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Filière Nutrition et diététique

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# Project “Nutritional Reference Values (NRVs) for Switzerland”

## Full report

**Report prepared by:**

Nutrition and Dietetics Department, School of Health Sciences, HES-SO University of Applied Sciences and Arts Western Switzerland, Geneva.

**Main authors:**

Dr. Bucher Della Torre Sophie, dietician, assistant professor

Dr. Jotterand Chaparro Corinne, dietician, assistant professor

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HEdS-Genève
Haute école
de santé Genève

25, rue des Caroubiers
1227 Carouge
+41 22 388 34 60

diet.heds@hesge.ch
www.hesge.ch/heds

Hes·SO//GENÈVE
Haute Ecole Spécialisée de Suisse occidentale

**Research team:**

Bertoni Valeria, dietician, MSc, assistant

Moullet Clémence, dietician, MPH, senior academic associate

Negro Flavia, dietician, assistant

Parel Nicolas, dietician, MSc, assistant

Vaucher de la Croix Camille, dietician, assistant

**Methodological support:**

Dr. Chatelan Angéline, dietician, senior academic associate

Dr. Tume Lyvonne, registered nurse, visiting professor, HES-SO Geneva, and Reader (Associate Professor) in Child Health (Critical Care Nursing) School of Health & Society, University of Salford

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## List of abbreviations

| | |
|---|---|
| AI | Adequate Intake |
| ALA | Alpha-Linolenic acid |
| ANSES | Agence nationale de sécurité sanitaire de l'alimentation, de l'environnement et du travail (France) - National Agency for the food, environmental and occupational health and safety |
| AR | Average Requirement |
| BW | Body weight |
| COMA | Committee on Medical Aspects of Food and Nutrition Policy |
| CSS | Conseil Supérieur de la Santé |
| D-A-CH | German, Austrian and Switzerland |
| DHA | Docosahexaenoic acid |
| EFSA | European Food Safety Authority |
| EPA | Eicosapentaenoic acid |
| FCN | Federal Commission for Nutrition |
| FSVO | Federal Food Safety and Veterinary Office |
| IOM | Institute of Medicine (USA) |
| LA | Linoleic acid |
| LARN | Revisione dei Livelli di Assunzione di Riferimento di Nutrienti ed energia per la popolazione italiana |
| LTI | Lower Threshold Intake |
| MUFA | Monounsaturated fatty acids |
| NCM | Nordic Council of Ministers |
| NNR | Nordic Nutrition Recommendations |
| NRVs | Nutritional Reference Values |
| PAL | Physical Activity Level |
| PRI | Population Reference Intake |
| PUFA | Polyunsaturated fatty acids |
| REE | Resting energy expenditure |
| RI | Reference Intake range for macronutrients |
| SACN | Scientific Advisory Committee on Nutrition (United Kingdom) |
| SFA | Saturated fatty acids |

| | |
|---|---|
| SINU | Società Italiana di Nutrizione Umana |
| TEI | Total energy intake |
| UL | Tolerable upper intake level |
| Vit | Vitamin |
| WHO | World Health Organization |

# 2 Introduction

The Nutritional Reference Values (NRVs) provide the scientific basis for dietary recommendations. They are designed for healthy individuals and are used for many goals including:

- Formulation of specific nutritional recommendations and food-based dietary guidelines to different identified populations.
- To serve as the basis for nutritional information on food labels.
- To define nutrition policies to help consumers make positive choices for a balanced diet.

This concept refers to a set of values including Average Requirement (AR), Population Reference Intake (PRI), Adequate Intake (AI), Reference Intake range for macronutrients (RI), and Tolerable upper intake level (UL) and Lower Threshold Intake (LTI). These terms are defined in Appendix I.

Many nutrition scientific societies or organizations such as the World Health Organization (WHO) provide NRVs, which are more or less regularly updated. The three main linguistic regions of Switzerland often refer to NRVs published by different organizations, such as the Società Italiana di Nutrizione Umana (SINU), the National Agency for the food, environmental and occupational health and safety (ANSES, France), or the D-A-CH reference values for nutrients jointly issued by the Nutrition Societies of Germany, Austria and Switzerland. Therefore, the NRVs used in Switzerland are sometimes different, depending on the linguistic region. In addition, the Federal Commission for Nutrition (FCN) has also developed specific NRVs for the Swiss population for six nutrients: i.e., lipids (2013), proteins (2011), carbohydrates (2009), vitamin D (2012), folate, (2002) and iodine (2013).

It is important for Switzerland to have harmonized, nationwide NRVs based on solid and reliable scientific and recognized data throughout the country in order to assess the nutritional status of the population and update the food-based dietary guidelines that is the Swiss food pyramid. In this context, the Federal Food Safety and Veterinary Office (FSVO) has commissioned the Department of Nutrition and Dietetics of the University of Applied Sciences of Western Switzerland to undertake this project.

# 3 Aim and objectives of the project

This project aims to identify which reference societies may provide updated and appropriate NRVs for nutritional intakes of the population living in Switzerland, and to assess which NRVs of the FCN should be updated.

The main objectives of this project are the following:

1. To identify the main societies in Europe that have defined NRVs (AI, AR, PRI, UL, and LTI)
2. To select one or two reference societies that may provide a large part of the NRVs for Switzerland, based on a two-step analysis (including comparisons of the NRVs for macro- and micronutrients and of the methodologies used to define the NRVs).

3. To assess the need to update the NRVs published by the FCN (for lipids, proteins, carbohydrates, vitamin D, folate, and iodine).
4. To propose a model of NRVs specific to Switzerland in the form of a summary table including population groups and age sub-categories for energy, macro- and micronutrients, and their NRVs and to highlight proposals for changes from the current Swiss NRVs.

# 4 Overall methods of the project

## 4.1 Overview of the two-step methodology

In order to identify which reference society would provide recent and appropriate NRVs for the majority of nutrients for population living in Switzerland, our research team has developed a methodology in two steps, displayed in Figure 1. During Step 1, from September 2020 to February 2021, we have researched, compared and analyzed the NRVs of seven nutrients and the methodologies used to define them by eight identified societies. The nutrients analyzed during this stage were the following: protein, carbohydrates, folate, vitamin D, calcium, iodine, and iron. We have chosen these nutrients for three reasons: first, the FCN provides NRVs for the majority of these nutrients (protein, carbohydrates, folate, vitamin D, and iodine), secondly their NRVs may vary between subgroups including gender, and thirdly large variabilities were expected between societies. The analyses were summarized in the Intermediate report 1, which was sent to an expert group, followed by an online survey and individual interviews, in order to pre-select2.4 societies for Step 2. In Step 2 conducted from February to June 2021, all nutrients were analyzed and summarized in the Intermediate report 2, submitted to the experts group. This was followed by a second online survey and a focus group. These methodologies and findings of Steps 1 and 2 are detailed in the next chapters.

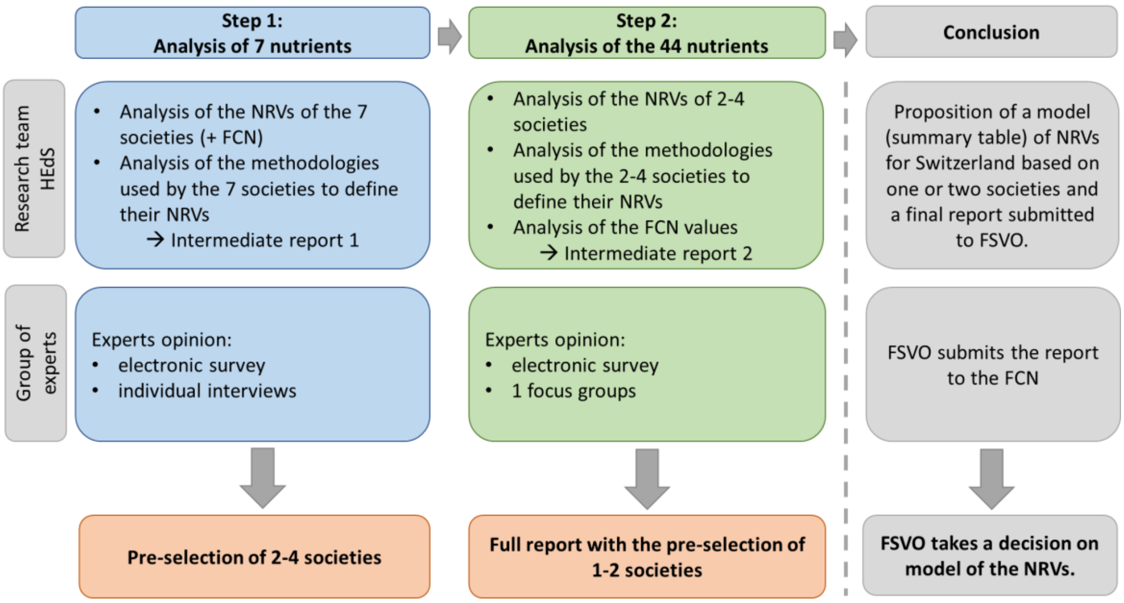



Figure 1: Main steps of the project including the procedure for a pre-selection of 2-4 societies, followed by the selection of one, possibly two societies

## 4.2 Identification of the main societies for inclusion into this project

To identify the eligible societies that may provide NRVs for Switzerland, inclusion and exclusion criteria were set. The inclusion criteria were societies with the following characteristics:

- having recently updated their NRVs (after 2011);
- providing NRVs for energy, all macronutrients and for the majority of micronutrients, and specify the type of value i.e. AI, AR, PRI, UL, or LTI;
- providing NRVs for one or more European countries with a population close to those of the Swiss population in terms of socio-demographic characteristics and eating habits. Those factors do not influence the physiological needs, but they may be taken into account to define the PRI.
- being internationally recognized.

The exclusion criteria were defined as societies that do not meet the inclusion criteria, i.e.:

- not providing NRVs sufficiently specific to the Swiss population;
- having outdated NRVs (published before 2010);
- not providing NRVs for the majority of nutrients;
- being not exclusively European or provide NRVs for a population with characteristics different from those of Switzerland.

Based on these inclusion/exclusion criteria, the FSVO identified seven societies eligible for the analysis and excluded some societies, as shown in Table 1. To ensure completeness of the research, our team conducted a literature search on electronic databases and websites of scientific societies of nutrition to find additional societies that could meet the inclusion criteria. This leads to the inclusion of the Conseil Supérieur de la Santé (CSS) (the Superior Health Council of Belgium). We also included the FCN as this society provides specific values for Switzerland, despite providing NRVs for only six nutrients.

Table 1: Societies having defined NRVs that have been included in the current project or excluded

| **Included societies** | | |
|---|---|---|
| **Acronym** | **Name of the society** | **Country** |
| ANSES | The National Agency for the food, environmental and occupational health and safety | France |
| FCN | The Federal Commission for Nutrition | Switzerland |
| CSS | Conseil Supérieur de la Santé | Belgium |
| D-A-CH | The D-A-CH values | Germany, Austria and Switzerland |
| EFSA | The European Food Safety Authority | Europe |
| NNR | The Nordic Nutrition Recommendations | Denmark – Finland - Island - Norway – Sweden |
| SACN | The Scientific Advisory Committee on Nutrition | United Kingdom |
| SINU | Società Italiana di Nutrizione Umana | Italy |
| **Excluded societies and reasons for exclusion** | | |
| Institute of Health Medicine, US, World Health Organization: excluded by the FSVO: recommendations not developed specifically for European populations or for populations having characteristics that may differ from those of Switzerland | | |
| Spanish, Portuguese and Dutch Societies: excluded by the research group: population with characteristics different from those of Switzerland and/or border countries already included. | | |

## 4.3 Collaboration with an expert group

An expert group was created to provide their expertise at the different steps of the project. This group consisted of experts from the three language regions of Switzerland, as shown in Table 2. We have selected these experts coming from different institutions, for their various scientific backgrounds, professional experience, knowledge of the nutritional recommendations and of the Swiss context. None had a conflict of interest.

Table 2: Description of the expert group

| | |
|---|---|
| German part of Switzerland | - Prof. Undine Lehmann, Bern University of Applied Sciences<br>- Prof. Sabine Rohrmann, University of Zurich<br>- Esther Infanger, Externas GmbH |
| Italian part of Switzerland | - Evelyne Battaglia-Richi, Studio Battaglia |
| French part of Switzerland | - Prof. Pedro Marques-Vidal, University of Lausanne - CHUV<br>- Murielle Jaquet, Swiss Nutrition Society |

# Step 1 of the project

# 5 Step 1 of the project

## 5.1 Aim of Step 1

The aim of Step 1 was to pre-select 2-4 societies out of the 8 included societies, based on the analysis of seven nutrients: i.e. protein, carbohydrates, folate, vitamin D, calcium, iodine and iron.

## 5.2 Method of Step 1

For Step 1, we used the following methodology: 1) a general description of the included societies; 2) a description of the methodologies used by the societies and a comparison of their NRVs for seven nutrients; 3) an online survey for our group of experts; 4) and individual interviews with the experts. The figure 2 details the methodology of Step 1.

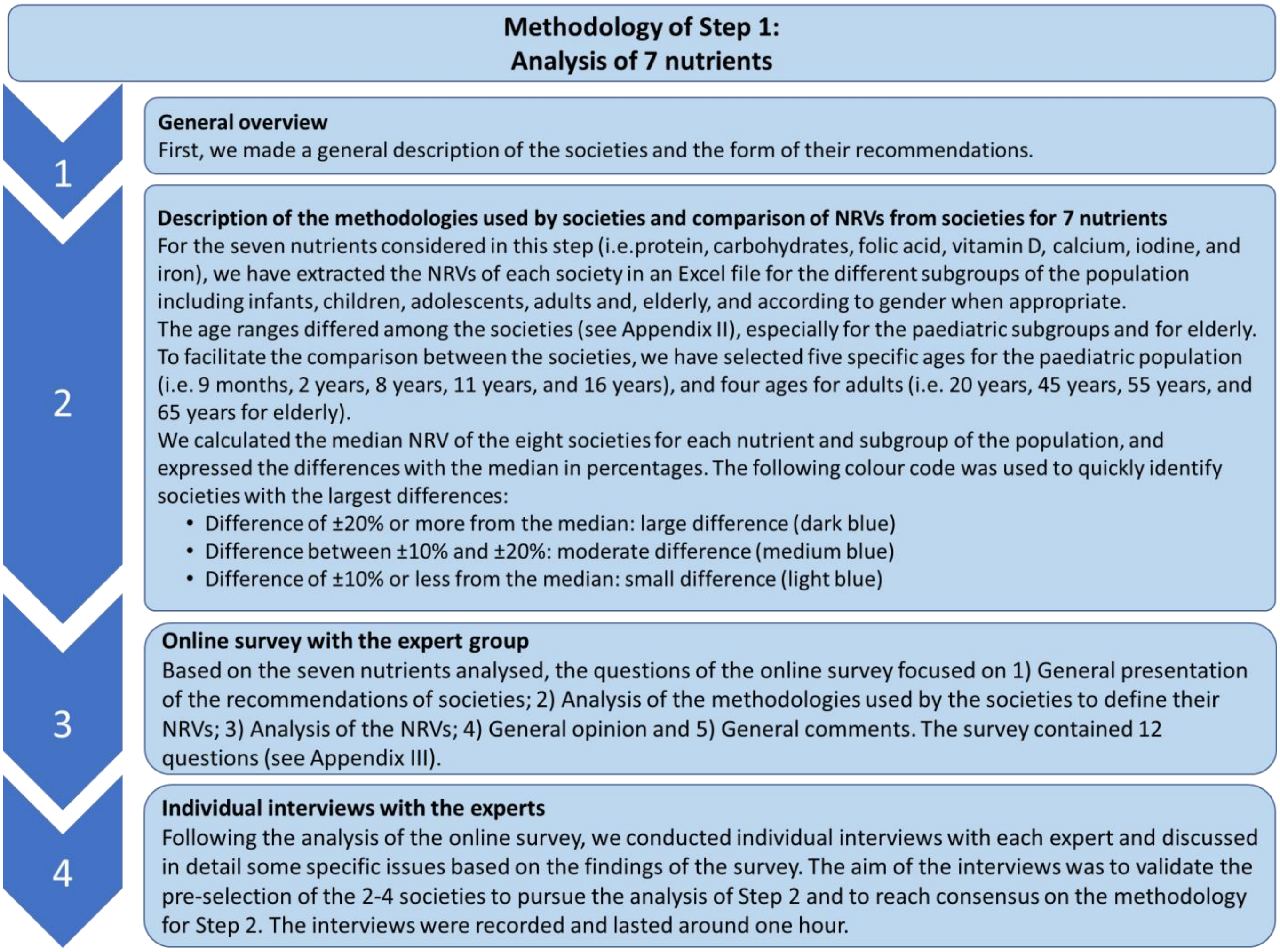



Figure 2: Description of the methodology followed in Step 1

## 5.3 Main results of Step 1

### 5.3.1 Description of the included societies

The eight societies described their NRVs and the associated methodologies used to define the NRVs in various ways. The types of publications differed among the societies including mainly electronic scientific reports or publications. The NRVs of SINU and D-A-CH are available online, however their complete methodologies have been published in an e-book and in a folder, respectively, that are not freely available. The language of publication was mainly English, but also French, German and Italian.

Most societies, including the CSS, the NNR and the SINU, have published one unique report or a few reports regrouping the analyzed nutrients. Others (D-A-CH, ANSES and SACN) have published one main report and additional reports for some nutrients and/or subgroups. The EFSA has published one report per nutrient including the different subgroups of population as did the FCN for seven nutrients.

Some general information on these publications are provided below:

- The CSS published the “Recommandations nutritionnelles pour la Belgique – 2016 ». This report covers NRVs for macro- and micronutrients for the different subgroups of the population.
- The Nordic Council of Ministers (NCM) published “Nordic Nutrition Recommendations - NNR 2012”. This report provides NRVs for macro- and micronutrients for the different subgroups of the population. The NNR will be updated and new recommendations will be published in 2022.
- The SINU published in 2014 an-ebook “la IV Revisione dei Livelli di Assunzione di Riferimento di Nutrienti ed energia per la popolazione italiana (LARN). This e-book contains NRVs for all nutrients and subgroups of population.
- The D-A-CH recommendations can be found in a paper document published in German in 2015. For some nutrients, an update is available in the form of electronic published scientific articles.
- The SACN replaced the Committee on Medical Aspects of Food and Nutrition Policy (COMA) in 2000 and has since published updates for some macro- and micronutrients including carbohydrates, vitamin D, folic acid, iodine, and iron. For other nutrients, the SACN refers to the 1991 COMA publication « Dietary reference values for food energy and nutrients for the United Kingdom ».
- At the beginning of the project, the ANSES had one major report for NRVs for adults published in 2016 and several reports for subgroups of the population. New recommendations containing NRVs for all subgroups of the population were published in March 2021, at the end of Step 1.
- The FCN published one report per nutrient, either in German, English or French. The FCN also published one report in 2018 for elderly for all nutrients.
- The EFSA has published one report per nutrient between 2010 and 2019.

The publications and website links of the different societies are provided in Appendix IV.

### 5.3.2 Description of the methodologies used by societies to define the NRVs

All societies used various methodologies, depending on the nutrient and sometimes on the subgroups. Despite this heterogeneity, we have observed some trends:

- The EFSA, D-A-CH, NNR and SACN have used mostly their own methodology. For some nutrients, they have updated their NRVs based on their own previous publications.
- The ANSES and the CSS have either adapted or adopted the methodologies of other societies. They have frequently used the methodology proposed by the EFSA.
- The SINU has mostly developed their recommendations based on several societies and scientific data or adopted NRVs from other societies.
- Depending on the nutrient, the FCN used one of the three types of methodologies.

### 5.3.3 Comparison of NRVs from societies for the 7 nutrients

The NRVs of each society for 9 specific ages are presented below (Tables 3-9 and Figures 3-7). For some nutrients, the NRVs for women and men are differentiated. In most cases, the value indicated is the PRI, except when indicated. For the FCN, the values for the age of 65 years were taken from the report on nutrition for elderly (> 65 y) published in 2018.

*Macronutrients*

Table 3: NRVs for protein

| g/kg per day | FCN | ANSES | CSS | D-A-CH | EFSA | NNR | SACN (COMA) | SINU |
|---|---|---|---|---|---|---|---|---|
| Date | 2011 2018 | 2014 | 2016 | 2017 | 2012 | 2012 | 1991 | 2014 |
| 9 mo | 1,14 | ** | - | 1,3 | 1,31 | 1,1 | *** | 1,32 |
| 2 y | 0,86 | ** | 0,97 | 1,0 | 0,97 | 1,0 | *** | 1,0 |
| 8 y | 0,91* | ** | 0,92 | 0,9 | 0,92 | 0,9 | *** | 0,99 |
| 11 y | 0,87* | ** | 0,9* | 0,9 | 0,9* | 0,9 | *** | 0,96* |
| 16 y | 0,87* | ** | 0,85* | 0,85* | 0,85* | 0,9 | *** | 0,91* |
| 20 y | 0,8 | 0,83 | 0,83 | 0,8 | 0,83 | 0,83 | 0,75 | 0,9 |
| 45 y | 0,8 | 0,83 | 0,83 | 0,8 | 0,83 | 0,83 | 0,75 | 0,9 |
| 55 y | 0,8 | 0,83 | 0,83 | 0,8 | 0,83 | 0,83 | 0,75 | 0,9 |
| 65 y | 1,0-1,2 | 1,00 | 0,83 | 1,0 | 0,83 | 0,83 | 0,75 | - |

* Average between the low and high range recommended; ** NRV expressed as percentage of total energy intake;

*** NRV expressed as grams per day; - = no defined NRV.

Most societies expressed NRVs for protein in grams per kilogram of body weight (kg) and per day. The ANSES proposed a range of percentage from total energy intake (TEI) for children and adolescents (6% to 20%). The SACN/COMA proposed a recommendation in grams per day for children (13,7 to 28,3 g per day). For adults, the NRVs ranged from 0,75 g/kg/d (SACN) to 0,9 g/kg/d (SINU) with four societies at 0,83 g/kg/d. The NRVs of all societies are higher for children and adolescents due to growth. The ANSES, D-A-CH and FCN propose higher NRVs for the age group over 65 years.

Table 4: NRVs for carbohydrates

| % of TEI | FCN | ANSES | CSS | D-A-CH | EFSA | NNR | SACN | SINU |
|---|---|---|---|---|---|---|---|---|
| Date | 2009 2018 | 2016 | 2016 | 2009 | 2010 | 2012 | 2015 | 2014 |
| 9 mo | - | 40-50 | - | - | - | 45-60 | - | 45-60 |
| 2 y | - | 40-50 | 50-55 | - | 45-60 | 45-60 | 50 | 45-60 |
| 8 y | - | 40-55 | 50-55 | - | 45-60 | 45-60 | 50 | 45-60 |
| 11 y | - | 40-55 | 50-55 | - | 45-60 | 45-60 | 50 | 45-60 |
| 16 y | - | 40-55 | 50-55 | - | 45-60 | 45-60 | 50 | 45-60 |
| 20 y | 45-55 | 40-55 | 50-55 | 45-55 | 45-60 | 45-60 | 50 | 45-60 |
| 45 y | 45-55 | 40-55 | 50-55 | 45-55 | 45-60 | 45-60 | 50 | 45-60 |
| 55 y | 45-55 | 40-55 | 50-55 | 45-55 | 45-60 | 45-60 | 50 | 45-60 |
| 65 y | 45-65 | 40-55 | 50-55 | 45-55 | 45-60 | 45-60 | 50 | 45-60 |

- = no defined NRV

All societies propose NRVs for carbohydrates expressed as a percentage of TEI. They all provide a range, except the SACN that proposes unique NRVs at 50% of TEI. The EFSA, NNR and SINU recommend 45-60% of TEI for all age groups including children. Most societies do not provide NRV for children younger than one year.

*Micronutrients*

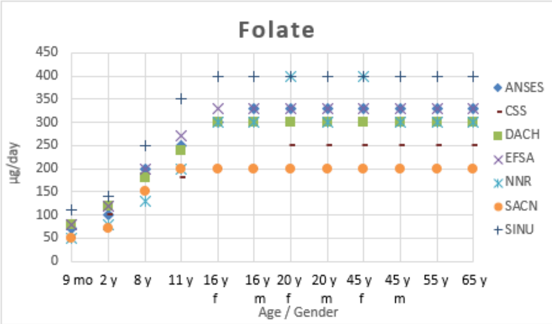
For micronutrients, the values are coloured according their difference with the median for each age.

| Difference ≥ 20%: large difference | Difference between ≥10% and < 20%: moderate difference | Difference <10%: non-significant difference |
|---|---|---|

Table 5 – Figure 3: NRVs for folates

| µg per day | FCN | ANSES | CSS | D-A-CH | EFSA | NNR | SACN | SINU | Median |
|---|---|---|---|---|---|---|---|---|---|
| Date | 2018 | 2001 2016 2019 | 2016 | 2018 | 2014 | 2012 | 2017 | 2014 | |
| 9 mo | - | 70 | 50 | 80 | 80** | 50 | 50 | 110** | 70 |
| 2 y | - | 100 | 100 | 120 | 120 | 80 | 70 | 140 | 100 |
| 8 y | - | 200 | 150 | 180 | 200 | 130 | 150 | 250 | 180 |
| 11 y | - | 250 | 180 | 240 | 270 | 200 | 200 | 350 | 240 |
| 16 y F | - | 300 | 200 | 300 | 330 | 300 | 200 | 400 | 300 |
| 16 y M | - | 330 | 200 | 300 | 330 | 300 | 200 | 400 | 300 |
| 20 y F | - | 330 | 250* | 300 | 330 | 400 | 200 | 400 | 330 |
| 20 y M | - | 330 | 250* | 300 | 330 | 300 | 200 | 400 | 300 |
| 45 y F | - | 330 | 250* | 300 | 330 | 300 | 200 | 400 | 330 |
| 45 y M | - | 330 | 250* | 300 | 330 | 300 | 200 | 400 | 300 |
| 55 y | - | 330 | 250* | 300 | 330 | 300 | 200 | 400 | 300 |
| 65 y | 400*** | 330 | 250* | 300 | 330 | 300 | 200 | 400 | 300 |

* Average between the low and high range recommended; ** Adequate intake; *** not taken into account in the median; - = no defined NRV

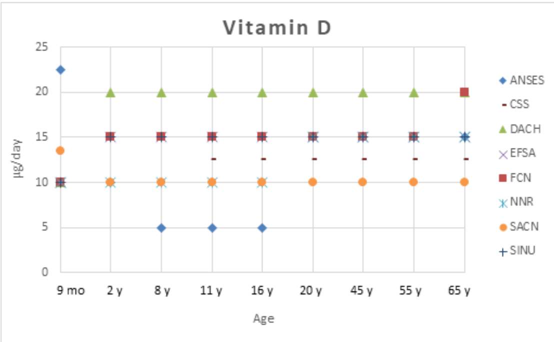



All societies recommend similar values for women and men, except the NNR that recommends higher values for women. The NRVs of the ANSES, D-A-CH, and EFSA are very close. The SACN recommendations are the lowest for adults. In contrast, the SINU recommends the highest NRVs for all subgroups.

Table 6 – Figure 4: NRVs for vitamin D

| µg per day | FCN | ANSES | CSS | D-A-CH | EFSA | NNR | SACN | SINU | Median |
|---|---|---|---|---|---|---|---|---|---|
| Date | 2012 2018 | 2001 2016 | 2016 | 2015 | 2016 | 2012 | 2016 | 2014 | |
| 9 mo | 10 | 22,5* | 10 | 10** | 10** | 10 | 9,25** | 10** | 10,0 |
| 2 y | 15 | 10 | 10 | 20** | 15** | 10 | 10 | 15 | 12,5 |
| 8 y | 15 | 5 | 10 | 20** | 15** | 10 | 10 | 15 | 12,5 |
| 11 y | 15 | 5 | 12,5* | 20** | 15** | 10 | 10 | 15 | 13,8 |
| 16 y | 15 | 5 | 12,5* | 20** | 15** | 10 | 10 | 15 | 13,8 |
| 20 y | 15 | 15 | 12,5* | 20** | 15** | 10 | 10 | 15 | 15,0 |
| 45 y | 15 | 15 | 12,5* | 20** | 15** | 10 | 10 | 15 | 15,0 |
| 55 y | 15 | 15 | 12,5* | 20** | 15** | 10 | 10 | 15 | 15,0 |
| 65 y | 20 | 15 | 12,5* | 20** | 15** | 10 | 10 | 15 | 15,0 |

* Average between the low and high range recommended; ** Adequate intake



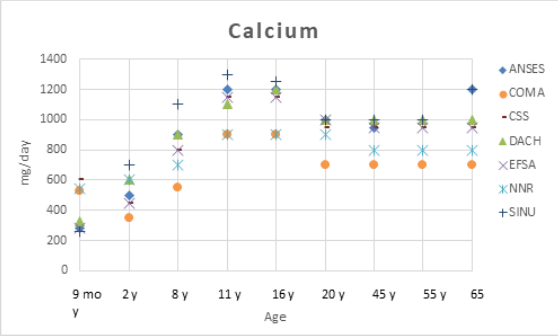

The D-A-CH and EFSA propose an AI for all subgroups of population and others propose a PRI. The NRVs vary widely between the different societies for the subgroups of children, ranging from 5 to 22.5 µg per day. For adults, the D-A-CH recommend systematically the highest NRVs (20 µg per day) while the SACN proposes the lowest values (10 µg per day). The FCN recommends the same NRVs than the EFSA, ANSES and SINU, except for elderly.

Table 7 – Figure 5: NRVs for calcium

| mg per day | FCN | ANSES | CSS | D-A-CH | EFSA | NNR | SACN (COMA) | SINU | Median |
|---|---|---|---|---|---|---|---|---|---|
| Date | - | 2001 2015 2016 | 2016 | 2015 | 2015 | 2012 | 1991 | 2014 | |
| 9 mo | - | 280** | 600 | 330** | 280** | 540 | 525 | 260** | 330 |
| 2 y | - | 500 | 450 | 600 | 450 | 600 | 350 | 700 | 500 |
| 8 y | - | 900 | 800 | 900 | 800 | 700 | 550 | 1100 | 800 |
| 11 y | - | 1200 | 1150 | 1100 | 1150 | 900 | 900* | 1300 | 1150 |
| 16 y | - | 1200 | 1150 | 1200 | 1150 | 900 | 900* | 1250* | 1150 |
| 20 y | - | 1000 | 950 | 1000 | 1000 | 900 | 700 | 1000 | 1000 |
| 45 y | - | 950 | 950 | 1000 | 950 | 800 | 700 | 1000 | 950 |
| 55 y | - | 950 | 950 | 1000 | 950 | 800 | 700 | 1000 | 950 |
| 65 y | 1200*** | 1200 | 950 | 1000 | 950 | 800 | 700 | 1200 | 950 |

* Average between the low and high range recommended; ** Adequate intake;

*** not taken into account in the median; - = no defined NRV

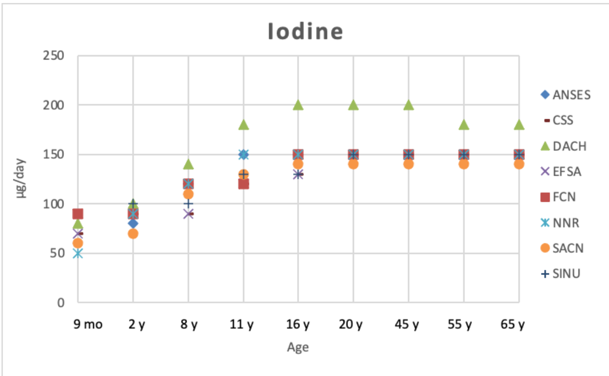



Large variations appear in NRVs for young children (6 to 11 months). For this group, some societies (ANSES, D-A-CH, EFSA, SINU) propose an AI, whereas others (CSS, NNR, SACN) propose a PRI. For all other age groups, the SACN/COMA and NNR propose the lowest values, and SINU proposes the highest values. For adults, most societies have a PRI between 950 and 1000 mg per day, except NNR with 800 (900 until 20 years old) and SACN with 700 mg per day. The ANSES and SINU propose higher NRVs for elderly.

Table 8 – Figure 6: NRVs for iodine

| µg per day | FCN | ANSES | CSS | D-A(-CH) | EFSA | NNR | SACN | SINU | Median |
|---|---|---|---|---|---|---|---|---|---|
| Date | 2013 | 2001 2016 | 2016 | 2015 | 2014 | 2012 | 2014 | 2012 | |
| 9 mo | 90 | - | 70** | 80 | 70** | 50 | 60 | 70** | 70 |
| 2 y | 90 | 80 | 90** | 100 | 90** | 90 | 70 | 100** | 90 |
| 8 y | 120 | 120 | 90** | 140 | 90** | 120 | 110 | 100** | 115 |
| 11 y | 120 | 150 | 120** | 180 | 120** | 150 | 130 | 130** | 130 |
| 16 y | 150 | 150 | 130** | 200 | 130** | 150 | 140 | 130** | 145 |
| 20 y | 150 | 150 | 150** | 200 | 150** | 150 | 140 | 150** | 150 |
| 45 y | 150 | 150 | 150** | 200 | 150** | 150 | 140 | 150** | 150 |
| 55 y | 150 | 150 | 150** | 180 | 150** | 150 | 140 | 150** | 150 |
| 65 y | 150 | 150 | 150** | 180 | 150** | 150 | 140 | 150** | 150 |

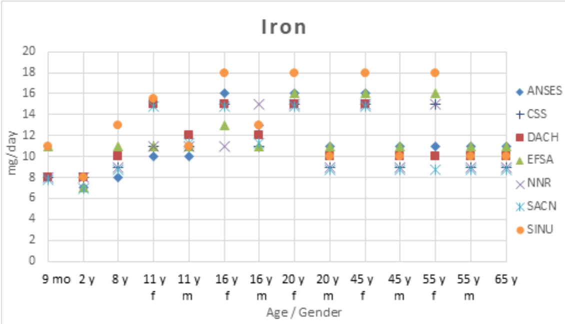
- = no defined NRV; ** Adequate intake




The NRVs for iodine vary widely among the societies for children, especially infants. For adults, the FCN, ANSES, CSS, EFSA, NNR and SINU recommend the same NRVs. The D-A-CH recommendations are higher and the SACN recommendations are lower. It is worth highlighting that the D-A-CH provide higher NRVs for Germany and Austria than for the Swiss population (for example, the Swiss NRV is 150 µg per day for children older than 12 years and for adults). This difference is explained by a better iodine status due to salt fortification in Switzerland.

Table 9 – Figure 7: NRVs for iron

| mg per day | FCN | ANSES | CSS | D-A-CH | EFSA | NNR | SACN | SINU | Median |
|---|---|---|---|---|---|---|---|---|---|
| Date | - | 2001<br>2015<br>2016 | 2016 | 2015 | 2015 | 2012 | 2010 | 2014 | |
| 9 mo | - | 8 (AR) | 8 | 8 | 11 | 8 | 7,8 | 11 | 8 |
| 2 y | - | 7 | 8 | 8 | 7 | 8 | 6,9 | 8 | 8 |
| 8 y | - | 8 | 9 | 10 | 11 | 9 | 8,7 | 13 | 9 |
| 11 y F | - | 10 | 11 | 15 | 11 | 11 | 14,8 | 14* | 11 |
| 11 y M | - | 10 | 11 | 12 | 11 | 11 | 11,3 | 10 | 11 |
| 16 y F | - | 16 | 15 | 15 | 13 | 11 | 14,8 | 18 | 15 |
| 16 y M | - | 13 | 11 | 12 | 11 | 15 | 11,3 | 13 | 12 |
| 20 y F | - | 16 | 15 | 15 | 16 | 15 | 14,8 | 18 | 15 |
| 20 y M | - | 11 | 9 | 10 | 11 | 9 | 8,7 | 10 | 10 |
| 45y F**<br>45y F*** | - | 16<br>11 | 15<br>9 | 15<br>10 | 16<br>11 | 15<br>9 | 14,8<br>14,8 | 18<br>10 | 15 |
| 45 y M | - | 11 | 9 | 10 | 11 | 9 | 8,7 | 10 | 10 |
| 55y F*** | - | 11 | 9 | 10 | 11 | 9 | 8,7 | 10 | 15 |
| 55 y M | - | 11 | 9 | 10 | 11 | 9 | 8,7 | 10 | 10 |
| 65 y | 8**** | 11 | 9 | 10 | 11 | 9 | 8,7 | 10 | 10 |




* Average between the low and high range recommended, ** Premenopausal women; *** Postmenopausal women; **** not taken into account in the median; - = no defined NRV;

> The NRVs of all societies differ between women and men since adolescence. For adult men, the NRVs do not differ widely among the societies. For women, large variations appear between the societies and depending on age groups. The SINU recommends the highest values.

### 5.3.4 Findings of the online survey 1

As described previously, the expert group completed an online survey in January 2021 after reading the intermediate report 1. The main findings of this survey are presented here.

*General presentation of the recommendations of societies*

Regarding the language of publication of the recommendations, all experts responded that a society that publishes only in English could be selected (Yes, absolutely; n=4, Rather yes: n=2.). Their responses varied about the selection of a society that publishes only in one (or mostly in one) of the national languages (Rather no: n=3, Rather yes: n=2, and Yes, absolutely: n=1).

Regarding the date of publications of the recommendations, we asked the experts to what extent publications related to NRVs from the societies were sufficiently up-to-date to be included. For EFSA, all experts responded "Yes, absolutely". In contrast, the responds for NNR, SACN/COMA and SINU were more contrasted, including negative answers, as shows in Figure 8.

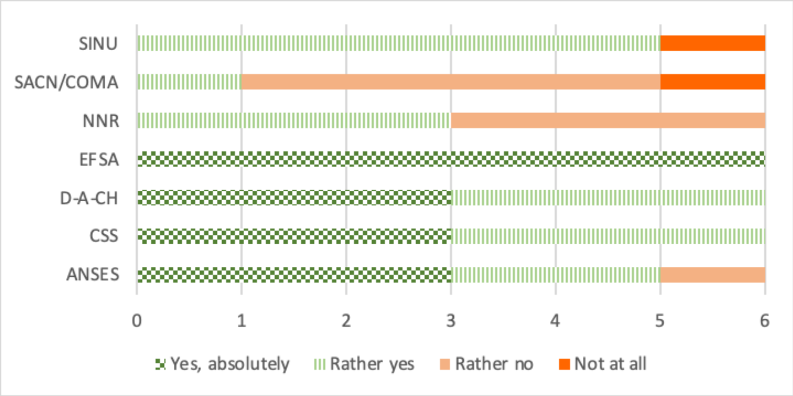



Figure 8: Expert opinions on the pre-selection of societies based on the publications dates of their recommendations

*Analysis of the methodologies used by the societies to define their NRVs and NRVs themselves*

Based on the methodologies to define the NVRs for the 7 nutrients and the NRV themselves, all experts were clearly in favor of selecting EFSA, followed by D-A-CH (Figures 9 and 10). The majority of experts would have not selected SINU and SACN/COMA.

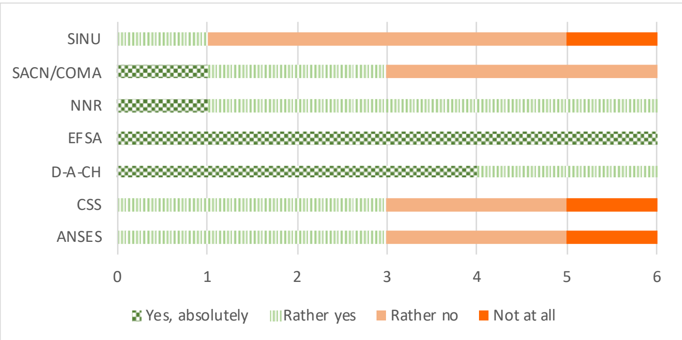



Figure 9: Expert opinions on the pre-selection of societies based on their methodologies used to define the NVRs

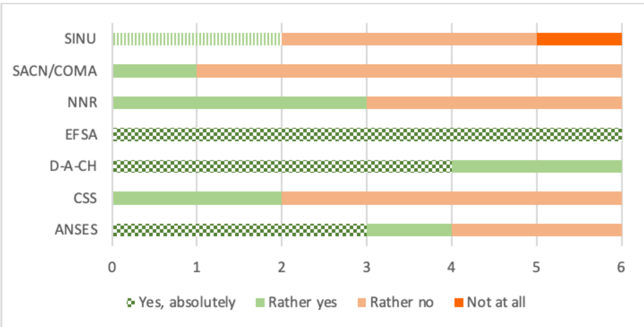



Figure 10: Expert opinions on the pre-selection of societies based on NRVs (values themselves)

No experts were in favor of selecting a society that uses predominantly the methodologies and NRVs of another society (Rather no: n=5; Not at all: n=1).

*General opinion*

Based on the intermediate report, all experts would have selected EFSA and D-A-CH for Step 2 of this project, with a preferred choice for EFSA. The majority of experts were not in favor of selecting SACN/COMA, CSS, NNR, and SINU for Step 2 of the project (Figures 11-12).

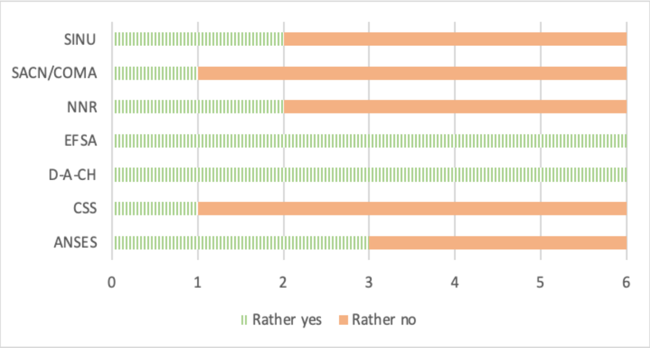



Figure 11: Experts opinions on the pre-selection of the societies for Step 2

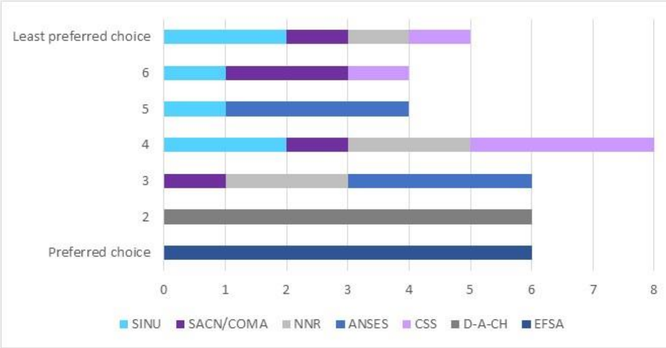



Figure 12: Order of preference of experts for the pre-selection for Step 2

### 5.3.5 Findings of the individual interviews

The section below presents the main findings of the individual interviews conducted with the experts in February 2021. The interviews were divided into two parts. Table 10 presents the findings of the first part of the individual interviews which was related to some comments made by the experts during the online survey.

Table 10: Answers related to the comments from the online survey

| Question 1: Do you think that other societies should be added to the analysis? | |
|---|---|
| Predominant answer | No, it is not necessary. |
| Arguments | The most important scientific societies have been included; these countries have quite similar dietary consumption to Switzerland. |
| Question 2: Should the recommendations for pregnant and lactating women be in a dedicated section in the report? | |
| Predominant answer | No. The data of pregnant and breastfeeding women should be included in a specific table for each nutrient and not in a dedicated section for this population. |
| Arguments | It would be easier for the reader to have all data for the same nutrient in the same section including subgroups of the population.<br>→ Such specific tables will be added for all nutrients. |
| Question 3: Are there certain nutrients that could be a problem? if so, which ones and for what reasons? | |
| Predominant answer | Vitamin D |
| Arguments | NRVs differ widely between societies; depends on supplementation and sun exposure.<br>→ Information on supplementation and sun exposure will be added in the next analysis. |

The findings of the second part of the interviews related to the pre-selection of 2-4 societies for Step 2 are summarized in Table 11.

Table 11: Answers related to the pre-selection of 2-4 societies

<table>
<tr><td colspan="3">Question 1: Which societies should be eliminated before moving on to Step 2?</td></tr>
<tr><td>Predominant answers</td><td colspan="2">SACN/COMA, SINU, CSS, and NNR</td></tr>
<tr><td>Arguments</td><td colspan="2">SACN/COMA: data have not been updated recently for a large number of nutrients<br>SINU: language/access and NRVs mainly based on other societies<br>CSS: based mostly on EFSA and other societies<br>NNR: data will be updated in 2022.</td></tr>
<tr><td colspan="3">Question 2: Do you think that a 3rd and maybe a 4th society should be included in the 2nd stage of analysis? And which ones?</td></tr>
<tr><td>Predominant answer</td><td colspan="2">Yes, at least a third society.</td></tr>
<tr><td>Arguments</td><td colspan="2">We need a third society in case the EFSA and D-A-CH do not provide NRVs for some nutrients, for some subgroups of the population, or have very different NRVs.</td></tr>
<tr><td>Which societies?</td><td colspan="2">ANSES and NNR<br>ANSES: provide NRVs for specific subgroups<br>NNR: not only based on other societies</td></tr>
<tr><td colspan="3">Question 3: The EFSA and the D-A-CH are ranked as the better choices by all experts. Could you, at this stage, name the advantages and disadvantages of each?</td></tr>
<tr><td></td><td>Advantages</td><td>Disadvantages</td></tr>
<tr><td>EFSA</td><td>- Recommendations at European level<br>- Designed for all countries around Switzerland with quite similar characteristics<br>- Reports are in English<br>- User-friendly website<br>- Used as a basis for legislations / industry<br>- High credibility</td><td>- Has not been developed specifically for the Swiss population.</td></tr>
<tr><td>D-A-CH</td><td>- Has been developed integrating Swiss experts, although most experts in the group are from Germany and Austria.</td><td>- Not all reports are in English → need to translate part of the material (also for future up-dates), which has practical and financial impacts.<br>- The accessibility may be problematic as some reports are only available in paper format.</td></tr>
<tr><td colspan="3">Question 4: Do you think the methodology planned for Step 2 (similar to Step 1) is suitable or would you recommend modifications / adaptations?</td></tr>
<tr><td>Predominant answers</td><td colspan="2">The methodology seems adequate, straightforward and clear.</td></tr>
<tr><td>Propositions</td><td colspan="2">Compare the values and search for the rational used by each society to explain the difference.<br>Verify and synthesize the completeness of the recommendations for the different nutrients and subgroups.</td></tr>
</table>

| Question 5: In your opinion, what are the essential criteria to consider in deciding between societies at the final stage? | |
|---|---|
| Predominant answers | • Scientific basis, credibility and rigor of methodology<br>• Applicability / practical use (including consistency with legislation) / practice<br>• Realistic NRVs or a clear message on supplements<br>• Accessibility to basic data – in English or national languages<br>• Regular updates<br>• Difference from current values<br>• Complete data for most nutrients |
| **Question 6: Do you already have suggestions at this stage to ensure the adoption of the new NRVs in Switzerland, particularly by the three language regions?** | |
| Predominant answers | • The communication from FSVO (and from Promotion Santé Suisse and Swiss Nutrition Society) must be clear, strong and reach all target users.<br>• It must be clear that these values are the new NRVs for all Switzerland that replaced the precedent in the three language areas, based on a scientific analysis. |

### 5.4 Conclusions of Step 1

Based on the intermediate report, the online survey, interviews with experts and a meeting with FSVO, we decided to include the three following societies for Step 2: **EFSA, D-A-CH** and ANSES. The preference of the experts was for EFSA and D-A-CH. They suggested to also include ANSES in order to have a third society to make comparison with EFSA and D-A-CH. However, at the beginning of Step 2, in March 2021, the ANSES announced their decision to use the NRVs of the EFSA for all nutrients, except sodium. For this reason, the analyses of Step 2 were only performed on the NRVs of EFSA and D-A-CH, and finally not on the oldest NRVs of ANSES.

# Step 2 of the project

# 6 Step 2 of the project

## 6.1 Aim of Step 2

The aim of Step 2 was to pre-select 1-2 societies, using the methodologies described in details below.

## 6.2 Method of Step 2

For Step 2, we used the following methodology: 1) a general comparison of the societies previously selected, EFSA and D-A-CH; 2) a description of the methodologies used by EFSA and D-A-CH and a comparison of the NRVs from those society for all nutrients; 3) an online survey for our group of experts; 4) a focus group with the experts. The figure 13 details our methodology.

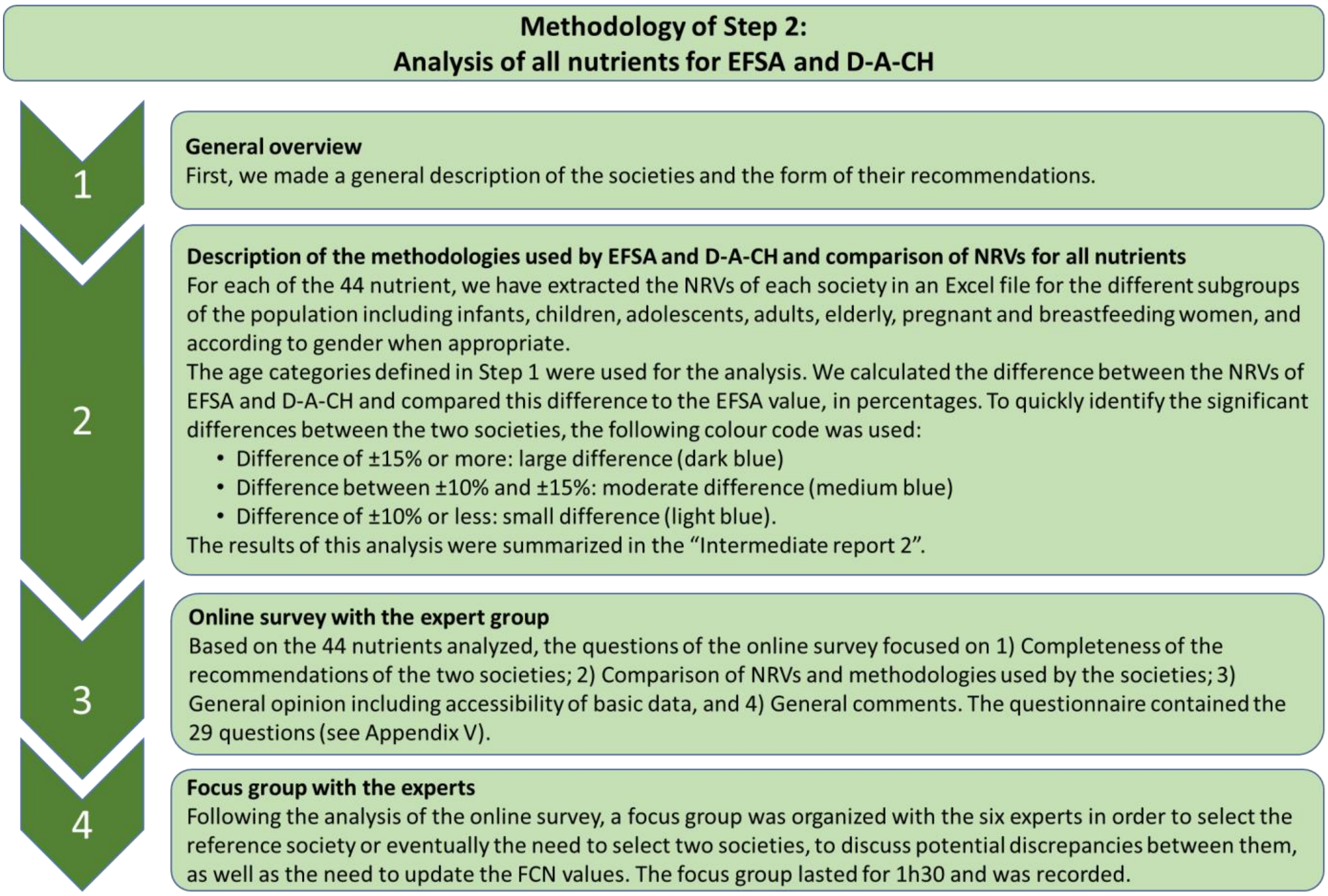



Figure 13: Description of the methodology followed in Step 2

## 6.3 Results of Step 2

### 6.3.1 General comparison of the NRVs between EFSA and D-A-CH

The EFSA has provided for all nutrient an electronic report in English summarizing the current evidence and the methodology used to define the NRVs when appropriate, except for alcohol for which EFSA does not provide any NRVs. The D-A-CH has published electronic reports mainly in English for the 18 nutrients shown in Table 12. For the other nutrients, the methodology used to define the NRVs, when available, has been described in a folder published in German in 2015 including updates for some nutrients. The website links for the electronic reports are available in Appendix VI.

Table 12: Accessibility of the scientific reports of the EFSA and D-A-CH

| | **EFSA** | **D-A-CH** |
|---|---|---|
| **Electronic reports** | All nutrients | Energy, protein, carbohydrates (in German), fats (in German), alcohol (in German), cobalamin, vitamin D, folates, thiamine, riboflavin, niacin, vitamin B6, vitamin C, calcium, chloride, potassium, selenium, sodium, zinc |
| **Paper reports** | - | Water, biotin, pantothenic acid, vitamin A, vitamin E, vitamin K, chrome, copper, fluorine, iodine, iron, magnesium, manganese, molybdenum, phosphorus |

For some nutrients, we were not able to compare the NRVs of EFSA with those of the D-A-CH for two main reasons:

- the NRVs were not defined for some nutrients by one or the two societies;
- the units used to express the NRVs were different between the two societies.

For all age categories, the EFSA and D-A-CH have not provided NRVs for sugars, monounsaturated fatty acids, and cholesterol. The D-A-CH has not provided NRVs for carbohydrates and fibres for children and adolescents and for EPA and DHA for all age categories. As described in Table 13, the NRVs of some nutrients have not been provided by the D-A-CH for pregnant and breastfeeding women.

Table 13: Completeness and non-comparability of the NRVs of EFSA and D-A-CH

| Nutrient | Subgroups | No EFSA value | No D-A-CH value | Different units |
|---|---|---|---|---|
| **Macronutrients** | | | | |
| Carbohydrates | Children and adolescents | | X | |
| Fibres | Children and adolescents | | X | |
| Sugars | All categories | X | X | |
| Fats | | | | |
| Monounsaturated fatty acids | All categories | X | X | |
| Saturated fatty acids | All categories | | | EFSA: "as low as possible" D-A-CH: < 10% of TEI |
| EPA and DHA | All categories | | X | |
| Cholesterol | All categories | X | X | |
| Protein | Pregnancy : 1st trimester<br>Pregnant<br>Breastfeeding | | X | EFSA: intake of X g/d in addition to the PRI |
| Alcohol | All categories | X | | |
| **Vitamins** | | | | |
| Niacin | All categories | | | EFSA: Niacin equivalent/MJ per day (or PAL 1.4 - 2)<br>D-A-CH: mg per day (PAL 1.4) |
| **Minerals and trace elements** | | | | |
| Chromium | All categories<br>Pregnancy<br>Breastfeeding | X | <br>X<br>X | |
| Copper | Pregnancy<br>Breastfeeding | | X | |
| Manganese | Pregnancy<br>Breastfeeding | | X | |
| Molybdenum | Pregnancy<br>Breastfeeding | | X | |

The differences of NRVs between the EFSA and D-A-CH for each subgroup are shown in Table 14 on the next page. We calculated this difference taking the EFSA value as the reference. The left column highlights the nutrients and specific subgroups with a difference ≥ 20% between the EFSA and D-A-CH. The right column shows a difference between ≥10 and < 20%.

Only eight nutrients had a large difference ≥ 20% for all subgroups (or for the majority of subgroups): fibres, PUFA (LA), pantothenic acid, vitamin D, chlorine, iodine, phosphorus, and sodium. Other nutrients had differences for some subgroups, mainly children, pregnant and breastfeeding women, and women/men. We did not observe systematic differences between the EFSA and D-A-CH.

Table 14: Summary of differences of NRVs between EFSA and D-A-CH for all nutrients (EFSA as reference)

| Nutrient | Difference ≥ 20% (EFSA as reference) | | Difference between ≥10 and < 20% (EFSA as reference) | |
|---|---|---|---|---|
| | Value | Subgroups | Value | Subgroups |
| **Macronutrients** | | | | |
| Fibers | + 20% | Adults; pregnancy; breastfeeding | | |
| PUFA (LA) | + 25-38% | All subgroups except 9mo | + 13% | 9mo |
| Protein | - 21% | 65y; 75y | | |
| Water | ± 20-23% | 16y (women); 55-75y (men) | ± 10-18% | 20y (women); 2y; 11y (men); 20y and 45y (women) |
| **Vitamins** | | | | |
| Biotin | | | - 14% | 16 y |
| Cobalamin | | | - 10% | Breastfeeding (2nd) |
| Folate | | | + 10-11% | 8y; 11y; breastfeeding |
| Pantothenic acid | - 20-25% | 8y; 16y; adults; pregnancy | + 14% | Breastfeeding |
| Riboflavin | + 21-38% | 11y; 16y (women); adults (women); pregnancy; breastfeeding | ± 10-19% | 2y; 8y (girls); adults (men) |
| Thiamin | - 21-54% | 9mo; 2y; 65y (women); 75y (women); pregnancy (2nd) | - 12-19% | 8y; 20y; 45y; 55y; 65y (men); 75y (men); pregnancy (2nd and 3rd) ; breastfeeding |
| Vitamin A | - 20-60% | 9mo; 2y; 16y | - 13-14% | 8y; 20y, 45y, & 55y (men); pregnancy (2nd and 3nd) |
| Vitamin B6 | + 25% | 16y (women) | + 12-17% | 11y; adults (women); pregnancy (1st) |
| Vitamin C | + 19% | Breastfeeding | | |
| Vitamin D | - 33% | All subgroups except 9mo | | |
| Vitamin E | - 55% | Breastfeeding | ± 17–20% | 9mo; 2y, 8y, 16y & 20y (women); pregnancy |
| Vitamin K | - 25% | 2y | ± 11–14% | 11y; 20y, 45y & 55y (women) ; 65y & 75y (men) ; pregnancy; breastfeeding |
| **Minerals and trace elements** | | | | |
| Calcium | - 33% | 2y | - 13-18% | 9mo; 8y; pregnancy; breastfeeding |
| Chlorine | + 26-65% | All subgroups | | |
| Copper | ± 22-63% | 9mo;8y, 45y, 55y & 65y (men) | ± 14-17% | 11y; 16y (women) |
| Fluoride | ± 21-25% | 9mo; 8y | - 11-14% | 2y; all adult (men) |
| Iodine | - 20-55% | 8y; 11y; 16y; all adults; breastfeeding | - 11-15% | 9mo; 2y; pregnancy |
| Iron | ± 25-88% | 9mo; 11y (girls); 45y (women); pregnancy; Breastfeeding | - 14-15% | 2y; 16y (women) |
| Magnesium | ± 25-54% | 9mo; 2y; 8y; 11y (men); 16y; breastfeeding | - 14% | 20y (men) |
| Manganese | - 75-150% | 9mo; 2y; 8y; 11y | - 17% | 16y; all adults |
| Molybdenum | - 67-200% | 9mo; 2y; 8y; 11y; | - 15% | 16y; all adults |
| Phosphorus | - 27–100% | All subgroups | | |
| Potassium | ± 20-38% | 9mo; 2y | - 10-14% | 8y; 16y; all adults; pregnancy; breastfeeding |
| Selenium | | | + 12-18% | 8y; 11y; 16y (women); adults (women); pregnancy; breastfeeding |
| Sodium | + 20-64% | Children (except 9mo); adults; pregnancy; breastfeeding | | |
| Zinc | + 23-30% | 2y; 11y (girls); pregnancy (1st) | + 14-19% | 9 mo ; 8y ; 11y (boys) ; adults (women) |

### 6.3.2 NRVs and methodologies for energy

The D-A-CH and EFSA propose a similar approach to determine energy requirements. A factorial method is used including the estimation of resting energy expenditure by a predictive equation multiplied by a physical activity level. The details of these methods for the different subgroups are presented in Appendix VII. In addition, both societies provide daily average requirements for the different subgroups in different tables.

### 6.3.3 NRVs and methodologies for nutrients

This sub-chapter describes the NRVs and their associated methodologies for the 44 nutrients, classified in three tables:

- Macronutrients
- Vitamins
- Minerals and trace elements.

Tables 15-17 below present, for each nutrient, the subgroups with a difference of NRVs ≥ 10% (left column) and a comparison of the methodology of the D-A-CH and EFSA when a difference ≥ 15% was detected (right column). The methodologies used by the D-A-CH and EFSA were quite similar and we did not observe a systematic difference between them. The detailed NRVs of EFSA and D-A-CH are available in Appendices VII-IX.

Table 15: Summary of differences of NRVs between EFSA and D-A-CH for macronutrients

| **Nutrient** | **Difference in NRVs and subgroups** | **Methodology (for nutrients with difference ≥ 15% between EFSA and D-A-CH)** |
|---|---|---|
| Carbohydrates | Not comparable | |
| Fibres | Adults, pregnancy and breastfeeding | The D-A-CH proposes higher NRVs considering the protective role of fibres against diseases rather than the quantity for an optimal laxative effect. |
| Sugars | No NRVs | |
| Fats | Not comparable | |
| Saturated fatty acids (SFA) | Not comparable | The D-A-CH recommends <10% of TEI and the EFSA recommends an intake as low as possible. |
| Monounsaturated fatty acids (MUFA) | No NRVs | |
| Alpha-linolenic (ALA) | Similar NRVs | |
| Linoleic acid (LA) | All subgroups | The EFSA proposes higher NRVs considering epidemiological studies while the D-A-CH proposes values based on biomarker studies. |
| Eicosapentaenoic acid, Docosahexaenoic acid (EPA, DHA) | Not comparable : No NRVs for D-A-CH | |
| Cholesterol | No NRVs | |
| Protein | Elderly | The D-A-CH proposes higher NRVs for the age group over 65 years, based on the results of many studies showing better results (metabolic and functional parameters) in older people with higher protein intake. The EFSA proposes the same values for adults and for the elderly, based on nitrogen balance studies.<br>For pregnant and lactating women, a similar methodology has been used. D-A-CH proposes a recommended protein intake expressed in kg of body weight per day, while EFSA gives an additional amount in grams. |
| Water | Adolescents, adults and elderly | The main difference between the two societies is that EFSA proposes different values according to gender, which is not the case for D-A-CH. |
| Alcohol | Not comparable : No NRVs for EFSA | The EFSA does not consider alcohol in the nutritional recommendations. In 2006, the European commissioned presented its first EU alcohol strategy including alcohol policies approaches, but no recommendation of intake for this non-essential nutrient. |

Table 16: Summary of differences of NRVs between EFSA and D-A-CH for vitamins

| **Nutrient** | **Difference in NRVs ≥ 10% and subgroups** | **Methodology (for nutrients with difference > 15% between EFSA and D-A-CH)** |
|---|---|---|
| Biotin | 16 y | |
| Cobalamin | Breastfeeding | |
| Folate | Children; breastfeeding | |
| Niacin | Expressed in different units | Both societies base their recommendations on the same AR (5.5 mg/1000 kcal). However, the D-A-CH defines recommendations for a fixed PAL of 1.4. The EFSA defines its recommendation in mg niacin equivalent per MJ and provides the same value for each age groups, and also provides a summary table with recommendations expressed in mg/day for PAL of 1.4, 1.6, 1.8 and 2.0. The recommendations of the D-A-CH are approaching the values of EFSA for a PAL of 1.6. |
| Pantothenic acid | Children, adults, pregnancy; breastfeeding | The D-A-CH and the EFSA used the same methodology. However, the D-A-CH's recommendations are based on an American study while the EFSA used European data. In addition, the D-A-CH considers that breastfeeding does not require additional intake. |
| Riboflavin | Children, adults, pregnancy, breastfeeding | D-A-CH uses mainly the glutathione reductase activity in erythrocytes and also the urinary excretion of riboflavin. The EFSA uses the urinary excretion as the primary biomarker for assessing the riboflavin requirement.<br>For adults, the EFSA provides the same value for all gender and age categories. However, the D-A-CH recommends different values according to sex or age, by taking into account values for energy intake.<br>The recommendation of D-A-CH for children are derived taking into account the values for energy. Based on the mean requirement for adults, the EFSA applies allometric scaling and growth factors, considering differences in reference body weight and assuming a coefficient of variation of 10% intake.<br>For pregnant women, the D-A-CH defines a recommendation based on the additional calories needed in the 2nd and 3rd trimesters of pregnancy. The EFSA uses an allometric scaling, the reference body weight for non-pregnant women and the mean gestational increase in body weight. In addition, the EFSA applies this additional requirement to the whole period of pregnancy.<br>For lactating women, the D-A-CH defines a recommendation based on the additional calories needed at this stage. The EFSA considers the losses through breast milk. |
| Thiamin | Children, adults, elderly, pregnancy, breastfeeding | The same methodology by both societies has been used. The differences are in the coefficient of variation used (10 and 20%). The unit of the recommendation differs between the societies. The D-A-CH expressed recommendations in mg per day for a PAL of 1.4. The EFSA defines its recommendation in mg per MJ and provide the same value for each age groups, and also provides a summary table with recommendations expressed in mg/day for PAL of 1.4, 1.6, 1.8 and 2.0. |

| | | |
|---|---|---|
| Vitamin A | Children, adults (men), pregnancy | The D-A-CH proposes higher NRVs for infants due to incomplete maturation of the digestive tract. For older groups, they use the same approach than for adults. The EFSA considered that the same equation as for adults could be used, using reference values for body weight.<br>The conversion factor used by EFSA is: 1 µg vitamin A = 6 µg beta carotene. This value is also used in Swiss legislation for the indication of the vitamin A content in fortified foods.<br>The conversion factor used by the D-A-CH is: 1 µg vitamin A = 12 µg beta carotene. |
| Vitamin B6 | Adolescents and adults (women), pregnancy | The D-A-CH and EFSA use similar approach based on balance studies. The D-A-CH sets an AR of 1.2 mg/d, but the EFSA uses a conservative approach and sets a slightly higher value of 1.3 mg/d. For pregnant women, the D-A-CH specifies the weight gain in each trimester of pregnancy while the EFSA considers a total weight gain throughout the entire pregnancy. |
| Vitamin C | Breastfeeding | For adults, the same methodology has been used. For lactating woman, the EFSA proposed a higher value (60 mg/d vs. 30 mg/d proposed by D-A-CH) to cover vitamin C losses in breast milk. |
| Vitamin D | All groups except 9 mo | The D-A-CH proposes higher NRVs for all age group except for the age group 9 mo. These recommendations are based on 3 studies from Northern countries conducted in winter while the EFSA has developed its own prediction equations based on 35 studies. |
| Vitamin E as α--tocopherol | Children and adults (women), pregnancy, breastfeeding | Both societies propose AIs. The D-A-CH considers an additional requirement of 0.4 mg of tocopherol equivalents to protect 1 g of linoleic acid in to addition basic requirements. The EFSA is based on dietary surveys from nine European countries. |
| Vitamin K as phylloquinone | Children, adults, breastfeeding, pregnancy | Both societies propose an AI equivalent at 1 µg / kg / d for all subgroups, except newborns. |

Table 17: Summary of differences of NRVs between EFSA and D-A-CH for minerals and trace elements

| **Nutrient** | **Difference in NRVs ≥ 10% and subgroups** | **Methodology (for nutrients with difference > 15% between EFSA and D-A-CH)** |
|---|---|---|
| Calcium | Children, pregnancy; breastfeeding | In infants, the recommendation is mainly derived from the content of breast milk. For infants from 4 to <12 months of age, the D-A-CH also considers the calcium intake from solid foods. The EFSA assumes an absorption of 60%. In children, the factorial approach is used by both societies, based on calcium balance studies. |
| Chloride | All subgroups | The recommendations for chloride are derived from the recommended sodium values, which differ between the two societies. |
| Chromium | No NRVs | - |
| Copper | Children, adults (men), pregnancy; breastfeeding | The D-A-CH proposes values based in part on the values recommended by the WHO. The EFSA is based on the estimated average intakes from food surveys in 8 European countries and the results of other studies. However, these values are quite similar. |
| Fluoride | Children, men | The EFSA and D-A-CH propose an AI of 0,05 mg/kg/day and use reference body weights for calculations. |
| Iodine | Children, adolescents, pregnancy; breastfeeding | The EFSA recommends similar values to the D-A-CH values for Switzerland. For Germany and Austria, the D-A-CH proposes higher NRVs that take into account the specific iodine intake of these populations. |
| Iron | Children, women, pregnancy; breastfeeding | Both societies determined the requirements using a factorial approach, based on needs for growth, iron losses and considering biodisponiblity. For pregnant women, the EFSA uses the same values as for non-pregnant women. The D-A-CH increases the intake due to additional needs for the placenta and the fetus. |
| Magnesium | Children, adolescents (men), breastfeeding | The EFSA and D-A-CH used the same methodology but based their recommendations on studies from different countries. |
| Manganese | All subgroups | Both societies used the same methodologies for adult values. For children, the D-A-CH values were calculated by extrapolation based on body weight and assumed food intake. The EFSA extrapolates data from adults using isometric scaling and body weights of the respective age groups. For all populations, the D-A-CH values are higher than those of EFSA. |
| Molybdenum | All subgroups | Both societies propose AIs based on the average molybdenum intakes used with mixed diets. Values for children are derived from those of adults. |
| Phosphorus | All subgroups | The D-A-CH considered an average requirement for adults at 580 mg/day, and used a coefficient of variation of 10% and an additional 20%, to define the recommended intake at 700 mg/day. In children and adolescents, additional needs for growth were considered, as well as in pregnant and breastfeeding women. |

| | | |
|---|---|---|
| | | The EFSA used the calcium to phosphorus molar ratio in the whole body for setting an AI for phosphorus, taking into account estimated phosphorus intakes in Western countries. |
| Potassium | All subgroups | For children, the EFSA and D-A-CH provide reference values based on the values for adults and taking into account differences in body weight and growth factors. The D-A-CH proposes a higher value considering the high prevalence of hypertension in Germany.<br>For infants aged 0 - 3 months, the estimated value from the D-A-CH was set based on the potassium intake via breast milk. From this reference value, the estimated value for infants aged 4-11 months was derived by extrapolation.<br>The EFSA values for infants and children (AIs) are extrapolated from the AI for adults by isometric scaling and including a growth factor. The AI for adults have been derived from observational and interventional studies on the relationship between potassium intake and blood pressure and stroke. |
| Selenium | Children > 8 years, adolescents, women, pregnancy; breastfeeding | For adults, the EFSA proposes the same values for men and women, while D-A-CH proposes a lower value for women, considering the lower average body weight compared to men. This impacts the values for children which are derived from adult values. |
| Sodium | All subgroups, except infants | The D-A-CH values are derived from balance studies. The values for children and adolescents are extrapolated from this estimated value considering differences in body mass. The EFSA considers mainly balances studies, and in view of the limited evidence available, a formal expert knowledge elicitation was undertaken. |
| Zinc | Children, women, pregnancy (1$^{st}$ trimester) | The D-A-CH and EFSA used the same methodology. The differences seem to be related to the reference weights, phytate intake or estimated losses. For pregnant women, the D-A-CH takes into account the weight gain in each trimester, while the EFSA proposes an average value for the whole pregnancy. |

In this analysis, we have also compared the NRVs of the FCN with those of the EFSA and D-A-CH.

The FCN has provided NRVs for carbohydrates, fats, protein, folates, vitamin D, and iodine. The FCN has also provided a range of NRVs for all nutrients for elderly, in a report published in 2018. In this report, for all nutrients, the lowest recommendation corresponds to the D-A-CH values and the highest recommendations corresponds to the IOM values (except for vitamin D).

The FCN has provided a range of NRVs for carbohydrates similar to D-A-CH for all subgroups, except children and adolescents for which no recommendations were provided. The FCN recommends that a maximum of 10% of daily energy intake should come from added sugars (e.g. sucrose, glucose, fructose), as well as honey, concentrated juice and fruit juice. The D-A-CH and the EFSA have not provided recommendations for sugar.

For total fats intake for adults, the FCN recommends a larger range of intake (20-40% of TEI) than the D-A-CH (30%) and EFSA (20-35%). The FCN has provided NRVs for monounsaturated fatty acids in contrast to the EFSA and the D-A-CH. For the EPA and DHA, the EFSA has provided recommendations for all subgroups and the FCN has provided recommendations for adults, elderly, pregnant and breastfeeding women. The NRVs of the FCN for adults are twice those of the EFSA. The D-A-CH does not provide NRVs for these nutrients. For saturated fatty acids, the FCN recommends an intake <10% of TEI similar to the D-A-CH and the EFSA recommends an intake as low as possible.

For protein, the NRVs of the FCN are very close to the values of D-A-CH and EFSA. However, the FCN proposes lower NRVs for younger children and higher for elderly, respectively.

For folates, the FCN recommends that women supplement their diet with a folic acid supplement (0.4 mg/day), if possible four weeks before the beginning of a pregnancy and during the first twelve weeks of pregnancy.

For vitamin D, the FCN recommends similar values than those of the EFSA (lower than the D-A-CH values), except for elderly.

For iodine, the recommendations of the EFSA and FCN are similar. The D-A-CH provides higher NRVs for Germany and Austria than for the Swiss population. The D-A-CH explains this difference by a better iodine status due to salt fortification in Switzerland. For pregnant women, the FCN recommends higher values than the D-A-CH and the EFSA.

#### 6.3.4 Findings of the online survey 2

Based on the intermediate report 2, the expert group completed an online survey in April 2021. Considering the completeness of the recommendations of the two societies, the experts would mostly choose the EFSA for macronutrients, while they had no preference between the two societies for vitamins, minerals and trace elements, as shown in Figure 14.

Based on the NRVs and methodologies used, the majority of experts would has chosen both societies for macronutrients, mineral and trace elements. They had more contrasting opinions on vitamins. No expert preferred the D-A-CH only.

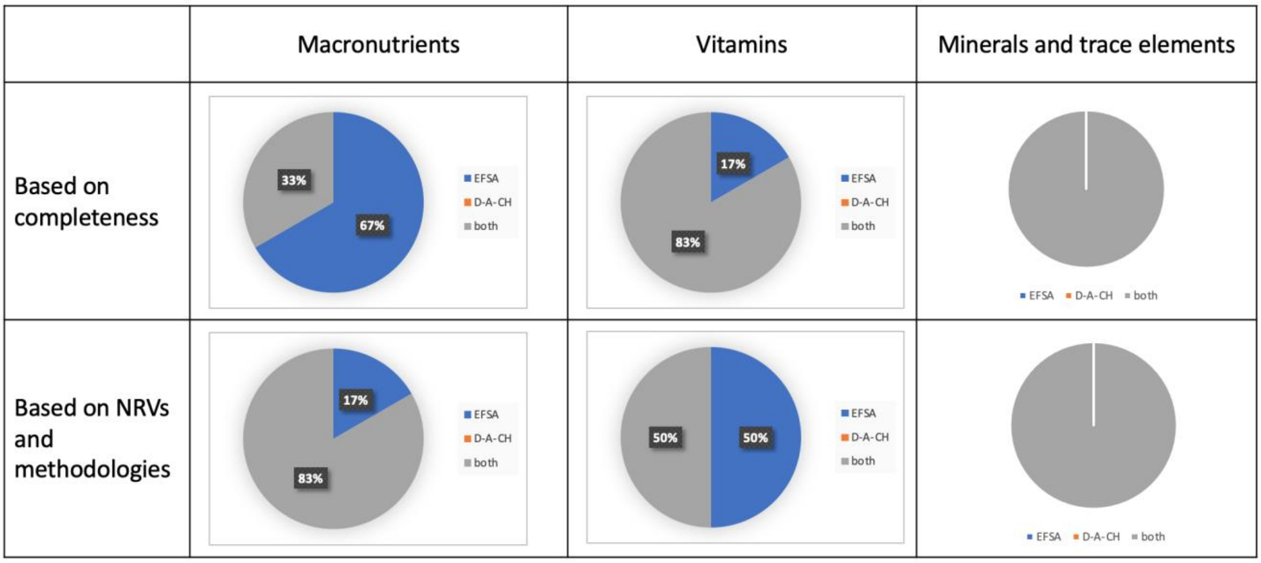



Figure 14: Preference of experts (n=6) for EFSA, D-A-CH, or both for recommendations on macronutrients, vitamins, minerals, and trace elements.

The experts rated both societies equally credible and the overall comparison of NRVs and methodologies used did not differentiate the societies. The accessibility of EFSA scientific reports was highlighted and the completeness of the EFSA recommendations was also emphasized. Regarding acceptability and applicability, the experts' opinion was divided, as illustrated in Figure 15.

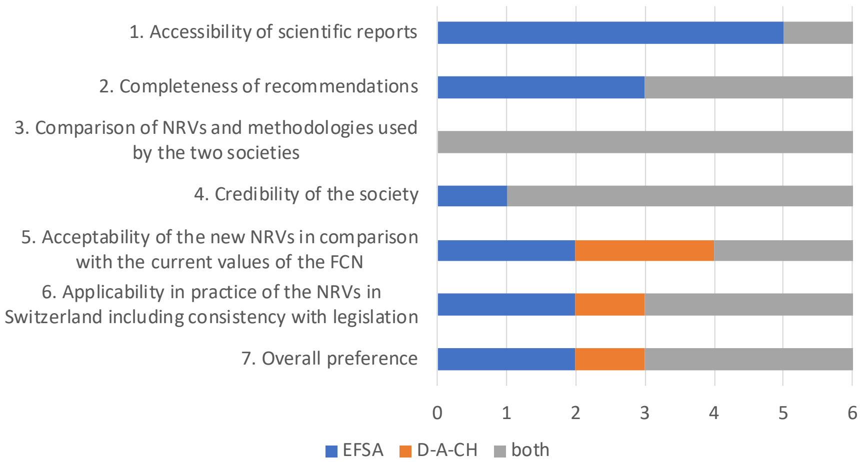



Figure 15: Preference of experts for each society based on several criteria

Overall, based on the 2nd intermediate report, the general opinion of the experts was the following:

- two experts preferred EFSA as the main society;
- one expert selected D-A-CH;
- and three experts had no preference between the two societies.

The experts raised comments on several macronutrients, vitamins, minerals or trace elements. Those are summarized in the Table 18 below.

Table 18: Comments from the experts for some nutrients

| Energy and macronutrients | N comments | Comment |
| --- | --- | --- |
| Energy | 1 | D-A-CH: Recommendation based on BMI 22 kg/m$^2$, low for general population. |
| Carbohydrates | 1 | D-A-CH: No recommendation for children |
| Fibers | 4 | EFSA: Older recommendation based on laxation<br>D-A-CH: Based on chronic diseases prevention. No recommendation for children |
| Sugar | 2 | Both: Do not provide NRVs, which is problematic. |
| SFA, MUFA, PUFA | 3 | EFSA: SFA: the recommendation “as low as possible” may be confusing<br>D-A-CH: No recommendation for EPA and DHA |
| Proteins | 2 | EFSA: Older recommendation, especially for elderly |
| Alcohol | 2 | EFSA: No recommendation, which is problematic |
| Vitamins | | |
| Beta carotene | 1 | EFSA: EFSA and Swiss law: 1 mcg retinol = 6 µg beta carotene<br>D-A-CH: 1 µg retinol = 12 µg beta carotene |
| Vitamin D | 2 | D-A-CH: Does not take in account sun exposure.<br>Both: May not be reachable with food only |
| Folates | 1 | For pregnancy, the FCN recommendation is more appropriate / suitable. |
| Minerals and trace elements | | |
| Iodine | 2 | D-A-CH: The recommendation for Switzerland differs from the one for Germany and Austria. |
| Iron | 2 | EFSA: Recommendation more suitable for adults<br>D-A-CH: recommendation more suitable for pregnant and breastfeeding women. |
| Sodium | 3 | D-A-CH: The very low recommendation may not be reachable and may lead to iodine deficiency. |

### 6.3.5 Findings of the focus group

The focus group, conducted with the experts, included three main topics of discussion. First, the six experts debated on the proposition to choose EFSA as the main society for the NRVs. Secondly, they discussed and argued the nutrients for which another recommendation would be needed. Finally, they shared global comments and recommendations regarding the implementation of these new NRVs.

*Choice of the main society*

Based on scientific evidence, EFSA and D-A-CH would qualify as main society. However, all experts agreed that the scientific background information should be freely accessible in national languages or in English. This is the case for EFSA, with scientific electronic reports in English, but not for D-A-CH with some electronic publications in English but most of the information in German in paper documents assembled in a folder.

Therefore, based on its excellent reputation (scientific methodology), the fact that it is used by many other societies and easy access, including a user-friendly website, EFSA stands out for the main society for the large majority of experts. It appeared also that no society is optimal for all nutrients or sub-groups of population. Therefore, EFSA alone is not enough, it needs to be complete with some values from one or several alternative societies. As one expert said, “Our strength is to select the best values from EFSA, D-A-CH or another society”.

The question of accessibility and acceptability of the new values was also debated. With scientific reports in English, the data are accessible to scientific, but an expert questioned this accessibility for the public.

Furthermore, Switzerland is currently part of the D-A-CH, therefore, the experts raised the questions of what will happened with the D-A-CH recommendations, if another society is chosen, and what may be the consequences. The experts highlighted the fact that it could be very confusing for the public to have two sources of recommendations.

Finally, all experts underlined the importance to develop a communication plan to ensure a clear explanation of the new NRVs and promote a large acceptance across all regions in Switzerland. All scientific EFSA documentation is published in English and the new Swiss values should be accessible in national Swiss languages. The new values should not be presented as EFSA values but as the new Swiss values. The main documents should be available in the national languages. A regular up-date of the recommendation is needed.

*Alternative choices for targeted nutrients*

For some specific nutrients, EFSA was not proposed as the reference society, mainly because no NRVs was provided and/or because recommendations from the FCN exist. Table 19 below presents these nutrients and the argumentation for the choice of alternative societies.

Table 19: Opinion of the experts for the choice of alternative society for some targeted nutrients

| Nutrients | Argumentation |
|---|---|
| Protein | The EFSA values are too low for elderly. The experts recommend the FCN values. Those are consistent with the D-A-CH values that have been adapted in 2017 based on a review of the scientific evidence. |
| Fats | According to the experts, the EFSA recommendation “As low as possible” may be interpreted differently from different people. Therefore, they recommend the FCN value of maximum 10% of total energy intake from SFA. The FCN does not provide recommendation for cholesterol due to the lack of scientific data, which was an important point to highlight according to the experts. |
| Sugar | The consumption of sugars is problematic in Switzerland; therefore, it is important to set a target value for sugars. One expert suggested to use the WHO recommendation of 10% of TEI. The experts discussed if the 5%TEI should be added, however, because, this recommendation is debated and because a step-wise approach may be more effective, the 10% recommendation was preferred. The experts highlighted the fact that the type of sugars should be clarified and defined (free sugars versus added sugars). The FCN uses the following definition: a maximum of 10% of daily energy intake should come from added sugars, as well as honey, thick juice and fruit juice. |
| Fibers | The EFSA recommendation has not been revised lately and is based on the laxative effects of fibers, not taking in account the large amount of evidence for preventive effect of fibers on cancer and chronic disease prevention. Therefore, the FCN recommendation of 30 g/day of fibers would be more adequate. One expert highlighted that this value is high but achievable. Moreover, even if we did not select SACN in this project, they have very recently up-dated their recommendation on fibers to 30 g/day, based on these preventive effects. |
| Alcohol | The EFSA does not consider alcohol in their nutritional recommendations. However, a recommendation for this nutrient seems essential for the experts given the deleterious effects of alcohol on health. The experts recommend using the D-A-CH or WHO values. |
| Folates | For pregnant women, the EFSA recommends a daily intake of 600 μg of folates, as the FCN recommends taking a supplementation of 400 μg/d. These recommendations are in fact complementary as the EFSA recommendation cannot be reached by food only. The experts highlighted that the new recommendation should fit the recommendation of the Swiss Society of Obstetrics and Gynecology. This point has been checked: this society recommends following the FSVO recommendations (supplementation of 400 μg/d). |
| Iron | For pregnant and lactating women, EFSA does not recommend higher intake than for non-pregnant women. The experts recommend using the D-A-CH values for those sub-groups. |
| Iodine | The experts highlighted that the FCN values for pregnant women might be difficult to reach. The main sources of iodine are fortified salt and fish and pregnant women cannot increase widely their consumption of those foods. Therefore, the FCN recommendation for pregnant women implies that this population should take a supplement, in addition to the salt fortification. The question of testing pregnant women for iodine status was raised by the experts. |
| Sodium | The experts highlighted the need to differentiate between basic physiological requirement of sodium and recommendation of maximum intake of salt. The D-A-CH, EFSA, IOM or WHO could be considered for these values. |
| Water | The recommendation from EFSA and D-A-CH, that include both water from beverages and food, are quite different. The methodologies should maybe further be analyzed. |
| Vitamin D | Irrespective of the society, the recommendations for vitamin D are quite high. The experts highlighted that we should be made it clear that this recommendation cannot be reached by diet, as it may be confusing for the population to know how to reach the recommend. They mentioned that the sun light exposure should also be taken in account. The D-A-CH for example made an effort to explain that either you have to expose to sun or you have to take a supplement. The implication for industry fortified product should be taken in account. The experts recommend using the FCN recommendation and to explain how to reach a certain biomarker. |

### 6.4 Conclusions of Step 2

Based on the second intermediate report, the online survey, and a focus group with the experts, we recommend EFSA as the main society to provide nutritional recommended values for Switzerland, complemented by alternative societies, primarily the FCN, for some specific nutrients or subgroups.

The communication on the new Swiss nutritional reference values is a key point highlighted by the expert group for their implementation and adoption by the scientists, health professional, industry and population.

# 8 Recommendations for reference societies and justifications

After conducting Steps 1 and 2 of this project and in collaboration with the expert group, we recommend EFSA as the main reference for providing updated and appropriate NRVs for nutritional intakes of the population living in Switzerland, and alternative societies for nine specific nutrients and some subgroups of the population. For these nutrients, we have selected the FCN, when possible, in order to reduce the number of different societies, to have Swiss recommendations and a pragmatic approach (Table 20). Summary tables of the proposed NRVs are available in supplemental files.

Table 20: Opinions of the experts for the choice of alternative society for some targeted nutrients

| Nutrients and subgroups | Choice of reference society | Rationale for this choice |
|---|---|---|
| **SFA, MUFA** | FCN | - EFSA does not have NRVs<br>- Preference for Swiss recommendations |
| **Sugar** | FCN | - EFSA does not have NRVs<br>- Preference for Swiss recommendations, which are in agreement with those of the WHO |
| **Fibers for adults** | FCN | - The NRVs of EFSA (25 g for adults) seem too low. They were based on the quantity of fibers needed to optimal laxative effect instead of the protective role against chronic disease. The NRVs of FCN at 30 g/d seemed more appropriate.<br>- Preference for Swiss recommendations<br>- For children, the NRVs of EFSA are used in the absence of FCN values. Recommendations from FCN are needed in the future for this subgroup. |
| **Alcohol** | D-A-CH | - EFSA and FCN do not have NRVs<br>- Recommendations from FCN or a Swiss institution are needed in the future |
| **Folates supplementation during pregnancy** | FCN | - The FCN has established recommendation for supplementation (+400 µg/d of synthetic acid) for women who wish to become pregnant and during the first 12 weeks of pregnancy.<br>- This recommendation is complementary to the NRV of EFSA (total intake of 600 µg/d). |
| **Iron for pregnancy and breastfeeding** | D-A-CH | - EFSA does not have specific NRV for pregnant and breastfeeding women.<br>- Preference for the D-A-CH recommendations, which are higher for this population than for non-pregnant women.<br>- Recommendations from FCN are needed in the future. |
| **Iodine** | FCN | - Preference for Swiss recommendations due to the specific iodine fortification of salt in Switzerland. For adults, the NRVs of EFSA and FCN are similar. |
| **Subgroups: elderly > 65 years** | FCN | - The FCN has established specific recommendations for elderly in 2018, using the NRVs of D-A-CH and IOM. |
| **Vitamin D** | Comments: The NRVs are those of EFSA, which match requirements under conditions of minimal cutaneous vitamin D synthesis. In the presence of cutaneous vitamin D synthesis, the requirement for dietary vitamin D is lower or may even be zero. In suboptimal sun exposure conditions, a supplementation should be considered in addition to habitual dietary intake. | |

# 9 Conclusions

This project has included two steps and involved an expert group from the three language regions of Switzerland in order to identify one or two reference societies that may provide updated and appropriate NRVs for nutritional intakes of the population living in Switzerland.

We initially took seven societies into consideration in addition to FCN. At the end of Step 1, three main societies have been pre-selected i.e. the EFSA, D-A-CH and the ANSES. For Step 2, we finally analyzed and compared the NRVs and the methodologies of EFSA and D-A-CH, as the ANSES has announced in the meanwhile that they had selected the NRVs of EFSA for all nutrients, except sodium.

At the end of Step 2, we have selected in collaboration with the expert group the EFSA as the main reference society and alternative societies for nine specific nutrients (fatty acids, sugar, fibers for adults, alcohol, folates during pregnancy, iron during pregnancy and breastfeeding and iodine) and some subgroups of the population (elderly > 65 years old). We have selected the FCN as alternative reference society, except for alcohol and iron for which we have chosen the D-A-CH values. In the future, recommendations from the FCN or another Swiss institution for these nutrients should be developed.

Despite the diversity among the experts in terms of scientific background, professional experience, institutions, regions, and professions, we did not observe large discrepancy between the members of the group during the analysis and selection of reference societies. The process to achieve the final consensus of selecting EFSA as the main reference society and the FCN as alternative society was quite straightforward.

One major issue highlighted by our research team and the expert group is the importance of optimal communication and accessibility of the new Swiss NRVs. The values and the summaries of the scientific background should be available in the three national languages. The full scientific reports need to be available either in English (freely accessible on the EFSA website) or in the three national languages. To ensure proper implementation and appropriation of the new Swiss NRVs by the population and stakeholders including health professionals, scientists and industry, the FSVO needs to develop and executes a strong communication plan. Our propositions include:

- an interactive website including a link to the EFSA website and resources
- downloadable NRVs summary tables and explanations (user-friendly and graphically attractive)
- short videos with key points
- collaboration with the Swiss Society for Nutrition to ensure proper implementation diffusion and communication through existing channels (ex: Tabula magazine, annual meeting)
- media and social media campaigns.

A dedicated group of experts, within or commissioned by FSVO, will be necessary to follow the updates of EFSA publications, to adapt the Swiss NRVs and to highlight those changes for the public and professionals.

# 10 Appendices

## 10.1 Appendix I: Glossary

| | |
|---|---|
| Adequate intake AI | A dietary recommendation used when there is not enough data to calculate an average requirement. An adequate intake is the average nutrient level consumed daily by a typical healthy population that is assumed to be adequate for the population's needs. |
| Allometric scaling | Considers that organs, tissues or processes grow at different rates. This is the opposite of the isometric scaling. |
| Average requirement AR | The level of a nutrient in the diet that meets the daily needs of half the people in a typical healthy population. |
| Depletion-repletion studies | Measure nutrient status while subjects are maintained on diets containing marginally low or deficient levels of a nutrient; then the deficit is corrected with measured amounts of that nutrient. |
| Factorial method | Evaluates the various needs of the organism separately and takes into account the actual absorption coefficient. These requirements include net maintenance requirement, net growth requirement, net gestation requirement, etc. |
| Isometric scaling | Considers a relative growth of a part of an organism to be identical to the overall growth of that organism. It is the opposite of the allometric scaling. |
| Population Reference Intake PRI | The intake of a nutrient that is likely to meet the needs of almost all healthy people in a population. It stands for population reference intake. |
| Tolerable upper intake UL | The maximum intake of substances in food, such as nutrients or contaminants, that can be consumed daily over a lifetime without adverse health effects. |

## 10.2 Appendix II: Definitions of population subgroups by the different societies

| Societies | Age groups 0–12 months | Age groups 1–18 years | Age groups adults (years) | Upper age group (years) | Other characteristics |
|---|---|---|---|---|---|
| **ANSES** | 0-5, 6-11 | 12-35, 4-5, 6-9, 10-13, 14-17 | + 18 years | > 65 | Pregnant<br>Lactating |
| **CSS**<br>Ex: calcium | 0-5, 6-11 | 1-3, 4-6, 7-10, 11-14, 15-18 | 18-60 | > 60 | Pregnant<br>Lactating |
| Ex : iron | 0-3, 5-6, 7-12 | 1-3, 4-5, 6-9, 10-13, 14-17 | 18-30, 31-60, 61-71 | > 74 | Pregnant<br>Lactating |
| **D-A-CH** | 0–3, 4–12 | 1–3, 4–6, 7–9, 10–12, 13–14, 15–18 | 19–24, 25–50, 51–64 | ≥ 65 | |
| **EFSA**<br>Ex: calcium | 7-11 | 1-3, 4-10, 11-17 | 18-24, >25 | | |
| Ex: proteins | 6-12 | 18, 2, 3 → 17 (per year) | 18-59 | > 60 | Pregnant<br>trimester 1 to 3<br>Lactating women semester 1 to 2 |
| **FCN**<br>Ex: fluor | 0-4, 4-12 | 1-4, 4-7, 7-10, 10-13, 13-15, 15-19 | 19-25, 25-51, 51-65 | > 65 | Pregnant<br>Lactating |
| **NNR**<br>Macronutrients | 6-12 | 12-23 | | | Pregnant<br>Lactating |
| Micronutrients | < 6, 6-12 | 12-23,2-5, 6-9, 10-13, 14-17, | 18-30, 31-60, 61-74 | > 74 | |
| **SACN** | | 1, 2-3, 4-6, 7-10, 11-14, 15-18 | 19-64, 65-74 | > 75 | |
| **SINU** | 6-12 months | 1-3, 4-6,7-10,11-14,15-17 | 18-19,30-59, 60-74 | > 75 | Pregnant<br>trimester 1 to 3<br>Lactating women semester 1 to 2 |

## 10.3 Appendix III: Questionnaire for the online survey of Step 1

| General presentation of the recommendations of societies | |
|---|---|
| 1. To what extent do you think that the publications related to NRVs from the following society are sufficiently up-to-date to be included? | |
| - ANSES | ☐ Yes, absolutely ☐ Rather yes ☐ Rather no ☐Not at all |
| - CSS | ☐ Yes, absolutely ☐ Rather yes ☐ Rather no ☐Not at all |
| - D-A-CH | ☐ Yes, absolutely ☐ Rather yes ☐ Rather no ☐Not at all |
| - EFSA | ☐ Yes, absolutely ☐ Rather yes ☐ Rather no ☐Not at all |
| - NNR | ☐ Yes, absolutely ☐ Rather yes ☐ Rather no ☐Not at all |
| - SACN/COMA | ☐ Yes, absolutely ☐ Rather yes ☐ Rather no ☐Not at all |
| - SINU | ☐ Yes, absolutely ☐ Rather yes ☐ Rather no ☐Not at all |
| 2. To what extent do you think a society that publishes only in one (or mostly in one) of the national languages can be selected? | ☐ Yes, absolutely ☐ Rather yes ☐ Rather no ☐Not at all |
| 3. To what extent do you think a society that publishes only in English can be selected? | ☐ Yes, absolutely ☐ Rather yes ☐ Rather no ☐Not at all |
| **Analysis of the methodologies used by the societies to define their NRVs** | |
| 4. Based on the methodologies used by each of the societies below to define the NRVs for the 7 nutrients, to what extent would you select this society? | |
| - ANSES | ☐ Yes, absolutely ☐ Rather yes ☐ Rather no ☐Not at all |
| - CSS | ☐ Yes, absolutely ☐ Rather yes ☐ Rather no ☐Not at all |
| - D-A-CH | ☐ Yes, absolutely ☐ Rather yes ☐ Rather no ☐Not at all |
| - EFSA | ☐ Yes, absolutely ☐ Rather yes ☐ Rather no ☐Not at all |
| - NNR | ☐ Yes, absolutely ☐ Rather yes ☐ Rather no ☐Not at all |
| - SACN/COMA | ☐ Yes, absolutely ☐ Rather yes ☐ Rather no ☐Not at all |
| - SINU | ☐ Yes, absolutely ☐ Rather yes ☐ Rather no ☐Not at all |
| 5. To what extent do you think that a society that uses predominantly the methodologies and NRVs of another society can be selected? | ☐ Yes, absolutely ☐ Rather yes ☐ Rather no ☐Not at all |
| 6. Is there one or more subgroup(s) of the population for which the methodology seems inadequate?<br>If yes, for which subgroup(s), nutrient (s) and for which society-ies? | ☐ No ☐ Yes |
| 7. Is there one or more nutrient(s) for which the methodology seems inadequate?<br>If yes, for which one(s) and for which society-ies? | ☐ No ☐ Yes |

| **Analysis of the NRVs** | |
|---|---|
| 8. Following the analysis of the NRVs defined for the 7 nutrients (values themselves), do you think that the following society could provide suitable NRVs for Switzerland? | |
| - ANSES | ☐ Yes, absolutely ☐ Rather yes ☐ Rather no ☐Not at all |
| - CSS | ☐ Yes, absolutely ☐ Rather yes ☐ Rather no ☐Not at all |
| - D-A-CH | ☐ Yes, absolutely ☐ Rather yes ☐ Rather no ☐Not at all |
| - EFSA | ☐ Yes, absolutely ☐ Rather yes ☐ Rather no ☐Not at all |
| - NNR | ☐ Yes, absolutely ☐ Rather yes ☐ Rather no ☐Not at all |
| - SACN/COMA | ☐ Yes, absolutely ☐ Rather yes ☐ Rather no ☐Not at all |
| - SINU | ☐ Yes, absolutely ☐ Rather yes ☐ Rather no ☐Not at all |
| 9. Do you have any comments about the NRV of one or more nutrients? | Free answer |
| **General opinion** | |
| 10. Based on the intermediate report, to what extent do you think the following societies should be pre-selected for Step 2 analysis? | |
| - ANSES | ☐ Rather yes ☐ Rather no ☐ I can't say |
| - CSS | ☐ Rather yes ☐ Rather no ☐ I can't say |
| - D-A-CH | ☐ Rather yes ☐ Rather no ☐ I can't say |
| - EFSA | ☐ Rather yes ☐ Rather no ☐ I can't say |
| - NNR | ☐ Rather yes ☐ Rather no ☐ I can't say |
| - SACN/COMA | ☐ Rather yes ☐ Rather no ☐ I can't say |
| - SINU | ☐ Rather yes ☐ Rather no ☐ I can't say |
| 11. Based on the intermediate report, what would be your order of preference for the pre-selection of the societies for Step 2 analysis? | Arrange the seven societies according to your order of preference (1 = the most appropriate; 7 = the least appropriate) |
| **General comments** | |
| 12. Do you have any general comments on the project (analysis, methodology, next step…) that may be discussed during the individual interviews? | Free answer |

## 10.4 Appendix IV: Publications and website links of the different societies

| Societies | Nutrients | Year of publication | Website link |
|---|---|---|---|
| ANSES | Lipids | 2016 | https://www.anses.fr/fr/system/files/NUT2012SA0103Ra-1.pdf |
| ANSES | Protein, carbohydrates, vit D, iron, iodine, folic acid, calcium | 2017<br>2017<br>2012<br>2016<br>2017<br>2017<br>2017 | **0-3 years**<br>https://www.anses.fr/fr/system/files/NUT2017SA0145.pdf<br>**4-17 years**<br>https://www.anses.fr/fr/system/files/NUT2017SA0142.pdf<br>**children – minerals et vitamins**<br>https://www.anses.fr/fr/content/avis-de-lanses-relatif-%C3%A0-l%E2%80%99%C3%A9valuation-des-apports-en-vitamines-et-min%C3%A9raux-issus-de<br>**adults**<br>https://www.anses.fr/fr/system/files/NUT2012SA0103Ra-2.pdf<br>**>65 years**<br>https://www.anses.fr/fr/system/files/NUT2017SA0143.pdf<br>**Lactating and pregnant**<br>https://www.anses.fr/fr/system/files/NUT2017SA0141.pdf<br>**Updated recommendations**<br>https://www.anses.fr/fr/system/files/NUT2012SA0103Ra-1.pdf |
| CSS | Protein, carbohydrates, vit D, iron, iodine, folate, calcium | 2016 | https://www.health.belgium.be/sites/default/files/uploads/fields/fpshealth_theme_file/css_9285_avis_rec_nutr.pdf |
| D-A-CH | Proteins | 2017 | https://www.dge.de/wissenschaft/referenzwerte/protein/ |
| D-A-CH | Carbohydrates | 2015 | https://www.dge.de/wissenschaft/referenzwerte/kohlenhydrate-ballaststoffe/?L=0 |
| D-A-CH | Vit D | 2015 | https://www.dge.de/wissenschaft/referenzwerte/vitamin-d/ |
| D-A-CH | Iron | 2015 | https://www.dge.de/wissenschaft/referenzwerte/eisen/ |
| D-A-CH | Iodine | 2015 | https://www.dge.de/wissenschaft/referenzwerte/jod/ |
| D-A-CH | Folic acid | 2015 | https://www.dge.de/wissenschaft/referenzwerte/folat/ |
| D-A-CH | Calcium | 2015 | https://www.dge.de/wissenschaft/referenzwerte/calcium/?L=0 |
| EFSA | Protein | 2012 | https://efsa.onlinelibrary.wiley.com/doi/10.2903/j.efsa.2012.2557 |
| EFSA | Carbohydrates | 2010 | https://efsa.onlinelibrary.wiley.com/doi/10.2903/j.efsa.2010.1462 |
| EFSA | Vit D | 2016 | https://efsa.onlinelibrary.wiley.com/doi/10.2903/j.efsa.2016.4547 |
| EFSA | Iron | 2015 | https://efsa.onlinelibrary.wiley.com/doi/10.2903/j.efsa.2015.4254 |

| | | | |
|---|---|---|---|
| EFSA | Iodine | 2014 | https://efsa.onlinelibrary.wiley.com/doi/10.2903/j.efsa.2014.3660 |
| EFSA | Folic acid | 2014 | https://efsa.onlinelibrary.wiley.com/doi/10.2903/j.efsa.2014.3893 |
| EFSA | Calcium | 2015 | https://efsa.onlinelibrary.wiley.com/doi/10.2903/j.efsa.2015.4101 |
| FCN | Protein | 2011 | https://www.blv.admin.ch/blv/fr/home/das-blv/organisation/kommissionen/eek/proteine-in-der-ernaehrung-des-mensches.html |
| FCN | Carbohydrates | 2009 | https://www.blv.admin.ch/blv/fr/home/das-blv/organisation/kommissionen/eek/kohlenhydrate-in-der-ernaehrung.html |
| FCN | Vit D | 2012 /2018 | https://www.blv.admin.ch/blv/fr/home/das-blv/organisation/kommissionen/eek/vitamin-d-mangel.html |
| FCN | Iodine | 2013 | https://www.blv.admin.ch/blv/fr/home/das-blv/organisation/kommissionen/eek/jodversorgung-in-der-schweiz.html |
| FCN | Folic acid | 2002 | https://www.blv.admin.ch/blv/fr/home/das-blv/organisation/kommissionen/eek/folsaeure.html |
| FCN | Protein | 2011 | https://www.blv.admin.ch/blv/fr/home/das-blv/organisation/kommissionen/eek/proteine-in-der-ernaehrung-des-mensches.html |
| FCN | Elderly – all nutrients | 2018 | https://www.blv.admin.ch/blv/fr/home/das-blv/organisation/kommissionen/eek/ernaehrung-im-alter.html |
| NNR | Protein, carbohydrates, vit D, iron, iodine, folic acid, calcium | 2012 | https://www.norden.org/en/publication/nordic-nutrition-recommendations-2012 |
| SACN | Protein and calcium | 1991 | https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/743790/Dietary_Reference_Values_-_A_Guide__1991_.pdf |
| SACN | Iron | 2010 | https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/339309/SACN_Iron_and_Health_Report.pdf |
| SACN | Iodine | 2014 | https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/339439/SACN_Iodine_and_Health_2014.pdf |
| SACN | Carbohydrates | 2015 | https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/445503/SACN_Carbohydrates_and_Health.pdf |
| SACN | Vit. D | 2016 | https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/537616/SACN_Vitamin_D_and_Health_report.pdf |
| SACN | Folic acid | 2017 | https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/637111/SACN_Update_on_folic_acid.pdf |
| SINU | Protein | 2014 | https://sinu.it/2019/07/09/proteine/ |
| SINU | Carbohydrates | 2014 | https://sinu.it/2019/07/09/carboidrati-e-fibra-alimentare/ |

| | | | |
|---|---|---|---|
| SINU | Vit D | 2014 | https://sinu.it/2019/07/09/vitamine-livello-massimo-tollerabile-di-assunzione-ul/<br>https://sinu.it/2019/07/09/vitamine-fabbisogno-medio-ar/<br>https://sinu.it/2019/07/09/assunzione-raccomandata-per-la-popolazione-pri-e-assunzione-adeguata-ai/ |
| SINU | Iron | 2014 | https://sinu.it/2019/07/09/minerali-livello-massimo-tollerabile-di-assunzione-ul-e-obiettivo-nutrizionale-per-la-popolazione-sdt/<br>https://sinu.it/2019/07/09/minerali-fabbisogno-medio-ar/<br>https://sinu.it/2019/07/09/minerali-assunzione-raccomandata-per-la-popolazione-pri-e-assunzione-adeguataai/ |
| SINU | Iodine | 2014 | https://sinu.it/2019/07/09/minerali-livello-massimo-tollerabile-di-assunzione-ul-e-obiettivo-nutrizionale-per-la-popolazione-sdt/<br>https://sinu.it/2019/07/09/minerali-fabbisogno-medio-ar/<br>https://sinu.it/2019/07/09/minerali-assunzione-raccomandata-per-la-popolazione-pri-e-assunzione-adeguataai/ |
| SINU | Folic acid | 2014 | https://sinu.it/2019/07/09/vitamine-livello-massimo-tollerabile-di-assunzione-ul/<br>https://sinu.it/2019/07/09/vitamine-fabbisogno-medio-ar/<br>https://sinu.it/2019/07/09/assunzione-raccomandata-per-la-popolazione-pri-e-assunzione-adeguata-ai/ |
| SINU | Calcium | 2014 | https://sinu.it/2019/07/09/minerali-livello-massimo-tollerabile-di-assunzione-ul-e-obiettivo-nutrizionale-per-la-popolazione-sdt/<br>https://sinu.it/2019/07/09/minerali-fabbisogno-medio-ar/<br>https://sinu.it/2019/07/09/minerali-assunzione-raccomandata-per-la-popolazione-pri-e-assunzione-adeguataai/ |

## 10.5 Appendix V: Questionnaire for the online survey of Step 2

| **Completeness of the recommendations of the two societies** | |
|---|---|
| 4. Based on the completeness of the recommendations of the two societies for **macronutrients**, do you think the following society may be selected?<br>- D-A-CH<br>- EFSA | <br><br>☐ Yes, absolutely ☐ Rather yes ☐ Rather no ☐Not at all<br>☐ Yes, absolutely ☐ Rather yes ☐ Rather no ☐Not at all |
| 5. Based on the completeness of the recommendations of the two societies for **macronutrients**, which society would you prefer? | ☐ D-A-CH ☐ EFSA ☐ Both |
| 6. Based on the completeness of the recommendations of the two societies for **macronutrients**, do you think some nutrients may be problematic? | ☐ Yes ☐ No |
| 7. If yes, which **macronutrients**?<br>And what would you propose? | Free answer |
| 8. Based on the completeness of the recommendations of the two societies for **vitamins**, do you think the following society may be selected?<br>- D-A-CH<br>- EFSA | <br><br>☐ Yes, absolutely ☐ Rather yes ☐ Rather no ☐Not at all<br>☐ Yes, absolutely ☐ Rather yes ☐ Rather no ☐Not at all |
| 9. Based on the completeness of the recommendations of the two societies for **vitamins**, which society would you prefer? | ☐ D-A-CH ☐ EFSA ☐ Both |
| 10. Based on the completeness of the recommendations of the two societies for **vitamins**, do you think some nutrients may be problematic? | ☐ Yes ☐ No |
| 11. If yes, which **vitamins**?<br>And what would you propose? | Free answer |
| 12. Based on the completeness of the recommendations of the two societies for **minerals and trace elements**, do you think the following society may be selected?<br>- D-A-CH<br>- EFSA | <br><br>☐ Yes, absolutely ☐ Rather yes ☐ Rather no ☐Not at all<br>☐ Yes, absolutely ☐ Rather yes ☐ Rather no ☐Not at all |
| 13. Based on the completeness of the recommendations of the two societies for **minerals and trace elements**, which society would you prefer? | ☐ D-A-CH ☐ EFSA ☐ Both |
| 14. Based on the completeness of the recommendations of the two societies for **minerals and trace elements**, do you think some nutrients may be problematic? | ☐ Yes ☐ No |
| 15. If yes, which **minerals and trace elements**?<br>And what would you propose? | Free answer |

| Comparison of NRVs and methodologies used by the societies | |
|---|---|
| 16. Based on the comparison of NRVs and methodologies used by the two societies for **macronutrients**, do you think the following society may be selected?<br>- D-A-CH<br>- EFSA | <br><br><br>☐ Yes, absolutely ☐ Rather yes ☐ Rather no ☐Not at all<br>☐ Yes, absolutely ☐ Rather yes ☐ Rather no ☐Not at all |
| 17. Based on the comparison of NRVs and methodologies used by two societies for **macronutrients**, which society would you prefer? | ☐ D-A-CH ☐ EFSA ☐ Both |
| 18. Based on the comparison of NRVs and methodologies used by the two societies for **macronutrients**, do you think some nutrients may be problematic? | ☐ Yes ☐ No |
| 19. If yes, which **macronutrients**?<br>And what would you propose? | Free answer |
| 20. Based on the comparison of NRVs and methodologies used by the two societies for **vitamins**, do you think the following society may be selected?<br>- D-A-CH<br>- EFSA | <br><br><br>☐ Yes, absolutely ☐ Rather yes ☐ Rather no ☐Not at all<br>☐ Yes, absolutely ☐ Rather yes ☐ Rather no ☐Not at all |
| 21. Based on the comparison of NRVs and methodologies used by two societies for **vitamins**, which society would you prefer? | ☐ D-A-CH ☐ EFSA ☐ Both |
| 22. Based on the comparison of NRVs and methodologies used by the two societies for **vitamins**, do you think some nutrients may be problematic? | ☐ Yes ☐ No |
| 23. If yes, which **vitamins**?<br>And what would you propose? | Free answer |
| 24. Based on the comparison of NRVs and methodologies used by the two societies for **minerals and trace elements**, do you think the following society may be selected?<br>- D-A-CH<br>- EFSA | <br><br><br>☐ Yes, absolutely ☐ Rather yes ☐ Rather no ☐Not at all<br>☐ Yes, absolutely ☐ Rather yes ☐ Rather no ☐Not at all |
| 25. Based on the comparison of NRVs and methodologies used by two societies for **minerals and trace elements**, which society would you prefer? | ☐ D-A-CH ☐ EFSA ☐ Both |
| 26. Based on the comparison of NRVs and methodologies used by the two societies for **minerals and trace elements**, do you think some nutrients may be problematic? | ☐ Yes ☐ No |
| 27. If yes, which **minerals and trace elements**?<br>And what would you propose? | Free answer |

| | |
|---|---|
| 28. For all nutrients, we have considered a difference between the NRVs of the two societies ≥15% as scientifically significant. For you, what would be a clinically significantly cut-off? | Free answer |
| **General opinion including accessibility of basic data** | |
| 26. Which society would you select considering the following criteria: | |
| - Accessibility of scientific reports | ☐ D-A-CH ☐ EFSA ☐ Both |
| - Completeness of recommendations | ☐ D-A-CH ☐ EFSA ☐ Both |
| - Comparison of NRVs and methodologies used by the two societies | ☐ D-A-CH ☐ EFSA ☐ Both |
| - Credibility of the society | ☐ D-A-CH ☐ EFSA ☐ Both |
| - Acceptability of the new NRVs in comparison with the current values of the FCN | ☐ D-A-CH ☐ EFSA ☐ Both |
| - Applicability in practice of the NRVs in Switzerland including consistency with legislation | ☐ D-A-CH ☐ EFSA ☐ Both |
| 27. Overall, based on the 2nd intermediate report, which society would you prefer? | ☐ D-A-CH ☐ EFSA ☐ Both |
| 28. Do you have any general comments about the choice of the society? | Free answer |
| **General comments** | |
| 29. Do you have any general comments on the project that should be discussed during the focus group? | Free answer |

## 10.6 Appendix VI: Website link of the scientific reports of EFSA and D-A-CH

| Nutrient | EFSA | D-A-CH |
|---|---|---|
| | | |
| Energy | https://www.efsa.europa.eu/en/efsajournal/pub/3005 | https://www.karger.com/Article/Fulltext/430959 |
| Carbohydrates | https://efsa.onlinelibrary.wiley.com/doi/10.2903/j.efsa.2010.1462 | https://pubmed.ncbi.nlm.nih.gov/22286913/ |
| Fats | https://efsa.onlinelibrary.wiley.com/doi/10.2903/j.efsa.2010.1461 | https://pubmed.ncbi.nlm.nih.gov/26414007/ |
| Protein | https://efsa.onlinelibrary.wiley.com/doi/10.2903/j.efsa.2012.2557 | https://pubmed.ncbi.nlm.nih.gov/30904906/ |
| Water | https://efsa.onlinelibrary.wiley.com/doi/10.2903/j.efsa.2010.1459 | Not available online |
| Alcohol | - | Not available online |
| Vitamins | | |
| Biotin | https://efsa.onlinelibrary.wiley.com/doi/10.2903/j.efsa.2014.3580 | Not available online |
| Cobalamin | https://efsa.onlinelibrary.wiley.com/doi/10.2903/j.efsa.2015.4150 | https://pubmed.ncbi.nlm.nih.gov/30657638/ |
| Folate | https://efsa.onlinelibrary.wiley.com/doi/10.2903/j.efsa.2014.3893 | https://www.nature.com/articles/ejcn201445 |
| Niacin | https://efsa.onlinelibrary.wiley.com/doi/10.2903/j.efsa.2014.3759 | https://www.sciencedirect.com/science/article/pii/S2352364615300432 |
| Pantothenic acid | https://efsa.onlinelibrary.wiley.com/doi/10.2903/j.efsa.2014.3581 | Not available online |
| Riboflavin | https://efsa.onlinelibrary.wiley.com/doi/10.2903/j.efsa.2017.4919 | https://www.sciencedirect.com/science/article/pii/S2352364615300432 |
| Thiamin | https://efsa.onlinelibrary.wiley.com/doi/10.2903/j.efsa.2016.4653 | https://www.sciencedirect.com/science/article/pii/S2352364615300432 |
| Vitamin A | https://efsa.onlinelibrary.wiley.com/doi/10.2903/j.efsa.2015.4028 | Not available online |
| Vitamin B6 | https://efsa.onlinelibrary.wiley.com/doi/10.2903/j.efsa.2016.4485 | https://pubmed.ncbi.nlm.nih.gov/32690847/ |
| Vitamin C | https://efsa.onlinelibrary.wiley.com/doi/10.2903/j.efsa.2013.3418 | https://pubmed.ncbi.nlm.nih.gov/26227083/ |
| Vitamin D | https://efsa.onlinelibrary.wiley.com/doi/10.2903/j.efsa.2016.4547 | https://pubmed.ncbi.nlm.nih.gov/22677925/ |
| Vitamin E | https://efsa.onlinelibrary.wiley.com/doi/10.2903/j.efsa.2015.4149 | Not available online |
| Vitamin K | https://efsa.onlinelibrary.wiley.com/doi/10.2903/j.efsa.2017.4780 | Not available online |
| Minerals and trace elements | | |
| Calcium | https://efsa.onlinelibrary.wiley.com/doi/10.2903/j.efsa.2015.4101 | https://pubmed.ncbi.nlm.nih.gov/24356454/ |
| Chloride | https://efsa.onlinelibrary.wiley.com/doi/10.2903/j.efsa.2019.5779 | https://pubmed.ncbi.nlm.nih.gov/29232668/ |
| Chromium | https://www.efsa.europa.eu/en/efsajournal/pub/3845 | Not available online |
| Copper | https://efsa.onlinelibrary.wiley.com/doi/10.2903/j.efsa.2015.4253 | Not available online |
| Fluoride | https://efsa.onlinelibrary.wiley.com/doi/10.2903/j.efsa.2013.3332 | Not available online |
| Iodine | https://efsa.onlinelibrary.wiley.com/doi/10.2903/j.efsa.2014.3660 | Not available online |

| | | |
|---|---|---|
| Iron | https://efsa.onlinelibrary.wiley.com/doi/10.2903/j.efsa.2015.4254 | Not available online |
| Magnesium | https://efsa.onlinelibrary.wiley.com/doi/10.2903/j.efsa.2015.4186 | Not available online |
| Manganese | https://efsa.onlinelibrary.wiley.com/doi/10.2903/j.efsa.2013.3419 | Not available online |
| Molybdenum | https://efsa.onlinelibrary.wiley.com/doi/10.2903/j.efsa.2013.3333 | Not available online |
| Phosphorus | https://efsa.onlinelibrary.wiley.com/doi/10.2903/j.efsa.2015.4185 | Not available online |
| Potassium | https://efsa.onlinelibrary.wiley.com/doi/10.2903/j.efsa.2016.4592 | https://pubmed.ncbi.nlm.nih.gov/28803230/ |
| Selenium | https://efsa.onlinelibrary.wiley.com/doi/10.2903/j.efsa.2014.3846 | https://pubmed.ncbi.nlm.nih.gov/26302929/ |
| Sodium | https://efsa.onlinelibrary.wiley.com/doi/10.2903/j.efsa.2019.5778 | https://pubmed.ncbi.nlm.nih.gov/29232668/ |
| Zinc | https://efsa.onlinelibrary.wiley.com/doi/10.2903/j.efsa.2014.3844 | https://pubmed.ncbi.nlm.nih.gov/32380426/ |
| Tolerable upper intake UL | | |
| D-A-CH | https://valeursnutritives.ch/fr/nutriments/ | |
| EFSA | https://www.efsa.europa.eu/sites/default/files/assets/UL_Summary_tables.pdf | |
| Swiss legislation | https://www.blv.admin.ch/blv/fr/home/lebensmittel-und-ernaehrung/rechts-und-vollzugsgrundlagen/hilfsmittel-und-vollzugsgrundlagen/hoechstmengenmodell.html | |

## 10.7 Appendix VII: Description of the NRVs and methodology for energy and macronutrients

### 10.7.1 Energy

| | EFSA 2013 | D-A-CH 2015 |
|---|---|---|
| Unit | MJ/d | Kcal/d |
| Infants to 7- 11 months | Table with ARs for E for m and w<br>AR (MJ/d) for m and w<br>AR (MJ/Kg/d) for m and w | No recommendation under 1 y |
| Infants, children and adolescents | Table with ARs for E for m and w<br>REE by Henry 2005<br>Average BW and height by :<br>WHO 2006 1 to 2y and standards of EU 3 to 17y<br>AR : growth factor of 1.01<br>Age groups:<br>1 to 3y : AR=REE (MJ/d) x PAL 1.4<br>4 to 9y: AR=REE (MJ/d) x PAL 1.4 – 1.6 – 1.8<br>10 to 17y : AR=REE (MJ/d) x PAL 1.6 – 1.8 – 2.0 | Table with REE and guiding values for E intake for m and w<br>REE based on DLW method<br>Median BW: by WHO child growth standards<br>For infants, E storage in growing tissue is based on: multi-component model and the E needed for stored 1g of protein and 1g of fat<br>Age group : 1 to < 4y :<br>REE (Kcal/d) x PAL 1.4-1.6<br>Age groups : 4 to < 7y ; 7 to < 10y; 10 to < 13y; 13 to < 15 y; 15 to < 19y<br>REE (Kcal/d) x PAL 1.4-1.6– 1.8<br>For children and adolescents, energy storage in growing tissue is: 1% of TEE |
| Adults | Table with ARs for energy for m and w<br>Age group : 18-29 ; 30-39 ; 40-49 ;50-59<br>REE by Henry 2005<br>BW and height : data from representative national surveys in<br>EU Member States<br>AR=REE (MJ/d) x PAL 1.4 – 1.6 – 1.8 – 2.0 | Table with REE and guiding values for energy intake for m and w<br>Age group : 19 to < 25y; 25 to < 51y ; 51 to < 65y<br>REE (Kcal/d) x PAL 1.4-1.6– 1.8<br>REE according to Müller et al. Reference body mass index of 22 kg/m2 |
| Elderly person | Table with ARs for energy for m and w<br>Age group: 60-69 ;70-79<br>Same method as for adults | Table with REE and guiding values for energy intake for m and w<br>65 and older<br>Same method as for adults |
| Pregnant women | Mj/d in addition to the AR for energy of non-pregnant, in the 1st, 2nd and 3rd trimester | Increase in BW of 12 kg Kcal/d for additional energy intake in the 2nd and 3rd trimester |
| Women breastfeeding | Mj/d in addition to the AR for energy of non-lactating w, during the 1st 6 months | Kcal/d for additional energy intake during the 1st 4-6 months |

AR : Average requirement; BW : body weight ; REE : resting energy expenditure ; DLW : doubly labelled water method. ; E : energy ; PAL, physical activity level ; TEE : total energy expenditure

### 10.7.2 Carbohydrates

#### *10.7.2.1 Total carbohydrates*

NRVs for children and adolescents

| % of TEI | D-A-CH | EFSA | FCN |
|---|---|---|---|
| Date | - | 2010 | - |
| 9 mo | - | - | - |
| 2 y | - | 45-60 | - |
| 8 y | - | 45-60 | - |
| 11 y | - | 45-60 | - |
| 16 y | - | 45-60 | - |

- = no defined NRV.

NRVs for adults and elderly:

| % of TEI | D-A-CH | EFSA | FCN |
|---|---|---|---|
| Date | 2009 | 2010 | 2009/2018 |
| 20 y | 45-55 | 45-60 | 45-55 |
| 45 y | 45-55 | 45-60 | 45-55 |
| 55 y | 45-55 | 45-60 | 45-55 |
| 65 y | 45-55 | 45-60 | 45-65/45-55 |
| 75 y | 45-55 | 45-60 | 45-65/45-55 |

FCN 2018 > 65y: 1st value= IOM 2015/ 2nd value= D-A-CH 2017

NRVs for pregnant and breastfeeding women:

| % of TEI | D-A-CH | EFSA | FCN |
|---|---|---|---|
| Date | 2009 | 2010 | 2009 |
| Pregnancy: 1st trimester | 45-55 | 45-60 | 45-55 |
| Pregnancy: 2nd trimester | 45-55 | 45-60 | 45-55 |
| Pregnancy: 3rd trimester | 45-55 | 45-60 | 45-55 |
| Breastfeeding: 1st semester | 45-55 | 45-60 | 45-55 |
| Breastfeeding: 2nd semester | 45-55 | 45-60 | 45-55 |

**Description of the methodology to define the NRVs (Total carbohydrates)**

| Society | Methodology |
|---|---|
| FCN | **Elderly subjects (2018):** The values are from IOM 2015 and D-A-CH 2017. |

##### *10.7.2.2 Fibres*

NRVs for children and adolescents

| g per day | D-A-CH | EFSA** | FCN |
|---|---|---|---|
| Date | - | 2010 | - |
| 9 mo | - | - | - |
| 2 y | - | 10 | - |
| 8 y | - | 16 | - |
| 11 y | - | 19 | - |
| 16 y | - | 21 | - |

**All values are AI; - = no defined NRV.

NRVs for adults and elderly:

| g per day | D-A-CH** | EFSA** | FCN |
|---|---|---|---|
| Date | 2017 | 2010 | 2009/*2018* |
| 20 y | 30 | 25 | 30 |
| 45 y | 30 | 25 | 30 |
| 55 y | 30 | 25 | 30 |
| 65 y | 30 | 25 | 25-30/30 |
| 75 y | 30 | 25 | 25-30/30 |

**All values are AI; FCN 2018 >65y: 1st value= IOM 2015/ 2nd value= D-A-CH 2017

NRVs for pregnant and breastfeeding women:

| g per day | D-A-CH** | EFSA** | FCN |
|---|---|---|---|
| Date | 2017 | 2010 | 2009 |
| Pregnancy: 1st trimester | 30 | 25 | 30 |
| Pregnancy: 2nd trimester | 30 | 25 | 30 |
| Pregnancy: 3rd trimester | 30 | 25 | 30 |
| Breastfeeding: 1st semester | 30 | 25 | 30 |
| Breastfeeding: 2nd semester | 30 | 25 | 30 |

**All values are AI

**Description of the methodology to define the NRVs (Fibres)**

| Society | Methodology |
| --- | --- |
| D-A-CH | **For adults, pregnancy and breastfeeding:** The panel considered the evidence of the protective role of fibre intake against chronic diseases such as coronary heart disease and type 2 diabetes. |
| EFSA | **For adults, pregnancy and breastfeeding:** The role of dietary fibre in bowel function was considered the most suitable criterion for establishing an adequate intake. Based on the available evidence on bowel function, the Panel considers dietary fibre intakes of 25 g per day to be adequate for normal laxation in adults. |
| FCN | **Adults, pregnancy and breastfeeding:** The recommendation comes from D-A-CH.<br>**Elderly subjects (2018):** The values are from IOM 2015 and D-A-CH 2017. |

#### *10.7.2.3 Sugars*

NRVs for children and adolescents

| % of TEI | D-A-CH | EFSA | FCN |
|---|---|---|---|
| Date | - | - | 2018 |
| 9 mo | - | - | - |
| 2 y | - | - | - |
| 8 y | - | - | - |
| 11 y | - | - | - |
| 16 y | - | - | ≤10 |

- = no defined NRV.

NRVs for adults and elderly:

| % of TEI | D-A-CH | EFSA | FCN |
|---|---|---|---|
| Date | - | - | 2018 |
| 20 y | - | - | ≤10 |
| 45 y | - | - | ≤10 |
| 55 y | - | - | ≤10 |
| 65 y | - | - | ≤10 |
| 75 y | - | - | ≤10 |

- = no defined NRV.

NRVs for pregnant and breastfeeding women:

| % of TEI | D-A-CH | EFSA | FCN |
|---|---|---|---|
| Date | - | - | 2018 |
| Pregnancy: 1st trimester | - | - | ≤10 |
| Pregnancy: 2nd trimester | - | - | ≤10 |
| Pregnancy: 3rd trimester | - | - | ≤10 |
| Breastfeeding: 1st semester | - | - | ≤10 |
| Breastfeeding: 2nd semester | - | - | ≤10 |

- = no defined NRV.

**Description of the methodology to define the NRVs (Total fat)**

| Society | Methodology |
|---|---|
| FCN | **All age group:** The recommendation comes from the WHO. |

### 10.7.3 Fats

#### *10.7.3.1 Total fat*

NRVs for children and adolescents

| % of TEI | D-A-CH | EFSA | FCN |
|---|---|---|---|
| Date | 2015 | 2010 | 2013 |
| 9 mo | 35-45 | 40 | - |
| 2 y | 30-40 | 35-40 | - |
| 8 y | 30-35 | 20-35 | - |
| 11 y | 30-35 | 20-35 | - |
| 16 y | 30 | 20-35 | - |

- = no defined NRV.

NRVs for adults and elderly:

| % of TEI | D-A-CH | EFSA | FCN |
|---|---|---|---|
| Date | 2015 | 2010 | 2013/2018 |
| 20 y | 30 | 20-35 | 20-35 (40) |
| 45 y | 30 | 20-35 | 20-35 (40) |
| 55 y | 30 | 20-35 | 20-35 (40) |
| 65 y | 30 | 20-35 | 20-35/30 (20-40) |
| 75 y | 30 | 20-35 | 20-35/30 (20-40) |

FCN 2018 >65y: 1st value= IOM 2015/ 2nd value= D-A-CH 2017

NRVs for pregnant and breastfeeding women:

| % of TEI | D-A-CH | EFSA | FCN |
|---|---|---|---|
| Date | 2015 | 2010 | 2013 |
| Pregnancy: 1st trimester | 30 | 20-35 | 20-35 (40) |
| Pregnancy: 2nd trimester | 30-35 | 20-35 | 20-35 (40) |
| Pregnancy: 3rd trimester | 30-35 | 20-35 | 20-35 (40) |
| Breastfeeding: 1st semester | 30-35 | 20-35 | 20-35 (40) |
| Breastfeeding: 2nd semester | 30-35 | 20-35 | 20-35 (40) |

**Description of the methodology to define the NRVs (Total fat)**

| Society | Methodology |
|---|---|
| FCN | **Adults, pregnancy and breastfeeding:** The recommendation is the sum of the values of the other fatty acids (saturated, monounsaturated and polyunsaturated).<br>**Elderly subjects (2018):** Endorses the recommendations from IOM 2015 and D-A-CH 2017. |

#### *10.7.3.2 Alpha-linolenic (ALA)*

NRVs for children and adolescents

| % of TEI | D-A-CH | EFSA | FCN |
|---|---|---|---|
| Date | 2015 | 2010 | - |
| 9 mo | 0,5 | 0,5 | - |
| 2 y | 0,5 | 0,5 | - |
| 8 y | 0,5 | 0,5 | - |
| 11 y | 0,5 | 0,5 | - |
| 16 y | 0,5 | 0,5 | - |

- = no defined NRV.

NRVs for adults and elderly:

| % of TEI | D-A-CH | EFSA | FCN |
|---|---|---|---|
| Date | 2015 | 2010 | - |
| 20 y | 0,5 | 0,5 | - |
| 45 y | 0,5 | 0,5 | - |
| 55 y | 0,5 | 0,5 | - |
| 65 y | 0,5 | 0,5 | - |
| 75 y | 0,5 | 0,5 | - |

- = no defined NRV.

NRVs for pregnant and breastfeeding women:

| % of TEI | D-A-CH | EFSA | FCN |
|---|---|---|---|
| Date | 2015 | 2010 | - |
| Pregnancy: 1st trimester | 0,5 | 0,5 | - |
| Pregnancy: 2nd trimester | 0,5 | 0,5 | - |
| Pregnancy: 3rd trimester | 0,5 | 0,5 | - |
| Breastfeeding: 1st semester | 0,5 | 0,5 | - |
| Breastfeeding: 2nd semester | 0,5 | 0,5 | - |

- = no defined NRV.

#### *10.7.3.3 Cholesterol*

NRVs for children and adolescents

| Mg per day | D-A-CH | EFSA | FCN |
|---|---|---|---|
| Date | - | - | 2013 |
| 9 mo | - | - | - |
| 2 y | - | - | - |
| 8 y | - | - | - |
| 11 y | - | - | - |
| 16 y | - | - | - |

- = no defined NRV.

NRVs for adults and elderly:

| Mg per day | D-A-CH | EFSA | FCN |
|---|---|---|---|
| Date | - | - | 2013 |
| 20 y | - | - | - |
| 45 y | - | - | - |
| 55 y | - | - | - |
| 65 y | - | - | - |
| 75 y | - | - | - |

- = no defined NRV.

NRVs for pregnant and breastfeeding women:

| Mg per day | D-A-CH | EFSA | FCN |
|---|---|---|---|
| Date | - | - | 2013 |
| Pregnancy: 1st trimester | - | - | - |
| Pregnancy: 2nd trimester | - | - | - |
| Pregnancy: 3rd trimester | - | - | - |
| Breastfeeding: 1st semester | - | - | - |
| Breastfeeding: 2nd semester | - | - | - |

- = no defined NRV.

**Description of the methodology to define the NRVs (Cholesterol)**

| Society | Methodology |
|---|---|
| FCN | **All age group**: No recommendation can be made on the basis of the available scientific data, which suggest, in particular, considerable differences in its effects from one individual to another. |

#### *10.7.3.4 Eicosapentaenoic acid, Docosahexaenoic acid (EPA, DHA)*

NRVs for children and adolescents

| mg per day | D-A-CH | EFSA | FCN |
|---|---|---|---|
| Date | - | 2010 | 2013 |
| 9 mo | - | - | - |
| 2 y | - | 100* | - |
| 8 y | - | 250 | - |
| 11 y | - | 250 | - |
| 16 y | - | 250 | - |

*Only DHA; - = no defined NRV.

NRVs for adults and elderly:

| mg per day | D-A-CH | EFSA | FCN |
|---|---|---|---|
| Date | - | 2010 | 2013 |
| 20 y | - | 250 | 500 |
| 45 y | - | 250 | 500 |
| 55 y | - | 250 | 500 |
| 65 y | - | 250 | 500 |
| 75 y | - | 250 | 500 |

- = no defined NRV.

NRVs for pregnant and breastfeeding women:

| mg per day | D-A-CH | EFSA | FCN |
|---|---|---|---|
| Date | - | 2010 | 2013 |
| Pregnancy: 1st trimester | - | 250 +100-200* (400) | 500** |
| Pregnancy: 2nd trimester | - | 250 +100-200* (400) | 500** |
| Pregnancy: 3rd trimester | - | 250 +100-200* (400) | 500** |
| Breastfeeding: 1st semester | - | 250 +100-200* (400) | 500** |
| Breastfeeding: 2nd semester | - | 250 +100-200* (400) | 500** |

*****250 from (EPA+DHA) and in addition 100-200 from DHA; ******Minimum 200mg from DHA; - = no defined NRV.

**Description of the methodology to define the NRVs (EPA and DHA)**

| Society | Methodology |
|---|---|
| FCN | **All age group**: The recommendation is based on studies related to inflammatory markers. |

#### *10.7.3.5 Linoleic acid (LA)*

NRVs for children and adolescents

| % of TEI | D-A-CH | EFSA | FCN |
|---|---|---|---|
| Date | 2015 | 2010 | - |
| 9 mo | 3,5 | 4 | - |
| 2 y | 3 | 4 | - |
| 8 y | 2,5 | 4 | - |
| 11 y | 2,5 | 4 | - |
| 16 y | 2,5 | 4 | - |

- = no defined NRV.

NRVs for adults and elderly:

| % of TEI | D-A-CH | EFSA | FCN |
|---|---|---|---|
| Date | 2015 | 2010 | - |
| 20 y | 2,5 | 4 | - |
| 45 y | 2,5 | 4 | - |
| 55 y | 2,5 | 4 | - |
| 65 y | 2,5 | 4 | - |
| 75 y | 25 | 4 | - |

- = no defined NRV.

NRVs for pregnant and breastfeeding women:

| % of TEI | D-A-CH | EFSA | FCN |
|---|---|---|---|
| Date | 2015 | 2010 | - |
| Pregnancy: 1st trimester | 2,5 | 4 | - |
| Pregnancy: 2nd trimester | 2,5 | 4 | - |
| Pregnancy: 3rd trimester | 2,5 | 4 | - |
| Breastfeeding: 1st semester | 2,5 | 4 | - |
| Breastfeeding: 2nd semester | 2,5 | 4 | - |

- = no defined NRV.

**Description of the methodology to define the NRVs (Linoleic-acid)**

| Society | Methodology |
|---|---|
| D-A-CH | **All age group**: The recommendations are based on studies that measure the effects of n-6 on lipid biomarkers. |
| EFSA | **All age group** :The Panel proposes to set an Adequate Intake for linoleic acid of 4 E%, based on the lowest estimated mean intakes of the various population groups from a number of European countries, where overt LA deficiency symptoms are not present. |

#### *10.7.3.6 Monounsaturated fatty acids (MUFA)*

NRVs for children and adolescents

| % of TEI | D-A-CH | EFSA | FCN |
|---|---|---|---|
| Date | - | - | 2013 |
| 9 mo | - | - | - |
| 2 y | - | - | - |
| 8 y | - | - | - |
| 11 y | - | - | - |
| 16 y | - | - | - |

- = no defined NRV.

NRVs for adults and elderly:

| % of TEI | D-A-CH | EFSA | FCN |
|---|---|---|---|
| Date | - | - | 2013 |
| 20 y | - | - | 10-15 |
| 45 y | - | - | 10-15 |
| 55 y | - | - | 10-15 |
| 65 y | - | - | 10-15 |
| 75 y | - | - | 10-15 |

- = no defined NRV.

NRVs for pregnant and breastfeeding women:

| % of TEI | D-A-CH | EFSA | FCN |
|---|---|---|---|
| Date | - | - | 2013 |
| Pregnancy: 1st trimester | - | - | 10-15 |
| Pregnancy: 2nd trimester | - | - | 10-15 |
| Pregnancy: 3rd trimester | - | - | 10-15 |
| Breastfeeding: 1st semester | - | - | 10-15 |
| Breastfeeding: 2nd semester | - | - | 10-15 |

- = no defined NRV.

**Description of the methodology to define the NRVs (Monounsaturated fatty acids)**

| Society | Methodology |
|---|---|
| FCN | **All age group**: The recommendation is based on studies related to blood lipids and insulin sensitivity. |

#### *10.7.3.7 Saturated fatty acids (SFA)*

NRVs for children and adolescents

| % of TEI | D-A-CH | EFSA | FCN |
|---|---|---|---|
| Date | 2015 | 2010 | 2013 |
| 9 mo | <10 | As low as possible | - |
| 2 y | <10 | As low as possible | - |
| 8 y | <10 | As low as possible | - |
| 11 y | <10 | As low as possible | - |
| 16 y | <10 | As low as possible | - |

- = no defined NRV.

NRVs for adults and elderly:

| % of TEI | D-A-CH | EFSA | FCN |
|---|---|---|---|
| Date | 2015 | 2010 | 2013 |
| 20 y | <10 | As low as possible | <10 |
| 45 y | <10 | As low as possible | <10 |
| 55 y | <10 | As low as possible | <10 |
| 65 y | <10 | As low as possible | <10 |
| 75 y | <10 | As low as possible | <10 |

- = no defined NRV.

NRVs for pregnant and breastfeeding women:

| % of TEI | D-A-CH | EFSA | FCN |
|---|---|---|---|
| Date | 2015 | 2010 | 2013 |
| Pregnancy: 1st trimester | <10 | As low as possible | <10 |
| Pregnancy: 2nd trimester | <10 | As low as possible | <10 |
| Pregnancy: 3rd trimester | <10 | As low as possible | <10 |
| Breastfeeding: 1st semester | <10 | As low as possible | <10 |
| Breastfeeding: 2nd semester | <10 | As low as possible | <10 |

- = no defined NRV.

**Description of the methodology to define the NRVs (Saturated fatty acids)**

| Society | Methodology |
|---|---|
| FCN | **All age group**: The recommendation is based on studies related to LDL and insulin sensitivity. |

### 10.7.4 Protein

NRVs for children and adolescents:

| g/kg per day | D-A-CH* | EFSA* | FCN |
|---|---|---|---|
| Date | 2017 | 2012 | 2011 |
| 9 mo | 1,3 | 1,31 | 1,1 |
| 2 y | 1,0 | 0,97 | 0,86 |
| 8 y | 0,9 | 0,92 | 0,91 |
| 11 y F | 0,9 | 0,9 | 0,82-0,9 (0,86) |
| 11 y M | 0,9 | 0,91 | 0,85-0,91 (0,88) |
| 16 y F | 0,8 | 0,84 | 0,82-0,9 (0,86) |
| 16 y M | 0,9 | 0,87 | 0,85-0,91 (0,88) |

(#) Average between the low and high range recommended; *All values are PRI.

NRVs for adults and elderly:

| g/kg per day | D-A-CH* | EFSA* | FCN |
|---|---|---|---|
| Date | 2017 | 2012 | 2011/2018 |
| 20 y | 0,8 | 0,83 | 0,8 |
| 45 y | 0,8 | 0,83 | 0,8 |
| 55 y | 0,8 | 0,83 | 0,8 |
| 65 y | 1,0 | 0,83 | 1,0/1,2 |
| 75 y | 1,0 | 0,83 | 1,0/1,2 |

*All values are PRI. FCN 2018 >65y: 1st value= IOM 2015/ 2nd value= D-A-CH 2017

NRVs for pregnant and breastfeeding women:

| g/kg per day | D-A-CH* | EFSA* | FCN |
|---|---|---|---|
| Date | 2017 | 2012 | 2011 |
| Pregnancy: 1st trimester | - | 0,83 + 1 | 1,1 |
| Pregnancy: 2nd trimester | 0,9 | 0,83 + 9 | 1,1 |
| Pregnancy: 3rd trimester | 1,0 | 0,83+28 | 1,1 |
| Breastfeeding: 1st semester | 1,2 | 0,83+19 | 1,3 |
| Breastfeeding: 2nd semester | 1,2 | 0,83+13 | 1,3 |

*All values are PRI; - = no defined NRV

**Description of the methodology to define the NRVs (Proteins)**

| Society | Methodology |
|---|---|
| D-A-CH | **Seniors (> 65 years):** reports on metabolic and functional parameters under various protein intakes were additionally considered. Based on the results of many studies showing better results in older people with higher protein intake, the estimated value is higher than for adults.<br><br>**Pregnancy**: the values are according to the body weight gain and protein deposition. For the 1st trimester, an additional protein intake (0.4 g/d) can be neglected. For the 2nd and 3rd trimester, average additional protein requirements are considerably higher (considering a CV of 12%: the recommended additional protein intakes calculated to 7 and 21 g/d respectively). To determine the recommended daily protein intake per kg body weight, the protein requirement for protein deposition is divided by total body weight.<br><br>**Lactation**: according to the average protein content in breast milk and assuming an average milk intake of the suckling of 750 mL/d, the additional protein intake of 23 g/day (CV 12%) is proposed. The recommended daily protein intake per kg body weight is based on the reference weight for women at the age of 19 to under 25 years. |
| EFSA | An AR and a PRI for protein can be derived for adults, infants and children, and pregnant and lactating women based on nitrogen balance studies and on factorial estimates of the nitrogen needed for deposition of newly formed tissue and for milk output.<br>For **older adults**, the protein requirement is considered to be equal to that for adults (based on nitrogen balance studies). The lower energy requirement of sedentary elderly people means that the protein to energy ratio of their requirement may be higher than for younger age groups.<br>For **pregnant and lactating women**, the protein requirements are based on nitrogen balance studies and on factorial estimates of the nitrogen needed for deposition of newly formed tissue and for milk output. The Panel give an additional number of grams (the whole number) during each stage of pregnancy and lactation. |
| FCN | **Elderly subjects (2018):** Endorses the most recommendations from IOM |

AR: Average Requirement; PRI: Population Reference Intake; CV: coefficient of variation

### 10.7.5 Water

NRVs for children and adolescents

| Ml per day | D-A-CH | | EFSA | FCN |
|---|---|---|---|---|
| Date | 2015 | 2015 | 2010 | - |
| 9 mo | 110* | 900 | 900** | - |
| 2 y | 95* | 1170 | 1300 | - |
| 8 y | 60* | 1570 | 1600 | - |
| 11 y F | 50* | 1880 | 1900 | - |
| 11y M | 50* | 1880 | 2100 | - |
| 16 y F | 40* | 2450 | 2000 | - |
| 16y M | 40* | 2450 | 2500 | - |

***ml per kg per day** ** Average value

NRVs for adults and elderly:

| Ml per day | D-A-CH | | EFSA | FCN |
|---|---|---|---|---|
| Date | 2015 | 2015 | 2010 | 2018 |
| 20 y F | 35* | 2360 | 2000 | - |
| 20y M | 35* | 2360 | 2500 | - |
| 45 y F | 35* | 2270 | 2000 | - |
| 45y M | 35* | 2270 | 2500 | - |
| 55 y F | 30* | 1970 | 2000 | - |
| 55y M | 30* | 1970 | 2500 | - |
| 65 y F | 30* | 1990 | 2000 | 1500/1400 |
| 65 M | 30* | 1990 | 2500 | 1500/1400 |
| 75 y F | 30* | 1990 | 2000 | 1500/1400 |
| 75y M | 30* | 1990 | 2500 | 1500/1400 |

*****ml per kg per day

NRVs for pregnant and breastfeeding women:

| Ml per day | D-A-CH | | EFSA | FCN |
|---|---|---|---|---|
| Date | 2015 | 2015 | 10 | - |
| Pregnancy: 1st trimester | 35* | 2360 | 2150** | - |
| Pregnancy: 2nd trimester | 35* | 2360 | 2150** | - |
| Pregnancy: 3rd trimester | 35* | 2360 | 2150** | - |
| Breastfeeding: 1st semester | 45* | 2710 | 2700 | - |
| Breastfeeding: 2nd semester | 45* | 2710 | 2700 | - |

*****ml per kg per day ** Average value

All the values from EFSA and D-A-CH consider intakes from beverages of all kind and from food.

| **Society** | **Methodology** |
|---|---|
| D-A-CH | **All age group:** Adequate Intakes (AI) have been defined derived from observed intakes in population groups with desirable osmolarity values of urine. The values are the same for men and women. |
| EFSA | **All age group:** Adequate Intakes (AI) have been defined derived from a combination of observed intakes in population groups with desirable osmolarity values of urine and desirable water volumes per energy unit consumed. The same AIs as for adults are defined **for the elderly** and **for adolescents of 14 years or older**. |
| FCN | **Elderly subjects (2018):** Endorses the recommendations from IOM 2015 and D-A-CH 2017. |

#### 10.7.6 Alcohol

NRVs for children and adolescents:

| g per day | D-A-CH | EFSA | FCN |
|---|---|---|---|
| Date | 2015 | - | - |
| 9 mo | Abstain | - | - |
| 2 y | Abstain | - | - |
| 8 y | Abstain | - | - |
| 11 y | Abstain | - | - |
| 16 y | Abstain | - | - |

NRVs for adults and elderly:

| g per day | D-A-CH | EFSA | FCN |
|---|---|---|---|
| Date | 2015 | - | - |
| 20 y F | 10 | - | - |
| 20 y M | 20 | - | - |
| 45 y F | 10 | - | - |
| 45 y M | 20 | - | - |
| 55 y F | 10 | - | - |
| 55 y M | 20 | - | - |
| 65 y F | 10 | - | - |
| 65 y M | 20 | - | - |
| 75 y F | 10 | - | - |
| 75 y M | 20 | - | - |

D-A-CH = tolerable and non-prejudicial quantity

NRVs for pregnant and breastfeeding women:

| g per day | D-A-CH | EFSA | FCN |
|---|---|---|---|
| Date | 2015 | - | - |
| Pregnancy: 1st trimester | Should not drink alcohol | - | - |
| Pregnancy: 2nd trimester | | - | - |
| Pregnancy: 3rd trimester | | - | - |
| Breastfeeding: 1st semester | | - | - |
| Breastfeeding: 2nd semester | | - | - |

- = no defined NRV

## 10.8 Appendix VIII: Description of the NRVs and methodology for vitamins

### 10.8.1 Biotin

NRVs for children and adolescents:

| µg per day | D-A-CH** | EFSA** | FCN |
|---|---|---|---|
| Date | 2020 | 2014 | - |
| 9 mo | 6 | 6 | - |
| 2 y | 20 | 20 | - |
| 8 y | 25 | 25 | - |
| 11 y | 35 | 35 | - |
| 16 y | 40 | 35 | - |

**All values are AI; - = no defined NRV

NRVs for adults and elderly:

| µg per day | D-A-CH** | EFSA** | FCN |
|---|---|---|---|
| Date | 2020 | 2014 | - |
| 20 y | 40 | 40 | - |
| 45 y | 40 | 40 | - |
| 55 y | 40 | 40 | - |
| 65 y | 40 | 40 | - |
| 75 y | 40 | 40 | - |

**All values are AI; - = no defined NRV

NRVs for pregnant and breastfeeding women:

| µg per day | D-A-CH** | EFSA** | FCN |
|---|---|---|---|
| Date | 2020 | 2014 | - |
| Pregnancy: 1st trimester | 40 | 40 | - |
| Pregnancy: 2nd trimester | 40 | 40 | - |
| Pregnancy: 3rd trimester | 40 | 40 | - |
| Breastfeeding: 1st semester | 45 | 45 | - |
| Breastfeeding: 2nd semester | 45 | 45 | - |

**All values are AI; - = no defined NRV

### 10.8.2 Cobalamin

NRVs for children and adolescents:

| µg per day | D-A-CH* | EFSA** | FCN |
|---|---|---|---|
| Date | 2018 | 2015 | - |
| 9 mo | 1,4 | 1,5 | - |
| 2 y | 1,5 | 1,5 | - |
| 8 y | 2,5 | 2,5 | - |
| 11 y | 3,5 | 3,5 | - |
| 16 y | 4 | 4 | - |

***PRI; **AI; - = no defined NRV

NRVs for adults and elderly:

| µg per day | D-A-CH* | EFSA** | FCN |
|---|---|---|---|
| Date | 2018 | 2015 | 2018 |
| 20 y | 4 | 4 | - |
| 45 y | 4 | 4 | - |
| 55 y | 4 | 4 | - |
| 65 y | 4 | 4 | 2,4/3,0 |
| 75 y | 4 | 4 | 2,4/3,0 |

***PRI; **AI; FCN 2018 >65y: 1st value= IOM 2015/ 2nd value= D-A-CH 2017; - = no defined NRV

NRVs for pregnant and breastfeeding women:

| µg per day | D-A-CH* | EFSA** | FCN |
|---|---|---|---|
| Date | 2018 | 2015 | - |
| Pregnancy: 1st trimester | 4,5 | 4,5 | - |
| Pregnancy: 2nd trimester | 4,5 | 4,5 | - |
| Pregnancy: 3rd trimester | 4,5 | 4,5 | - |
| Breastfeeding: 1st semester | 5,5 | 5 | - |
| Breastfeeding: 2nd semester | 5,5 | 5 | - |

***PRI; **AI; - = no defined NRV

**Description of the methodology to define the NRVs (Cobalamin)**

| Society | Methodology |
|---|---|
| FCN | **Elderly subjects (2018)**: The values are from IOM 2015 and D-A-CH 2017. |

### 10.8.3 Folate

NRVs for children and adolescents:

| µg per day | D-A-CH* | EFSA | FCN |
|---|---|---|---|
| Date | 2018 | 2014 | 2018 |
| 9 mo | 80 | 80** | - |
| 2 y | 120 | 120* | - |
| 8 y | 180 | 200* | - |
| 11 y | 240 | 270* | - |
| 16 y F | 300 | 330* | - |
| 16 y M | 300 | 330* | - |

***PRI; **AI; - = no defined NRV

NRVs for adults and elderly:

| µg per day | D-A-CH* | EFSA* | FCN |
|---|---|---|---|
| Date | 2018 | 2014 | 2018 |
| 20 y F | 300 | 330 | - |
| 20 y M | 300 | 330 | - |
| 45 y F | 300 | 330 | - |
| 45 y M | 300 | 330 | - |
| 55 y | 300 | 330 | - |
| 65 y | 300 | 330 | 400/300 |
| 75 y | 300 | 330 | 400/300 |

***PRI; FCN 2018 >65y: 1st value= IOM 2015/ 2nd value= D-A-CH 2017; - = no defined NRV

NRVs for pregnant and breastfeeding women:

| µg per day | D-A-CH* | EFSA | FCN |
|---|---|---|---|
| Date | 2018 | 2014 | 2018 |
| Pregnancy: 1st trimester | 550 | 600** | + 400 µg/day synthetic folic acid |
| Pregnancy: 2nd trimester | 550 | 600** | - |
| Pregnancy: 3rd trimester | 550 | 600** | - |
| Breastfeeding: 1st semester | 450 | 500* | - |
| Breastfeeding: 2nd semester | 450 | 500* | - |

***PRI; **AI; - = no defined NRV

**Description of the methodology to define the NRVs (folate)**

| Society | Methodology |
|---|---|
| FCN | **Elderly subjects (2018)**: The values are from IOM 2015 and D-A-CH 2017. |

### 10.8.4 Niacin

NRVs for children and adolescents:

| | D-A-CH* | EFSA[1] | FCN |
|---|---|---|---|
| Date | 2016 | 2016 | - |
| Unit | mg per day | mg per day | - |
| 9 mo F | 5 | 4,0 | - |
| 9 mo M | 5 | 4,5 | |
| 2 y F | 8 | 6,2* | - |
| 2 y M | 8 | 6,7* | |
| 8 y F | 10 | 9,6* | - |
| 8 y M | 11 | 10,4* | |
| 11 y F | 11 | 12,5** | - |
| 11 y M | 13 | 13,3** | - |
| 16 y F | 13 | 14,7** | - |
| 16 y M | 17 | 18,6** | - |

*All values are PRI; ** PRI at PAL = 1.4; *** PRI at PAL = 1.6; - = no defined NRV

[1] Niacin can be synthesised in the human body from the indispensable amino acid tryptophan. Approximately 60 mg of tryptophan yields 1 mg of niacin defined as 1 mg niacin equivalent (NE). PRIs for niacin expressed in mg NE/day

NRVs for adults and elderly:

| | D-A-CH* | EFSA[1] | FCN |
|---|---|---|---|
| Date | 2016 | 2016 | 2018 |
| Unit | mg per day | mg per day | Mg-eq per day |
| 20 y F | 13 | 12,3** | - |
| 20 y M | 16 | 15,3** | - |
| 45 y F | 12 | 11,7** | - |
| 45 y M | 15 | 14,6** | - |
| 55 y F | 11 | 11,6** | - |
| 55 y M | 15 | 14,4** | - |
| 65 y F | 11 | 10,6** | 14/11 |
| 65 y M | 14 | 13,2** | 16/14 |
| 75 y F | 11 | 10,5** | 14/11 |
| 75 y M | 14 | 12,9** | 16/14 |

*All values are PRI; ** PRI at PAL = 1.4; FCN 2018 >65y: 1st value= IOM 2015/ 2nd value= D-A-CH 2017; - = no defined NRV

[1] Niacin can be synthesised in the human body from the indispensable amino acid tryptophan. Approximately 60 mg of tryptophan yields 1 mg of niacin defined as 1 mg niacin equivalent (NE). PRIs for niacin expressed in mg NE/day

NRVs for pregnant and breastfeeding women:

| | D-A-CH* | EFSA[1] | FCN |
|---|---|---|---|
| Date | 2016 | 2016 | - |
| Unit | mg per day | mg per day | - |
| Pregnancy: 1st trimester | - | 12,8 | - |
| Pregnancy: 2nd trimester | 14 | 14 | - |
| Pregnancy: 3rd trimester | 16 | 15,6 | - |
| Breastfeeding: 1st semester | 16 | 15,6 | - |
| Breastfeeding: 2nd semester | 16 | 15,6 | - |

*All values are PRI; - = no defined NRV

[1] Niacin can be synthesised in the human body from the indispensable amino acid tryptophan. Approximately 60 mg of tryptophan yields 1 mg of niacin defined as 1 mg niacin equivalent (NE). PRIs for niacin expressed in mg NE/day

### Description of the methodology to define the NRVs (Niacin)

| **Society** | **Methodology** |
|---|---|
| D-A-CH | The reference values for niacin intake are derived based on the assumption of an AR needed to avoid symptoms of pellagra and to maintain the body's vitamin store (measured by diminished urinary excretion of the niacin metabolites). The PRI is defines assuming a CV of 10% and taking into account the guiding values for energy intake. |
| EFSA | The Panel adopted the AR for adults defined by the Scientific Committee for Food (1993), based on data on urinary excretion of niacin metabolites as an endpoint. The PRI (in mg NE/MJ) derived from the AR assuming a coefficient of variation of 10 %. For all categories of age and life stage groups, the Panel considers that there is no evidence that the relationship between niacin requirement and energy requirement differs from that of adults. |
| FCN | **Elderly subjects (2018)**: The values are from IOM 2015 and D-A-CH 2017. |

AR: Average Requirement; PRI: Population Reference Intake; CV: coefficient of variation

### 10.8.5 Pantothenic acid

NRVs for children and adolescents:

| mg per day | D-A-CH** | EFSA** | FCN |
|---|---|---|---|
| Date | 2015 | 2014 | - |
| 9 mo | 3 | 3 | - |
| 2 y | 4 | 4 | - |
| 8 y | 5 | 4 | - |
| 11 y | 5 | 5 | - |
| 16 y | 6 | 5 | - |

**All values are AI; - = no defined NRV

NRVs for adults and elderly:

| mg per day | D-A-CH** | EFSA** | FCN |
|---|---|---|---|
| Date | 2015 | 2014 | - |
| 20 y | 6 | 5 | - |
| 45 y | 6 | 5 | - |
| 55 y | 6 | 5 | - |
| 65 y | 6 | 5 | - |
| 75 y | 6 | 5 | - |

**All values are AI; - = no defined NRV

NRVs for pregnant and breastfeeding women:

| mg per day | D-A-CH** | EFSA** | FCN |
|---|---|---|---|
| Date | 2015 | 2014 | - |
| Pregnancy: 1st trimester | 6 | 5 | - |
| Pregnancy: 2nd trimester | 6 | 5 | - |
| Pregnancy: 3rd trimester | 6 | 5 | - |
| Breastfeeding: 1st semester | 6 | 7 | - |
| Breastfeeding: 2nd semester | 6 | 7 | - |

**All values are AI; - = no defined NRV

**Description of the methodology to define the NRVs (B5)**

| Society | Methodology |
|---|---|
| D-A-CH | The values are based on an American study that compared vitamin B5 intakes and its markers in blood and red blood cells in adolescents. The intake considered optimal for male adolescents was selected and considered as reference values **for adolescents, adults, pregnant and lactating women**.<br><br>**For children**, the values are extrapolated from this reference value. |
| EFSA | The setting of AIs is based on observed pantothenic acid intakes with a mixed diet and the apparent absence of signs of deficiency in the EU, suggesting that current intake levels are adequate.<br>The AI **for adults** also applies to **pregnant women**. For **lactating women**, the AI is proposed, to compensate the losses through breast milk. **For infants** over six months, the AI is proposed by extrapolating from the pantothenic acid intake of exclusively breast-fed infants aged zero to six months, using allometric scaling and reference body weight for each age group, in order to account for the role of pantothenic acid in energy metabolism. The AI **for children** and adolescents is based on observed intakes in the EU. |

### 10.8.6 Riboflavin

NRVs for children and adolescents:

| mg per day | D-A-CH* | EFSA | FCN |
|---|---|---|---|
| Date | 2016 | 2017 | - |
| 9 mo | 0,4 | 0,4** | - |
| 2 y | 0,7 | 0,6* | - |
| 8 y F | 0,9 | 1,0* | - |
| 8 y M | 1,0 | 1,0* | - |
| 11 y F | 1,0 | 1,4* | - |
| 11 y M | 1,1 | 1,4* | - |
| 16 y F | 1,2 | 1,6* | - |
| 16 y M | 1,6 | 1,6* | - |

*****PRI; **AI; - = no defined NRV

NRVs for adults and elderly:

| mg per day | D-A-CH* | EFSA* | FCN |
|---|---|---|---|
| Date | 2016 | 2017 | 2018 |
| 20 y F | 1,1 | 1,6 | - |
| 20 y M | 1,4 | 1,6 | - |
| 45 y F | 1,1 | 1,6 | - |
| 45 y M | 1,4 | 1,6 | - |
| 55 y F | 1,0 | 1,6 | - |
| 55 y M | 1,3 | 1,6 | - |
| 65 y F | 1,0 | 1,6 | 1,1/1,0 |
| 65 y M | 1,3 | 1,6 | 1,3/1,3 |
| 75 y F | 1,0 | 1,6 | 1,1/1,0 |
| 75 y M | 1,3 | 1,6 | 1,3/1,3 |

*All values are PRI; FCN 2018 >65y: 1st value= IOM 2015/ 2nd value= D-A-CH 2017; - = no defined NRV

NRVs for pregnant and breastfeeding women:

| mg per day | D-A-CH* | EFSA* | FCN |
|---|---|---|---|
| Date | 2016 | 2017 | - |
| Pregnancy: 1st trimester | - | 1,9 | - |
| Pregnancy: 2nd trimester | 1,3 | 1,9 | - |
| Pregnancy: 3rd trimester | 1,4 | 1,9 | - |
| Breastfeeding: 1st semester | 1,4 | 2,0 | - |
| Breastfeeding: 2nd semester | 1,4 | 2,0 | - |

*****PRI; - = no defined NRV

**Description of the methodology to define the NRVs (Riboflavin)**

| Society | Methodology |
|---|---|
| D-A-CH | Studies primarily investigating the glutathione reductase activity in erythrocytes and also the excretion of riboflavin in urine are used as a basis. An activity coefficient of <1.2 and a 24-hour urinary excretion level of riboflavin of ≥120 µg were taken as a basis for target levels. A riboflavin intake of 0.5 mg/1000 kcal is specified as the AR.<br>The riboflavin have important functions as part of energy metabolism. Consequently, the reference values are derived in consideration of the reference values for energy intake.<br>**Infants, children and adolescents:** based on the mean requirement for adults and assuming a CV of 10%, a recommended intake is derived by taking into account the guiding values for energy intake.<br>**Pregnancy**: based on the AR for adults, a higher recommended intake is derived to the higher guiding value for energy intake (+250 kcal/d in the 2nd trimester and +500 kcal/d in the 3rd trimester) and assuming a CV of 10%.<br>**Lactation**: based on the AR for adults, a higher recommended intake is derived to the higher guiding value for energy intake (guiding value for energy intake +500 kcal/d) and assuming a CV of 10%. |
| EFSA | The inflection point in the urinary riboflavin excretion curve in relation to riboflavin intake reflects body saturation and can be used as a biomarker of adequate riboflavin status. Erythrocyte glutathione reductase activation coefficient is a useful biomarker, but has limitations.<br>There is no indication of different requirement according to sex or between younger and older adults.<br>**Children:** based on the mean requirement for adults, applying allometric scaling and growth factors, considering differences in reference body weight and assuming a coefficient of variation of 10%.<br>**Pregnancy**: It was calculated from the AR of adult (1.34 mg/day), applying allometric scaling, using the reference body weight for non-pregnant women (58.5 kg) and the mean gestational increase in body weight (12 kg). The accretion in fetal tissues mostly occurs in the last months of pregnancy. In order to allow for the extra need related to the growth of maternal tissues (e.g. placenta), the Panel applies this additional requirement to the whole period of pregnancy. PRI derived assuming a CV of 10%.<br>**Lactation**: an additional intake is required to balance the losses through breast milk (0.291 mg/day corrected for absorption efficiency of 95%) and almost considering a CV of 10%. |
| FCN | **Elderly subjects (2018)**: The values are from IOM 2015 and D-A-CH 2017. |

CV: coefficient of variation

### 10.8.7 Thiamin

NRVs for children and adolescents:

| | D-A-CH* | EFSA | FCN |
|---|---|---|---|
| Date | 2016 | 2016 | - |
| Unit | mg per day | mg per day | - |
| 9 mo F | 0,4 | 0,26 | - |
| 9 mo M | 0,4 | 0,29 | - |
| 2 y F | 0,6 | 0,40** | - |
| 2 y M | 0,6 | 0,43*** | - |
| 8 y F | 0,8 | 0,62*** | - |
| 8 y M | 0,9 | 0,68*** | - |
| 11 y F | 0,9 | 0,81*** | - |
| 11 y M | 1,0 | 0,86*** | - |
| 16 y F | 1,1 | 0,96*** | - |
| 16 y M | 1,4 | 1,2*** | - |

*All values are PRI; ** PRI at PAL = 1.4; *** PRI at PAL = 1.6; - = no defined NRV

NRVs for adults and elderly:

| | D-A-CH* | EFSA** | FCN* |
|---|---|---|---|
| Date | 2016 | 2016 | 2018 |
| Unit | mg per day | mg per day | mg per day |
| 20 y F | 1,0 | 0,99 | - |
| 20 y M | 1,3 | 0,88 | - |
| 45 y F | 1,0 | 0,76 | - |
| 45 y M | 1,2 | 0,94 | - |
| 55 y F | 1,0 | 0,76 | - |
| 55 y M | 1,2 | 0,93 | - |
| 65 y F | 1,0 | 0,69 | 1,1/1,0 |
| 65 y M | 1,1 | 0,85 | 1,2/1,1 |
| 75 y F | 1,0 | 0,69 | 1,1/1,0 |
| 75 y M | 1,1 | 0,84 | 1,2/1,1 |

*All values are PRI; ** PRI at PAL = 1.4; FCN 2018 >65y: 1st value= IOM 2015/ 2nd value= D-A-CH 2017; - = no defined NRV

NRVs for pregnant and breastfeeding women:

| | D-A-CH* | EFSA* | FCN |
|---|---|---|---|
| Date | 2016 | 2016 | - |
| Unit | mg per day | mg per day | - |
| Pregnancy: 1st trimester | - | 1,02 | - |
| Pregnancy: 2nd trimester | 1,2 | 1,1 | - |
| Pregnancy: 3rd trimester | 1,3 | 1,2 | - |
| Breastfeeding: 1st semester | 1,3 | 1,2 | - |
| Breastfeeding: 2nd semester | 1,3 | 1,2 | - |

*All values are PRI; - = no defined NRV

### Description of the methodology to define the NRVs (Thiamin)

| Society | Methodology |
|---|---|
| D-A-CH | Studies primarily investigating the transketolase activity in erythrocytes, and also the excretion of thiamin in urine are used as a basis. A TDP effect of <15% and 24-hour urinary excretion levels of thiamin of >66 µg were taken as a basis for a target value for an adequate thiamin supply. Using thiamin balance studies, the desired level of thiamin excretion in urine and adequate transketolase activity in erythrocytes was achieved given an intake of 0.45 mg thiamin/1000 kcal. This is specified as the average requirement. For the recommend intake values, a coefficient of variation of 10% has been used due to the variation in requirement within the population. In addition, the guiding values for energy intake according to age has been taken into account. |
| EFSA | Data from depletion–repletion studies in adults on the amount of dietary thiamin intake associated with αETK < 1.15 or with the restoration of normal (baseline) ETKA, without a sharp increase in urinary thiamin excretion, has been used to estimate thiamin requirement. The coefficient of variation of 20% has been used to cover uncertainties related to distribution of thiamin requirements in the general population. The Panel endorses the population reference intake (PRI) of 0.1 mg/MJ (0.4 mg/1,000 kcal) for all adults. The Panel considers that thiamin requirement is related to energy requirement and decides to set DRVs on a per MJ basis. The same AR and PRI as for adults, expressed in mg/MJ, are proposed for infants aged 7–11 months, children aged 1 to < 18 years, and during pregnancy and lactation. |
| FCN | **Elderly subjects (2018)**: The values are from IOM 2015 and D-A-CH 2017 |

TDP: thiamin diphosphate ; αETK: erythrocyte transketolase activity coefficient; ETKA: the erythrocyte transketolase activity

### 10.8.8 Vitamin A

NRVs for children and adolescents:

| µg per day | D-A-CH* | EFSA* | FCN |
|---|---|---|---|
| Date | 2020 | 2015 | - |
| 9 mo | 400 | 250 | - |
| 2 y | 300 | 250 | - |
| 8 y | 450 | 400 | - |
| 11 y | 600 | 600 | - |
| 16 y F | 800 | 650 | - |
| 16 y M | 950 | 750 | - |

*All values are PRI; - = no defined NRV

NRVs for adults and elderly:

| µg per day | D-A-CH* | EFSA* | FCN* |
|---|---|---|---|
| Date | 2020 | 2015 | 2018 |
| 20 y F | 700 | 650 | - |
| 20 y M | 850 | 750 | - |
| 45 y F | 700 | 650 | - |
| 45 y M | 850 | 750 | - |
| 55 y F | 700 | 650 | - |
| 55 y M | 850 | 750 | - |
| 65 y F | 700 | 650 | 700/800 |
| 65 y M | 800 | 750 | 900/1000 |
| 75 y F | 700 | 650 | 700/800 |
| 75 y M | 800 | 750 | 900/1000 |

*All values are PRI; FCN 2018 >65y: 1st value= IOM 2015/ 2nd value= D-A-CH 2017; - = no defined NRV

NRVs for pregnant and breastfeeding women:

| µg per day | D-A-CH* | EFSA* | FCN |
|---|---|---|---|
| Date | 2020 | 2015 | - |
| Pregnancy: 1st trimester | 700 | 700 | - |
| Pregnancy: 2nd trimester | 800 | 700 | - |
| Pregnancy: 3rd trimester | 800 | 700 | - |
| Breastfeeding: 1st semester | 1300 | 1300 | - |
| Breastfeeding: 2nd semester | 1300 | 1300 | - |

*All values are PRI; - = no defined NRV

**Description of the methodology to define the NRVs (Vitamin A)**

| Society | Methodology |
|---|---|
| D-A-CH | **For infants**, the panel considered that vitamin A metabolism is different from that of adults. It considered that the maturation of the gastrointestinal tract and liver are not complete, and therefore this influences vitamin A utilization. In addition, the panel considered that an increased requirement is due to the necessary replenishment of the body's own liver stores. |
| EFSA | For **infants aged 7–11 months and children**, the same target concentration of retinol in the liver and the same equation as for adults were used to calculate ARs. Specific values for reference body weight and for liver/body weight ratio were used. The Panel decided to apply the value for catabolic rate in adults and correct it on the basis of a growth factor. |
| FCN | **Elderly subjects**: The values are from IOM 2015 and D-A-CH 2017. |

AR: Average Requirement; PRI: Population Reference Intake; CV: coefficient of variation

### 10.8.9 Vitamin B6

NRVs for children and adolescents:

| mg per day | D-A-CH* | EFSA | FCN |
|---|---|---|---|
| Date | 2019 | 2016 | - |
| 9 mo | 0,3 | 0,3** | - |
| 2 y | 0,6 | 0,6* | - |
| 8 y | 1,0 | 1,0* | - |
| 11 y | 1,2 | 1,4* | - |
| 16 y F | 1,2 | 1,6* | - |
| 16 y M | 1,6 | 1,7* | - |

* PRI; **AI; - = no defined NRV

NRVs for adults and elderly:

| mg per day | D-A-CH* | EFSA* | FCN* |
|---|---|---|---|
| Date | 2019 | 2016 | 2018 |
| 20 y F | 1,4 | 1,6 | - |
| 20 y M | 1,6 | 1,7 | - |
| 45 y F | 1,4 | 1,6 | - |
| 45 y M | 1,6 | 1,7 | - |
| 55 y F | 1,4 | 1,6 | - |
| 55 y M | 1,6 | 1,7 | - |
| 65 y F | 1,4 | 1,6 | 1,5/1,2 |
| 65 y M | 1,6 | 1,7 | 1,7/1,4 |
| 75 y F | 1,4 | 1,6 | 1,5/1,2 |
| 75 y M | 1,6 | 1,7 | 1,7/1,4 |

* All values are PRI; FCN 2018 >65y: 1st value= IOM 2015/ 2nd value= D-A-CH 2017; - = no defined NRV

NRVs for pregnant and breastfeeding women:

| mg per day | D-A-CH* | EFSA* | FCN |
|---|---|---|---|
| Date | 2019 | 2016 | - |
| Pregnancy: 1st trimester | 1,5 | 1,8 | - |
| Pregnancy: 2nd trimester | 1,8 | 1,8 | - |
| Pregnancy: 3rd trimester | 1,8 | 1,8 | - |
| Breastfeeding: 1st semester | 1,6 | 1,7 | - |
| Breastfeeding: 2nd semester | 1,6 | 1,7 | - |

* All values are PRI; - = no defined NRV

**Description of the methodology to define the NRVs (Vitamin B6)**

| Society | Methodology |
|---|---|
| D-A-CH | **Women**: the AR was derived on the basis of balance studies using a PLP plasma concentration of ≥30 nmol/L as a biomarker of an adequate vitamin B6 status. AR is set at 1.2 mg/d The RI was derived considering a CV of 10%.<br>**Adolescents**: The RIs were extrapolated from the vitamin B6 requirement for women considering differences in body weight, an allometric exponent, growth factors as appropriate, and a CV.<br>**Pregnant women:** The reference values consider the requirements for the foetus. The AR was derived on the basis of the weight gain during pregnancy (16.7 g/d in the 1st, 60.6 g/d in the 2nd, and54.2 g/d in the 3rd trimester), a vitamin B6 requirement of 15 nmol/g tissue growth (3.7 mg/kg) and an average bioavailability of 75%. The recommended vitamin B6 intake for pregnant women is estimated after taking a CV of 10% (addition of 20%) into account. |
| EFSA | **Women:** ARs and PRIs can be derived from the vitamin B6 intake required to maintain a (mean) concentration of plasma PLP above 30 nmol/L. A conservative approach has been used and the Panel derives an AR for (all) women at 1.3 mg/d.<br>**Children aged 15–17 y:** the Panel derives the same ARs as for adults. PRIs is an extrapolation of ARs by an allometric scaling considered differences in reference body weight.<br>**Pregnant women:** the AR for non-pregnant women is increased to account for the uptake of vitamin B6 by the fetal and maternal tissues. The additional vitamin B6 intake (0.2 mg/day) is estimated,based on the mean gestational weight gain (12 kg) and the average vitamin B6 content of the human tissue (3.7 µg/g tissue), a pregnancy duration of 280 days and the vitamin B6 bioavailability from a mixed diet (75%). |
| FCN | **Elderly subjects (2018)**: The values are from IOM 2015 and D-A-CH 2017 |

AR: average requirement; RI: recommended intake; PRIs: Population Reference Intakes; PLP: pyridoxal-5′-phosphate; CV: coefficient of variation

### 10.8.10 Vitamin C

NRVs for children and adolescents:

| mg per day | D-A-CH | EFSA* | FCN |
|---|---|---|---|
| Date | 2015 | 2013 | - |
| 9 mo | 20** | 20 | - |
| 2 y | 20* | 20 | - |
| 8 y | 45* | 45 | - |
| 11 y | 65* | 70 | - |
| 16 y F | 90* | 90 | - |
| 16 y M | 105* | 100 | - |

* PRI; **AI; - = no defined NRV

NRVs for adults and elderly:

| mg per day | D-A-CH* | EFSA* | FCN |
|---|---|---|---|
| Date | 2015 | 2013 | 2018 |
| 20 y F | 95 | 95 | - |
| 20 y M | 110 | 110 | - |
| 45 y F | 95 | 95 | - |
| 45 y M | 110 | 110 | - |
| 55 y F | 95 | 95 | - |
| 55 y M | 110 | 110 | - |
| 65 y F | 95 | 95 | 75/95 |
| 65 y M | 110 | 110 | 90/110 |
| 75 y F | 95 | 95 | 75/95 |
| 75 y M | 110 | 110 | 90/110 |

D-A-CH : F if smoke = 135/ H if smoke =155; * All values are PRI; FCN 2018 >65y: 1st value= IOM 2015/ 2nd value= D-A-CH 2017; - = no defined NRV

NRVs for pregnant and breastfeeding women:

| mg per day | D-A-CH* | EFSA* | FCN |
|---|---|---|---|
| Date | 2015 | 2013 | - |
| Pregnancy: 1st trimester | 95 | 105 | - |
| Pregnancy: 2nd trimester | 105 | 105 | - |
| Pregnancy: 3rd trimester | 105 | 105 | - |
| Breastfeeding: 1st semester | 125 | 155 | - |
| Breastfeeding: 2nd semester | 125 | 155 | - |

* All values are PRI; - = no defined NRV

**Description of the methodology to define the NRVs (Vitamin C)**

| Society | Methodology |
| --- | --- |
| D-A-CH | The maintenance of the body pools and of plasma and cellular vitamin C concentrations are considered a criterion for establishing the requirement for vitamin C, assuming that proximate saturation of body pools and plasma concentrations is associated with fulfilling the coenzymatic and antioxidant functions of vitamin C. In line with the EFSA, the average vitamin C requirement in healthy adults is considered to be the vitamin C amount that compensates for the metabolic losses of vitamin C and ensures a fasting ascorbate plasma level of 50 µmol/l.<br><br>For **lactating women,** the recommendation is derived on the basis of the estimated value for infants (20 mg vitamin C/d). At an absorption rate of 80%, about 25 mg vitamin C/d are sufficient to compensate for the amount that is transferred with breast milk when feeding the infant. Therefore, the AR in lactating women is 25 mg/d higher than that in non-lactating women. Assuming a CV of 10% (addition of 20%), the reference value for the intake is about 30 mg/d higher than in non-lactating women. |
| EFSA | For healthy adults, the AR is determined from the quantity of vitamin C that balances metabolic vitamin C losses and allows the maintenance of an adequate body pool characterised by fasting plasma ascorbate concentrations at around 50 µmol/L. As no value for metabolic losses is available in women, the AR for women is extrapolated from the AR for men on the basis of differences in reference body weight.<br>For **lactating women**, intakes of 60 mg/d in addition to the PRI of non-lactating women are proposed to cover vitamin C losses in breast milk. |
| FCN | **Elderly subjects (2018)**: The values are from IOM 2015 and D-A-CH 2017 |

**10.8.11 Vitamin D**

NRVs for children and adolescents:

| µg per day | D-A-CH** | EFSA** | FCN |
|---|---|---|---|
| Date | 2015 | 2016 | 2012/2018 |
| 9 mo | 10 | 10 | 10 |
| 2 y | 20 | 15 | 15 |
| 8 y | 20 | 15 | 15 |
| 11 y | 20 | 15 | 15 |
| 16 y | 20 | 15 | 15 |

*PRI; ** AI; - = no defined NRV

NRVs for adults and elderly:

| µg per day | D-A-CH** | EFSA** | FCN |
|---|---|---|---|
| Date | 2015 | 2016 | 2012/2018 |
| 20 y | 20 | 15 | 15 |
| 45 y | 20 | 15 | 15 |
| 55 y | 20 | 15 | 15 |
| 65 y | 20 | 15 | 20 |
| 75 y | 20 | 15 | 20 |

*PRI; ** AI; FCN 2018 >65y: 1st value= IOM 2015/ 2nd value= D-A-CH 2017; - = no defined NRV

NRVs for pregnant and breastfeeding women:

| µg per day | D-A-CH** | EFSA** | FCN |
|---|---|---|---|
| Date | 2015 | 2016 | 2012/2018 |
| Pregnancy: 1st trimester | 20 | 15 | 15 |
| Pregnancy: 2nd trimester | 20 | 15 | 15 |
| Pregnancy: 3rd trimester | 20 | 15 | 15 |
| Breastfeeding: 1st semester | 20 | 15 | 15 |
| Breastfeeding: 2nd semester | 20 | 15 | 15 |

*PRI; ** AI; - = no defined NRV

**Description of the methodology to define the NRVs (Vitamin D)**

| Society | Methodology |
|---|---|
| D-A-CH | **All age group:** The panel considered adequate intake to achieve a 25(OH)D level of 50nmol/l, with missing endogenous synthesis. The values proposed for adolescents, adults and the elderly are all based on studies by Cashman et al. All were randomized clinical trials conducted in winter in Finland, Ireland and Denmark. The same values as for adults are proposed for pregnant and breastfeeding women. |
| EFSA | **All age group**: The panel considered adequate intake to achieve a 25(OH)D level of 50nmol/l, with minimal endogenous synthesis. The panel undertook a meta-regression analysis of the relationship between serum 25(OH)D concentration and total vitamin D intake, based on 35 studies. The meta-regression analysis resulted in two predictive equations of achieved serum 25(OH)D concentrations: one derived from an unadjusted model (including only the natural log of the total intake) and one derived from a model including the natural log of the total intake and adjusted for a number of relevant factors (baseline serum 25(OH)D concentration, latitude, study start year, type of analytical method applied to assess serum 25(OH)D, assessment of compliance) set at their mean values. |
| FCN | **All age group except elderly subjects:** The recommendations are based on those of the Institute of Medicine (IOM, 2010), the International Osteoporosis Foundation (IOF, 2010) and the US Endocrine Society (2011).<br><br>**Elderly subjects (2018)**: The recommendations are from IOM 2015 and D-A-CH 2017 |

### 10.8.12 Vitamin E as α-tocopherol

NRVs for children and adolescents:

| mg per day | D-A-CH** | EFSA** | FCN |
|---|---|---|---|
| Date | 2015 | 2015 | - |
| 9 mo | 4 | 5 | - |
| 2y F | 5 | 6 | - |
| 2 y M | 6 | 6 | - |
| 8 y F | 9 | 9 | - |
| 8 y M | 10 | 9 | - |
| 11 y F | 11 | 11 | - |
| 11 y M | 13 | 13 | - |
| 16 y F | 12 | 11 | - |
| 16 y M | 15 | 13 | - |

**AI; - = no defined NRV

NRVs for adults and elderly:

| mg per day | D-A-CH** | EFSA** | FCN |
|---|---|---|---|
| Date | 2015 | 2015 | 2018 |
| 20 y F | 12 | 11 | - |
| 20 y M | 15 | 13 | - |
| 45 y F | 12 | 11 | - |
| 45 y M | 14 | 13 | - |
| 55 y F | 12 | 11 | - |
| 55 y M | 13 | 13 | - |
| 65 y F | 11 | 11 | 15/11 |
| 65 y M | 12 | 13 | 15/12 |
| 75 y F | 11 | 11 | 15/11 |
| 75 y M | 12 | 11 | 15/12 |

**AI; FCN 2018 >65y: 1st value= IOM 2015/ 2nd value= D-A-CH 2017; - = no defined NRV

NRVs for pregnant and breastfeeding women:

| mg per day | D-A-CH** | EFSA** | FCN |
|---|---|---|---|
| Date | 2015 | 2015 | 2018 |
| Pregnancy: 1st trimester | 13 | 11 | - |
| Pregnancy: 2nd trimester | 13 | 11 | - |
| Pregnancy: 3rd trimester | 13 | 11 | - |
| Breastfeeding: 1st semester | 17 | 11 | - |
| Breastfeeding: 2nd semester | 17 | 11 | - |

**AI; - = no defined NRV

**Description of the methodology to define the NRVs (Vitamin E as α-tocopherol)**

| **Society** | **Methodology** |
|---|---|
| D-A-CH | The D-A-CH considers a basic requirement of 4mg per day of tocopherol equivalents to protect the double bonds against peroxidation. In addition, it considers that 0.4mg of tocopherol equivalents are necessary to protect 1g of linoleic acid. It therefore considers the intake of unsaturated fatty acids to determine the recommendation, adding the basic requirement |
| EFSA | EFSA conclude that ARs and PRIs for α-tocopherol cannot be derived for adults, infants and children, and proposes AIs based on observed intakes. **For children and adults,** this approach considers the range of average intakes of α-tocopherol and α-tocopherol-equivalents estimated from dietary surveys in nine EU countries.<br><br>**Children:** For infants aged 7–11 months, EFSA proposes AIs based on estimated intakes in fully breast-fed infants and upwards extrapolation by allometric scaling.<br><br>**Pregnancy and lactating women:** The AI set for pregnant or lactating women is the same as for non-pregnant non-lactating women. |
| FCN | **Elderly subjects (2018)**: The values are from IOM 2015 and D-A-CH 2017 |

### 10.8.13 Vitamin K as phylloquinone

NRVs for children and adolescents:

| µg per day | D-A-CH** | EFSA** | FCN |
|---|---|---|---|
| Date | 2015 | 2017 | - |
| 9 mo | 10 | 10 | - |
| 2 y | 15 | 12 | - |
| 8 y | 30 | 30 | - |
| 11 y | 40 | 45 | - |
| 16 y F | 60 | 65 | - |
| 16 y M | 70 | 65 | - |

**AI; - = no defined NRV

NRVs for adults and elderly:

| µg per day | D-A-CH** | EFSA** | FCN |
|---|---|---|---|
| Date | | | 2018 |
| 20 y F | 60 | 70 | - |
| 20 y M | 70 | 70 | - |
| 45 y F | 60 | 70 | - |
| 45 y M | 70 | 70 | - |
| 55 y F | 65 | 70 | - |
| 55 y M | 80 | 70 | - |
| 65 y F | 65 | 70 | 90/65 |
| 65 y M | 80 | 70 | 120/80 |
| 75 y F | 65 | 70 | 90/65 |
| 75 y M | 80 | 70 | 120/80 |

*PRI; **AI; FCN 2018 >65y: 1st value= IOM 2015/ 2nd value= D-A-CH 2017; - = no defined NRV

NRVs for pregnant and breastfeeding women:

| µg per day | D-A-CH** | EFSA** | FCN |
|---|---|---|---|
| Date | 2015 | 2017 | |
| Pregnancy: 1st trimester | 60 | 70 | - |
| Pregnancy: 2nd trimester | 60 | 70 | - |
| Pregnancy: 3rd trimester | 60 | 70 | - |
| Breastfeeding: 1st semester | 60 | 70 | - |
| Breastfeeding: 2nd semester | 60 | 70 | - |

**AI; - = no defined NRV

**Description of the methodology to define the NRVs (Vitamin K as phylloquinone )**

| Society | Methodology |
|---|---|
| D-A-CH | The D-A-CH refers to the plasma prothrombin level to set its recommendation. It considers a vitamin K intake of 1 µg per kg per day to be adequate for all age groups beyond the newborn. |
| EFSA | EFSA considers vitamin K as phylloquinone and menaquinones. EFSA concludes that none of the biomarkers of vitamin K intake or status is suitable by itself to derive DRVs for vitamin K and that available data on intake of phylloquinone or menaquinones and health outcomes cannot be used to derive DRVs for vitamin K.<br>**EFSA concludes that ARs and PRIs for vitamin K cannot be derived for adults, infants and children, and therefore sets AIs.** EFSA also concludes that available evidence on intake, absorption, function and content in the body or organs of menaquinones is insufficient, thus sets AIs for phylloquinone only.<br>After having considered several possible approaches, based on biomarkers, intake data and the factorial approach, which all are associated with considerable uncertainties, the reference value proposed by the Scientific Committee for Food in 1993. An AI of 1 lg phylloquinone/kg body weight per day is set for all age and sex population in 1993 is maintained. The same AI for phylloquinone of 1 lg/kg body weight per day is set for all age and sex population groups.<br><br>**Children: For infants and children,** EFSA decided not to use growth factors, considering that the requirement for growth would be covered by such an intake. The Panel considers the respective reference body weights for adults, infants and children to set Ais for phylloquinone expressed in lg/day. EFSA notes that the proposed AI in adults (70 ug/day) is close to the median phylloquinone intake of 76 ug/day in the German National Nutrition Survey II that used updated phylloquinone composition data.<br><br>**Pregnancy and Lactating women:** The mean gestational increase in body weight and the reference body weight of non-pregnant women were taken into account by the Panel in its calculations, but the AI set **for pregnant women is finally the same as for non-pregnant** women obtained after rounding. In view of the small excretion of vitamin K in breast milk, the AI set for lactating women is the same as the one for non-lactating women obtained after rounding |
| FCN | **Elderly subjects (2018)**: The values are from IOM 2015 and D-A-CH 2017 |

## 10.9 Appendix IX: Description of the NRVs and methodology for minerals and trace elements

### 10.9.1 Calcium

NRVs for children and adolescents:

| mg per day | D-A-CH | EFSA | FCN |
|---|---|---|---|
| Date | 2015 | 2015 | - |
| 9 mo | 330** | 280** | - |
| 2 y | 600* | 450* | - |
| 8 y | 900* | 800* | - |
| 11 y | 1100* | 1150* | - |
| 16 y | 1200* | 1150* | - |

*PRI; **AI; - = no defined NRV

NRVs for adults and elderly:

| mg per day | D-A-CH* | EFSA* | FCN |
|---|---|---|---|
| Date | 2015 | 2015 | 2018 |
| 20 y | 1000 | 1000 | - |
| 45 y | 1000 | 950 | - |
| 55 y | 1000 | 950 | - |
| 65 y | 1000 | 950 | 1200/1000 |
| 75 y | 1000 | 950 | 1200/1000 |

*PRI; FCN 2018 >65y: 1st value= IOM 2015/ 2nd value= D-A-CH 2017; - = no defined NRV

NRVs for pregnant and breastfeeding women:

| mg per day | D-A-CH* | EFSA* | FCN |
|---|---|---|---|
| Date | 2015 | 2015 | - |
| Pregnancy: 1st trimester | 1000-1200 (1100) | 950-1000 (975) | - |
| Pregnancy: 2nd trimester | 1000-1200 (1100) | 950-1000 (975) | - |
| Pregnancy: 3rd trimester | 1000-1200 (1100) | 950-1000 (975) | - |
| Breastfeeding: 1st semester | 1000-1200 (1100) | 950-1000 (975) | - |
| Breastfeeding: 2nd semester | 1000-1200 (1100) | 950-1000 (975) | - |

*All values are PRI; (#) Average between the low and high range recommended; - = no defined NRV

**Description of the methodology to define the NRVs (Calcium)**

| Society | Methodology |
|---|---|
| D-A-CH | **Infants from 4 to <12m:** derived from the calcium content of breast milk and from the calcium intake from solid foods. For this age group, the daily calcium intake increases with the introduction of solid foods and the calcium retention is higher as well. The intake of calcium from solid foods is about 140 mg per day and from breast milk is 190 mg per day.<br>**Children at 2y:** calcium retentions for their growth needs is taken into account (140mg/d). For the derivation of the reference values 20% are added. |
| EFSA | **Infants 7–11m:** AI was derived by extrapolating the average amount of calcium absorbed by exclusively breast-fed infants (120 mg/day) using isometric scaling and assuming an absorption of 60 %, and was calculated as 280 mg/day.<br>**Children aged 1-3y:** in the factorial approach, to derive the AR for calcium are used: reference weight, calcium losses, requirement for bone calcium accretion, physiological accretion (120mg/d), % of absorption (45%), dietary requirement. |
| FCN | **Elderly subjects (2018)**: The values are from IOM 2015 and D-A-CH 2017 |

AR: Average Requirement; AI : Adequate intake; m: months

### 10.9.2 Chloride

NRVs for children and adolescents:

| mg per day | D-A-CH** | EFSA | FCN |
|---|---|---|---|
| Date | 2016 | 2019 | - |
| 9 mo | 450 | 300** | - |
| 2 y | 600 | 1700 | - |
| 8 y | 1150 | 2600 | - |
| 11 y | 1700 | 3100 | - |
| 16 y | 2300 | 3100 | - |

The values proposed for EFSA are considered to be safe and adequate intakes for the general EU population; **D-A-CH proposed an adequate intake; - = no defined NRV

NRVs for adults and elderly:

| mg per day | D-A-CH** | EFSA | FCN* |
|---|---|---|---|
| Date | 2016 | 2019 | 2018 |
| 20 y | 2300 | 3100 | - |
| 45 y | 2300 | 3100 | - |
| 55 y | 2300 | 3100 | - |
| 65 y F | 2300 | 3100 | 2000/2300 |
| 65 y M | 2300 | 3100 | 1800/2300 |
| 75 y F | 2300 | 3100 | 2000/2300 |
| 75 y M | 2300 | 3100 | 1800/2300 |

*PRI; The values proposed for EFSA are considered to be safe and adequate intakes for the general EU population; **D-A-CH proposed an adequate intake; FCN 2018 >65y: 1st value= IOM 2015/ 2nd value= D-A-CH 2017; - = no defined NRV

NRVs for pregnant and breastfeeding women:

| mg per day | D-A-CH** | EFSA | FCN |
|---|---|---|---|
| Date | 2016 | 2019 | - |
| Pregnancy: 1st trimester | 2300 | 3100 | - |
| Pregnancy: 2nd trimester | 2300 | 3100 | - |
| Pregnancy: 3rd trimester | 2300 | 3100 | - |
| Breastfeeding: 1st semester | 2300 | 3100 | - |
| Breastfeeding: 2nd semester | 2300 | 3100 | - |

The values proposed for EFSA are considered to be safe and adequate intakes for the general EU population; **D-A-CH proposed an adequate intake; - = no defined NRV

**Description of the methodology to define the NRVs (Chloride)**

| Society | Methodology |
|---|---|
| D-A-CH | The reference values for chloride intake were derived based on the estimated values for sodium intake (except for infants). The estimated values for chloride intake are set in equimolar amounts corresponding to the estimated values for sodium (1 mmol sodium is equivalent to 23.0 mg sodium and 1 mmol chloride is equivalent to 35.5 mg chloride, which means that 1 mg sodium (0.04 mmol) corresponds to 1.54 mg chloride). It is not considered useful to derive gender-specific estimated values for adults and childrens. |
| EFSA | Reference values for chloride can be set at values equimolar to the reference values for sodium for all population groups (by 35.5/23 and rounded to the nearest 0.1) |
| FCN | **Elderly subjects (2018)**: The values are from IOM 2015 and D-A-CH 2017 |

### 10.9.3 Chromium

NRVs for children and adolescents:

| µg per day | D-A-CH** | EFSA | FCN |
|---|---|---|---|
| Date | 2015 | - | - |
| 9 mo | 20-40 (30) | - | - |
| 2 y | 20-60 (40) | - | - |
| 8 y | 20-100 (60) | - | - |
| 11 y | 20-100 (60) | - | - |
| 16 y | 30-100 (65) | - | - |

** All values are AI; (#) Average between the low and high range recommended; - = no defined NRV

NRVs for adults and elderly:

| µg per day | D-A-CH** | EFSA | FCN |
|---|---|---|---|
| Date | 2015 | - | - |
| 20 y | 30-100 (65) | - | - |
| 45 y | 30-100 (65) | - | - |
| 55 y | 30-100 (65) | - | - |
| 65y | 30-100 (65) | - | - |
| 75y | 30-100 (65) | - | - |

** All values are AI; (#) Average between the low and high range recommended; - = no defined NRV

NRVs for pregnant and breastfeeding women:

| µg per day | D-A-CH | EFSA | FCN |
|---|---|---|---|
| Date | 2015 | - | - |
| Pregnancy: 1st trimester | - | - | - |
| Pregnancy: 2nd trimester | - | - | - |
| Pregnancy: 3rd trimester | - | - | - |
| Breastfeeding: 1st semester | - | - | - |
| Breastfeeding: 2nd semester | - | - | - |

- = no defined NRV

### 10.9.4 Copper

NRVs for children and adolescents:

| mg per day | D-A-CH** | EFSA** | FCN |
|---|---|---|---|
| Date | 2015 | 2013 | - |
| 9 mo | 0,6–0,7 (0,65) | 0,4 | - |
| 2 y | 0,5–1,0 (0,75) | 0,7 | - |
| 8 y | 1,0–1,5 (1,25) | 1,0 | - |
| 11 y F | 1,0–1,5 (1,25) | 1,1 | - |
| 11 y M | 1,0–1,5 (1,25) | 1,3 | - |
| 16 y F | 1,0–1,5 (1,25) | 1,1 | - |
| 16 y M | 1,0–1,5 (1,25) | 1,3 | - |

** AI; (#) Average between the low and high range recommended; - = no defined NRV

NRVs for adults and elderly:

| mg per day | D-A-CH** | EFSA** | FCN |
|---|---|---|---|
| Date | 2015 | 2013 | - |
| 20 y F | 1,0–1,5 (1,25) | 1,3 | - |
| 20 y M | 1,0–1,5 (1,25) | 1,6 | - |
| 45 y F | 1,0–1,5 (1,25) | 1,3 | - |
| 45 y M | 1,0–1,5 (1,25) | 1,6 | - |
| 55 y F | 1,0–1,5 (1,25) | 1,3 | - |
| 55 y M | 1,0–1,5 (1,25) | 1,6 | - |
| 65y F | 1,0–1,5 (1,25) | 1,3 | 900/1000-1500 |
| 65 y M | 1,0–1,5 (1,25) | 1,6 | 900/1000-1500 |
| 75y F | 1,0–1,5 (1,25) | 1,3 | 900/1000-1500 |
| 75 y M | 1,0–1,5 (1,25) | 1,6 | 900/1000-1500 |

** AI; (#) Average between the low and high range recommended; FCN 2018 >65y: 1st value= IOM 2015/ 2nd value= D-A-CH 2017; - = no defined NRV

NRVs for pregnant and breastfeeding women:

| mg per day | D-A-CH | EFSA** | FCN |
|---|---|---|---|
| Date | 2015 | 2013 | - |
| Pregnancy: 1st trimester | - | 1,5 | - |
| Pregnancy: 2nd trimester | - | 1,5 | - |
| Pregnancy: 3rd trimester | - | 1,5 | - |
| Breastfeeding: 1st semester | - | 1,5 | - |
| Breastfeeding: 2nd semester | - | 1,5 | - |

** AI; (#) Average between the low and high range recommended; - = no defined NRV

**Description of the methodology to define the NRVs (Copper)**

| Society | Methodology |
|---|---|
| D-A-CH | In adults, about 1.25 mg copper / day replace the losses with the stool and urine. The WHO puts the average requirement at 11 µg / kg body weight. The Scientific Committee for Food (SCF) names 1.1 mg copper / day as the Population Reference Intake. The estimated values for an adequate intake are to be set in the range of 1.0 mg to 1.5 mg copper / day according to the available test results. |
| EFSA | In the absence of appropriate biomarkers of copper status and the limitations of available balance studies, AI were defined base on mean observed intakes in several EU countries.<br><br>**Children:** For infants aged 7–11 months and children, EFSA propose AIs after considering observed intakes and taking into account, for infants aged 7–11 months, upwards extrapolation from the estimated copper intakes of breast-fed infants aged 0–6 months.<br><br>**Adults:** EFSA conclude that ARs and PRIs for copper cannot be derived for adults, infants and children, and proposes AIs. For adults, this approach considers the range of average copper intakes estimated from dietary surveys in eight EU countries and the results of some balance studies.<br><br>**Pregnancy and lactating women:** The Panel considers it appropriate to increase the AI for pregnant women to cover the amount of copper deposited in the fetus and placenta over the course of pregnancy and in anticipation of the needs for lactation. For lactating women the same increment is estimated to compensate for copper losses in breast milk. |

#### 10.9.5 Fluoride

NRVs for children and adolescents:

| mg per day | D-A-CH** | EFSA** | FCN |
|---|---|---|---|
| Date | 2015 | 2013 | - |
| 9 mo | 0,5 | 0,4 | - |
| 2 y | 0,7 | 0,6 | - |
| 8 y F | 1,1 | 1,4 | - |
| 8 y M | 1,1 | 1,5 | - |
| 11 y F | 2,0 | 2,3 | - |
| 11 y M | 2,0 | 2,2 | - |
| 16 y F | 2,9 | 2,8 | - |
| 16 y M | 3,2 | 3,2 | - |

** All values are AI; - = no defined NRV

NRVs for adults and elderly:

| mg per day | D-A-CH** | EFSA** | FCN |
|---|---|---|---|
| Date | 2015 | 2013 | 2018 |
| 20 y F | 3,1 | 2,9 | - |
| 20 y M | 3,8 | 3,4 | - |
| 45 y F | 3,1 | 2,9 | - |
| 45 y M | 3,8 | 3,4 | - |
| 55 y F | 3,1 | 2,9 | - |
| 55 y M | 3,8 | 3,4 | - |
| 65 y F | 3,1 | 2,9 | 3,0/3,1 |
| 65 y M | 3,8 | 3,4 | 4,0/3,8 |
| 75 y F | 3,1 | 2,9 | 3,0/3,1 |
| 75 y M | 3,8 | 3,4 | 4,0/3,8 |

** All values are AI; FCN 2018 >65y: 1st value= IOM 2015/ 2nd value= D-A-CH 2017; - = no defined NRV

NRVs for pregnant and breastfeeding women:

| mg per day | D-A-CH** | EFSA** | FCN |
|---|---|---|---|
| Date | 2015 | 2013 | |
| Pregnancy: 1st trimester | 3,1 | 2,9 | - |
| Pregnancy: 2nd trimester | 3,1 | 2,9 | - |
| Pregnancy: 3rd trimester | 3,1 | 2,9 | - |
| Breastfeeding: 1st semester | 3,1 | 2,9 | - |
| Breastfeeding: 2nd semester | 3,1 | 2,9 | - |

** All values are AI; - = no defined NRV

**Description of the methodology to define the NRVs (Fluoride)**

| Society | Methodology |
|---|---|
| D-A-CH | The recommendations are based on observational studies where the fluoride content in drinking water is 1mg per liter and thus offers adequate protection against tooth decay. In these areas, the fluoride intake in children is 0.05 mg per kg per day. |
| EFSA | EFSA concluded that the AI of fluoride from all sources for both children and adults can be set at 0.05 mg/kg body weight per day. It is calculated with the relevant reference body weights and rounded, where necessary. |
| FCN | **Elderly subjects (2018):** The values are from IOM 2015 and D-A-CH 2017 |

### 10.9.6 Iodine

NRVs for children and adolescents:

| **µg per day** | **D-A-CH*** | **EFSA**** | **FCN** |
|---|---|---|---|
| Date | 2015 | 2014 | 2013 |
| 9 mo | 80 | 70 | 90 |
| 2 y | 100 | 90 | 90 |
| 8 y | 140 | 90 | 120 |
| 11 y | 180 | 120 | 120 |
| 16 y | 200 | 130 | 150 |

*PRI; **AI; - = no defined NRV

NRVs for adults and elderly:

| **µg per day** | **D-A-CH*** | **EFSA**** | **FCN** |
|---|---|---|---|
| Date | 2015 | 2014 | 2013/2018 |
| 20 y | 200 | 150 | 150 |
| 45 y | 200 | 150 | 150 |
| 55 y | 180 | 150 | 150 |
| 65y | 180 | 150 | *150* |
| 75y | 180 | 150 | *150* |

*PRI; **AI; - = no defined NRV

NRVs for pregnant and breastfeeding women:

| **µg per day** | **D-A-CH*** | **EFSA**** | **FCN** |
|---|---|---|---|
| Date | 2015 | 2014 | 2013 |
| Pregnancy: 1st trimester | 230 | 200 | 250 |
| Pregnancy: 2nd trimester | 230 | 200 | 250 |
| Pregnancy: 3rd trimester | 230 | 200 | 250 |
| Breastfeeding: 1st semester | 260 | 200 | 250 |
| Breastfeeding: 2nd semester | 260 | 200 | 250 |

*PRI; **AI; - = no defined NRV

**Description of the methodology to define the NRVs (Iodine)**

| Society | Methodology |
|---|---|
| D-A-CH | **All age group:** The recommendation is based on the WHO, which considers a median urinary iode greater than or equal to 100 µg/L and a plasma concentration greater than or equal to 1 µg/L, the thresholds below which an increased risk of goitre is observed. However, due to insufficient iodine intakes in some regions and in some categories of the population in Germany and Austria and considering other parameters such as the content of iodine in the blood, the level of iodine in food and water, the D-A-CH decided to retain the value of 200 µg/d for the German and Austrian populations. |
| EFSA | The AI for iodine is based on a large epidemiological study in European school-aged children showing that goitre prevalence is lowest for a urinary iodine concentration above around 100 µg/L. From this study, a urinary iodine concentration of ≥ 100 µg/L has been accepted as the threshold indicating sufficient iodine intake of school-aged children. In the absence of similar suitable data for other age groups it is proposed that this threshold also be applied for **adults, infants and young children**<br><br>**For pregnant women**, an AI of 200 µg/day is proposed, taking into account additional needs due to increased maternal thyroid hormone production and the iodine uptake by the fetus, placenta and amniotic fluid. The proposed AI for lactating women of 200 µg/day takes into account the existence of large iodine stores in conditions of adequate iodine status before pregnancy and considers that a full compensation for the iodine secreted in breast milk is not justified for the derivation of an AI for iodine for lactating women |
| FCN | **Elderly subjects (2018):** The values are from IOM 2015 and D-A-CH 2017.<br>**Others age group (2012**): Endorses the most recents recommendations from IOM |

### 10.9.7 Iron

NRVs for children and adolescents:

| mg per day | D-A-CH* | EFSA* | FCN |
|---|---|---|---|
| Date | 2015 | 2015 | - |
| 9 mo | 8,0 | 11 | - |
| 2 y | 8,0 | 7,0 | - |
| 8 y | 10 | 11 | - |
| 11 y F | 15 | 11 | - |
| 11y M | 12 | 11 | - |
| 16 y F | 15 | 13 | - |
| 16y M | 12 | 11 | - |

*All values are PRI; - = no defined NRV

NRVs for adults and elderly:

| mg per day | D-A-CH* | EFSA* | FCN |
|---|---|---|---|
| Date | 2015 | 2015 | - |
| 20 y F | 15 | 16 | - |
| 20 y M | 10 | 11 | - |
| 45 y F | 15 | 11 | - |
| 45 y M | 10 | 11 | - |
| 55 y F | 10 | 11 | - |
| 55 y M | 10 | 11 | - |
| 65y | 10 | 11 | - |

*All values are PRI; - = no defined NRV

NRVs for pregnant and breastfeeding women:

| mg per day | D-A-CH* | EFSA* | FCN |
|---|---|---|---|
| Date | 2015 | 2015 | - |
| Pregnancy: 1st trimester | 30 | 16 | - |
| Pregnancy: 2nd trimester | 30 | 16 | - |
| Pregnancy: 3rd trimester | 30 | 16 | - |
| Breastfeeding: 1st semester | 20 | 16 | - |
| Breastfeeding: 2nd semester | 20 | 16 | - |

*All values are PRI; - = no defined NRV

**Description of the methodology to define the NRVs (Iron)**

| Society | Methodology |
|---|---|
| D-A-CH | Requirements were determined factorially, based on needs for growth, iron losses and considering biodisponiblity. During pregnancy, the D-A-CH considers that 350 mg are necessary for the foetus, 50 mg for the placenta and 450 mg for the increase in maternal blood volume. |
| EFSA | **Children:** In infants aged 7–11 months and children, requirements were calculated factorially, considering needs for growth and replacement of iron losses, and assuming 10 % dietary iron absorption for ages 7 months to 11 years and 16 % dietary iron absorption thereafter. In the absence of knowledge about the variation in requirement, PRIs for infants and children were estimated using a CV of 20 %. In girls aged 12–17 years, the PRI was set at the midpoint of the calculated dietary requirement of 97–98 % of adolescent girls and the PRI for premenopausal women.<br><br>**Adults:** The Panel concludes that ARs and PRIs for iron can be derived factorially. ARs **for men and premenopausal women** were estimated based on modelled whole-body iron losses using data from North American adults and a percentage dietary iron absorption that relates to a serum ferritin concentration of 30 µg/L. In men, obligatory losses at the 50th percentile are 0.95 mg/day and the AR was calculated taking into account 16 % absorption. The PRI was calculated as the requirement at the 97.5th percentile of whole-body iron losses and was rounded.<br><br>**Pregnancy and lactating women**, for whom it was assumed that iron stores and enhanced absorption provide sufficient additional iron, DRVs are the same as for premenopausal women. |

### 10.9.8 Magnesium

NRVs for children and adolescents:

| mg per day | D-A-CH* | EFSA** | FCN |
|---|---|---|---|
| Date | 2015 | 2015 | - |
| 9 mo | 60 | 80 | - |
| 2 y | 80 | 170 | - |
| 8 y | 170 | 230 | - |
| 11 y F | 250 | 250 | - |
| 11 y M | 230 | 300 | - |
| 16 y F | 350 | 250 | - |
| 16 y M | 400 | 300 | - |

*PRI; ** AI; - = no defined NRV

NRVs for adults and elderly:

| mg per day | D-A-CH* | EFSA** | FCN |
|---|---|---|---|
| Date | 2015 | 2015 | 2018 |
| 20 y F | 310 | 300 | - |
| 20 y M | 400 | 350 | - |
| 45 y F | 300 | 300 | - |
| 45 y M | 350 | 350 | - |
| 55 y F | 300 | 300 | - |
| 55 y M | 350 | 350 | - |
| 65y F | 300 | 300 | 320/300 |
| 65 y M | 350 | 350 | 420/350 |
| 75 y F | 300 | 300 | 320/300 |
| 75 y M | 350 | 350 | 420/350 |

*PRI; ** AI; - = no defined NRV; FCN 2018: 1st value= IOM 2015/ 2nd value= D-A-CH 2017

NRVs for pregnant and breastfeeding women:

| mg per day | D-A-CH* | EFSA** | FCN |
|---|---|---|---|
| Date | 2015 | 2015 | |
| Pregnancy: 1st trimester | 310-350 (330) | 300 | - |
| Pregnancy: 2nd trimester | 310-350 (330) | 300 | - |
| Pregnancy: 3rd trimester | 310-350 (330) | 300 | - |
| Breastfeeding: 1st semester | 390 | 300 | - |
| Breastfeeding: 2nd semester | 390 | 300 | - |

*PRI; ** AI; (#) Average between the low and high range recommended; - = no defined NRV

**Description of the methodology to define the NRVs (Magnesium)**

| Society | Methodology |
|---|---|
| D-A-CH | The recommendations are based on observed intakes in populations with similar magnesium intake (USA, Norway, UK). For breastfeeding women, the D-A-CH considers that an additional intake of 90mg is necessary to compensate for losses related to breastfeeding. |
| EFSA | The recommendations are based on observed intakes in healthy populations in the European Union (Finland, France, Germany, Ireland, Italy, Latvia, the Netherlands, Sweden and the UK). For lactating women, the Panel considers that there is no evidence for an increased need for magnesium. |
| FCN | The values are from IOM 2015 and D-A-CH 2017. |

### 10.9.9 Manganese

NRVs for children and adolescents:

| mg per day | D-A-CH* | EFSA** | FCN |
|---|---|---|---|
| Date | 2015 | 2103 | - |
| 9 mo | 0,6–1,0 (0,8) | 0,02–0,5 (0,26) | - |
| 2 y | 1,0–1,5 (1,25) | 0,5 | - |
| 8 y | 2,0–3,0 (2,5) | 1,5 | - |
| 11 y | 2,0–5,0 (3,5) | 2 | - |
| 16 y | 2,0–5,0 (3,5) | 3 | - |

*PRI; ** AI; (#) Average between the low and high range recommended; - = no defined NRV

NRVs for adults and elderly:

| mg per day | D-A-CH* | EFSA** | FCN |
|---|---|---|---|
| Date | 2015 | 2013 | - |
| 20 y | 2,0–5,0 (3,5) | 3 | - |
| 45 y | 2,0–5,0 (3,5) | 3 | - |
| 55 y | 2,0–5,0 (3,5) | 3 | - |
| 65y | 2,0–5,0 (3,5) | 3 | - |

*PRI; ** AI; (#) Average between the low and high range recommended; - = no defined NRV

NRVs for pregnant and breastfeeding women:

| mg per day | D-A-CH | EFSA** | FCN |
|---|---|---|---|
| Date | 2015 | 2013 | 2018 |
| Pregnancy: 1st trimester | - | 3 | - |
| Pregnancy: 2nd trimester | - | 3 | - |
| Pregnancy: 3rd trimester | - | 3 | - |
| Breastfeeding: 1st semester | - | 3 | - |
| Breastfeeding: 2nd semester | - | 3 | - |

** AI; - = no defined NRV

**Description of the methodology to define the NRVs (Manganese)**

| **Society** | **Methodology** |
|---|---|
| D-A-CH | *The expert group has established nutritional references based on the median intake observed in a population considered healthy.*<br>**Adults:** An intake of 2 mg to 5 mg manganese / day in adults neither in deficiency an overdose occurs. From balance studies, however, a requirement of 0.74 mg / day was derived, which ensures all physiological functions, but no body reserves. The research available on the need for manganese are still incomplete, so that only estimated values for an appropriate intake are given here. In Germany, the median daily manganese intake for women is 3.8 mg and for men 4.3 mg<br>**6-12 month:** An average of manganese intake of 71ug/kg or 80ug/kg body softness per day was determined. On this basis, the ranges given in the table from 4 to 12 months of age were estimated. The table values for children and adolescents were derived by extrapolation on the basis of bodyweight and assumed food intake |
| EFSA | The EFSA concludes that there is insufficient evidence to derive an Average Requirement (AR) and a Population Reference Intake (PRI) for manganese. Data on manganese intake or status and health outcomes were not available for the setting of DRVs for manganese.<br>**Children:** An AI is also proposed for infants and children based on extrapolation from the adult AI using isometric scaling and body weights of the respective age groups.<br>**Adults:** They propose an Adequate Intake (AI) for adults based on observed mean manganese intakes from mixed diets in the EU. It was considered unnecessary to give sex-specific values.<br>**Pregnancy and lactating women:** They propose that the adult AI also applies to pregnant and lactating women. |

### 10.9.10 Molybdenum

NRVs for children and adolescents:

| µg per day | D-A-CH** | EFSA** | FCN |
|---|---|---|---|
| Date | 2015 | 2013 | - |
| 9 mo | 20–40 (30) | 10 | - |
| 2 y | 25–50 (37,5) | 15 | - |
| 8 y | 40–80 (60) | 30 | - |
| 11 y | 50–100 (75) | 45 | - |
| 16 y | 50–100 (75) | 65 | - |

** AI; (#) Average between the low and high range recommended; - = no defined NRV

NRVs for adults and elderly:

| µg per day | D-A-CH** | EFSA** | FCN |
|---|---|---|---|
| Date | 2015 | 2013 | - |
| 20 y | 50–100 (75) | 65 | - |
| 45 y | 50–100 (75) | 65 | - |
| 55 y | 50–100 (75) | 65 | - |
| 65y | 50–100 (75) | 65 | - |

** AI; (#) Average between the low and high range recommended; - = no defined NRV

NRVs for pregnant and breastfeeding women:

| µg per day | D-A-CH | EFSA** | FCN |
|---|---|---|---|
| Date | 2015 | 2013 | |
| Pregnancy: 1st trimester | - | 65 | - |
| Pregnancy: 2nd trimester | - | 65 | - |
| Pregnancy: 3rd trimester | - | 65 | - |
| Breastfeeding: 1st semester | - | 65 | - |
| Breastfeeding: 2nd semester | - | 65 | - |

** AI; - = no defined NRV

**Description of the methodology to define the NRVs (Molybdenum)**

| Society | Methodology |
|---|---|
| D-A-CH | An AI is set at 50-100 µg/day, based on molybdenum intakes with a mixed diet. For infants and children, AI is set by extrapolating from the AI for adults and taking into account age-specific reference values for energy. |
| EFSA | EFSA concluded that there is insufficient evidence to derive an Average Requirement (AR) and a Population Reference Intake (PRI) for molybdenum. Data on the relationship between molybdenum intakes and health outcomes were unavailable for the setting of DRVs for molybdenum.<br><br>**Adults / pregnancy / lactating women:** EFSA propose an Adequate Intake (AI) for adults based on mean molybdenum intakes at the lower end of the range of observed intakes with mixed diets in the EU. It was considered unnecessary to give sex-specific values. The Panel suggests that the adult AI can be applied to pregnant and lactating women. An AI is also proposed for infants and children based on extrapolation from the adult AI using isometric scaling and the body weights of the respective age groups<br><br>**Children:** No data are available on which to base an average molybdenum requirement for infants and children. The Panel decided that an AR cannot be established and proposes an AI extrapolated from the adult AI using isometric scaling and the reference body weights of the respective age groups, with rounding up to the nearest 5 µg. For infants aged 7 to 11 months, scaling down from an adult AI and rounding up to the nearest 5 µg results in an AI of 10 µg/day. |

### 10.9.11 Phosphorus

NRVs for children and adolescents:

| mg per day | D-A-CH* | EFSA** | FCN |
|---|---|---|---|
| Date | 2015 | 2015 | - |
| 9 mo | 300 | 160 | - |
| 2 y | 500 | 250 | - |
| 8 y | 800 | 440 | - |
| 11 y | 1250 | 640 | - |
| 16 y | 1250 | 640 | - |

*PRI; ** AI; - = no defined NRV

NRVs for adults and elderly:

| mg per day | D-A-CH* | EFSA** | FCN |
|---|---|---|---|
| Date | 2015 | 2015 | 2018 |
| 20 y | 700 | 550 | - |
| 45 y | 700 | 550 | - |
| 55 y | 700 | 550 | - |
| 65y | 700 | 550 | 700/700 |
| 75 y | 700 | 550 | 700/700 |

*PRI; ** AI; FCN 2018 >65y: 1st value= IOM 2015/ 2nd value= D-A-CH 2017; - = no defined NRV

NRVs for pregnant and breastfeeding women:

| mg per day | D-A-CH* | EFSA** | FCN |
|---|---|---|---|
| Date | 2015 | 2015 | |
| Pregnancy: 1st trimester | 800-1250 (1025) | 550 | - |
| Pregnancy: 2nd trimester | 800-1250 (1025) | 550 | - |
| Pregnancy: 3rd trimester | 800-1250 (1025) | 550 | - |
| Breastfeeding: 1st semester | 1250-900 (1075) | 550 | - |
| Breastfeeding: 2nd semester | 1250-900 (1075) | 550 | - |

*PRI; ** AI; (#) Average between the low and high range recommended; - = no defined NRV

**Description of the methodology to define the NRVs (Phosphorus)**

| Society | Methodology |
|---|---|
| D-A-CH | The average requirement for adults can be estimated at 580 mg / day. Using a coefficient of variation of 10% and an additional 20%, the recommended intake is estimated at 700 mg / day. In children and adolescents, additional needs for growth are considered, as well as in pregnant and breastfeeding women.<br><br>The tolerable total intake for the physiological serum phosphate concentration of adults would be reached with an intake of 3.5 g of phosphorus / day. |
| EFSA | EFSA derived DRVs for phosphorus based on the AI (for infants aged 7–11 months) and the PRIs (for all other age groups) for calcium. The Panel used data on the calcium to phosphorus ratio in the bone of healthy men and women and adjusted these data for the proportion of phosphorus present outside bone. In addition, data on whole-body contents of calcium and phosphorus in Caucasian adults were used to calculate molar calcium to phosphorus ratios in the whole body. These data indicate that the calcium to phosphorus molar ratio in the whole body ranges from 1.4:1 to 1.9:1.<br><br>**Adults / pregnancy / lactating women:** EFSA considered that the available data are insufficient to derive ARs and PRIs for phosphorus and, therefore, the Panel proposed that AIs are set for all population groups. For this, the Panel chose the lower bound of the range (i.e. a calcium to phosphorus molar ratio in the whole body of 1.4:1, which results in the higher phosphorus intake value) for setting an AI for phosphorus, taking into account estimated phosphorus intakes in Western countries, which are considerably higher than the values calculated on the basis of this range. It was considered that the AI for adults should also apply to pregnant and lactating women. |
| FCN | **Elderly subjects (2018)**: The values are from IOM 2015 and D-A-CH 2017 |

#### 10.9.12 Potassium

NRVs for children and adolescents:

| mg per day | D-A-CH** | EFSA** | FCN |
|---|---|---|---|
| Date | 2016 | 2016 | - |
| 9 mo | 600 | 750 | - |
| 2 y | 1100 | 800 | - |
| 8 y | 2000 | 1800 | - |
| 11 y | 2900 | 2700 | - |
| 16 y | 4000 | 3500 | - |

** AI; - = no defined NRV

NRVs for adults and elderly:

| mg per day | D-A-CH** | EFSA** | FCN |
|---|---|---|---|
| Date | 2016 | 2016 | 2018 |
| 20 y | 4000 | 3500 | - |
| 45 y | 4000 | 3500 | - |
| 55 y | 4000 | 3500 | - |
| 65 y | 4000 | 3500 | 4700/4000 |
| 75 y | 4000 | 3500 | 4700/4000 |

** AI; FCN 2018 >65y: 1st value= IOM 2015/ 2nd value= D-A-CH 2017; - = no defined NRV

NRVs for pregnant and breastfeeding women:

| mg per day | D-A-CH** | EFSA** | FCN |
|---|---|---|---|
| Date | 2016 | 2016 | - |
| Pregnancy: 1st trimester | 4000 | 3500 | - |
| Pregnancy: 2nd trimester | 4000 | 3500 | - |
| Pregnancy: 3rd trimester | 4000 | 3500 | - |
| Breastfeeding: 1st semester | 4400 | 4000 | - |
| Breastfeeding: 2nd semester | 4400 | 4000 | - |

** AI; - = no defined NRV

**Description of the methodology to define the NRVs (Potassium)**

| Society | Methodology |
|---|---|
| D-A-CH | For adults, the estimated value was based on the 24-h urinary potassium excretion and on preventive considerations regarding hypertension and stroke (3,500–4,700 mg/d). Considering the high prevalence of hypertension.<br><br>In Germany (approximately 30%), the estimated value for potassium intake is set to 4,000 mg/d. The estimated values for children and adolescents were extrapolated from the adult estimated value considering differences in body mass. For infants aged 0 to under 4 months, the estimated value was set based on the potassium intake via breast milk. From this reference value, the estimated value for infants aged 4 to under 12 months was also derived by extrapolation. |
| EFSA | The Panel decides to set DRVs on the basis of the relationships between potassium intake and blood pressure and stroke (3,500 mg or 90 mmol/d).<br>For infants and children, the AIs are extrapolated from the AI for adults by isometric scaling and including a growth factor. An AI of 750 mg (19 mmol)/day is set for infants aged 7–11 months. For children, AIs of 800 mg (20 mmol)/day (1–3 years old) are set. |
| CFN | **Elderly subjects (2018)**: The values are from IOM 2015 and D-A-CH 2017 |

**10.9.13 Selenium**

NRVs for children and adolescents:

| µg per day | D-A-CH** | EFSA** | FCN |
|---|---|---|---|
| Date | 2015 | 2014 | - |
| 9 mo | 15 | 15 | - |
| 2 y | 15 | 15 | - |
| 8 y | 30 | 35 | - |
| 11 y | 45 | 55 | - |
| 16 y F | 60 | 70 | - |
| 16y M | 70 | 70 | - |

** All values are AI; - = no defined NRV

NRVs for adults and elderly:

| µg per day | D-A-CH** | EFSA** | FCN |
|---|---|---|---|
| Date | 2015 | 2014 | 2018 |
| 20 y F | 60 | 70 | - |
| 20 y M | 70 | 70 | - |
| 45 y F | 60 | 70 | - |
| 45 y M | 70 | 70 | - |
| 55 y F | 60 | 70 | - |
| 55 y M | 70 | 70 | - |
| 65y F | 60 | 70 | 55/60 |
| 65 y M | 70 | 70 | 55/70 |
| 75 y F | 60 | 70 | 55/60 |
| 75 y M | 70 | 70 | 55/70 |

** AI; FCN 2018 >65y: 1st value= IOM 2015/ 2nd value= D-A-CH 2017; - = no defined NRV

NRVs for pregnant and breastfeeding women:

| µg per day | D-A-CH** | EFSA** | FCN |
|---|---|---|---|
| Date | 2015 | 2014 | - |
| Pregnancy: 1st trimester | 60 | 70 | - |
| Pregnancy: 2nd trimester | 60 | 70 | - |
| Pregnancy: 3rd trimester | 60 | 70 | - |
| Breastfeeding: 1st semester | 75 | 85 | - |
| Breastfeeding: 2nd semester | 75 | 85 | - |

**All values are AI; - = no defined NRV

**Description of the methodology to define the NRVs (Selenium)**

| Society | Methodology |
|---|---|
| D-A-CH | **For adults**: the saturation of selenoprotein P (SePP) in plasma is used as a criterion for the derivation of reference values for selenium intake in adults. For persons from selenium-deficient regions (China) SePP saturation was achieved with a daily intake of 49g of selenium. When using the reference body weights, the D-A-CH reference values are based upon, the resulting estimated value for selenium intake is 70g/day for men and 60g/day for women<br><br>**For children and adolescents:** the values are extrapolated using the estimated value for adults in relation to body weight. |
| EFSA | **For adults:** the levelling of plasma selenoprotein P was used for establishing DRVs for selenium in adults. Evidence from human studies on the relationship between selenium intake and plasma SEPP1 concentration was reviewed. Given the uncertainties in available data on this relationship, they were considered insufficient to derive an Average Requirement. An Adequate Intake (AI) of 70 µg/day for adults was set.<br><br>**For children and adolescents:** the AIs for selenium were extrapolated from the AI for adults by isometric scaling and application of a growth factor. |
| FCN | **Elderly subjects (2018):** the values are from IOM 2015 and D-A-CH 2017 |

#### 10.9.14 Sodium

NRVs for children and adolescents:

| g per day | D-A-CH | EFSA | FCN |
|---|---|---|---|
| Date | 2016 | 2019 | - |
| 9 mo | 0,2 | 0,2** | - |
| 2 y | 0,4 | 1,1 | - |
| 8 y | 0,75 | 1,7 | - |
| 11 y | 1,1 | 2,0 | - |
| 16 y | 1,5 | 2,0 | - |

**AI; D-A-CH=Estimated values for AI ; EFSA = Safe and adequate intake; - = no defined NRV

NRVs for adults and elderly:

| g per day | D-A-CH | EFSA | FCN |
|---|---|---|---|
| Date | 2016 | 2019 | 2018 |
| 20 y | 1,5 | 2,0 | - |
| 45 y | 1,5 | 2,0 | - |
| 55 y | 1,5 | 2,0 | - |
| 65 y | 1,5 | 2,0 | *1,2-1,3/1,5* |
| 75 y | 1,5 | 2,0 | *1,2-1,3/1,5* |

D-A-CH=Estimated values for AI ; EFSA = Safe and adequate intake for the general EU population of adults; FCN 2018 >65y: 1st value= IOM 2015/ 2nd value= D-A-CH 2017; - = no defined NRV

NRVs for pregnant and breastfeeding women:

| g per day | D-A-CH | EFSA** | FCN |
|---|---|---|---|
| Date | 2016 | 2019 | - |
| Pregnancy: 1st trimester | 1,5 | 2,0 | - |
| Pregnancy: 2nd trimester | 1,5 | 2,0 | - |
| Pregnancy: 3rd trimester | 1,5 | 2,0 | - |
| Breastfeeding: 1st semester | 1,5 | 2,0 | - |
| Breastfeeding: 2nd semester | 1,5 | 2,0 | - |

D-A-CH=Estimated values for AI ; EFSA = Safe and adequate intake; - = no defined NRV

**Description of the methodology to define the NRVs (Sodium)**

| Society | Methodology |
|---|---|
| D-A-CH | For adults, the estimated value for sodium intake was derived on the basis of a balance study. The estimated values for children and adolescents were extrapolated from this estimated value considering differences in body mass. For infants aged 0 to under 4 months, an estimated value was set based on the sodium intake via breast milk. From this value, the estimated value for infants aged 4 to under 12 months was also derived by extrapolation. The estimated value for lactating women takes into account the fact that the sodium loss via breast milk is compensated through homoeostatic mechanisms. |
| EFSA | The Panel considered the quantitative relationships between sodium intake and the selected criteria (biomarkers, studies of Na balance, indicators of Na requirement in children, pregnancy and lactation, Na intake and health consequences) together with the related uncertainties. In view of the limited evidence available and of the associated uncertainties, a formal expert knowledge elicitation (EKE) was undertaken. EKE is a systematic, documented and reviewable process to retrieve expert judgements from a group of experts in the form of a probability distribution. The roulette method was chosen. This approach allows the experts to draw their own distribution of uncertainty on the parameter to be estimated by placing different numbers of plastic counters along the range of possible parameter values conveniently split in subintervals. The judgements were elicited following the Sheffield protocol, in which experts first make separate judgements about the distribution, then share and discuss their distributions, and finally develop a consensus distribution and document their reasoning. |
| FCN | **Elderly subjects (2018)**: The values are from IOM 2015 and D-A-CH 2017 |

### 10.9.15 Zinc

NRVs for children and adolescents:

| mg per day | D-A-CH** | EFSA* | FCN |
|---|---|---|---|
| Date | 2019 | 2014 | - |
| 9 mo | 2,5 | 2,9 | - |
| 2 y | 3 | 4,3 | - |
| 8 y | 6 | 7,4 | - |
| 11 y F | 8 | 10,7 | - |
| 11y M | 9 | 10,7 | - |
| 16 y F | 11 | 11,9 | - |
| 16y M | 14 | 14,2 | - |

*PRI; ** AI; - = no defined NRV

NRVs for adults and elderly:

| mg per day | D-A-CH** | EFSA* | FCN |
|---|---|---|---|
| Date | 2019 | 2014 | 2018 |
| 20 y F | 7-8-10 (8,5) | 7,5-9,3-11-12,7 (10,1) | - |
| 20 y M | 11-14-16 (13,5) | 9,4-11,7-14-16,3 (12,85) | - |
| 45 y F | 7-8-10 (8,5) | 7,5-9,3-11-12,7 (10,1) | - |
| 45 y M | 11-14-16 (13,5) | 9,4-11,7-14-16,3 (12,85) | - |
| 55 y F | 7-8-10 (8,5) | 7,5-9,3-11-12,7 (10,1) | - |
| 55 y M | 11-14-16 (13,5) | 9,4-11,7-14-16,3 (12,85) | - |
| 65y F | 7-8-10 (8,5) | 7,5-9,3-11-12,7 (10,1) | 8/7 |
| 65 y M | 11-14-16 (13,5) | 9,4-11,7-14-16,3 (12,85) | 11/10 |
| 75 y F | 7-8-10 (8,5) | 7,5-9,3-11-12,7 (10,1) | 8/7 |
| 75 y M | 11-14-16 (13,5) | 9,4-11,7-14-16,3 (12,85) | 11/10 |

*PRI, depending on phytate intake level of 300, 600, 900 or 1200 mg/d; ** AI, depending on phytate intake level of 330, 660 or 990 mg/d; (#) Average between the low and high range recommended; FCN 2018 >65y: 1st value= IOM 2015/ 2nd value= D-A-CH 2017; - = no defined NRV

NRVs for pregnant and breastfeeding women:

| mg per day | D-A-CH** | EFSA* | FCN |
|---|---|---|---|
| Date | 2019 | 2014 | - |
| Pregnancy: 1st trimester | 7-9-11 (9) | (10,1) +1,6 | - |
| Pregnancy: 2nd trimester | 9-11-13 (11) | (10,1) +1,6 | - |
| Pregnancy: 3rd trimester | 9-11-13 (11) | (10,1) +1,6 | - |
| Breastfeeding: 1st semester | 11-13-14 (12,5) | (10,1) +2,9 | - |
| Breastfeeding: 2nd semester | 11-13-14 (12,5) | (10,1) +2,9 | - |

*PRI, depending on phytate intake level of 300, 600, 900 or 1200 mg/d; ** AI, depending on phytate intake level of 330, 660 or 990 mg/d; (#) Average between the low and high range recommended; For pregnant and lactating women, the value of +1,6mg/d and +2,9mg/d should be added to the PRI of non-pregnant and non-lactating women; - = no defined NRV.

| Society | Methodology |
|---|---|
| D-A-CH | **For adults:** the reference values were calculated using the factorial method considering endogenous zinc losses via intestinal losses, urine, faeces, skin, sweat and semen (in men). The second step was using saturation response modelling taking into account the inhibitory effect of dietary phytate on zinc absorption. NRVs are provided for phytate intake levels of 330, 660 and 990 mg/day. A reference weight of 60 kg for women and of 70.7 kg for men were used.<br><br>**For children**: zinc losses are calculated from the zinc losses of adults adjusted to the respective reference body weight. An average absorption rate of 31% and a coefficient of variation of 10% were considered.<br><br>**For pregnancy**: there is an additional requirement during pregnancy of 8 µg zinc per gram weight gain. |
| EFSA | **For adults**: the first step was to assess needs based on faecal losses. The second step was using saturation response modelling taking into account the inhibitory effect of dietary phytate on zinc absorption. NRVs are provided for phytate intake levels of 300, 600, 900 and 1 200 mg/day. A reference weight of 58.5 kg for women and of 68.1kg for men were used.<br><br>**For children**: the requirement were estimated factorially, based on extrapolation from estimates of adult losses plus zinc needs for growth. An average absorption rate of 31% and a coefficient of variation of 10% were considered.<br><br>**For pregnant women**: an additional physiological requirement of about 0.4 mg/day may be calculated for the whole pregnancy. |
| FCN | **Elderly subjects (2018):** the values are from IOM 2015 and D-A-CH 2017 |