



EVIDENCE MANAGEMENT UNIT

Dietary Exposure (DietEx) Tool

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Abstract

Dietary Exposure (DietEx) Tool is a user-friendly tool for estimating chronic dietary exposure to different substances present in food (e.g. intentionally added or naturally present chemicals, contaminants, proteins, novel food ingredients, etc.). In the DietEx Tool, individual consumption data from the EFSA Comprehensive European Food Consumption Database are used to estimate dietary exposure for different countries, age groups (from infants to adults aged 75 years or older) and, for a limited number of countries, special population groups (i.e. "Pregnant women", "Lactating women" and "Vegetarians").

This document describes the most relevant features of the DietEx Tool and simple instructions on how to use it.

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1. Main features

1.1. General information

The purpose of the Dietary Exposure (DietEx) Tool is to provide a user-friendly tool for estimating chronic dietary exposure to different substances present in food (e.g. intentionally added or naturally present chemicals, contaminants, proteins, novel food ingredients, etc.). It allows users to estimate the mean and the 95th percentile exposure for different age classes and special population groups throughout several EU countries. The DietEx Tool can be used by applicants, risk assessors as well as risk managers.

The DietEx Tool is not intended to replace other domain specific exposure tools which are made available by EFSA on its website¹, e.g. the Food Additives Intake Model 2.0 (FAIM), the Feed additives consumer exposure calculator (FACE) and the Pesticide Residue Intake Model (PRIMo).

1.2. Food consumption database

The EFSA Comprehensive European Food Consumption Database (Comprehensive Database) is used in the DietEx Tool to estimate dietary exposure for different countries, age groups (from infants to adults aged 75 years or older) and, for a limited number of countries, special population groups (e.g. "Pregnant women", "Lactating women" and "Vegetarians"). Food consumption summary statistics and methodological details of all dietary surveys included in the Comprehensive Database are available on the dedicated page of the EFSA website ([here](#)). Additional information on the dietary surveys supported by EFSA under the EU Menu framework project² are available in the external scientific reports. All of them are available in a virtual issue of the EFSA journal ([here](#)).

The most recent dietary surveys per country and population group are used by the tool. Exceptions have been made when the age ranges of two different surveys within the same age class did not largely overlap. Dietary surveys with only one day per subject have been excluded since they are considered not adequate to assess chronic exposure (EFSA, 2011). A new DietEx Tool version will be produced each time the Comprehensive Database is updated (e.g. new dietary surveys added) which is expected to occur once per year.

1.3. Food categories

Consumption records are codified according to the FoodEx2 food classification and description system.³ FoodEx2 has been developed by EFSA; it consists of descriptions of a large number of individual food items aggregated into food groups and broader food categories in a hierarchical parent-child relationship.

The DietEx Tool allows the use of any FoodEx2 term at any of the seven levels of the Exposure Hierarchy. However, not all subjects who participated in the dietary surveys included in the Comprehensive Database were able (or were asked) to report enough information on the different consumption records to always assign the most detailed FoodEx2 terms possible. For example, subject A reported the consumption of swordfish whereas subject B only reported the consumption of fish, without being able or having been asked to specify the fish eaten. Both eating events are coded as "Fish (meat)" (FoodEx2 code: A026V) at the 2nd level of the Exposure Hierarchy. For subject A, different FoodEx2 codes can be assigned to all lower levels down to the 5th: "Swordfish" (FoodEx2 code: A07Y0), whereas for subject B, all lower levels will be considered as "unspecified". The lowest specified code is used in the Comprehensive Database and, consequently in the DietEx Tool. This means that the consumption event of subject B will present the code "Fish (meat)" (FoodEx2 code: A026V) for all levels of the Exposure Hierarchy from the 2nd to the 7th.

In order to reduce the uncertainty related to the presence of a large number of "unspecified" eating events, FoodEx2 terms were excluded from the DietEx tool when in at least 50% of the different population groups (i.e. dietary surveys per population group), more than 50% of the eating events were classified as "unspecified". For example, only "Oysters" (FoodEx2 code: A02HG) at the 3rd level of the Exposure Hierarchy can currently be used in DietEx,

¹ <https://www.efsa.europa.eu/en/science/tools-and-resources>

² EU Member States used different methods to collect food consumption data, which sometimes made it difficult to carry out EU-wide analyses or country-to-country comparisons. EFSA's EU Menu project aims to provide standardised information on what people eat in all countries and regions across the EU.

³ <https://www.efsa.europa.eu/en/data/data-standardisation>

despite the fact that at level 4, the following FoodEx2 terms are available: "Oyster, european" (FoodEx2 code: A02HJ), "Oyster, portuguese cupped" (FoodEx2 code: A02HK), "Oyster, sydney rock" (FoodEx2 code: A02HL) and "Oyster, pacific cupped" (FoodEx2 code: A02HM). However, in most of the population groups, the consumption of "Oysters" was reported without the details allowing the use of FoodEx2 terms at the 4th level of the Exposure Hierarchy.

All FoodEx2 terms belonging, under the Exposure Hierarchy, to "Major isolated ingredients, additives, flavours, baking and processing aids" (FoodEx2 code: A046L) and "Other ingredients" (FoodEx2 code: A0F0S) were not made available in the DietEx Tool. This is because these consumption records are, in the large majority, the result of a disaggregation of foods (i.e. a composite dish "disaggregated" into each component/ingredient) that should have not been disaggregated according to the Guidance on the EU Menu methodology (EFSA, 2014). In addition, "Food for sporting people" (FoodEx2 code: A03RX) and its children terms have been as well excluded in line with their removal from Regulation (EU) 609/2013⁴ (European Commission, 2016).

Facets⁵ are currently not represented in the DietEx Tool.

1.4. Occurrence levels

Users of the DietEx Tool are required to input in the tool the levels of occurrence for the substance under evaluation, for each FoodEx2 category to be considered in the assessment of exposure. The occurrence levels can be derived from analytical results or, in the case of intentionally added substances, current, proposed or intended use levels can be used as well. If applicable, a regulatory maximum level exposure scenario can be assessed by inputting in the DietEx tool the maximum regulatory levels.

Occurrence and/or consumption data can be expressed in the dry (e.g. "Tea extract (powder)", FoodEx2: A03HY) or liquid (e.g. "Tea beverages", FoodEx2: A03LB) form. The use of dilution factors for FoodEx2 categories from Arcella et al. (2018) is recommended when, for calculating exposure, users need to match the occurrence values measured in dry samples with their respective amounts consumed in liquid form (or vice versa).

1.5. Exposure assessment methodology

In the DietEx Tool, dietary exposure is calculated by multiplying, for each FoodEx2 category, the occurrence levels inputted by the user with their respective consumption amount for each individual in the Comprehensive Database. The exposures per FoodEx2 category are subsequently added by the tool to derive an estimate of the individual total exposure per day and per kilogram of body weight (based on each individual body weight registered in the consumption survey). These exposure estimates are averaged over the number of survey days, resulting in an individual average exposure per day for the survey period. This is carried out for all individuals, resulting in distributions of individual exposure per survey and population group. On the basis of these distributions, the mean and the 95th percentile of exposure are calculated per survey and population group, both in mg/day and mg per kg body weight/day. The 95th percentiles of exposure calculated by the tool for population groups with a number of subjects/consumers lower than 60 require cautious interpretation as the results may not be statistically robust (EFSA, 2011).

Exposure results are provided for all subjects and for consumers only. For each population group, the % contribution to the mean exposure is presented for the same FoodEx2 categories for which occurrence levels have been inputted by the user.

More accurate exposure estimates might be calculated by EFSA, as needed, making use of all available information stored in the Comprehensive Database (e.g. using the facets) and/or by using different statistical methodologies (e.g. probabilistic). This might be of particular relevance for exposure assessments carried out in the context of new or renewal applications.

2. How to use the Dietary Exposure (DietEx) Tool

To make use of the DietEx tool, you need first to register. Please, send an email to servicedesk@efsa.europa.eu with your name, last name, e-mail address and affiliation to receive you login details.

⁴ https://ec.europa.eu/food/food/labelling-and-nutrition/foods-specific-groups_en

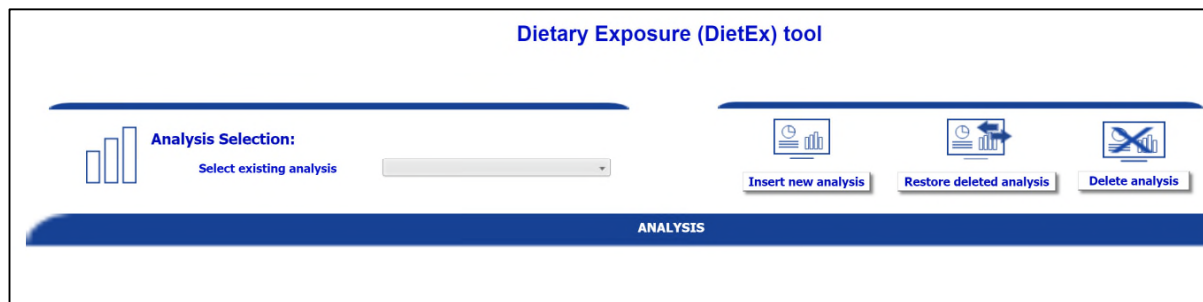
⁵ Facets are collections of additional terms describing properties and aspects of foods from various perspectives; they are used in FoodEx2 to add further detail to the information provided by the food list term.

To provide feedback or to ask any question related to the DietEx Tool, please contact data.collection@efsa.europa.eu.

2.1. Running a dietary exposure assessment

Once you log in, you see the initial screen of the DietEx Tool (screenshot 1).

Screenshot 1






When starting a dietary exposure assessment for a particular substance, you could start by either selecting an existing analysis in the drop-down menu ("**Select existing analysis**") or creating a new analysis ("**Insert new analysis**"). If you create a new analysis, a new page opens where you have to (screenshot 2):

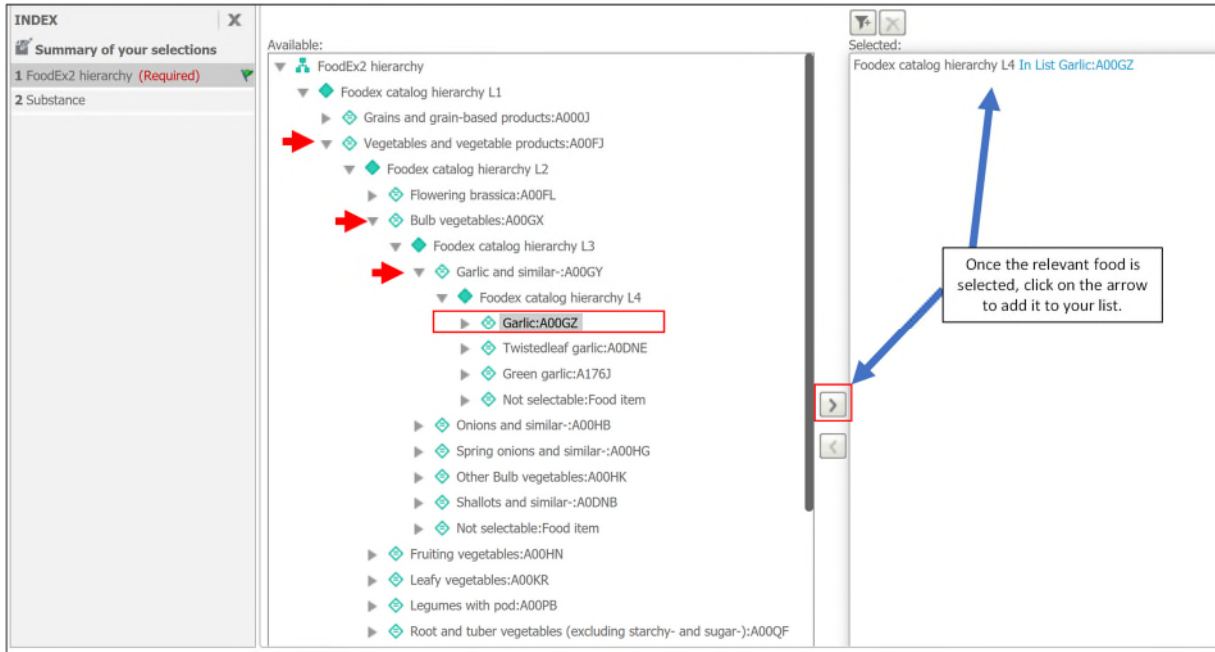
1) select the different FoodEx2 codes relevant for your exposure assessment, paying attention to the "parent-child" hierarchical organisation in FoodEx2 system classification,³

2) select, at the bottom of the page, the substance under assessment from the pre-defined list or introduce the name of your substance.

The FoodEx2 hierarchy shows by default the Level 1 (Foodex2 catalogue hierarchy L1). To select the FoodEx2 codes relevant for your analysis, click on the arrow in front of each of the food groups at Level 1 to display the different foods under the hierarchical parent-child structure. As an example, to select "Garlic" (hierarchy L4), you should click on the arrow "Vegetable and vegetable products" (hierarchy L1), then on "Bulb vegetables (hierarchy L2) and then on "Garlic and similar" (hierarchy L3).

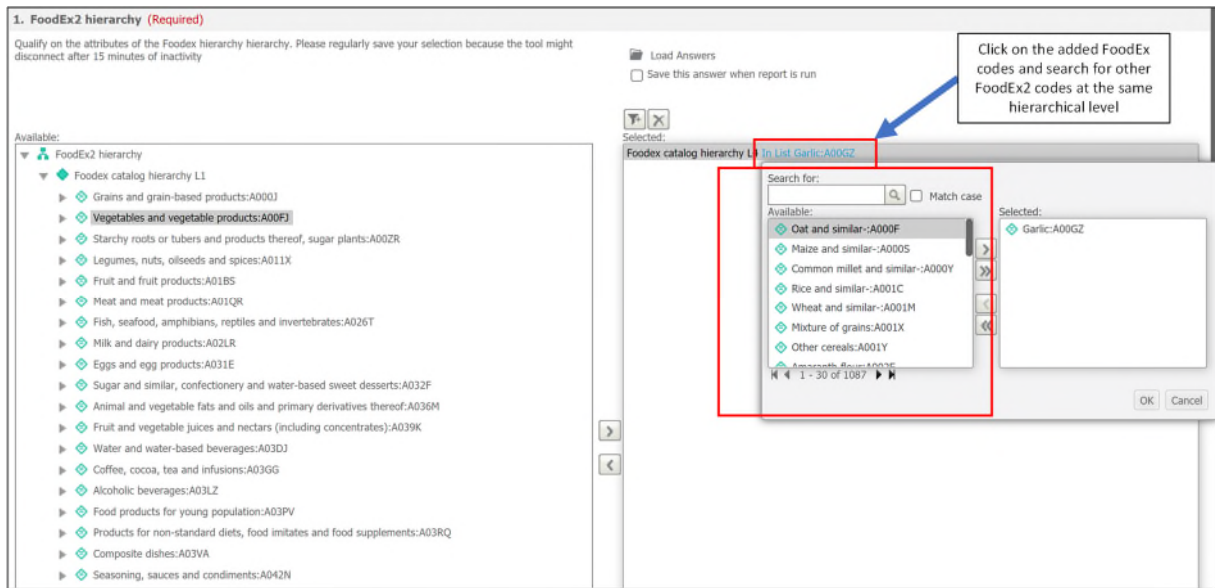
Then, add your food to create your list of relevant FoodEx2 codes by using  (see screenshot 2 below), by clicking  once the FoodEx2 code is selected, or by double-clicking the selected FoodEx code. In the right-hand window, you can delete from your list any FoodEx2 code previously added by selecting and clicking on .

Screenshot 2



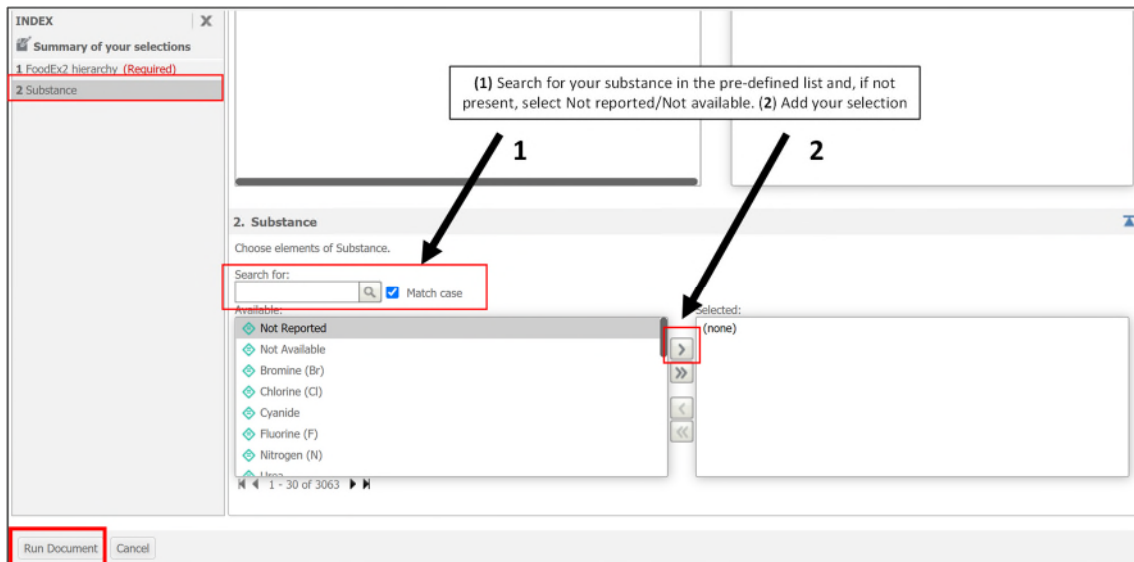
If you click on the FoodEx2 codes in your list (in blue), a pop-up window will appear allowing you to search for any FoodEx2 code at the same hierarchical level (on the left in screenshot 3). You will be able to select the FoodEx2 codes relevant for your analysis and add them to the list.

Screenshot 3



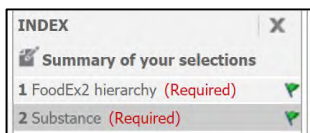
To select the substance under assessment, scroll down to the bottom of the page or select "2 Substance" in the upper left-hand side of the page. You can search for your substance within a pre-defined list; if your substance is not present, select "Not reported/Not available". Once this is done, add your selection (see screenshot 4).

Screenshot 4



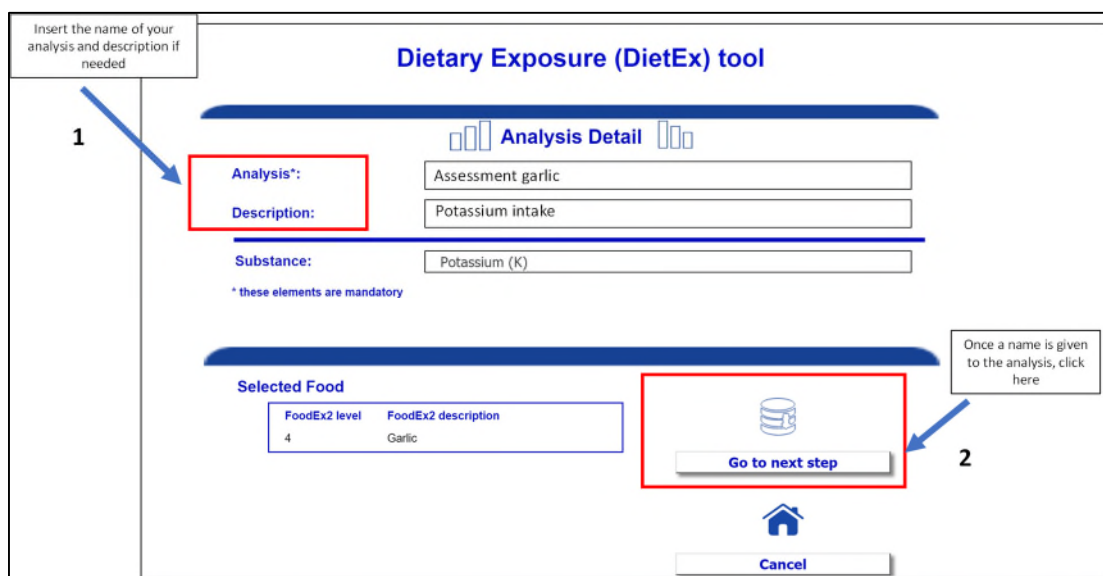
Once the desired FoodEx2 codes and the name of the substance have been selected, a green flag will be shown on the left panel indicating that you can proceed with the analysis (screenshot 5).

Screenshot 5



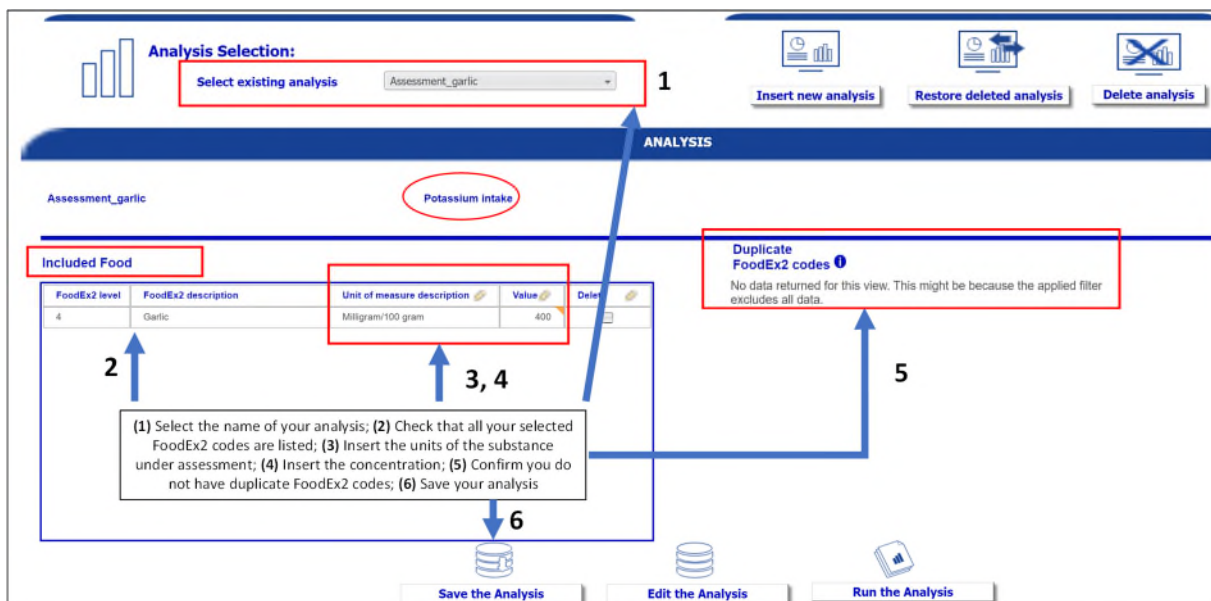
Then, click **“Run document”** in the lower left corner of the page. A new page will open showing the FoodEx2 codes and the substance you selected (screenshot 6). Two fields can be filled in: a mandatory one to name the analysis (**“Analysis”**), and, optionally, a description of the analysis (**“Description”**). Once this is done, press **“Go to next step”**.

Screenshot 6



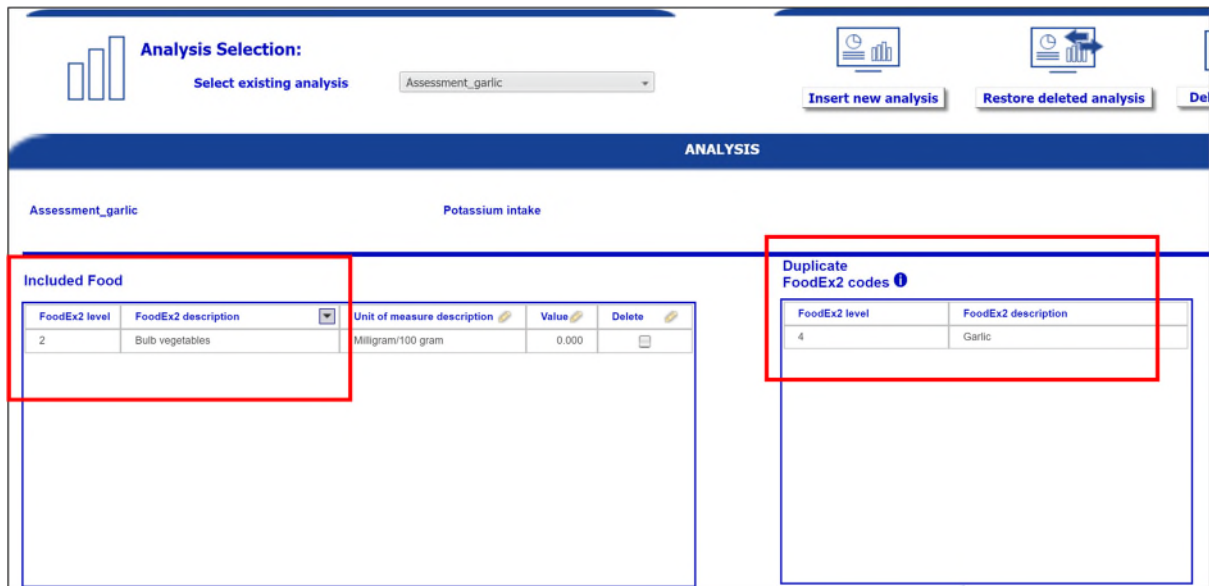
In the new page (screenshot 7), you should select in the drop-down menu under **"Select existing analysis"**, the analysis you created in the previous step. Immediately, a table named **"Included food"** will be shown, listing your FoodEx2 codes at the selected FoodEx2 level. In this table, you will have to input the concentration of the substance to be assigned to each FoodEx2 code (**"Value"**) and to select the units for the value inserted (**"Unit of measure description"**). To select the desired units, click under **"Unit of measure description"** for each of the FoodEx2 codes to open a drop-down menu with the list of units available. It is possible to sort the information contained in each of the columns (e.g. FoodEx2 level, value, etc.) by clicking at the headings. Once ready, save your analysis (**"Save your analysis"**).

Screenshot 7



You should also pay attention to the information displayed under **"Duplicate FoodEx2 codes"** (see screenshots 7 and 8); if you find FoodEx2 codes listed there, this indicates that for those 'children' codes the 'parent' FoodEx2 code has been already selected. Under this situation, dietary exposure estimations will take into account all the different 'children' under the 'parent' FoodEx2 code, and in the table **"Included food"** only the 'parent' FoodEx2 code will be listed. As an example, the selection of the FoodEx2 codes "Bulb vegetables" ('parent', FoodEx2 level 2) and "Garlic" ('child', FoodEx2 level 4) would result in only "Bulb vegetables" being displayed in the table **"Included food"** and "Garlic" listed under **"Duplicate FoodEx2 codes"** (see screenshot 8). Dietary exposure estimation would include all foods under "Bulb vegetables".

Screenshot 8



In this example, if you would like to consider only the 'child' FoodEx2 code for the exposure estimations, select **"Delete"** for the 'parent' FoodEx2 code in the table **"Included foods"**, and then click on **"Save the Analysis"**; only the 'child' FoodEx2 code will be now included in the table "Included foods".

You can further exclude any other FoodEx2 code from the table **"Included foods"** by clicking on **"Delete"** and then **"Save the Analysis"**.

To add additional FoodEx2 codes, click on **"Edit the Analysis"** to come back to the page with the FoodEx2 hierarchy (see screenshot 2) and select the desired FoodEx2 codes (note that the FoodEx2 codes already being part of your analysis are not shown here). Before clicking on **"Run document"** (lower left corner of the page), you will need to add again the substance under assessment following the steps explained above. Click on **"Run document"**, and in the new page you will see the name of your analysis (**"Analysis"**), the description (**"Description"**), the substance under assessment (**"Substance"**), and a table with the new selected FoodEx2 codes (**"Selected foods"**). Confirm that the list of FoodEx2 codes is correct, and click on **"Go to next step"**. In the new page, select your analysis under **"Select existing analysis"**, and the table **"Included foods"** will be shown containing the previously selected and newly added FoodEx2 codes; for the new ones, introduce the corresponding concentration of the substance (**"Value"**) and select the units (**"Unit of measure description"**). Once you check that no FoodEx2 codes are displayed under **"Duplicate FoodEx2 codes"**, save your analysis (**"Save your analysis"**), and click on **"Run the analysis"**.

Warning!: DietEx tool is disconnected from the server after 30 minutes of inactivity; to avoid losing the information already inserted, you are advised to save your analysis periodically while introducing the desired FoodEx codes and the substance under analysis. As indicated above, you can later modify at any time your selection by clicking on **"Edit the Analysis"**.

2.2. Output

After running the dietary exposure estimations, an Excel file is automatically generated (accessible at the bottom of your screen) containing four different worksheets.

In the worksheet **"Analysis summary"**, you will find the date of the analysis as well as the name and the description of the analysis, the substance under assessment and the list of foods considered in the dietary exposure estimations. A table shows, for the whole population, the minimum and maximum estimates for the mean and the 95th percentile exposure across the different dietary surveys in each population group (in mg/day and mg per kg body weight/day). In this worksheet, the 95th percentile of exposure is only shown for those population groups where the sample size was sufficiently large to allow this calculation, i.e. above 60 subjects (EFSA, 2011). The number of dietary surveys used for each population group is also depicted.

In the worksheet "Consumers only", dietary exposure is estimated for each individual food among consumers in each of the dietary surveys and population groups. For an appropriate interpretation of the results, information on the number (and percentage of the total population) of consumers for each food is provided. Mean and 95th percentile exposure estimates are shown in both mg/day and mg per kg body weight/day.

In the worksheet "Whole population", similar information as in the previous worksheet is shown but considering the whole population. The total number of individuals considered in each dietary survey and population group to estimate dietary exposure is shown.

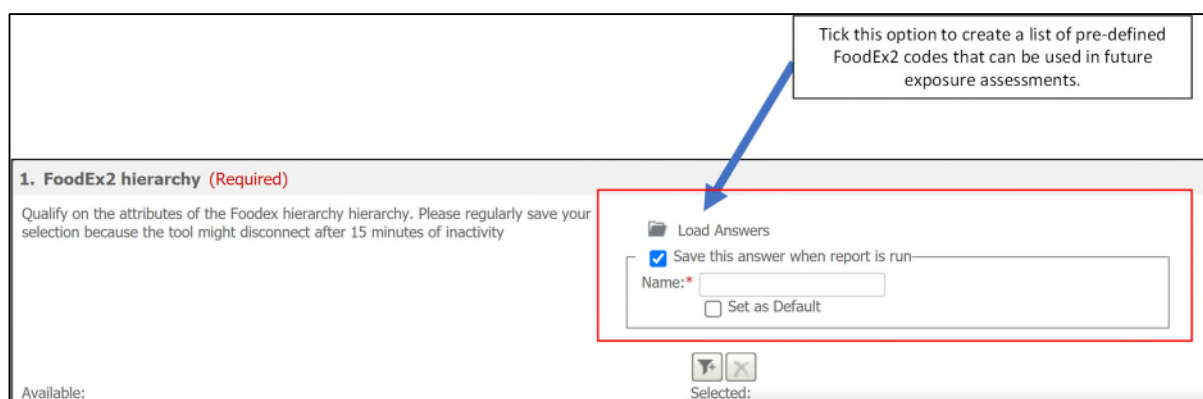
In the worksheet "Food percentual contribution", for each of the dietary surveys and population groups, information is provided on the average contribution (expressed as a percentage) of each of the foods to the mean dietary exposure estimate in the whole population.

2.3. Creating a pre-defined list of FoodEx2 codes

The user has also the option to create a pre-defined list of FoodEx2 codes that can be saved and used for different dietary intake assessments. To create a list, select your desired FoodEx2 codes, click on "**Save this answer when report is run**" and write a name for the list (see screenshot 9). This option can be particularly useful if you have created a list with numerous FoodEx2 codes that could be the basis for different future dietary exposure assessments just including/excluding other FoodEx2 codes.

When you want to make use of this list for a dietary exposure assessment, click first on "**Insert new analysis**" (see screenshot 1), then on "**Load answers**" at the top of your screen and select your list of FoodEx2 codes as starting point. Add/exclude FoodEx2 codes as needed and proceed with the analysis as explained above. If you want to save your updated pre-defined list, you should click again on "**Save this answer when report is run**" before pressing "**Run document**".

Screenshot 9



2.4. Running a dietary exposure assessment with an existing analysis

In the initial page (screenshot 1), just select your analysis in the drop-down menu under "**Select existing analysis**"; a table will be displayed with your selected FoodEx2 codes and the corresponding concentrations assigned to the substance under assessment. You can directly run your analysis by clicking on "**Run the analysis**" or "**Edit the Analysis**" to modify the current variables following the steps indicated above in the document (e.g. FoodEx2 codes, substance under assessment, concentrations, etc.). Any change introduced in the selected method is automatically saved under the same name.

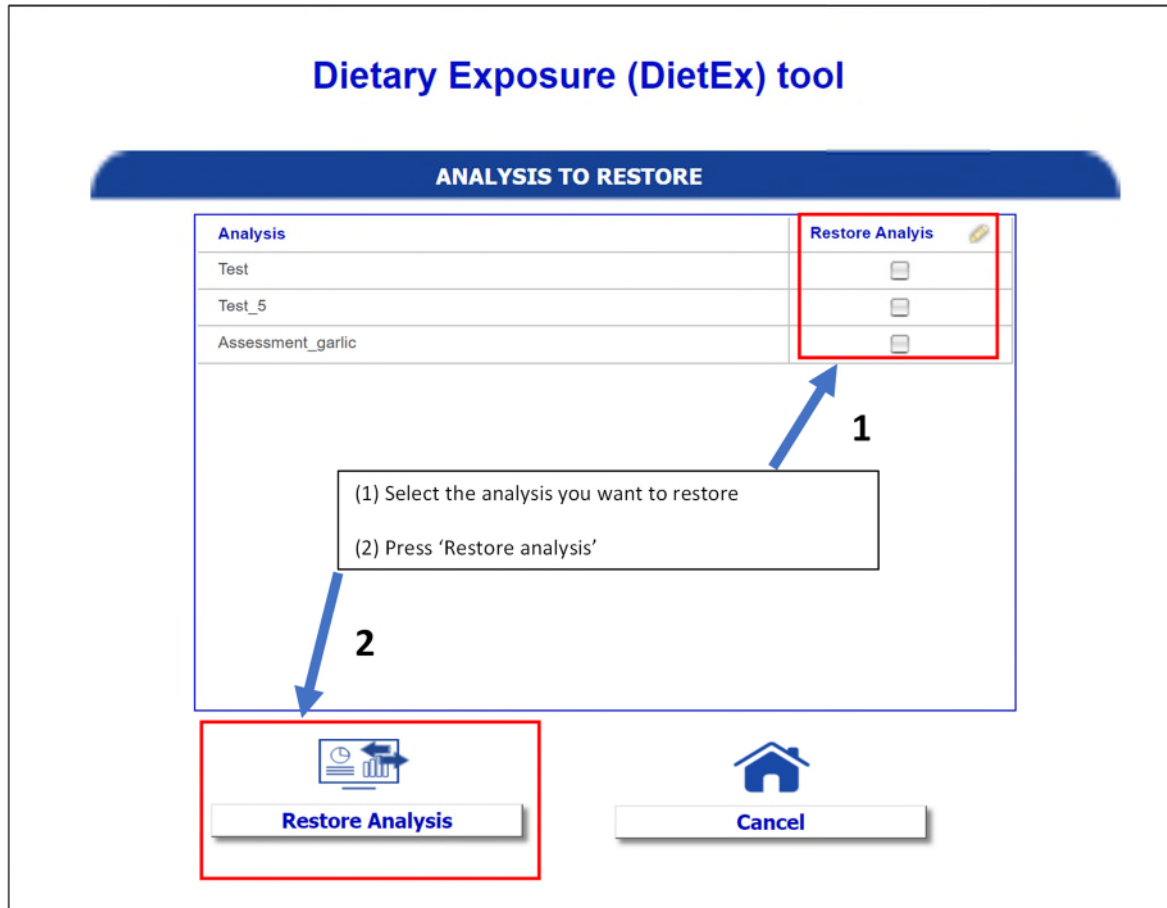
2.5. Deleting an existing analysis

In the initial page (screenshot 1), just select the analysis to be deleted in the drop-down menu under "**Select existing analysis**" and click on "**Delete analysis**". A deleted analysis is kept for one week in the bin in the case you want to restore it.

2.6. Restoring a deleted analysis

In the initial page (screenshot 1), click on restore analysis. In the new page (screenshot 10), select the analysis/analyses you want to restore and press **"Restore analysis"**; you will come back to the initial page and your analysis/analyses will be found again under **"Select existing analysis"**.

Screenshot 10



References

- Arcella D, Ioannidou S and Sousa R, 2018. Internal report on the harmonisation of dilution factors to be used in the assessment of dietary exposure. European Food Safety Authority (EFSA). <https://doi.org/10.5281/zenodo.1256085>.
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- European Food Safety Authority, 2014. Guidance on the EU Menu methodology. EFSA Journal 2014;12(12):3944, 80 pp. doi:10.2903/j.efsa.2014.3944.
- EFSA (European Food Safety Authority), 2011. Use of the EFSA Comprehensive European Food Consumption Database in Exposure Assessment. The EFSA Journal, 2011, 34 pp.