

Short Overview of Food Consumption Databases

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Abstract

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The utilisation of food consumption databases is widespread and involves for example, the risk assessment, understanding of consumers' food consumption trends, health education, and planning of prevention projects. Harmonisation of national consumption data for international comparison is an important and challenging work. First attempts started in the 70's and have been continuing up to now. The present study gives an overview of the collection methods, types and utilisation of food consumption data, as well of the most important phases of the international harmonisation work. As this study shows, it is crucial to harmonise the surveys parameters like the time of the data collection, method, number of participants, and number of the analysed days for an internationally comparable consumption database. From this point of view, the efforts of the EU menu project are promising.

Keywords: consumption data; consumption survey; harmonisation work; utilisation

The importance of collection and systematisation of food consumption data have been recognised for a long time. The importance and complexity of this task is shown by the fact that collaborations are being built in the last decades, thus the creation of food composition databases has been developed progressively. During this time there were progress and changes in the data collection methods and their harmonisation, as well as in the utilisation of these data.

The aim of this study is to give an overview of the types of the food consumption data and their collection methods, as well as to present the international harmonisation efforts. For this purpose the available literature has been reviewed and summarised.

Importance of the food consumption databases

Tracking the food consumption data provides important information for researchers, epidemiologists, participants in the health education,

dieticians, decision makers, and professionals of the food industry (YAMINI *et al.* 2006).

Knowing the food consumption data is essential for the risk assessment or, to be more precise, for consumers' accurate assessment of exposure to harmful substances (e.g. contaminants, pesticides, food additives, migrating compounds) and microbiological contaminants. On the basis of the results of the risk assessment, the previously determined intake levels (e.g. ADI = Acceptable Daily Intake) can be controlled or modified, furthermore different endangered groups of the population (e.g. children, sensitive groups) can be identified.

Food consumption data are important for the understanding of the consumption trends and characteristics. Possessing this information, the participants in the food industry can form their development concepts and, based on the knowledge of the preference of different foodstuffs, the levels of their production can be reduced or increased.

On the basis of the food consumption data the risk factors of many diseases can be recognised. Several social programmes aim at the protection

of the health status of different public groups. The knowledge of the food consumption data – and the intake of different nutrients based on these – is crucial for those programmes.

Collection of food consumption data

Food consumption data can be collected by means of microstatistics (household level) and macrostatistics (national level), as well as with food consumption surveys (individual level). The characteristics of these survey methods, furthermore the advantages and disadvantages of their utilisation, will be demonstrated hereinafter.

Microstatistic data – Household Budget Survey. Household Budget Surveys are national surveys of private households carried out by the National Statistical Offices, focusing on the households expenditure on goods and services, furthermore giving a picture about the living conditions. The results of the surveys are broken down by household characteristics, like income, socio-economic characteristics, size and composition, degree of urbanisation, and region (European Communities 2003).

Household Budget Surveys contain foods (own produced and purchased items) consumed in a household, which are recorded in quantities and their values and accounted in a processed form (while macrostatistics contain items as raw materials) (KSH 2005a). Thus these surveys do not contain the consumption in different establishments (e.g. hospitals and schools) (IMRE 2004) and the consumption by foreign people in another country.

However, since the data are recorded by the households (TRICHOPOULOU *et al.* 2003), they are based on their own admission. Thus the quality of these data – regarding the national food consumption data – is less reliable than that of the data from national balances. However microstatistic data ensure reliable results for the decision makers about the structure of the consumption on the basis of socio-economic viewpoints.

Macrostatistic data – Food balance sheets. Food balance sheets present a comprehensive overview of a country food supply during a specific reference period (FAO 2001). The food balance sheets show for each primary commodity their availability for human consumption according to the formula:

$$\text{Production} + \text{Import} - \text{Export} - \text{Losses} \pm \text{Stock changes} = \text{Domestic utilisation}$$

Food balance sheets are based on raw materials – including the consumption in catering. The country sheets – beyond the public consumption – contain the foreign tourists' shopping. However, they do not contain the consumption of the countries inhabitants abroad, the goods imported by tourists, and the products from other sources which can not be taken into account (e.g. coffee, cigarette) (KSH 2005b). Macrostatistic data can be used for the understanding of the national consumption structure and nutrition status.

Food consumption surveys. The best way to collect detailed information about the consumption habits is the completion of a food consumption survey. A number of methods can be used like a 24 h recall, a food record or diary, and a food frequency questionnaire. Every method has advantages and disadvantages, thus it is important to find the most appropriate one for the aim of the survey. The selection depends on the following factors: the objective (collect data about the consumption of a nutrient or a foodstuff); the target group (a person or a group); want to determine total or relative consumption; socio-demographic factors of the respondents (gender, age, education, social situation, etc.); duration of the survey; how much detailed data are required; and the other sources available (BÍRÓ 2008).

The results of these surveys are appropriate for the detailed characterisation of the individuals, as well as for the analysis of nutrition- and food safety risks.

International efforts to harmonise. In line with globalisation and regional integration, the need for internationally comparable food consumption data was also been increasing. Several European countries have national food consumption data and statistics, which give detailed information on the consumption habits of a given group of the population.

VERGER *et al.* (2002) compared the food consumption in 23 European countries given in surveys, and found that – on the basis of the given criteria (age, data collection method, duration of the survey, food grouping system, and food composition tables) – a maximum of 15 countries data could be made comparable at the individual level for the adult population.

Harmonisation of the surveys is a complex work, however, for the solution of this problem a number of collaborations have been initiated. The main phases of the harmonisation work will be demonstrated hereinafter.

Global Environment Monitoring System (GEMS/Food). GEMS/Food was established in 1976 and since then has been continually providing information to the governments on the levels and trends of contaminants in food as well as their contribution to total human exposure. The work is implemented by the World Health Organization (WHO) in co-operation with a network of more than 30 Collaborating Centres and recognised national institutions from all around the world, furthermore it involves national experts in more than 100 countries.

Regional Diets data were first derived in 1989 from the food balance sheets of the Food and Agriculture Organization of the United Nations (FAO) to predict dietary exposure to radionuclides in food, later to predict the exposure to various chemicals occurring in food (e.g. pesticide residues). The FAO/WHO Codex Committee on Pesticide Residues used these data for the exposure assessment of pesticide residues, furthermore the Joint FAO/WHO Expert Committee on Food Additives used them for the long time exposure assessment of contaminants and toxic substances. On the basis of the food balance sheets five regional dietary patterns were created: Middle Eastern, Far Eastern, African, Latin American, and European. WHO introduced the GEMS/Food cluster diets in 1997 and established 13 cluster diets – including 383 different food items – representing 183 countries (WHO 2013a). Nowadays the cluster diets are based on a newly available methodology. Finally 17 cluster diets composed of 2 up to 30 countries were defined, and the new map of the cluster diets was drawn (SY *et al.* 2013). Compared to the previous clusters Hungary for example, is still in the same cluster with the Czech Republic, Denmark, Ireland, Slovakia, and Slovenia, however, there are some new countries in this cluster too (Lithuania, Portugal, Romania, Serbia and Montenegro, and Sweden) and some have been relocated into other clusters (Austria, Belgium, Croatia, France, Germany, Luxemburg, Malta, Netherlands, Poland, Switzerland, and United Kingdom) (GEMS/FOOD 2013; WHO 2013b).

Food and Agriculture Organization Corporate Statistical Database (FAOSTAT). FAOSTAT is a comprehensive database which has been providing time-series and cross sectional data about hunger, food, and agriculture since 1961. The database contains the data from approximately 245 countries. Besides many topics (e.g. food supply, production, forestry, resources, population)

it contains the data from the food balance sheets for countries by year. The FAOSTAT can be used for free (FAOSTAT 2013), and with this useful tool data can be browsed (by domain, by country/region or by commodities), downloaded (standard or bulk), compared, and furthermore analysed (linear regression or univariate analysis).

Data Food Networking (DAFNE). The National Nutrition Centre in Athens (Greece) has organised a number of events since 1987 aiming at developing the most appropriate way of using the data from the national Household Budget Surveys (TRICHOPOULOU *et al.* 2005). Even though the data of the food balance sheets are a valuable source to determine the trends of food availability over time, they are less appropriate for inter-country comparisons. Individual nutrition surveys are expensive, labour-intensive, and conducted with different methodologies (TRICHOPOULOU & LAGIOU 1998). On the basis of the above-mentioned reasons, the results of the Household Budget Surveys were used for DAFNE. Recognising the need for the dietary data that would provide a regular flow of comparable nutrition information, the DAFNE project developed a freely accessible database (DAFNE 2013) which – according to a common classification system for the food and socio-demographic variables – contains the daily individual food data of the participating 24 countries (TRICHOPOULOU *et al.* 2003). The DAFNE database is a useful tool to identify and qualify food choices and habits in order to promote healthy eating (TRICHOPOULOU & DAFNE Contributors 2001), to make social and cultural differences in food consumption habits (TRICHOPOULOU *et al.* 2002), and to develop strategies, which promote healthy food decisions (NASKA *et al.* 2000).

European Food Consumption Survey Method (EFCOSUM). The EFCOSUM project (1999–2001) was conducted within the framework of the EU programme on Health Monitoring with the participation of 23 European countries (CHURCH 2006). The main objective of the project was to define a monitoring method for the following of the food consumption in all age and gender categories. Furthermore, to increase the harmonisation and availability of food consumption data (DE HENAUW *et al.* 2002).

European Food Consumption Validation (EFCOVAL). The three year EFCOVAL project (2006–2009) was conducted with the participation of 15 partners from 11 countries. The aim

of the project was to continue the work started by the EFCOSUM project, as well as to develop and validate a survey method appropriate for the assessment of the intake of food, nutrients and hazardous chemicals within the European population (EFCOVAL 2013).

EFSA Comprehensive European Food Consumption Database. A system for the collection and analysis of the data on the food supply chain covered by the European Food Safety Authority (EFSA) was set up, in the form of a network, to support the reliable, science-based risk assessment (European Communities 2002). It was emphasised at the EFSA Scientific Colloquium about the European Food Consumption Database in 2005, that the food consumption data are vital for the exposure assessment, and also as recommended that EFSA should take the lead in the co-ordination and completion of the pan-European consumption surveys (EFSA 2008). EFSA established the Food Consumption Database Manager's Network in 2006 to develop a concise food consumption database representing different groups of the population (EFSA 2009). In order to give general principles for the collection of the dietary data appropriate for the estimation of nutrient intake and exposure assessment of biological agents and chemical substances, EFSA published a guidance document (BIRÓ 2008).

As the beginning of the harmonisation work, EFSA created the Concise European Food Consumption Database in 2008 which was the first database to collect the results of the EU Member States (19 countries) individual dietary surveys. However, this could provide only limited data on the risk assessment, thus EFSA with the EU Member States (22 countries) developed a more detailed database, the EFSA Comprehensive European Food Consumption Database. In order to help the most accurate exposure assessment, a detailed food classification system was developed called FoodEx. It is a hierarchical system which contains 20 main categories that are further divided into 4 subgroups. The results of the harmonisation work can be found on the EFSA website (EFSA 2013a). However, the information of the Comprehensive Database can not be used for a country-to-country comparison, because the parameters of the dietary surveys have not been harmonised (e.g. duration of the survey, socio-demographic factors, and survey methods) (EFSA 2011).

Flavourings, Additives, and Food Contact Material Exposure Task (FACET). FACET was

a 4-year project founded by the European Commission (Framework Programme 7) with the aim to develop a sustainable surveillance system to estimate the intake of food additives, flavourings, and food contact materials. This project involved 20 partners from 13 countries. Within FACET, eight European countries (Finland, France, Hungary, Ireland, Italy, Poland, Portugal, and the United Kingdom) food consumption databases were harmonised according to the common food categorisation system (HEARTY 2011), which contains 18 main food categories with 4 tiers. It turned out during the harmonisation work that the data of the countries national surveys were limited for the accurate exposure assessment of the target chemicals. Hence, a targeted Food Frequency Questionnaire was developed and completed in the above-mentioned 8 countries. The FACET project resulted in an exposure assessment tool, which is available free of charge on the website of the Joint Research Centre (JRC 2013).

“What is on the Menu in Europe?” The EU Menu project. The EFSA coordinated EU Menu project is the first EU-wide survey, which covers the representative consumption data over all four seasons between 2012-2017 (EFSA 2013b). Total consumption of 2 non-consecutive days and the completion of a Food Frequency Questionnaire (for modelling the intake distributions), furthermore anthropometric data (e.g. weight and height) will be collected in 27 Member States from a minimum of 80 000 respondents (VALSTA 2010). As the preparation of the project work, the PANCAKE project (Pilot study for the Assessment of Nutrient Intake and Food Consumption among Kids in Europe, with the leadership of the National Institute for Public Health and the Environment, the Netherlands) develops and tests the tools and procedures for the dietary survey of infants, toddlers, children, and breastfeeding mothers, while the PILOT-PANEU project (Pilot study in the view of a Pan-European dietary survey, with the leadership of the Hungarian Food Safety Authority, Hungary) does the same in the case of adolescents, adults, and elderly (ARCELLA 2012).

Conclusion

The utilisation of food consumption databases is widespread (e.g. estimation of nutrient intake, exposure assessment, recognition of diseases' risk

factors and understanding of consumption trends), thus the development of an internationally harmonised database is an urgent task. The parameters (e.g. survey method, duration of the survey, and number of the analysed days) of different surveys have to be standardised. Food consumption data can be collected by microstatistics and macrostatistics, however, the best way to collect detailed and individual information is the accomplishment of a food consumption survey. The importance and complexity of the standardisation task are shown by the fact that a number of projects and programmes were started during the last decades, from which the recent EU Menu is the most promising. Hopefully, an internationally harmonised food consumption database will be formed soon as a result of systematic efforts of the last few decades in order to be able to provide reliable food consumption data for the risk assessment and other purposes.

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