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Integration of nutritional data based on household budget surveys in European countries

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A large amount of information concerning nutrition is collected in almost all European countries by the National Statistical Offices through Household Budget Surveys (HBS) at variable time intervals. Although HBS are designed in order to analyse economic implications of trends in food consumption and to obtain the necessary information for the estimation of price indices rather than for nutritional purposes, they represent a unique source of dietary patterns data.

There are many sources of data concerning food availability or intake, ranging from the nationally-collected and Food and Agriculture Organization (FAO)-assembled food balance sheets (FAO, 1983) to the specifically-designed food consumption surveys and nutritional epidemiological investigations (Table 1; Kelly, 1987). Data from all these sources can be useful for specific purposes and their collation and editing in a single database represents a very valuable undertaking (World Health Organization, 1992; Food and Agriculture Organization, 1993). However, use of information from different sources, each possessing its own validity attributes and methodological characteristics, raises issues of comparability that are difficult to address. The problem is made more complicated when explanatory factors for food intake variability are not defined using standard criteria, when expected nutritional variation by time or place is of the same order of magnitude as the presumed systematic error, or when representativeness is questionable or plainly absent. Perhaps more important for a changing world that is being rapidly dominated by similar commercial, economic, regulatory and communication forces, a nutritional database would be useful only if it could be or become: (1) truly international, with built-in feedback mechanisms to improve comparability; (2) representative and linked to explanatory demographic and socio-economic factors that are themselves subject to rapid changes; (3) very large, in order to generate precise estimates for inherently complex patterns; (4) regularly updated; and (5) last, and clearly not least, affordable.

INTEGRATION OF NUTRITIONAL DATA FROM HOUSEHOLD BUDGET SURVEYS

Multi-purpose HBS, regularly undertaken in order to serve a wide range of objectives in most of the developed countries can form the basis of a system that meets all or most of the previously stated criteria. Feasibility studies, undertaken by the Data Food Networking, (DAFNE; Network for the pan-European Food Data Bank based on Household Budget Surveys, Cooperation in Science and Technology with Central and Eastern European Countries) team have demonstrated that the prospect is realistic and the potential enormous, assuming goodwill and a minimal adjustment in infrastructure. The DAFNE team was recently granted further support by the Commission of the European Communities

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Table 1. *Sources of nutritional data* (From Kelly, 1987)

Level	Source	Type of data
National	Food Balance Sheets	Ecological; large units
Household	Household Budget Surveys	Ecological; small units
Individual	Dietary Surveys	Analytical; individuals

through the Agriculture and Agro-industry, including Fisheries (AAIR) programme and, thus, is continuing its effort towards the ultimate objective. The objective is to provide comparable and harmonized dietary exposure data for individuals in specified sections of the population based on the HBS data. Experience from preliminary studies conducted by the DAFNE team has shown that the information available is of many different forms, levels of detail and quality. It is necessary, therefore, to establish a common framework for the participating countries and specify the information to be gathered.

HBS have several advantages (Trichopoulou, 1992): they are conducted regularly in most European countries with a time interval which varies from 1 to 7 years; they use representative samples of households; they generate a substantial amount of data concerning nutrition; they allow cross-linkage to socio-demographic characteristics of the households, which could be useful for standardization and exploratory analyses.

However, HBS have several limitations. HBS nutrition data are different from one country to another, not only in relation to the number of food items which are recorded but also the type of information provided. There is also a problem with the consumption of food commodities and beverages outside the household, although information about the expenditure involved in these meals is available. Moreover, in most countries no information is collected concerning losses and waste of food, but the resulting overestimation of food availability for the human population may not vary substantially across time periods and population groups, and can be estimated through small *ad hoc* studies. In addition, estimation of nutrient intakes from HBS food availability data requires that a series of assumptions and approximations be made, because most countries collect data only for large food groups. Finally, there is no uniform coding system, and rules must be developed and agreed upon for the aggregation of food items appearing in the HBS.

METHODOLOGY

A series of activities aiming at the development of the most appropriate way of using food and related data from the HBS was needed, as presented in Figs. 1 and 2. These activities include: (1) study of current methods of HBS data collection and processing; (2) assessment of comparability and harmonization of socio-demographic data from various countries, with emphasis on education and occupation of household members and specification of locality of household; (3) assessment of comparability and harmonization of food data from the various countries, with emphasis on food coding and food aggregation. For the implementation of the indicated series of activities, several steps have already been taken in countries participating in the DAFNE project and it is expected that they will also be taken in all the countries that will join the DAFNE team in the future.

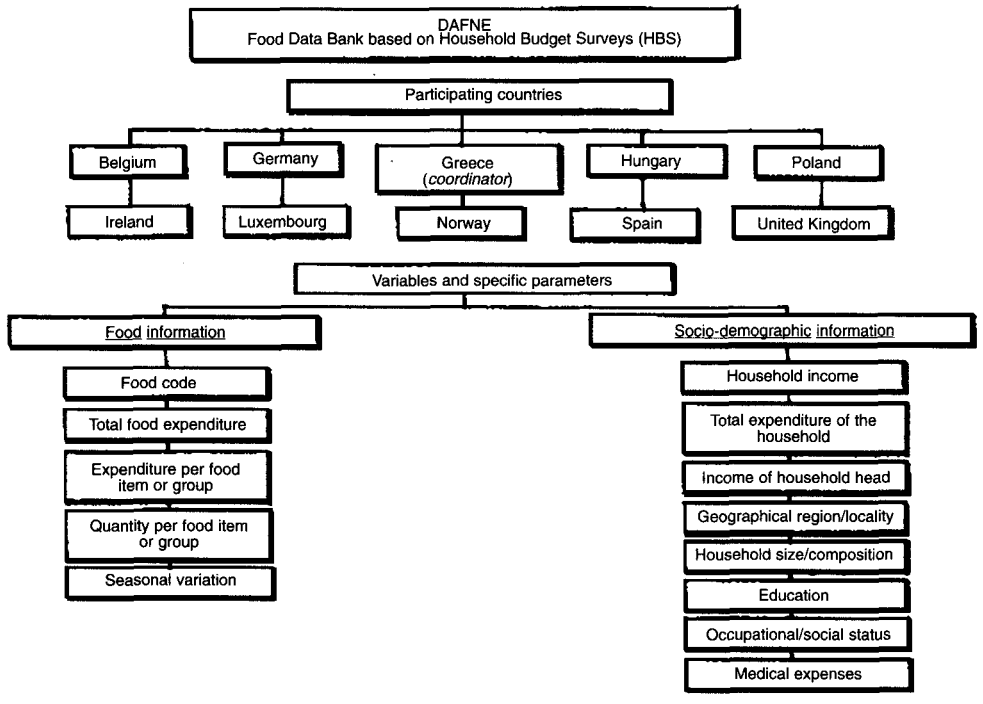

Fig. 1. The Data Food Networking (DAFNE) project: primary variables.

Selection of Household Budget Survey variables

The variables shown in Fig. 1 should be collected from the National Statistical Offices and should be considered during the process of formation of the DAFNE database.

Comparability of food and socio-demographic data

HBS data from various countries are collected in ASCII format. Comparable (among countries) categories of socio-demographic variables, such as education and degree of urbanization, are formed. The DAFNE team has worked extensively on food aggregation, and a table of comparable food information for the countries already participating has been formed. Where the level of detail varies the data collapse to the lowest level of detail. All information, however, is saved in special files for possible future analysis.

Data concerning meals taken out of home are collected in the HBS only in terms of their monetary cost. Small pilot studies are necessary to determine the extent to which people are eating out of home and provide information on the kind of foods consumed in these out of home meals. Allowances for inedible material in the foods as purchased are also not included in the HBS. An edibility factor is required for calculating the edible portion.

The Statistical Analysis Systems (1995) statistical package has been used by the DAFNE team for the analysis of the data. Part of the analysis refers to the production of summary statistics, such as means with their standard errors, for every food item and every comparable food group. Further analysis includes fitting of linear models and standardization by different socio-demographic variables in order to make international comparisons.

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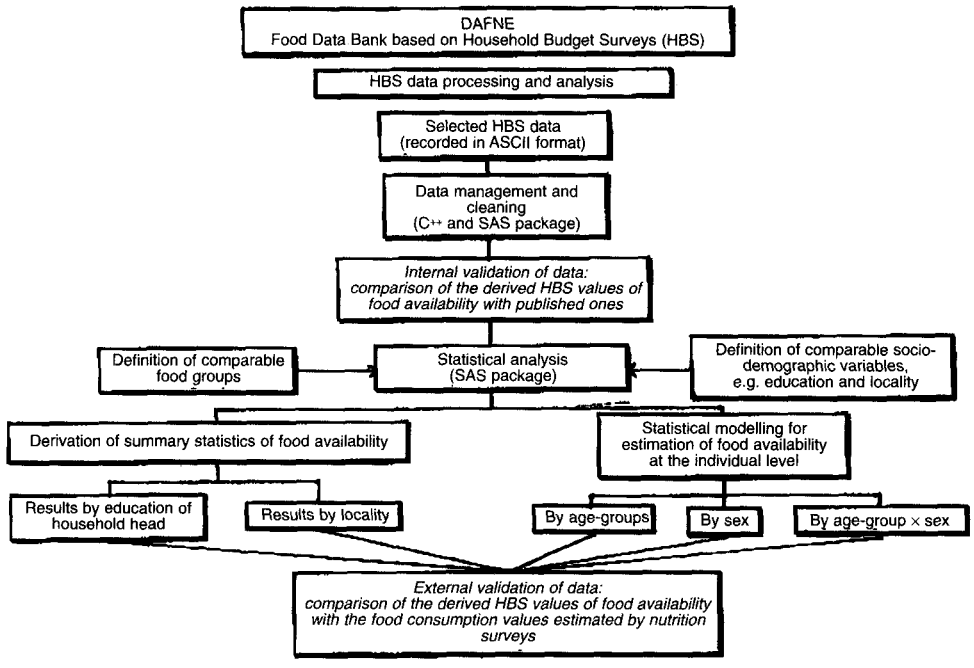

Fig. 2. The Data Food Networking (DAFNE) project: data processing and analysis. C++, C++ (Visual C++) version 4, 1995 (Magenda Ltd); SAS package, Statistical Analysis Systems (1995).

Estimation of individual food availability by age and gender

The information on household composition provided by the HBS is used to estimate the availability of food groups to a family member belonging to a specific age-group. The individuals in each household were grouped by age into the following groups: 0–12 years, children; 13–18 years, adolescents; 19–65 years, adults; and 66 years or more, elderly.

Even though the HBS do not record availability of food items to individuals, they obtain information on household composition. It is possible, therefore, using simple mathematical modelling, to estimate availability for household members of different types. Models can be used to estimate typical food consumption by age, gender, age–gender groups and other socio-demographic characteristics. These models can be applied to any food and population group.

Estimation of food consumption and nutrient intake from food availability: the use of conversion factors and food composition tables

An essential element in converting the quantity data into nutrients is the development of appropriate conversion factors. These are based on food composition tables. However, a problem may be posed by the fact that the list of food items in the HBS may not be sufficiently detailed to enable a direct application of these food composition tables. This particularly applies to foods, such as the different kinds of fruit and vegetables, which tend to be grouped together. In such a case it is necessary to create 'average conversion factors' on the basis of the mix of food items of particular food categories.

Table 2. *Mean availability (g/d per person) of major food groups in countries participating in the Data Food Networking project*

	Belgium	Greece	Hungary	Poland
Meat	169	175	190	187
Fish	27	39	5	15
Milk	153	112	245	317
Dairy products (excluding butter)	85	84	56	64
Fresh fruits	151	341	149	95
Potatoes	187	155	139	301
Fresh vegetables	116	252	185	175
Bread	147	218	211	255
Cereals and products	73	105	108	90
Oils and fats	44	90	54	59
Sugar and confectionery	48	81	76	102

Validation

To validate the assessment of nutritional information through HBS, comparison of food information derived from HBS with information collected by special nutrition surveys is required. Only in very few countries are both HBS and individual nutrition surveys conducted. However, in Britain both surveys are regularly undertaken. Thus, in the context of the DAFNE project, and in order to validate the previously mentioned model-derived estimates, the model was applied to the data from the British HBS of 1987 (Ministry of Agriculture, Fisheries and Food, 1988) and the resulted estimates were compared with the corresponding observed data from the National British Diet and Nutrition Survey (Gregory *et al.* 1990; NDNS) which collects data on an individual basis. A strong association was found between the estimated individual consumption from the HBS data and that observed in the NDNS data. The Spearman's correlation coefficient for butter was 0·9 and high correlations were also found for most other food items.

Household Budget Survey food database

The existing HBS food database of the DAFNE I countries could be the basis for the establishment of common functional specifications and standards in the methods used in different European countries in order to achieve comparable and harmonized HBS data. The Pan-European Food Databank based on HBS would allow all interested bodies to have access to the data collected in every country and in all countries together in order to identify differences concerning dietary patterns and high-risk population groups on account of their nutritional habits. Examples are given in Tables 2 and 3.

CONCLUSIONS

Nutrition information is valuable for public health, economic, marketing and several other purposes. HBS have been collecting nutrition data in most countries for prolonged time periods. In spite of weaknesses and imperfections, these data could be extremely valuable if used cautiously and judiciously. The DAFNE project has already demonstrated that it is

Table 3. *Average tomato availability (g/d per person) by education, locality and age in countries participating in the Data Food Networking project*

	Belgium	Greece	Hungary	Poland
Education				
No education or primary	20	98	36	50
Primary school completed	18	90	30	42
Secondary school not completed	19	76	23	33
Secondary school completed	21	83	26	33
University or higher education	31	77	24	31
Locality				
Rural	18	82	32	26
Semi-urban	20	84	25	27
Urban	21	101	24	29
Age-groups (years)				
0–12	21	80	24	28
13–18	31	118	31	37
19–65	18	90	32	29
>66	8	59	23	14
Observed grand mean	20	87	27	27

possible to integrate data collected with a similar philosophy but variable technical specifications from various countries. A HBS nutrition database is clearly imperfect, but it can provide information at least as good, and probably better than, that imparted through the Food and Agriculture Organization Food Balance Sheets. Since it is unrealistic to contemplate an international system for monitoring dietary intakes at the individual level, HBS may represent the best of existing realistic alternatives.

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REFERENCES

Food and Agriculture Organization (1983). *A Comparative Study of Food Consumption Data from Food Balance Sheets and House Surveys. FAO Economic and Social Development Paper* no. 34. Rome: FAO.

Food and Agriculture Organization (1993). *Compendium of Food Consumption Statistics from Household Surveys in Developing Countries. FAO Economic and Social Development Paper* 113. Rome: FAO.

Gregory, J., Foster, K., Tyler, H. & Wiseman, M. (1990). *The Dietary and Nutritional Survey of British Adults.* London: H.M. Stationery Office.

Kelly, A. (1987). *Nutritional Surveillance in Europe: A Critical Appraisal. EURO-NUT Report* no. 9. Wageningen, The Netherlands: EURO-NUT.

Ministry of Agriculture, Fisheries and Food (1988). *Household Food Consumption and Expenditure, 1987. Annual Report of the National Food Survey Committee.* London: H.M. Stationery Office.

Statistical Analysis Systems (1995). *SAS User's Guide, Statistics, version* 6.04. Cary, NC: SAS Institute Inc.

Trichopoulou, A. (editor) (1992). Monitoring food intake in Europe: A food databank based on Household Budget Surveys. *European Journal of Clinical Nutrition* **46,** Suppl. 5, S3–S8.

World Health Organization (1992). *Food and Health Indicators (software).* Copenhagen: WHO, Regional Office for Europe.

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