



Consumption of fortified foods, and intake of vitamins and minerals from all foods

Report from the secretariat

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Contributors

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Terms of reference

The background for the request to the Norwegian Scientific Committee for Food Safety (NSCFS) is Article 16 of Regulation (EC) No 1925/2006. Article 16 establishes that the Commission shall submit by 1 July 2013 a report to the European Parliament and the Council on the effects of implementing that Regulation. With regard to this, the Member States shall provide the necessary relevant information to the Commission by 1 July 2012.

The Norwegian Food Safety Authority has requested the NSCFS to estimate the average intake levels in Norway of foods to which vitamins and minerals have been added, and any observed changes in the intake of such foods in the time period 1997 -2011, to the extent that there are data on this. Further, the NSCFS is requested to estimate the average intake levels of vitamins and minerals and to report on any observed changes in the intake levels of vitamins and minerals in the time period 1997-2011, to the extent that there are data on this. The intake shall be calculated both for ordinary and enriched foods and beverages. The dietary survey methodologies shall be described.

Both the intake of the foods to which vitamins and minerals have been added, and the intake of vitamins and minerals should be provided for the population groups 18 years and above, and children and adolescents (13-, 9-, 4-, 2- and 1-year-olds).

The detailed request appears from the appendixes in the draft regulation that describes the information that shall be submitted to the EU Commission. The relevant sections in the appendixes that deal with calculation of consumption and intake levels are described in the attachment to the request.

Answer to the terms of reference

In the present report, the consumption data on fortified food and drinks is based on data from the national food consumption surveys; Spedkost 1999 and 2007, Småbarnskost 1999 and 2007, Ungkost 2000, Norkost 2 and Norkost 3.

The calculated vitamin and mineral intakes are based on the same national dietary surveys. All vitamins and minerals are calculated without dietary supplements.

1 Consumption surveys

A short description of the consumption surveys and the different methodologies used is given below:

- **1-year-old infants;** Spedkost 2006-2007 and Spedkost 1998-99.
Spedkost 2006-2007 is based on a semi-quantitative food frequency questionnaire. In addition to predefined household units, food amounts were also estimated from photographs. The study was conducted in 2007, and a total of 1635 1-year-old children participated (Øverby *et al.*, 2009).

Spedkost 1998-99 is based on a semi-quantitative food frequency questionnaire. In addition to predefined household units, food amounts were also estimated from photographs. The study was conducted in 1999, and a total of 1932 1-year-olds participated (Lande & Andersen, 2005).

- **2-year-old children;** Småbarnskost 2007 and Småbarnskost 1999.
Småbarnskost 2007 is based on a semi-quantitative food frequency questionnaire. In addition to predefined household units, food amounts were also estimated from photographs. The study was conducted in 2007, and a total of 1674 2-year-olds participated (Kristiansen, Andersen & Lande, 2009).

Småbarnskost 1999 is based on a semi-quantitative food frequency questionnaire. In addition to predefined household units, food amounts were also estimated from photographs. The study was conducted in 1999, and a total of 1720 2-year-old children participated (Lande & Andersen, 2005).

- **4-year-old children;** Ungkost 2000 is based on a 4-day food intake registration with a precoded food diary. Food amounts were presented in predefined household units or as portions estimated from photographs (Pollestad *et al.*, 2002). The study was conducted in 2001, and 391 4-year-olds participated.
- **9- and 13-year-old children/adolescents;** Ungkost 2000 is based on a 4-day food intake registration with a precoded food diary. Food amounts were presented in predefined household units or as portions estimated from photographs (Øverby & Andersen, 2002). The study was conducted in 2000 and 815 9-year-old children and 1009 13-year-old adolescents participated.
- **Adults;** Norkost 3 and Norkost 2
Norkost 3; Norkost 3 is 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 study was conducted in 2010/2011 and 1787 adults aged 18-70 participated.
Norkost 2; Norkost 2 is based on a semi-quantitative food frequency questionnaire. The study was conducted in 1997. A total of 2672 adults (1381 females and 1291 males) aged 16-79 participated (Johansson L & Solvoll K, 1999).

2 Mean consumption of fortified foods

Consumption data on fortified foods are limited in all the national dietary surveys. There are only three products or groups of products which have consumption data. The three products presented in this report are: low fat milk with added vitamin D, butter and margarine fortified with vitamin A and D, and energy drinks.

Table salt (NaCl) has been fortified with iodine for many years (0,5 mg NaCl per 100 g). Salt fortified with iodine is not included in this report. Salt is added in many industry produced foods like sauce, soups, bread and ready-to-eat meals, and the salt content changes with brands and recipes changes constantly. In addition salt with and without iodine is added to food prepared at home both during cooking and at the table. All the sources and the unknown quantities of how much of the salt that is fortified makes it difficult to assess salt intake within the limits of a dietary survey methodology.

Consumption of fortified butter (with 1174 µg retinol and 8 µg vitamin D per 100g) and margarines (with 900 µg retinol and 8 µg vitamin D per 100 g) have been calculated from the data in all of the national dietary surveys, and low fat milk (0.4 µg vitamin D per 100 g) have been calculated using data from surveys conducted from year 2000 onwards. Consumption of butter/margarine include both fat spread on bread and in cooking, and low fat milk includes both milk for drinking and in cooking.

The FFQ for the 1- and 2-year-olds did not include questions of energy drinks, neither did the FFQ used in Norkost 2. Energy drinks were asked for in Ungkost 2000 and Norkost 3. The data is included, but due to the low numbers of reported consumers in the surveys it is not possible to interpret a mean consumption.

Consumption of fortified foods and drinks and intake of vitamins and minerals from these sources were computed by using food databases in the software system (KBS) developed at the Institute of Basic Medical Sciences, Department of Nutrition, at the University of Oslo. The food databases are mainly based on various versions of the official Norwegian food composition table (Rimestad et al. 2000, The Norwegian Food Composition Table 1995 and 2006).

Intakes of vitamins and minerals are calculated without including supplements and cod liver oil. It should however, be emphasised that cod liver oil containing vitamin D and retinol (or other vitamin D supplementation) is recommended for infants from 4 weeks and is commonly used in all age groups in Norway.

Tables 1-4 show mean consumption of margarine, butter, low fat milk and energy drinks in different age groups.

Table 1 Consumption (g/day) of margarine/butter and low fat milk in 1-year-olds (both breastfed and non-breastfed), mean intake and standard deviation (sd), number of consumers. Data from Spedkost 1999 and Spedkost 2007.

| Foods | Spedkost 1999 | | Spedkost 2007 | |
|------------------|--------------------------------|----------------------------------|--------------------------------|----------------------------------|
| | Mean consumption, all (n=1932) | Mean consumption, consumers only | Mean consumption, all (n=1635) | Mean consumption, consumers only |
| Margarine/Butter | 12 (10) | 12 (9), n=1862 | 9 (9) | 10 (9), n=1504 |
| Low fat milk | Not on market | Not on market | 17 (78) | 154 (188), n=178 |

Table 2 Consumption (g/day) of margarine/butter and low fat milk in 2-year-olds, mean intake and standard deviation (sd), number of consumers. Data from Småbarnskost 1999 and Småbarnskost 2007

| Foods | Småbarnskost 1999 | | Småbarnskost 2007 | |
|------------------|--------------------------------|----------------------------------|--------------------------------|----------------------------------|
| | Mean consumption, all (n=1720) | Mean consumption, consumers only | Mean consumption, all (n=1674) | Mean consumption, consumers only |
| Margarine/Butter | 19 (10) | 19 (10), n=1712 | 16 (11) | 16 (11), n=1669 |
| Low fat milk | Not on market | Not on market | 55 (149) | 219 (229), n=420 |

Table 3 Consumption (g/day) of margarine/butter, energy drinks and low fat milk in children and adolescents, mean intake and standard deviation (sd), number of consumers. Data from Ungkost 2000.

| Foods | 4-year-olds | | 9-year-olds | | 13-year-olds | |
|------------------|-------------------------------|----------------------------------|-------------------------------|----------------------------------|--------------------------------|----------------------------------|
| | Mean consumption, all (n=391) | Mean consumption, consumers only | Mean consumption, all (n=810) | Mean consumption, consumers only | Mean consumption, all (n=1005) | Mean consumption, consumers only |
| Margarine/Butter | 16 (9) | 16 (9), n=389 | 17 (12) | 17 (12), n=799 | 13 (12) | 14 (11), n=957 |
| Low fat milk | 15 (59) | 128 (120), n=47 | 26 (87) | 147 (156), n=146 | 32 (104) | 173 (183), n=187 |
| Energy drinks | Not reported | Not reported | 0 (2) | 62,5 , n=1 | 1 (20) | 164 (134), n=9 |

Table 4 Consumption (g/day) of the fortified foods: margarine/butter, energy drinks and low fat milk in adults, mean intake and standard deviation (sd), number of consumers. Data from Norkost 2 and Norkost 3.

| Foods | Norkost 2* | | Norkost 3* | |
|-------------------------|--|-----------------------------|--|--|
| | Consumption, all (n=2672) mean (sd) | Consumption, consumers only | Consumption g/day, all (n=1787) mean (sd) | Consumption, consumers only mean (sd) n |
| Margarine/Butter, g/day | 22 (22) | 22 (22), n=2670 | 19 (17) | 21 (17), n=1667 |
| Low fat milk, g/day | Not on market | Not on market | 55 (171) | 309 (292), n=319 |
| Energy drinks, g/day | Not reported | Not reported | 2 (22) | 250 (125), n=11 |

*The consumption cannot be directly compared between Norkost 2 and 3 because different dietary assessment methods have been used.

3 Interpretation of changes in consumption of fortified foods 1997-2011

Interpretations of the changes in consumption of vitamins, minerals from all foods, and changes in consumption of fortified foods between different dietary surveys have to be performed with outmost caution.

Among 1- and 2-year-olds the dietary survey method was on both occasions a semi-quantitative food frequency questionnaire (FFQ). However, the questionnaires were slightly modified between the two surveys. A calibration study has been conducted for the 2-year-old's questionnaires (Kristiansen et al., in press). Results from this study showed that there were significant differences observed between the two FFQs for carbohydrates and added sugar, and 5 out of 16 food groups. Fortified foods were not an issue in the calibration study, and the results do not indicate if there could be differences in reporting of fortified foods. Therefore, it is not possible to derive any information on any changes in the consumption.

Norkost 2 and 3 cannot be compared directly since the two surveys were performed with two different dietary assessment methods: FFQ and 24-hour recalls.

Fortified foods available on the market in the time period 1997-2011 have changed. Fortified butter and margarine have been on the market during the whole time period 1997-2011. Low fat milk with added vitamin D (Ekstra lettmeik) was introduced in 2000. Different energy drinks like Battery and Red Bull have also been introduced to the Norwegian market in this period. However, due to the low reported consumption of energy drinks in the surveys it is not possible to interpret a mean intake.

4 Mean intake of vitamins and minerals

Table 5 shows the mean intake of vitamins and minerals in Norway according to data from the national consumption surveys. The calculated intake from the whole diet includes intake of vitamin D from fortified butter, margarine and low fat milk, and retinol from fortified butter and margarine.

Table 5 The intake of vitamins and minerals in 1-year-olds has been calculated among all infants, also breastfed children. In all age groups the intake has been calculated from foods and drinks only, and food supplements have not been included. e 5 Mean daily intake of vitamins and minerals (excluding food supplements). Data from Norkost 3 (2010/11), Norkost 2 (1997), Ungkost 2000, Småbarnskost 2007, Småbarnskost 1999, Spedkost 2007 and Spedkost 1999.

| | Norkost 3 n=1787 | Norkost 2 n=2672 | Ungkost, 13-year-olds n=1005 | Ungkost, 9-year-olds n=810 | Ungkost, 4-year-olds n=391 | Småbarns- kost, 2007 n=1674 | Småbarns- kost, 1999 n=1720 | Spedkost 2007, 1-year- olds n=1635 | Spedkost 1999 n=1932 |
|------------------------------|---------------------|---------------------|------------------------------------|----------------------------------|----------------------------------|-----------------------------------|-----------------------------------|---|----------------------------|
| Vitamin A, RAE, µg | 880 | 1182 | 935 | 994 | 906 | 702 | 1114 | 829 | 1903 |
| Vitamin D, µg | 5.75 | 5.2 | 2.5 | 2.8 | 2.6 | 2.9 | 2.7 | 6.0 | 3.1 |
| Vitamin E, mg | 11.1 | 7.8 | 6.9 | 6.1 | 4.5 | 4.5 | 4.3 | 3.7 | 5.3 |
| Thiamin, mg | 1.6 | 1.5 | 1.1 | 1.1 | 0.9 | 1.0 | 0.9 | 0.9 | 0.8 |
| Riboflavin, mg | 1.8 | 1.8 | 1.4 | 1.44 | 1.2 | 1.5 | 1.4 | 1.1 | 1.3 |
| Vitamin B ₆ , mg | 1.7 | * | * | * | * | * | * | * | * |
| Folate, µg | 255 | * | * | * | * | 148 | * | 115 | * |
| Vitamin B ₁₂ , µg | 7.4 | * | * | * | * | * | * | * | * |
| Vitamin C, mg | 108 | 124 | 89 | 84 | 66 | 59 | 84 | 89 | 96 |
| Calcium, mg | 918 | 948 | 858 | 833 | 675 | 787 | 771 | 709 | 732 |
| Magnesium, mg | 391 | 347 | 247 | 237 | 186 | 230 | 194 | 120 | 184 |
| Iron, mg | 11.2 | 11.1 | 9.4 | 8.8 | 6.6 | 7.1 | 7.1 | 10.7 | 10.9 |
| Potassium, mg | 3797 | * | * | * | * | * | * | * | * |

*Not a valid value in KBS.

References

- Johansson L & Solvoll K (1999): Norkost 1993-94 og 1997. Landsomfattende kostholdsundersøkelser blant menn og kvinner i alderen 16-79 år. Statens råd for ernæring og fysisk aktivitet, Oslo.
- Kristiansen AL, Andersen LF & Lande B (2009): Småbarnskost – 2 år. Landsomfattende kostholdsundersøkelse blant 2 år gamle barn. Helsedirektoratet. Oslo
- Kristiansen AL, Lillegaard ITL, Lande B and Andersen LF: Effect of changes in a food-frequency questionnaire – Comparing data from two national dietary survey instruments among 2-year-olds, Br J Nutr, In press.
- Lande B (2003): Spedkost 6 – Landsomfattende kostholdsundersøkelse blant spedbarn i Norge. Sosial- og helsedirektoratet. Oslo.
- Lande B & Andersen LF (2005): Spedkost 12 måneder. Landsomfattende kostholdsundersøkelse blant spedbarn i Norge. Sosial- og helsedirektoratet. Oslo.
- Pollestad ML, Øverby NC & Andersen LF (2002): Kosthold blant 4-åringene. Landsomfattende kostholdsundersøkelse. UNGKOST-2000. Sosial- og helsedirektoratet. Oslo.
- Totland TH, Melnæs BK, Lundberg-Hallèn N, Helland-Kigen KM, Lund-Blix NA, Myhre JB, Johansen AMW, Løken EB & Andersen LF (2012): En landsomfattende kostholdsundersøkelse blant menn og kvinner i Norge i alderen 18-70 år, 2010-11. Helsedirektoratet. Oslo.
- Øverby NC & Andersen LF (2002): Ungkost 2000. Landsomfattende kostholdsundersøkelse blant elever i 4.- og 8. klasse i Norge. Sosial- og helsedirektoratet. Oslo.
- Øverby NC, Kristiansen AL, Andersen LF & Lande B (2008): Spedkost – 6 måneder. Landsomfattende kostholdsundersøkelse blant 6 måneder gamle barn. Helsedirektoratet, Mattilsynet og Universitetet i Oslo. Oslo.
- Øverby NC, Kristiansen AL, Andersen LF & Lande B (2009): Spedkost - 12 måneder. Landsomfattende kostholdsundersøkelse blant 12 måneder gamle barn. Helsedirektoratet. Oslo.