European Food Safety Authority

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GUIDANCE of EFSA

Use of the EFSA Comprehensive European Food Consumption Database in Exposure Assessment[1]

European Food Safety Authority[2, 3]

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European Food Safety Authority (EFSA), Parma, Italy

ABSTRACT

The EFSA Comprehensive European Food Consumption Database (Comprehensive Database) has been built from existing national information on food consumption at a detailed level. Competent organisations in the European Union's Member States provided EFSA with data from those most recent national dietary survey in their country, at the level of consumption by the individual consumer. This included food consumption data concerning infants (2 surveys from 2 Member States), toddlers (8 surveys from 8 Member States), children (16 surveys from 14 Member States), adolescents (14 surveys from 12 Member States), adults (21 surveys from 20 Member States), elderly (9 surveys from 9 Member States) and very elderly (8 surveys from 8 Member States) for a total of 32 different dietary surveys carried out in 22 different Member States. Surveys on children were mainly obtained through the Article 36 project "Individual food consumption data and exposure assessment studies for children" (acronym EXPOCHI). The aim of the present document is to give an overview of the Comprehensive Database and to provide guidance on its use for dietary exposure assessments. Summary statistics of this database are available on the EFSA website.

KEY WORDS

Exposure assessment, food consumption data, dietary survey, food record, 24-hour recall, food classification.

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4 The acronyms used to identify the two Spanish studies were erroneously inverted in Tables from 1 to 5 and on page 10.

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SUMMARY

In 2008, following the recommendations received by the EFSA Scientific Committee, EFSA created the EFSA Concise European Food Consumption Database (hereafter called Concise Database). The Concise Database is the first database in Europe containing information from individual dietary surveys from the majority of EU Member States (19 countries). However, the Concise Database intended to provide consumption data only on a limited number of broad food categories. Hence, its use was limited to preliminary exposure assessments. More detailed information on food consumption in Europe is required to undertake more accurate exposure assessments, which are an integral part of the risk assessment process carried out at EFSA. In collaboration with the EU Member States, EFSA thus decided to develop a more detailed food consumption database called the EFSA Comprehensive European Food Consumption Database (hereafter called Comprehensive Database).

The Comprehensive Database has been built on existing information on food consumption at a detailed level. By the end of 2008, competent organisations in EU Member States were approached to provide EFSA with data from the most recent national dietary survey in their country, including at least the adult population, at the level of consumption by the individual consumer. In addition, food consumption data for children, obtained through the EFSA Article 36 project "Individual food consumption data and exposure assessment studies for children" (acronym EXPOCHI), have been included in the Comprehensive Database. This now contains consumption data concerning infants (2 surveys from 2 Member States), toddlers (8 surveys from 8 Member States), children (16 surveys from 14 Member States), adolescents (14 surveys from 12 Member States), adults (21 surveys from 20 Member States), elderly (9 surveys from 9 Member States) and very elderly (8 surveys from 8 Member States) for a total of 32 different dietary surveys carried out in 22 different Member States.

The aim of the present document is to give an overview of the Comprehensive Database and to provide guidance on its use for dietary exposure assessments. Information concerning the methodologies used in each of the 32 dietary surveys included in the Comprehensive Database is presented. Methodological differences between the national dietary surveys related to the level of detail requested concerning the description of food and beverages, and consequently to their classification, have been identified. The preliminary version of the hierarchical food classification system 'FoodEx', developed by EFSA, was used to codify all foods and beverages present in the Comprehensive Database. FoodEx is a hierarchical system based on 20 main food categories that are further divided into subgroups up to a maximum of 4 levels. It was demonstrated that all data providers were able to classify correctly the large majority of their food to at least the 2nd level of the FoodEx.

Summary statistics are available on the EFSA website. For each country, food consumption data are presented according to the 1st (including 20 categories) and 2nd (including around 160 categories) level of the preliminary FoodEx system; per age class (Infants, Toddlers, Other children, Adolescents, Adults, Elderly and Very elderly); and for the total population and for consumers only. The summary statistics include the total number of individuals and, for each of the first two FoodEx levels, age classes, number of consumers, the mean, median and the standard deviation, as well as low and high percentiles. Food consumption statistics are reported both in grams/day and in grams/kg body weight per day, for both chronic and acute consumption. Summary statistics from the Comprehensive Database can be used as a quick screening tool to assess chronic and acute exposure to hazardous substances. A method for this purpose is presented and discussed.

An agreement between EFSA and the national data providers clearly defines the conditions of use of the Comprehensive Database. EFSA has the right to use the raw individual food consumption data for carrying out risk assessments and other scientific analyses within the activities related to EFSA's mandate and a formal authorisation from the data provider must be requested for any other use of the data. Currently, the EFSA Comprehensive Database is the best available source of food consumption information providing data on a EU-wide basis and will be very useful in the risk assessment work conducted by EFSA.

The use of these data for direct country-to-country comparisons is not advisable because the database comprises data collected using different methodologies. The collection of accurate and detailed food consumption data derived from a harmonised methodology across Europe is therefore still a primary long term objective for EFSA and has been recognised as a top priority for collaboration with the EU Member States. Therefore, a project proposal, called "What's on the Menu in Europe? (EU MENU)", has been developed by EFSA for the establishment of an EU-wide standardised food consumption data collection system.

TABLE OF CONTENTS

BACKGROUND

In 2005, EFSA's Scientific Committee published an opinion on exposure assessment recommending the urgent collection of available food consumption data at an aggregated level followed by an expanded collection of data at a detailed level. As a first response, EU Member States collaborated on the establishment of the "EFSA Concise European Food Consumption Database", which is operational since the end of February 2008. At the end of 2008, EFSA started projects to establish the "EFSA Comprehensive European Food Consumption Database" built on existing information for adults at a detailed level. It is anticipated that when the Comprehensive Database is operational it will greatly improve the accuracy of EFSA's exposure assessment calculations. However, concerns over the comparability of different dietary surveys will still apply, mainly because of various survey methodologies, different clustering of age groups and use of diverse food categorisation systems. Such methodological differences must therefore be considered before using the food consumption data to assess the exposure to the different hazardous substances within the remit of EFSA.

In 2009, EFSA developed a preliminary food classification system (here referred to as FoodEx) with the aim of better addressing different exposure assessment needs within EFSA's remit. This system has already been applied to the development of the EFSA Comprehensive European Food Consumption Database and an EFSA (2010a) scientific report presents the outcome of this exercise.

TERMS OF REFERENCE

The aim of the present document is to give an overview of the "EFSA Comprehensive European Food Consumption Database" established by EFSA and to provide guidance on its use for dietary exposure assessments.

CONSIDERATION

1. Introduction

In 2005, an opinion of the Scientific Committee (EFSA, 2005) related to exposure assessment suggested the establishment of a harmonised food consumption database in the EU. It further recommended that EFSA should contribute to the development of a European framework for the harmonisation of food-related data collection in the European Union (EU) and make these data publicly accessible. To support the establishment of a common database on food consumption, as suggested by the Scientific Committee, EFSA organised the Scientific Colloquium "European Food Consumption Database – current and medium to long-term strategies" (28-29 April 2005, Brussels, Belgium). The objective of this colloquium was to have an open scientific debate on the state of the art of harmonised approaches to food consumption data collection and the development of a database on food consumption at European and international level. A report is available on the EFSA website outlining suggested future initiatives (EFSA, 2008a). The discussions among the participants led to the agreement that harmonisation of food consumption data was the ultimate requirement in addressing dietary exposure assessment at European level. The Colloquium was in favour of a pan-European dietary survey and recommended EFSA to take the lead in the coordination and completion of associated tasks in meeting this requirement. In the meantime, it was suggested that EFSA would compile existing food consumption data from Member States.

In 2007 following the recommendations of the Colloquium, EFSA created the Expert Group on Food Consumption Data (EGFCD), an EFSA network with representatives from each EU Member State. The Expert Group coordinates the initiative to harmonise the collection and collation of food consumption data and provides a platform for exchange of views between experts from the European countries. As a first initiative, the Expert Group cooperated in the establishment of the EFSA Concise European Food Consumption Database (hereafter called Concise Database) (EFSA, 2008b) as suggested in the above mentioned opinion of the Scientific Committee on exposure assessment (EFSA, 2005). The Concise Database has been fully operational since the end of February 2008 and is the first database in Europe containing information from individual dietary surveys from the majority of EU Member States (19 countries). The Concise Database provided consumption data only on a limited number of broad food categories, to be used for preliminary exposure assessments as required. However, more detailed and harmonised information on food consumption in Europe is required to undertake more accurate exposure assessment, which is an integral part of the risk assessment process carried out at EFSA. Thus, in collaboration with the EU Member States, EFSA decided to develop a more detailed food consumption database called the EFSA Comprehensive European Food Consumption Database (hereafter Comprehensive Database).

In 2006 EFSA started an initiative to collect food consumption data to be used for the exposure assessment of pesticide residues in the framework of Article 24 of Regulation (EC) No 396/2005[5]. Aggregated consumption data for food commodities for which pesticide Maximum Residue Levels (MRLs) are established were compiled and incorporated in the EFSA Pesticide Residue Intake Model (PRIMo) (EFSA, 2007). The EFSA PRIMo was intended to reflect the national models used for pesticide risk assessment. The consumption data and the methodology concerning how the data were aggregated were reported to EFSA.

2. Objective of this guidance document

The aim of the present document is to give an overview of the EFSA Comprehensive European Food Consumption Database — established by EFSA on the basis of data provided by EU Member States — and to provide guidance for dietary exposure assessments.

[5] Regulation of the Parliament and of the Council (EC) No 396/2005 of 23 February 2005. OJ L 70, 16.03/2005, p. 1-16.

3. Development of the Comprehensive Database

The Comprehensive Database has been built from existing information from individual dietary surveys at a detailed level. By the end of 2008, competent organisations in EU Member States were approached to provide EFSA with data from the most recent national dietary survey in their country, including at least the adult population, at the level of consumption by the individual consumer. The consumption data were requested to be expressed at the most disaggregated level possible. Twenty Member States accepted to participate in this project and signed a collaboration agreement with EFSA for the formatting and provision of such food consumption data. Data from two different dietary surveys were made available from Bulgaria and Spain.

In 2008, EFSA also launched a call for proposals focused on children: Individual food consumption data and exposure assessment studies for children (acronym EXPOCHI) (Huybrechts et al., 2010). Within this project, which started at the end of 2008, food consumption data from 14 dietary surveys and 13 different Member States were used to carry out exposure assessment studies in children (in particular young children, 1-3 years old) for food colours (Huybrechts et al., 2010), selenium (Sioen et al., 2010), chromium (Boon et al. 2010a) and lead (Boon et al. 2010b). Within this Article 36 project, food consumption data specifically focused on children, and used for the exposure assessments, were provided to EFSA at the finest level of detail.

3.1. Data transfer

All institutions providing EFSA with food consumption data for the Comprehensive Database were asked to supply EFSA with a database schema describing their food consumption and related data tables. Based on this information, the DATEX Unit developed the first draft of a data model (Appendix A). This model was proposed, discussed and endorsed during an *ad hoc* meeting in which all data providers were represented. The transmission of food consumption and related data was accomplished through an application designed by EFSA, called Data Collection Framework (DCF). This system performed preliminary controls concerning the compliance of the data submitted to EFSA with the above mentioned database schema. The data is also validated for structural and controlled terminology compliance by the DCF.

A different approach was used within the EXPOCHI project. Food consumption and related data were transmitted to EFSA by means of Excel spreadsheets. The database schema used within the EXPOCHI project was different from the one used for the Comprehensive Database, but the two databases are compatible with respect to the basic variables (subject code, gender, age in years, body weight in kg, day of consumption, amount consumed in grams, original food code and original food name in English). The most important difference is that, in the case of the EXPOCHI project, for each food code the amount consumed is summed per day and not per meal or eating occasion, as in the adult component of the Comprehensive Database. Also, certain non-dietary information has not been provided for children, for example, the height of the subjects is not available. Another important difference is that six of the dietary surveys obtained through the EXPOCHI project are not representative at national level but focus on specific region(s) within the country.

Food consumption data obtained through the EXPOCHI project have been added to the Comprehensive Database which now contains data from 32 different dietary surveys (22 through the Comprehensive Database and 10 new ones through the EXPOCHI) carried out in 22 different Member States (Table 1).

Data from four dietary surveys (from Denmark, France, Italy and Poland) obtained though the EXPOCHI project were already provided within the collaboration agreements aimed at developing the first version of the Comprehensive Database. In order to be consistent, in all dietary surveys included in the Comprehensive Database the amount consumed is summed per food and per day, as in the EXPOCHI database, and not per meal or eating occasion.

3.2. Food classification system

In 2009, existing food classification systems were evaluated and considered not fully compatible with all exposure assessment needs within EFSA's remit. Therefore, it was decided to develop a preliminary food classification system (here referred to as FoodEx) that could better address the current needs. The main objective of FoodEx was to facilitate the assessment of dietary exposure to potentially hazardous chemicals by allowing accurate matching of the datasets on chemical occurrence and food consumption. FoodEx is a hierarchical system based on 20 main food categories that are further divided into subgroups up to a maximum of 4 levels. It does not currently use a catalogue of properties (facets) to describe food and beverages. In total, FoodEx comprises 1,893 different end-points (food names). Most food names are generic to allow the user to classify several similar foods under one name.

Within the project developing the adult component of the Comprehensive Database, data providers were asked to codify all foods and beverages present in the national food consumption database according to the preliminary FoodEx classification system developed by EFSA. Recommendations were given to the data providers on how to disaggregate composite dishes to the most detailed level possible. Each list of foods and beverages was checked in order to evaluate the correctness of the FoodEx codes assigned by the data providers. In the case of inconsistencies, a different matrix code was proposed and data providers were asked whether they agreed or, if not, to give a justification for keeping the original FoodEx code used. All food items reported within the EXPOCHI project have also been reclassified according to the draft FoodEx system. The use of FoodEx as a harmonised classification system for the Comprehensive Database is discussed in EFSA's scientific report "Evaluation of the FoodEx, the food classification system applied to the development of the EFSA Comprehensive European Food Consumption Database" (EFSA, 2010a). Methodological differences between the national dietary surveys related to the level of detail requested concerning the description of food and beverages and consequently to their classification have been identified. However, findings reported in the above mentioned document demonstrate that all data providers were able to classify the large majority of their food items to at least the 2nd level of the FoodEx, including around 160 categories. The 3rd and 4th level could also be used, but their completeness was shown to vary according to the country and food group.

In November 2009, EFSA created an ad hoc external Working Group on "Development of a Food Classification and Description System for exposure assessment" and in June 2010 EFSA organised the Scientific Colloquium on "Food Classification: Unambiguous ambiguity – the challenge of describing food" in Parma to support the establishment of a uniform food classification and description system. The above mentioned WG is currently developing a refined version of the preliminary FoodEx food classification and description system with the aim of serving a broad range of needs in EFSA. The new system should address the needs of most Units in EFSA and be accepted by EFSA's Member State networks on data collection regarding food consumption, occurrence of chemical contaminants and residues as well as microbiological hazards. The WG is expected to finalise the above mentioned work by the end of 2011.

It is important to highlight that, for some of the dietary surveys included in the Comprehensive Database (Table 1), the amount consumed for processed foods is reported as cooked whereas in other surveys yield factors were used to transform the consumption figures to raw foods/ingredients. This difference is particularly important because, when the amount of cooked foods is reported, consumption levels are likely to be overestimated for certain foods such as pasta or rice (the cooked weight of one portion is greater than its raw weight) whereas underestimation may result for other foods such as meat or fish (their weight decrease when cooked due to moisture loss). For example, the weight of cooked pasta or rice is 2-3 times higher compared to the corresponding uncooked product. Furthermore, the breakdown of composite foods in the vast majority of the surveys resulted in more accurate intakes of the different components of composite dishes. When recipes are reported under composite foods and not disaggregated into ingredients, an underestimation of the foods regularly used as ingredients in respective recipes, e.g. cheese, tomato, etc., can be expected in these survey data. The

breakdown of certain cereal products (e.g. bread, porridges and fine bakery ware) into their basic ingredients, like flour or other milling products and other basic ingredients may result in a shift in apparent consumption of cereal products to basic milling products. In some countries for instance consumption of bread and fine bakery ware may be very low or not seen at all, whereas consumption of basic milling products may be higher than in other countries. This problem has been more extensively presented and discussed in the EFSA's scientific report evaluating the FoodEx system (EFSA, 2010a). The EXPOCHI protocol concerning the classification of foods is described by De Neve et al. (2010).

3.3. Data validation and storage

In order to control the correctness of the data transmission phase, data providers were asked to check preliminary summary statistics produced using the SAS programme. Few clear outliers concerning the amount of consumption (e.g. 10 kg of white cabbage consumed by a subject in one eating occasion) were identified and corrected at a later stage. The data collected and validated were stored in a SAS database.

4. Overview of the dietary surveys included in the Comprehensive Database

The main information concerning the methodologies used in each of the 32 dietary surveys included in the Comprehensive Database is presented in Table 1. This table shows that only data collected through food records (15 dietary surveys), 24-hour dietary recalls (16 dietary surveys) and 48-hour dietary recalls (1 dietary survey) are included in the Comprehensive Database. Food consumption data for adults from 18 to 64 years of age (21 surveys) and children below 10 (16 surveys) are available from 20 and 14 Member States, respectively. Four dietary surveys started the data collection phase before 2000, more than ten years ago. Food consumption data were collected on one day only per subject in 6 dietary surveys, all including adults.

Additional information concerning methodologies and protocols is only available for the dietary surveys in the adult component of the Comprehensive Database. In this case, data providers systematically compiled a report describing in detail the methodology employed during the dietary survey. All information contained in the reports was checked for completeness and consistency. When necessary, clarifications were requested to the data providers. Where applicable, information reported was verified against the related food consumption data provided to EFSA. An overview of the above mentioned information is presented below.

Sample representativeness is a crucial aspect for the evaluation of the food consumption data gathered in the Comprehensive Database. Significant biases can arise from a survey sample that does not represent the population at national level. The sampling strategy and response rate are shown in Table 2. In 16 surveys the study population was sampled at individual level whereas in the remaining 6 surveys, it was sampled at household level. The use of the household as a sampling unit seems to be a convenient choice since an interviewer could collect information from more subjects during the same visit. However, food consumption estimates are likely to be mutually dependent when subjects from the same household are interviewed, thus leading to a reduced variability in terms of dietary pattern observed. Sample units were selected randomly in all surveys but different sampling frames were used. The national population register was the most used sampling frame (in 8 surveys). In Spain, the use of universities, health centres and pharmacies to randomly recruit subjects is likely to constitute a potential source of bias. In Slovakia, the study population cannot be considered representative of the general population since subjects were only selected among employees of confectionary and bakery manufactures. All surveys considered were stratified for gender and age groups with the exception of Austria. The response rate considerably varied, from 27% (Hungary) to 96 % (Slovakia and Poland).

Information on the diet of pregnant and breastfeeding women are available only from nine different surveys (Table 3). In seven surveys pregnant and breastfeeding women were excluded. Information on specific study subjects' long term dietary pattern (e.g. vegetarian, health related or slimming) had been

collected in half of the surveys (Table 3). Dietary estimates of these important subgroups should be treated cautiously since their number is, despite few exceptions, overall rather low.

Another important aspect of food consumption data is their representativeness over the different weekdays and seasons. The weekday and seasonal representativeness of the surveys are shown in Table 4. In six surveys record or recall days did not evenly cover week and weekend days. For example, in Slovakia only 5% of the records for which the consumption date was known related to weekend days. The effects of uneven sampling fractions over days of the week are potentially relevant for foods that exhibit specific consumption patterns related to weekend consumption, e.g. alcoholic drinks. Twelve surveys captured consumption figures across all seasons. In the remaining surveys the seasonality was not fully covered, with only one season represented in Bulgaria NSFIN (Spring), Estonia (Summer), Hungary (Winter) and The Netherlands (Fall). This issue is particularly relevant when using food consumption data to assess exposure to hazardous chemicals mainly present in seasonal foods.

Systematic bias and large random error may occur while quantifying foods and no gold standard exists for estimation of portion size (Wrieden et al., 2009). The methods used to estimate portion size are shown in Table 5. Three surveys were conducted using the weighing method, either as the sole method (United Kingdom for food consumed inside the home) or combined with other measurement tools (Ireland and Spain AESAN-FIAB), to estimate the amount of food consumed. In the British survey, for food eaten outside of home, a ruler and information on household measures and known packaging size were used. In the majority of surveys (19) a combination of 2 or more measurement tools were used and in 16 studies the picture book was used as one of these tools. Out of the six surveys in which no picture book was used, two were weighed surveys (United Kingdom and Spain AESAN-FIAB), Austria relied on household measurements only, Spain AESAN was conducted using household measurements and packaging size, while in the Slovakian survey the interviewer estimated portion sizes without any tool but relied only on the subject's description. In Hungary, subjects used "reference tables" to estimate and fill in the portion sizes in the record. Three out of the six dietary surveys including children <10 years of age (Bulgaria II, Denmark and Italy) reported the use of a picture book with small portion sizes appropriate for children. The remaining three (Poland, Latvia and France) did not use specific tools for children. It might be advisable to more closely examine estimated food portion quantities in those surveys' data using only household measurement tools (Austria), household measurement tools in combination with packaging size (Spain II) and, in particular, those reporting no use of any PSMAs (Hungary and Slovakia) to quantify portion sizes.

Detailed information concerning the methodologies used for the dietary surveys obtained through the EXPOCHI project is not available. A detailed analysis of the methodological differences of the data collected through the EXPOCHI project has therefore not been carried out. However, it can be assumed that they might be affected by the same drawbacks identified above for the dietary surveys of the adult component of the Comprehensive Database.

Important differences resulted therefore to exist with respect to a number of parameters affecting the level of detail and the accuracy of the collected data, such as: the dietary assessment method, the number of days per subject, the sampling design and the quantification of portion sizes. A cautious interpretation of the results is therefore always recommended when data from the Comprehensive Database are used.

Table 1: Dietary surveys included in the EFSA Comprehensive European Food Consumption Database

Country	Name of the dietary survey (Acronym)	Survey period	Geographical level	Age range (years old)	Number of subjects	Method	Replicates	Amount reported[a]	Reference
Austria	ASNS	2005 – 06	National	19 to 65	2,123	24-hour recall	1	as consumed	Elmadfa et al., 2008
Belgium	Regional Flanders	2002 – 03	Regional	2.5 to 6.5	661	Food record	3	mixed	Huybrechts et al., 2008
	Diet National 2004	2004 – 05	National	> 15	3,245	24-hour recall	2	as consumed	De Vriese et al., 2005
Bulgaria	NSFIN	2004	National	> 16	1,204	24-hour recall	1	as raw	Petrova & Angelova, 2006
	NUTRICHILD	2007	National	< 5	1,723	24-hour recall	2	mixed	Petrova et al., 2009
Cyprus	Childhealth	2003	National	11 to 18	303	Food record	3	mixed	Not available
Czech Republic	SISP04	2003 – 04	National	> 4	1,751	24-hour recall	2	as raw	Ruprich et al., 2006
Denmark	Danish Dietary Survey	2000 – 02	National	4 to 75	4,118	Food record	7	as raw[c]	Lyhne et al.2005
Estonia	NDS 1997	1997	National	19 to 64	1,866	24-hour recall	1	mixed	Pomerleau et al., 1999
Finland	FINDIET 2007	2007	National	25 to 74	2,038	48-hour recall	1	as raw[c]	Paturi et al., 2008; Reinivuo et al, 2010
	DIPP	2003 – 06	Regional	1, 3 and 6	1,448	Food record	3	mixed	Räsänen et al., 2006
	STRIP	2000	Regional	7 to 8	250	Food record	4	mixed	Simell et al., 2009
France	INCA2	2005 – 07	National	3 to79	4,079	Food record	7	as consumed	AFSSA, 2009; Lioret et al. 2010; Dubuisson et al. 2010
Germany	DONALD	2006 – 08	Regional	1 to 10	926	Food record	3	mixed	Kroke et al., 2004; Sichert-Hellert and Kersting, 2004
	National Nutrition Survey II	2005 – 07	National	14 to 80	13,926	24-hour recall	2	as consumed	MRI, 2008; Krems et al., 2006
Greece	Regional Crete	2004 – 05	Regional	4 to 6	874	Food record	3	mixed	Linardakis et al., 2008
Hungary	National Repr Surv	2003	National	> 18	1,360	Food record	3	as raw[c]	Rodler et al., 2005
Ireland	NSIFCS	1997 – 99	National	18 to 64	958	Food record	7	as raw	Kiely et al., 2001; Harrington et al., 2001

Country	Name of the dietary survey (Acronym)	Survey period	Geographical level	Age range (years old)	Number of subjects	Method	Replicates	Amount reported[a]	Reference
Italy	INRAN-SCAI 2005–06	2005 – 06	National	> 0.1	3,323	Food record	3	as raw	Leclercq et al., 2009
Latvia	EFSA_TEST	2008	National	7 to 66	2,070	24-hour recall	2	as consumed[b]	Šantare et al., 2008
Netherlands	VCP_kids	2005 – 06	National	2 to 6	1,279	Food record	3	as raw	Ocké et al., 2008
	DNFCS-2003	2003	National	19 to 30	750	24-hour recall	2	as raw	Ocké et al., 2005
Poland	IZZ-FAO-2000	2000	National	1 to 96	4,134	24-hour recall	1	as raw	Sekula et al., 2004; Szponar et al., 2001 and 2003
Slovakia	SK MON 2008	2008	National	19 to 59	2,761	24-hour recall	1	mixed[b]	Not available
Slovenia	CRP-2008	2007 – 08	National	18 to 65	410	24-hour recall	1	as consumed	Gabrijelčič Blenkuš et al. 2009
Spain	enKid	1998 – 00	National	1 to 14	382	24-hour recall	2	mixed	Serra-Majem et al., 2001
	NUT-INK05	2004 – 05	Regional	4 to 18	1,050	24-hour recall	2	mixed	Larrañaga Larrañaga et al., 2006
	AESAN-FIAB	1999 – 2001	National	17 to 60	1,068	Food record	3	as consumed	Requejo et al., 2002
	AESAN	2009	National	18 to 60	418	24-hour recall	2	as consumed	Ortega et al., 2010
Sweden	NFA	2003	National	3 to 18	2,495	24-hour recall	4	as consumed	Enghardt-Barbieri et al., 2006
	RIKSMATEN 1997-98	1997 – 98	National	18 to 74	1,210	Food record	7	as consumed[b]	Becker and Pearson, 2002
United Kingdom	NDNS	2000 – 01	National	19 to 64	1,724	Food record	7	as cooked	Henderson et al 2002

[a] For some of the dietary surveys a different approach from the one listed here has been used to report amounts consumed of specific foods/composite dishes.
[b] Significant proportion of composite dishes were not disaggregated
[c] Most/part of the cereal products (e.g. bread and/or fine bakery ware) were disaggregated to their basic ingredients e.g. flour etc.

Table 2: Sampling information for the dietary surveys of the adult component of the Comprehensive Database

Country	Name of the dietary survey (Acronym)	Sampling method and sampling frame	Sample unit	Response rate (%)	Sample stratification variables			
					Gender	Age groups	Geographical areas	Others
Austria	ASNS	Random from telephone book, Job centres, gynaecologists, university	Individual	48	No	No	No	Employment status
Belgium	Diet National 2004	Random from the national population register	Individual	41	Yes	Yes	Yes	
Bulgaria	NSFIN	Random from the national population register	Individual	85	Yes	Yes	Yes	Urban vs. rural residence
	NUTRICHILD	Random from the register of general practitioner's practices	Individual	78	Yes	Yes	Yes	Urban vs. rural residence
Czech Republic	SISP04	Random from the address register	Household	54	Yes	Yes	Yes	Urban vs. rural residence
Denmark	Danish Dietary Survey	Random from the national population register	Individual	53	Yes	Yes	No	
Estonia	NDS 1997	Random from the national population register	Individual	67	Yes	Yes	No	Urban vs. rural residence
Finland	FINDIET 2007	Random from the national population register	Individual	62	Yes	Yes	Yes	
France	INCA2	Random from the general population census	Household	60	Yes	Yes	Yes	Size of urban area
Germany	National Nutrition Survey II	Random from the national population register	Individual	42[§]	Yes	Yes	Yes	
Hungary	National Repr Surv	Random from the general population census	Individual	27	Yes	Yes	No	
Ireland	NSIFCS	Random from the electoral list	Individual	63	Yes	Yes	Yes	Education level Urban vs. rural residence, Social status, Employment status
Italy	INRAN-SCAI 2005–06	Random from the telephone book	Household	33	No	No	Yes	Household structure
Latvia	EFSA_TEST	Random from a consumer panel	Individual	56	Yes	No	Yes	

Country	Name of the dietary survey (Acronym)	Sampling method and sampling frame	Sample unit	Response rate (%)	Sample stratification variables			
					Gender	Age groups	Geographical areas	Others
Netherlands	DNFCS-2003	Random from a consumer panel	Individual	42	Yes	Yes	Yes	Education level
Poland	IZZ-FAO-2000	Random from the sample of the household budget survey	Household	96	Yes	Yes	No	
Slovakia	SK MON 2008	Random among employees of confectionary and bakery manufactures and canteen	Individual	96	Yes	Yes	Yes	
Slovenia	CRP-2008	Random from the national population register	Individual	52	Yes	Yes	No	
Spain	AESAN-FIAB	Random from the university, health centre, pharmacies	Individual	71	Yes	Yes	Yes	
	AESAN	Random from the university, health centre, pharmacies	Individual	28	Yes	Yes	Yes	Urban vs. rural residence
Sweden	RIKSMATEN 1997-98	Random from the national population register	Household	60	Yes	Yes	Yes	
United Kingdom	NDNS	Random from the postcode address file	Household	47	No	No	No	Region, population density and socio-economic status

Table 3: Number of breastfeeding and pregnant women and subjects on special diet in the adult component of the Comprehensive Database

Country	Name of the dietary survey (Acronym)	Number of women		Number of subjects on special diet			
		Breastfeeding	Pregnant	Health conditions	Vegetarian	Slimming	Vegetarian and slimming
Austria	ASNS	Not available	Not available				
Belgium	Diet National 2004	7	9	331	1		
Bulgaria	NSFIN	Excluded[a]	Excluded[a]	70	1	116	
	NUTRICHILD	Not applicable	Not applicable				
Czech Republic	SISP04	Not available	Not available	86	9	66	
Denmark	Danish Dietary Survey	59	50				
Estonia	NDS 1997	Excluded[a]	Excluded[a]				
Finland	FINDIET 2007	Not available	22	584	29	26	22
France	INCA2	20	27	314	19	181	1
Germany	National Nutrition Survey II	36	52	2106	287	141	1
Hungary	National Repr Surv	Not available	Not available				
Ireland	NSIFCS	Excluded[a]	3	77	9	70	
Italy	INRAN-SCAI 2005–06	10	19	80		76	
Latvia	EFSA_TEST	Excluded[a]	Excluded[a]				
Netherlands	DNFCS-2003	Excluded[a]	Excluded[a]	8	12	24	
Poland	IZZ-FAO-2000	26	23				
Slovakia	SK MON 2008	Not available	Not available				
Slovenia	CRP-2008	Excluded[a]	Excluded[a]				
Spain	AESAN-FIAB	0	3	10		1	
	AESAN	Not available	0	4		16	
Sweden	RIKSMATEN 1997-98	16	11	2	18		
United Kingdom	NDNS	Excluded[a]	Excluded[a]		66	314	11

[a] Breastfeeding and/or pregnant women specifically excluded according to the sampling design

Table 4: Percentage of record or recall days in the dietary surveys of the adult component of the Comprehensive Database according to the day of the week and season

Country	Name of the dietary survey (Acronym)	% of record or recall days according to the day of the week a			% of record or recall days according to the season a				
		Week days	Week end days	Unclassified	Spring	Summer	Fall	Winter	Unclassified
Austria	ASNS	49	14	37	21	26	25	27	1
Belgium	Diet National 2004	76	24	0	26	25	27	23	0
Bulgaria	NSFIN	92	8	0	100	0	0	0	0
	NUTRICHILD	54	46	0	60	40	0	0	0
Czech Republic	SISP04	74	26	0	34	23	12	31	0
Denmark	Danish Dietary Survey	72	28	0	25	26	39	10	0
Estonia	NDS 1997	73	27	0	0	100	0	0	0
Finland	FINDIET 2007	67	33	0	9	0	0	91	0
France	INCA2	71	29	0	20	17	24	39	0
Germany	National Nutrition Survey II	75	25	0	20	27	40	13	0
Hungary	National Repr Surv	67 §	33b	0	0	0	0	100	0
Ireland	NSIFCS	71	29	0	26	28	27	18	0
Italy	INRAN-SCAI 2005–06	78	22	0	26	24	25	25	0
Latvia	EFSA_TEST	72	28	0	0	49	50	0	0
Netherlands	DNFCS-2003	71	29	0	0	0	100	0	0
Poland	IZZ-FAO-2000	77	23	0	0	31	69	0	0
Slovakia	SK MON 2008	78	5	17	23	19	29	7	23
Slovenia	CRP-2008	76	24	0	11	14	56	19	0
Spain	AESAN-FIAB	43	30	27	28	7	25	22	17
	AESAN	73	26	0	75	19	0	6	0
Sweden	RIKSMATEN 1997-98	71	29	0	0	0	0	0	100
United Kingdom	NDNS	71	29	0	31	24	22	23	0

[a] Information extracted from the "Comprehensive European Food Consumption Database". [b] Percentages reported by the national data provider.

Table 5: Portion size estimation in the dietary surveys of the adult component of the Comprehensive Database

Country	Name of the dietary survey (Acronym)	Portion sizes estimated by				
		Weighing	Picture book	Household measures	Known packaging size	Ruler
Austria	ASNS	No	No	Yes	No	No
Belgium	Diet National 2004	No	Yes, based on EPIC-soft	Yes	No	No
Bulgaria	NSFIN	No	Yes, validated	Yes	Yes	No
	NUTRICHILD	No	Yes, validated	Yes	Yes	No
Czech Republic	SISP04	No	Yes, tested in a convenient sample	Yes	No	Yes
Denmark	Danish Dietary Survey	No	Yes, validated	Yes	No	No
Estonia	NDS 1997	No	Yes, not validated	Yes	No	No
Finland	FINDIET 2007	No	Yes, validated (Ovaskainen et al., 2008)	Yes	Yes	Yes
France	INCA2	No	Yes, validated (Le Moullec et al.,1996)	Yes	Yes	No
Germany	National Nutrition Survey II	No	Yes, based on EPIC-soft	Yes	No	No
Hungary	National Repr Surv	No	No	No	No	No
Ireland	NSIFCS	Yes	Yes, not validated	Yes	Yes	No
Italy	INRAN-SCAI 2005–06	No	Yes, based on EPIC-soft	Yes	Yes	No
Latvia	EFSA_TEST	No	Yes, not validated	Yes	No	No
Netherlands	DNFCS-2003	No	Yes, based on EPIC-soft	Yes	No	Yes
Poland	IZZ-FAO-2000	No	Yes, tested in a convenient sample	Yes	Yes	No
Slovakia	SK MON 2008	No	No	No	No	No
Slovenia	CRP-2008	No	Yes, not validated	Yes	No	No
Spain	AESAN-FIAB	Yes	No	Yes	Yes	No
	AESAN	No	No	Yes	Yes	No
Sweden	RIKSMATEN 1997-98	No	Yes, validated (Becker et al., 1998)	Yes	No	No
United Kingdom	NDNS	Yes	No	No	Yes	Yes

5. Summary statistics from the Comprehensive Database

An agreement between EFSA and the national data providers clearly defines the conditions of use. EFSA has the right to use the raw, individual food consumption data for carrying out risk assessments and other scientific analyses within the activities related to EFSA's mandate and a formal authorisation from the data provider must be requested for any other use of the data. Consequently, individual food consumption data are stored by EFSA. Only summary statistics from the Comprehensive Database are made available to the public on the EFSA website.

For each country, food consumption data are presented on the EFSA website according to the 1st (including 20 categories) and 2nd (including around 160 categories) level of the preliminary FoodEx system (EFSA, 2010a), per age class, for the total population and for consumers only. Food consumption data at the 3rd and 4th level have not been published because, as outlined in the previous section related to food classification, information are not homogeneously available across countries at this stage.

The following age classes have been considered:

1. Infants: up to and including 11 months
2. Toddlers: from 12 up to and including 35 months of age
3. Other children: from 36 months up to and including 9 years of age
4. Adolescents: from 10 up to and including 17 years of age
5. Adults: from 18 up to and including 64 years of age
6. Elderly: from 65 up to and including 74 years of age
7. Very elderly: from 75 years of age and older

Individual age was, for some of the dietary surveys, reported in integer years (e.g. without the fraction) creating difficulties in assigning an age class to those subjects having, as a rounded figure, exactly the age of the thresholds (1, 3, 10, 18, 65 and 75 years old). The strict application of the above mentioned rule for age classes would have created groups with very few subjects. For practical reasons, taking into account the sampling design of the national dietary survey, subjects on the thresholds were moved to the lower or upper class. For example, in the Irish dietary survey for adults, six subjects aged exactly 65 years should have been included in the "Elderly" class but, since they should have been the only subjects in this class in the survey and considering that the age range in the sampling design is 18 – 64 years, they have been classified in the Comprehensive database as "Adults".

The Comprehensive Database resulted to contain food consumption data from: 2 surveys (in 2 MSs) for infants, 8 surveys (in 8 MSs) for toddlers, 16 surveys (in 14 MSs) for children, 14 surveys (in 12 MSs) for adolescents, 21 surveys (in 20 MSs) for adults, 9 surveys (in 9 MSs) for elderly, 8 surveys (in 8 MSs) for very elderly.

The summary statistics include the total number of individuals and, for each of the first two FoodEx levels, further include age classes, number and percentage of consumers, the mean and the standard deviation, as well as low and high percentiles. Food consumption statistics are reported both in grams/day and in grams/kg body weight per day. For individual missing body weights, values were estimated by imputation using the average body weight of individuals of a similar age class and gender within the same dietary survey.

Summary statistics from the Comprehensive Database have been published for both chronic and acute consumption. For calculation of chronic consumption, intake statistics have been calculated based on individual average consumption over the total survey period, whereas for acute consumption, statistics have been calculated based on every single reporting day. For example, if subjects in a population had recorded their consumption by means of a 7 day food record, the average intake of each individual over the 7 days was calculated. The average value for each subject was then considered only once when calculating the "chronic" average consumption and other statistics related to chronic consumption at population level. On the other hand, "acute" consumption figures were calculated using each reporting day independently, and in summing eating occasions for a considered food. All days from each subject (7 days in the above reported example) were used to calculate the "acute" average consumption and the other statistics related to acute consumption at population level.

Dietary surveys with only one day per subject were excluded when calculating chronic consumption statistics, since they are considered not adequate to assess chronic exposure because the number of assessment days of a survey affects the distribution of consumption, particularly at the upper tails (EFSA, 2006). In particular, as survey duration increases, also the observed percentage of subjects reporting non zero consumption for commonly and rarely eaten foods becomes larger (Nusser et al., 1995), whereas the observed mean and high percentiles consumption, in consumers only, decreases, as also illustrated by Lambe et al. (2000).

5.1. Reliability of high percentiles

The definition of high-level consumers is crucial to the outcome of the risk assessment because, in practice, it determines the proportion of the population that would have to exceed a health based limit value before action is considered necessary to reduce dietary exposure. High percentiles (95^{th}, 97.5^{th}, 99^{th} and even 99.9^{th}) are often used to identify high-level consumers. The selection of percentile could be based on scientific criteria (statistical difficulties could prevent the measurement of high percentiles) but also social and ethical criteria have been used. For this reason a variety of high percentiles are provided in the summary statistics calculated from the Comprehensive Database, to inform risk managers in the most appropriate way in regard to particular food safety situations. However, the reliability of high percentiles is related to the number of subjects used to calculate them. Percentiles calculated on a limited number of subjects should be treated with caution as the results may not be statistically robust.

A clear indication concerning the minimum number of observations necessary to estimate a given percentile cannot be found in the literature. Different options can be used, none of them being a widely accepted standard. A very simple option is to require that the calculated percentile must at least be different from the maximum value within the sample. This means that at least 20 observations are needed to identify the single observation at the 95^{th} percentile and 100 observations are needed for the 99^{th} percentile.

According to Kroes et al. (2002), a high percentile P can be assessed with sufficient precision if the sample size n satisfies the rule $n(1\text{-}P) \geq 8$. The minimum sample sizes for the 95^{th}, 97.5^{th} and 99^{th} can be therefore estimated equal to 160, 320 and 800 respectively. However, the rationale behind this rule is not presented in the above mentioned paper. Here, a non-parametric method is proposed to set guidelines to determine the minimum number of samples for which (extreme) percentiles can be computed. This method does not assume any given distribution for the data, e.g. log-normal distribution, and was implemented in the SAS Enterprise Guide 4.2 software. The proposed method, based on a model aimed at calculating confidence intervals for percentiles (Conover, 1971), calculates also the coverage probability of each non-parametric confidence interval, as described in the SAS manual[6]. In statistics, the coverage probability of a confidence interval is the probability that the

[6] For details of the methods used to calculate the 95th percentile values, the 95 % confidence intervals and their coverage probability see Base SAS(R) 9.2 Procedures Guide: Statistical Procedures, Third Edition.

interval contains the true value of interest (e.g. 95th or 99th percentiles). When the number of observations is not large enough, the coverage probability may not attain the nominal value, and drops below, for example, 95%. This is more likely to occur at high percentiles, e.g. 95th or 99th. Therefore, the coverage probability has been used to set guidelines to determine the minimum number of samples for which (extreme) percentiles can be computed. In the case of significance level (α) being set at 0.05 to determine a 95% confidence interval, the coverage probability should target 95%. In this case this is achieved for $n \geq 59$ and $n \geq 298$ for the 95th or 99th percentiles, respectively.

It is important to notice that the options presented and discussed above aim at identifying the minimum number of observations necessary to estimate a given percentile and that nothing can be said about the precision of these estimates. In any case, as also highlighted in a guidance of EFSA (2006) related to uncertainties in dietary exposure assessment, a limited sample size can be an important source of uncertainty which should be assessed qualitatively or quantitatively.

The summary statistics published on the EFSA website include all percentiles, even if calculated on a very limited number of subjects/days. However percentiles calculated over a number of subjects/days lower than 60 (for the 95th percentile) and lower than 300 (for the 99th percentile) have been flagged with a warning in the comment field, indicating the need for a cautious interpretation of the results which may not be statistically robust.

5.2. Use of the summary statistics from the Comprehensive Database

Summary statistics from the Comprehensive Database can be used as a screening tool to assess chronic and acute exposure to hazardous substances. They can be used to identify substances that might be of concern and to prioritise the use of resources for safety assessments. As in the case of the Concise Database, the use of the summary statistics from the Comprehensive Database is therefore intended to produce conservative estimates of exposure (EFSA, 2008b). If the database is used for screening assessments, an analysis of uncertainty is usually not required, provided that appropriate conservative assumptions take account of the uncertainties (EFSA, 2006). However, risk assessors are responsible for ensuring that the use of the database is conservative for the specific case. If data from the Comprehensive Database are used for a more precise exposure assessment, the degree of uncertainty of the adopted model should be evaluated and discussed.

Due to the methodological differences in the collection of the food consumption data mentioned above, dietary data collected within different dietary surveys cannot be merged together with the aim to assess the exposure at European level. In line with the EFSA opinion on exposure assessments (EFSA, 2005) and with the opinion of WHO (2009), it is proposed to assess the exposure at the country level. Food consumption data are therefore required for each EU country and, in order to be protective of public health for the whole of Europe, multi-national calculations should provide exposure estimates that are equal to or greater than the highest exposure observed at national level. If the estimated multi-national dietary exposure to a chemical does not exceed its respective health-based guidance value then the level of exposure should be acceptable at national level, because the level of overestimation for international dietary exposure assessments for any region would tend to be greater than that for national estimates (WHO, 2009). This applies to both acute and chronic exposure assessments. In the case where nutrient deficiency is addressed, the multi-national intake estimate, compared with the recommended nutritional reference value, should be lower than the lowest intake observed at national level.

Potential exposure for mean and high level consumers can be calculated for each food category, through combination of mean and high concentration values with mean and high consumption values from the Comprehensive Database, respectively. Although the intuitive approach to estimate the

http://support.sas.com/documentation/cdl/en/procstat/63104/HTML/default/viewer.htm#/documentation/cdl/en/procstat/63104/HTML/default/procstat_univariate_sect028.htm.

exposure from all food categories is to add up the high level of consumption for each separate category, this results in a gross over-estimate since it assumes that high-level consumers of one food are also high level consumers of all the other foods. However, it is very unlikely that individuals are high-level consumers of more than one food category when a limited number of food categories is used. One approach proposed by the United Kingdom (European Commission, 1998) and also presented in the EFSA Guideline concerning the use of the Concise Database (EFSA, 2008), which has been found to work reasonably well, is to estimate the total exposure from all food sources by assuming that an individual might be a high level consumer of two food categories and would be an average consumer of the remaining other groups. In practice, this method consists in summing the 95th percentile of exposure of the two most contributing food categories (calculated for consumers only) with the mean exposure for the remaining categories (calculated for the total population). This approach has been tested using UK data for a range of pesticides and radionuclides (Pesticides Safety Directorate, 2004) and has been shown to give a reasonable approximation of the 97.5th percentile of exposure to the results obtained using the full computerised method.

It is important to note, however, that this method is only valid when using a small number of food categories. For example, the validity of the method is acceptable when using the 16 food categories developed by the Confederation of the Food & Drink Industry in the EU (CIAA), but is not acceptable when using a database containing 800 food categories. This method is therefore likely to be valid when using FoodEx at Level 1, including only 20 categories. When using FoodEx at Level 2, which includes around 160 categories, different assumptions concerning the number of categories for which an individual can be assumed to be a high level consumer, are needed. For this purpose, an ad hoc analysis was performed in order to identify the number of Level 2 FoodEx food categories for which a subject can be considered as high level consumer. In this exercise subjects were considered high level consumers for a specific Level 2 FoodEx food category if they exceeded the 95th percentile calculated for the total population per dietary survey and age class. In this analysis, it was not possible to use the 95th percentile derived for consumers only due to the low number of consumers for a large number of food categories, dietary surveys and age groups. For the same reason, only dietary surveys and age groups including at least 59 subjects were considered in this exercise. The above mentioned assumption, that an individual might be a high level consumer of a maximum of two food categories, has been tested in the case of a larger number of categories, e.g. the about 160 categories of Level 2 FoodEx. To this purpose, the cumulative percentage of subjects identified as high consumers, from zero to 10 different Level 2 FoodEx food categories, have been calculated for each dietary survey and age class. Since no differences were identified across the different dietary surveys (results not shown), Table 6 only presents the results of this analysis according to the different age classes but with all surveys merged together. In the case of adolescents, for example, 8% of the subjects were never found to be high consumers of any of the Level 2 FoodEx food categories whereas the cumulative percentage of subjects resulting to be high consumers of maximum one Level 2 FoodEx food category is 23%. This means that 15% of the adolescents (23% - 8% = 15%) resulted to be high consumers for only one FoodEx food category. On average, 95% of the subjects included in the Comprehensive Database were found to be high consumers of a maximum of 8 Level 2 FoodEx food categories. A small percentage of subjects (6 - 9%, excluding infants) were never found to be high consumers of any of the Level 2 FoodEx food categories. Hence, when estimating the total exposure from all Level 2 FoodEx food categories, a conservative assumption is that an individual can be a high level consumer of up to 8 categories. According to the analysis above, this assumption is valid for at least 95% of the population.

An important assumption of this method is that the consumption of each food category is independent from the others. However, significant correlations between some food categories are known to exist. An example is the correlation between vegetables and added fats identified in a sample of Italian teenagers (Leclercq and Arcella, 2001).

Table 6: Cumulative percentage of subjects identified either as never high consumers* or as high consumers for a maximum number of Level 2 FoodEx food categories

Age class	Never high consumers	Maximum number of Level 2 FoodEx food categories (% of subjects)									
		1	2	3	4	5	6	7	8	9	10
Infants	33	50	62	72	79	84	88	91	94	96	97
Toddlers	9	22	41	59	74	83	90	94	96	97	98
Other children	7	20	38	55	69	80	88	93	95	97	98
Adolescents	8	23	41	58	71	80	87	92	95	97	98
Adults	6	19	36	52	66	77	85	91	94	96	98
Elderly	7	19	36	52	67	77	85	91	94	97	98
Very elderly	7	20	37	53	68	79	87	92	95	97	99
Minimum	6	19	36	52	66	77	85	91	94	96	97
Maximum	33	50	62	72	79	84	90	94	96	97	99
Average	11	25	41	57	70	80	87	92	95	97	98

* Subjects were considered high level consumers for a specific Level 2 FoodEx food category if they exceeded the 95th percentile calculated for the total population.

6. Future activities

In the monitoring and control of food safety and calculation of dietary exposure to some hazardous chemicals (e.g. pesticides, contaminants, etc.) it is necessary, in lower tier assessments, to aggregate consumption data derived from the same agricultural crops and to translate them into the equivalent edible portion of the Raw Agricultural Commodity (RAC). The RAC is the agricultural product before it has undergone any form of processing; it is the raw part (or parts) of the plant or animal as moving in trade. EFSA is currently working to the development of a database of standardised factors in order to convert the food consumption information from the Comprehensive Database to the RAC level. Access to standardised conversion factors will initially support the update of the EFSA PRIMo model with the latest Member State's food consumption data.

Currently, the EFSA Comprehensive Database is the best source of food consumption information providing data on a EU wide basis and will be very useful in the risk assessment work conducted by EFSA. However, it comprises data derived using different methodologies and therefore its use for direct country-to-country comparisons is not advisable. The collection of accurate, harmonised and detailed food consumption data at European level is therefore a primary long term objective for EFSA and has been recognised as a top priority for collaboration with the EU Member States.

In 2008, the Expert Group on Food Consumption Data (EGFCD) drafted the Guidance of EFSA on "Methods and protocols for the collection of national food consumption data in view of a Pan-European dietary survey" (EFSA, 2009). The main objective of the EFSA Guidance is to suggest methods and protocols for the collection of dietary information at national level in the framework of a pan-European data collection that can be used, as described above, to perform risk assessment for all possible biological agents and chemical substances considered by EFSA's Scientific Panels. Although methods and protocols described in this Guidance document can be voluntarily applied to individual national dietary surveys, they should be used in order to achieve harmonisation within a pan-European dietary survey.

The project for the collection of food consumption data at a pan-European level is currently under development and is the progression of the previously EU-funded initiatives putting into practice this concerted European effort. The objective is to carry out the first pan-European food consumption survey in the EU, called "What's on the Menu in Europe? (EU MENU)". The added value of this data collection is the use of a harmonised methodology providing comparable and detailed enough information suitable for risk assessment purposes representing all countries and regions in the EU. The collection of food consumption data is planned to be carried out as a rolling program from 2013, with a preparatory phase in 2010-2012. The survey should preferably be repeated in each country about

every ten years. With active promotion activities, special attention will be paid to ensure a high participation rate in all countries to support the collection of representative data.

CONCLUSIONS AND RECOMMENDATIONS

The EFSA Comprehensive Database is a unique tool and will greatly improve the accuracy of EFSA's exposure assessment calculations. The use of food consumption data from the Comprehensive Database at the individual level is restricted to EFSA but summary statistics are made available to the public on the EFSA website. However, the use of summary statistics from the Comprehensive Database is intended to produce conservative estimates of exposure. In addition, the interpretation of the summary statistics, and in particular of high and low percentiles, should be cautious since these may have been calculated on a very limited number of subjects/days and consequently not be statistically robust.

In any case, it is important that all users keep the methodological differences in the collection of the food consumption data included in the Comprehensive Database in mind and, in particular, avoid the use of these data for direct country-to-country comparisons. In particular, dietary surveys with only one day per subject should be excluded when calculating chronic exposure. It is neither recommended that dietary data collected within different dietary surveys are merged together with the aim to assess the exposure at European level. Exposure should therefore always be assessed at the country level.

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APPENDIX

A. DATA MODEL OF THE ADULT COMPONENT OF THE COMPREHENSIVE DATABASE

a. SUBJECT TABLE

Variable	Description	Example	Type	Database link / vocabulary
SURVEY	Acronym of the dietary survey		Text description (Max 250 car)	DIET-NATIONAL-2003
COUNTRY	Country of the dietary survey		Standard ISO-3166-1-alpha-2 coding system.	AT Austria BE Belgium BG Bulgaria CZ Czech Republic DE Germany DK Denmark EE Estonia ES Spain FI Finland FR France GB United Kingdom HU Hungary IE Ireland IT Italy LV Latvia NL Netherlands PL Poland SE Sweden SI Slovenia SK Slovakia XX Unknown
ORSUBCODE	Unique subject identifier	10457	ID	Variable used to link the subject DB with the Consumption DB
GENDER	Gender	G1	Controlled vocabulary	G1 Male G2 Female G3 Missing
BIRTHDAY	Birth day	13	Numerical value	
BIRTHMONTH	Birth month	4	Numerical value	
BIRTHYEAR	Birth year	1972	Numerical value	

Variable	Description	Example	Type	Database link / vocabulary
AGE	Age in years	27	Numerical value	
WEIGHT	Body weight in kg	68	Numerical value	
HEIGHT	Height in cm	176	Numerical value	
REGION	Region, area or city of residence	North Est	Text description (Max 250 car)	
ENRGYINTAKE	Average energy intake over the survey period in Kcal per day	2500	Numerical value	
UNOVREP	Subject identified as under or over reporter	U2	Controlled vocabulary	U1 Under reporter U2 Normal U3 Over reporter U4 Unclassified
WF	Weighting factor used to normalize for age groups, gender, regions	365	Numerical value	
SPECIALCON	Subject identified as being in special conditions	D2	Controlled vocabulary	C1 Normal condition C2 Lactating C3 Pregnant C4 Chronic / long term disease C5 Unclassified
SPECDIET	Subject identified as having particular eating pattern	D2	Controlled vocabulary	D1 Normal diet D2 Vegetarian diet D3 Slimming diet D4 Diet related to health conditions (e.g. celiac, diabete, …) D5 Unclassified D23 Vegetarian and slimming diet
EDUCATION	Description of the current education level or highest diploma obtained	Elementary school	Text description (Max 250 car)	
ACTIVITY	Description of the activity level	Low	Text description (Max 250 car)	
ETHNIC	Self-defined ethnic group	Black - African	Text description (Max 250 car)	
COMMENTSSUBJECT	Text field to be used in order to provide additional information about the subject or to report on possible problems related to him/her.		Text description (Max 250 car)	

b. FOOD CONSUMPTION DATA TABLE

Variable	Description	Example	Type	Database link
ORSUBCODE	Unique subject identifier	10457	Ref ID	Variable used to link the "Foods" DB with the "Consumption" DB
DAY	Ordinal number of the survey day	1	Numerical value	
WEEK	Code of the week day of consumption	W1	Controlled vocabulary	W1 Monday W2 Tuesday W3 Wednesday W4 Thursday W5 Friday W6 Saturday W7 Sunday W8 Unclassified
SEASON	Code of the season of consumption	S1	Controlled vocabulary	S1 Spring S2 Summer S3 Fall S4 Winter S5 Unclassified
CONDAY	Date of consumption (day)	13	Numerical value	
CONMONTH	Date of consumption (month)	4	Numerical value	
CONYEAR	Date of consumption (year)	2006	Numerical value	
EXECPTIONDAY	The subject reported to have followed a exceptional diet in the specific day because of a special event (e.g. sickness, wedding party, religious event, etc.)	S2	Controlled vocabulary	E1 No E2 Yes, unspecified E3 Yes, consumed more than normal E4 Yes, consumed less than normal E5 Unclassified
TIMEHOUR	Time of consumption (hours)	13	Numerical value	
TIMEMINUTES	Time of consumption (minutes)	30	Numerical value	

Variable	Description	Example	Type	Database link
MEAL	Code of the meal as defined within the dietary survey. If not available the time of consumption will be used by EFSA to eventually assign eating occasion to meals.	M3	Controlled vocabulary	M0 Before breakfast M1 Breakfast M2 Snack between breakfast and lunch M3 Lunch M4 Snack between lunch and dinner M5 Dinner M6 Snack after dinner M7 Unclassified
PLACE	Place of consumption in English	P5	Controlled vocabulary	P1 At home P2 Out of home P3 Unclassified
EATSEQ	Ordinal number of the eating occasion within the meal. Each different food, recipe and composite food determines an eating occasion.	1	Numerical value	
RECIPECODE	Unique original identifier for the recipe or composite food when applicable. This code must be repeated for each ingredient belonging to the recipe or composite food.	H9874	Text description	
ORRECIPEDESC	Description of the recipe or composite food when applicable (in the original language). This code must be repeated for each ingredient belonging to the recipe or composite food.	Zuppa di fagioli	Text description	
ENRECIPEDESC	Description of the recipe or composite food when applicable (in English). This code must be repeated for each ingredient belonging to the recipe or composite food.	Beans soup	Text description	
AMOUNTRECIPE	Amount consumed of the total recipe or composite food (in grams as consumed). This code must be repeated for each ingredient belonging to the recipe or composite food.	150	Numerical value	
ORFOODCODE	Unique identifier for the food or for the ingredient in case of recipe or composite food	10201	Ref ID	Variable used to link the "Foods" DB with the "Consumption" DB
AMOUNTFOOD	Amount (edible) consumed of the food or of the raw ingredient in case of recipe or composite food	50	Numerical value	
UNITMEAS	Unit of measurement for the amount (edible) consumed of the food or of the ingredient in case of recipe or	U1	Controlled vocabulary	U1 grams U2 units

Variable	Description	Example	Type	Database link
	composite food. Grams for all foods and beverages, Units for supplements and medicines.			
BRAND	Brand name	ACME	Text description (Max 250 car)	
PROCESS	Description of the type of processing (in English)	Deep fried	Text description (Max 250 car)	
PACKAGE	Description of the type of packaging (in English)	Glass	Text description (Max 250 car)	

c. FOOD DESCRIPTION AND COMPOSITION TABLE

Variable	Description	Example	Type	Database link
ORFOODCODE	Unique original (National) food identifier	10201	ID	Variable used to link the "Foods" DB with the "Consumption" DB
ORFOODNAME	Food description in the original language	Mela	Text description	
ENFOODNAME	Food description in the English language	Apple	Text description	
FOODEXCODE	EFSA food identifier (see attached document)	CI.09.001454	Controlled vocabulary	
COMMENTSFOOD	Text field to be used in order to provide additional information about the food (e.g. facets) or to report on possible problems related to its classification		Text description (Max 250 car)	
ENERGY	Amount of energy per 100 grams edible portions of the food (in Kcal)	80	Numerical value	
FAT	Amount of total fat per 100 grams edible portions of the food (in grams)	6	Numerical value	
CARB	Amount of total carbohydrates per 100 grams edible portions of the food (in grams)	3	Numerical value	
PROTEINS	Amount of proteins per 100 grams edible portions of the food (in grams)	3	Numerical value	
ALCOHOL	Amount of alcohol per 100 gram edible portions of the food (in grams)	0	Numerical value	

GLOSSARY AND ABBREVIATIONS

CIAA: Confederation of the Food & Drink Industry in the EU

Comprehensive Database: EFSA Comprehensive European Food Consumption Database

Concise Database: EFSA Concise European food consumption database

DATEX Data Collection and Exposure

DCF Data Collection Framework

EC: European Commission

EFSA European Food Safety Authority

EGFCD: Expert Group on Food Consumption Data

EU MENU: What's on the Menu in Europe?

EU European Union

EXPOCHI: Individual food consumption data and exposure assessment studies for children

FCE WG: Food Consumption and Exposure Working Group

IT Information Technology

MS Member State

MRLs Maximum Residue Levels

PRIMo Pesticide Residue Intake Model