EUROFIR WORKPACKAGE 1.3, TASK GROUP 4
GUIDELINES FOR QUALITY INDEX ATTRIBUTION TO ORIGINAL DATA FROM SCIENTIFIC LITERATURE OR REPORTS FOR EUROFIR DATA INTERCHANGE

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Report prepared by Work Package 1.3, Task Group 4:

Marine Oseredczuk (AFSSA)

Simonetta Salvini (CSPO)

In collaboration with Work Package 1.8.

Mark Roe (IFR)

Anders Moller (DFI)

and members of EuroFIR Work Package 1.3 and 1.8 and compilers (Isabelle Castanheira, Paolo Colombani, Joanne Holden, Jayne Ireland, Ian Unwin, Ana-Lucia Vasquez)

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The initial report is updated by EuroFIR NEXUS Task 1.4. Updates were made based on the EuroFIR NEXUS deliverable 1.8 Report on integrated data quality evaluation system including specific contributions from Isabel Castanheira (INSA), Velimatti Ollilainen (University of Helsinki), Mark Roe (IFR) and Paul Finglas.

Marine Oseredczuk (ANSES)

Susanne Westenbrink (RIVM)

In collaboration with EuroFIR NEXUS compilers,

Some suggested modifications may need validation by the EuroFIR compiler network.

***ABSTRACT**:*

The purpose of this document is to give guidelines for quality assessment and Quality Index attribution to original data from scientific literature and laboratory reports in EuroFIR interchange data. This system was partially inspired by existing systems (USDA, AFSSA, BASIS, CSPO, BLS) and it should allow compilers to evaluate the quality of their original data according to common guidelines. The system provides 7 scores to be stored and interchanged: one score for each of the 6 categories (see below), plus the summary score, the so called Quality Index (QI).

Quality evaluation is based on the following categories: 1. Food description 2. Component identification 3. Sampling plan 4. Number of analytical samples 5. Sample handling 6. Analytical method and analytical quality control.

To help compilers in the evaluation, a set of criteria is proposed within each category: answers to the criteria will guide the compiler to evaluate the quality of the datum that is entered in the interchange files. Each category receives a score from 5 for high quality to 1 for low quality. All scores are then summed to form the QI, ranging from 35 (high) to 6 (low).

A set of examples is reported at the end of the document

KEYWORDS:

Quality Assessment, Quality Index, Confidence Code, Category, Criterion/criteria, Original data from scientific literature and laboratory reports

Contents

1. PRINCIPLES

The purpose of this document is to provide guidelines for quality assessment and QI attribution to original data from scientific literature and reports in EuroFIR interchange data. Since the launch of the initial report the term indicating the Quality Evaluation of analytical data from SCIentific literature and laboratory REPorts transferred to *QE scirep*, although the terms QI attribution, QI index are also used in the text.

The new system of quality assessment for EuroFIR data interchange presented below was inspired by existing systems - USDA, AFSSA, BASIS, CSPO, BLS (see Appendix 2,3,4,5,6) - and should allow compilers to evaluate the quality of their original data according to common guidelines.

As currently proposed, the system allows for 6 scores from each of the quality categories (see below) and a total score for the quality index (QI). These 7 quality indicators will all be interchanged. A Confidence Code (CC) based on the quality index may be developed and could also be interchanged.

1.1. CATEGORIES

Previous work conducted by WP 1.3 TG4 to compare the existing quality assessment systems described the following common CATEGORIES:

1. Food description
2. Component identification
3. Sampling plan
4. Number of analytical samples
5. Sample handling
6. Analytical method and analytical quality control

An evaluation of documentation and quality assessment was carried out by compilers in August 2007 and the results were used to revise the quality assessment system. The main conclusion of the testing exercise was that categories related to analytical method (4, 5 and 6) were difficult for compilers without an analytical background to assess and that consideration should be given to simplifying those categories.
The initial seven categories described above were reduced to four with 'number of analytical samples', sample handling', analytical method' and 'analytical performance' merged into a single category. Following further discussion at the EuroFIR compiler network meeting in Norwich, March 2008, it was agreed to revert back to 7 categories to enable compilers to interchange the specific scores for all relevant sampling and analytical questions, for compatibility with the EuroFIR BASIS quality assessment system and to allow more direct comparison with the USDA data evaluation system. Then, in March 2013, reorganization of criteria for analytical method and analytical control category lead to merging of these categories.

1.2. CRITERIA

In each category, criteria will be used to assess the level of quality, e.g., in the category food description, one of the criteria will be: "for primary foods, was the name of part of plant or part of animal provided?"

For each criterion, the compiler will give one answer: YES, NO. For some criteria, NOT APPLICABLE is an additional possible answer.

IMPORTANT WARNINGS TO ANSWER CRITERIA APPROPRIATELY

1. **NOT APPLICABLE means that the criterion considered is not relevant for the food and nutrient considered, it does not mean that the information is missing in the data source.**

2. **Unless stated in the guidelines specific to a criterion, generally speaking, when information is <u>not provided in the data source</u> and where common eating habits allow various possibilities, the answer to the criterion considered should be <u>NO</u> and not NOT APPLICABLE.**

3. **In the given context of data quality assessment with *QE scirep*, "provided" means "<u>provided in the data source or undoubtedly inferred from information provided in the data source</u>". If no information is available in the whole data source to answer the criterion, the answer should be the one that leads to minimum score for this criterion: NO, in accordance with point 1.**

The criteria presented in this document are for quality assessment of original data within the framework of EuroFIR data interchange. For quality assessment of original data aimed at producing representative food composition data for a specific country, sampling plan and food description may be assessed using different criteria. For EuroFIR data interchange, the aim of the quality assessment of the sampling plan is to know if samples are representative for the consumption of the food in the country where the study was conducted, whereas for quality assessment of original data to be included in a national database, it is important for compilers to evaluate the sampling plan in terms of representativeness of the samples for the consumption of the food in the compiler's own country *(see practical examples in the categories mentioned).*

1.3. SCORING OF EACH CATEGORY

Based on answers to all criteria within a category, the compiler will assign a score (1-5) to the category or 1-10 for the category analytical method and analytical quality control), based on their *subjective* judgment. Criteria that are NOT APPLICABLE are not counted in the total score for the quality assessment and they will not have a negative effect on the quality score for the category.

The answers given to each criterion should be kept for future reference/validation/reproducibility of the final score that was assigned (*please note: this implies however that these answers be kept in a separate file/spread sheet/dataset, not to be interchanged at this stage).*

The following scores can thus be assigned to each category:

5 = high quality
4= less than high quality but better than intermediate
3= intermediate
2= better than low quality but less than intermediate
1= low quality

Only for category 6 (analytical method and analytical quality control), the score can reach 10, 10 meaning high quality.

When data is interchanged, compilers can refer to the quality scores given in each category and can make their own assessment of whether or not the data interchanged is fit for purpose.

Where all criteria are YES or NOT APPLICABLE the score for this category should be 5 (high quality). Where all criteria are NO (with or without some NOT APPLICABLE criteria), the score for this category should be 1 (low quality). Where there are criteria with a mixture of YES and NO answers, the present report indicates a scoring strategy that can be translated in an algorithm for automatic determination of the score for the category based on answers to criteria given by compilers.

1.4. QUALITY INDEX – QI

The individual scores assigned to the six categories should be summed, to obtain the overall Quality Index, a number that will range from 6 (low quality) to 35 (high quality).

Scores for the six categories could also be weighted to comply with the USDA scheme (0-100%) and to make the resulting CC easier to establish (e.g. 0-25: D, 26-50: C, 51-75: B, 76-100: A). Initially the weighting of each category could be 1 (all categories are weighted equally); however there is a strong case for some

categories, e.g. food description and component identification to be considered more important than the others.

In addition to the overall QI, the individual scores of the six categories will be recorded as part of EuroFIR value documentation.

1.5. CONFIDENCE CODE – CC

In some systems, quality index is summarized in a so called “confidence code” (CC), that is in general expressed as A, B, C or D depending on the quality index scoring. The CC easily summarizes the level of confidence that can be given to the specific component in the interchange dataset, where A = high and D = low.

At the present time, no confidence code is assigned to the EuroFIR quality assessment process.

2. FOOD DESCRIPTION

2.1. GENERAL COMMENTS AND DEFINITION

The description of a food in the data source should be unambiguous. However, the type of information needed in terms of food description will not be the same for all types of food. Compilers will have to assess if the information provided in the source reference is appropriate in terms of food description. Some evaluation criteria will apply to all kinds of food, some apply only to manufactured food and some to homemade or restaurant made dishes.

In the EuroFIR interchange files (either for original data or aggregated, compiled data) all foods must be described by the LanguaL food indexing system. Most of the criteria for assessment listed below are thus based on LanguaL facets.

2.2. CRITERIA FOR ASSESSMENT

	FOOD DESCRIPTION	YES	NO	N/A
	A. FOR ALL TYPES OF FOOD			
1	Is the **food group** (e.g. beverage, dessert, savory snack, pasta dish) provided?			
2	Was the **source of the food** or of the main ingredient provided (best if scientific name included, cutivar/variety, genus/species, etc.)?			
3	Was the name of the **part of plant or part of animal provided**?			
4	Was the **analyzed portion** described and is it clear if the food was analyzed with or without the inedible part?			
5	Was the extent of **heat treatment** provided?			
6	If the food was cooked, were satisfactory **cooking method** details provided?			
7	Was relevant information on **treatment applied** provided?			

8	Was information on **preservation method** provided?			
9	Was information on **packing medium** provided?			
10	Was information about the geographical **origin of the food** provided (place of purchase for manufactured foods, place of production for other foods)?			
11	Was information about the date of purchase (for manufactured foods, date of production for other foods) of the food provided?			
12	Was the **moisture** content of the sample measured and the result given?			
	B: FOR MANUFACTURED PREPACKED FOOD ONLY			
13	Was the **generic name** provided (e.g. chocolate paste with hazelnuts)?			
14	Was the **commercial name** provided (e.g. Nutella)?			
15	Was the **brand** provided (e.g. Ferrero)?			
16	Was relevant information on **consumer group/ dietary use/label claim** provided?			
	C: FOR HOME MADE DISHES OR FOODS SOLD IN RESTAURANTS			
17	Was the **complete name and description** of the recipe provided?			

2.3. COMMENTS ON CRITERIA FOR ASSESSMENT

A. FOR ALL TYPES OF FOOD

Criterion 1. Is the food group (e.g. beverage, dessert, pasta dish) provided ?

This is a basic criterion to understand what the food is, even if the main ingredient is not known, e.g. in composite foods. Food classification is indexed using facet A of the LanguaL thesaurus. In the context of *QE scirep*, no precise food classification system is referred to, since many different ones are available and also included in LanguaL facet A. Any food group may contribute to proper identification of the food.

Criterion 2. Was the source of the food or of the main ingredient provided (best if scientific name included, cultivar/variety, genus/species, etc.)?

Food source is indexed using facet B of the LanguaL thesaurus.

For primary foods, the biological source (plant, animal, mineral) needs to be specified. If facet B is a generic term (e.g. MEAT ANIMAL (MAMMAL) [B1134] or VEGETABLE-PRODUCING PLANT [B1579]) or NOT KNOWN) then the answer to this criterion is NO.

For composite manufactured foods, the food source of the main ingredient might be specified (in which case, the answer is YES). In some cases, a generic term is acceptable, for example SUGAR—PRODUCING PLANT for sugar (it is not essential to know the source of the sugar used as an ingredient). If the main ingredient is not known, then the criterion should be NOT APPLICABLE.

Criterion 3. Was the name of the part of the plant or part of animal provided?

This criterion is needed to specify if the part of the plant or animal that is the principal ingredient of the food was defined in the paper. The criterion should be described by LanguaL facet C. What constitutes a clear indication will depend on the food. For example, for a fruit or vegetable it should be clear whether or not the peel or skin was present. As mentioned in the warnings, the whole data source should be considered to find the requested information. When a fruit is peeled during sample preparation, even if the food description did not mention that the value to be assessed refers to fruit without peel, compilers should consider that the information was clearly provided in the data source and the answer YES should be chosen.

In the case of wheat bread, we need to know if it was made with refined flour or whole grain flour, including or excluding the germ. For an animal product we want to know if we are talking about a muscle, an egg, an organ, etc.

Criterion 4. Was the analyzed portion described and is it clear if the food was analyzed with or without the inedible part?

The analyzed portion should be described because in some cases it may be a major determinant of quality (e.g. for a fruit it should be clear whether or not the value relates to the fruit with or without skin).

This information is also included in 'part of plant or animal' (criterion 3.), but it is better to explicitly include it as a criterion. It applies to all types of food, even processed: for example we can have canned mackerel that was analysed with bones or without bones. If the paper specifies what part was analysed, then the answer will be YES. If the food could contain an inedible part but the part analysed was not specified then the answer will be NO. If the food clearly wouldn't have an inedible portion (e.g. a beverage) the answer will be NOT APPLICABLE.

When assessing this criterion, if a compiler has some doubts on the exact nature of the edible portion of a food because it is not explicitly indicated in the data source, the compiler should pay attention to the context of the data source. Is it a paper published in a journal dedicated to feed (animals may eat different parts of plants or of animals than human do)? Does the paper originate from a country where eating habits are different from the local habits? When this is the case, the compiler should make a sensible assessment and possibly answer NO to the criterion.

This edible portion differs when food is considered cooked or raw, treated or not, preserved or not. Size of food may also affect edible portion.

Criterion 5. Is the extent of heat treatment provided?

This criterion is meant to assess if any type of heat treatment has been applied to the food. If information on whether the food was heat treated or not is provided, then a specific LanguaL facet F can be assigned, and the answer to the criteria will be YES. In particular, if it is clear that no heat treatment was applied, i.e. the food was "raw", the answer is YES. If facet F is NOT KNOWN, then the answer to this criterion is NO. In many cases this information will not be stated but can be undoubtedly be inferred by the type of food, for example bread or pasteurized dairy products and in that case the answer will be YES.

Heat treatment can be applied either in relation with a cooking or a preservation method. Refer to LanguaL http://www.langual.org/langual_Thesaurus.asp:

* a fully-heated food is a food heat-treated for a time sufficient to fully change its flavor and textural characteristics and to cause significant chemical changes and/or destruction of enzyme and microbial activity. The product can be consumed without further cooking.

* a partially heat-treated food is a food heat-treated for a time sufficient to partially change its flavor and textural characteristics and to cause some chemical changes and/or some reduction in enzyme and microbial activity. The product can be ready for consumption in a shortened cooking time. Products labeled

'quick cooking' are often partially heat-treated. Some products are consumed partially heat-treated, e.g., pasteurized milk, blanched broccoli, or rare beef.

So, extent of heat treatment refers to time (and temperature) of treatment. They can be compared to usual cooking recommendations made in cookbooks on duration and temperature in order to distinguish between partially and fully heat-treated foods, if not explicitly stated in the data source.

Criterion 6. If the food was cooked before consumption, were satisfactory cooking method details provided?

Cooking procedure can affect the nutrient content of food. Therefore it is essential to know how the food was cooked. In other words, can a specific LanguaL facet G be assigned to the food? The cooking method details that may be provided (where applicable) include:

- Instrument (traditional oven or micro-wave oven, pan) or method (boiled, deep-fried...)
- Ingredients added for cooking (salt, water, fat…)

Cooking time and cooking temperature are not mentioned there since they refer to criterion 5.

For primary foods, if facet G is NOT KNOWN or if important cooking method details are missing, then the answer to this criterion is NO. If the food was manufactured (e.g. breakfast cereal) or not cooked, then the answer is NOT APPLICABLE.

Criterion 7. Was relevant information on treatment applied provided?

Treatments applied are described by LanguaL facet H. These treatments are for example :
- component removed (e.g. alcohol, fat) component substituted (e.g. fat substituted)
- food modified (instantized, microbially / enzymatically modified: e.g. lactic acid fermented, cured, alcohol-acetic acid fermented, pickled, physically/chemically modified, e.g. candied, distilled, parboiled…)
- ingredient added (e.g. coated, oil added, filled or stuffed)
- water added or removed

Many foods will have treatments applied that may not be relevant in terms of food description and may not affect nutrient content. This criterion should be considered in terms of treatments that are relevant for food description or nutrient content e.g. addition of nutrients in foods that may be fortified, coatings, water addition or removal.

If the food is indexed with relevant treatment(s) or with NO TREATMENT APPLIED (e.g. raw food), the answer will be YES, as the information has been provided. If the food is indexed with TREATMENT APPLIED NOT KNOWN or if there is likely to be a relevant treatment that is not described, the answer will be NO.

Criterion 8. Was information on preservation method provided?

Preservation method can have an impact on nutrient content therefore information concerning treatments applied to the food specifically for preservation purposes is required. This criterion is described by LanguaL facet J. If the food is indexed with PRESERVATION METHOD NOT KNOWN, then the answer to this criterion is NO. If the food is indexed with NO PRESERVATION METHOD USED, the answer is YES, as the information has been provided. .

Criterion 9. Was information on packing medium provided?

Food can be packed in a medium for preservation or handling. As suggested in LanguaL, the packing medium can be edible (oil, salt brine, water, fruit juice…) and it can affect the nutrient content of the food. If a packing medium is used, then a specific LanguaL facet K should be assigned. If the food is indexed with PACKING MEDIUM NOT KNOWN, then the answer to this criterion is NO. If no packing medium was used, the answer is NOT APPLICABLE.

Criterion 10. Was information about the geographical origin of food provided? (place of purchase for manufactured foods, place of production for other foods)

The geographical origin of the food sample (geographical place or region) is important, because it allows verification of the applicability of the data to the country of the compiler. This criterion is described by LanguaL facet R and may relate to place of origin, production (for primary foods) or sale (for manufactured products) of the food. Identification of country or fishing zone will lead to the answer YES. There is no possibility to answer NOT APPLICABLE for this criterion. Identification of place of production or purchase should always be mentioned for proper documentation of nutrient data quality.

Criterion 11. Was information about the date of purchase (for manufactured foods, date of production for other foods) of the food provided?

For some foods the date of production is relevant (e.g. some fish are more or less fat depending on the season, fruit can contain more vitamins in the peak season), while for other foods it is irrelevant (e.g. soft drinks, etc). It is therefore important to look for this information in the paper. The answer will be YES if available, NO if not available. There is no possibility to answer NOT APPLICABLE for this criterion.

Criterion 12. Was the moisture content of the sample measured and the result given?

In order to be sure that nutrient data refer to a food with similar characteristics to the food in your database, it is important to compare the moisture of the samples. If the information is provided, answer YES, if not provided answer NO. There is no possibility to answer NOT APPLICABLE for this criterion.

When total solids or dry matter content are mentioned in the data source, moisture content can be deducted from this value and the answer to this criterion should be YES.

B: FOR MANUFACTURED PREPACKED FOOD ONLY

Criterion 13. Was the generic name provided (e.g. chocolate paste with hazelnuts)?

For manufactured food, it is important that a generic name is provided, so that users in different countries can understand what type of product was analysed. And even in the same country, a brand name may not be sufficient to identify a food. If information is provided, answer YES, if not provided and the type of product is not certain, answer NO.

Criterion 14. Was the commercial name provided (e.g. Nutella)?

For manufactured food, it is also important that the commercial name is provided. For example, when compilers have to aggregate data from different sources, it can be useful to know if the different data correspond to the same brand analyzed at different times (in this case, compilers may select the most recent data only), or to different brands. Commercial name and brand are criteria belonging to the category ‘food description’, but they may be relevant at a later stage, i.e. for aggregation. If a composite sample was analyzed, the commercial names of the primary samples should be given.

If information provided, answer YES, if not provided, answer NO.

Criterion 15. Was brand provided (e.g. Ferrero)?

For manufactured food, it is also important that the brand name is provided. The brand can help compilers to better identify products because in some cases, commercial names are different from one country to another, whereas brands are generally worldwide.

If information provided, answer YES, if not provided, answer NO. For composite samples, a list of commercial names of the primary samples (Criterion 14) may be sufficient and the answer NOT APPLICABLE be given.

Criterion 16. Was relevant information on consumer group/dietary use/label claim provided (e.g. enriched, low sodium, etc?)

Manufactured food can be designed for a specific consumer group or a specific dietary use, and sometimes specific claims are made concerning the food. This criterion is described by LanguaL facet P. Compilers should only use the answer 'NOT APPLICABLE' when they are sure (i.e. when specified in the source or when they know the legislation applied in the country where the sampling was done) that no relevant label claim or dietary use etc is possible for the food / component pair considered.

If a specific LanguaL facet P can be assigned, answer YES. If the food is indexed CONSUMER GROUP NOT KNOWN, then the answer to this criterion is NO. If the food is indexed CONSUMER GROUP NOT APPLICABLE, answer N/A.

C: FOR HOME MADE DISHES OR FOODS SOLD IN RESTAURANTS

Criterion 17. Was the complete name and description of the recipe provided?

The description of the recipe should at least include the ingredients used and any other relevant information, excluding the cooking method, which should already have been evaluated (if relevant) in criterion 6.

If name and description of the recipe are provided and are satisfactory, answer YES. If name and description of the recipe are not provided or are not satisfactory, the answer to this criterion is NO. If the item is not a home made or restaurant dish, the answer to this criterion is NOT APPLICABLE.

2.4. SCORING CATEGORY 'FOOD DESCRIPTION' USING ITS CRITERIA

At the end of the evaluation of all the criteria for the category, the compiler should judge the level of the available information and assign an appropriate score using the following method:

1) The following calculation has to be done depending on the number of YES, NO, and NOT APPLICABLE answers:

$$\frac{5 * \text{Number of YES answers}}{\text{Number of YES answers} + \text{Number of NO answers}}$$

2) A rounding procedure should be applied: values have to be rounded to the nearest integer. For example: 5,4 → 5; 5,77→ 5,8. Values ending with 5 will be rounded up. For example: 5,5 → 6; 4,5 → 5

3) If QI score for food description category < 1, round it up to 1.

For example if 8 categories are YES, 2 NO and 2 NOT APPLICABLE the quality score is (8*5)/10 = 4.

3. COMPONENT IDENTIFICATION AND RELATED TERMS

3.1. GENERAL COMMENTS AND DEFINITION

All components included in EuroFIR databases are clearly identified according to EuroFIR Standards and the related EuroFIR component thesaurus. In the process of quality assessment, compilers should be able to precisely assess if the component reported in the scientific publication used as a source refers to the same component that is included in the database. The work related to the quality assessment of the component identification is closely linked to the work related to category "analytical method" and "analytical quality control", especially since component identification may depend on the analytical method.

In addition to simply comparing component as presented in the paper and as presented in the EuroFIR component thesaurus, compilers should also pay attention to the unit (e.g. g, mg) and the matrix unit (e.g. per 100g) used to express the value in the paper. The unit and matrix unit should be unambiguous so that values can be converted from the unit and matrix unit used in the source to that used in a food composition database. There is no possibility to answer NOT APPLICABLE for any of the criterion of this category.

3.2. CRITERIA FOR ASSESSMENT

	COMPONENT IDENTIFICATION	YES	NO	N/A
1	Is the component described unambiguously?			
2	Is the unit unequivocal?			
3	Is the matrix unit unequivocal?			

3.3. COMMENTS ON CRITERIA FOR ASSESSMENT

Criterion 1. *Is the component described unambiguously?*

The component should be clearly identified and it should match the definition used in the EuroFIR component thesaurus. The chemical identity of the component must have been correctly established, e.g. based on the analytical method used.

Criterion 2. Is the unit unequivocal?

The value source should give the concentration of the component using a clear unequivocal unit. The unit does not need to match the unit used in the compiler's databank because if the unit reported is clear the value can be re-calculated without affecting data quality.

Criterion 3. Is the matrix unit unequivocal?

The value source should give the matrix unit of the component using a clear unequivocal unit.

3.4 SCORING CATEGORY 'COMPONENT IDENTIFICATION' USING ITS CRITERIA

At the end of the evaluation of all the criteria for the category component identification, the compiler should judge the level of the available information, and assign an appropriate score. If all three criteria are satisfied the score should be 5 but if 1 or more criteria are not satisfied the score should be 1. An intermediate score is not possible because if the component, unit or matrix unit are not unequivocal then the data is low quality for this category.

The scoring method in short is:

Number of YES answers = 3 → score for the category =5
Number of YES answers < 3 → score for the category =1

4. SAMPLING PLAN

4.1. GENERAL COMMENTS AND DEFINITIONS

Nomenclature for sampling in analytical chemistry has been defined by the IUPAC (International Union of Pure and Applied Chemistry) Compendium of Chemical Terminology, informally known as the IUPAC Gold

Book. Its electronic version is freely available at http://goldbook.iupac.org/T06284.html. The definitions of this nomenclature were also presented by W. Horwitz, in Nomenclature for Sampling in Analytical Chemistry (Recommendations 1990). Pure Appl. Chem., Vol. 62, No. 6, pp. 1193-1208, 1990. IUPAC recommendations will be the basis (with slight adjustments) of the assessment for all categories related to sampling. EuroFIR sampling definitions are given in Appendix 1.

When the same publication concerns different types of food, different sampling plans may have been developed for these different types of food reported in that publication. The quality assessment of an original datum must be based only on the information concerning the sampling of the precise food being assessed.

4.2. CRITERIA FOR ASSESSMENT

	SAMPLING PLAN (FOR ALL TYPES OF FOODS)	YES	NO	N/A
1	Was the sampling plan developed **to represent the consumption in the country where the study was conducted**?			
2	Is the sample a composite sample? (TO BE VALIDATED)?			
3	Were samples taken during **more than one season**?			
4	Were samples taken from **more than one geographical location**?			
5	Were samples taken from **the most important sales outlets (supermarket, local grocery, street market, restaurant, household etc)**?			
6	Was **more than one brand** (for manufactured pre-packed product) or more than one **cultivar** (for plant foods) or **subspecies** (for animal foods) sampled?			

4.3. COMMENTS ON CRITERIA FOR ASSESSMENT

Criterion 1: Was the sampling plan developed to represent the consumption in the country where the study was conducted?

For original data interchange in the context of EuroFIR, the representativeness of the sampling plan has to be evaluated from the point of view of the country where the study was conducted. As a consequence, the country of origin of the compiler performing the assessment should not intervene in this assessment.

Criterion 1 is important because it allows rapid identification of data produced with sampling plans that could be inadequate for inclusion in a national food composition databank (e.g. some sampling plans can aim at studying the effect of an experimental diet or experimental growth conditions on the composition of a food).

A sampling plan can be developed statistically, covering several seasons, geographical locations, sales outlet and brands, but the purpose of the sampling plan can be different from representativeness of the whole national consumption (e.g. the sampling plan can concern foods consumed by elderly women with low income).

The answer should be YES in the following cases:

- Any one unit has an equal chance of being sampled (random sampling, Greenfield H., Southgate D., 2003, p71)
- Or: samples were selected based on national consumption data, national production data or national population data.

No convenience sampling is acceptable. Convenience sampling is described by Greenfield H., Southgate D., 2003, p71 as sampling based on accessibility, expediency, cost or other reason not directly concerned with sampling parameters.

There is no possibility to answer NOT APPLICABLE for this criterion.

Criterion 2: Is the sample a composite sample?

PROPOSED MODIFICATIONS OF *QE SCIREP* TO BE VALIDATED:
Rephrase the criterion (formerly Was the number of primary samples <9), using now: Is the sample a composite sample?

There is no possibility to answer NOT APPLICABLE for this criterion.

Criterion 3: Were samples taken during more than one season?

For some foods, it is not relevant to sample in different seasons (for example, some foods are consumed only during one season, e.g. Christmas pudding, and some foods may have the same composition year long, e.g. soft drinks), while for some foods it may be relevant and very important to sample during more than one season. For that reason, relevance of season is considered during evaluation of this criterion.

For some foods, it is not the number of seasons for sampling that counts, but the relevance of the seasons themselves: when a food is consumed mainly in summer and autumn, sampling in winter and spring may not be relevant. Usually, manufactured pre-packed products are consumed all year, so it can be relevant to sample them at any time. Fruits and vegetables have seasonal peaks of production and consumption even if the majority of them are consumed most of the time - if there is only one season for sampling and if this season is the season of maximum consumption, then the answer to the criterion would be NOT APPLICABLE. When the food is consumed during the period of sampling but is also equally consumed in other seasons, then the answer to the criterion should be NO.

Criterion 4: Were samples taken from more than one geographical location?

It would be difficult for compilers to assess the relevance of the choice of a region and the number of regions for food sampling in a country that is not their country of origin or residence. So, to be pragmatic, for all types of food the assessment will be based only on the number of geographical locations for sampling. In the specific context of EuroFIR original data quality assessment, a geographical location is for example a city, or a region (or Länder in Germany, for example), but it does not refer to the smallest entities such as an area of a city.

There is no possibility to answer NOT APPLICABLE for this criterion.

Criterion 5: Were samples taken from the most important sales outlets (supermarket, local grocery, street market, restaurant, household…)?

In order to be representative of the food consumed by the national population, it is advisable that the samples taken are as available to consumers. A representative sampling plan is not done by sampling the ‘freshest’ foods right at the end at the production line or in the field.

Most foods are sold in many different types of sales outlet, this being a potential source of variability in composition. Compilers should be aware of sales outlets that are important for each food. When samples are taken from more than one sales outlet that are not the most important, the answer to the Criterion should be NO. For some foods e.g. branded processed and packaged foods, different types of sales outlet may sell the same product and in that case this criterion is not relevant.

For food sampled in a country that is not the country of the compiler, unless the data source mentions that the type of sales outlets where the food was sampled are the most important or very minor, consider the answer is NO. When a food is sold in only one type of sales outlet, then the answer to the criterion will be NOT APPLICABLE, since the issue is not relevant.

Criterion 6: Was more than one brand (for manufactured prepacked product) or more than one cultivar (for plant foods) or subspecies (for animal foods) sampled?

This criterion is relevant to generic foods, whether primary (for example fresh strawberries) or manufactured (for example pasteurised half-skimmed milk, canned beans). In this case, a relevant sampling plan should include the most consumed brands, cultivars or subspecies in the country of sampling.

When the data assessed concern a unique cultivar or subspecies described as such with LanguaL, then this criterion is NOT APPLICABLE.

4.4. SCORING CATEGORY 'SAMPLING PLAN' USING ITS CRITERIA

A previous version of *QE scirep* in June 2008 planned that compilers could assign different weights to the various criteria of this category. This would be a too compiler-dependant procedure. Therefore, following the *QE scirep* exercise done in November 2012, it is decided to assign equal weights to all criteria. A scoring strategy similar to the one used for the category food description has to be applied.

1) The following calculation has to be done depending on the number of YES, NO, and NOT APLICABLE answers :

$$\frac{5 * \text{Number of YES answers}}{\text{Number of YES answers} + \text{Number of NO answers}}$$

2) A rounding procedure should be applied: values have to be rounded to the nearest integer. For example: 5,4 → 5; 5,77→ 5,8. Values ending with 5 will be rounded up. For example: 5,5 → 6; 4,5 → 5

3) If QI score for sampling plan category < 1, round it up to 1.

5. NUMBER OF ANALYTICAL SAMPLES

5.1. GENERAL COMMENTS AND DEFINITION OF SAMPLES (IUPAC)

Definitions of sampling terms can be found in 'EuroFIR sampling Definitions' Appendix 1.

Analytical sample refers to the amount or volume of the test sample taken, from the primary or laboratory sample, for analysis, usually of known weight or volume. An analytical portion, of proper size for measurement of the concentration or other property of interest, can be taken from the analytical sample. Do not confuse **analytical samples** with **primary samples** (evaluated with the sampling plan) or with **replicate analyses** (evaluated with the analytical quality control).

5.2. CRITERIA FOR ASSESSMENT

Assessment of the number of analytical samples is based on the question

Is the number of analytical samples 1, 2, 3, 4 or ≥5?

5.3. COMMENTS ON CRITERIA FOR ASSESSMENT

Number of analytical samples

The number of analytical values used to produce the value to be quality assessed, without repetition. Repetitions are repeated analyses from the same homogenate (from extraction to analyses) or repeated analyses of the same extract. When the analytical value was obtained from a composite sample, the number to consider is still 1. This definition is compatible with the one used in USDA data quality assessment system (Holden et al., 1999[1], Holden et al. 2002[2]).

5.4. SCORING CATEGORY 'NUMBER OF ANALYTICAL SAMPLES'

When the number of analytical samples is not given in the publication, by default, it has to be considered for assessment as being minimal (i.e.1, so level 1 has to be chosen). If the number of analytical samples is ≥5, the score should be 5. If the number of samples is 2 – 4 the score should be equal to the number of samples.

The scoring method in short is:

Number of analytical samples > 5 → score for the category =5
Number of analytical samples ≤ 5 → score for the category = number of analytical samples.

It is obvious that the scoring strategy for the assessment of the number of analytical samples is totally arbitrary. Some situations (depending on the food, nutrient, amount of nutrient in the food and level of representativeness required) will require more analytical samples and some less! This category is considered important because analysis of a number of analytical samples allows measurement of variation around the mean value.

6. SAMPLE HANDLING

6.1. GENERAL COMMENTS

As mentioned earlier in the chapter regarding sampling plan, when referring to the IUPAC definition, sample handling is a part of the sampling plan itself, but will be considered in a distinct category.

As shown by W. Horowitz in Nomenclature for Sampling in Analytical Chemistry (Recommendations 1990). Pure Appl. Chem., Vol. 62, No. 6, pp. 1193-1208, 1990, sampling usually ends with the removal of the analytical portion from the analytical (or test) sample. If the laboratory sample is homogenous, then, the analytical portion can be taken directly from the laboratory sample (skipping the analytical sample step).

[1] Holden J., Alridge A., Beecher G., Buzzard M., Bhagwat S., David S, Douglass L., Gebhardt S., Haytowitz D., Schakel S., 1999, Carotenoid content of U. S. foods: an update of the database, Journal of Food Composition and Analysis, 12, 169-198

[2] Holden J., Baghwat S., Patterson K., 2002, Development of a multi nutrient data quality evaluation system, Journal of Food Composition and Analysis, 15, 339-348

In the context of EuroFIR original data quality assessment, 'sample handling' correspond to all steps leading up to taking the analytical portion, excluding the steps considered in the categories 'sampling plan'. 'Sample handling' also excludes chemical operations done in order to extract or purify the analyte from the analytical portion (these chemical operations are to be considered in the assessment of the analytical method).

As the purpose of the analysis is to estimate the concentration of the analyte in the primary sample from the analyte in the analytical portion, sample handling should be conducted so as to preserve the concentration of the analyte during the different steps of sample handling.

Adequate sample handling conditions can depend on:

- The analyte: some may be sensitive to microbial activity, to oxidation (enhanced by light, heat, catalysts) - Greenfield and Southgate (2003) summarize in table 5.6 p80 the effects of sample storage on nutrient content and precautions required to minimize them
- The food or food matrix: if the matrix is sensitive to drying out, then the concentration of the analyte in the matrix may change over time if samples are not kept in sealed containers. Some food matrices will be very difficult to homogenize (e.g. biscuits with jam filling), others such as liquids, will require less precautions.
- Storage duration: if sample storage is very short (similar in time and conditions to storage by consumers), then it is probably not necessary to go through a process of freeze drying or freezing at very low temperature.

General recommendations were proposed by Greenfield and Southgate (p76 to 79) for appropriate sample handling and include secure storage in inert containers, cooling of samples with crushed ice or solid CO_2 with minimal headspace, minimum delay of storage, exclusion of possibilities of contamination during cutting, mincing or grinding food samples, use of plastic or Teflon coated tools.

6.2. CRITERIA FOR ASSESSMENT

It is not possible to describe, for each food and analyte, the list of critical points to be considered for adequate sample handling. It is up to compilers to select from the proposed list of potential hazards that could affect the nutrient content of foods the applicable criteria for the data assessed. EuroFIR Guidelines for Analytical Methods (GAMA) considers the handling of samples, in relation to the analytical method and the component and can be referred to for more specific guidelines.

Sample handling including transportation and storage prior to taking the analytical portion can occur. The primary sample can be stored under some conditions while the analytical samples and analytical portions may be stored in other conditions,

	SAMPLE HANDLING	YES	NO	N/A
1	Were appropriate stabilization treatments applied (e.g. protection from heat/air/light/microbial activity)?			
2	Were the samples homogenized?			

6.3. COMMENTS ON CRITERIA FOR ASSESSMENT

Criterion 1: Were appropriate stabilization treatments applied (e.g. protection from heat/air/light/microbial activity, etc)?

This criterion is very much dependent on the type of component/food matrix considered. Some points are listed here as reminders of issues to be considered:

- HEAT: Greenfield and Southgate, 2003 p79, considers that storage in a frozen state is usually the minimum acceptable with preference given to –40°C or even –70°C. Storage at –20°C or –30°C is mentioned as acceptable for fat analyses.
- AIR: air contains dioxygen which can cause oxidation; air can also be a carrier of microbial organisms or particles. Depending on its water content and the water content of the food, air can also be responsible for water transfer. Protection against air in general can be achieved by storage in sealed container with at least minimum headspace or in vacuum packing.
- LIGHT: protection against light can be achieved by using aluminum bags for storage, or more simply, using closed cartons.
- MICROBIOLOGICAL OR ENZYMATIC ACTIVITY: some foods may naturally contain microbial organisms or particles (enzymes) which can modify the level of a nutrient in a food. Greenfield and Southgate, 2003 p79 indicate that sugars and vitamin C can be lost and folates deconjugated. Protection from deconjugation of folates can be obtained by addition of ascorbate).
- Damages that can occur due to MICROBIOLOGICAL OR ENZYMATIC CONTAMINATION can be comparable to damages due to microbiological or enzymatic activity pre-existing in food.
- Microbiological or enzymatic contamination can occur because of inadequate cleaning procedures or inadequate application of the procedures.
- CHEMICAL CONTAMINATION can also be due to inadequate cleaning procedures or inadequate application of them. The use of Teflon coated tools can prevent chemical contamination. The operations of mixing, grinding, homogenization can be critical steps for chemical contamination.

Greenfield and Southgate, 2003 p80 have made a table with “effects of sample storage and preparation on nutrient content and precautions required to minimize them”.

If compilers judge that protection from these potential damages would have no impact on the level of the analyte in the food considered, they can choose the answer ‘NOT APPLICABLE’.

As mentioned earlier, if sample transportation and storage time is short enough (similar in time and conditions to consumer application), then it is probably not necessary to take special measures to protect the analyte. Depending on the analyte, food matrix, duration of transportation and storage steps, precautions other than those described can be necessary.

Criterion 2: Were samples homogenized?

Even when considering some liquids or other apparently homogenous primary samples, homogenization is necessary before taking any portion of material. The importance of homogenization depends on the food and nutrient considered: for a composite dish such as sandwiches or couscous (with semolina, vegetables, meat and gravy), homogenization is essential. For these foods, if the information is not explicitly provided in the data source or undoubtedly inferred from information provided in the data source, the answer should be ‘NO’ If the food really does not need homogenization (water, soft drinks, whisky), then answer should be ‘NOT APPLICABLE’.

Verification of homogenization is ideal, but this requires additional analyses and expense, which is rarely feasible when producing food composition data. Therefore, these guidelines propose not to consider that verification or validation of homogenization is compulsory.

6.4. SCORING CATEGORY 'SAMPLE HANDLING' USING ITS CRITERIA

If compilers judge that the criteria have no impact on the level of the analyte in the food considered, they can choose the answer 'NOT APPLICABLE' for these criteria. When sample stabilization is necessary, but it is not described in the data source, the answer to this criterion should be NO. If the answer to either criterion 1 or 2 is NO then the category score should be 1 (low quality). If the answer to both criteria is YES or one YES and one NOT APPLICABLE, the score should be 5 (high quality).

This scoring method in short is:

Number of NO answers = 0 → score for the category =5
Number of NO answers > 0 → score for the category =1

7. ANALYTICAL METHOD AND ANALYTICAL QUALITY CONTROL

7.1. GENERAL COMMENTS

For EuroFIR data interchange, it was decided that the analytical method used to obtain a value in the source document will be described using a method type code from the EuroFIR Method Type Thesaurus and a method indicator descriptor from the EuroFIR Analytical Methods Thesaurus (e.g.: chromatography, HPLC). It was also decided that additional information on the key steps of an analytical method will be recorded in text fields as Methods Specifications in food composition databases and in the EuroFIR interchange files.

Some tools are currently developed within EuroFIR to link analytical methods and components and to define guidelines for assessment of analytical methods: these GAMA for each component will describe appropriate methods of analysis (including official methods) for that component and will include the key method steps to consider for assessment. The documents also indicate criteria for analytical quality control and will enable the compiler to decide whether or not an appropriate analytical method has been used and adequately applied.

Discussion with analysts in the framework of the EuroFIR NEXUS project lead to the merging of the analytical method and analytical quality control catagories and to the following new set of criteria. The former criteria were generally kept, with slight modifications. One criterion on assessment of key method steps was deleted, mainly because it may be too difficult for compilers to apply correctly, in so far as compilers are generally non-chemists. Three new criteria were added:

- Use of in-house validation study,
- Participation in collaborative studies,
- Recovery study leading to a maximum relative standard deviation of 20%.

7.2. CRITERIA FOR ASSESSMENT

For every criteria of this category NOT APPLICABLE is not a possible answer.

The way to answer the criteria is not linear, that is to say all criteria do not have to be answered independently. Depending on the answer to the criterion on accreditation of the lab for a given method, 6 criteria may or may not need to be answered in the new version of *QE scirep* for the category analytical method and analytical quality control. This is due to the fact that the fulfillment of these 6 criteria is indeed implied by the obtaining of an accreditation, according to ISO/IEC 17025:2005. (Consequently, if the 6 criteria are positively answered, the score should be the same as the score obtained when a lab is accredited for a given method.)

	ANALYTICAL METHOD	YES	NO	N/A
1	Were analytical sample replicates tested?			
2	Was the laboratory accredited for this method? *If yes, stop the assessment for this category, if no, answer the 6 following questions*			
	FOR VALUES OBTAINED WITH NON-ACCREDITED METHOD			
3	Does the analytical method used in the source match the list of appropriate analytical methods given in the GAMA?			
4	Was the method validated by an in-house validation study?			
5	Was the method validated by performance testing (PT schemes, proficiency testing)?			
6	Was the method validated by a collaborative study?			
7	Was the method validated using an appropriate reference material (analyte, concentration, matrix)			
8	Was the method validated by a recovery study leading to a relative standard deviation ≤ 20%			

7.3. COMMENTS ON CRITERIA FOR ASSESSMENT

Criterion 1. Were analytical sample replicates tested?

To satisfy this criterion, analytical portion replicates need to be tested (e.g. duplicate or triplicate determination for each sample ID). Analytical portion is defined in Appendix 1.

There is no possibility to choose NOT APPLICABLE for this criterion.

Criterion 2. Was the laboratory accredited for this method?

There is no possibility to choose NOT APPLICABLE for this criterion.

Criterion 3. ***Does the analytical method used in the source match the list of appropriate analytical methods given in the GAMA?***

This assessment should be based on the EuroFIR Analytical Method Guidelines for each component, taking into account food matrix.

If no information is available in the data source to answer the criterion, the answer should be the one that leads to minimum score for this criterion: NO.

There is no possibility to choose NOT APPLICABLE for this criterion.

Criterion 4. Was the method validated by a in-house validation study?

If no information is available in the data source to answer the criterion, the answer should be the one that leads to minimum score for this criterion: NO.

There is no possibility to choose NOT APPLICABLE for this criterion.

Criterion 5. Was the method validated by performance testing (PT schemes, proficiency testing)?

If no information is available in the data source to answer the criterion, the answer should be the one that leads to minimum score for this criterion: NO.

There is no possibility to choose NOT APPLICABLE for this criterion.

Criterion 6. Was the method validated by a collaborative study?

If no information is available in the data source to answer the criterion, the answer should be the one that leads to minimum score for this criterion: NO.

There is no possibility to choose NOT APPLICABLE for this criterion.

Criterion 7. Was the method validated using an appropriate reference material (analyte, concentration, matrix)

A reference material is a material or substance one or more whose property values are sufficiently homogenous and well established to be used for the calibration on an apparatus, the assessment of a measurement method, or of assigning values to materials (ISO/IEC Guide 30 – 119,2.1).

Appropriate reference materials are mentioned in the GAMA or a link to the institutions providing these materials is given. The analyte in the reference material should be similar to the one to be tested in the food samples. Its concentration in the reference material should be compatible with the expected range of concentrations in the food samples. The matrix of the reference material should be as close as possible to the matrix of the food samples to be tested.

If no information is available in the data source to answer the criterion, the answer should be the one that leads to minimum score for this criterion: NO.

There is no possibility to choose NOT APPLICABLE for this criterion.

Criterion 8. Was the method validated by a recovery study leading to a relative standard deviation ≤ 20%

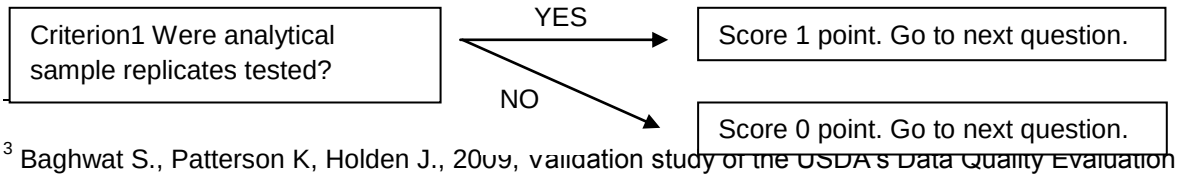
This criterion is inspired by the pragmatic approach used by the USDA and described by Bhagwat et al, 2009[3].

If no information is available in the data source to answer the criterion, the answer should be the one that leads to minimum score for this criterion: NO.

There is no possibility to choose NOT APPLICABLE for this criterion.

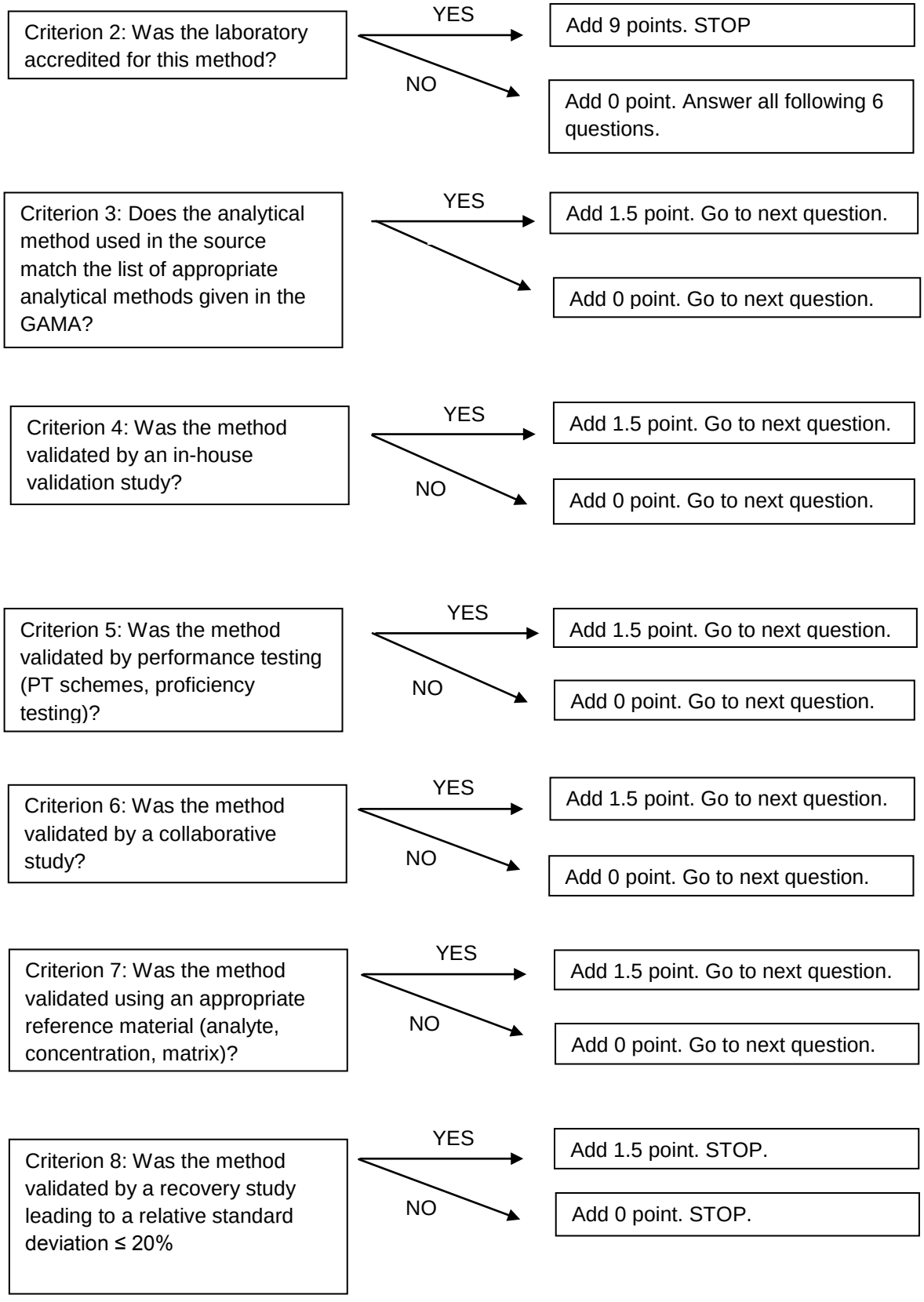
7.4. SCORING CATEGORY 'ANALYTICAL METHOD AND QUALITY CONTROL' USING ITS CRITERIA

:



[3] Baghwat S., Patterson K, Holden J., 2009, Validation study of the USDA's Data Quality Evaluation System, Journal of Food Composition and Analysis, 22, 366-372

Add to the previous score the one obtained after using this schemes:



Final score after summation of points obtained will be rounded to the nearest integer, this meaning that values ending with ,5 will be rounded up to the nearer highest integer.

Possible scores for this category analytical method and analytical quality control are then: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10.

9. APPLICABILITY TO OTHER DATA SOURCES

9.1. GENERAL COMMENTS

The EuroFIR quality assessment system is designed for evaluation of data from original scientific literature but may also be applied to other sources of data, e.g. product labels.

The food description may be scored by making assumptions based on list of ingredients on the food label and by the compiler's knowledge of the relevant food-processing. Component identification should be assumed to be acceptable, since it should comply with food labelling regulations (*Council Directive 90/496/EEC of 24 September 1990 on nutrition labelling for foodstuffs*). The other categories can only be scored as low quality because there is no information available.

If these categories are scored as low quality then the overall quality index will also be low. If it were decided to compute a Confidence Code, consideration should be given to using a specific Confidence Code for data from industry. This code would imply that the data has not been quality assessed by EuroFIR and responsibility for data quality rests with the product manufacturer in accordance with EU labelling regulations.

10.1 SUMMARY OF CATEGORIES AND CRITERIA

FOOD DESCRIPTION

A. FOR ALL TYPES OF FOOD

Is the **food group** (e.g. beverage, dessert, savory snack, pasta dish) provided?
Was the source of the food or of the main ingredient provided (best if scientific name included, cutivar/variety, genus/species, etc)?
Was the name of the part of plant or part of animal provided?
Was the analyzed portion described and is it clear if the food was analyzed with or without the inedible part?
Was the extent of heat treatment provided?
If the food was cooked, were satisfactory cooking method details provided?
Was relevant information on treatment applied provided?
Was information on preservation method provided?
Was information on packing medium provided?
Was information about the geographical origin of food provided (place of purchase for manufactured foods, place of production for other foods)?
Was information about the date of purchase (for manufactured foods, date of production for other foods) of the food provided?
Was the moisture content of the sample measured and the result given?

B: FOR MANUFACTURED PREPACKED FOOD ONLY

Was the generic name)?
Was the commercial name provided)?
Was brand provided?
Was relevant information on consumer group/dietary use/label claim provided?

C: FOR HOME MADE DISHES OR FOODS SOLD IN RESTAURANTS

Was the complete name and description of the recipe provided?

COMPONENT IDENTIFICATION

Is the component described unambiguously?
Is the unit unequivocal?
Is the matrix unit unequivocal?

SAMPLING PLAN

Was the sampling plan developed to represent consumption in the country where the study was conducted?
Is the sample a composite sample?
Were samples taken during more than one season?
Were samples taken from more than one geographical location?
Were samples taken from the most important sales outlet (supermarket, local grocery, street market, restaurant, household…)?
Was more than one brand (for manufactured pre-packed product) or more than one cultivar (for plant foods) or subspecies (for animal foods) sampled?

NUMBER OF ANALYTICAL SAMPLES

Is the number of analytical samples 1, 2, 3, 4, or ≥ 5?

SAMPLE HANDLING

Were appropriate stabilization treatments applied (e.g. protection from heat/air/light/microbial activity)?
Were the samples homogenized?

ANALYTICAL METHOD AND ANALYTICAL QUALITY CONTROL

Were analytical sample replicates tested?
Was the laboratory accredited for this method?

FOR VALUES OBTAINED WITH NON-ACCREDITED METHOD

Does the analytical method used in the source match the list of appropriate analytical methods given in the GAMA?
Was the method validated by an in-house validation study?
Was the method validated by performance testing (PT schemes, proficiency testing)?
Was the method validated by a collaborative study?
Was the method validated using an appropriate reference material (analyte, concentration, matrix)
Was the method validated by a recovery study leading to a relative standard deviation ≤ 20% (or 80% ≤ CV ≤120%)

10.2 SUMMARY OF SCORING CATEGORIES

FOOD DESCRIPTION

Scoring: number of criteria answered positively * 5 / total number of criteria judged relevant
Possible scores: 1, 2, 3, 4 or 5 (after rounding)

COMPONENT IDENTIFICATION

Possible scores: 5 or 1 only (1 if one or more criteria are not satisfied)

SAMPLING PLAN

Possible scores: 1, 2, 3, 4 or 5 (after rounding)

NUMBER OF ANALYTICAL SAMPLES

Possible scores: 1, 2, 3, 4 or 5

SAMPLE HANDLING

Possible scores: 5 or 1 only (1 if one or more criteria are not satisfied)

ANALYTICAL METHOD AND ANALYTICAL QUALITY CONTROL

Possible scores: 1, 2, 3, 4 or 5, 6, 7, 8, 9, 10.

11. EXAMPLES

In this section we will discuss a few examples of quality assessment of scientific papers. For each paper the example will concentrate on one specific component/food pair.

11.1 EXAMPLE 1

Paper: Sahan Y, Basoglu F, Gucer S. ICP-MS analysis of a series of metals (Namely: Mg, Cr, Co, Ni, Fe, Cu, Zn, Sn, Cd and Pb) in black and green olive samples from Bursa, Turkey. Food Chemistry 105 (2007) 395-399.

Value assessed: Zinc in green olives = 10.58 mg/kg

Food Description

CRITERION	YES	NO	N/A	NOTE
Is the food group (e.g. beverage, dessert, savory snack, pasta dish) provided?	X			
Was the **food source** of the food or of the main ingredient provided (best if scientific name included, variety, species, cultivar)?	X			
Was the name of the **part of plant or part of animal provided**?	X			
Was the **analyzed portion** described and is it stated explicitly if the food was analyzed with or without the inedible part?	X			
Was the extent of **heat treatment** provided?			X	
If the food was cooked, were satisfactory **cooking method** details provided?			X	
Was relevant information on **treatment applied** provided?	X			Alkalized, fermented
Was information on **preservation method** provided?	X			Preserved in brine
Was information on **packing medium** provided?			X	Not stated – may be in brine
Was information about the geographical origin of the food provided (place of purchase for manufactured foods, place of production for other foods)?	X			Bought in Bursa, Turkey
Was information on the date of purchase (for manufactured foods) or date of production (production (for other foods) of the food provided?		X		Probably not relevant for Zn
Was the **moisture** of the sample measured and the result given?		X		

Seven positive answers were given out of 9 possible answers (3 were considered Not Applicable).

To standardize the scoring system, the 7/8 of the maximum score were calculated as (7*5)/9 = 3.9

Food Description Score = 4

Component Identification

CRITERION	YES	NO	N/A	NOTES
Is the component described unambiguously?	X			
Is the unit unequivocal?	X			
Is the matrix unequivocal	X			

All criteria received a YES answer. **Component Identification Score = 5**

Sampling Plan

CRITERION	YES	NO	N/A	NOTES
Was the sampling plan developed to represent consumption in the country where the study was conducted?		X		
Is the sample a composite sample?		X		There are 46 analytical samples but there is no mention regarding the fact that each of the samples could be a composite.
Were samples taken during more than one season of the year?			X	Not relevant for Zn?
Were samples taken from more than one geographical location?		X		
Were samples taken from the most important sales outlet (supermarket, local grocery, street market, restaurant, household…)?			X	Market suppliers different to large retailers?
Was more than one brand (for manufactured pre-packed product) or more than one cultivar (for plant foods) or subspecies (for animal foods) sampled?	X			25 brands

2 criteria were considered not relevant for zinc in olives. 1 criteria out of the remaining 4 obtained a positive answer NOT APPLICABLE. The score was therefore calculated as (1*5)/4 = 1.25

Sampling Plan Score = 1

Number of Analytical Samples

The number of analytical samples is >5 therefore **Number of Analytical Samples score = 5**

Sample Handling

CRITERION	YES	NO	N/A	NOTES
Was appropriate treatment for **stabilization** applied (e.g. protection from heat/air/light/microbial activity)	X			Steps taken to avoid metal and dust contamination
Were the samples homogenized?		X		

Samples were protected from contamination and but were not homogenized so **Sample Handling Score = 1**

Analytical Method and analytical quality control

CRITERION	YES	NO	N/A	NOTES
Were analytical sample replicates tested?		X		
Was the laboratory accredited for this method?		X		
Does the analytical method used in the source match the list of appropriate analytical methods given in the GAMA?	X			ICP-MS
Was the method validated by a in-house validation study?		X		
Was the method validated by performance testing (PT schemes, proficiency testing)?		X		
Was the method validated by a collaborative study?		X		
Was the method validated using an appropriate reference material (analyte, concentration, matrix)		X		
Was the method validated by a recovery study leading to a relative standard deviation ≤ 20% (or 80% ≤ CV ≤120%)		X		

Analytical method and analytical quality control score = 1,5 rounded up to 2

Total Quality Index = 4 + 5 + 1 + 5 + 1 + 2 = 16

11.2 EXAMPLE 2

Paper: Barros L, Baptista P, Correia D, Casal S, Oliveira B, Ferreira I. Fatty acid and sugar compositions, and nutritional value of five wild edible mushrooms from Northeast Portugal. Food Chemistry 105 (2007) 140-145.

Value assessed: Total fat content of Mushroom (A. arvensis) = 0.14 g/100g fresh weight

Food Description

CRITERION	YES	NO	N/A	NOTES
Is the food group (e.g. beverage, dessert, savory snack, pasta dish) provided?	X			
Was the **food source** of the food or of the main ingredient provided (best if scientific name included, variety, species, cultivar)?	X			
Was the name of the **part of plant or part of animal clearly** provided?	X			Plant above surface
Was the **analyzed portion** described and is it stated explicitly if the food was analyzed with or without the inedible part?		X		Stalks trimmed?
Was the extent of **heat treatment** provided?			X	Assume no treatment?
If the food was cooked, were satisfactory **cooking method** details provided?			X	Assume raw?
Was relevant information on **treatment applied** provided?	X			Water removed
Was information on **preservation method** provided?		X		
Was information on **packing medium** provided?			X	
Was information about the geographical **origin of the food** provided (place of purchase for manufactured foods, place of production for other foods)?	X			Braganca (North-east Portugal)
Was information on the date of purchase (for manufactured foods) or date of production (production (for other foods) of the food provided?	X			Autumn 2006
Was the **moisture** of the sample measured and the result given?	X			

3 criteria can be considered NOT APPLICABLE. Among the 9 remaining criteria, 7 positive answers were given. The score can be calculated as (7*5)/9 = 3.88

Food Description Score = 4

Component Identification

CRITERION	YES	NO	N/A	NOTES
Is the component described unambiguously?	X			
Is the unit unequivocal?	X			g

Is the matrix unequivocal	X			g/100g

All criteria received a YES answer. **Component Identification Score = 5**

Sampling Plan

CRITERION	YES	NO	N/A	NOTES
Was the sampling plan developed to represent consumption in the country where the study was conducted?		X		
Is the sample a composite sample?		X		Not stated
Were samples taken during more than one season?			X	
Were samples taken from more than one geographical location?		X		
Were samples taken from the most important sales outlet (supermarket, local grocery, street market, restaurant, household…)?			X	Wild mushroom
Was more than one brand (for manufactured pre-packed product) or more than one cultivar (for plant foods) or subspecies (for animal foods) sampled?			X	A; Avensis is specified

No relevant criteria obtained a positive score. The total score is by definition = 1

Sampling Plan Score = 1

Number of Analytical Samples

The number of analytical samples is 3 therefore **Number of Analytical Samples score = 3**

Sample Handling

CRITERION	YES	NO	N/A	NOTES
Was appropriate treatment for **stabilization** applied (e.g. protection from heat/air/light/microbial activity)			X	
Were the samples homogenized?		X		

Samples were not homogenized so **Sample Handling Score = 1**

Analytical method and analytical quality control

CRITERION	YES	NO	N/A	NOTES

Were analytical sample replicates tested?		X		
Was the laboratory accredited for this method?		X		
Does the analytical method used in the source match the list of appropriate analytical methods given in the GAMA?		X		
Was the method validated by a in-house validation study?		X		
Was the method validated by performance testing (PT schemes, proficiency testing)?		X		
Was the method validated by a collaborative study?		X		
Was the method validated using an appropriate reference material (analyte, concentration, matrix)		X		
Was the method validated by a recovery study leading to a relative standard deviation ≤ 20% (or 80% ≤ CV ≤120%)		X		

Analytical Method and analytical quality control score = 1

Total Quality Index = 4 + 5 + 1 + 3 + 1 + 1 = 15

APPENDIX 1 EUROFIR SAMPLING DEFINITIONS

Sampling and analysis are key components of quality evaluation of food composition data. The proposed EuroFIR quality assessment system will include assessment of sampling and analysis and it is essential that compilers and evaluators interpret information from value references in the same way. Recent EuroFIR meetings (WP2.4, Iceland, May 2007 and WP1.8/1.3, Paris, June 2007) have highlighted the problem of consistent interpretation of sampling and analysis methods.

The term 'sample' as used in analytical chemistry should be applied exclusively to represent a portion of material selected in some manner to represent a larger body of material. The result obtained from the sample is an estimate of the quantity or concentration of a constituent of the parent material. The use of a sample always introduces an uncertainty.

IUPAC definitions recommend confining the use of the term SAMPLE to its statistical concept. If a potential exists for sampling error due to the heterogeneity of a population, the term SAMPLE with an appropriate modifier to indicate its position in the sampling scheme should be used (i.e., increment, primary sample, secondary sample, laboratory sample, test/analytical sample).

'Nomenclature for sampling in analytical chemistry (Recommendations 1990)', contains definitions of a wide range of sampling terms. The following terms may be useful for value documentation and quality assessment in EuroFIR datasets:

- **Sample**

A portion of material selected from a larger quantity of material.

The term sample implies the existence of a sampling error. If there is no or negligible sampling error, the portion removed is an analytical (test) portion or aliquot.

- **Sampling Plan**

A predetermined procedure for the selection, withdrawal, preservation, transportation, and preparation of the portions to be removed from a population as samples.

- **Lot**

A quantity of material which is assumed to be a single population for sampling purposes.

- **Batch**

A quantity of material which is known or assumed to be produced under uniform conditions.

The distinction between a lot and a batch relates to knowledge of production history – a lot may consist of one or more batches.

- **Unit**

Each of the discrete, identifiable portions of material suitable for removal from a population as a sample or as a portion of a sample, and which can be individually considered, examined, or tested, or combined.

- **Replicate sample**

Multiple samples taken under comparable conditions. This selection may be accomplished by taking units in time or space.

Often the only thing replicated is the act of taking the physical sample.

- **Primary sample**

The collection of one or more units initially taken from a population.

- **Laboratory sample**

The sample or subsample sent to or received by the laboratory.

- **Analytical (test) sample**

The sample, prepared from the laboratory sample, from which analytical portions are removed for testing or for analysis.

- **Analytical portion**

The quantity of material, of proper size for measurement of the concentration or other property of interest, removed from the sample.

This portion may be taken directly from the primary sample or from the laboratory sample if no preparation is required (e.g. with liquids) but usually it is taken from the analytical sample.

HIERARCHY OF TERMS

The primary sample delivered to the laboratory is the *laboratory sample.* If it is homogenous (e.g. a beverage), a portion may be removed directly for analysis as the *analytical portion*. If the laboratory sample requires preparation the prepared material is the *analytical sample*, from which an *analytical portion* is removed for analysis.

Sampling usually ends with the removal of the analytical portion from the analytical sample. Methods of analysis are usually designed so that any further subdividing (aliquoting) introduces negligible sampling error.

BASIS DOCUMENTATION FOR QUALITY ASSESSMENT

The BASIS data evaluation form collects the following information for use in quality assessment:

- **Primary sample year**
  Year the primary sample was collected

- **Primary sample unit size**

Amount of material comprising each unit of the primary sample (see IUPAC definition above), e.g. weight of 1 bottle of wine, weight of a frozen meal, weight of an ice-cream, weight of one bunch of grapes

- **Number of primary sample units**

The number of units comprising the primary sample (see IUPAC definition above).

- **Analytical portion size**

Amount of material comprising the analytical portion (see IUPAC definition above).

- **Number of analytical portions**

See IUPAC definition above.

- **Number of analytical portion replicates**

The number of analyses carried out on each analytical portion

SAMPLING DOCUMENTATION IN EUROFIR DATASETS

Since sampling is an important aspect of quality assessment, the sampling details recorded by BASIS should be included in the EuroFIR standard for value documentation.

APPENDIX 2 USDA ORIGINAL DATA QUALITY ASSESSMENT SYSTEM (VITAMIN B2)

Evaluating Riboflavin (Vitamin B2) Methodology by HPLC with fluorescence detection

Question	**Sampling Plan - Answer all questions**	**Answers**	**Rating**
			0
1	Was the sampling plan developed statistically?		
2	How many regions (countries) were sampled?		
3	How many cities in each region or country on average?		
4	How many locations in each city on average?		
5	How many different lots (or individual samples) collected at each location?		
6	Was the sampling done during more than one season?		

	Sample Handling - Answer all questions	**Answers**	0
7	Is homogenization necessary for this type of sample? (If "No skip to Ques 11)		
8	Was the sample homogenized?		
9	Was the homogeniety of the sample verified?		
10	Was information given on the equipment used to homogenize?		
11	Was only the edible portion used for analysis? (inedible portion such as seeds removed)		
12	Was moisture information given?		
13	Were the samples stored properly? (e.g. Frozen/ refrigerated?)		

	Number of Samples	**Answers**	0
14	How many samples were analyzed?		
	(The rating for number of samples is determined by the number of sample aliquots analyzed independently.Repeated analyses from the same homogenate or the same composite validates homogeneity of the sample, but the number of samples is one.)----**For mean values use the count of individual, independent samples that went into that mean.**		

	Analytical Quality Control	**Answers**	0
15	Was a control or reference QC material analyzed with the analytical samples? **(If "No", skip remainder of questions but if "Yes" continue with Question 16)**		
16	If a control or reference QC material was analyzed what type was it? **An in-house QC material is a material developed by the laboratory and used as a reference material.**		
17	If commercial QC material (SRM/CRM), how was the nutrient value listed?		
18	How close were the QC material results to the expected values?		
19	How frequently were QC materials analyzed?		
20	What was the coefficient of variation (%rsd) for the QC material?		

Evaluating Riboflavin (Vitamin B2) Methodology by HPLC with fluorescence detection

	Sample Processing Questions	Answers
1	Was sample processing done under yellow light with low actinic glassware?	
2	Was the pH maintained between 5.0 and 7.0?	
3	Were standards dissolved completely with gentle heating?	
4	If high starch foods analyzed, were they treated with appropriate enzymatic digestion?	
5	If high protein foods analyzed, were they treated with appropriate enzymatic digestion or protein precipitation?	
6	Was purity and efficiency of enzyme preparations tested?	
7	Were samples kept frozen until beginning extraction?	
8	Was a two stage extraction done (methanol+methylene chloride, buffer to pH5.5 in 2nd stage)?	

Method (Interim) score
0

Laboratory Validation
0

Total Method Rating
0

	Analysis Questions	Answers
9	Was the sample protected from light during analysis?	
10	Was extract filtered before injection into the HPLC?	
11	Were excitation and emission wavelengths reported for the fluorometric detection?	
12	Was the purity of the standards checked?	
13	Were standards prepared daily?	
14	Was more than one concentration of standard used for external calibration?	
15	Were at least 3 concentrations of a standard used for external calibration or was an internal standard used?	

Laboratory Validation of Method

	Questions	Answers
1	Was a commercial reference material (CRM/SRM) analyzed? **(If "No" or "Unknown, skip to Ques 4)**	
2	How is the nutrient value listed for the commercial reference material?	
3	How close were the reference material results to the expected values?	
4	What was the coefficient of variation (%rsd) for repeated analysis of the same material?	
5	What was the % recovery of the nutrient?	
6	Method results compared to separate independent method or separate laboratory - difference between results	

APPENDIX 3 AFSSA ORIGINAL DATA QUALITY ASSESSMENT SYSTEM

FOR DATA TAKEN FROM SCIENTIFIC PUBLICATIONS (MAXIMUM QUALITY INDEX = 100 POINTS)

1. FOOD DESCRIPTION / 20 POINTS

1.1 Is the food correctly identified? 1 to 10 points

☐ ***Detailed, unambiguous description (scientific name, portion of the plant, of the animal…) 10 points***

☐ ***More or less detailed description 1 to 9 points***

☐ ***Ambiguous description of the food*** ***Data should not be entered.*** ***If the food is not processed, multiply the score by 2.***

1.2 Is the food processing correctly described? 1 to 10 points

☐ ***Detailed description of the process and its parameters (time, T°, ingredients added…) 10 points***

☐ ***More or less detailed description of the process 1 to 9 points***

☐ ***Ambiguous description of process*** ***Data should not be entered***

2. SAMPLING (CHOOSE ONE OF THE NEXT SUBHEADINGS) / 20 POINTS

For brand name foods 1 to 20 points

☐ ***Probabilistic sampling (Σ market shares) / 5 = x points, cannot exceed 20 points***

☐ ***Sampling of leader brand 2 to 19 points***

☐ ***« Convenience sampling » 1 point***

For non manufactured foods 1 to 20 points

- ***For plant foods : pay attention to season, variety, location…***
- ***For fat fishes : pay attention to season, location, position of the sample taken in the body***
- ***For breads, pastries, cheeses, meats, mixed dishes (non factory feedstuffs) : pay special attention to the number and type of retail points, regions of sampling…***

3. NUMBER OF SAMPLES ANALYSED / 20 POINTS

To obtain the score, multiply by 2 the number of samples cannot exceed 20 points

4. SAMPLE HANDLING / 10 POINTS

4.1 Storage conditions / 2 points

If described and adequate 2 points

4.2 Information on humidity and edible portion / 2 points

If humidity is measured 2 points

4.3 Homogenization / 6 points

☐ ***Homogenization validated 6 points***

☐ ***Homogenization done and described 4 points***

☐ ***Homogenization done but not described 2 points***

☐ ***Unknown 0 point***

5. ANALYTICAL METHOD / 10 POINTS

☐ ***"Official" method (AFNOR, ISO, AOCS, AOAC, etc.) 10 points***

☐ ***Method named and described 6 points***

☐ ***Method named but not described 3 points***

☐ ***Unknown 0 point***

6. EXECUTION OF THE ANALYTICAL METHOD BY THE LAB / 10 POINTS

☐ ***The lab is accredited for the analysis of the nutrient in the matrix in question 10 points***

☐ ***Inter laboratory comparison, use of standards, reference materials… 1 to 9 points***

☐ ***No information 0 point***

7. QUALITY CONTROL IN THE LAB / 10 POINTS

☐ ***Accredited laboratory 10 points***

☐ ***Daily quality control 6 points***

☐ ***Mention of quality control 1 to 5 points***

☐ ***No information 0 point***

APPENDIX 4 BASIS ORIGINAL DATA QUALITY ASSESSMENT SYSTEM

Quality Assessment: 91/100 points

Plant/Food description: ◆ (•) Yes ( ) No

- **Primary food:** Are the plant and plant part properly described
- **Manufactured and pre-packed food:** Is the commercial name or brand name provided

Processing defined: ◆ (•) Yes ( ) No

- Yes = Processing properly defined or not applied
- No = Processing applied but not properly defined

Sampling plan: ◆ ( ) 1 ( ) 2 ( ) 3 (•) 4 ( ) 5

5. Ideal sampling plan
4. Samples taken from several sources. Eg more than one site over more than one year
3. Samples taken from several sources. Eg more than one site on a single year (representative of a region)
1. No sample plan - one sample origin - one field or one supermarket (this is not representative, as a single figure)

Sample handling: ◆ ( ) 1 ( ) 2 ( ) 3 (•) 4 ( ) 5

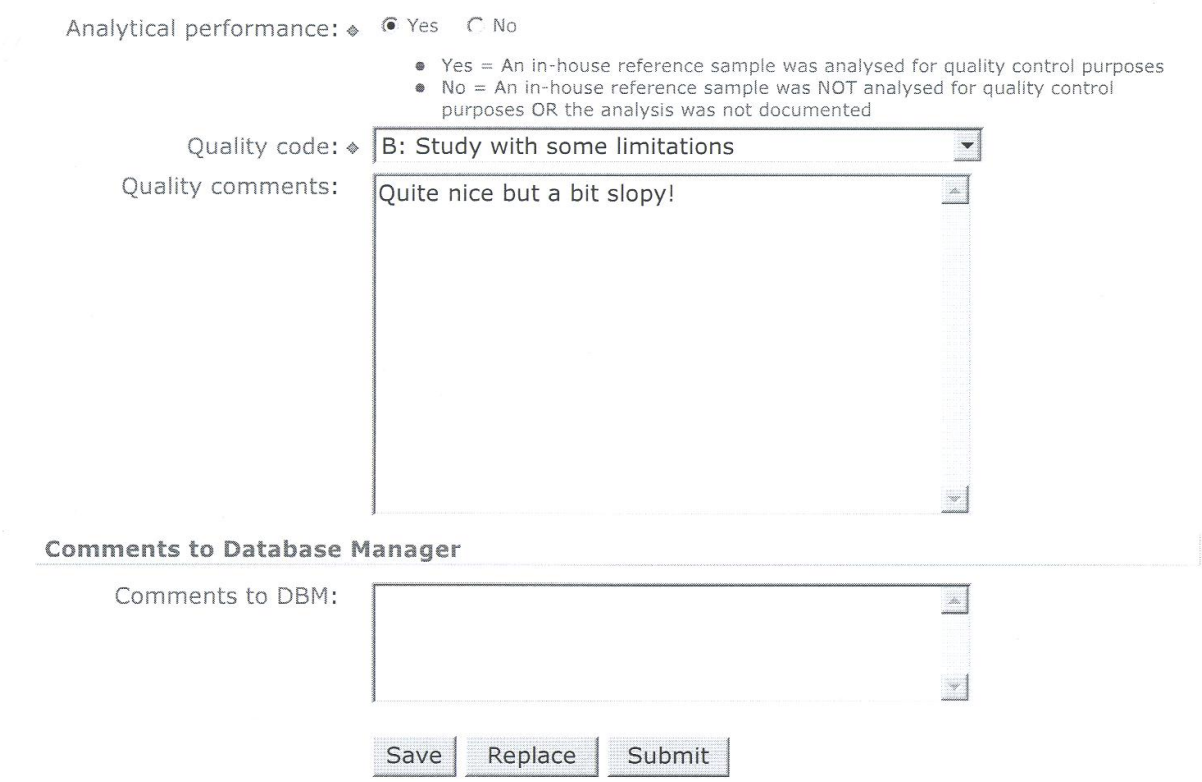
- Indicate how appropriate the sample was handled before analysis with a number between 1 (very poor) to 10 (perfect).

Compound identification: ◆ ( ) 1 ( ) 2 ( ) 3 ( ) 4 (•) 5

5. There are no doubts on the evidence of component identification eg by NMR, FTIR or multiple evidence, single ion/disintegration method
3. There is uncertainty in the component identification, eg MS if isomers could not be determined/ retention time with diode array detection, or the use of a well established method
1. The chemical identity poorly esablished eg by Retention time comparison

Analytical method: ◆ ( ) 1 ( ) 2 ( ) 3 (•) 4 ( ) 5

- Appropriate extraction procedures Solvent/conditions of extraction: is it appropriate for the compounds in question?
- Recoveries
- Spiking experiments (with the spike added at a level similar to that of the analyte in the food or plant under consideration.)
- Use of Internal standard (added at an appropriate level) or quantified by standard addition method
- Peak purity
- Linearity of response of detector
- Standard curves for analytes
- Reproducibility of the sample quantification
- Reproducabity of sample work up
- Purity of standards


Analytical performance:
Yes
No
Yes = An in-house reference sample was analysed for quality control purposes
No = An in-house reference sample was NOT analysed for quality control purposes OR the analysis was not documented
Quality code:
B: Study with some limitations
Quality comments:
Quite nice but a bit slopy!
Comments to Database Manager
Comments to DBM:
Save
Replace
Submit

APPENDIX 5 CSPO ORIGINAL DATA QUALITY ASSESSMENT SYSTEM

CSPO (adapted from USDA/CAROTENOIDS)		
COMPONENT IDENTIFICATION		**POINTS**
The correspondence between the component in the database and the component provided by the scientific paper is checked but not rated.		
FOOD DESCRIPTION		**POINTS**
The correspondence between food in database and the food in scientific paper is checked but not rated		
SAMPLING PLAN	**MAX 3 PTS WEIGHTING 1**	**POINTS**
@ Representative for the studied population, more geographical areas studied		3
@ At least 2 geographical areas		2
@ 1 geographical area, representative for part of the studied population		1
@ No description or area not representative		0
SAMPLING PLAN 2	**MAX 1 PTS WEIGHTING 1**	**POINTS**
Is the food sampled in Italy?	@ yes	1
	@ no	0
SAMPLE HANDLING	**MAX 3 PTS WEIGHTING 1**	**POINTS**
@ Well documented sample handling procedures, only edible part analyzed, details provided on sample preparation and storage, info about storage of samples before analyses provided, information about moisture provided		3
@ as above but no info about moisture provided		2
@ sample handling procedures not well documented, it is not specified if the analyses are performed on edile matter only		1
@ no information at all about sample handling		0
NUMBER OF SAMPLES	**MAX 3 PTS WEIGHTING 1**	**POINTS**
@ More than 10 samples analyzed		3
@ 3-10 samples		2
@ 1-2 samples		1
@ no information		0
ANALYTICAL METHOD	**MAX 3 PTS WEIGHTING 1**	**POINTS**
@ HPLC, standard reference material, analyses repeated, results of varibility tests are presented		3
@ HPLC, use of in house standards only, analyses repeated but with no further details		2
@ HPLC with no further details		1
@ not HPLC		0
QUALITY CONTROL	**MAX 3 PTS WEIGHTING 1**	**POINTS**
@ The accuracy and precision of method are optimal.		3
@ The accuracy and precision of method are acceptable.		2
@ Some information are provided on accuracy and precision of method.		1
@ No information		0
MAX ACHIEVABLE SCORE		**16**

APPENDIX 6 BLS ORIGINAL DATA QUALITY ASSESSMENT SYSTEM

BLS（Quality and Evaluation System for Nutritional Data from Reference Sources and Laboratory Analyses

	Product Description	**Answer**	**Result**	**Total Score**	**Weighting/Rating**
1	Can the analyzed product clearly be identified through its description?	Sufficient	1		2
2	Has the origin of the product been precisely defined? (e.g. kind and species of plants, algae, mushrooms and fish (with Latin names), part of the animal, animal species of egg or dairy product).	Yes	2		
3	Can the state and condition of the analyzed product be recognized clearly? (e.g. **Fruit:** with or without rind, degree of ripeness, undamaged; **Animal:** organ or muscle meat, with or without skin, bones or fat).	Yes	2		
4	Has industrial processing such as cooking, enrichment or treatment of the product been described in detail?	Yes	2		
5	Are there information about the packing (e.g. material, form, contact surface, etc.) and about the packaging medium (e.g.syrup, fat, gas, etc.)?	Yes	1		
6	Is the geographical origin of the product known?	Yes	1	9	
	Sampling Plan and Number of Samples	**Answer**	**Result**	**Total Score**	**Weighting/Rating**
7	Has the sample been randomly chosen?	Yes	2		2
8	Was the sampling conducted in more than one season or year?	Yes	2		
9	Was the sample extracted in several regions, towns or locations?	No	0		
10	How many individual samples have been analyzed separately?	2 to 4	1		
11	Was more than one measurement per sample conducted?	Yes	2	7	
	Sampling Processing	**Answer**	**Result**	**Total Score**	**Weighting/Rating**
12	Was the sample stored properly prior to analysis (e.g. deep-frozen, refrigerated)?	Yes	2		2
13	Was homogenization of the sample necessary? If 'no', please proceed with question 16.	Yes	0		
14	Was the sample homogenized?	Yes	3		
15	Was information given on the equipment used to homogenize?	Yes	2		
16	Was moisture information given? If 'no', please proceed with question 18.	Yes	2		
17	Was information given on moisture measurement methods?	Yes	1	10	
	Analytical Method	**Answer**	**Result**	**Total Score**	**Weighting/Rating**
18	Has the nutrient been identified and outlined properly? (Name, unit and calculation. See example below).	Yes	2		2
19	Was an official method used? (e.g. AOAC, LFBG § 64, 1). If 'yes', please proceed with question 24.	Yes	8		
20	If no official method was used, has the used method been documented in detail?		0		
21	Is the analytical method comparable to other known, official methods (e.g. extraction mode, precison of measurements, equipment)	Yes	2		
22	Were standards in more than 3 standard concentrations for external calibration used?	Yes	2		
23	Was an internal standard used?	Yes	2	16	
	Quality Assurance	**Answer**	**Result**	**Total Score**	**Weighting/Rating**
24	Is the laboratory where analyses are carried out accredited (e.g. ISO) or has it successfully participated in interlaboratory tests?	Yes	2		2
25	Was the analyzed nutrient examined with a certified reference material? If 'no or unknown', please proceed with question 27.	Yes	2		
26	Was the nutrient as expected in the reference material? If 'yes', proceed with question 28.	Yes	2		
27	How was the finding of the nutrient in the sample?	Not in the range	0		
28	Does the measured sample lie within the linear range of the caliber straight-line? (MARINE: SHOULD caliber straight-line BE CALIBRATION LINE??)	Yes	2		
29	Was the coefficient of variation of the analysis acceptable for the products? (<= 20%)	Yes	2		
30	Were the results of the analytical method comparable to the results of other analytical methods?	Yes	1	11	

Total Evaluation 106

Quality Index	Evaluation (Mark)	Description
102-75	A	Value is reliable
74-50	B	Value is reliable but there are documentation problems