



VKM Report 2021: 12

Assessment and updating of a fortification model

Scientific Opinion of the Panel on Nutrition, Dietetic products, Novel food and Allergy of the Norwegian Scientific Committee for Food and Environment

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Preparation of the opinion

The Norwegian Scientific Committee for Food and Environment (Vitenskapskomiteen for mat og miljø, VKM) appointed a project group to draft the opinion. The project group consisted of one VKM member and two VKM staff. The Committee, by the Panel on nutrition, dietetic products, novel food and allergy assessed and approved the final opinion. Before the panel's final approval VKM arranged a public consultation of the opinion from 28. April to 12. May 2021.

The public consultation was announced on www.vkm.no and in mail to specific recipients. The list of specific recipients was derived from a list of stakeholders from the Norwegian Food Safety Authority), EFSA Focal Point and receivers suggested in the communication plan for VKMs opinion on *Benefit and risk assessment of iodization of household salt and salt used in bread and bakery products*. The results of the public consultation on the draft assessment and updating of a fortification model will be published on www.vkm.no in a separate document.

Authors of the opinion

The authors have contributed to the opinion in a way that fulfils the authorship principles of VKM (VKM, 2019). The principles reflect the collaborative nature of the work, and the authors have contributed as members of the project group and/or the VKM Panel on nutrition, dietetic products, novel food and allergy.

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Competence of VKM experts

Persons working for VKM, either as appointed members of the Committee or as external experts, do this by virtue of their scientific expertise, not as representatives for their employers or third-party interests. The Civil Services Act instructions on legal competence apply for all work prepared by VKM.

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Summary

VKM have update the fortification model with new estimates for intakes of retinol, β -carotene, vitamin D, tocopherol, thiamine, riboflavin, niacin vitamin B12, vitamin B6, folic acid, vitamin C, calcium, magnesium, iron, zinc, copper, selenium, iodine, phosphorus and energy in elderly (70+ years), adults (18-70 years), 13-, 9-, 4-, 2- and 1-year-olds. The new estimated intakes of these nutrients are based on data from the national food consumption surveys: Norkost 3 (2010-2011), Ungkost 3 (2015), Småbarnskost 3 (2015) and Spedkost 3 (2020), and the Skedsmo-study (2018) in the elderly. Data for vitamin K and chromium is not available in the Norwegian Food Composition Table, and the estimated intakes of vitamin K and chromium in adults, 13-, 9- and 4-year-olds are calculated from the Danish National Survey of Diet and Physical Activity (2011-2013). Intake estimates could not be calculated for molybdenum or fluoride due to lack of data.

As value for comparison of these intakes we have used tolerable upper intake levels (ULs), safe upper levels (SULs) or guidance levels (GLs) established by either EFSA, NASEM (US), VKM, EVM (UK) or Rasmussen et al. (2006) (DK). The SULs and GLs must be considered as more uncertain values than the ULs, as they are based on a far poorer data base.

All calculations have been made according to the model. In addition to the requested calculations for intakes in the 95th percentile, we have made similar estimates for the 90th and 75th percentiles.

A summary of the calculations are given in the Summary Tables 1.5-1 to 1.5-5. The column to the extreme right in these tables shows the most vulnerable and limiting age group. Table 1.5-6 shows the amount of the various nutrients that can be added to foodstuffs in Norway (per 100 kcal) without exceeding UL/GL in 95th percentile of the population at the various age groups if 25, 20, 15, 10 or 5% of the energy in the diet is derived from fortified products if all the requested age groups are included.

The model does not include fortification of foods such as salt, seasonings, water or foodstuffs that do not naturally contain energy. Furthermore, the model does not include the risk of low nutrient intake.

If light products are assessed in the same manner as their analogous non-light products, this leads to a higher content of added nutrients per unit of energy for light products.

In gluten free products that are fortified with nutrients, the concentrations are at approximately the same levels as the gluten containing alternatives. Persons (children/adults) on a gluten free diet have therefore generally the same risk of exceeding ULs/GLs as persons that consume the gluten containing products.

Sammendrag

VKM har oppdatert berikningsmodellen med nye estimater av inntak av retinol, β -karoten, vitamin D, tokoferol, tiamin, riboflavin, niacin vitamin B12, vitamin B6, folsyre, vitamin C, kalsium, magnesium, jern, sink, kobber, selen, jod, fosfor og energi hos eldre (70+ år), voksne (18-70 år), 13-, 9-, 4-, 2- og 1-åringer. De nye estimerte inntakene av disse næringsstoffene er basert på data fra de nasjonale kostholdsundersøkelsene: Norkost 3 (2010-2011), Ungkost 3 (2015), Småbarnskost 3 (2015) og Spedkost 3 (2020), og Skedsmo-studien (2018) blant eldre. Data for vitamin K og krom er ikke tilgjengelig i den norske matvaretabellen, og estimerte inntak av vitamin K og krom hos voksne, 13-, 9- og 4-åringer er beregnet fra Danmarks nasjonale undersøkelse av kost og fysiske aktivitet (2011-2013). Estimert inntak kunne ikke beregnes for molybden eller fluor på grunn av mangel på data.

Vi har sammenliknet de beregnede inntaksestimatene med tolerable øvre inntaksnivåer (UL), trygge øvre nivåer (SUL) eller veiledende nivåer (GL) etablert av enten EFSA, NASEM (US), VKM, EVM (UK) eller Rasmussen et al. (2006) (DK). SUL og GL må betraktes som mer usikre verdier enn UL, da de er basert på en langt dårligere datagrunnlag.

Alle beregninger er gjort i henhold til modellen. I tillegg til å beregne estimater for inntak i 95-persentilen, har vi beregnet tilsvarende estimater for 90- og 75-persentilen.

Beregningene er gitt i oppsummeringstabellene 1.5-1 til 1.5-5. Kolonnen ytterst til høyre i disse tabellene viser den mest sårbare og begrensende aldersgruppen. Tabell 1.5-6 viser mengden av de forskjellige næringsstoffene som kan tilsettes næringsmidler i Norge (per 100 kcal) uten å overskride UL/GL i 95-persentilen av befolkningen i de ulike aldersgruppene hvis 25, 20, 15, 10 eller 5 % av energien i kosten kommer fra berikede produkter.

Modellen kan ikke brukes for tilsetning av vitaminer og mineraler til for eksempel salt, krydder, vann eller matvarer som ikke naturlig inneholder energi. Modellen omfatter ikke risiko for lavt inntak av næringsstoffer.

Hvis lettprodukter vurderes på samme måte som de analoge ikke-lettproduktene, vil dette medføre et høyere innhold av tilsatte næringsstoffer per energienhet.

I glutenfrie produkter som er tilsatt næringsstoffer, er mengden av tilsatte næringsstoffer omtrent på samme nivå som i de glutenholdige alternativene. Personer (barn/voksne) med et glutenfritt kosthold vil derfor generelt sett ha samme risiko for å overskride UL/GL som personer som spiser glutenholdige produkter.

Abbreviations

ALA - acceptable level of addition

DANSDA - Danish National Survey of Diet and Physical Activity

EFSA - European Food Safety Authority

EI95 - the 95th percentile energy intake

EVM – Expert Group on Vitamins and minerals (UK)

GL – guidance level

KBS - kostberegningssystemet

IOM – Institute of Medicine (US)

MA – maximal allowance

NASEM - National Academies of Sciences, Engineering, and Medicine (US)

NNR – Nordic nutrition recommendations

OIM – observed individual means

PFF - proportion of energy from fortified foods

SUL – safe upper level

UL – tolerable upper intake level

VKM – Vitenskapskomiteen for mat og miljø (Norwegian Scientific Committee on Food and Environment)

Background as provided by the Norwegian Food Safety Authority

According to Norwegian food legislation, foods and drinks fortified with vitamins and minerals could until January 1. 2020 not be placed on the market without special permission from the Norwegian Food Safety Authority (NFSA). This was regulated in the supplementary Norwegian provisions on the addition of vitamins, minerals and certain «other substances» in the regulation (EF) 1925/2006.

In 2006 the Norwegian Scientific Committee for Food and Environment adapted a Danish model for assessing applications concerning food fortification with vitamins and minerals into Norwegian conditions. The NFSA also requested the Norwegian Scientific Committee for Food and Environment to assess whether the model can represent a safe assessment of fortification. The Norwegian Scientific Committee for Food and Environment updated the model in 2009¹ and in 2013², and the model was used in the NFSA as a tool in the management of applications on food fortification.

From January 1. 2020, amendments regarding the national provisions on the addition of vitamins, minerals and «other substances» entered into force and two so-called positive lists were introduced in the regulation [Forskrift om tilsetning av vitaminer, mineraler og visse andre stoffer til næringsmidler - Lovdata](#), one for the addition of vitamins and minerals, and the other concerning the addition of certain “other substances”.

This implies that food business operators may add vitamins and minerals that appear in the positive list to relevant food categories (i.e. in accordance with the requirements in Annex 1 in the regulation).

If a food business operator wants to add vitamins and minerals to foods in different quantities or to other categories of food from those stated in the positive list, the food business operator must notify the NFSA according to the relevant procedures described in the regulation. As part of the basis to assess these notifications, the NFSA requests an updated model. The model will be fully explained below.

¹

² [Revurdering av modell for beriking av mat og drikke - Vitenskapskomiteen for mat og miljø](#)

Thiamine, riboflavin, vitamin B₁₂, biotin, pantothenic acid, potassium, chloride and sodium

The addition of thiamine, riboflavin, vitamin B₁₂, biotin, pantothenic acid, potassium, chloride and sodium is excepted from the obligation of notification, provided that the addition not represents a health risk, with reference to footnote 1 in Annex 1 in [Forskrift om tilsetning av vitaminer, mineraler og visse andre stoffer til næringsmidler - Lovdata](#)

Iodine

Currently there are several food categories in Annex 1 in [Forskrift om tilsetning av vitaminer, mineraler og visse andre stoffer til næringsmidler - Lovdata](#) where iodine may be added_ i.e. «vegetarian alternatives to milk based drinks», «carbohydrate-electrolyte drinks», «carbohydrate-electrolyte drinks also containing protein/fat», «meal replacements for weight control», «junior milk», «bars etc.». The NFSA therefore requests that iodine is included in the fortification model as it can be used as a basis to assess future notifications on the addition of iodine.

Terms of reference as provided by the Norwegian Food Safety Authority

The Norwegian Scientific Committee for Food and Environment is requested to update the model for food fortification. The updating of the model should be based upon data from the following food consumption surveys: Ungkost 3 (2015), Småbarnskost 3 (2015) and Spedkost 3 (2020). The updating should include new calculations for energy and vitamins and minerals from the diet and from food supplements.

The following is requested included as part of updating the model

- assessment of the consequences of the amended classification of products such as gluten free foods, sport products, meal replacements for weight control³ etc.
 - o to which degree are these products included in the fortification model, and could the intake of vitamins and minerals from these products, in the future, be included in the model?
- if sufficient scientific data, - assessment of possible inclusion of the additional vitamins and minerals in the model: vitamin K, chromium, fluoride, iodine, molybdenum, manganese, phosphorus (with reference to relevant assessments from the Norwegian Scientific Committee for Food and Environment)
- inclusion of the recommended Tolerable Upper Intake Levels (UL-levels) from relevant assessments from the Norwegian Scientific Committee for Food and Environment (published after 2013)
- if available data – inclusion of the age group «70 years and older»
- a presentation of various versions of the model, based on assumptions that 5%,10 %, 15%, 20 % and 25 % of the energy in the diet is derived from fortified foods
- inclusion of the estimated intake of energy and nutrients from the 95th percentile from foods and drinks in each age group

Additionally, if sufficient scientific data:

- is there a risk that healthy persons (children/adults) on a gluten free diet can exceed UL/GL for any nutrients?

The Norwegian Food Safety Authority requests that the following dietary surveys are used:

- Spedkost 3 (2020)
- Småbarnskost 3 (2020)
- Ungkost 2015
- Norkost 3 2010-2011
- and if available: relevant intake data from other Nordic countries or other European countries etc.

³ The products were until July 2016 classified as foods for particular nutritional uses and are now classified as regular foods.

1 Assessment and revision of the fortification model

1.1 The fortification model formula

This is an assessment and revision of previous fortification models by (VKM, 2006; VKM, 2013a). It is based on a model suggested by Danish authorities in 2006 (Rasmussen et al., 2006), but some adaptations have been made.

The formula for the model is as follows:

$$ALA = \frac{MA}{EI95 \times PFFn}$$

ALA: acceptable level of addition

MA (maximal allowance for intake of micronutrients from fortified foods) = (UL, SUL or GL) – (intake from food for the 95th percentile level + mean intake from food supplements among food supplement users).

EI95: the 95th percentile energy intake

PFFn: proportion of energy from fortified foods.

UL: Tolerable Upper Intake Level.

SUL: Safe Upper Level. Comparable to UL. Term used by the Expert group on Vitamins and Minerals, UK (EVM, 2003).

GL: Guidance Level is a value for upper intake in cases where the UL has not been set (see below).

The fortification model is based on the intake of vitamins and minerals and energy from the diet at the 95th percentile level in various age groups. As for the additional intakes of vitamins and minerals from food supplements, the mean values among those who have used such supplements are added.

As additional information, VKM has calculated intake of vitamins and minerals and energy from the diet at the 90th and 75th percentile levels in various age groups.

The total intake from regular foods plus supplements is deducted from the UL/GL for the relevant age group, giving the maximum amount of nutrients that can be “allocated” for food

fortification. The maximum amount of a nutrient that can be “allocated” is distributed over the energy intake at the 95th percentile level for the same age group. Based on these inputs, an estimate is made showing which age group is most likely to have an excessive intake of each nutrient.

VKM does not have access to any information on how much of present energy intakes that are derived from fortified foods or drinks at an individual level. VKM has calculated for the assumptions that 5, 10, 15, 20 or 25% of the energy intakes are derived from fortified foods/drinks.

Finally, the accepted level of addition of vitamins or minerals in the most sensitive age group is listed in Table 1.5-6. Most often, the most sensitive age groups are children between the ages of one and four.

This fortification model does not apply to non-caloric products such as e.g. salt or “light products”. “Light products” should be assessed in the same manner as their analogous “non-light products”.

1.2 Vitamins and minerals included in this revision of the model

In this revision of the fortification model, the Norwegian Food Safety Authorities have requested VKM to evaluate maximum limits for addition of the following nutrients: retinol, beta-carotene, vitamin D, vitamin E, niacin, vitamin B6, folic acid, vitamin C, vitamin K, calcium, magnesium, iron, zinc, copper, selenium, iodine, phosphorus, chromium, molybdenum, manganese and fluoride. Vitamin K, iodine, phosphorus, chromium, molybdenum, manganese and fluoride were not included in previous versions of this fortification model from VKM.

As thiamine, riboflavin, vitamin B12, biotin, pantothenic acid, potassium, chloride and sodium may be added to several food groups without specified maximum limits, the Norwegian Food Safety Authorities have omitted these substances from the terms of reference. However, as thiamine, riboflavin and vitamin B12 are quite commonly added to foods, VKM has decided to include thiamine, riboflavin and vitamin B12 in the model. VKM have been requested to conduct a benefit and risk assessment of potassium in salt replacers, and will include potassium in the model after finishing the thorough work on this mandate.

For vitamin K, chromium, molybdenum and fluoride no intake estimations could be done from national dietary surveys due to lack of concentration data in food and drinks in the Norwegian Food Composition Table. VKM have investigated the possibility of using data from exposure calculations from EFSA or Danish DANSDA (the Danish National Survey of Diet and Physical Activity), and for vitamin K and chromium we have included data from DANSDA 2011-2013 for age groups at or above 4 years. It should be noted that data on vitamin K and chromium is not available for 1- and 2-year olds.

In 2018, VKM concluded that any dose of manganese as an ingredient in food supplements may be associated with increased risk of negative health effects (VKM, 2018b). This conclusion also applies for manganese as fortification ingredient.

1.3 UL/GL values

Health risks associated with high intakes of vitamins and minerals are described in assessments of Tolerable Upper Intake Levels (ULs) for Foods by the European Food Safety Authority (EFSA), Institute of Medicine/National Academies of Sciences, Engineering, and Medicine (NASEM) (US), Nordic Nutrition Recommendations (NNR) and in previous VKM opinions, and will not be further described in this report.

References to the specific ULs/SULs/GLs used for this revised version of the fortification model are given in Appendix I *Tolerable Upper Intake Levels (ULs), Safe Upper Levels (SUL) and Guidance Levels (GLs) used for this fortification model*. It should be noted that GLs are based on weaker data than ULs or SULs, and are therefore subject to more uncertainty.

The Scientific Committee on Food (SCF) and EFSA has set ULs for the vitamins A, D, E, niacin (nicotinamide and nicotinic acid), vitamin B₆ and folic acid and for the minerals calcium (only for adults), magnesium (only for adults), zinc, copper, iodine and selenium and. [Overview table of published ULs from SCF/EFSA is given here.](#)

In a series of opinions from VKM on maximum limits for dietary supplements, VKM has also made separate assessments of several ULs based on previous reports not only from SCF/EFSA, but also from IOM/NASEM, NNR or EVM. VKM concluded different from the ULs from SCF/EFSA for vitamin D and children (VKM, 2014), and for zinc (VKM, 2017h). In this fortification model we have used the ULs suggested by VKM for vitamin C, beta-carotene, vitamin D (children and adolescents), calcium (children and adolescents), magnesium (children and adolescents), phosphorus, iron, zinc, chromium and manganese (VKM, 2014, 2015a, 2016a, 2016b, 2017b, 2017d, 2017h, 2018a, 2018b).

For thiamine we have used temporary GLs suggested by Rasmussen et al., (2006), and for riboflavin and vitamin B12 we have used GLs suggested by Rasmussen et al. (2006), and an Expert Group on Vitamins and Minerals (EVM, 2003).

For vitamin K we have used GLs for phylloquinone suggested by (EVM, 2003; VKM, 2018c).

Some of the substances do not have a suggested UL for all age groups. The VKM has extrapolated values for the various age groups from values for adults (UL or GL) on the basis of body weight or body surface area (body weight ratio^{0.75}) (Przyrembel, 2018).

The UL for vitamin A includes retinol and retinyl esters in µg retinol equivalents per day. The UL for adults for vitamin A does not apply for postmenopausal women.

The ULs for beta-carotene, folic acid and magnesium are only applicable for the amount of nutrients added as fortifying agents or in food supplements, and not for those that are naturally present in foods/drinks.

1.4 Intake calculations

The Panel has made use of consumption data from the nationwide Norwegian dietary surveys conducted on various age groups: Adults (Norkost 3, 2010-2011), children and adolescents (Ungkost 3, 2015-2016), 2-year-olds (Småbarnskost, 2019) and infants 12 months (Spedkost 3, 2020). Norkost 3 covers only adults up to 70 years. No national dietary survey provides data for persons above 70 years. For adults above 70 years, we have used data from the Skedsmo study (Ottestad et al., 2018). For vitamin K and chromium, we have used data from the Danish National Survey of Diet and Physical Activity (DANSDA, 2011-2013) for 4-, 9- and 13-year olds and adults.

1-year-old children: the exposure in 1-year-olds was estimated from Spedkost 3, conducted in 2019 (Paulsen et al., 2020). Spedkost 3 was carried out by the University of Oslo and the Norwegian Institute of Public Health. The food consumption survey was based on a semi-quantitative food frequency questionnaire (FFQ). The caretaker was asked to have the last two weeks in mind when answering the questionnaire. In addition to predefined household units, food amounts were also estimated from photographs. A total of 1957 1-year-olds participated. The participation rate was 65%. Only children that did not receive breastmilk were included in this assessment (n=1024).

2-year-old children: The intake in 2-year-olds was estimated from Småbarnskost 3, conducted in 2019 (Astrup et al., 2020). Småbarnskost 3 was carried out by the University of Oslo and the Norwegian Institute of Public Health. This food consumption survey was based on a semi-quantitative food frequency questionnaire (FFQ). The caretaker was asked to have the last two weeks in mind when answering the questionnaire. In addition to predefined household units, food amounts were also estimated from photographs. A total of 1413 2-year-olds participated. The participation rate was 47%.

4-, 9- and 13-year-old children/adolescents: The intake in 4-, 9- and 13-year-old children was estimated from the national food consumption survey Ungkost 3 (Hansen et al., 2016; Hansen et al., 2015). The Ungkost 3 study was carried out by the University of Oslo, the Norwegian Food Safety Authority, the Norwegian Directorate of Health and the Norwegian Institute of Public Health in 2015 for 4th and 8th graders (8-9-year-olds and 12-13-year-olds), and in 2016 for 4-year-old children. The dietary assessment tool was a 4 days validated web-based food diary. A total of 399 4-year-old, 636 9-year-old and 687 13-year-old children participated. The participation rates were 20, 55 and 53%, respectively.

Adults 18-70 years: Norkost 3 was based on two 24-hour recalls by telephone at least one month apart. Food amounts were presented in household measures or estimated from photographs (Totland et al., 2012). The Norkost 3 study was carried out by the University of

Oslo, the Norwegian Food Safety Authority, the Norwegian Directorate of Health and the Norwegian Institute of Public Health. A total of 1787 adults aged 18-70 years participated. The participation rate was 37%.

Adults 70 years and above: A dietary study in adults living in the municipality of Skedsmo were used for the age 70 and above (Ottestad et al., 2018). The dietary assessment tool was two 24-hour recalls, the first face-to-face, and the second was an unannounced telephone interview 14 days, or more, later. Portion sizes were estimated in household measures, and with the same type of photographs as in Norkost 3. A total of 387 adults were included in the cross-sectional dietary survey. The participation rate was 15%.

DANSDA 2011-2013: Intake of food and drink was collected from a representative sample of 3946 individuals aged 4-75 years with a participation rate of 54% (Pedersen et al., 2015). The participants kept a food record for seven consecutive days in a pre-coded (semi-closed) questionnaire with answering categories for the most commonly consumed foods and dishes in the Danish diet. The participants in the results presented in this report were grouped (4 to 9-years-olds, 10 to 17-years-olds and 18 to 75-years-olds).

The intake of nutrients from fortified foods and drinks that are already available on the Norwegian market are included only to a limited extent in the calculations. The intake of vitamins A and D from fortified butter, margarine and milk for which general permission has been granted by the Norwegian Food Safety Authority are included in our exposure estimates, whereas no other fortifications are included.

The exposure estimates are based on means of survey days (OIMs) from Norkost 3, Ungkost 3, DANSDA and the Skedsmo study, whereas data for 1- and 2-year-olds are based on FFQ.

VKM has estimated the intake of each included nutrient/substance in the 95th percentile from regular foods and drinks (not including food supplements) in each age group. The 95th percentile is commonly used in risk assessments, and covers most of the consumers. It should be noted that there is a higher uncertainty associated with the 95th percentile than the mean value, and the 95th percentile is more likely an overestimation than underestimation of intake.

With use of the dietary and supplement intake calculations the amount of nutrients that can be allocated for fortification have been estimated. Tables 1.5-6 accounts for the most vulnerable groups, i.e. the age group that tolerates the lowest addition per 100 kcal before a risk of exceeding the UL/SUL/GL arises. The age groups that (at the 95th percentile level) already have an intake from diet and food supplements that exceeds the UL/GL will have a tolerance for fortification after the calculations that is below zero (a negative number). In practice this means that fortification with this nutrient cannot be done without exceeding UL/SUL/GL. The negative numbers have been changed to zero in the column on the extreme right in Table 1.5-6.

1.4.1 Food supplements

The use of food supplements in Norway is common among adults (47% among the men, and 58% among the women) (Totland et al., 2012). In children and adolescents, the intake of food supplements range from 43% among the 13-year olds to 79% among breastfed 1-year-olds (67% in non-breastfed).

In the fortification model, the mean values of nutrient intake from food supplements (users only) is added to the intakes from regular foods and drinks to estimate the total intake of nutrients.

As most of the calculations are based on mean intake among food supplement users, the estimates do not account for high intakes from food supplements. There will be uncertainty associated with the estimates for food supplements with few users.

1.4.2 Intake of vitamins and minerals from certain product categories

VKM is requested to comment on to which degree products such as gluten free products, sports products, meal replacers for weight control etc. are included in this fortification model. Additionally, if sufficient scientific data, is there a risk that healthy persons (children/adults) on a gluten free diet can exceed UL/GL for any nutrients?

These products are only to a very limited extent included in the fortification model. These products are registered in the food surveys for adults (2x24 hours recall) and children and adolescents (4 days food diary) if they have been consumed by some of the participants. However, very few people in the surveys have eaten such products.

In the dietary surveys for 1- and 2-year-olds (FFQs) fortified infant formula and baby porridges are included, whereas gluten free products are not. However, both the gluten containing and the gluten-free alternatives are subject to the same regulation for addition of vitamins and minerals. On the Norwegian market, only a few of the gluten free products are fortified.

VKM received data on the content of vitamins and minerals (27.1.2021) in some fortified gluten free products, such as, bread, crisp breads and breakfast cereals from the Norwegian Food Safety Authority, see Table 1.4.2-1. Most of these fortified products contain vitamins and minerals in similar concentrations as their gluten containing alternatives. Three of the products VKM received data on contained vitamins and minerals in high concentrations, especially of iron, niacin and folic acid. Individuals consuming these fortified products will be at risk of exceeding the ULs/GLs for iron, niacin and folic acid.

Table 1.4.2-1 Concentration of some nutrients per 100 g in gluten free fortified products available in Norway (mg/100g). Product names in Norwegian. Data obtained from webpages and provided by the Norwegian Food Safety Authority (per 27.01.2021).

	Niacin	Vitamin B6	Folic acid	Thiamine	Riboflavin	Vitamin B12	Iron	Magnesium
<i>Breakfast cereals</i>								
GoFree Cornflakes								121 mg
GoFree Chocolate Cornflakes	16 mg	1.4 mg	183 µg					106 mg
Special flakes	25 mg	2.5 mg	250 µg	1.8 mg	2.0 mg	1.3 µg	20 mg	
Flakes & Red berries	25 mg	2.5 mg	250 µg	1.8 mg	2.0 mg	1.3 µg	20 mg	
<i>Cake-/flour mix</i>								
Mix Glutenfri	4 mg	0.35 mg	40 µg	0.4 mg	0.4 mg		6.5 mg	
Glutenfri Mix med fiber	4 mg	0.35 mg	40 µg	0.4 mg	0.4 mg		8.0 mg	
Fin Mix	4 mg	0.35 mg	40 µg	0.4 mg	0.4 mg		7.5 mg	
Grov Mix	4 mg	0.35 mg	40 µg	0.4 mg	0.4 mg		8.0 mg	
<i>Crispbread</i>								
Rosmarinknekkebrød	4 mg	0.3 mg	40 µg	0.3 mg	0.3 mg		12 mg	
Surdeigsknekkebrød	4 mg	0.3 mg	40 µg	0.3 mg	0.3 mg		8.5 mg	
<i>Breads</i>								
Trio rundstykker	2.4 mg	0.21 mg	30 µg	0.20 mg	0.21 mg		4.5 mg	
Toasty fiber	1.8 mg	0.14 mg	27 µg	0.17 mg	0.21 mg		4.0 mg	
Mykt fjellbrød	2.4 mg	0.21 mg	30 µg	0.2 mg	0.21 mg		5.3 mg	
Minibaguetter	2.7 mg	0.21 mg	30 µg	0.2 mg	0.21 mg		4.5 mg	
Grova grovbrød	1.8 mg	0.14 mg	27 µg	0.12 mg	0.12 mg		4.0 mg	
Minibaguetter fiber	2.7 mg	0.21 mg	30 µg	0.2 mg	0.21 mg		4.5 mg	
<i>Pizza</i>								
Pizzabunn	2.4 mg	0.21 mg	30 µg	0.2 mg	0.21 mg		4.5 mg	

1.5 Results of the calculations

All the calculations are given in Appendix II *All calculations in the fortification model*.

All calculations have been made according to the model formula – with Norwegian dietary data and Norwegian data for the intake of food supplements, except for vitamin K1 and chromium in which Danish data was used. In addition to the requested calculations for intakes in the 95th percentile, we have made similar estimates for the 90th and 75th percentiles.

A summary of the calculations can be viewed in the Summary Tables 1.5-1 to 1.5-5 below. The column to the extreme right in these tables shows the most vulnerable and limiting age group. Table 1.5-6 shows the amount of the various nutrients that can be added to foodstuffs in Norway (per 100 kcal) without exceeding UL/GL in 95th percentile of the population at the various age groups if 25, 20, 15, 10 or 5% of the energy in the diet is derived from fortified products if all the requested age groups are included. The negative

numbers in Tables 1.5-1 to 1.5-5 have been changed to zero in Table 1.5-6. As can be seen from the results in these Summary Tables, the assumptions of 5 or 25% of the energy derived from fortified foods affect the amount that may be added per 100 kcal, but does not affect which nutrients that could be added to foods or drinks. Inclusion of the youngest age groups affects both which nutrients that may be added (especially for vitamin D and several of the minerals or trace elements) and the amount that could be added without exceeding the ULs/GLs.

Example if 25 or 5% of the energy is derived from fortified foods/drinks:

The most vulnerable group for vitamin D intake is 1-year-old children. For this group, the 95th percentile intake of vitamin D from food is 16.8 µg per day, and the intake from food supplements is 9.6 µg, giving a total possible intake of 26.4 µg vitamin D/day. The UL for this age group is 25 µg, i.e. an MA of -1.4 µg. EI95 is 2000 kcal/day for this age group.

For 1-year-olds $ALA_{25} = [-1.4 \mu\text{g} / (2000 \text{ kcal} \times 0.25)] \times 100 = -0.3 \mu\text{g}$ vitamin D per 100 kcal (changed to zero in the column on the extreme right in Table 1.5-6)

For 1-year-olds $ALA_5 = [-1.4 \mu\text{g} / (2000 \text{ kcal} \times 0.05)] \times 100 = -1.4 \mu\text{g}$ vitamin D per 100 kcal (changed to zero in the column on the extreme right in Table 1.5-6)

For men 18-70 years $ALA_{25} = [69.2 \mu\text{g} / (4200 \text{ kcal} \times 0.25)] \times 100 = 7 \mu\text{g}$ vitamin D per 100 kcal

For men 18-70 years $ALA_5 = [69.2 \mu\text{g} / (4200 \text{ kcal} \times 0.05)] \times 100 = 33 \mu\text{g}$ vitamin D per 100 kcal

Table 1.5-1 Summary Table 25 E%. Amount of nutrients that can be added per 100 kcal of foodstuff for each included age group according to the calculations in the fortification model assuming that 25% of the energy in the diet is derived from fortified foods.

E%: 25	Men, 70+	Women, 70+	Men 18-70 y	Women, 18-70 y	Adolescents, 13 y	Children, 9 y	Children, 4 y	Children, 2 y	Infants, 1 y	Most sensitive age group
Retinol, µg	101	207	80	183	42	25	-34	-268	-362	1-year-olds
β-carotene, µg	531	616	244	337	387	320	350	200	200	1- and 2-year-olds
Vitamin D, µg	9	11	7	11	4	2	2	1	-0.3	1-year-olds
Tocopherol, mg	37	44	25	37	25	22	20	16	14	1-year-olds
Thiamine, mg	6	8	4	6	4	4	4	3	2	1-year-olds
Riboflavin, mg	5	6	4	5	3	3	3	2	2	1- and 2-year-olds
Niacin, mg	118	138	80	118	60	51	38	25	24	1-year-olds
Vitamin B12, µg	266	317	188	272	170	158	144	104	105	2-year-olds
Vitamin B6, mg	3	3	2	3	2	1	0.9	0.5	0.5	1- and 2-year-olds
Folic acid, µg	116	144	79	117	64	53	49	25	22	1-year-olds
Vitamin C, mg	103	117	58	88	133	167	97	45	29	1-year-olds

E%: 25	Men, 70+	Women, 70+	Men 18-70 y	Women, 18-70 y	Adolescents, 13 y	Children, 9 y	Children, 4 y	Children, 2 y	Infants, 1 y	Most sensitive age group
Calcium, mg	126	164	28	100	69	178	179	135	178	Adult men
Magnesium, mg	11	32	16	19	23	31	23	5	4	1-year-olds
Iron, mg	4	5	2	2	1	0.3	-2	-2	-5	1-year-olds
Zinc, mg	2	3	0.7	2	0.3	0.5	-1	-2	-2	1-year-olds
Copper, mg	0.3	0.4	0.1	0.3	0.3	0.2	0	-0.1	-0.1	1- and 2-year-olds
Selenium, µg	19	28	12	23	16	9	2	-3	-4	1-year-olds
Iodine, µg	-14	19	-8	12	20	2	-2	-30	-34	1-year-olds
Phosphorus, mg	85	159	-27	88	96	161	167	213	270	Adult men
Vitamin K1, µg	NA	NA	83	112	69	62	42	NA	NA	4-year-olds
Chromium, µg	NA	NA	2145	2887	1620	1059	1059	NA	NA	4- and 9-year-olds

NA: not available

Table 1.5-2 Summary Table 20 E%. Amount of nutrients that can be added per 100 kcal of foodstuff for each included age group according to the calculations in the fortification model assuming that 20% of the energy in the diet is derived from fortified foods.

E%: 20	Men, 70+	Women, 70+	Men 18-70 y	Women, 18-70 y	Adolescents, 13 y	Children, 9 y	Children, 4 y	Children, 2 y	Infants, 1 y	Most sensitive age group
Retinol, µg	126	259	100	229	53	32	-43	-335	-452	1-year-olds
β-carotene, µg	664	770	304	421	484	400	438	250	250	1 and 2 year olds
Vitamin D, µg	11	14	8	13	5	2	2	2	-0.4	1-year-olds
Tocopherol, mg	46	54	31	47	32	28	25	20	18	1-year-olds
Thiamine, mg	8	9	5	8	5	5	5	3	3	1- and 2-year-olds
Riboflavin, mg	7	8	5	7	4	4	3	2	2	1- and 2-year-olds
Niacin, mg	148	172	100	148	75	64	48	32	30	1-year-olds
Vitamin B12, µg	333	397	235	341	213	198	180	130	131	2-year-olds
Vitamin B6, mg	4	4	2	4	3	2	1	0.7	0.6	1-year-olds
Folic acid, µg	145	180	99	147	80	66	61	31	28	1-year-olds
Vitamin C, mg	128	146	72	110	166	209	121	56	36	1-year-olds
Calcium, mg	158	205	36	125	86	222	224	169	223	Adult men
Magnesium, mg	14	40	20	24	29	38	29	6	5	1-year-olds
Iron, mg	4	6	2	3	1	0.3	-2	-2	-7	1-year-olds
Zinc, mg	2	4	0.9	3	0.3	0.6	-1	-3	-3	1-year-olds
Copper, mg	0.4	0.5	0.2	0.3	0.4	0.3	-0.1	-0.1	-0.2	1-year-olds
Selenium, µg	24	35	15	29	20	11	3	-4	-5	1-year-olds
Iodine, µg	-17	24	-10	14	25	3	-3	-37	-43	1-year-olds
Phosphorus, mg	107	199	-33	110	120	201	209	266	338	Adult men
Vitamin K1, µg	NA	NA	103	140	86	78	53	NA	NA	4-year-olds
Chromium, µg	NA	NA	2681	3609	2025	1324	1324	NA	NA	4- and 9-year-olds

NA: not available

Table 1.5-3 Summary Table 15 E%. Amount of nutrients that can be added per 100 kcal of foodstuff for each included age group according to the calculations in the fortification model assuming that 15% of the energy in the diet is derived from fortified foods.

E%: 15	Men, 70+	Women, 70+	Men 18-70 y	Women, 18-70 y	Adolescents, 13 y	Children, 9 y	Children, 4 y	Children, 2 y	Infants, 1 y	Most sensitive age group
Retinol, µg	168	345	134	306	70	42	-57	-446	-603	1-year-olds
β-carotene, µg	885	1027	406	562	645	533	583	333	333	1 and 2 year olds
Vitamin D, µg	15	19	11	18	7	3	3	2	-0.5	1-year-olds
Tocopherol, mg	61	73	42	62	42	37	33	26	24	2-year-olds
Thiamine, mg	11	13	7	11	7	6	6	4	4	1- and 2-year-olds
Riboflavin, mg	9	11	6	9	6	5	4	3	3	1- and 2-year-olds
Niacin, mg	197	230	133	197	99	85	64	42	41	1-year-olds
Vitamin B12, µg	444	529	313	454	284	264	240	174	174	1- and 2-year-olds
Vitamin B6, mg	5	6	3	5	4	2	1	0.9	0.8	1-year-olds
Folic acid, µg	193	241	131	196	107	89	82	41	37	1-year-olds
Vitamin C, mg	171	195	96	146	222	279	162	74	48	1-year-olds
Calcium, mg	211	273	47	166	115	296	299	225	297	Adult men
Magnesium, mg	18	53	27	32	38	51	38	8	7	1-year-olds
Iron, mg	6	9	3	4	2	0.5	-3	-3	-9	1-year-olds
Zinc, mg	3	5	1	3	0.5	0.8	-2	-4	-4	1-year-olds
Copper, mg	0.5	0.7	0.2	0.5	0.5	0.3	-0.1	-0.2	-0.2	1- and 2-year-olds
Selenium, µg	32	47	20	39	26	15	4	-6	-6	1-year-olds
Iodine, µg	-23	32	-14	19	33	4	-4	-50	-57	1-year-olds
Phosphorus, mg	142	265	-44	147	160	268	279	355	451	Adult men
Vitamin K1, µg	NA	NA	138	187	115	104	71	NA	NA	4-year-olds
Chromium, µg	NA	NA	3575	4812	2699	1765	1765	NA	NA	4- and 9-year-olds

NA: not available

Table 1.5-4 Summary Table 10 E%. Amount of nutrients that can be added per 100 kcal of foodstuff for each included age group according to the calculations in the fortification model assuming that 10% of the energy in the diet is derived from fortified foods.

E%: 10	Men, 70+	Women, 70+	Men 18-70 y	Women, 18-70 y	Adolescents, 13 y	Children, 9 y	Children, 4 y	Children, 2 y	Infants, 1 y	Most sensitive age group
Retinol, µg	252	517	200	458	105	63	-86	-669	-905	1-year-olds
β-carotene, µg	1328	1540	609	843	968	800	875	500	500	1 and 2 year olds
Vitamin D, µg	22	29	16	26	10	4	4	3	-0.7	1-year-olds
Tocopherol, mg	92	109	62	93	63	56	50	39	36	1-year-olds
Thiamine, mg	16	19	11	16	10	9	9	6	6	1- and 2-year-olds
Riboflavin, mg	13	16	9	13	8	8	7	4	4	1- and 2-year-olds

E%: 10	Men, 70+	Women, 70+	Men 18-70 y	Women, 18-70 y	Adolescents, 13 y	Children, 9 y	Children, 4 y	Children, 2 y	Infants, 1 y	Most sensitive age group
Niacin, mg	295	345	199	295	149	128	96	64	61	1-year-olds
Vitamin B12, µg	666	793	470	681	425	396	360	261	261	1- and 2-year-olds
Vitamin B6, mg	7	9	5	7	5	3	2	1	1	1-year-olds
Folic acid, µg	289	361	197	293	161	133	123	62	56	1-year-olds
Vitamin C, mg	257	292	145	220	333	418	243	112	72	1-year-olds
Calcium, mg	316	409	71	250	172	444	448	338	446	Adult men
Magnesium, mg	28	80	41	48	58	76	57	13	10	1-year-olds
Iron, mg	9	13	5	6	3	0.7	-4	-5	-13	1-year-olds
Zinc, mg	5	8	2	5	0.7	1	-3	-5	-6	1-year-olds
Copper, mg	0.7	1	0.3	0.7	0.7	0.5	-0.1	-0.3	-0.4	1-year-olds
Selenium, µg	48	71	30	59	39	22	6	-9	-9	1-year-olds
Iodine, µg	-34	47	-20	29	50	6	-6	-75	-86	1-year-olds
Phosphorus, mg	213	398	-66	221	240	402	418	533	676	Adult men
Vitamin K1, µg	NA	NA	206	280	173	156	106	NA	NA	4-year-olds
Chromium, µg	NA	NA	5363	7218	4049	2648	2648	NA	NA	4- and 9-year-olds

NA: not available

Table 1.5-5 Summary Table 5 E%. Amount of nutrients that can be added per 100 kcal of foodstuff for each included age group according to the calculations in the fortification model assuming that 5% of the energy in the diet is derived from fortified foods.

E%: 5	Men 70+	Women, 70+	Men 18-70 y	Women, 18-70 y	Adolescents, 13 y	Children, 9 y	Children, 4 y	Children, 2 y	Infants, 1 y	Most sensitive age group
Retinol, µg	503	1034	401	917	211	126	-172	-1338	-1809	1-year-olds
β-carotene, µg	2655	3080	1218	1686	1935	1600	1750	1000	1000	1 and 2 year olds
Vitamin D, µg	44	57	33	53	20	8	8	7	-1	1-year-olds
Tocopherol, mg	184	218	125	186	126	112	99	79	72	1-year-olds
Thiamine, mg	32	38	22	32	20	18	18	13	12	1-year-olds
Riboflavin, mg	27	32	18	27	17	15	13	9	9	1- and 2-year-olds
Niacin, mg	590	689	399	590	298	256	192	127	122	1-year-olds
Vitamin B12, µg	1332	1586	940	1362	851	792	720	521	523	2-year-olds
Vitamin B6, mg	15	17	9	14	11	6	4	3	2	1-year-olds
Folic acid, µg	579	722	394	587	321	266	245	123	111	1-year-olds
Vitamin C, mg	514	584	289	439	666	836	485	223	143	1-year-olds
Calcium, mg	632	819	142	499	344	889	896	675	892	Adult men
Magnesium, mg	55	160	81	96	115	153	114	25	20	1-year-olds
Iron, mg	18	26	9	11	6	1	-8	-9	-26	1-year-olds
Zinc, mg	10	16	4	10	1	2	-5	-11	-12	1-year-olds
Copper, mg	1	2	0.6	1	1	1	-0.2	-0.5	-0.7	1-year-olds
Selenium, µg	95	142	61	117	78	44	12	-17	-18	1-year-olds

E%: 5	Men 70+	Women, 70+	Men 18-70 y	Women, 18-70 y	Adolescents, 13 y	Children, 9 y	Children, 4 y	Children, 2 y	Infants, 1 y	Most sensitive age group
Iodine, µg	-69	95	-41	58	100	11	-12	-149	-171	1-year-olds
Phosphorus, mg	427	796	-133	441	479	803	836	1065	1352	Adult men
Vitamin K1, µg	NA	NA	413	561	346	312	212	NA	NA	4-year-olds
Chromium, µg	NA	NA	10726	14437	8098	5296	5296	NA	NA	4- and 9-year-olds

NA: not available

The maximum addition of each nutrient that can be added to 100 kcal of foods or drinks according to this fortification model is given in Table 1.5-6 under the assumptions that 25, 20, 15, 10 or 5% of the energy in the diet is derived from fortified foods or drinks and inclusion of all the requested age groups (from 1-year-olds to above 70 years). It should be noted that for vitamin K1 and chromium, data for 1- and 2-year-olds are not available.

Table 1.5-6 Maximum amount of nutrients that can be added per 100 kcal of foodstuff according to the calculations in the fortification model assuming 25, 20, 15, 10 or 5 E% from fortified foods and inclusion of all age groups requested (from 1-year-olds to above 70 years).

Nutrients	25 E%	20 E%	15 E%	10 E%	5 E%
Retinol, µg	0	0	0	0	0
β-carotene, µg	200	250	333	500	1000
Vitamin D, µg	0	0	0	0	0
Tocopherol, mg	14	18	24	36	72
Thiamine, mg	2	3	4	6	12
Riboflavin, mg	2	2	3	4	9
Niacin, mg	24	30	41	61	122
Vitamin B12, µg	104	130	174	261	521
Vitamin B6, mg	0.5	0.6	0.8	1	2
Folic acid, µg	22	28	37	56	111
Vitamin C, mg	29	36	48	72	143
Calcium, mg	28	36	47	71	142
Magnesium, mg	4	5	7	10	20
Iron, mg	0	0	0	0	0
Zinc, mg	0	0	0	0	0
Copper, mg	0	0	0	0	0
Selenium, µg	0	0	0	0	0
Iodine, µg	0	0	0	0	0
Phosphorus, mg	0	0	0	0	0
Vitamin K1*, µg	42	53	71	106	212
Chromium*, µg	1059	1324	1765	2648	5296
Manganese, mg	0	0	0	0	0

*Data for 1- and 2-year-olds are not available.

1.6 Limitations of the model

The model does not include the risk of low nutrient intake. Furthermore, the model does not include fortification of foods such as salt, seasonings, water or foodstuffs that do not naturally contain energy.

Since light products are to be assessed in the same manner as their analogous non-light products, this leads to a higher content of added nutrients per unit of energy for light products than that which the model has included in the calculations. If light products (including products that provide no energy) become a major source of a nutrient, the prerequisites for the calculations in the model will no longer apply.

The model includes mean intakes of vitamins and minerals from supplements (users only). Individuals with higher intakes than the means, may not be sufficiently protected from exceedance of ULs/GLs.

Consumers with high energy intakes from a few single food or drink item may not be sufficiently protected from high intakes if their energy sources are fortified above the energy percent given in the model.

Nutritional policy authorities require special measures to be implemented for some nutrients in order to increase the intake in certain sections of the population. The model does not assess the risk of a low intake of nutrients (only high intakes) and does not take into account the fact that food fortification targeted directly at certain groups of the population may be desirable e.g. population groups with intakes of iron and vitamin D below recommended levels.

2 Uncertainties

Section 1.6 describes the main limitations in the model itself, e.g. what the model does not include or cover, and certain population group that might not be protected from exceeding ULs/GLs with this model. In this chapter we describe uncertainties underlying the data inputs in the model.

Several of the ULs are established based on older studies, and newer published studies should be included. The data for establishing ULs are often scarce, especially in children and adolescents. For nutrients in the model that have been estimated based on GLs the uncertainty is high. Some of the GLs are based on one or few studies and in small population groups not necessarily representative for the whole population.

In the model, we have used intakes in the 95th percentiles as estimates for nutrients and energy from foods and drinks. Data in the 95th percentile is generally associated with uncertainty, and the estimated intakes in the 95th percentiles may be higher than the true intakes.

For intakes of nutrients from food supplements we have used mean intakes among supplement users of the specific nutrient only. The input data for supplements with rarely included nutrients are associated with uncertainty. For some nutrients, especially in the younger age groups, these means are based on very few individuals e.g. from one to ten subjects.

The intake of nutrients from fortified foods and drinks that are already available on the Norwegian market are included only to a limited extent in the calculations. The intake of vitamins A and D from fortified butter, margarine and milk for which general permission has been granted by the Norwegian Food Safety Authority are included in our exposure estimates as are infant formulas and baby porridges, whereas no other fortifications are included. For folic acid, magnesium and beta-carotene, intake data from foods or drinks are not included because the UL for these nutrients are established for supplemental forms only. As we cannot separate natural containing folate, magnesium or beta-carotene from the added forms in e.g. infant formulas or baby porridges, any contribution to folic acid, magnesium or beta-carotene from infant formulas or baby porridges are not accounted for.

The food consumption data used in this assessment are from five different studies with four different dietary assessment methods.

3 The need for monitoring

To ensure that food fortification does not represent a health risk, the prerequisites on which the model is based must be monitored:

- Surveillance of intake of fortified products on the Norwegian market, including intake of fortified light products and products without energy, e.g. fortified salt, waters etc. Without good knowledge on available fortified products on the market, and good consumption data of these products, all intake estimates for vitamins and minerals will be associated with uncertainty in the whole population.
- The intake of nutrients and energy from food/drinks and vitamin and mineral supplements in different groups of the population.

4 Answers to the terms of reference

Products such as gluten free products, sports products, meal replacers for weight control etc. are only to a very limited extent included in the fortification model. These products are registered in the food surveys if they have been consumed by some of the participants. However, very few people in the surveys have eaten such products.

Due to lack of data on tolerable upper intake levels/ upper guidance levels or exposure data, molybdenum, and fluoride could not be included in the model. For vitamin K1 and chromium exposure data was not available for 1- and 2-year-olds.

The tolerable upper intake levels/ safe upper levels/ guidance levels VKM have used for this opinion are given in Appendix I.

Maximum amount of nutrients that can be added per 100 kcal of foodstuff according to the calculations in the fortification model assuming 25, 20, 15, 10 or 5 E% from fortified foods is given in Summary Tables 1.5-1 to 1.5-5 and Table 1.5-6. All the calculations are given in Appendix II.

In gluten free products that are fortified with nutrients, the concentrations are at approximately the same levels as the gluten containing alternatives. Persons (children/adults) on a gluten free diet have therefore generally the same risk of exceeding ULs/GLs as persons that consume the gluten containing products. There are currently three specific gluten free breakfast cereals on the Norwegian market that contain much higher concentrations of iron, folic acid and niacin (up to ten fold). Subjects consuming high amounts of these specific breakfast cereals will be at risk of exceeding UL for these nutrients.

Dietary patterns develop and change over time. To keep up with the changes, the fortification model needs to be updated along with new national dietary surveys.

5 Data gaps

- Intake of nutrients derived from fortified products.
- More knowledge about supplement use, especially in certain age groups such as children, adolescents and elderly.
- Updated ULs for several nutrients with emphasis on studies in the younger age groups. Several nutrients lack ULs, and studies investigating negative health effects from high intakes are scarce, especially in children and adolescents.
- Food composition data for vitamin K, chromium, molybdenum, manganese and fluoride.
- Intake of products such as gluten free products, sports products, meal replacers for weight control etc.

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Appendix I

Tolerable Upper Intake Levels (ULs), Safe Upper Levels (SULs) and Guidance Levels (GLs) used for this fortification model

Nutrients	Unit	Men ≥ 18 years	Women ≥ 18 years	Adolescents 13 years	Children 9 years	Children 4 years	Children 2 years	Infants 1 year	Reference
Vitamin A	RE	3000	3000	2000	1500	1100	800	800	VKM, 2013b based on SCF, 2002
β-carotene*	µg	4000	4000	3000	2000	2000	1000	1000	EFSA, 2018 (no UL); VKM, 2015a
Vitamin D	µg	100	100	50	25	25	25	25	VKM, 2013b; VKM, 2014
Tocopherol	mg	300	300	220	160	120	100	100	EFSA, 2018; VKM, 2017g
Thiamine	mg	50	50	34	25	20	15	15	Rasmussen et al., 2006
Riboflavin	mg	43	43	29	22	16	12	12	Rasmussen et al., 2006; EVM, 2003
Niacin	mg	900	900	500	350	220	150	150	EFSA, 2018; VKM, 2017c
Vitamin B12	µg	2000	2000	1330	1000	730	530	530	Rasmussen et al., 2006; EVM, 2003
Vitamin B6	mg	25	25	20	10	7	5	5	EFSA, 2018; VKM, 2017f
Folic acid*	µg	1000	1000	600	400	300	200	200	EFSA, 2018; VKM, 2015b
Vitamin C	mg	1000	1000	1200	1200	650	400	400	EFSA, 2018 (no UL); VKM, 2016a
Calcium	mg	2500	2500	2500	2500	2500	2500	2500	EFSA, 2018 (no UL in children and adolescents); VKM, 2016a
Magnesium*	mg	250	250	250	250	250	85	85	EFSA, 2018 (no UL in young children); VKM, 2016b
Iron	mg	50	50	30	20	14	10	10	EFSA, 2018 (no UL); VKM, 2017d
Zinc	mg	40	40	23	23	12	7	7	VKM, 2017h
Copper	mg	5	5	4	3	2	1	1	EFSA, 2018; VKM, 2017a
Selenium	µg	300	300	200	130	90	60	60	EFSA, 2018; VKM, 2017e
Iodine	µg	600	600	450	300	250	200	200	EFSA, 2018; VKM, 2020
Phosphorus	mg	3000	3000	3000	3000	3000	3000	3000	EFSA, 2018 (no UL); VKM, 2017b

Nutrients	Unit	Men ≥ 18 years	Women ≥ 18 years	Adolescents 13 years	Children 9 years	Children 4 years	Children 2 years	Infants 1 year	Reference
Vitamin K	µg	1000	1000	670	500	370	270	270	EFSA, 2018 (no UL); VKM, 2018c
Chromium	µg	21000	21000	13020	6930	6930	3570	3570	EFSA, 2018 (no UL); VKM, 2018a
Manganese	mg	0	0	0	0	0	0	0	EFSA, 2018 (no UL); VKM, 2018b

*The ULs for beta-carotene, folic acid and magnesium are only applicable for the amount of nutrients added as fortifying agents or in food supplements, and not for those that are naturally present in foods/drinks.

Appendix II

All calculations in the fortification model

Intakes in the 95th percentile in all included age groups

Table Appendix II-1: Intakes in the 95th percentile in men above 70 years from the Skedsmo study. Energy intake in the 95th percentile is approximately 2900 kcal.

Skedsmo study, men 70 +	UL/GL	95P intake from food/drink	Intake from suppl. (mean, users only)	Maximal amount (MA)	Max addition pr. 100 kcal (FA) E% from fortified foods				
					25	20	15	10	5
Retinol, µg	3000	1786	484	730	101	126	168	252	503
β-carotene, µg	4000	0	150	3850	531	664	885	1328	2655
Vitamin D, µg	100	19	17	64	9	11	15	22	44
Tocopherol, mg	300	17	17	266	37	46	61	92	184
Thiamine, mg	50	2	0.8	47	6	8	11	16	32
Riboflavin, mg	43	3	0.9	39	5	7	9	13	27
Niacin, mg	900	34	11	856	118	148	197	295	590
Vitamin B12, µg	2000	18	51	1931	266	333	444	666	1332
Vitamin B6, mg	25	3	1	21	3	4	5	7	15
Folic acid, µg	1000	0	161	839	116	145	193	289	579
Vitamin C, mg	1000	215	40	745	103	128	171	257	514
Calcium, mg	2500	1563	20	917	126	158	211	316	632
Magnesium, mg	250	0	170	80	11	14	18	28	55
Iron, mg	50	16	8	26	4	4	6	9	18
Zinc, mg	40	17	9	14	2	2	3	5	10
Copper, mg	5	2	1	2	0.3	0.4	0.5	0.7	1
Selenium, µg	300	129	33	138	19	24	32	48	95
Iodine, µg	600	624	76	-100	-14	-17	-23	-34	-69
Phosphorus, mg	3000	2381	0	619	85	107	142	213	427

Table Appendix II-2: Intakes in the 95th percentile in women above 70 years from the Skedsmo study. Energy intake in the 95th percentile is approximately 2500 kcal.

Skedsmo study, women 70 +	UL/GL	95P intake from food/drink	Intake from suppl. (mean, users only)	Maximal amount (MA)	Max addition pr. 100 kcal (FA) E% from fortified foods				
					25	20	15	10	5
Retinol, µg	3000	1303	404	1293	207	259	345	517	1034
β-carotene, µg	4000	0	150	3850	616	770	1027	1540	3080
Vitamin D, µg	100	17	12	72	11	14	19	29	57
Tocopherol, mg	300	16	12	272	44	54	73	109	218

Skedsmo study, women 70 +	UL/GL	95P intake from food/ drink	Intake from suppl. (mean, users only)	Maximal amount (MA)	Max addition pr. 100 kcal (FA) E% from fortified foods				
					25	20	15	10	5
					Thiamine, mg	50	2	1	47
Riboflavin, mg	43	2	1	40	6	8	11	16	32
Niacin, mg	900	29	10	861	138	172	230	345	689
Vitamin B12, µg	2000	16	1	1983	317	397	529	793	1586
Vitamin B6, mg	25	2	1	22	3	4	6	9	17
Folic acid, µg	1000	0	98	902	144	180	241	361	722
Vitamin C, mg	1000	219	51	731	117	146	195	292	584
Calcium, mg	2500	1291	186	1023	164	205	273	409	819
Magnesium, mg	250	0	50	200	32	40	53	80	160
Iron, mg	50	13	5	32	5	6	9	13	26
Zinc, mg	40	13	6	20	3	4	5	8	16
Copper, mg	5	1	1	3	0.4	0.5	0.7	1	2
Selenium, µg	300	99	24	177	28	35	47	71	142
Iodine, µg	600	424	57	119	19	24	32	47	95
Phosphorus, mg	3000	2005	0	995	159	199	265	398	796

Table Appendix II-3: Intakes in the 95th percentile in men 18-70 years from Norkost 3 and DANSDA 2011-2013 (for vitamin K1 and chromium). Energy intake in the 95th percentile is approximately 4200 kcal in Norkost 3 and 3900 kcal in DANSDA.

Norkost 3, men 18-70 y (data for vitamin K1 and chromium is from DANSDA)	UL/GL	95P intake from food/ drink	Intake from suppl. (mean, users only)	Maximal amount (MA)	Max addition pr. 100 kcal (FA) E% from fortified foods				
					25	20	15	10	5
					Retinol, µg	3000	1691	467	842
β-carotene, µg	4000	0	1443	2557	244	304	406	609	1218
Vitamin D, µg	100	17	14	69	7	8	11	16	33
Tocopherol, mg	300	23	15	262	25	31	42	62	125
Thiamine, mg	50	3	1	46	4	5	7	11	22
Riboflavin, mg	43	4	1	38	4	5	6	9	18
Niacin, mg	900	48	15	837	80	100	133	199	399
Vitamin B12, µg	2000	19	6	1975	188	235	313	470	940
Vitamin B6, mg	25	3	2	20	2	2	3	5	9
Folic acid, µg	1000	0	172	828	79	99	131	197	394
Vitamin C, mg	1000	258	135	607	58	72	96	145	289
Calcium, mg	2500	2032	169	299	28	36	47	71	142
Magnesium, mg	250	0	79	171	16	20	27	41	81
Iron, mg	50	21	10	19	2	2	3	5	9
Zinc, mg	40	22	10	8	0.7	0.9	1	2	4
Copper, mg	5	2	1	1	0.1	0.2	0.2	0.3	0.6
Selenium, µg	300	129	43	128	12	15	20	30	61
Iodine, µg	600	569	117	-86	-8	-10	-14	-20	-41

Norkost 3, men 18-70 y (data for vitamin K1 and chromium is from DANSDA)	UL/GL	95P intake from food/ drink	Intake from suppl. (mean, users only)	Maximal amount (MA)	Max addition pr. 100 kcal (FA) E% from fortified foods				
					25	20	15	10	5
					Phosphorus, mg	3000	3153	126	-279
Vitamin K1, µg	1000	187	8	805	83	103	138	206	413
Chromium, µg	21000	64	21	20915	2145	2681	3575	5363	10726

Table Appendix II-4: Intakes in the 95th percentile in women 18-70 years from Norkost 3 and DANSDA 2011-2013 (for vitamin K1 and chromium). Energy intake in the 95th percentile is approximately 2900 kcal in both Norkost 3 and DANSDA.

Norkost 3, women 18-70 y (data for vitamin K1 and chromium is from DANSDA)	UL/GL	95P intake from food/ drink	Intake from suppl. (mean, users only)	Maximal amount (MA)	Max addition pr. 100 kcal (FA) E% from fortified foods				
					25	20	15	10	5
					Retinol, µg	3000	1285	386	1329
β-carotene, µg	4000	0	1556	2444	337	421	562	843	1686
Vitamin D, µg	100	12	11	76	11	13	18	26	53
Tocopherol, mg	300	18	12	270	37	47	62	93	186
Thiamine, mg	50	2	2	46	6	8	11	16	32
Riboflavin, mg	43	3	2	39	5	7	9	13	27
Niacin, mg	900	32	12	856	118	148	197	295	590
Vitamin B12, µg	2000	13	12	1975	272	341	454	681	1362
Vitamin B6, mg	25	3	2	20	3	4	5	7	14
Folic acid, µg	1000	0	149	851	117	147	196	293	587
Vitamin C, mg	1000	244	119	637	88	110	146	220	439
Calcium, mg	2500	1500	276	724	100	125	166	250	499
Magnesium, mg	250	0	111	139	19	24	32	48	96
Iron, mg	50	17	17	16	2	3	4	6	11
Zinc, mg	40	16	9	15	2	3	3	5	10
Copper, mg	5	2	1	2	0.3	0.3	0.5	0.7	1
Selenium, µg	300	94	36	170	23	29	39	59	117
Iodine, µg	600	421	95	84	12	14	19	29	58
Phosphorus, mg	3000	2282	78	640	88	110	147	221	441
Vitamin K1, µg	1000	179	8	813	112	140	187	280	561
Chromium, µg	21000	46	21	20933	2887	3609	4812	7218	14437

Table Appendix II-5: Intakes in the 95th percentile in 13-year-olds from Ungkost 3 and DANSDA 2011-2013 (for vitamin K1 and chromium). Energy intake in the 95th percentile is approximately 3100 kcal in Ungkost 3 and 3200 kcal in DANSDA.

Ungkost 3, 13-year-olds (data for vitamin K1 and chromium is from DANSDA)	UL/GL	95P intake from food/drink	Intake from suppl. (mean, users only)	Maximal amount (MA)	Max addition pr. 100 kcal (FA) E% from fortified foods				
					25	20	15	10	5
Retinol, µg	2000	1486	187	327	42	53	70	105	211
β-carotene, µg	3000	0	0	3000	387	484	645	968	1935
Vitamin D, µg	50	11	8	31	4	5	7	10	20
Tocopherol, mg	220	16	8	196	25	32	42	63	126
Thiamine, mg	34	2	0.6	31	4	5	7	10	20
Riboflavin, mg	29	2	0.7	26	3	4	6	8	17
Niacin, mg	500	28	10	462	60	75	99	149	298
Vitamin B12, µg	1330	10	1	1319	170	213	284	425	851
Vitamin B6, mg	20	2	0.9	17	2	3	4	5	11
Folic acid, µg	600	0	102	498	64	80	107	161	321
Vitamin C, mg	1200	117	51	1032	133	166	222	333	666
Calcium, mg	2500	1592	375	533	69	86	115	172	344
Magnesium, mg	250	0	71	179	23	29	38	58	115
Iron, mg	30	14	7	9	1	1	2	3	6
Zinc, mg	23	17	4	2	0.3	0.3	0.5	0.7	1
Copper, mg	4	2	0.3	2	0.3	0.4	0.5	0.7	1
Selenium, µg	200	62	17	121	16	20	26	39	78
Iodine, µg	450	230	65	155	20	25	33	50	100
Phosphorus, mg	3000	2257	0	743	96	120	160	240	479
Vitamin K1, µg	670	111	6	553	69	86	115	173	346
Chromium, µg	13020	49	14	12957	1620	2025	2699	4049	8098

Table Appendix II-6: Intakes in the 95th percentile in 9-year-olds from Ungkost 3 and DANSDA 2011-2013 (for vitamin K1 and chromium). Energy intake in the 95th percentile is approximately 3100 kcal in Ungkost 3 and 3200 kcal in DANSDA.

Ungkost 3, 9-year-olds (data for vitamin K1 and chromium is from DANSDA)	UL/GL	95P intake from food/drink	Intake from suppl. (mean, users only)	Maximal amount (MA)	Max addition pr. 100 kcal (FA) E% from fortified foods				
					25	20	15	10	5
Retinol, µg	1500	1154	188	158	25	32	42	63	126
β-carotene, µg	2000	0	0	2000	320	400	533	800	1600
Vitamin D, µg	25	9	7	10	2	2	3	4	8
Tocopherol, mg	160	14	7	140	22	28	37	56	112
Thiamine, mg	25	2	0.6	23	4	5	6	9	18
Riboflavin, mg	22	2	0.7	19	3	4	5	8	15
Niacin, mg	350	22	7	321	51	64	85	128	256
Vitamin B12, µg	1000	9	0.9	990	158	198	264	396	792

Ungkost 3, 9-year-olds (data for vitamin K1 and chromium is from DANSDA)	UL/GL	95P intake from food/drink	Intake from suppl. (mean, users only)	Maximal amount (MA)	Max addition pr. 100 kcal (FA) E% from fortified foods				
					25	20	15	10	5
					Vitamin B6, mg	10	2	0.7	8
Folic acid, µg	400	0	68	332	53	66	89	133	266
Vitamin C, mg	1200	116	39	1045	167	209	279	418	836
Calcium, mg	2500	1389	0	1111	178	222	296	444	889
Magnesium, mg	250	0	59	191	31	38	51	76	153
Iron, mg	20	12	6	2	0.3	0.3	0.5	0.7	1
Zinc, mg	23	16	4	3	0.5	0.6	0.8	1	2
Copper, mg	3	1	0.3	1	0.2	0.3	0.3	0.5	1
Selenium, µg	130	58	17	55	9	11	15	22	44
Iodine, µg	300	217	69	14	2	3	4	6	11
Phosphorus, mg	3000	1996	0	1004	161	201	268	402	803
Vitamin K1, µg	500	89	5	406	62	78	104	156	312
Chromium, µg	6930	37	8	6885	1059	1324	1765	2648	5296

Table Appendix II-7: Intakes in the 95th percentile in 4-year-olds from Ungkost 3 and DANSDA 2011-2013 (for vitamin K1 and chromium). Energy intake in the 95th percentile is approximately 2000 kcal in Ungkost 3 and 2600 kcal in DANSDA.

Ungkost 3, 4-year-olds (data for vitamin K1 and chromium is from DANSDA)	UL/GL	95P intake from food/drink	Intake from suppl. (mean, users only)	Maximal amount (MA)	Max addition pr. 100 kcal (FA) E% from fortified foods				
					25	20	15	10	5
					Retinol, µg	1100	1079	193	-172
β-carotene, µg	2000	0	250	1750	350	438	583	875	1750
Vitamin D, µg	25	10	7	8	2	2	3	4	8
Tocopherol, mg	120	14	7	99	20	25	33	50	99
Thiamine, mg	20	1	0.6	18	4	5	6	9	18
Riboflavin, mg	16	2	0.7	13	3	3	4	7	13
Niacin, mg	220	20	8	192	38	48	64	96	192
Vitamin B12, µg	730	9	2	720	144	180	240	360	720
Vitamin B6, mg	7	2	0.8	4	0.9	1	1	2	4
Folic acid, µg	300	0	55	245	49	61	82	123	245
Vitamin C, mg	650	121	44	485	97	121	162	243	485
Calcium, mg	2500	1243	361	896	179	224	299	448	896
Magnesium, mg	250	0	136	114	23	29	38	57	114
Iron, mg	14	10	12	-8	-2	-2	-3	-4	-8
Zinc, mg	12	12	5	-5	-1	-1	-2	-3	-5
Copper, mg	2	1	1	-0.2	0	-0.1	-0.1	-0.1	-0.2
Selenium, µg	90	51	27	12	2	3	4	6	12
Iodine, µg	250	198	64	-12	-2	-3	-4	-6	-12
Phosphorus, mg	3000	1662	502	836	167	209	279	418	836
Vitamin K1, µg	370	89	5	276	42	53	71	106	212

Ungkost 3, 4-year-olds (data for vitamin K1 and chromium is from DANSDA)	UL/GL	95P intake from food/drink	Intake from suppl. (mean, users only)	Maximal amount (MA)	Max addition pr. 100 kcal (FA) E% from fortified foods				
					25	20	15	10	5
					Chromium, µg	6930	37	8	6885

Table Appendix II-8: Intakes in the 95th percentile in 2-year-olds from Småbarnskost 3. Energy intake in the 95th percentile is approximately 2000 kcal.

Småbarnskost 3, 2-year-olds	UL/GL	95P intake from food/drink	Intake from suppl. (mean, users only)	Maximal amount (MA)	Max addition pr. 100 kcal (FA) E% from fortified foods				
					25	20	15	10	5
					Retinol, µg	800	1922	216	-1338
β-carotene, µg	1000	0	0	1000	200	250	333	500	1000
Vitamin D, µg	25	8	10	7	1	2	2	3	7
Tocopherol, mg	100	13	9	79	16	20	26	39	79
Thiamine, mg	15	2	0.6	13	3	3	4	6	13
Riboflavin, mg	12	2	0.7	9	2	2	3	4	9
Niacin, mg	150	15	8	127	25	32	42	64	127
Vitamin B12, µg	530	7	1	521	104	130	174	261	521
Vitamin B6, mg	5	2	0.7	3	0.5	0.7	0.9	1	3
Folic acid, µg	200	0	77	123	25	31	41	62	123
Vitamin C, mg	400	138	39	223	45	56	74	112	223
Calcium, mg	2500	1574	251	675	135	169	225	338	675
Magnesium, mg	85	0	60	25	5	6	8	13	25
Iron, mg	10	12	7	-9	-2	-2	-3	-5	-9
Zinc, mg	7	12	6	-11	-2	-3	-4	-5	-11
Copper, mg	1	1	0.4	-0.5	-0.1	-0.1	-0.2	-0.3	-0.5
Selenium, µg	60	53	24	-17	-3	-4	-6	-9	-17
Iodine, µg	200	253	96	-149	-30	-37	-50	-75	-149
Phosphorus, mg	3000	1935	0	1065	213	266	355	533	1065

Table Appendix II-9: Intakes in the 95th percentile in 1-year-olds from Spedkost 3 (non-breastfeds only). Energy intake in the 95th percentile is approximately 2000 kcal.

Spedkost 3 (non-breastfeds only), 1-year-olds	UL/GL	95P intake from food/drink	Intake from suppl. (mean, users only)	Maximal amount (MA)	Max addition pr. 100 kcal (FA) E% from fortified foods				
					25	20	15	10	5
					Retinol, µg	800	2394	215	-1809
β-carotene, µg	1000	0	0	1000	200	250	333	500	1000
Vitamin D, µg	25	16,8	10	-1	-0.3	-0.4	-0.5	-0.7	-1

Spedkost 3 (non-breastfeds only), 1-year-olds	UL/GL	95P intake from food/drink	Intake from suppl. (mean, users only)	Maximal amount (MA)	Max addition pr. 100 kcal (FA) E% from fortified foods				
					25	20	15	10	5
Tocopherol, mg	100	20	8	72	14	18	24	36	72
Thiamine, mg	15	2	0.7	12	2	3	4	6	12
Riboflavin, mg	12	2	0.8	9	2	2	3	4	9
Niacin, mg	150	19	9	122	24	30	41	61	122
Vitamin B12, µg	530	6	1	523	105	131	174	261	523
Vitamin B6, mg	5	2	0.8	2	0.5	0.6	0.8	1	2
Folic acid, µg	200	0	89	111	22	28	37	56	111
Vitamin C, mg	400	217	40	143	29	36	48	72	143
Calcium, mg	2500	1358	250	892	178	223	297	446	892
Magnesium, mg	85	0	65	20	4	5	7	10	20
Iron, mg	10	22	14	-26	-5	-7	-9	-13	-26
Zinc, mg	7	13	6	-12	-2	-3	-4	-6	-12
Copper, mg	1	1	0.4	-0.7	-0.1	-0.2	-0.2	-0.4	-0.7
Selenium, µg	60	52	26	-18	-4	-5	-6	-9	-18
Iodine, µg	200	267	104	-171	-34	-43	-57	-86	-171
Phosphorus, mg	3000	1648	0	1352	270	338	451	676	1352

Intakes in the 90th percentile in all included age groups

Table Appendix II-10: Intakes in the 90th percentile in men above 70 years from the Skedsmo study. Energy intake in the 90th percentile is approximately 2700 kcal.

Skedsmo study, men 70 +	UL/GL	90P intake from food/drink	Intake from suppl. (mean, users only)	Maximal amount (MA)	Max addition pr. 100 kcal (FA) E% from fortified foods				
					25	20	15	10	5
Retinol, µg	3000	1190	484	1326	196	246	327	491	982
β-carotene, µg	4000	0	150	3850	570	713	951	1426	2852
Vitamin D, µg	100	16	17	68	10	13	17	25	50
Tocopherol, mg	300	16	17	267	40	50	66	99	198
Thiamine, mg	50	2	1	47	7	9	12	17	35
Riboflavin, mg	43	3	1	39	6	7	10	15	29
Niacin, mg	900	30	11	859	127	159	212	318	636
Vitamin B12, µg	2000	15	51	1934	286	358	477	716	1432
Vitamin B6, mg	25	2	1	21	3	4	5	8	16
Folic acid, µg	1000	0	161	839	124	155	207	311	622
Vitamin C, mg	1000	163	40	797	118	148	197	295	591
Calcium, mg	2500	1263	20	1217	180	225	301	451	902
Magnesium, mg	250	0	170	80	12	15	20	30	59
Iron, mg	50	15	8	27	4	5	7	10	20
Zinc, mg	40	14	9	16	2	3	4	6	12
Copper, mg	5	2	1	2	0.3	0.4	0.6	0.9	2

Skedsmo study, men 70 +	UL/GL	90P intake from food/ drink	Intake from suppl. (mean, users only)	Maximal amount (MA)	Max addition pr. 100 kcal (FA) E% from fortified foods				
					25	20	15	10	5
Selenium, µg	300	107	33	160	24	30	39	59	118
Iodine, µg	600	448	76	76	11	14	19	28	56
Phosphorus, mg	3000	2206	0	794	118	147	196	294	588

Table Appendix II-11: Intakes in the 90th percentile in women above 70 years from the Skedsmo study. Energy intake in the 90th percentile is approximately 2300 kcal.

Skedsmo study, women 70 +	UL/GL	90P intake from food/ drink	Intake from suppl. (mean, users only)	Maximal amount (MA)	Max addition pr. 100 kcal (FA) E% from fortified foods				
					25	20	15	10	5
Retinol, µg	3000	1012	404	1584	275	344	459	689	1377
β-carotene, µg	4000	0	150	3850	670	837	1116	1674	3348
Vitamin D, µg	100	14	12	74	13	16	22	32	65
Tocopherol, mg	300	15	12	273	48	59	79	119	238
Thiamine, mg	50	2	0.8	47	8	10	14	21	41
Riboflavin, mg	43	2	1	40	7	9	12	17	35
Niacin, mg	900	26	10	864	150	188	250	376	751
Vitamin B12, µg	2000	13	0.8	1987	345	432	576	864	1727
Vitamin B6, mg	25	2	1	22	4	5	6	10	19
Folic acid, µg	1000	0	98	902	157	196	261	392	784
Vitamin C, mg	1000	185	51	764	133	166	221	332	664
Calcium, mg	2500	1109	186	1205	210	262	349	524	1048
Magnesium, mg	250	0	50	200	35	44	58	87	174
Iron, mg	50	12	5	33	6	7	10	15	29
Zinc, mg	40	12	6	22	4	5	6	10	19
Copper, mg	5	1	1	3	0.5	0.6	0.8	1	2
Selenium, µg	300	82	24	195	34	42	56	85	169
Iodine, µg	600	350	57	193	33	42	56	84	167
Phosphorus, mg	3000	1802	0	1198	208	260	347	521	1042

Table Appendix II-12: Intakes in the 90th percentile in men 18-70 years from Norkost 3 and DANSDA 2011-2013 (for vitamin K1 and chromium). Energy intake in the 90th percentile is approximately 3700 kcal in Norkost 3 and 3600 kcal in DANSDA.

Norkost 3, men 18-70 y (data for vitamin K1 and chromium is from DANSDA)	UL/GL	90P intake from food/drink	Intake from suppl. (mean, users only)	Maximal amount (MA)	Max addition pr. 100 kcal (FA) E% from fortified foods				
					25	20	15	10	5
Retinol, µg	3000	1353	467	1180	128	159	213	319	638
β-carotene, µg	4000	0	1443	2557	276	346	461	691	1382
Vitamin D, µg	100	13	14	74	8	10	13	20	40
Tocopherol, mg	300	20	15	265	29	36	48	72	143
Thiamine, mg	50	3	1	46	5	6	8	12	25
Riboflavin, mg	43	3	1	38	4	5	7	10	21
Niacin, mg	900	40	15	846	91	114	152	229	457
Vitamin B12, µg	2000	15	6	1979	214	267	356	535	1069
Vitamin B6, mg	25	3	2	20	2	3	4	5	11
Folic acid, µg	1000	0	172	828	90	112	149	224	448
Vitamin C, mg	1000	212	135	653	71	88	118	176	353
Calcium, mg	2500	1676	169	655	71	89	118	177	354
Magnesium, mg	250	0	79	171	18	23	31	46	92
Iron, mg	50	18	10	22	2	3	4	6	12
Zinc, mg	40	20	10	10	1	1	2	3	5
Copper, mg	5	2	1	2	0.2	0.2	0.3	0.4	1
Selenium, µg	300	109	43	148	16	20	27	40	80
Iodine, µg	600	458	117	25	3	3	5	7	14
Phosphorus, mg	3000	2838	126	36	4	5	6	10	19
Vitamin K1, µg	1000	158	8	834	93	116	154	232	463
Chromium, µg	21000	57	21	20922	2325	2906	3874	5812	11623

Table Appendix II-13: Intakes in the 90th percentile in women 18-70 years from Norkost 3 and DANSDA 2011-2013 (for vitamin K1 and chromium). Energy intake in the 90th percentile is approximately 2600 kcal in Norkost 3 and 2700 kcal in DANSDA.

Norkost 3, women 18-70 y (data for vitamin K1 and chromium is from DANSDA)	UL/GL	90P intake from food/drink	Intake from suppl. (mean, users only)	Maximal amount (MA)	Max addition pr. 100 kcal (FA) E% from fortified foods				
					25	20	15	10	5
Retinol, µg	3000	928	386	1686	259	324	432	648	1297
β-carotene, µg	4000	0	1556	2444	376	470	627	940	1880
Vitamin D, µg	100	10	11	79	12	15	20	30	61
Tocopherol, mg	300	15	12	273	42	53	70	105	210
Thiamine, mg	50	2	2	46	7	9	12	18	36
Riboflavin, mg	43	2	2	39	6	7	10	15	30
Niacin, mg	900	29	12	859	132	165	220	330	661
Vitamin B12, µg	2000	11	12	1977	304	380	507	760	1521

Norkost 3, women 18-70 y (data for vitamin K1 and chromium is from DANSDA)	UL/GL	90P intake from food/ drink	Intake from suppl. (mean, users only)	Maximal amount (MA)	Max addition pr. 100 kcal (FA) E% from fortified foods				
					25	20	15	10	5
					Vitamin B6, mg	25	2	2	21
Folic acid, µg	1000	0	149	851	131	164	218	327	655
Vitamin C, mg	1000	206	119	675	104	130	173	260	519
Calcium, mg	2500	1275	276	949	146	183	243	365	730
Magnesium, mg	250	0	111	139	21	27	36	53	107
Iron, mg	50	15	17	18	3	3	5	7	14
Zinc, mg	40	14	9	17	3	3	4	7	13
Copper, mg	5	2	1	2	0.3	0.4	1	1	2
Selenium, µg	300	80	36	184	28	35	47	71	142
Iodine, µg	600	340	95	165	25	32	42	63	127
Phosphorus, mg	3000	2082	78	840	129	162	215	323	646
Vitamin K1, µg	1000	143	8	849	126	157	210	314	629
Chromium, µg	21000	42	21	20937	3102	3877	5170	7754	15509

Table Appendix II-14: Intakes in the 90th percentile in 13-year-olds from Ungkost 3 and DANSDA 2011-2013 (for vitamin K1 and chromium). Energy intake in the 90th percentile is approximately 2700 kcal in Ungkost 3 and 2900 kcal in DANSDA.

Ungkost 3, 13- year-olds (data for vitamin K1 and chromium is from DANSDA)	UL/GL	90P intake from food/ drink	Intake from suppl. (mean, users only)	Maximal amount (MA)	Max addition pr. 100 kcal (FA) E% from fortified foods				
					25	20	15	10	5
					Retinol, µg	2000	945	187	868
β-carotene, µg	3000	0	0	3000	444	556	741	1111	2222
Vitamin D, µg	50	8	8	34	5	6	8	13	25
Tocopherol, mg	220	14	8	198	29	37	49	73	147
Thiamine, mg	34	2	0.6	32	5	6	8	12	23
Riboflavin, mg	29	2	0.6	26	4	5	6	10	19
Niacin, mg	500	24	10	466	69	86	115	173	345
Vitamin B12, µg	1330	9	1	1320	196	244	326	489	978
Vitamin B6, mg	20	2	0.9	17	3	3	4	6	13
Folic acid, µg	600	0	102	498	74	92	123	184	369
Vitamin C, mg	1200	94	51	1055	156	195	260	391	781
Calcium, mg	2500	1366	375	759	112	141	187	281	562
Magnesium, mg	250	0	71	179	27	33	44	66	133
Iron, mg	30	12	7	11	2	2	3	4	8
Zinc, mg	23	15	4	4	1	1	1	2	3
Copper, mg	4	1	0.3	2	0.3	0.4	1	1	2
Selenium, µg	200	55	17	128	19	24	32	47	95
Iodine, µg	450	194	65	191	28	35	47	71	141
Phosphorus, mg	3000	1995	0	1005	149	186	248	372	744
Vitamin K1, µg	670	92	6	572	79	99	131	197	394

Ungkost 3, 13-year-olds (data for vitamin K1 and chromium is from DANSDA)	UL/GL	90P intake from food/drink	Intake from suppl. (mean, users only)	Maximal amount (MA)	Max addition pr. 100 kcal (FA) E% from fortified foods				
					25	20	15	10	5
					Chromium, µg	13020	42	14	12964

Table Appendix II-15: Intakes in the 90h percentile in 9-year-olds from Ungkost 3 and DANSDA 2011-2013 (for vitamin K1 and chromium). Energy intake in the 90th percentile is approximately 2300 kcal in Ungkost 3 and 2400 kcal in DANSDA.

Ungkost 3, 9-year-olds (data for vitamin K1 and chromium is from DANSDA)	UL/GL	90P intake from food/drink	Intake from suppl. (mean, users only)	Maximal amount (MA)	Max addition pr. 100 kcal (FA) E% from fortified foods				
					25	20	15	10	5
					Retinol, µg	1500	830	188	482
β-carotene, µg	2000	0	0	2000	348	435	580	870	1739
Vitamin D, µg	25	7	7	11	2	2	3	5	10
Tocopherol, mg	160	12	7	141	25	31	41	61	123
Thiamine, mg	25	2	0.6	23	4	5	7	10	20
Riboflavin, mg	22	2	0.7	19	3	4	6	8	17
Niacin, mg	350	19	7	324	56	70	94	141	282
Vitamin B12, µg	1000	8	0.9	992	172	216	287	431	862
Vitamin B6, mg	10	2	0.7	8	1	2	2	3	7
Folic acid, µg	400	0	68	332	58	72	96	144	289
Vitamin C, mg	1200	93	39	1068	186	232	310	464	929
Calcium, mg	2500	1214	0	1286	224	280	373	559	1118
Magnesium, mg	250	0	59	191	33	42	55	83	166
Iron, mg	20	11	6	3	0.5	1	1	1	2
Zinc, mg	23	14	4	5	1	1	1	2	4
Copper, mg	3	1	0.3	2	0.3	0.3	0.4	1	1
Selenium, µg	130	50	17	63	11	14	18	27	55
Iodine, µg	300	180	69	51	9	11	15	22	44
Phosphorus, mg	3000	1780	0	1220	212	265	354	530	1061
Vitamin K1, µg	500	72	3	425	71	88	118	177	354
Chromium, µg	6930	35	8	6887	1148	1435	1913	2870	5739

Table Appendix II-16: Intakes in the 90th percentile in 4-year-olds from Ungkost 3 and DANSDA 2011-2013 (for vitamin K1 and chromium). Energy intake in the 90th percentile is approximately 1800 kcal in Ungkost 3 and 2400 kcal in DANSDA.

Ungkost 3, 4-year-olds (data for vitamin K1 and chromium is from DANSDA)	UL/GL	90P intake from food/drink	Intake from suppl. (mean, users only)	Maximal amount (MA)	Max addition pr. 100 kcal (FA) E% from fortified foods				
					25	20	15	10	5
Retinol, µg	1100	848	193	59	13	16	22	33	66
β-carotene, µg	2000	0	250	1750	389	486	648	972	1944
Vitamin D, µg	25	8	7	10	2	3	4	5	11
Tocopherol, mg	120	13	7	100	22	28	37	56	112
Thiamine, mg	20	1	0.6	18	4	5	7	10	20
Riboflavin, mg	16	2	0.7	14	3	4	5	8	15
Niacin, mg	220	17	8	195	43	54	72	109	217
Vitamin B12, µg	730	7	2	721	160	200	267	401	802
Vitamin B6, mg	7	2	0.8	5	1	1	2	3	5
Folic acid, µg	300	0	55	245	54	68	91	136	272
Vitamin C, mg	650	104	44	502	112	139	186	279	558
Calcium, mg	2500	1109	361	1030	229	286	381	572	1144
Magnesium, mg	250	0	136	114	25	32	42	63	127
Iron, mg	14	9	12	-7	-2	-2	-3	-4	-8
Zinc, mg	12	10	5	-3	-1	-1	-1	-2	-4
Copper, mg	2	1	1	-0.1	0.0	0.0	0.0	-0.1	-0.1
Selenium, µg	90	45	27	18	4	5	7	10	20
Iodine, µg	250	160	64	26	6	7	10	14	29
Phosphorus, mg	3000	1510	502	988	220	274	366	549	1098
Vitamin K1, µg	370	72	5	293	49	61	81	122	244
Chromium, µg	6930	35	8	6887	1148	1435	1913	2870	5739

Table Appendix II-17: Intakes in the 90th percentile in 2-year-olds from Småbarnskost 3. Energy intake in the 90th percentile is approximately 1800 kcal.

Småbarnskost 3, 2-year-olds	UL/GL	90P intake from food/drink	Intake from suppl. (mean, users only)	Maximal amount (MA)	Max addition pr. 100 kcal (FA) E% from fortified foods				
					25	20	15	10	5
Retinol, µg	800	1544	216	-960	-213	-267	-356	-533	-1067
β-carotene, µg	1000	0	0	1000	222	278	370	556	1111
Vitamin D, µg	25	7	10	8	2	2	3	4	9
Tocopherol, mg	100	11	9	80	18	22	30	45	89
Thiamine, mg	15	2	0.6	13	3	4	5	7	14
Riboflavin, mg	12	2	0.7	9	2	3	3	5	10
Niacin, mg	150	13	8	129	29	36	48	72	143
Vitamin B12, µg	530	6	1	522	116	145	193	290	580
Vitamin B6, mg	5	2	0.7	3	1	1	1	2	3

Småbarnskost 3, 2-year-olds	UL/GL	90P intake from food/ drink	Intake from suppl. (mean, users only)	Maximal amount (MA)	Max addition pr. 100 kcal (FA) E% from fortified foods				
					25	20	15	10	5
Folic acid, µg	200	0	77	123	27	34	46	68	137
Vitamin C, mg	400	114	39	247	55	69	91	137	274
Calcium, mg	2500	1363	251	886	197	246	328	492	984
Magnesium, mg	85	0	60	25	6	7	9	14	28
Iron, mg	10	10	7	-7	-2	-2	-3	-4	-8
Zinc, mg	7	11	6	-9	-2	-3	-3	-5	-10
Copper, mg	1	1,0	0.4	-0.4	-0.1	-0.1	-0.1	-0.2	-0.4
Selenium, µg	60	48	24	-12	-3	-3	-4	-7	-13
Iodine, µg	200	213	96	-109	-24	-30	-40	-61	-121
Phosphorus, mg	3000	1708	0	1292	287	359	479	718	1436

Table Appendix II-18: Intakes in the 90th percentile in 1-year-olds from Spedkost 3 (non-breastfeds only). Energy intake in the 90th percentile is approximately 1700 kcal.

Spedkost 3 (non- breastfeds only), 1-year-olds	UL/GL	90P intake from food/ drink	Intake from suppl. (mean, users only)	Maximal amount (MA)	Max addition pr. 100 kcal (FA) E% from fortified foods				
					25	20	15	10	5
Retinol, µg	800	1852	215	-1267	-298	-373	-497	-745	-1491
β-carotene, µg	1000	0	0	1000	235	294	392	588	1176
Vitamin D, µg	25	15	10	0.1	0.0	0.0	0.0	0.1	0.1
Tocopherol, mg	100	18	8	75	18	22	29	44	88
Thiamine, mg	15	2	0.7	12	3	4	5	7	14
Riboflavin, mg	12	2	0.8	9	2	3	4	5	11
Niacin, mg	150	17	9	124	29	36	49	73	146
Vitamin B12, µg	530	5	1	524	123	154	205	308	616
Vitamin B6, mg	5	2	0.8	3	1	1	1	1	3
Folic acid, µg	200	0	89	111	26	33	44	65	131
Vitamin C, mg	400	194	40	166	39	49	65	98	196
Calcium, mg	2500	1166	250	1084	255	319	425	638	1275
Magnesium, mg	85	0	65	20	5	6	8	12	23
Iron, mg	10	20	14	-23	-5	-7	-9	-14	-27
Zinc, mg	7	12	6	-11	-3	-3	-4	-6	-13
Copper, mg	1	1	0.4	-0.6	-0.1	-0.2	-0.2	-0.4	-1
Selenium, µg	60	47	26	-13	-3	-4	-5	-8	-15
Iodine, µg	200	215	104	-119	-28	-35	-47	-70	-140
Phosphorus, mg	3000	1454	0	1546	364	455	606	909	1819

Intakes in the 75th percentile in all included age groups

Table Appendix II-19: Intakes in the 75th percentile in men above 70 years from the Skedsmo study. Energy intake in the 75th percentile is approximately 2300 kcal.

Skedsmo study, men 70 +	UL/GL	75P intake from food/drink	Intake from suppl. (mean, users only)	Maximal amount (MA)	Max addition pr. 100 kcal (FA) E% from fortified foods				
					25	20	15	10	5
Retinol, µg	3000	837	484	1679	292	365	487	730	1460
β-carotene, µg	4000	0	150	3850	670	837	1116	1674	3348
Vitamin D, µg	100	9	17	74	13	16	21	32	64
Tocopherol, mg	300	12	17	271	47	59	79	118	236
Thiamine, mg	50	2	1	48	8	10	14	21	41
Riboflavin, mg	43	2	1	40	7	9	12	17	35
Niacin, mg	900	25	11	865	150	188	251	376	752
Vitamin B12, µg	2000	9	51	1940	337	422	562	844	1687
Vitamin B6, mg	25	2	1	22	4	5	6	10	19
Folic acid, µg	1000	0	161	839	146	182	243	365	730
Vitamin C, mg	1000	123	40	837	146	182	243	364	728
Calcium, mg	2500	971	20	1509	262	328	437	656	1312
Magnesium, mg	250	0	170	80	14	17	23	35	70
Iron, mg	50	12	8	30	5	7	9	13	26
Zinc, mg	40	12	9	19	3	4	6	8	17
Copper, mg	5	1	1	3	0.5	0.6	0.8	1	2
Selenium, µg	300	76	33	191	33	41	55	83	166
Iodine, µg	600	237	76	287	50	62	83	125	250
Phosphorus, mg	3000	1793	0	1207	210	262	350	525	1049

Table Appendix II-20: Intakes in the 75th percentile in women above 70 years from the Skedsmo study. Energy intake in the 75th percentile is approximately 1900 kcal.

Skedsmo study, women 70 +	UL/GL	75P intake from food/drink	Intake from suppl. (mean, users only)	Maximal amount (MA)	Max addition pr. 100 kcal (FA) E% from fortified foods				
					25	20	15	10	5
Retinol, µg	3000	724	404	1872	394	493	657	985	1971
β-carotene, µg	4000	0	150	3850	811	1013	1351	2026	4053
Vitamin D, µg	100	9	12	80	17	21	28	42	84
Tocopherol, mg	300	11	12	276	58	73	97	146	291
Thiamine, mg	50	1	0.8	48	10	13	17	25	50
Riboflavin, mg	43	2	1	40	8	11	14	21	42
Niacin, mg	900	20	10	870	183	229	305	458	916
Vitamin B12, µg	2000	8	0.8	1991	419	524	699	1048	2096
Vitamin B6, mg	25	2	1	22	5	6	8	12	23
Folic acid, µg	1000	0	98	902	190	237	316	475	949

Skedsmo study, women 70 +	UL/GL	75P intake from food/drink	Intake from suppl. (mean, users only)	Maximal amount (MA)	Max addition pr. 100 kcal (FA) E% from fortified foods				
					25	20	15	10	5
Vitamin C, mg	1000	125	51	825	174	217	289	434	868
Calcium, mg	2500	851	186	1463	308	385	513	770	1540
Magnesium, mg	250	0	50	200	42	53	70	105	211
Iron, mg	50	10	5	35	7	9	12	19	37
Zinc, mg	40	10	6	24	5	6	8	13	25
Copper, mg	5	1	1	3	0.6	0.8	1,0	2	3
Selenium, µg	300	64	24	213	45	56	75	112	224
Iodine, µg	600	223	57	320	67	84	112	168	336
Phosphorus, mg	3000	1554	0	1446	304	380	507	761	1522

Table Appendix II-21: Intakes in the 75th percentile in men 18-70 years from Norkost 3 and DANSDA 2011-2013 (for vitamin K1 and chromium). Energy intake in the 75th percentile is approximately 3100 kcal in both Norkost 3 and DANSDA.

Norkost 3, men 18-70 y (data for vitamin K1 and chromium is from DANSDA)	UL/GL	75P intake from food/drink	Intake from suppl. (mean, users only)	Maximal amount (MA)	Max addition pr. 100 kcal (FA) E% from fortified foods				
					25	20	15	10	5
Retinol, µg	3000	948	467	1585	205	256	341	511	1023
β-carotene, µg	4000	0	1443	2557	330	412	550	825	1650
Vitamin D, µg	100	8	14	78	10	13	17	25	50
Tocopherol, mg	300	15	15	270	35	44	58	87	174
Thiamine, mg	50	2	1	47	6	8	10	15	30
Riboflavin, mg	43	3	1	39	5	6	8	13	25
Niacin, mg	900	31	15	854	110	138	184	275	551
Vitamin B12, µg	2000	11	6	1983	256	320	427	640	1280
Vitamin B6, mg	25	2	2	21	3	3	4	7	13
Folic acid, µg	1000	0	172	828	107	134	178	267	534
Vitamin C, mg	1000	141	135	724	93	117	156	234	467
Calcium, mg	2500	1295	169	1036	134	167	223	334	668
Magnesium, mg	250	0	79	171	22	28	37	55	110
Iron, mg	50	15	10	25	3	4	5	8	16
Zinc, mg	40	16	10	14	2	2	3	4	9
Copper, mg	5	2	1	2	0.3	0.3	0.4	1	1
Selenium, µg	300	79	43	178	23	29	38	57	115
Iodine, µg	600	260	117	223	29	36	48	72	144
Phosphorus, mg	3000	2350	126	524	68	85	113	169	338
Vitamin K1, µg	1000	115	8	877	113	141	189	283	566
Chromium, µg	21000	49	21	20930	2701	3376	4501	6752	13503

Table Appendix II-22: Intakes in the 75th percentile in women 18-70 years from Norkost 3 and DANSDA 2011-2013 (for vitamin K1 and chromium). Energy intake in the 75th percentile is approximately 2300 kcal in both Norkost 3 and DANSDA.

Norkost 3, women 18-70 y (data for vitamin K1 and chromium is from DANSDA)	UL/GL	75P intake from food/drink	Intake from suppl. (mean, users only)	Maximal amount (MA)	Max addition pr. 100 kcal (FA) E% from fortified foods				
					25	20	15	10	5
Retinol, µg	3000	653	386	1961	341	426	568	853	1705
β-carotene, µg	4000	0	1556	2444	425	531	708	1063	2125
Vitamin D, µg	100	6	11	82	14	18	24	36	72
Tocopherol, mg	300	12	12	276	48	60	80	120	240
Thiamine, mg	50	2	2	47	8	10	14	20	41
Riboflavin, mg	43	2	2	39	7	9	11	17	34
Niacin, mg	900	23	12	865	150	188	251	376	752
Vitamin B12, µg	2000	8	12	1980	344	430	574	861	1722
Vitamin B6, mg	25	2	2	21	4	5	6	9	18
Folic acid, µg	1000	0	149	851	148	185	247	370	740
Vitamin C, mg	1000	147	119	734	128	160	213	319	638
Calcium, mg	2500	1027	276	1197	208	260	347	520	1041
Magnesium, mg	250	0	111	139	24	30	40	60	121
Iron, mg	50	12	17	21	4	5	6	9	19
Zinc, mg	40	12	9	19	3	4	6	8	17
Copper, mg	5	1	1	3	0.4	1	1	1	2
Selenium, µg	300	60	36	204	35	44	59	89	177
Iodine, µg	600	189	95	316	55	69	92	137	275
Phosphorus, mg	3000	1781	78	1141	198	248	331	496	992
Vitamin K1, µg	1000	105	8	887	154	193	257	386	771
Chromium, µg	21000	36	21	20943	3642	4553	6070	9106	18211

Table Appendix II-23: Intakes in the 75th percentile in 13-year-olds from Ungkost 3 and DANSDA 2011-2013 (for vitamin K1 and chromium). Energy intake in the 75th percentile is approximately 2300 kcal in Ungkost 3 and 2400 kcal in DANSDA.

Ungkost 3, 13-year-olds (data for vitamin K1 and chromium is from DANSDA)	UL/GL	75P intake from food/drink	Intake from suppl. (mean, users only)	Maximal amount (MA)	Max addition pr. 100 kcal (FA) E% from fortified foods				
					25	20	15	10	5
Retinol, µg	2000	506	187	1307	227	284	379	568	1137
β-carotene, µg	3000	0	0	3000	522	652	870	1304	2609
Vitamin D, µg	50	5	8	37	6	8	11	16	32
Tocopherol, mg	220	11	8	201	35	44	58	87	175
Thiamine, mg	34	2	0.6	32	6	7	9	14	28
Riboflavin, mg	29	2	0.6	27	5	6	8	12	23
Niacin, mg	500	19	10	471	82	102	137	205	410
Vitamin B12, µg	1330	7	1	1322	230	287	383	575	1150

Ungkost 3, 13-year-olds (data for vitamin K1 and chromium is from DANSDA)	UL/GL	75P intake from food/drink	Intake from suppl. (mean, users only)	Maximal amount (MA)	Max addition pr. 100 kcal (FA) E% from fortified foods				
					25	20	15	10	5
					Vitamin B6, mg	20	1	0.9	18
Folic acid, µg	600	0	102	498	87	108	144	217	433
Vitamin C, mg	1200	61	51	1088	189	237	315	473	946
Calcium, mg	2500	1049	375	1076	187	234	312	468	936
Magnesium, mg	250	0	71	179	31	39	52	78	156
Iron, mg	30	10	7	13	2	3	4	5	11
Zinc, mg	23	13	4	6	1	1	2	3	5
Copper, mg	4	1	0.3	3	0.5	1	1	1	2
Selenium, µg	200	42	17	141	25	31	41	61	123
Iodine, µg	450	131	65	254	44	55	74	110	221
Phosphorus, mg	3000	1658	0	1342	233	292	389	583	1167
Vitamin K1, µg	670	69	6	595	99	124	165	248	496
Chromium, µg	13020	33	14	12973	2162	2703	3604	5405	10811

Table Appendix II-24: Intakes in the 75th percentile in 9-year-olds from Ungkost 3 and DANSDA 2011-2013 (for vitamin K1 and chromium). Energy intake in the 75th percentile is approximately 2000 kcal in Ungkost 3 and 2200 kcal in DANSDA.

Ungkost 3, 9-year-olds (data for vitamin K1 and chromium is from DANSDA)	UL/GL	75P intake from food/drink	Intake from suppl. (mean, users only)	Maximal amount (MA)	Max addition pr. 100 kcal (FA) E% from fortified foods				
					25	20	15	10	5
					Retinol, µg	1500	524	188	788
β-carotene, µg	2000	0	0	2000	400	500	667	1000	2000
Vitamin D, µg	25	5	7	14	3	3	5	7	14
Tocopherol, mg	160	10	7	143	29	36	48	72	143
Thiamine, mg	25	1	0.6	23	5	6	8	12	23
Riboflavin, mg	22	2	0.7	20	4	5	7	10	20
Niacin, mg	350	15	7	328	66	82	109	164	328
Vitamin B12, µg	1000	6	0.9	993	199	248	331	497	993
Vitamin B6, mg	10	1	0.7	8	2	2	3	4	8
Folic acid, µg	400	0	68	332	66	83	111	166	332
Vitamin C, mg	1200	60	39	1101	220	275	367	551	1101
Calcium, mg	2500	995	0	1505	301	376	502	753	1505
Magnesium, mg	250	0	59	191	38	48	64	96	191
Iron, mg	20	9	6	5	1	1	2	2	5
Zinc, mg	23	11	4	8	2	2	3	4	8
Copper, mg	3	1	0.3	2	0.3	0.4	1	1	2
Selenium, µg	130	40	17	73	15	18	24	37	73
Iodine, µg	300	131	69	100	20	25	33	50	100
Phosphorus, mg	3000	1547	0	1453	291	363	484	727	1453
Vitamin K1, µg	500	54	5	441	80	100	134	200	401

Ungkost 3, 9-year-olds (data for vitamin K1 and chromium is from DANSDA)	UL/GL	75P intake from food/drink	Intake from suppl. (mean, users only)	Maximal amount (MA)	Max addition pr. 100 kcal (FA) E% from fortified foods				
					25	20	15	10	5
Chromium, µg	6930	30	8	6892	1253	1566	2088	3133	6265

Table Appendix II-25: Intakes in the 75th percentile in 4-year-olds from Ungkost 3 and DANSDA 2011-2013 (for vitamin K1 and chromium). Energy intake in the 75th percentile is approximately 1600 kcal in Ungkost 3 and 2200 kcal in DANSDA.

Ungkost 3, 4-year-olds (data for vitamin K1 and chromium is from DANSDA)	UL/GL	75P intake from food/drink	Intake from suppl. (mean, users only)	Maximal amount (MA)	Max addition pr. 100 kcal (FA) E% from fortified foods				
					25	20	15	10	5
Retinol, µg	1100	596	193	311	78	97	130	194	389
β-carotene, µg	2000	0	250	1750	438	547	729	1094	2188
Vitamin D, µg	25	6	7	12	3	4	5	7	15
Tocopherol, mg	120	10	7	103	26	32	43	64	128
Thiamine, mg	20	1	0.6	18	5	6	8	11	23
Riboflavin, mg	16	2	0.7	14	3	4	6	9	17
Niacin, mg	220	14	8	198	50	62	83	124	248
Vitamin B12, µg	730	6	2	723	181	226	301	452	903
Vitamin B6, mg	7	1	0.8	5	1	2	2	3	6
Folic acid, µg	300	0	55	245	61	77	102	153	306
Vitamin C, mg	650	76	44	530	133	166	221	331	663
Calcium, mg	2500	865	361	1274	319	398	531	796	1593
Magnesium, mg	250	0	136	114	29	36	48	71	143
Iron, mg	14	8	12	-6	-1	-2	-2	-4	-7
Zinc, mg	12	9	5	-2	-0.5	-1	-1	-1	-2
Copper, mg	2	0.9	1	0.1	0.0	0.0	0.0	0.1	0.1
Selenium, µg	90	38	27	25	6	8	10	16	31
Iodine, µg	250	131	64	55	14	17	23	34	69
Phosphorus, mg	3000	1313	502	1185	296	370	494	741	1481
Vitamin K1, µg	370	54	5	311	57	71	94	141	283
Chromium, µg	6930	30	8	6892	1253	1566	2088	3133	6265

Table Appendix II-26: Intakes in the 75th percentile in 2-year-olds from Småbarnskost 3. Energy intake in the 75th percentile is approximately 1500 kcal.

Småbarnskost 3, 2-year-olds	UL/GL	75P intake from food/ drink	Intake from suppl. (mean, users only)	Maximal amount (MA)	Max addition pr. 100 kcal (FA) E% from fortified foods				
					25	20	15	10	5
					Retinol, µg	800	1063	216	-479
β-carotene, µg	1000	0	0	1000	267	333	444	667	1333
Vitamin D, µg	25	6	10	10	3	3	4	6	13
Tocopherol, mg	100	9	9	83	22	28	37	55	110
Thiamine, mg	15	1	0.6	13	4	4	6	9	18
Riboflavin, mg	12	2	0.7	10	3	3	4	6	13
Niacin, mg	150	11	8	131	35	44	58	87	175
Vitamin B12, µg	530	5	1	524	140	175	233	349	698
Vitamin B6, mg	5	1	0.7	3	1	1	1	2	4
Folic acid, µg	200	0	77	123	33	41	55	82	164
Vitamin C, mg	400	84	39	277	74	92	123	185	369
Calcium, mg	2500	1090	251	1159	309	386	515	773	1545
Magnesium, mg	85	0	60	25	7	8	11	17	33
Iron, mg	10	8	7	-6	-1	-2	-2	-4	-7
Zinc, mg	7	9	6	-7	-2	-2	-3	-5	-10
Copper, mg	1	0.8	0.4	-0.2	-0.1	-0.1	-0.1	-0.1	-0.3
Selenium, µg	60	39	24	-3	-1	-1	-1	-2	-4
Iodine, µg	200	167	96	-63	-17	-21	-28	-42	-84
Phosphorus, mg	3000	1417	0	1583	422	528	704	1055	2111

Table Appendix II-27: Intakes in the 75th percentile in 1-year-olds from Spedkost 3 (non-breastfeds only). Energy intake in the 75th percentile is approximately 1400 kcal.

Spedkost 3 (non- breastfeds only), 1-year-olds	UL/GL	75P intake from food/ drink	Intake from suppl. (mean, users only)	Maximal amount (MA)	Max addition pr. 100 kcal (FA) E% from fortified foods				
					25	20	15	10	5
					Retinol, µg	800	1410	215	-825
β-carotene, µg	1000	0	0	1000	286	357	476	714	1429
Vitamin D, µg	25	12	10	3	1	1	2	2	5
Tocopherol, mg	100	14	8	78	22	28	37	56	111
Thiamine, mg	15	2	0.7	13	4	4	6	9	18
Riboflavin, mg	12	2	0.8	10	3	3	5	7	14
Niacin, mg	150	15	9	127	36	45	60	90	181
Vitamin B12, µg	530	4	1	525	150	187	250	375	749
Vitamin B6, mg	5	1	0.8	3	1	1	1	2	4
Folic acid, µg	200	0	89	111	32	40	53	79	159
Vitamin C, mg	400	156	40	204	58	73	97	146	292
Calcium, mg	2500	962	250	1288	368	460	613	920	1840

Spedkost 3 (non-breastfeds only), 1-year-olds	UL/GL	75P intake from food/drink	Intake from suppl. (mean, users only)	Maximal amount (MA)	Max addition pr. 100 kcal (FA) E% from fortified foods				
					25	20	15	10	5
Magnesium, mg	85	0	65	20	6	7	9	14	28
Iron, mg	10	16	14	-19	-6	-7	-9	-14	-28
Zinc, mg	7	10	6	-9	-3	-3	-4	-6	-13
Copper, mg	1	1	0.4	-0.4	-0.1	-0.1	-0.2	-0.3	-1
Selenium, µg	60	39	26	-5	-1	-2	-2	-4	-7
Iodine, µg	200	164	104	-68	-19	-24	-32	-49	-97
Phosphorus, mg	3000	1211	0	1789	511	639	852	1278	2556