SECTION 4: LESSONS FROM OTHER ELDERLY STUDIES IN THE DEVELOPED, DEVELOPING AND NEWLY INDUSTRIALISED WORLD

EURONUT-SENECA STUDY ON NUTRITION AND THE ELDERLY IN EUROPE: FORMULATIONS

L de Groot, W van Staveren

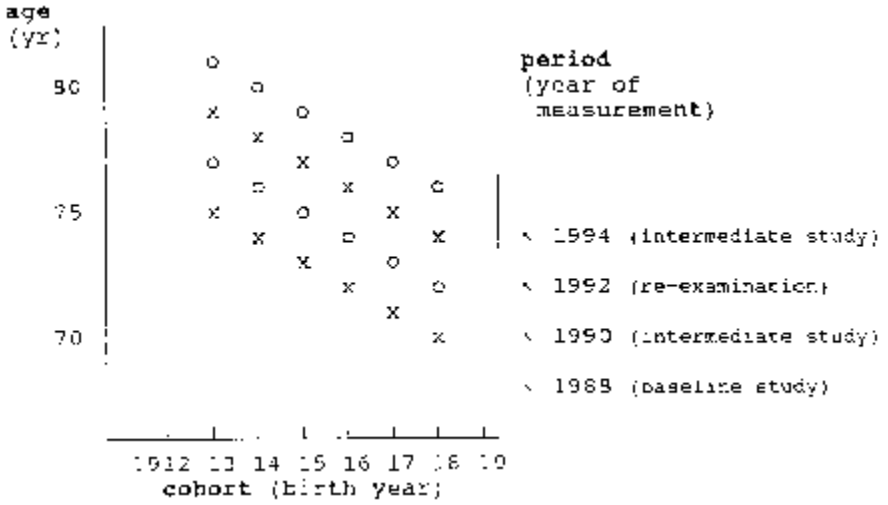
Lisette de Groot and Wija van Staveren
Wageningen Agricultural University
The Netherlands

In 1988 a Europe-wide multicentre study on Nutrition and Health in the Elderly was started to examine dietary patterns in the elderly in relation to lifestyle, social and economic conditions and to health and performance. This Survey in Europe on Nutrition and the Elderly, a Concerted Action (SENECA) started as part of Euronut, the EC umbrella Concerted Action on Nutrition and Health.

18.1 DESIGN

For the SENECA study a repeated measurement scheme was designed to study processes of differential change and developments across cultures in different European ecological settings, hereby aiming to maximally distinguish age from the combination of period and cohort effects (Figure 18.1). The SENECA baseline study may be characterised as a cross-sectional study based on stratified cluster sampling.

Figure 18.1. Design of the SENECA study. Period has to be read diagonally. x = regular measurement, O = intermediate measurement: body weight, some general health parameters.



18.2 SAMPLE AND SAMPLE SIZE

For data collection, subjects from 19 traditional towns with stable populations of 10,000 to 20,000 inhabitants and a socio-economic structure comparable to the country or the region as a whole, were chosen in 12 countries. The towns selected were:

Belgium: Hamme (H/B);
Denmark: Roskilde (R/DK);
France: Chateau Renault-Amboise (CA/F), Haguenau (H/F), Romans (R/F);
Greece: Anogia-Archanes (AA/GR), Markopoulou (M/GR);
Hungary: Monor (M/H);
Italy: Padua (P/I), Fara Sabina-Magliano Sabina-Poggio Mirteto (FMP/I);
The Netherlands: Culemborg (C/NL);
Norway: Elverum (E/N);
Poland: Marki (M/PL);
Portugal: Coimbra (C/P), Vila Franca de Xira (V/P);
Spain: Betanzos (B/E);
Switzerland: Yverdon (Y/CH), Burgdorf (Bu/CH), Bellinzona (Be/CH).
(See Figure 18.2).

For each town a stratified sample was centrally drawn from the eligible population, which included all subjects born between 1913 and 1918 except those individuals living in psycho-geriatric nursing homes, not fluent in the country's language or not at all able to answer questions independently. Fifty to 75 subjects of each sex and year of birth studied were randomly selected with the assumption that after non-participation and dropouts 30 subjects, 35 subjects and 45 subjects of both sexes from the birth cohorts 1913-1914, 1915-1916 and 1917-1918, respectively would remain.

Figure 18.2. Situation of survey towns (birth-cohorts 1913-1914 enrolled, birth- cohorts 1913-1918 enrolled).

No.	Country	Survey town	Abbreviation
1.	Belgium	Hamme	H/B
2.	Denmark	Roskilde	R/DK
3.	France	Chateau Renault/ Amboise	CA/F
4.	France	Haguenau	H/F
5.	France	Romans	R/F
6.	Greece	Markopoulou	M/GR
7.	Greece	Anogia/Archanes	AA/GR
8.	Hungary	Monor	M/H
9.	Italy	Padua	P/I
10.	Italy	Fara Sabina, Magliano Sabina, Poggio Mirteto	FMP/I
11.	Netherlands	Culemborg	C/NL
12.	Norway	Elverum	E/N

13.	Poland	Marki	M/PL
14.	Portugal	Coimbra	C/P
15.	Portugal	Vila France de Xira	V/P
16.	Spain	Betanzos	B/E
17.	Switzerland	Yverdon	Y/CH
18.	Switzerland	Burgdorf	Bu/CH
19.	Switzerland	Bellinzona	Be/CH

The core protocol called for a sample of people born in 1913-1914. It was optional to also include the cohorts 1915-1916 and 1917-1918. Nine centres chose this option and committed to follow-up by recruiting this larger number of subjects. The SENECA baseline study started in 1988. Between November 1988 and May 1989, 2,586 elderly subjects were studied according to a strictly standardised methodology. Two centres (P/I and M/PL) started their surveys far later (1-1½ years).

18.3 DATA COLLECTION

18.3.1 General questionnaire

A questionnaire was designed to gather information regarding socio-demographic situation, socio-economic status, life-style (living situation, use of tobacco, drinking habits, physical activity), medication, use of supplements, self-perceived health, activities of daily living, dietary habits and dietary awareness. The questionnaire was tried out, then translated back into English from the site specific translated questionnaires to have them carefully compared with the original English version.

18.3.2 Food consumption

Food consumption data were obtained in a personal interview using a modified version of the dietary history method consisting of two parts: an estimated 3-day record and a check list of foods. In order to assess the subjects' usual pattern of intake, the subjects were questioned about their usual intake, covering the preceding month as the reference period. Portion sizes were recorded in household measures and checked by weighing. Food consumption data were converted into energy and nutrients by using country-specific food consumption tables (see Table 18.1). At each site approximately seven women completed a 3-day weighed record to assess the validity of the applied method.

Table 18.1. Nutrients and other components of interest in the SENECA study.

- energy(MJ/d)
- protein (g/day): total, animal and vegetable
- fat (g/day): total, polyunsaturated, monounsaturated, saturated
- cholesterol (mg/day)

- carbohydrate (g/day): total, polysaccharides, mono- and disaccharides
- dietary fibre (g/day)
- alcohol (g/day)
- calcium (mg/day)
- iron (10^{-1} g/day)
- vitamin A as retinol equivalents (mg/day)
- ß-carotene (mg/day)
- vitamin B1 (10^{-2} g/day)
- vitamin B2 (10^{-2} g/day)
- vitamin B6 (optional) (10^{-2} g/day)
- vitamin C (mg/day)
- water (g/day)

18.3.3 Anthropometry

Trained personnel obtained data in a standardised manner on body weight, height, skinfold thicknesses and circumferences of waist, hip and upper arm.

18.3.4 Biochemical measurements

Blood samples were taken for haematological and biochemical analyses. Haemoglobin and haematocrit were analysed at the study site. Aliquots of serum, plasma and whole blood were stored at -80°C and after completion of sample collection, they were sent to Wageningen, The Netherlands and transported from there to central laboratories - CIVO/TNO (Zeist, The Netherlands), Nestle Research Centre (Lausanne, Switzerland), Hoffmann - La Roche (Basel, Switzerland) and the Department of Human Nutrition (Wageningen, The Netherlands) - where analyses for vitamins (vitamins A,E,B6,B12, folic acid, b-carotene), albumin and lipids (triglycerides, total cholesterol, HDL-cholesterol) were carried out in all samples. Blood collection procedures were standardised to limit the impact of potential confounders such as time of blood collection and time of last meal. All materials for blood collection were supplied.

18.3.5 Non-responders questionnaire

As part of the survey a non-participation study was carried out in order to signal possible selectivity in participation and to correct for it whenever necessary. Subjects unwilling to participate in the study were invited to complete a short non-responders questionnaire.

18.3.6 Training and standardisation

Since uniformity of data collection is of the utmost importance in this multicentre survey, due attention was given to the standardisation of methodologies. The protocol of the study was

developed in close consultation with the participants, pilot studies were carried out and all procedures were described in detail in a manual of operations.
Moreover, subjects were centrally sampled, common exclusion criteria were applied, the translation of questionnaires was checked and all materials needed for the collection, storage and transport of blood samples were supplied and similarly treated samples were centrally analysed. Further, from its start in 1988 until the completion of the baseline study the SENECA study was co-ordinated centrally at the Department of Human Nutrition at the Wageningen University, The Netherlands. Here all collected data were thoroughly checked, cleaned and stored.

18.4 STUDY OF VALIDITY OF THE DIETARY HISTORY METHOD IN ELDERLY SUBJECTS

This section is copied from Nes M, van Staveren WA, Zajkas G, Inelmen EM, Moreiras-Varela O. Euronut-SENECA study on Nutrition and the Elderly: Validity of the dietary history in elderly subjects. Eur J Clin Nutr, 1991; 45(3): 97-104.

The modified dietary history which was used for assessment of food consumption in the Euronut-SENECA study, was validated against a 3-day weighed record in a subsample of 82 elderly subjects from 11 of the 19 participating centres. The modified dietary history provided consistently higher intakes of energy and nutrients than the weighed record, with a median difference of 14% (energy) of the record mean.

Unattenuated correlation coefficients for nutrient intakes varied from 0.18 (vitamin A) to 0.79 (water) with a median coefficient of 0.58 (energy). On the whole there was a fair agreement between the dietary history and the 3-day weighed record when nutrients were expressed in weight units and a good agreement when standardised for the apparently lower energy intake by the record method (see Tables 18.2-18.5).

Table 18.2. Daily intakes of energy and macronutrients obtained by dietary history (DH) and 3-day weighed record (WR), and mean differences between the methods with corresponding 90% confidence intervals (CI).

Energy and macronutrients	Dietary history		Weighed record		Difference DH-WR			
	n*	mean	SD	mean	SD	mean	SD	%**	90%CI
Energy (MJ)	82	8.3	2.7	7.3	2.0	1.0	2.1	14	[0.6 ; 1.4]
Total protein (g)	82	73.8	23.4	66.4	17.2	7.4	19.8	11	[3.7 ; 11.0]
Vegetable protein (g)	75	24.7	10.6	22.6	9.8	2.1	10.6	9	[0.0 ; 4.1]
Animal protein (g)	75	49.1	19.0	44.6	14.7	4.5	15.3	10	[1.6 ; 7.5]
Total fat (g)	82	83.0	29.2	71.6	25.5	11.4	28.0	16	[6.2 ; 16.5]
Saturated fat (g)	75	30.6	11.7	26.7	11.2	3.9	9.5	15	[2.1 ; 5.7]
MUFA (g)	82	31.2	11.4	26.8	9.8	4.3	11.0	16	[2.3 ; 6.3]
PUFA (g)	82	14.0	9.6	11.0	7.4	3.0	8.3	27	[1.4 ; 4.5]
Cholesterol (mg)	82	296	124	292	122	4.1	123	1	[-18.5 ; 26.7]
Total carbohydrates (g)	82	222	84.6	194	56.9	28.6	71.5	15	[15.4 ; 41.7]
Mono- + disaccharides (g)	75	100	43.2	78.2	37.9	21.8	33.8	28	[15.3 ; 28.3]
Polysaccharides (g)	75	120	66	116	46	4.8	58.7	4	[-6.5 ; 16.1]
Fibre (g)	75	20.4	8.3	16.5	7.7	3.9	5.4	24	[2.8 ; 4.9]
Alcohol (g)	82	7.1	15.3	6.3	13.2	0.8	10.8	12	[-1.2 ; 2.8]
Water (g)	62	1921	955	1683	732	238	584	14	[114 ; 362]

* Some local food tables do not supply all required nutrients, therefore for some nutrients n<82.

** % = difference as percentage of weighed record (WR).

Table 18.3. Daily intakes (medians and corresponding quartiles) of micronutrients obtained by dietary history (DH), and 3-day weighed record (WR), and mean difference between the methods with corresponding 90% confidence intervals (CI).

Micronutrients		Dietary history	Weighed record	Difference DH-WR			
	n*	Mean (P25,P50,P75)**	Mean (P25,P50,P75)	Mean	SD	%***	90% CI
Calcium (mg)	82	1030 (714,914,1314)	894 (584,847,1200)	136	351	15	[71 ; 200]
Iron (0.1mg)	82	113 (89,108,133)	101 (78,97,122)1	12	35	12	[5 ; 18]
Vitamin A (mg)	75	1213 (542,1002,1360)	969 (420,686,1138)	243	1415	25	[-29 ; 516]
ß-carotene (mg)	26	2484 (495,1604,3657)	2191 (683,1099,3533)	293	2393	13	[-516 ; 1103]
Vitamin B1 (0.01 mg)	82	97 (72,90,114)	90 (68,87,107)	7	30	8	[2 ; 13]
Vitamin B2 (0.01 mg)	82	156 (120,149,187)	141 (105,134,176)	14	47	10	[6 ; 23]
Vitamin B6 (0.01 mg)	61	124 (92,124,149)	107 (80,106,132)	17	31	16	[10 ; 23]
Vitamin C (mg)	76	118 (74,104,139)	96 (53,94,125)	21	69	22	[8 ; 35]

* Some local food tables do not supply all required nutrients, therefore for some nutrients n<82.
*** % = difference as percentage of weighed record (WR).
** (P25,P50,P75) = first quartile, median, third quartile.

Table 18.4. Pearson's correlation coefficient (r) between dietary history and 3-day weighed record with corresponding 90% confidence intervals (CI) for energy and macronutrients.

Energy and macronutrients	n*	r	90% CI
Energy (MJ)	82	0.62	[0.49 ; 0.72]
Total protein (g)	82	0.56	[0.42 ; 0.67]
Vegetable protein (g)	75	0.47	[0.30 ; 0.60]
Animal protein (g)	75	0.62	[0.40 ; 0.72]
Total fat	82	0.48	[0.33 ; 0.61]
Saturated fat (g)	75	0.65	[0.53 ; 0.75]
MUFA (g)	82	0.47	[0.31 ; 0.60]
PUFA (g)	82	0.54	[0.40 ; 0.66]
Cholesterol (mg)	82	0.50	[0.35 ; 0.63]
Total; carbohydrate (g)	82	0.55	[0.41 ; 0.67]
Mono- & disaccharides (g)	75	0.66	[0.54 ; 0.76]
Polysaccharides (g)	75	0.50	[0.34 ; 0.63]
Fibre (g)	75	0.78	[0.69 ; 0.84]
Alcohol (g)	82	0.72	[0.62 ; 0.80]
Water (g)	62	0.79	[0.70 ; 0.86]

* Some local food tables do not supply all required nutrients, therefore for some nutrients n<82.

Table 18.5. Pearson's correlation coefficient (r) between dietary history and 3-day weighed record with corresponding 90% confidence intervals (CI) for micronutrients.

Micronutrients	n*	r	90% CI
Calcium (g)	82	0.67	[0.55 ; 0.76]
Iron (0.1mg)	82	0.58	[0.44 ; 0.69]
Vitamin A (mg)	75	0.18	[-0.02 ; 0.35]
ß-carotene (mg)	26	0.52	[0.23 ; 0.73]
Vitamin B1 (0.01 mg)	82	0.64	[0.52 ; 0.74]
Vitamin B2 (0.01 mg)	82	0.66	[0.54 ; 0.75]
Vitamin B6 (0.01 mg)	61	0.75	[0.63 ; 0.83]
Vitamin C (mg)	76	0.55	[0.41 ; 0.67]

* Some local food tables do not supply all required nutrients, therefore for some nutrients n<82.

18.5 COMPARISON WITH THE IUNS STUDY ON "FOOD HABITS IN LATER LIFE - A CROSS CULTURAL STUDY"

This paper concentrates on similarities and differences in design and methods between the above mentioned IUNS study [1] and the Euronut-SENECA project [2] mainly to indicate how far data collected in both studies are comparable. The motivation for starting both studies was the process by which the world's populations have been growing older, the so called epidemiological or demographic transition. This phenomenon is associated with social and economic problems due to progressive biological deterioration and increasing health problems in the elderly. Little information is available regarding nutrition in various geographical settings and health in later life.

Another incentive for the IUNS study was to develop methodology for defining health-food-lifestyle relationships which can be applied in different communities to allow for community specific programmes. On the same line Euronut-SENECA aimed for strengthening research between EC institutions in the field of nutrition and health of the elderly. The general objectives of both studies are descriptive with regard to nutrition, health and life-style of the older population. In the IUNS study, emphasis is on life-long food habits and geographical settings, in developed as well as developing countries. The Euronut-SENECA project concentrated on the assumed variation in dietary patterns and nutritional status of the elderly living in EC Member States, which may influence life expectations and morbidity and mortality patterns. Both studies are hypotheses generating rather than testing, although the IUNS has already formulated hypotheses to test in the baseline study. The design of both studies is cross-sectional but allows for a longitudinal extension. The Euronut-SENECA mixed longitudinal study-design will be able to discriminate between age-effects, period-effects and cohort-effects [3].

18.5.1 Research-sites and subjects

Table 18.6 shows the inclusion criteria for research settings and subjects for both the IUNS study and the Euronut-SENECA project. The main problem for comparison will be the wider age-category range in the IUNS study as compared to the SENECA population. In both studies, the samples are not representative for a country but only for a community.

Table 18.6. Inclusion criteria research sites and subjects in IUNS and SENECA study.		
	IUNS study	**SENECA**
Sites	Culturally homogeneous communities	Traditional town, 10,000-20,000 inhabitants. Population has a socio-economic structure comparable with that of the country.
Population	Random sample	Random sample
Age/n	70 years / 200	70 - 75 years, year of birth/ n*: 1913 / 30 } obligatory 1914 / 30 } obligatory 1915 / 35 1916 / 35 1917 / 45 1918 / 45
Gender	Stratified: 50% male / 50% female	Stratified: 50% male/50% female

* where n is number of subjects.

Not eligible:
1) Psycho-geriatric patients in nursing homes;
2) Foreign people not fluent in the country's language;
3)People not able to answer questions independently.

18.5.2 Variables being measured

Table 18.7. give the numbers of the questions in the IUNS questionnaire, which also have been asked in the Euronut-SENECA project. Common items for comparison in the questionnaire, but also blood chemistry and anthropometry are discussed below.

Table 18.7. Similar variables in IUNS and Euronut-SENECA study. Numbers refer respectively to numbers in the IUNS/Euronut- SENECA manual of operation.

IUNS	Euronut-SENECA
DEMOGRAPHIC CHARACTERISTICS	
Page 1/2 (questions without number)	1- 2 C, 3
DC 28	4b
DC 29	4a*
DC 31A, BP, BC, BG, BO	10*, 11
DC 32A	5*
DC 32B	6a*
DC 33A, B	7a, 7b*
MEMORY	
MA 7 - 10	1 - 2*
WELL-BEING	
WB 16	49*
WB 17A	55
HEALTH	
H 34	48
H 36	56
H 37	57
H 41	52*
H 42	50*
H 43	47*
MEDICATION AND VITAMINS	
H 44	54*
HEALTH AIDS	
H 46	53*
EXERCISE	
No similar questions	
ACTIVITIES OF DAILY LIVING	
ADL 88	17
SLEEP	
SL 89C	33b
SL 89D	33a
SMOKING	
SM 90 A-D	58 - 60*
SOCIAL ACTIVITY	
SAR 92	43 - 44*
SOCIAL RELATIONS	
SAR 93 - 101	39 - 42

ECONOMIC RESOURCES	
ECO 103 - 105	83 - 85*
DENTITION	
APP 55 Tth	65*
APP 56	75
EATING ENVIRONMENT	
DH 57	14*
DH 57 MOW	64
DH 60	64
DH 60 Place	64
DH 61	77*
DH 61A - 62	15 a-b
DH 65	12, 13 a-c*
ALCOHOL	
DH 76A - YES	78 - 82

* Marked questions are not exactly the same.

18.5.3 General questionnaire

Socio-demographic variables. There are common questions on age, sex, marital status, housing, education, living situation and work. SENECA did not ask for the living situation in the past. Questions on work and education are not fully comparable. Euronut-SENECA included a non-responders questionnaire. Both questionnaires finish with an interviewers evaluation, but there is some difference in the items concerning evaluation.

Memory. Four out of the five questions on memory in the IUNS questionnaire are also included in the SENECA questionnaire. The "mini-mental state" examination is not applied in the SENECA project.

Well-being. Regarding well-being only two of the 10 questions in the IUNS questionnaire have been used in the SENECA project. Thus the scores will be quite different between the two studies.

Health. Questions on health are rather similar.

Physical activity. The validated SENECA questionnaire [4] is more detailed regarding this topic and questions have been phrased in another way. Comparison of a few rough scores might be possible.

Activities of daily living. Questions are similar, except SENECA has no questions on "getting to the toilet".

Smoking. Questions are similar in both questionnaires.

Social activity and social network. There is much correspondence between the two questionnaires. However, the wording is not similar and not all the items are the same. Comparison of the results of both studies should be done carefully. For instance in the SENECA questionnaire Community activities are checked as follows:

- Do you participate in any community organisations? (Yes, No, Do not know/no answer)
- How many community organisations do you participate in? (mention number)
- How many hours per week do you spend in volunteer/community activities? (less than 1 hour, 1-2 hours, 3-4 hours, more than 4 hours, do not know/no answer).

For the IUNS the following questions were formulated: In the past year how often have you:

- gone to a senior centre or attended a senior citizen's group?
- attended a church group or other groups or clubs?
- done volunteer work? (never, 3 x year or less, 4-10 x year, 1 x month, 2-3 x month, 1 x week, 2-4 x week, 5 x week or more).

Some of the social-activity questions in the IUNS protocol are incorporated in the physical activity questionnaire of the SENECA protocol.

Economic resources. Although there are many similar questions included in the protocols, the answers will be hard to compare, due to cultural differences.

18.5.4 Nutritional section

Food habits and diet. The Euronut-SENECA protocol has the following items in common with the IUNS protocol: dentition, food avoidance, eating environment, food purchases, storage and cooking facilities and alcohol consumption. Cooking methods are included in the dietary history of the Euronut-SENECA protocol and correspond to the various dishes. It will not be easy to compare this information with the information on cooking methods in the IUNS questionnaire. In the Euronut-SENECA protocol there are no questions on appetite, food and religion, use of fat and salt and food beliefs. Use of fat can be deducted from the dietary history method. Although many questions on food habits in the English version of the protocol are similar in both studies, the versions in the local language may still be different. Examples of translation problems in the Euronut-SENECA study are given in Table 18.8 [5].

Food consumption. In the Euronut-SENECA study a validated modified dietary history method has been used [6]. Emphasis has been given to nutrient intake rather than food intake. Conversion of foods into nutrients has been done with local food tables. Problems encountered in using local food tables are described by van Staveren et al. [5]. The nutrients of interest are

shown in Table 18.3. The main food groups and some of the subgroups of the Eurocode have been used to compare intake of foods.

Table 18.8. Examples of translation errors in the questionnaire used in the Euronut-SENECA study.

Description of items	English questionnaire	Local questionnaire
Foods	Foods canned	Tinned foods
	Expensive products	Animal products
	Health food	Natural foods
Meat	Burned meat	Grilled, roasted, or browned
	Margarine	Diet margarine or
	High in PUFA	Low fat
Dairy	Buttermilk	Dairy cream, whey
Plant products	Fruit	Greens
Supplements	Doses in microgram	Doses in 10-1
Dentures	Removable	Natural

Due to problems with the Eurocode, these data are not yet available. Chapter 26 deals with the food groups which have been used. Food variety, an important item in the IUNS study, cannot be calculated from the SENECA data. At the moment, food consumption data collected in the Euronut-SENECA cannot be compared with the IUNS data. Therefore some extra work should be carried out. In the Euronut-SENECA study no data were collected on food intake in the distant past.

18.5.5 Anthropometric measurements, blood pressure and skintest

Anthropometry. The core protocol of SENECA includes: height, weight, skinfolds and waist and hip circumferences. In the method section it should be emphasised that even with central training sessions between investigator variation is hard to avoid [7,8]. Consequently, comparison of results from various multi-centre studies should be carefully interpreted. No data are available from the Euronut-SENECA project on loss of height and hip length. Also electrical impedance did not belong to the core protocol.

Blood pressure and skintest are not included in the Euronut-SENECA protocol.

Bloodchemistry. The following variables assessed in the IUNS study also have been assessed in the Euronut-SENECA study:

- haemoglobin and haematocrit in local laboratories;
- lipids centrally for all participants, at the Department of Human Nutrition WAU (The Netherlands)

- B12 and folate, centrally by Hoffmann-La Roche (Switzerland)
- Albumin, centrally by Nestec LTD (Switzerland).

18.5.6 Conclusion

The IUNS study on food habits in later life and the Euronut- SENECA project have collected for a great part similar information, which might be compared. However, the interpretation of the results from such a comparison should be done with great care.

18.6 DESCRIPTION OF SURVEY TOWNS AND POPULATIONS STUDIED

This section is copied from de Groot CPGM, van Staveren WA, Hautvast JGAJ, eds. Euronut-SENECA. Nutrition and the Elderly in Europe. Eur J Clin Nutr, 1991; 45(3): 23-30

Some 2,600 elderly people born between 1913 and 1918 have been enrolled in the Euronut SENECA study. In 12 European countries they were randomly selected from the resident populations of 19 'traditional' towns, mostly with a population size between 10,000 and 30,000 inhabitants. Site characteristics of these towns differ from mainly rural to urban and from lowlands to mountainous with a range of temperate climates. In the rural areas work opportunities are primarily agricultural, whereas in mixed rural/ urban, suburban and urban areas most of the working population are engaged in industry, administration and commerce. The percentage of people over the age of 65 ranged from 8% to 22% (see Tables 18.9-18.11).

Table 18.9. Number of participants.

Code	Survey	Abbr.-town	Birth-cohorts	Men	Women	Total
1.	Hamme	H/B	1913-1918	126	105	231
2.	Roskilde	R/DK	1913-1918	101	101	202
3.	Chateau Renault Amboise	CA/F	1913-1918	37	31	68
4.	Haguenau	H/F	1913-1918	110	110	220
5.	Romans	R/F	1913-1918	142	138	280
6.	Markopoulo	M/GR	1913-1914	33	27	60
7.	Anogia Archanes	AA/GR	1913-1914	36	49	85
9.	Monor	M/H	1913-1914	21	26	47
11.	Padua	P/I	1913-1918	97	94	191
12.	Fara Sabina, Magliano Sabina, Poggio Mirteto	FMP/I	1913-1914	32	32	64
13.	Culemborg	C/NL	1913-1918	114	124	238
14.	Elverum	E/N	1913-1914	32	28	60
15.	Coimbra	C/P	1913-1914	-	-	
16.	Vila Franca de Xira	V/P	1913-1918	111	111	222
19.	Betanzos	B/E	1913-1918	88	119	207
20.	Yverdon	Y/CH	1913-1918	123	126	249
21.	Burgdorf	Bu/CH	1913-1914	30	30	60
22.	Bellinzona	Be/CH	1913-1914	30	30	60
25.	Marki	M/PL	1913-1914	19	23	42

Missing codes (e.g. 8, 10) due to withdrawal of some centres before the start of the study.

Table 18.10. Research centre, type of survey area and starting date of the study.

Survey town		Research Centre	Type of area	Starting date (mo'yr)
1.	Hamme	Ghent-Belgium	suburban-rural	11'88
2.	Roskilde	Roskilde-Denmark	mixed urban-rural	11'88
3.	Amboise	Paris-France	plain urban	
	Chateau Renault		plain rural	9'88
4.	Haguenau	Strasbourg-France	plain urban and continental	12'88
5.	Romans	Valence-France	urban Mediterranean near the mountains	11'88
6.	Markopoulo	Athens-Greece	rural hilly	10'88
7.	Anogia		rural mountainous	
	Archanes	Iraklion-Greece	rural mountainous	12'88
9.	Monor	Budapest-Hungary	rural lowlands	2'89
11.	Padua	Padua-Italy	plain urban	9'89
12.	Fara	Sabina	natural hilly	
	Magliano	Sabina	rural hilly	
	Poggio Mirteto	Rome-Italy	suburban hilly	11'88
13.	Culemborg	Wageningen-N'lands	suburban lowlands	10'88
14.	Elverum	Oslo-Norway	mixed suburban rural inland area	2'89
15.	Coimbra	Coimbra-Portugal	--	--
16.	Villa Franca de Xira	Lisbon-Portugal	urban coastal	10'88
19.	Betanzos	Madrid-Spain	suburban/urban coastal	1'89
20.	Yverdon	Basel/Vevey-Switzerland	mixed urban/suburban at foot of Jura mountains	11'88
21.	Burgdorf	Basel/Vevey-Switzerland	urban/suburban at 536 m altitude	1'89
22.	Bellinzona	Basel/Vevey-Switzerland	urban/suburban at 220 m altitude	1'89
25.	Marki	Warsaw-Poland	urban/suburban	3'90

Table 18.11. Population characteristics and retirement age.

Survey towns	Population size (1000's)	% of people 65 y (%)	% of people 70-75 y (%)	Retirement age (y)
1. Hamme	23	13.4	4.5	65
2. Roskilde	49	13.9	4.3	70
3. Amboise	11	8.5*	4.1*	60-65
Chateau Renault	6	11.6	3.4	60-65
4. Haguenau	28	12	2.5	65
5. Romans	34	14.9	4.2	65
6. Markopoulo	16	12.3	3.1	65
7. Anogia	3	15.6	?	65
Archanes	4	17.2	?	65
9. Monor	21	19.2**	?	55 (women) 65 (men)
11. Padua	300	22.3	6.0	65
12. Magliano Sabina Fara Sabina Poggio Mirteto	18	13.1	4.0	65
13. Culemborg	21	10.1	2.8	65
14. Elverum	17	10.4	3.4	67
16. Vila Franca de Xira	22	12.5**	4.2***	70
19. Betanzos	12	14.8	4.9	65
20. Yverdon	21	17.7	4.8	62 (women) 65 (men)
21. Burgdorf	16	19.6	5.1	62 (women) 65 (men)
22. Bellinzona	17	16.2	4.9	62 (women) 65 (men)
25. Marki	18	9.0	2.5	60 (women) 65 (men)

* regional percentage;
** % over the age of 60;
*** % of people 70-79 years.

18.7 SUMMARY AND RECOMMENDATIONS FOR FURTHER ANALYSIS

This section is copied from Euronut-SENECA investigators: Summary and recommendations for

further analysis. ECJN, 1991; 45(3): 183-185.

18.7.1 Objectives and design of the Euronut SENECA Study

The Euronut-SENECA Study was conducted to explore dietary patterns in the elderly in relation to both social and economic conditions and to health and performance. This Chapter 26 presents the first descriptive results of data collected from November 1988 to May 1989, in about 2600 elderly people, 70-75 years of age, living in 19 small towns in 12 European countries. The data comprise demographic, social, diet, mobility, health and performance aspects, which were all collected by questionnaire. For the assessment of food consumption an adjusted dietary history method was developed and validated. In addition anthropometry and blood analyses have been carried out to evaluate the nutritional status. A mixed longitudinal study design was applied to be able to discriminate for age effect, period effect and cohort effect. The core protocol called for a random sample, stratified by age and sex, of elderly people born in 1913 and 1914. The mixed longitudinal design is valid only for 9 centres.

All methods and procedures were highly standardised, using a detailed manual of operations and central training of field work co-ordinators. Questionnaires developed in English were translated into the local language and then translated back into English in order to check for inconsistencies. For the blood samples, all collected material was supplied by the co-ordinating centre and all parameters were analysed in central laboratories with the exception of haemoglobin and haematocrit which were measured at the respective sampling sites. The co-ordinating centre was set up in the department of Human Nutrition, Wageningen Agricultural University, Wageningen, The Netherlands.

When interpreting the results of this study, one should keep in mind the following points:

- Although in most countries towns have been selected with a population and socio-economic structure comparable to the average country structure with regard to these parameters, the results are not representative for the country as a whole.

- Results of the non-responders questionnaires indicate a somewhat selective participation. The average participation rate was around 50% with a wide variation between centres. The present results therefore are not truly representative of all 70-75 year old people living in the towns studied. Yet, correction for selectivity by deriving weighting factors from data collected among non-responders, did not reveal large differences between corrected and uncorrected data.

- Despite all efforts to standardise the research protocol and methods,some inter-observer and inter-methodological differences may still exist, especially in data obtained by questionnaires. Due to cultural differences, some of the questions could not be completely the same for all research sites.

18.7.2 Highlights of the findings

As expected, the nutritional status parameters showed large differences between research towns, even between towns within the same country. For anthropometry, a geographical gradient was found for height: in the North-European towns both men and women were the tallest. In all centres, women were smaller than men, weighed less, had thicker triceps skinfolds and a lower waist-hip ratio. For all measures, "town effects" were significantly present and quite a number of specific differences between towns could be identified, illustrating the dissimilarity of distributions. Mean body mass index (BMI) varied from 24.4 (SD 3.8) kg/m^2 to 30.3 (SD 5.2) kg/m^2 among men; in women the range of means was 23.9 (SD 3.6) kg/m^2 to 30.5 (SD 5.1) kg/m^2. The prevalences of BMI exceeding 30 kg/m^2 were high. At nine research sites, these prevalences were over 30% in both men and women and they were as high as 40-50% in towns studied in Poland, Spain, Central Italy and on the mainland of Greece. These high prevalences of overweight are a matter of concern as a BMI of 30 or higher represents substantial risks at all ages. This is in contrast to moderate overweight possibly being a sign of good health. As another matter of concern, BMI values below 20 kg/m^2 were also found with significant percentages in the towns studied in Norway, Hungary and in Crete. These low values, reflecting low body reserves and possibly malnutrition, might indicate serious health risks. Obviously, they may also be a sign of an ongoing, as yet undiagnosed disease. The results for serum albumin were less alarming, indicating a very small number of subjects with levels below 35 g/L and only four men and no women having levels below 30 g/L. Also the haemoglobin levels and haematocrits did not indicate that the older adults participating in this study were in poor health.

The assays on blood lipids revealed significant differences between participating centres and between sexes for: serum cholesterol, HDL, LDL, and the ratios total cholesterol/HDL and LDL/HDL. For triglycerides, significant differences were found between centres, but not between sexes. The trends of serum lipid levels found in the present study indicate that on average the participants of Mediterranean countries have, lower serum lipid levels. These data are in accordance with the results of the "Seven Countries Study". Blood levels of the following vitamins were analysed for screening vitamin status: carotene, retinol, α-tocopherol, pyridoxal 5'-phosphate, vitamin B12 and folic acid. Data on vitamin D status are not yet available. The results showed large within and between centre differences, but no geographical pattern. The vitamin status for retinol and folic acid was adequate in all centres. Prevalence of low vitamin B6 levels was widespread and reached over 50% in some centres. Vitamin B12 biochemical deficiency was found in a limited number of centres, as it was for a-tocophorol. These data will be related to other aspects of nutrition in the near future to determine high and low risk situations.

The data collected on dietary habits enabled the investigators to identify groups of elderly subjects with particular dietary habits. They included those persons having low or high meal frequencies, those not having cooked meals regularly, those consuming home-produced foods,

those having special awareness in nutrition, those eating alone and those with food budgeting problems. As yet, these data have not been related to actual food consumption. As expected, the assessment of food consumption showed an enormous variability in energy and nutrient intake between and even within the different sites. Men had a significantly higher energy intake than women in all research towns, but in almost all the centres the diets of women had a higher nutrient density than those of men, except for iron.

A geographical pattern in nutrient intake was detected for fatty acids, alcohol, vitamin A, β-carotene and vitamin C. Higher intakes of unsaturated fatty acids, β-carotene and vitamin C indicated a more favourable pattern in the South, while low alcohol intakes and higher vitamin A intakes were more according to recommended intakes in the Northern European centres. Intakes of minerals and vitamins below the lowest Recommended Dietary Intakes (RDI) published by countries in Europe were recorded in some towns, indicating a risk for deficiencies. In this study, vitamin and mineral supplements were not complementing for low intakes, because - as it was noted in other studies- they were mostly used in those study centres where the elderly already had an adequate intake of these nutrients.

The questions on activities of daily living (ADL) revealed that in all centres good functioning was most prevalent in men and in the younger elderly born in 1917 or 1918. As in other studies, self-perceived global health was better in men than in women. This difference in health and performance between sexes might be due to the fact that throughout life women have a lower pulmonary peak capacity function, less muscle mass, and lower bone density. Thus, in the aged, reserves will be exhausted sooner in women. Also it might be assumed that men represent a more selective group of survivors than women. Percentages of elderly with good functional capacity varied considerably between the participating centres and this cannot be explained by the differences in age distribution between towns. The gender difference in prevalence of chronic diseases and use of medicines was less pronounced. Most people judged their health to be good, despite a high prevalence of chronic disease and physical impairment (e.g. leg problems).

Most of the elderly were still active in either professional activities, domestic work, sports or other hobbies. Professional physical activities are more often done by men in this age group, but on the whole women spent more hours per day on physically active tasks than men. This is due to the fact, that women spent more time on housework and on leisure- time activities.

18.7.3 Further cross-sectional analysis

The findings described so far will be used in further cross-sectional analyses on the role of differences in diet habits and nutrition on health, taking into account living habits and life-style. Diet and nutritional status will further be analysed in relation to anthropometric and biochemical parameters, physical activity, living conditions and nutritional awareness. Due attention will also be given to the relation of health (including the use of medicines) and performance and nutritional status. Cluster analyses may reveal specific risk profiles affecting health and

nutritional status, for instance, atherogenic profiles, social factors, alcohol intake and (im)mobility.

18.8 CONTINUATION OF SENECA

With all the valuable data collected in the first phase of the Euronut-SENECA Project, it is important to have the project continued. The proposal for a new concerted action will include a repetition of the SENECA core protocol, which might give more insight in the aetiology of nutrition and health in the elderly. Furthermore some new research topics will be introduced, for instance the assessment of bone-density, immunological status and morbidity and mortality patterns.

In implementing the follow-up study it will be important to continue the collaboration with the Special Programme for Research on Ageing of The World Health Organisation; the Committee on Geriatric Nutrition of the International Union of Nutritional Sciences and with research institutes in the United States of America. In conclusion, the first part of the Euronut-SENECA concerted action has provided us with unique data on dietary patterns, life styles and health in 19 towns in different socio-geographical settings in Europe. It has strengthened European collaboration on an important topic. The results make it possible to identify nutritional risk profiles in the elderly, of which importance and impact on health should be confirmed in a follow-up study and which can help to establish an adequate nutrition policy for the elderly in the future.

18.9 SENECA COLLABORATING CENTRES

18.9.1 SENECA participating centres - Principal investigators and key personnel:

1. Belgium

Ghent State University, Ghent

L de Prins
JP Deslypere
GG de Backer

2. Denmark

Roskilde Hospital, Roskilde
Danish Institute for Clinical Epidemiology, Copenhagen
Copenhagen City Hospital, Copenhagen

M Osler
M Schroll
C Hansen
HG Nielsen

K Palmvang
KM Christensen

3. France

Assistance Hôpitaux Publique de Paris, Paris
B Lesourd
C Garnier
N Mariotte
J Tichet

Centre Hospitalier Régional et Universitaire, Strasbourg
JL Schlienger
F Grünenberger
A Pradignac

Centre Hospitalier de Valence, Valence
M Ferry
B Sidobre
H Majorel-Riviere

4. Greece

Athens School of Public Health, Athens
A Trichopoulou
T Vassilakou

University of Crete, Iraklion
A Kafatos
C Theodorou
J Vlachonikolis
I Apostolaki

5. Hungary

National Institute of Food Hygiene and Nutrition, Budapest
G Zajkás
V Molnár
G Lengyel

6. Italy

University of Padua, Padua
G Enzi
EM Inelmen

National Institute of Nutrition, Rome
A Ferro-Luzzi
S Sette
E Toti

A Ghiselli

7. The Netherlands

Wageningen Agricultural University, Wageningen

JGAJ Hautvast
WA van Staveren
CPGM de Groot
YH Blauw
RPJ. van der Wielen

TNO Toxicology and Nutrition Institute, Zeist

MRH Löwik
H van den Berg

8. Norway

University of Oslo, Oslo

M Nes
K Lund-Larsen
K Trygg
HO Høivik

9. Poland

Warsaw Agricultural University, Warsaw

W Roszkowski
A Kiepurski
A Nowik

National Institute of Food and Nutrition, Warsaw

WB Szostak

10. Portugal

Coimbra University Hospital, Coimbra

MH Saldanha de Oliverira
J Ermida

National Institute of Health, Lisbon

JA Amorim Cruz
I Martins
C Mano
A Dantas
L Airoso
M Filipe

11. Spain

Ciudad Universitaria, Institute of Nutrition, Madrid

O Moreiras-Varela
A Carbajal
I Perea
B Ruiz-Roso
M Perez
G Varela-Moreiras

12. Switzerland

Foundation for Experimental Gerontology, Basel
D Schlettwein-Gsell
Nestec Ltd, Research Centre Nestlé, Lausanne
H Dirren
D Barclay
B Decarli
University of Basel, Basel
G Brubacher
HB Stähelin
F Hoffmann-La Roche Ltd, Basel
J Haller
W Schüep

18.9.2 Associate SENECA co-operating organisations:

World Health Organisation - Special Programme for Research on Aging (WHO-SPRA).
International Union of Nutritional Sciences (IUNS) - Committee on Geriatric Nutrition.

18.9.3 SENECA central laboratories:

F Hoffmann-La Roche Ltd, Vitamins and Find Chemicals division, Department of Human Nutrition and Health, Basel, Switzerland
Nestec Ltd., Nestlé Research Centre, Lausanne, Switzerland
TNO Toxicology and Nutrition Institute, TNO Nutrition and Food Research, Zeist, The Netherlands
Wageningen Agricultural University, Department of Human Nutrition, Wageningen, The Netherlands

18.9.4 SENECA steering committee:

JGAJ Hautvast, Wageningen, The Netherlands, chairman
JA Amorim Cruz, Lisbon, Portugal

H Dirren, Lausanne, Switzerland
A Ferro-Luzzi, Rome, Italy
M Schroll, Copenhagen, Denmark

18.9.4.1 Statistical advisory consultant:

MA van 't Hof, Department of Statistical Consultation, Nijmegen Catholic University, Nijmegen, The Netherlands.

18.9.4.2 Secretariat of the steering committee:

CPPGM de Groot, Wageningen, The Netherlands
WA van Staveren, Wageningen, The Netherlands

18.9.5 SENECA co-ordinating centre - Wageningen, The Netherlands

JGAJ Hautvast, project-leader Euronut: A concerted Action on Nutrition and Health in the European Community (1981-1991). WA van Staveren, project leader Euronut-SENECA. CPGM de Groot, co-ordinator Euronut-SENECA. GM Hoogkamer, secretariat. RPJ van der Wielen, data-management.

18.10 METHOLOGICAL PROBLEMS IN USING THE SENECA QUESTIONNAIRE.

Table 18.12. Methodological problems in using the SENECA questionnaire.

ITEM	NR.	PROBLEM/REMARKS	APPROACH
Demography			
Age, sex, marital status(1-3)	page 2	a) Used as memory test/no problem	a) -
		b) Difficult to find sufficient men in older age-groups	b) Oversampling
		c) % of married and not married subjects differ considerably different towns	c) Correct interpretation of results
		d) Living together without marriage due to tax problems	d) Code as living together
Education (4a, b)	DC 28,29	a) Different school systems and together in broad categories	a) Results presented per setting,
		b) No formal training	b) Coding, consensus within centre
		c) Bias towards higher education	c) Corrections made in data treatment
Living situation (10,11)	DC 31	a) 93% of the elderly in private houses: probably due to bias towards healthier elderly	a)
		b) What to do with subjects who only have their meals in the household	b) > 4 times dinner/week were included in household
Working conditions (5-7)	DC	a) Cultural problems in interpretation of data	a) Results presented per setting and together in broad categories
		b) Bias toward higher SEC	b) -
		c) What to do with two types of occupation	c) Most important economic source of highest social status
		d) Housewife	d) Unemployed
***Memory* (1-2)**	MA	Data only used for testing eligibility to the survey	
Well being			
Tired ? (49)	WB 16	Cultural discrepancy	-
Happy ? (55)	WB 17A	Cultural discrepancy	-
Health	Mind bias towards healthier people		Correction in data treatment
Subjective health	H 34	Difference in interpretation between cultures	
		Difference between subjective health and reported chronic disease/handicap.	
Rating relative to what you can do (56)	H 36	Difference in interpretation between cultures	
		Discrepancy between subjective health and reported chronic disease/handicap.	
Rating relative to others (57)	H 37	> 50% of subjects consider their health better than others.	
Eyes (52)	H 41	No objective check	
Hearing (51)	H 42	No objective check	
(Chronic diseases (47)	H 43	a) No objective check	
		b) Memory problems	
		c) Differences between towns might be due to differences between regional screening policy	
		d) Too many scored "others"	
Medication and vitamins (54)	H 44	a) Not always a sample available for check	
		b) Brand name/type/dose is not always clear	
		c) Specific drugs were coded differently between towns (tonics, injections)	c) Recalculate for doses in drug
Health aids (53)	H 46	-	
Smoking			

Have you ever smoked etc. (58)	SM 90 A-D	Minor problems in coding	Combining questions
Social activity/relations			
Social activities (43044)	SAR 92	Interpretation problems a) Within culture : number of activities/ contracts related to intensity?	
Relations 93-102	SAR	a) How are answers related to social well being b) Cross-cultural : Do questions have the same meaning? c) Mind extrapolation of data to larger/ more regions in this study small towns were selected d) Impact of "eating alone" e) Coding problems with "non structural activities"	
Economic Resources			
Main source of income EC (83,84) 103 - Food budgeting problems 105 (85)		- Validity of answers - Cross-cultural : Differences in benefice; pension e.g. - Very hard to get a complete picture of resources	
Dentition			
Number own/false teeth APP (65) 55th		a) What to do with partial denture denture (yes) b) Teeth of your own c) No objective check	a) Code as removable
Food Habits			
Food avoidance (75)	APP 56	a) Food groups vs specified foods : problems of interpretation b) Reason "dislike/taste" might have an underlying health reason	
Eating environment (14)	DH 57	Irregularly eating places/situation difficult to report	
Food purchases (15)	DH 61-2	Shop on wheels : no differentiation between shop providing all foods and shops providing only bread and milk	
Storage and cooking facilities (13 a-c)	DH 65	a) Problems in cross-cultural interpretation. b) "Translation refrigerator/deep-freeze"	
Alcohol (78-82) 76A Yes	DH	Validity problems - see report B, McIntyre, Appendix	Broad categories of drinkers

18.11 SUMMARY

- The Euronut (European Action on Nutrition and Health) SENECA (Survey in Europe on Nutrition and the Elderly, a concerted action) was conducted in 1988-89 on 2586 elderly people aged 75 years living in 19 small towns in 12 European countries.

- This study is largely descriptive, but also explores dietary patterns in the elderly in relation to both social and economic conditions and to health and performance. Anthropometry and blood analyses were also carried out.

- The study has both a first stage cross-sectional design (1988-1989) and a second stage mixed longitudinal design (for centres able to take part). Elderly living in psycho-geriatric homes were excluded as were elderly not fluent in the country's language or unable to answer questions independently.

- The cross-sectional study included a randomly selected sample of 30 men and 30 women born in 1913-1914 giving a total sample of 60. The longitudinal design included a randomly selected sample of 30 men and 30 women born in 1913-1914, 35 men and 35 women born in 1915-1916, 45 men and 45 women born in 1917-1918 giving a final sample of 110 men and 110 women.

- The following countries took part in the cross-sectional study: Norway, Italy, Greece, Switzerland, Poland, Hungary, Belgium, Denmark, Netherlands, France, Portugal and Spain - the last 6 countries also took part in the longitudinal study.

- It was specified that the size of the town(s) should be 10,000-30,000 and 'traditional' in nature. The majority of the towns selected were semi-rural. The results are not representative for the country as a whole.

- Results of the non-responders' questionnaire indicated that responders tended to be male, non-smokers, healthy and better educated.

- The data comprise demographic, social, diet, mobility, health and performance, which were all collected by questionnaire. Many questionnaire items were taken from the instrument used in the WHO 11 country elderly study (Heikkinen et al., 1983).

- Food consumption data were obtained in a personal interview using a modified version of the dietary history method consisting of two parts: 1. an estimated 3-day record and a check list of foods; 2. usual intake, covering the preceding month. Portion sizes were recorded in household measures and checked by weighing.

- Questionnaire items in the SENECA study which are comparable to the IUNS study

include the following: demography, memory, health, activities of daily living, smoking, social activity and networks, dentition, food avoidance, eating environment, food purchases, storage/ cooking facilities and alcohol consumption.

- In the IUNS study, emphasis is on variety of foods consumed over the past year where as in the SENECA study emphasis is on nutrient intake over the past month.

18.12 REFERENCES

1. IUNS committee on Nutrition and aging. Food habits in later life - a cross cultural study: protocol, 1989.

2. de Groot CPGM, van Staveren WA, Hautvast JGAJ, eds. Euronut- SENECA. Nutrition and the Elderly in Europe. Eur J Clin Nutr, 1991; 45(3): 1-196.

3. van 't Hof MA, Hautvast JGAJ, Schroll M, Vlachonikolis IG. Euronut-SENECA. Nutrition and the Elderly in Europe. Design, methods and participation. Eur J Clin Nutr, 1991; 45(3): 5-22.

4. Voorrips LE, Ravelli ACJ, Dongelmans PCA, Deurenberg P, van Staveren WA. A physical activity questionnaire for the elderly. Med Sci Sport Exerc, 1991; 23: 974-9.

5. van Staveren WA, de Groot CPGM, Hautvast JGAJ. Research on food habits and aging in different cultures in Europe: An exploration. In: Munro H, Schlierf G (eds). Nutrition of the Elderly. Nestle Nutrition Workshop Series, 1992; 29: 17-28.

6. Nes M, van Staveren WA, Zajkás G, Inelmen EM, Moreiras-Varela O. Euronut-SENECA. Nutrition and the Elderly in Europe. Validity of the dietary history method in elderly subjects. Eur J Clin Nutr, 1991; 45(3): 97-104.

7. de Groot CPGM, Sette S, Zajkás G, Carbajal A, Amorim Cruz JA. Euronut-SENECA. Nutrition and the Elderly in Europe. Nutritional status: anthropometry. Eur J Clin Nutr, 1991; 45(3): 31-42.

8. Durnin JVGA. Anthropometric methods of assessing nutritional status. In: Horwitz A, Macfayden DM, Munro H et al., eds. Nutrition and the elderly. Oxford University Press, 1989: 15-32.

18.13 LEGENDS

Figure 1. Design of the SENECA study. Period has to be read diagonally. x = regular measurement, O = intermediate measurement: body weight, some general health parameters.

Figure 2. Situation of survey towns (birth-cohorts 1913-1914 enrolled, birth- cohorts 1913-1918 enrolled).

CHAPTER 18

EURONUT-SENECA STUDY ON NUTRITION AND THE ELDERLY IN EUROPE

18.1 DESIGN

18.2 SAMPLE AND SAMPLE SIZE

18.3 DATA COLLECTION
18.3.1 General questionnaire
18.3.2 Food consumption
18.3.3 Anthropometry
18.3.4 Biochemical measurements
18.3.5 Non-responders questionnaire
18.3.6 Training and standardisation

18.4 STUDY OF VALIDITY OF THE DIETARY HISTORY METHOD IN ELDERLY SUBJECTS

18.5 COMPARISON WITH THE IUNS STUDY ON "FOOD HABITS IN LATER LIFE- A CROSS CULTURAL STUDY"
18.5.1 Research-sites and subjects
18.5.2 Variables being measured
18.5.3 General questionnaire
18.5.4 Nutritional section
18.5.5 Anthropometric measurements, blood pressure and skintest
18.5.6 Conclusion

18.6 DESCRIPTION OF SURVEY TOWNS AND POPULATIONS STUDIED

18.7 SUMMARY AND RECOMMENDATIONS FOR FURTHER ANALYSIS
18.7.1 Objectives and design of the Euronut-SENECA Study
18.7.2 Highlights of the findings
18.7.3 Further cross-sectional analysis

18.8 CONTINUATION OF SENECA

18.9 SENECA COLLABORATING CENTRES
18.9.1 SENECA participating centres - Principal investigators and key personnel
18.9.2 Associate SENECA co-operating organisations
18.9.3 SENECA central laboratories
18.9.4 SENECA steering committee