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Intake Assessment of Vegetable Oil using Food Consumption Data from the European Union (EU)

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Executive Summary

The Global Organization for EPA and DHA Omega-3s (GOED) has requested that Exponent provide an intake assessment for vegetable oils using data from relevant populations in the European Union (EU). The background for this request is that GOED wishes to have a better understanding of vegetable oil intake in relation to the intake of omega-3 EPA/DHA oils (fish/marine oils)[1] for any consideration of changes to the current system in the EU for the setting of maximum contaminant levels in the European Union (EU) under Regulation 1881/2006[2]. In order to assess the difference in exposure to contaminants from vegetable oils compared to omega-3 EPA/DHA oils, intakes of vegetable oils need to be considered in the relevant population groups for the EU.

To meet this request, Exponent has prepared a detailed dietary intake assessment of vegetable oils for EU populations using data from the European Food Safety Authority (EFSA) Comprehensive database, which have recently been included in the EFSA DietEx Tool. Based on this intake assessment using the DietEx tool, it was determined that adolescents had the greatest mean intakes of vegetable oils on an absolute basis ranging from 20.1 to 47.0 g/day and the elderly had the greatest 95th percentile intakes of vegetable oils ranging from 34.9 to 88.8 g/day. On a body weight basis, infants had the greatest mean and 95th percentile intake of vegetable oils ranging from 1.0 to 4.0 g/kg bw/day and from 3.5 to 8.8 g/kg bw/day, respectively.

The major food categories which contributed to the total intakes of vegetable oils were 'Vegetable fats and oils, edible', which contributed up to 89.3% to total mean vegetable oils intake in the elderly and 85.9% in adults, 'Margarines and similar' which contributed up to 57.6% to total mean vegetable oil intake in the very elderly and 38.7% in adults, and 'Blended fat and oils', which contributed up to 49.9% to total mean vegetable oil intake in adolescents and 36.6% in adults. Other categories which contributed highly to vegetable oil intakes were infant and follow-on formulae (in infants and toddlers), and Mayonnaise sauce (pregnant and lactating women).

The exposure assessment of vegetable oils was conducted using the EFSA DietEx tool, to estimate exposure in specific demographic groups in different Member States in the EU. This type of exposure methodology can be considered as a conservative assessment as the DietEx tool uses aggregated food categories rather than individual foods, and the assessment also assumes that vegetable oil was definitely included as an ingredient in all foods that could potentially contain it.

[1] This includes the intake of fish oil, omega-3 concentrates and other marine oils such as krill oil, and microalgal oils.

[2] Commission Regulation (EC) No 1881/2006 of 19 December 2006 setting maximum levels for certain contaminants in foodstuffs - https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A02006R1881-20230101

Background

GOED has requested that Exponent provide an intake assessment for vegetable oils using data from relevant populations in the European Union (EU). The background for this request is that GOED wishes to have a better understanding of vegetable oil intake in relation to the intake of omega-3 EPA/DHA oils (fish/marine oils)[3] for any consideration of changes to the current system in the EU for the setting of maximum contaminant levels in EU Regulation 1881/2006. In order to assess the different consumption patterns of vegetable oils and levels of intake compared to omega-3 EPA/DHA oils, the intake of vegetable oils needs to be considered in the relevant population groups for the EU.

To meet this request, Exponent has prepared a detailed dietary intake assessment of vegetable oils for EU populations using data from the EFSA Comprehensive database, which has recently been included in the EFSA DietEx Tool. Vegetable oil (e.g. sunflower, rapeseed, coconut, palm, olive etc) has a rather ubiquitous presence in the EU diet and is widely used in cooking and as an ingredient in many processed foods. To estimate the amount of vegetable oil used in food preparation and in processed foods to provide a comprehensive intake assessment, publicly available recipe databases were used, which represent the types of foods in the EFSA Comprehensive database. A brief description of the database, and the methods used to estimate intakes of vegetable oils is included in the following sections. The estimated intakes of vegetable oils are expressed on an absolute and on a per kilogram body weight basis per population group.

Methods

DietEx Tool

The Dietary Exposure (DietEx) Tool is a user-friendly tool developed by EFSA for estimating chronic dietary exposure to different substances present in food[4]. 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”).

The EFSA Comprehensive Database

In 2010, the Comprehensive Database was compiled by EFSA from detailed information on food consumption available in different European countries. At the request of EFSA, Competent Authorities in European countries submitted data on the level of food consumption by the individual consumer, based on the most recent national dietary survey conducted in their country. The most recent dietary surveys per country and population group are used by the DietEx tool (last updated in 2022). A new DietEx Tool version is produced each time the Comprehensive Database is updated (e.g. new dietary surveys added) which generally occurs once per year. Dietary surveys with only one day per subject have been excluded since they are considered not adequate to assess chronic exposure (EFSA, 2011a).

[3] This includes the intake of fish oil, omega-3 concentrates and other marine oils such as krill oil, and microalgal oils.

[4] https://www.efsa.europa.eu/en/science/tools-and-resources/dietex

Food consumption data (minimum of two non-consecutive days of data) for the following countries are collated in the current version of the Comprehensive Database: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, the Netherlands, Portugal, Romania, Slovenia, Spain and Sweden. In addition, each of these dietary surveys is composed of separate population groups[5].

A guidance document on using the data from the Comprehensive Database is available (EFSA, 2011a). EFSA has published detailed summary statistics from the Comprehensive Database, which are publicly available for download from the EFSA website[6]. The age classes used in the database were defined by EFSA and are as follows:

- Infants (up to and including 11 months)
- Toddlers (from 12 months up to and including 35 months)
- Other children (from 36 months up to and including 9 years)
- Adolescents (from 10 years up to and including 17 years)
- Adults (from 18 years up to and including 64 years)
- Elderly (from 65 years up to and including 74 years)
- Very elderly (from 75 years)

Food categorisation

Prior to undertaking the detailed intake assessment of vegetable oils, the information available in the EFSA Comprehensive database on the vegetable oils that were included in the database was reviewed. All FoodEx level2 food codes that represented a type of vegetable, or a potential source of vegetable / plant oil were examined.

The preliminary version of the hierarchical food classification system 'FoodEx', developed by EFSA, was used to codify all foods and beverages present in the Comprehensive Database (EFSA, 2011b). An updated version of FoodEx2 (first released in 2011 and updated annually) has been applied to the data within the EFSA Comprehensive Database, with up to 7 levels of food categorisation 'exposure hierarchy'[7]. Upon completion of the Comprehensive Database, food consumption data were published according to each FoodEx2 category for each country, age class, and for the total population or for consumers only (users-only). Further details pertaining to each food list item is included in the form of facets - collections of additional terms describing properties and aspects of foods from different perspectives.

In addition, as there is no recipe database associated with the EFSA Comprehensive database, the UK Food Standards Agency (FSA) recipe database was used to assess the amount of vegetable oil used as an ingredient in the selected EFSA FoodEx codes that were composite or processed foods (MRC, 2017). This allowed for a more precise estimate of exposure to vegetable oils from the total diet than would be possible without assigning such recipe fractions. Where a food was not found in the UK recipe database, manufacturer websites for the specific product types were used to identify the vegetable oil content.

A description of all foods in the EFSA Comprehensive database that were included in the intake assessment, including the composition of vegetable oil for each, is provided in the table in Appendix I. The vegetable oil content of infant and follow-on formula was calculated and

[5] https://www.efsa.europa.eu/en/microstrategy/food-consumption-survey
[6] https://www.efsa.europa.eu/en/food-consumption/comprehensive-database
[7] https://www.efsa.europa.eu/en/data/data-standardisation

taken into account, as this is a major contributor to vegetable oil intakes in infants and toddlers. The calculations used to calculate the amount of vegetable oil in infant and follow-on formula are described in detail in Appendix IV.

Statistical methods

In the DietEx Tool, dietary exposure of vegetable oil is calculated by multiplying, for each FoodEx2 category, the estimated concentration of vegetable oil for that food with the 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 intake 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 intake per day for the survey period. This is carried out for all individuals, resulting in distributions of individual intake per survey and population group. On the basis of these distributions, the mean and the 95th percentile of intake are calculated per survey and population group, both in g/day and g per kg body weight/day. The 95th percentile of exposure is only calculated by the tool for those population groups where the sample size was sufficiently large to allow for this calculation, i.e., above 60 subjects (EFSA, 2011a).

DietEx calculates both total population and consumer only (user-only) intakes. In the present report, 'total population' intake refers to the intake of vegetable oils averaged over all individuals surveyed regardless of whether they consumed any of the vegetable oils categories, and therefore includes "zero" users (those who reported no intake of the vegetable oils categories during the survey days). Data for users-only only were not presented as the % users were high, i.e. up to 96.2% in infants, up to 96.6% in vegetarians, up to 99.7% in the elderly and up to 100% in all other population groups. For the assessment based on the EFSA Comprehensive database, a description of the surveys included in the present assessment are provided in Appendix II.

Results

Intake estimates of vegetable oils were calculated using the DietEx tool, and results for the absolute intakes and intakes expressed on a body weight basis for each population group are presented in Table 1. Results in Table 1 indicate the range of the lowest to the highest intakes of vegetable oil for the surveys per population group in the DietEx tool. Detailed results per population group per country/survey are provided in the tables in Appendix III.

In the total population, it was determined that adolescents had the greatest mean intakes of vegetable oils on an absolute basis ranging up to 47.0 g/day. The elderly had the greatest 95th percentile intakes of vegetable oils ranging up to 88.8 g/day. Infants had the lowest mean and 95th percentile intakes of vegetable oils of up to 25.8 g/day and up to 45.7 g/day, respectively (Table 1)[8]. On a body weight basis, infants had the greatest mean and 95th percentile intake of vegetable oils ranging from 1.0 to 4.0 g/kg bw/day and from 3.5 to 8.8 g/kg bw/day, respectively. The very elderly, along with pregnant and lactating women had the lowest mean

[8] As per Table 1, the survey group 'vegetarians' were found to have the lowest mean and 95th percentile intakes on an absolute and on a body weight basis, but as this represents only one survey in Romania, and as this group is not indicative of an actual population group based on age, the results are not used for comparative purposes in the text.

intake of up to 0.5 mg/kg bw/day, and lactating women had the lowest 95th percentile intake of up to 0.9 g/kg bw/day (Table 1).

Table 1. Summary of the estimated daily intake of vegetable oils in the EU in the total population using DietEx

Population group	No. surveys	Vegetable oils g/day		Vegetable oils g/kg bw/day	
		Mean	P95*	Mean	P95*
Infants	12	8.6 - 25.8	28.4 - 45.7	1.0 – 4.0	3.5 - 8.8
Toddlers	15	10.3 - 25.9	24.3 - 47.7	0.8 - 2.2	2.0 - 4.2
Other children	19	14.4 - 39.1	25.6 - 62.6	0.6 - 1.7	1.4 - 3.2
Adolescents	21	20.1 – 47.0	42.7 - 81.6	0.4 - 0.9	0.9 - 1.7
Adults	22	18.6 - 42.9	40.9 - 85.5	0.2 - 0.6	0.6 - 1.2
Elderly	19	15.5 - 40.8	34.9 - 88.8	0.2 - 0.6	0.5 - 1.2
Very elderly	14	17.4 - 34.6	42.9 – 86.0	0.2 - 0.5	0.6 - 1.2
Pregnant women	6	18.2 - 35.8	40.0 - 81.1	0.3 - 0.5	0.6 - 1.1
Lactating women	2	20.0 - 30.8	44.1 - 60.5	0.3 - 0.5	0.7 - 0.9
Vegetarians	1	22.9	45.5	0.4	0.7

Age ranges: Infants: up to and including 11 months; Toddlers: from 12 months up to and including 35 months; Other children: from 36 months up to and including 9 years; Adolescents: from 10 years up to and including 17 years; Adults: from 18 years up to and including 64 years; Elderly: from 65 years up to and including 74 years; Very elderly: from 75 years.

*The 95th percentile of exposure is only summarised by DietEx for those population groups where the sample size was above 60 subjects.

The top 5 food categories (at FoodEx Level 3) which contributed to the total intakes of vegetable oils in each population group are presented in Table 2. The individual food codes per the FoodEx categories are shown in Appendix I. The major food categories which contributed to the total intakes of vegetable oils were Vegetable fats and oils, edible, which contributed up to 89.3% to total mean vegetable oil intake in the elderly, Margarines and similar, which contributed up to 57.6% to total mean vegetable oil intake in the very elderly, and Blended fat and oils, which contributed up to 49.9% to total mean vegetable oil intake in adolescents (Table 2). Other categories which contributed highly to vegetable oil intakes were Infant formula (liquid and powder) which contributed up to 72.5% total mean vegetable oil intake in infants, follow-on formula, liquid, which contributed up to 57.1% total mean vegetable oil intake in infants, and Mayonnaise sauce which contributed up to 21.0% total mean vegetable oil intake in pregnant and lactating women.

Table 2. The percentage contribution of the top 5 contributors* (FoodEx level 3 categories) to total mean intake of vegetable oils based on the EFSA Comprehensive Database using DietEx

FoodEx2 Level 3	Infants	Toddlers	Other children	Adolescents	Adults	Elderly	Very elderly	Pregnant & lactating	Vegetarians
Vegetable fats and oils, edible	2.9 - 31.6	0.3 - 68.5	0.3 – 74.1	1.6 – 75.3	2.3 – 85.9	2.0 – 89.3	0.5 – 87.3	35.4 – 65.6	57.5
Infant formula, liquid	1.8 – 72.5	0.4 – 48.7							
Infant formula, powder	0 – 72.4								
Follow-on formula, liquid	0.9 – 57.1	0.5 – 37.8							
Follow-on formula, powder	0.9 – 29.9								
Blended fat and oils		0.2 – 40.9	0 – 41.2	0 – 49.9	0 – 36.6	0 – 35.8	2.4 – 25.5	0.5 – 8.0	
Margarines and similar		0.6 – 29.4	0.1 – 36.0	1.2 – 36.3	0 – 38.7	0.2 – 50.5	2.7 – 57.6	0.8 – 9.3	3.9
Biscuit with inclusions, filling or coating			1.2 – 16.5						
Chocolate spread			0.1 – 16.5	0.7 – 16.2					
Mayonnaise sauce				1.4 – 15.2	1.0 – 15.2			1.5 – 21.0	
Salad dressing					0 – 11.6	0 – 12.0			
Multigrain bread and rolls						0 – 13.1			
Dumpling, sweet							0.7 – 36.9		
Meat soup							0.2 – 15.5		
Biscuits, sweet, plain								1.1 – 7.9	4.0
Fruit pie - tarts									3.0
Potato crisps or sticks									2.3

Ranges represent the % contribution from multiple surveys in the DietEx tool

Discussion

The present assessment uses nationally representative food consumption survey data on different population groups in the EU, as compiled into the EFSA Comprehensive food consumption survey database. As described in the present report, consumption data for vegetable oils in these surveys were examined according to the EFSA FoodEx coding system and these were used to estimate the intake of vegetable oils in all demographic groups in the EU.

The intake assessment of vegetable oils was undertaken using the DietEx tool as described in the report. From this assessment it was determined that adolescents had the greatest mean intakes of vegetable oils on an absolute basis ranging from 20.1 to 47.0 g/day. The elderly had the greatest 95th percentile intakes of vegetable oils ranging from 34.9 to 88.8 g/day. On a body weight basis, infants had the greatest mean and 95th percentile intake of vegetable oils ranging from 1.0 to 4.0 g/kg bw/day and from 3.5 to 8.8 g/kg bw/day, respectively.

The major food categories which contributed to the total intakes of vegetable oils were 'Vegetable fats and oils, edible', which contributed up to 89.3% to total mean vegetable oils intake in the elderly, 'Margarines and similar, which contributed up to 57.6% to total mean vegetable oil intake in the very elderly, and 'Blended fat and oils', which contributed up to 49.9% to total mean vegetable oil intake in adolescents. Other categories which contributed highly to vegetable oil intakes were Infant and follow-on formulae and Mayonnaise sauce. It should be noted that there is considerable variability in the intake of vegetable oils even within population groups. For example, there is a 3-fold difference in the range of mean vegetable oils intake in infants across EU Member States using the DietEx tool, with the lowest value estimated at 8.6 g/day and the highest value estimated at 25.8 g/day.

There are some difficulties in estimating the vegetable oil composition of foods in the EFSA Comprehensive Database, as vegetable oils are used as ingredients in many processed foods. Since the composition of foods is likely to vary from country to country the relative proportions of vegetable oil in each food will therefore also vary. However, since detailed information on the composition of foods was not available for all countries contributing to the EFSA Comprehensive Database, the UK recipe database was used as the best approximation for vegetable oil content of each food.

As mentioned in several EFSA guidance documents (EFSA, 2006, 2011a), fundamental methodological differences between surveys represented in the Comprehensive Database account for the large range in intake estimates between countries. Methods for collecting dietary data vary from 24-hour recalls to 7-day food records. Temporal differences in dietary behaviour, regional/seasonal differences in dietary behaviour, and the inclusion or exclusion of region-specific foods and composite dishes (comprising a mixture of foods) into the Comprehensive Database also are expected to contribute to the large variation observed. Other general considerations regarding the use of consumption surveys also play a role in the differences in intake estimates observed. It is noted that factors influencing under-reporting or misreporting of food consumption, errors in composite food calculations, subject sampling error or bias, and other sources of uncertainty may differ across countries and may contribute to the broad range of intake estimates across surveys. As mentioned above, detailed information on the composition of foods was not available for all countries contributing to the EFSA Comprehensive Database, therefore the UK recipe database and manufacturer websites were used as the best approximation for vegetable oil content of each food. This may also under/overestimate vegetable oil intakes since the vegetable oil content of foods are likely to

vary country to country and even regionally within countries. Therefore, in reality vegetable oils may be present in higher or lower amounts than those estimated based on UK food composition data. Overall, as far as possible, this assessment used a conservative model for estimating vegetable oil intakes, by assuming that vegetable oil was present as an ingredient in a certain food if there was a possibility it might be. This may produce an overestimation of vegetable oil intakes as some composite dishes or home cooked meals may use animal fats instead, and this is likely to vary between countries.

References

Berger A, Fleith M, Crozier G. Nutritional implications of replacing bovine milk fat with vegetable oil in infant formulas. Journal of pediatric gastroenterology and nutrition. 2000 Feb 1;30(2):115-30.

EFSA. Use of the EFSA Comprehensive European Food Consumption Database in Exposure Assessment. EFSA Journal 2011a ;9(3):2097. [34 pp.] doi:10.2903/j.efsa.2011.2097. Available from: http://www.efsa.europa.eu/en/efsajournal/pub/2097.htm.

EFSA. Evaluation of the FoodEx, the food classification system applied to the development of the EFSA Comprehensive European Food Consumption Database. EFSA Journal 2011b; 9(3):1970. [27 pp.] doi:10.2903/j.efsa.2011.1970. Available from: https://www.efsa.europa.eu/en/efsajournal/pub/1970.

EFSA NDA Panel (EFSA Panel on Dietetic Products, Nutrition and Allergies), 2014. Scientific Opinion on the essential composition of infant and follow-on formulae. EFSA Journal 2014;12(7):3760, 106 pp. doi:10.2903/j.efsa.2014.3760

EFSA (European Food Safety Authority), Arcella D, Ioannidou S, Sousa R. Internal report on the harmonisation of dilution factors to be used in the assessment of dietary exposure. EFSA Journal. 2018. Available online https://zenodo.org/record/1256085#.Y5CWNHbP2Uk

MRC Human Nutrition Research 2017. 'Food Standards Agency Standard Recipes Database, 1992 to 2012' [data collection]. UK Data Service. SN: 8159. Final Report available from: FSA Recipes Database Rebuild Final Report (ukdataservice.ac.uk)

Souza CO, Leite ME, Lasekan J, Baggs G, Pinho LS, Druzian JI, Ribeiro TC, Mattos ÂP, Menezes-Filho JA, Costa-Ribeiro H. Milk protein-based formulas containing different oils affect fatty acids balance in term infants: A randomized blinded crossover clinical trial. Lipids in Health and Disease. 2017 Dec;16(1):1-1.

Appendix I

FoodEx codes representing or containing vegetable oils from the EFSA Comprehensive Database

FoodEx Level 2 Category	FoodEx Level	FoodEx Code	Food Name	% Vegetable Oils*
Animal and vegetable fats/oils	3	A036N	Vegetable fats and oils, edible	100.0
Bread and similar products	3	A005Z	Extruded, pressed or puffed bread	5.0
	4	A005K	Bread and rolls with special ingredients added	2.3
	4	A005L	Multigrain bread and rolls	3.6
	4	A005V	Pretzels	8.6
	4	A006Q	Pizza base, cooked	3.4
	4	A007B	Croutons	6.0
	4	A007C	Bread stuffing	3.1
	4	A04KY	Single grain bread and rolls	0.1
	4	A0BB2	Sandwich bread (hamburger roll-type)	1.5
	5	A004Y	Wheat bread and rolls, white (refined flour)	0.9
	5	A005D	Wheat bread and rolls, semi-brown	0.9
	5	A005E	Wheat bread and rolls, brown or wholemeal	1.2
	5	A006S	Pita bread	2.0
	5	A006Y	Chapati	12.8
Breakfast cereals	4	A00EZ	Cereal bars plain	16.6
	4	A00FA	Cereal bars mixed	7.0
	5	A00DC	Popcorn (maize, popped)	22.0
Cheese	4	A031B	Processed cheese, sliceable	3.6
	4	A031C	Processed cheese, spreadable	4.0
	4	A031D	Processed cheese wedges and similar	4.0
	4	A04NX	Other processed cheese	2.0
Condiments (including table-top formats)	3	A045K	Salad dressing	41.0
	4	A043Z	Continental european brown cooked sauce, gravy	13.2
	4	A044C	Tomato-containing cooked sauces	12.5
	4	A044E	Vegetables-based cooked sauce	2.1
	4	A16BR	Meat sauce	2.3
	4	A16BS	Alcoholic sauce	5.6
	5	A043X	Bechamel sauce	4.2
	5	A043Y	Cheese sauce	1.8
	5	A044A	Cream sauce	5.6
	5	A044V	Pesto	31.0
	5	A044X	Mayonnaise sauce	60.7
	5	A045A	Aioli or garlic sauce	60.7
	5	A045D	Curry sauce	2.3
	5	A045E	Herbs, vegetables and oil sauces	7.1
	5	A045G	Horseradish sauce	17.7

FoodEx Level 2 Category	FoodEx Level	FoodEx Code	Food Name	% Vegetable Oils*
	5	A045N	Tartar sauce	23.2
	5	A046A	Chili pickle	22.8
	5	A046B	Lime pickle	10.9
	5	A046C	Mango pickle	19.5
Confectionery including chocolate	4	A034T	Chocolate substitutes	12.7
	5	A034G	Bitter chocolate	6.9
	5	A034J	Milk chocolate	12.7
	5	A034M	Couverture chocolate	12.7
	5	A034N	Gianduja chocolate	12.7
	5	A034P	White chocolate	25.8
	5	A034Q	Filled chocolate	9.4
	5	A034R	Chocolate coated confectionery	9.4
	5	A034S	Pralines	9.4
	5	A0C6P	Chocolate spread	32.8
Dairy dessert and similar	4	A02PY	Starchy pudding	3.6
	4	A02QA	Ice cream, milk-based	4.2
	4	A02QB	Ice cream, milk-imitate based	8.7
	4	A02QD	Milkshakes	2.8
	4	A04NT	Other ice cream and similar	4.2
Dessert sauces/toppings	3	A046J	Fudge sauce	4.0
	3	A046K	Alcoholic sweet sauce	4.0
Dishes, incl. Ready to eat meals (excluding soups and salads)	4	A03YJ	Egg based dishes	6.1
	4	A03YS	Mushroom based dishes	6.5
	5	A00CA	Cheese savoury pie	6.5
	5	A011M	Roesti	5.4
	5	A011N	Fries (finger chips)	6.7
	5	A011Q	Pan-fried potato	4.4
	5	A011S	Potato croquettes	6.1
	5	A03VE	Shepherd's pie	6.1
	5	A03VF	Potato casserole	6.3
	5	A03VG	Prepared potato salad	6.7
	5	A03VH	Potatoes and vegetables meal	0.9
	5	A03VJ	Potatoes and meat meal	8.2
	5	A03VK	Potatoes, meat, and vegetables meal	3.2
	5	A03VL	Potatoes and cheese meal	2.8
	5	A03VN	Hummus	19.1
	5	A03VR	Beans and meat meal	3.4
	5	A03VS	Beans and vegetables meal	3.0
	5	A03VT	Beans, meat, and vegetables meal	0.7
	5	A03VX	Goulash	4.6
	5	A03VY	Meat stew	0.8
	5	A03XA	Meat loaf	0.5
	5	A03XE	Moussaka	1.0

FoodEx Level 2 Category	FoodEx Level	FoodEx Code	Food Name	% Vegetable Oils*
	5	A03XF	Meat burger (no sandwich)	1.7
	5	A03XG	Meat balls	1.4
	5	A03XK	Bouillabaisse	4.0
	5	A03XL	Fish gratin	1.3
	5	A03XM	Seafood-based meals	4.0
	5	A03XN	Seafood salad	4.7
	5	A03XP	Prepared fish salad	4.7
	5	A03XQ	Fish and potatoes meal	1.3
	5	A03XR	Fish and rice meal	0.4
	5	A03XS	Fish and vegetables meal	1.7
	5	A03XT	Fishcakes	0.9
	5	A03XY	Creamed vegetable mix	2.9
	5	A03XZ	Vegetable casserole	5.4
	5	A03YA	Veggie pot pie	2.5
	5	A03YF	Vegetables, gratinated	4.0
	5	A03YG	Vegetable soufflé	6.0
	5	A03YH	Ratatouille	5.1
	5	A03YM	Quiche	12.6
	5	A03ZA	Sandwich with cheese topping/filling	13.2
	5	A03ZB	Sandwich with processed meat topping/filling	8.9
	5	A03ZC	Sandwich with fish topping/filling	11.4
	5	A03ZD	Sandwich with vegetable topping/filling	9.2
	5	A03ZE	Sandwich with cheese and vegetable topping/filling	13.2
	5	A03ZG	Sandwich with meat and vegetable topping/filling	8.9
	5	A03ZH	Sandwich with fish and vegetable topping/filling	11.4
	5	A03ZJ	Doner kebab	0.6
	5	A03ZK	Hot dog with bread	2.3
	5	A03ZL	Hamburger with bread	0.7
	5	A03ZP	Pizza and similar with cheese topping	3.2
	5	A03ZQ	Pizza and similar with processed meat topping	2.5
	5	A03ZR	Pizza and similar with fish/seafood topping	2.5
	5	A03ZS	Pizza and similar with vegetable topping	7.0
	5	A03ZT	Pizza and similar with cheese, and vegetables	7.0
	5	A03ZV	Pizza and similar with cheese, and vegetables and fruits	7.0
	5	A03ZX	Pizza and similar with meat, and vegetables	2.5
	5	A03ZY	Pizza and similar with cheese, meat, and vegetables	2.5
	5	A03ZZ	Pizza and similar with cheese, and mushrooms	7.0
	5	A040A	Pizza and similar with cheese, meat, and mushrooms	2.5

FoodEx Level 2 Category	FoodEx Level	FoodEx Code	Food Name	% Vegetable Oils*
	5	A040B	Pizza and similar with cheese, meat, mushrooms, and vegetables	2.5
	5	A040D	Sausage roll	4.9
	5	A040F	Spring rolls	12.0
	5	A040G	Vol au vent	7.3
	5	A040J	Meat-based canapé	7.3
	5	A040L	Cheese-based canapé	2.3
	5	A041C	Nasi goreng	2.4
	5	A041D	Paella	2.2
	5	A041F	Risotto	1.9
	5	A041G	Rice and vegetables meal	0.5
	5	A041H	Rice and meat meal	2.9
	5	A041J	Rice, meat, and vegetables meal	0.6
	5	A0CDP	Pasta, filled, cooked	1.3
Fat emulsions and blended fats	3	A04SD	Blended fat and oils	100.0
	3	A0F1G	Margarines and similar	70.0
Fine bakery wares	4	A009X	Biscuits, sweet, plain	16.0
	4	A00AE	Biscuit with inclusions, filling or coating	29.0
	4	A00AH	Éclair	7.8
	4	A00AJ	Beignets	16.0
	4	A00AK	Profiterole	7.8
	4	A00AL	Croquembouche	7.8
	4	A00AM	Gougere	7.8
	4	A00BF	Chocolate-based cakes	13.9
	4	A00BL	Buns	3.8
	4	A00BM	Croissant	5.3
	4	A00BR	Doughnuts-berliner	16.0
	4	A00BS	Kringles	16.0
	4	A00BX	Flan tart	1.5
	4	A00BZ	Fruit pie-tarts	14.0
	4	A00CB	Marzipan pie	16.5
	4	A00CK	Dumpling, sweet	19.9
	4	A00CL	Pancakes	6.4
	4	A00CM	Scones and similar	4.6
	4	A00CQ	Waffles	6.4
	4	A00CR	Spice cakes	12.0
	4	A16EQ	Puddings based on cereal products and/or nuts/fruits and similar	3.6
	4	A16FY	Fried dough sweet	16.0
	5	A00AQ	Sponge cake	5.5
	5	A00AV	Cream cake	5.5
	5	A00BA	Fruit cake	10.9
	5	A00BC	Muffins	6.4

FoodEx Level 2 Category	FoodEx Level	FoodEx Code	Food Name	% Vegetable Oils*
	5	A00BD	Meringue tart	8.3
	5	A0C6L	Rotation cooked layered cakes	9.0
Fish and seafood processed	5	A02KC	Fish fingers, breaded	9.0
Food for particular diets	3	A03RS	Food for weight reduction	1.5
Fried or extruded cereal, seed or root-based products	3	A06HL	Snacks other than chips and similar	30.0
	4	A0EQV	Puffs/curls-type extruded snack	30.0
	5	A00FC	Corn chips	21.7
	5	A00FD	Tortilla chips	21.7
	5	A00FF	Rice chips	21.7
	5	A011L	Potato crisps or sticks	33.4
Infant and follow-on formulae	4	A03PZ	Infant formulae, powder	30.0
	4	A03QE	Infant formulae, liquid	4.0
	4	A03QK	Follow-on formulae, powder	30.0
	4	A03QQ	Follow-on formulae, liquid	4.0
Meat and dairy imitates	5	A03TJ	Soya drink	0.1
	5	A03TL	Oats drink	0.5
	5	A03TM	Rice drink	0.9
	5	A03TN	Rye drink	0.9
	5	A03TP	Spelt drink	0.9
	5	A03TR	Imitation cream	5.9
	5	A03TS	Non dairy coffee creamer	5.9
	5	A03TY	Imitation cheese	22.0
Milk, whey and cream	4	A02MN	Cream sprayable	5.9
Pasta, doughs and similar products	3	A00CC	Pastry based on laminated dough	7.7
	4	A008L	Yeast leavened sweet doughs	9.3
	4	A008P	Chemically leavened doughs	10.5
	4	A008T	Unleavened doughs	30.5
	4	A009G	Choux pastry dough and similar	8.4
	4	A009J	Cake pre-mixes/batter	5.4
	4	A0ERE	Filled (stuffed) pastas	1.3
	5	A008J	Yeast bread – pizza dough	8.8
	5	A008K	Naturally leavened bread dough	8.8
	5	A008Y	Short pastry dough (pate brisee)	30.5
	5	A008Z	Fine dough without yeast	10.5
	5	A009A	French pie pastry dough	30.5
	5	A009D	Shortbread pastry	30.5
	5	A009E	Piped shortbread pastry	30.5
	5	A009F	Sweet almond pastry mass	6.5
	5	A009R	Quark oil dough	30.5
	3	A03RA	Biscuits, rusks and cookies for children	13.5

FoodEx Level 2 Category	FoodEx Level	FoodEx Code	Food Name	% Vegetable Oils*
Processed cereal-based food for infants and young children	4	A032C	Fried eggs	1.2
	4	A032E	Manufactured solid egg roll	12.0
	5	A01BM	Sesame paste (tahini) (sesamus indicum)	30.0
	5	A01BN	Peanut butter	5.5
Ready-to-eat meal for infants and young children	3	A03RD	Ready-to-eat vegetable-based meal for children	1.0
	3	A03RE	Ready-to-eat cereal-based meal for children	1.5
	3	A03RF	Ready-to-eat meat-based meal for children	1.3
	3	A03RG	Ready-to-eat fish-based meal for children	1.1
	3	A03RH	Ready-to-eat dairy-based meal for children	3.6
	3	A03RJ	Ready-to-eat fruit-based meal for children	1.5
	3	A03RK	Ready-to-eat mixed meal for children	2.1
Sausages	4	A025K	Spreadable cooked sausages	8.7
Soups and salads	4	A00EP	Corn semolina based thick soup	4.2
	4	A03YV	Mushroom salad	4.7
	4	A041M	Onion soup	8.3
	4	A041N	Tomato soup	0.7
	4	A041P	Potato soup	8.5
	4	A041Q	Legume (beans) soup	3.0
	4	A041R	Mushroom soup	0.5
	4	A041T	Meat soup	15.0
	4	A041X	Fish soup	8.5
	4	A041Y	Cereal products and grains based soup	8.5
	4	A041Z	Dairy/egg soup	8.5
	4	A042C	Mixed green salad	5.6
	4	A042D	Mixed vegetable salad	4.7
	4	A042E	Ceasar salad	5.6
	4	A042F	Greek salad	5.6
	4	A042G	Prepared legume (beans) salad	4.7
	4	A042H	Prepared pasta salad	4.3
	4	A042J	Prepared rice salad	5.1
	4	A042K	Prepared nut salad	13.4
	4	A042L	Prepared meat salad	5.6
	4	A042M	Prepared mixed egg/meat/fish/vegetable salad	5.6
	4	A0CDN	Mixed soups	0.5
	4	A0CVB	Gazpacho and similar	0.7

* In the absence of an EU-wide recipe database, information on the vegetable oil content for each food was derived from the UK Food Standards Agency (FSA) recipe database as closely matched as possible (MRC, 2017). Where a food was not found in the UK recipe database, manufacturer websites were used to identify the vegetable oil content.

Appendix II

Food consumption surveys in the DietEx tool used in the present intake assessment of vegetable oils

Population group	**Country**	**Survey details**
Infants	Bulgaria	NUTRICHILD
	Cyprus	National dietary survey of the children of Cyprus
	Denmark	Danish National Dietary survey among infants and young children 2006-2007
	Estonia	National Dietary Survey among children up to ten years old and breastfeeding mothers in Estonia
	Finland	Diabetes Prediction and Prevention Nutrition Study (DIPP) 2001-2009
	France	The French national dietary survey (INCA3, 2014-2015)
	Germany	Consumption Survey of Food Intake among Infants and Young Children
	Italy	Italian National Food Consumption Survey INRAN-SCAI 2005-06
	Latvia	Latvian National Dietary survey
	Portugal	National Food, Nutrition and Physical Activity Survey of the Portuguese general population
	Slovenia	Slovenian national food consumption survey
	Spain	Spanish National dietary survey on children and adolescents
Toddlers	Belgium	Regional Flanders
	Bulgaria	NUTRICHILD
	Cyprus	National dietary survey of the children of Cyprus
	Denmark	Danish National Dietary survey among infants and young children 2006-2007
	Estonia	National Dietary Survey among children up to ten years old and breastfeeding mothers in Estonia
	Finland	Diabetes Prediction and Prevention Nutrition Study (DIPP) 2001-2009
	France	The French national dietary survey (INCA3, 2014-2015)
	Germany	Consumption Survey of Food Intake among Infants and Young Children
	Hungary	Hungarian national food consumption survey
	Italy	Italian National Food Consumption Survey INRAN-SCAI 2005-06
	Latvia	Latvian National Dietary survey
	Netherlands	Dutch National Food Consumption Survey 2012-2016 (DNFCS)
	Portugal	National Food, Nutrition and Physical Activity Survey of the Portuguese general population
	Slovenia	Slovenian national food consumption survey

Population group	Country	Survey details
	Spain	Spanish National dietary survey on children and adolescents
Other children	Austria	Austrian Study on Nutritional Status 2010-12 - Children
	Belgium	Belgian national food consumption survey in children, adolescents and adults
	Bulgaria	NUTRICHILD
	Cyprus	National dietary survey of the children of Cyprus
	Czechia	Czech National Food Consumption Survey
	Denmark	The Danish National Dietary survey 2005-2008
	Estonia	National Dietary Survey among children up to ten years old and breastfeeding mothers in Estonia
	Finland	Diabetes Prediction and Prevention Nutrition Study (DIPP) 2001-2009
	France	The French national dietary survey (INCA3, 2014-2015)
	Germany	Consumption Survey of Food Intake among Infants and Young Children
	Germany	Eating Study as a KiGGS Module (EsKiMo)
	Greece	Regional Crete
	Hungary	Hungarian national food consumption survey
	Italy	Italian National Food Consumption Survey INRAN-SCAI 2005-06
	Latvia	Latvian National Dietary survey
	Netherlands	Dutch National Food Consumption Survey 2012-2016 (DNFCS)
	Portugal	National Food, Nutrition and Physical Activity Survey of the Portuguese general population
	Spain	Spanish National dietary survey on children and adolescents
	Sweden	National Food Administration
Adolescents	Austria	EU Menu Austria: Food consumption data for Austrian adolescents
	Belgium	Belgian national food consumption survey in children, adolescents and adults
	Cyprus	National dietary survey of the adult population of Cyprus
	Czechia	Czech National Food Consumption Survey
	Denmark	The Danish National Dietary survey 2005-2008
	Estonia	National Dietary Survey among 11-74 years old individuals in Estonia
	Estonia	National Dietary Survey among children up to ten years old and breastfeeding mothers in Estonia
	Finland	Nutrition and wellbeing of secondary school pupils
	France	The French national dietary survey (INCA3, 2014-2015)
	Germany	Eating Study as a KiGGS Module (EsKiMo)

Population group	Country	Survey details
	Germany	National Nutrition Survey II
	Greece	The EFSA-funded collection of dietary and related data in the general population aged 10-74 years in Greece
	Hungary	Hungarian national food consumption survey
	Italy	Italian National Food Consumption Survey INRAN-SCAI 2005-06
	Latvia	Latvian National Dietary survey
	Netherlands	Dutch National Food Consumption Survey 2012-2016 (DNFCS)
	Portugal	National Food, Nutrition and Physical Activity Survey of the Portuguese general population
	Romania	Romanian national food consumption survey for adolescents, adults and elderly
	Slovenia	Slovenian national food consumption survey
	Spain	Spanish National dietary survey on children and adolescents
	Sweden	RIKSMATEN ADOLESCENTS 2016
Adults	Austria	EU Menu Austria: Food consumption data for Austrian adults
	Belgium	Belgian national food consumption survey in children, adolescents and adults
	Croatia	Croatian food consumption survey on adults
	Cyprus	National dietary survey of the adult population of Cyprus
	Czechia	Czech National Food Consumption Survey
	Denmark	The Danish National Dietary survey 2005-2008
	Estonia	National Dietary Survey among 11-74 years old individuals in Estonia
	Finland	FINDIET 2017
	France	The French national dietary survey (INCA3, 2014-2015)
	Germany	National Nutrition Survey II
	Greece	The EFSA-funded collection of dietary and related data in the general population aged 10-74 years in Greece
	Hungary	Hungarian national food consumption survey
	Ireland	National Adult Nutrition Survey
	Italy	Italian National Food Consumption Survey INRAN-SCAI 2005-06
	Latvia	Latvian National Dietary survey
	Netherlands	Dutch National Food Consumption Survey 2012-2016 (DNFCS)
	Portugal	National Food, Nutrition and Physical Activity Survey of the Portuguese general population
	Romania	Romanian national food consumption survey for adolescents, adults and elderly
	Slovenia	Slovenian national food consumption survey

Population group	Country	Survey details
	Spain	Spanish National dietary survey in adults, elderly and pregnant women
	Sweden	RIKSMATEN ADOLESCENTS 2016
	Sweden	Swedish National Dietary Survey - Riksmaten adults 2010-11
Elderly	Austria	Austrian Study on Nutritional Status 2010-12 - Adults
	Belgium	Diet National 2004
	Cyprus	National dietary survey of the adult population of Cyprus
	Denmark	The Danish National Dietary survey 2005-2008
	Estonia	National Dietary Survey among 11-74 years old individuals in Estonia
	Finland	FINDIET 2017
	France	The French national dietary survey (INCA3, 2014-2015)
	Germany	National Nutrition Survey II
	Greece	The EFSA-funded collection of dietary and related data in the general population aged 10-74 years in Greece
	Hungary	Hungarian national food consumption survey
	Ireland	National Adult Nutrition Survey
	Italy	Italian National Food Consumption Survey INRAN-SCAI 2005-06
	Latvia	Latvian National Dietary survey
	Netherlands	Dutch National Food Consumption Survey 2012-2016 (DNFCS)
	Portugal	National Food, Nutrition and Physical Activity Survey of the Portuguese general population
	Romania	Romanian national food consumption survey for adolescents, adults and elderly
	Slovenia	Slovenian national food consumption survey
	Spain	Spanish National dietary survey in adults, elderly and pregnant women
	Sweden	Swedish National Dietary Survey - Riksmaten adults 2010-11
Very elderly	Austria	Austrian Study on Nutritional Status 2010-12 - Adults
	Belgium	Diet National 2004
	Denmark	The Danish National Dietary survey 2005-2008
	France	The French national dietary survey (INCA3, 2014-2015)
	Germany	National Nutrition Survey II
	Hungary	National Repr Surv
	Ireland	National Adult Nutrition Survey
	Italy	Italian National Food Consumption Survey INRAN-SCAI 2005-06

Population group	Country	Survey details
	Latvia	Latvian National Dietary survey
	Netherlands	Dutch National Food Consumption Survey 2012-2016 (DNFCS)
	Netherlands	Dutch National Food Consumption Surveys - Older Adults
	Portugal	National Food, Nutrition and Physical Activity Survey of the Portuguese general population
	Romania	Dieta Pilot Adults
	Sweden	Swedish National Dietary Survey - Riksmaten adults 2010-11
Lactating women	Estonia	National Dietary Survey among children up to ten years old and breastfeeding mothers in Estonia
	Greece	Diet Lactation GR
Pregnant women	Austria	EU Menu Austria: Food consumption data for Austrian pregnant women
	Cyprus	National dietary survey of the adult population of Cyprus
	Latvia	Dietary survey on pregnant women in Latvia (LGPPP)
	Portugal	National Food, Nutrition and Physical Activity Survey of the Portuguese pregnant women
	Romania	Ad-hoc consumption survey for Romanian pregnant women
	Spain	Spanish National dietary survey in adults, elderly and pregnant women
Vegetarians	Romania	Ad-hoc consumption survey for Romanian vegetarian adults

Appendix III

Table III.1. Estimated daily intake of vegetable oils in the total population in Infants based on the DietEx tool

Population	Country	n	Vegetable oils (g/day)		Vegetable oils (g/kg bw/day)	
			Mean	P95	Mean	P95
Infants	Bulgaria	859	14.3	38.1	2.1	6.9
	Cyprus	266	21.0	45.7	3.1	7.4
	Denmark	826	18.2	36.7	2.0	4.3
	Estonia	504	8.6	33.0	1.0	4.0
	Finland	500	13.8	33.6	1.7	4.1
	France	64	23.7	40.3	4.0	8.8
	Germany	159	15.1	28.4	1.7	3.5
	Italy	16*	14.9	41.7	1.8	5.8
	Latvia	171	10.1	33.9	1.6	5.5
	Portugal	234	17.1	37.5	2.1	4.7
	Slovenia	294	10.3	31.5	1.2	4.0
	Spain	289	25.8	41.6	2.9	4.7

*Number of observations lower than 60, the 95th percentile may not be statistically robust

Table III.2. Estimated daily intake of vegetable oils in the total population in Toddlers based on the DietEx tool

Population	Country	n	Vegetable oils (g/day)		Vegetable oils (g/kg bw/day)	
			Mean	P95	Mean	P95
Toddlers (12-35 months)	Belgium	36*	21.8	49.8	1.6	3.8
	Bulgaria	428	20.3	36.9	1.7	3.1
	Cyprus	275	25.9	47.7	2.2	4.2
	Denmark	917	13.7	27.8	1.1	2.3
	Estonia	268	10.3	26.2	0.8	2.2
	Finland	500	14.7	31.4	1.5	3.2
	France	139	18.6	36.4	1.6	3.3
	Germany	348	12.1	24.3	1.0	2.0
	Hungary	535	19.1	38.7	1.6	3.2
	Italy	36*	21.0	39.6	1.7	3.1
	Latvia	242	10.7	25.2	0.9	2.3
	Netherlands	440	20.0	38.6	1.6	3.3
	Portugal	571	15.4	31.2	1.3	2.8
	Slovenia	343	10.7	24.7	0.9	2.1
	Spain	326	24.2	42.1	2.0	3.7

*Number of observations lower than 60, the 95th percentile may not be statistically robust

Table III.3. Estimated daily intake of vegetable oils in the total population in Other Children based on the DietEx tool

Population	Country	n	Vegetable oils (g/day)		Vegetable oils (g/kg bw/day)	
			Mean	P95	Mean	P95
Other Children (3 to 9 years)	Austria	128	32.8	62.6	1.1	2.5
	Belgium	985	23.3	47.0	1.0	2.0
	Bulgaria	433	27.5	47.8	1.7	3.2
	Cyprus	297	27.7	51.7	1.2	2.5
	Czechia	389	25.9	53.9	1.1	2.3
	Denmark	298	27.1	53.6	1.1	2.1
	Estonia	765	14.4	34.3	0.6	1.4
	Finland	750	19.7	34.2	1.1	1.8
	France	852	23.1	44.4	1.0	2.0
	Germany	293	14.5	25.6	0.9	1.5
	Germany	835	19.9	37.2	0.7	1.5
	Greece	838	24.7	44.6	1.1	2.3
	Hungary	537	26.9	50.6	1.2	2.3
	Italy	193	39.1	62.3	1.6	2.9
	Latvia	782	16.4	37.5	0.7	1.6
	Netherlands	853	28.9	55.1	1.3	2.4
	Portugal	521	20.1	39.3	0.9	1.7
	Spain	556	26.7	45.6	1.1	2.1

Table III.4. Estimated daily intake of vegetable oils in the total population in Adolescents based on the DietEx tool

Population	Country	n	Vegetable oils (g/day)		Vegetable oils (g/kg bw/day)	
			Mean	P95	Mean	P95
Adolescents (10 to 17 years)	Austria	574	20.1	48.7	0.4	0.9
	Belgium	927	31.7	66.5	0.6	1.4
	Cyprus	271	34.7	70.7	0.7	1.5
	Czechia	298	33.9	66.4	0.8	1.5
	Denmark	377	25.9	49.5	0.5	1.1
	Estonia	300	22.0	52.8	0.4	1.0
	Estonia	41	16.0	33.7	0.4	0.8
	Finland	306	29.8	54.9	0.6	1.1
	France	1130	26.3	56.1	0.6	1.2
	Germany	393	22.0	42.7	0.6	1.1
	Germany	1011	25.6	55.7	0.4	1.0
	Greece	274	36.6	74.0	0.7	1.4
	Hungary	528	38.3	65.8	0.8	1.5
	Italy	247	47.0	76.9	0.9	1.6
	Latvia	620	22.9	53.6	0.5	1.2
	Netherlands	870	42.0	81.6	0.8	1.7
	Portugal	633	24.0	50.9	0.5	1.0
	Romania	356	20.5	43.7	0.4	1.0
	Slovenia	484	24.2	56.1	0.5	1.1
	Spain	609	29.6	50.9	0.6	1.2
	Sweden	2884	29.9	67.9	0.6	1.3

*Number of observations lower than 60, the 95th percentile may not be statistically robust

Table III.5. Estimated daily intake of vegetable oils in the total population in Adults based on the DietEx tool

Population	Country	n	Vegetable oils (g/day)		Vegetable oils (g/kg bw/day)	
			Mean	P95	Mean	P95
Adults (18 to 64 years)	Austria	2169	24.2	54.0	0.3	0.8
	Belgium	1234	31.5	68.7	0.4	1.0
	Croatia	2002	32.7	63.9	0.4	0.9
	Cyprus	272	34.4	66.5	0.5	1.0
	Czechia	1666	32.6	67.9	0.4	0.9
	Denmark	1739	27.0	60.2	0.4	0.8
	Estonia	2124	19.0	44.8	0.3	0.6
	Finland	1196	37.2	76.4	0.5	1.0
	France	1773	29.3	60.9	0.4	0.9
	Germany	10419	28.6	63.8	0.4	0.8
	Greece	260	42.9	85.5	0.6	1.2
	Hungary	529	34.2	73.7	0.4	0.9
	Ireland	1274	32.3	64.9	0.4	0.8
	Italy	2313	42.6	69.0	0.6	1.0
	Latvia	1080	20.7	52.4	0.3	0.7
	Netherlands	1478	40.1	85.4	0.5	1.1
	Portugal	3102	21.9	46.6	0.3	0.7
	Romania	740	18.6	40.9	0.2	0.6
	Slovenia	385	21.5	48.3	0.3	0.7
	Spain	536	24.9	43.6	0.3	0.7
	Sweden - Adolescents 2016	215	31.3	75.7	0.5	1.2
	Sweden - Adults 2010-11	1430	28.5	56.1	0.4	0.8

Table III.6. Estimated daily intake of vegetable oils in the total population in the Elderly based on the DietEx tool

Population	Country	n	Vegetable oils (g/day)		Vegetable oils (g/kg bw/day)	
			Mean	P95	Mean	P95
Elderly (64 to 74 years)	Austria	67	30.4	65.7	0.4	0.8
	Belgium	511	36.3	88.8	0.5	1.2
	Cyprus	260	34.6	69.2	0.5	0.9
	Denmark	274	24.2	49.8	0.3	0.7
	Estonia	525	15.5	37.9	0.2	0.5
	Finland	459	33.4	67.0	0.4	0.8
	France	384	30.7	62.0	0.4	0.9
	Germany	2006	26.2	58.7	0.3	0.8
	Greece	257	38.4	76.2	0.5	1.0
	Hungary	527	27.1	53.9	0.3	0.7
	Ireland	149	27.3	70.9	0.4	0.9
	Italy	290	40.8	70.7	0.6	1.0
	Latvia	300	16.7	41.0	0.2	0.5
	Netherlands	448	34.4	70.7	0.4	0.8
	Portugal	509	18.9	39.9	0.3	0.6
	Romania	356	16.2	34.9	0.2	0.5
	Slovenia	450	17.3	41.0	0.2	0.5
	Spain	264	22.9	38.7	0.3	0.5
	Sweden	295	24.7	48.2	0.3	0.6

Table III.7. Estimated daily intake of vegetable oils in the total population in the Very Elderly based on the DietEx tool

Population	Country	n	Vegetable oils (g/day)		Vegetable oils (g/kg bw/day)	
			Mean	P95	Mean	P95
Very Elderly (≥75 years)	Austria	25*	35.4	69.1	0.5	1.0
	Belgium	704	34.3	86.0	0.5	1.2
	Denmark	12*	22.4	42.7	0.3	0.6
	France	118	31.6	70.4	0.5	1.1
	Germany	490	25.5	57.2	0.3	0.8
	Hungary	80	32.6	49.7	0.5	0.8
	Ireland	77	25.6	65.3	0.4	0.9
	Italy	228	34.6	56.7	0.5	0.9
	Latvia	10*	20.5	61.0	0.3	0.8
	Netherlands	224	30.3	52.4	0.4	0.7
	Netherlands	450	34.1	70.0	0.5	0.9
	Portugal	241	17.4	42.9	0.2	0.6
	Romania	45*	45.1	86.7	0.6	1.2
	Sweden	72	26.9	47.4	0.4	0.7

*Number of observations lower than 60, the 95th percentile may not be statistically robust

Table III.8. Estimated daily intake of vegetable oils in the total population in pregnant and lactating women, and vegetarians based on the DietEx tool

Population	Country	n	Vegetable oils (g/day)		Vegetable oils (g/kg bw/day)	
			Mean	P95	Mean	P95
Lactating women	Estonia	379	20.0	44.1	0.3	0.7
	Greece	65	30.8	60.5	0.5	0.9
Pregnant women	Austria	254	20.9	48.5	0.3	0.7
	Cyprus	200	35.8	81.1	0.5	1.1
	Latvia	1002	23.7	49.1	0.3	0.7
	Portugal	136	23.7	44.8	0.3	0.7
	Romania	142	18.2	40.0	0.3	0.6
	Spain	133	24.8	41.9	0.4	0.7
Vegetarians	Romania	266	22.9	45.5	0.4	0.7

Appendix IV

Estimation of Vegetable Oils in Infant/Follow-On Formula

Infant and follow-on formulae typically contain vegetable oils as a source of lipids. There are several types of vegetable oils used in the production of infant and follow-on formula including soybean oil, canola oil, sunflower oil and palm oil (EFSA, 2014). In order to estimate the vegetable oil content of infant and follow-on formula (which is used as an ingredient in these products as a source of fat), lipid levels stipulated by Commission Delegated Regulation (EU) 2016/127[9] regarding specific compositional and information requirements for infant formula and follow-on formula were used. According to the Regulation, total lipid levels for both infant and follow-on formula must be between 4.4 and 6 g per 100 kcal. The Regulation stipulates a calorie content of between 60 to 70 kcal per 100 ml made-up formula. Therefore, assuming an average calorie content of 65 kcal/100 ml, lipid levels were calculated to be between 2.9 and 3.9 g per 100 ml formula.

Along with vegetable oils, there are some other ingredients in infant and follow-on formula that contribute to total fat composition, including fish or algal oil which provides a source of docosahexaenoic acid (DHA), arachidonic acid and skimmed milk powder. To calculate the content of vegetable lipids only in the formulae, the small amount of fish or algal oil that is generally included (0.01-0.02 g/100 ml) was subtracted to give lipid levels of 2.8 to 3.9 g/100 ml. As infant and follow-on formula generally contain milk protein, which typically contains residual milk fat equating to ~4% of the total lipid content (Berger *et al*., 2000), this was also subtracted from the lipid values, giving a range of 2.7 to 3.7 g/100 ml made-up formula. This resulted in a recipe fraction for vegetable oil of 0.027 to 0.037 for made-up formula. To calculate the vegetable oil recipe fraction for the dry powder, a dilution factor of 8 was applied to give recipe fractions of 0.2 to 0.3 (as outlined in the EFSA guidance on dilution factors for dietary intake assessments (EFSA, 2018)). The calculations used in the present assessment are described in Table IV.1.

To confirm that these calculations provide a reasonable estimate of vegetable oil levels in infant and follow-on formulae, the lipid/vegetable oil composition of formula recipes reported in the literature were used to compare with the values obtained from the EU regulation. For example, in a paper by Souza *et al*., (2017), the composition of a non-palm oil infant formula was reported. The formula contained 27.7 g lipids per 100 g dry powder, of which 95.1% were vegetable oils. As such, the formula contained 26.3 g vegetable oil per 100 g dry powder, resulting in a recipe fraction of 0.26, which is within the range calculated for the present assessment.

In order to perform a conservative estimate of vegetable oil intakes, the upper level from the range of vegetable oil recipe fractions calculated from minimum/maximum lipid levels permitted in infant/follow-on formula from EU regulation 2016/127 was applied. Therefore, a recipe fraction of 0.3 (30%) was applied for powdered infant/follow-on formula and a recipe fraction of 0.04 (4%) was applied for liquid/ready to drink formulae.

[9] Commission Delegated Regulation (EU) 2016/127 of 25 September 2015 supplementing Regulation (EU) No 609/2013 of the European Parliament and of the Council as regards the specific compositional and information requirements for infant formula and follow-on formula and as regards requirements on information relating to infant and young child feeding - https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A02016R0127-20220401

Table IV.1 Calculations for the vegetable oil content in infant formula and follow-on formula based on permitted lipid levels from Commission Delegated Regulation (EU) 2016/127

	Total Lipids (g per 100 kcal liquid formula)	DHA (mg/100 kcal liquid formula)	**g per 100 ml Liquid Formula**			**g per 100 g Powder Formula**		
			Total lipids[a]	Total vegetable oils[c]	Recipe fraction /% vegetable oil	Total lipids[b]	Total vegetable oils[c]	Recipe fraction /% vegetable oil
Minimum level of lipids permitted in infant/follow-on formula	4.4	20	2.9	2.7	0.03 / 3%	22.9	21.8	0.2 / 20%
Maximum level of lipids permitted in infant/follow-on formula	6.0	50	3.9	3.7	0.04 / 4%	31.2	29.6	0.3 / 30%

[a] Calculated assuming an average calorie content of 65 kcal/100 ml formula

[b] Calculated assuming an average calorie content of 65 kcal/100 ml formula, with a dilution factor of 8 applied to convert to dry/powder formula (EFSA, 2018)

[c] Minus lipids which must be DHA (likely from fish/algae sources) and 4% residual milk fat