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Dietary survey "HEUREKA" 1991: Dietary intake of a Swiss collective assessed by a self-administered 24-hour recall questionnaire

Summary

Food consumption (divided into 10 food groups) as well as energy and main nutrient intake of a Swiss collective (n = 3653) aged 7 years and older was studied. The caloric density was much improved for all five age groups considered as compared with findings in former studies. Carbohydrates gained and alcohol lost significance as main energy suppliers. These results indicate a positive trend in the dietary habits of the collective and suggest an improvement in the dietary habits of the Swiss population as a whole.

The majority of nutrition studies published in Switzerland have dealt with food availability¹, approximate dietary intake² and dietary composition in small population groups from different regions of Switzerland³⁻⁹. Representative data for the whole Swiss population do not currently exist. We carried out a large-scale dietary survey in 1991, with the purpose of getting a rough estimate of the mean dietary intake of the whole Swiss population. In this paper we describe the characteristics of the survey participants and their food and nutrient intake.

Methods

The nutrition survey was part of the programme of the National Research Exhibition, HEUREKA¹⁰,

which took place in Zurich, Switzerland daily from May 10 to November 3, 1991. The rate of participation in the survey did not vary significantly between weekdays and weekends.

Assessment technique

All visitors to the exhibition were eligible to take part in the survey regardless of gender, age, or any other personal factors. Since we wished to assess the mean dietary intake of the largest randomly-selected group possible, a voluntary, self-administered 24-hour recall questionnaire was used. The questionnaire included a reference list of 240 typical Swiss foods and beverages as well as a clear indication of standard Swiss household measures. The participants were instructed to recall their food

intake (both food type and amount) during the previous day. To ensure the accuracy and validity of specific food names, a booklet containing photographs of food servings was provided. At the same time, each participant's demographic data were collected. The questionnaire was available in German and French. The validity and design of the questionnaire are detailed in Beer-Borst and Amadò¹¹.

Data analysis

Data-entry as well as calculation of nutrient, energy and food group intake was performed using the Data Management System "Diet recall" (version 1.0 and 2.0)¹² which is based on the German computerised food composition table Bundeslebensmittelschlüssel (BLS) Version II.1¹³. Gender and five age groups were considered in the evaluation. A representative random sample of 50 questionnaires per gender and age-group was selected for analysis of food group intake. The food intake data were statistically evaluated by a Multifactor Analysis of Variance

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(ANOVA). The LSD test (least significant difference) was used to compare means when a significant F-ratio was indicated by ANOVA. Differences were considered significant at the $p < 0.05$ level¹⁴.

Results

Population characteristics

Of the 953568 visitors to the HEUREKA exhibition during spring, summer and fall 1991, 4195 individuals voluntarily completed questionnaires. Of these 3653 could be evaluated (87%). A total of 167 questionnaires were considered unusable mainly due to missing demographic data or the use of check marks instead of food consumption quantities. The remaining 375 completed questionnaires were not included because they were from people living in foreign countries (318) or from individuals on a special diet (57).

The characteristics of the population studied are presented in Tables 1 to 4 and in Figure 1. Of the total participants, 58% were female and 42% male. The ages of both sexes ranged from 7 years to older than 50 years (Table 1). A total of 305 females and 151 males indicated they were following an alternative type of diet (wholesome food 61%, vegetarianism 34% and others 5%). Nearly all the participants lived in the German speaking part of Switzerland and about 75% were from urban regions (Table 2). Most of the participants were engaged in non-manual occupations. Between 28 and 45% of the women over the age of 18 years reported a moderate work activity level. In men of the same age group, only 14–16% reported a moderate work activity level. Approximately 70% of females and males from all age groups were engaged in sport activities during their leisure time (Table 3).

	Age (years)					Total	%
	7–14	15–18	19–35	36–50	>50		
Females	189	460	866	377	227	2119	58
Males	110	214	643	349	218	1534	42
Total	229	674	1509	726	445	3653	

Table 1. Number of participants according to sex and age.

		Females	Males
		%	
Origin			
Language	German	92.7	94.2
	French	6.4	5.0
	Italian	0.9	0.8
Residence	city or town	48.7	53.1
	medium-sized township	36.4	32.5
	rural community	14.9	14.4
Working activity	light	71.1	80.6
	moderate	25.8	13.4
	strenuous	2.6	4.8
	very strenuous	0.5	1.2

Table 2. Origin (language, residence) and working activity of the participants.

The participants' body weight was judged by the Body Mass Index (BMI)^{15,16}, which has also been validated for children^{17–20}. Women and men 15 years and older had a mean median BMI from 20 to 25 kg/m² (desirable, normal body weight) (Table 3). The mean BMI for the boys and girls aged 7–14 years was 18 kg/m² (Table 4). The participants in the study seemed to be conscious of health-related issues. Smoking frequency ranged from 0% (100% non-smokers; 7–14 year old males) to 18% (19–35 year old men; Fig. 1). The percentage of alcohol abstainers decreased with increasing age from 98% to 6%. On average, more men than women were drinkers of alcoholic beverages (Fig. 1).

Food intake

Mean and median daily food intakes for the study population are presented in Table 5. In all, 10 different food groups were distinguished. Differences in food consumption between females and males were found for some of the food groups. Table 5 shows the significance of these differences. The mean consumption of cereal products, meat, sausages, fish and eggs was generally higher for men than for women. Men aged 15–18 and 19–35 years consumed significantly more milk and dairy products than did women of the same age groups. Men above 36 years drank more alcoholic beverages than did women of the same age. Intra-

Age (years)	Females					Males					
	7–14	15–18	19–35	36–50	>50	7–14	15–18	19–35	36–50	>50	
	%										
BMI	<20 kg/m ²	50.6	35.2	22.6	12.8	40.2	10.4	2.3	2.3		
	20–25 kg/m ²	47.2	62.1	61.5	74.0	57.5	82.5	76.8	70.6		
	26–30 kg/m ²	2.0	2.3	11.9	11.4	1.9	6.2	18.3	23.9		
	>30 kg/m ²	0.2	0.4	4.0	1.8	0.4	0.9	2.6	3.2		
Sport	none	3	5	12	31	36	7	3	15	24	30
	leisure	85	83	83	67	63	77	72	73	73	69
	high-performance	12	12	5	2	1	16	24	11	3	1
	record-performance	0	0	0	0	0	0	1	1	0	0

Table 3. Body-Mass Index (BMI) and sport activities of the collective according to sex and age.

	Percentile					mean ± s
	5th	25th	50th	75th	95th	
Males	14.5	16.0	18.0	19.3	23.2	18.1 ± 2.7
Females	14.6	16.3	17.6	19.1	21.6	17.8 ± 2.3

Table 4. Percentile values and mean ± standard deviation of Body-Mass Index (kg/m²) for males and females aged 7–14 years.

gender differences in food intake were also apparent. Women older than 50 years of age ate more vegetables, lettuce, potatoes, fruits and fruit products than did women under 50 years; a similar difference was found for men in these age groups. Girls and boys aged 7–14 years old also ate significantly less of these foods than did their 50+ counterparts. Women and men aged 19–35 years ate the smallest amount of meat, sausages, fish and eggs. The consumption of milk and dairy products was significantly higher for the 15–18 and 19–35 year-old men compared with men in other age groups. Alcohol consumption of both genders increased with age.

Nutrient and energy intake

Table 6 presents the mean and median daily crude nutrient intakes

of the collective. The caloric density is plotted in Figure 2. The data show that with increasing age women ingested consistently less energy per day (maximum difference between age groups = 9%). A similar trend was observed for men older than 15 years (maximum difference between age groups = 17%). The caloric density was relatively constant between sexes and age groups. Compared with the recommendations of the Deutsche Gesellschaft für Ernährung (DGE)²¹, the crude energy intake of women was within the accepted parameters, and that of the men was somewhat higher, with the exception of the 15–18 year-olds. Male crude carbohydrate intake was somewhat higher than that of females but for both genders the percentage contribution of carbohydrate to energy was about 8–12% lower than DGE guide-

lines. In particular, male daily crude fat intake was markedly higher than recommended²¹, and the percentage contribution to energy from fat was about 3–7% too high. For both females and males the daily crude protein intake was about 30–40 g/day above the recommended amount; the percentage contribution to energy was 3–4% higher than recommended. In general, the median crude alcohol intake approached 0 g/day with the exception of men older than 36 years. Analysis of data showed the existence of a small number of individuals with an extremely high alcohol consumption rate. This data caused the higher mean alcohol intakes and particularly high standard deviations. The percentage contribution of alcohol to energy intake increased from 0% to 3% and 0% to 5% respectively for women and men up to 50 years of age. After this age, the percentage contribution of alcohol to energy decreased.

Discussion

The results of the present study illustrate that a self-administered 24-hour recall questionnaire¹¹ can be considered an appropriate tool for large-scale nutrition surveys.

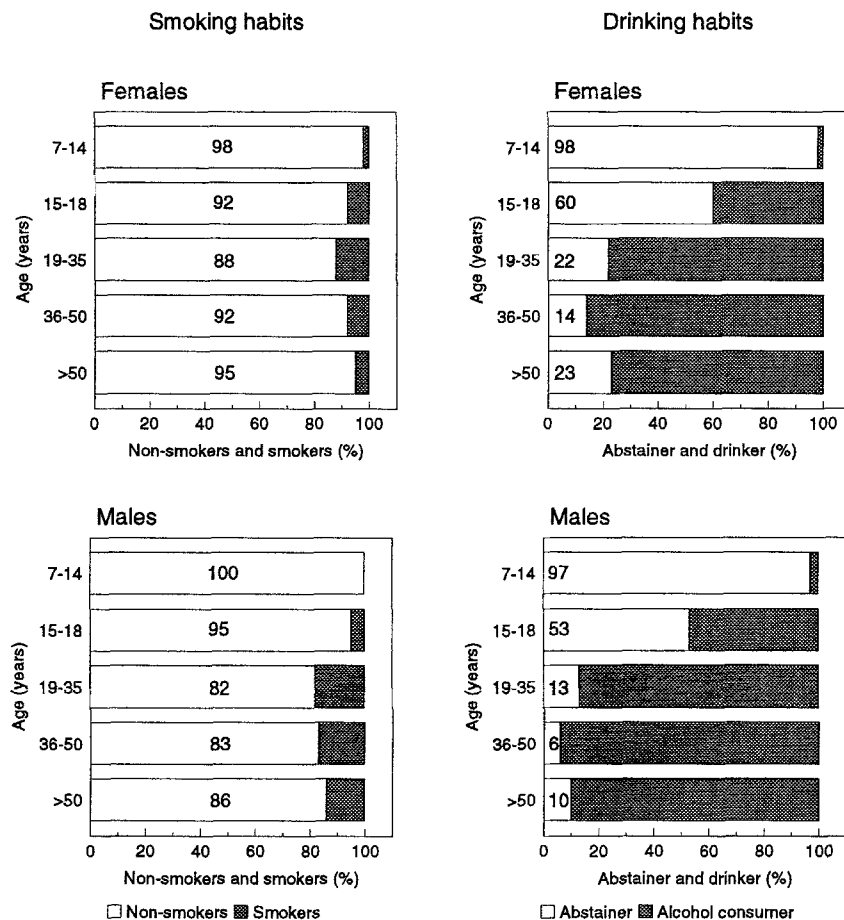


Figure 1. Smoking and drinking habits of the collective according to sex and age.

The level of participation for this assessment (about 4000 individuals) is one of the highest recorded in Switzerland cf.²² Although individuals of all ages were assessed, demographic data revealed that the sample was not representative of the whole Swiss population. Nevertheless, the data do reflect a realistic food intake pattern for at least part of the Swiss population. In general, the study population seemed to be aware of general health issues since frequencies of drinking and smoking were low, and the intake of dietary fiber was high²³. This could be due to the way in which the participants were recruited. It is generally expected that volunteers will be more aware

of health and nutrition issues. This is also supported by the low BMI values recorded for the participants, suggesting that they are conscious of their daily diet. Ensuring the respondent's anonymity through a self-administered questionnaire was a way of encouraging truthful responses. These data, therefore, probably accurately reflect the demographic characteristics of our respondents.

In general, the participants showed BMI distribution and a level of obesity in the normal range. It is difficult to define appropriate cut-off points for childhood obesity using BMI measurements. At present, the 95th percentile BMI is used as a conservative cut-off

point¹⁹. Unfortunately for our analysis, no age- and gender-specific standardised BMI percentile curves exist for Swiss children and adolescents. However, Rolland-Cachera et al.¹⁸ found that the American, Swedish and French curves are very similar. The percentile values of BMI for the children of our collective (Table 4) are comparable with those of French¹⁸, Austrian²⁰ and American Caucasian¹⁹ children.

Allowing for logistic discrepancies, for regional differences in food intake patterns and for the use of different food composition tables, it is possible to compare our results with those of other reports. Data published in the Third Swiss Nutrition Report concerning the approximate dietary intake of the Swiss population² may thus be compared with the results of our study. A close agreement between the two studies was apparent when the percentage contribution of protein to energy was compared. In the present study the percentage contribution of fat to energy was about 1–2% higher, that of carbohydrate about 3–4% higher, and the percentage contribution of alcohol to energy was about 4–5% lower. A comparison of our data with that of Morabia et al.⁶, obtained from a single Swiss canton (Geneva) in 1979–1982, showed that our population had a lower percentage contribution of alcohol and a higher contribution of carbohydrate to energy. In addition, the percentage contribution of fat to energy in women was about 4% less than that reported by Morabia et al.⁶. In a more recent study in the same canton, performed in 1991, Morabia et al.⁹ reported a reduction in the daily energy intake and in the percentage contribution of fat and alcohol to energy as compared to the earlier study⁶. It is unclear whether this observation is due to methodological differences or to an improvement in the dietary habits of the Geneva population.

Daily food intake (g/day)										
Food group	Females (age in years)					Males (age in years)				
	7–14	15–18	19–35	36–50	>50	7–14	15–18	19–35	36–50	>50
Cereal products	248 ± 184 (205) ab	256 ± 173 (205) abc	227 ± 136 (210) a	242 ± 132 (235) ab	231 ± 139 (230) a	289 ± 218 (248) abc	300 ± 198 (258) bc	300 ± 148 (300) bc	322 ± 196 (273) c	273 ± 140 (260) abc
Vegetables/Lettuce, Potatoes	228 ± 224 (185) a	309 ± 252 (275) abc	330 ± 249 (288) bc	333 ± 220 (359) bc	382 ± 231 (397) c	258 ± 234 (225) ab	309 ± 282 (240) abc	329 ± 229 (300) bc	386 ± 243 (350) c	380 ± 256 (350) c
Fruits, Fruit products	165 ± 187 (115) a	224 ± 174 (225) ab	204 ± 207 (137) a	211 ± 159 (210) ab	292 ± 202 (250) b	155 ± 202 (110) a	165 ± 293 (110) a	172 ± 250 (115) a	152 ± 174 (115) a	218 ± 195 (156) ab
Meat, Sausages, Fish, Eggs	113 ± 138 (98) ab	111 ± 103 (94) ab	89 ± 90 (85) a	113 ± 93 (103) ab	109 ± 79 (90) ab	147 ± 147 (110) bcd	163 ± 115 (118) cd	131 ± 91 (118) abc	159 ± 112 (170) cd	176 ± 137 (154) d
Soups, Dishes, Sauces, Dressings	176 ± 270 (58) ab	162 ± 208 (80) ab	192 ± 208 (110) ab	126 ± 151 (45) a	158 ± 190 (98) ab	165 ± 188 (79) ab	218 ± 280 (80) b	205 ± 198 (125) ab	210 ± 246 (110) ab	193 ± 170 (170) ab
Milk, Dairy products	380 ± 373 (260) ab	332 ± 236 (238) a	324 ± 325 (228) a	286 ± 209 (246) a	320 ± 287 (217) a	341 ± 290 (215) a	513 ± 424 (407) c	494 ± 309 (412) bc	308 ± 279 (244) a	312 ± 249 (234) a
Spreading fats	31 ± 34 (20) bc	22 ± 24 (20) ab	18 ± 19 (20) a	25 ± 21 (20) abc	23 ± 18 (20) ab	24 ± 25 (20) ab	34 ± 33 (35) c	26 ± 30 (20) abc	26 ± 19 (20) abc	22 ± 20 (20) ab
Sweet spreads, Desserts, Snacks, Nuts	102 ± 79 (90) ab	99 ± 97 (73) a	116 ± 103 (90) ab	118 ± 129 (79) ab	95 ± 110 (57) a	150 ± 184 (97) b	127 ± 132 (102) ab	139 ± 158 (93) ab	99 ± 110 (75) ab	115 ± 134 (63) ab
Liquor	0 ± 0 (0) a	23 ± 95 (0) ab	100 ± 223 (0) bc	106 ± 191 (0) bc	124 ± 224 (0) c	0 ± 0 (0) a	11 ± 52 (0) a	136 ± 248 (0) c	336 ± 374 (250) d	341 ± 391 (250) d
Non-alcoholic drinks	1036 ± 732 (900) a	1246 ± 745 (1100) abcd	1477 ± 682 (1550) d	1346 ± 573 (1300) cd	1221 ± 498 (1200) abc	1042 ± 626 (800) ab	1346 ± 715 (1300) cd	1295 ± 573 (1256) bcd	1480 ± 764 (1300) d	1192 ± 446 (1200) abc

Table 5. Mean ± standard deviation (median) daily food intake according to sex and age. Means in a row with different letters differ significantly (ANOVA $p < 0.05$).

Daily crude nutrient intake					
Sex and age	Energy	Carbo- hydrate	Fat	Protein	Alcohol
Females	kcal/day		g/day	g/day	g/day
7–14	2250 ± 784 (2133)	276 ± 104 (254)	93 ± 47 (86)	71 ± 35 (64)	0.8 ± 4 (0.1)
15–18	2135 ± 816 (1987)	273 ± 112 (257)	81 ± 41 (74)	71 ± 34 (63)	1.5 ± 6 (0.0)
19–35	2120 ± 690 (2022)	259 ± 92 (247)	82 ± 37 (79)	69 ± 28 (66)	6.3 ± 12 (0.1)
36–50	2101 ± 617 (2074)	248 ± 85 (241)	82 ± 34 (79)	71 ± 24 (67)	9.0 ± 14 (0.2)
> 50	2053 ± 618 (1981)	255 ± 85 (247)	75 ± 32 (72)	70 ± 24 (69)	8.0 ± 14 (0.2)
Males					
7–14	2663 ± 978 (2497)	326 ± 131 (307)	109 ± 50 (100)	87 ± 41 (79)	0.5 ± 2.5 (0.1)
15–18	3080 ± 1165 (2986)	380 ± 169 (356)	123 ± 56 (117)	100 ± 42 (95)	3.0 ± 10 (0.1)
19–35	2944 ± 963 (2842)	350 ± 131 (328)	115 ± 49 (109)	97 ± 37 (90)	13 ± 20 (0.5)
36–50	2745 ± 816 (2623)	321 ± 105 (313)	104 ± 43 (100)	89 ± 32 (85)	20 ± 23 (13)
> 50	2548 ± 761 (2425)	302 ± 106 (283)	96 ± 41 (91)	84 ± 31 (79)	16 ± 24 (11)

Table 6. Mean ± standard deviation (median) daily crude nutrient intake according to sex and age.

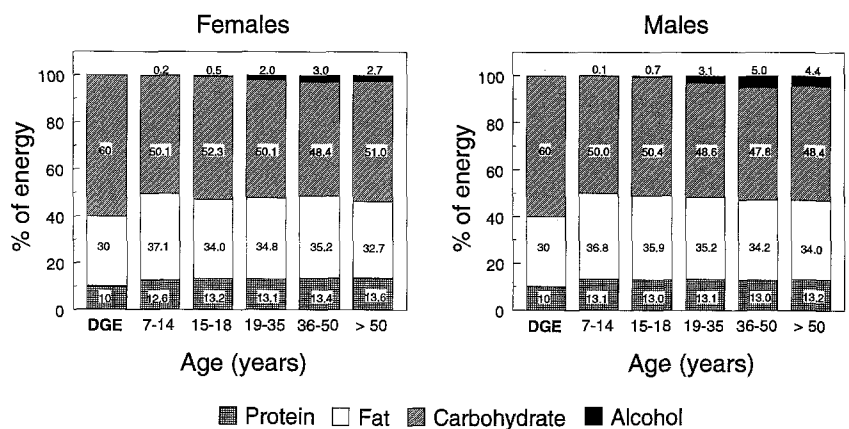


Figure 2. Mean caloric density according to sex and age compared with the recommendation of the Deutsche Gesellschaft für Ernährung (DGE)²¹.

The latter explanation may be correct, since our results are comparable to theirs, which were also obtained by a 24-hour recall in the same year.

The crude energy intake of the present study was higher than that reported for the German study “Vera”²⁴. In contrast to our study, the “Vera” population showed a reduction in carbohydrate intake and a negative variation of the caloric density with decreasing energy intake. In our study there was a lower alcohol intake in all age groups.

Similarly to Junod and Brubacher²⁵, we observed that men consumed more meat products than women. This fact, coupled with a higher cereal product consumption, seemed to account for the men’s higher energy intake. Findings for a sample from the canton of Geneva⁵ partly agree with our results. In that study, Gex-Fabry et al.⁵ observed an increased consumption of vegetable-related products with increasing age. These are rich in vitamins and minerals but naturally poor in energy, so that the energy intake of the older members of the population decreased with respect to standard requirements.

The data presented confirm that our collective tends to be aware of health and nutrition. Although this seems to be a general trend in Swiss nutrition, a projection of our data to the whole Swiss population must be made with caution. To obtain valid dietary data for the entire Swiss population, a representative nation-wide nutrition survey must be conducted.

Zusammenfassung**Ernährungserhebung „HEUREKA“ 1991: Die mit einem „24-hour recall“-Fragebogen erfasste Nahrungsaufnahme eines Schweizer Kollektives**

Der nach 10 Lebensmittelgruppen aufgeschlüsselte Lebensmittelverzehr sowie die Aufnahme an Energie und Hauptnährstoffen wurden für ein Schweizer Kollektiv (n=3653) im Alter von 7 Jahren und mehr untersucht. Die Energie-Nährstoffrelation war im Vergleich zu früheren Studien für alle 5 betrachteten Altersklassen günstiger. Kohlenhydrate haben als Energielieferanten an Bedeutung gewonnen, Alkohol verloren. Diese Resultate weisen auf einen positiven Trend in den Ernährungsgewohnheiten des Kollektives hin, und deuten eine Verbesserung der Ernährungsgewohnheiten der Schweizer Bevölkerung an.

Résumé**Enquête alimentaire «HEUREKA» 1991: Apport alimentaire d'un collectif suisse selon un questionnaire du rappel alimentaire de 24 heures**

La consommation alimentaire répartie sur 10 groupes d'aliments, l'apport énergétique et des nutriments principaux ont été étudiés pour un collectif Suisse (n=3653) âgé 7 ans et plus. La part relative des nutriments dans la ration énergétique a été plus favorable pour toutes cinq classes d'âge considérées par rapport aux études précédentes. Les glucides ont prit de l'importance et l'alcool a perdu de l'importance comme source d'énergie. Ces résultats indiquent une tendance positive des habitudes alimentaires du collectif et suggèrent une amélioration des habitudes alimentaires de toute la population suisse.

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