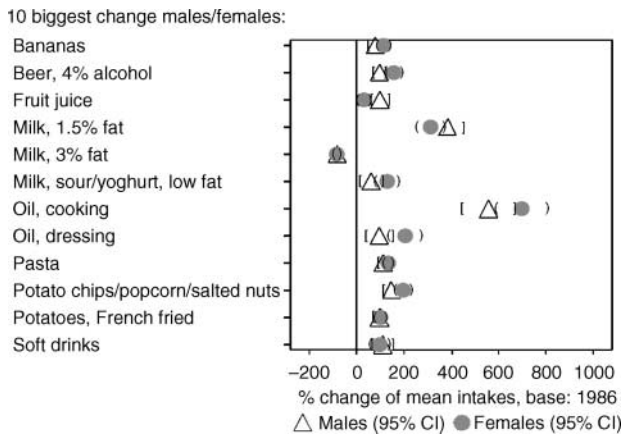


Fig. 3 Percentage change of mean intakes from 1986 to 1999 for those 10 food items having the largest change, in both males and females. 95% confidence interval (CI) of the mean indicated by ']' for males and '(' for females

were all stronger in our study population. The overall impression is that of similar directions for most trends and an assimilation of food habits in the northernmost parts to those in the rest of the country.

In a study of dietary trends in Scottish schoolchildren from 1990 to 1998¹⁴, similar trends were found: overall milk consumption decreased and full-fat milk was replaced by low-fat milk as the most frequently consumed form of milk. Females increased their intake of vegetables whereas males reported no significant change. Consumption of soft drinks, chips, sausages and burgers increased in both sexes. Although our survey covered adults only, the similarity between Scotland and Northern Sweden, both being areas of lower levels of wealth compared with the rest of the country, make these comparisons more relevant.

A prospective cohort of health professionals in the USA¹⁵ also showed trends towards more overweight and increase in self-reported use of low-fat dairy products.

A report on dietary trends from the South German MONICA centre in Augsburg, covering the period from 1984/85 to 1989/90, showed decreasing consumption of meat, sausages, ham, eggs and beer and increasing consumption of cooked vegetables, cereals, milk and sour-milk products. At baseline, intake frequencies of eggs, sausages and beer were much higher in Augsburg, and the consumption of milk and sour-milk products only one-quarter that of the Northern Sweden MONICA population¹⁶. In subgroup analysis of the same population there was a positive association between a higher level of education and healthier food habits in men¹⁷. This is of particular interest, since our study population underwent a substantial change in educational level between 1986 and 1999.

In the county of Västerbotten, containing about half the population of this study, the county council decided in 1984 to launch a community intervention programme for prevention of CVD, The Västerbotten Intervention Programme¹⁸. People aged 30, 40, 50 or 60 years were invited by local health authorities to participate in a risk factor screening combined with individual counselling. Separate subgroup analysis for the county of Västerbotten did not show nutritional trends different in size or direction from the rest of the study population.

The introduction of 1.5%-fat milk on the market in northern Sweden in 1986 coincided with the start of our

Table 3 Estimated total intakes in 1986, 1994 and 1999 compared with dietary guidelines

Estimated total intake	Men				Dietary guidelines‡	Women				
	1986	1994	1999	Trend		1986	1994	1999	Trend	
Total reported intake (MJ)†	7.69	7.39	7.48	-	Intake ~ expenditure	7.07	7.22	7.36	+	**
Protein (% of total)†	14.5	14.4	14.2	-	10–15%	14.8	14.6	14.3	-	***
Fat (% of total)†	38.6	36.1	37.1	-	<30%	37.7	36	36.3	-	***
Carbohydrates (% of total)†	45.8	48.2	47.4	+	55–60%	46.9	48.7	48.7	+	***
Saturated fat (% of total)†	17.2	15.3	15.2	-	<10%	16.6	15.2	14.5	-	***
Alcohol (% of total)†	1.1	1.4	1.5	+	Moderate/none	0.6	0.8	0.8	+	***
NSP = dietary fibre (g MJ ⁻¹)†	2.2	2.3	2.2	+	3g MJ ⁻¹	2.4	2.5	2.5	+	***

NSP – non-starch polysaccharides.

Linear trend in reported intakes for all observations, regression line with slope b , $P(b=0)$: *, $P < 0.05$; **, $P < 0.01$; ***, $P < 0.001$.

† Values for energy percentage/totals/combination of different questions are based on observations with >90% answered questions, missing values replaced by sex- and age-specific median consumption.

‡ Swedish dietary guidelines for adults, third edition (1992), quoted in reference 6.

study. Sales statistics from the Swedish dairy council are in agreement with our finding of 1.5%-fat milk replacing 3%-fat milk as the most popular form of milk during the observation period¹⁹. The Swedish Report of Public Health from 2001, based on food production and sales as well as a comparison of the above-mentioned nation-wide Swedish food surveys, found a similar trend towards higher consumption of pasta and rice, more use of oil and less spreads²⁰.

Further analysis of our data as well as that collected in similar studies is needed to estimate the relative influence on food habits of underlying socio-economic trends, food industry marketing, the availability of alternatives (low-fat milk, low-fat spreads, pasta, vegetable oil) public health campaigns and other forms of government interventions. Possible correlations between selected foods and anthropometrics or biochemical markers of morbidity deserve attention, as well.

Our data show a reduction in intake of some foods rich in saturated fat. Other secular trends such as increased use of convenience foods, insufficient intakes of fruits and vegetables and – as indicated from the rising trend towards obesity – a total energy intake that exceeds energy expenditure, remain important public health issues in northern Sweden.

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