

# Experience of the EURONUT-SENECA study in design, implementation, and data analysis

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## Abstract

*In 1988, a Europe-wide, multicentre study on nutrition and health in the elderly (SENECA: Survey Europe on Nutrition in the Elderly: a Concerted Action) was started to examine dietary patterns in the elderly in relation to lifestyle, social and economic conditions, health, and performance. This paper evaluates the process of obtaining the baseline measurements of this longitudinal study and discusses quality control and difficulties encountered in gathering and comparing data in a cross-cultural, multicentre study.*

## Introduction

In 1988 a European multicentre study on nutrition and health in the elderly (SENECA: Survey Europe on Nutrition in the Elderly: a Concerted Action) was started to explore cross-cultural differences in nutrition, lifestyle, health, and performance of elderly European people in a baseline study, and to test longitudinally specific hypotheses of healthy ageing. SENECA's baseline survey was carried out as part of a European Community Concerted Action on Nutrition and Health (EURONUT). Now that the first survey of the study has been completed, SENECA's experiences in the various stages of a multicentre study from design to publication can be helpful for others undertaking cross-cultural or multicentre surveys.

## Planning

Planning the study consisted of a series of steps, beginning with defining goals and objectives and ending with pilot testing, training, revising, and setting all details down in a manual of operations [1]. The baseline measurements began in 1988. In 12 European countries, subjects born between 1913 and 1918 from 19 traditional towns, with a stable population of 10,000 to 20,000 inhabitants and a socioeconomic structure comparable to that of the country or the region as a whole, were randomly chosen for data collection. Persons living in psychogeriatric nursing homes who were not able to answer questions independently were excluded. Data on nutrient and food intake, dietary habits, dietary awareness, nutritional and health status, and lifestyle were collected from 2,586 elderly subjects according to a strictly standardized methodology (table 1). A nonparticipation study was included to detect possible selectivity in participation and to correct for it whenever necessary. Non-participants were those persons who declined to participate in the study but agreed to answer nine short questions.

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The results of the baseline study were published in 1991 in a supplement to the *European Journal of Clinical Nutrition* [4] and presented at the First European Congress on Nutrition and Health of the Elderly (Noordwijkerhout, Netherlands). After the follow-up measurements were carried out in 1993-94, the results were summarized in an educational booklet "SENECA: Research into Action," based on ref. 5.

## Data collection and measurement error

In an international survey such as EURONUT-SENECA, uniformity of data collection is essential. Therefore, due attention was given to standardizing the methods. Nevertheless, methodological difficulties emerged during data collection and data evaluation. The types of error that occurred were mostly systematic, affecting subjects or groups of subjects non-randomly. Because the sources of possible error were recognized, most of the errors could be controlled for at the stage of data analysis or by making additional measurements.

TABLE 1. Data collected in the EURONUT-SENECA baseline study

Variables	Methods
Energy, nutrients, foods	Modified version of the dietary history method: estimated 3-day record and a check-list of foods [2]
Socio-demographic situation, socio-economic status, lifestyle, social nets, self-perceived health, medication, activities of daily living, physical activity, dietary habits	Questionnaire [1]
Haematology, albumin, cholesterol (total and high-density lipoprotein), triglycerides, retinol, carotene, $\alpha$ -toco-pherol, folic acid, vitamin B <sub>12</sub> , pyridoxal-5'-	Venipuncture

phosphate, vitamin D	
Marital status, education level, self-perceived health, pattern of consumption, use of cooked meals, housing situation, smoking habits	Non-responders' questionnaire [3]

## Dietary interview

Because one of EURONUT-SENECA's major aims was to study the relations among diet, nutritional status, health, and performance, information was needed about the mean values and distributions and the relative magnitudes of the food and nutrient intakes of the elderly people [2, 6]. To this end, a modified dietary history was used (table 1). On the three days preceding the interview, the examinees estimated their intakes of all foods and beverages. On the day of the interview, the subjects were questioned by trained interviewers about their usual dietary intake, using the preceding month as the reference period. One advantage of such a combination of methods is that the interviewer gets a good impression of the meal pattern of the elderly subjects. Moreover, it reduces the risk of erroneously omitting or adding foods. To avoid errors in estimating the weight of the most commonly eaten foods, the interviewer weighed these foods.

Food consumption data were converted into nutrient data by using country-specific food-composition tables. The differences between energy and nutrient intakes as calculated from local databases differed by less than 9% from intakes calculated from the Dutch database [7]. Difficulties in comparing food intake data were related to problems in classifying the foods according to the Eurocode system [8]. Fortunately, the Eurocode system has been revised so that in future studies the revised system will be more satisfactory [9]. Despite all possible sources of error and difficulties in comparing energy and nutrient intakes across the European sites, a validity study (which was part of EURONUT-SENECA's protocol) showed acceptable agreement between the modified dietary history method and a record of the weights of individual foods consumed [2,10].

## Questionnaire

The initial questionnaire was tested before the start of the study and again after a collective training session; it was then finalized and printed. The original questionnaire was written in English. Site-specific translations were back-translated into English and carefully compared with the original to validate their semantic fidelity. Thus, deviant translations could be traced and controlled for. The physical activity section of the questionnaire did not include specific questions about working activities. During the study it became clear that some southern towns still had high employment rates. Unfortunately, it was impossible to make up for this missing information at the stage of data analysis. Neither was it possible to control for the culturally defined meanings that some of the health-related questions were suspected to have. However, EURONUT-SENECA's different measures of (self-perceived) health showed stable trends between countries and sexes and were consistent with results from other health surveys [11].

## Anthropometry

Although anthropometric measures can be obtained relatively simply, intensive training is indispensable to obtain comparable data. In particular, the measurement of skinfolds has to be carefully standardized [12]. In the EURONUT-SENECA study, measurement of body weight

was standardized by prescribing the time of measurement and the clothing and by using regularly calibrated scales fitted on a wooden board. Methodologically suspect triceps skinfold values were found at two sites. At one site the lowest mean body mass index (BMI) coincided with the highest median skinfold values; an opposite tendency was observed in a second centre where skinfold thicknesses appeared to be low, with relatively high BMI values [13]. These unexpected skinfold values could be due in part to the fact that they were obtained by locally hired and relatively untrained field workers. This underlines the importance of training and standardization sessions for those who collect the anthropometric data.

## **Blood collection**

Collection of venipuncture specimens was highly standardized, and strict procedures for the preparation and storage of samples were followed. All materials were supplied centrally [1]. Moreover, to eliminate inter-laboratory and inter-methodological differences, all analyses for vitamins, albumin, and lipids were carried out in central laboratories. Each laboratory was asked to specify the precision of the techniques. Moreover, two blind duplicate samples from each survey site were analysed. Considerable diversity in blood biochemical profiles was found at the sites examined. Of particular interest were the counterintuitive patterns, such as the highest serum cholesterol values in Norwegian women, who were the leanest and among the most active groups of women [4]. Such findings need to be interpreted with great care.

## **Non-participation**

In the EURONUT-SENECA study the average participation rate was 51%, with wide variation among towns. To assess potential bias, a study of non-participants was incorporated into the EURONUT-SENECA study. In this way it was possible to find out that bias due to selective participation was small and insignificant for many of the variables examined [3].

## **Coordination and cooperation**

From its initiation in 1986 to its conclusion in 1994, the day-to-day activities of the EURONUT-SENECA project were organized by the coordinating centre at the Department of Human Nutrition in Wageningen. As part of the standardization of procedures, data cleaning and initial analysis were carried out at this centre. The project as a whole was supervised by a steering committee. Throughout the project, the close cooperation among all EURONUT-SENECA parties (investigators, steering committee, coordinating centre, laboratories) has been of the utmost importance. This close cooperation has opened doors for prolonging EURONUT-SENECA's collaborative research, even without support from the European Union. The EURONUT-SENECA network has published the valuable data from its follow-up measurement (1993/1994) in 1995/1996 [14].

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