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Post Launch Monitoring of Functional Foods

Methodology development (II)

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Abstract

Post Launch Monitoring of Functional Foods: Methodology development (II)

Despite the availability of numerous cohort and monitoring studies in different populations in the Netherlands, the available information on functional food and/or supplement use on the whole from these studies is rather limited. Unfortunately, food intake data are vital for Post Launch Monitoring (PLM) of functional foods. Data gathered within the framework of the Dutch National Food Consumption Survey (DNFCS) appear most appropriate for signaling purposes – a first step in PLM. It will be important for future national surveys to provide individual links to other registries and to focus the survey on, among others, special target and risks groups for functional food consumption and supplements. Collecting additional nutritional and health status information and further development of nutrient databases to calculate nutrient intake will be imperative. Two studies were investigated to obtain experience in using the currently available functional food consumption data. In the DNFCS 2003 study with participants aged 19 to 30 years, the total dietary intake by users generally met the recommendations, with folic acid being a frequent exception. The recommended amounts for the phytosterol/phytostanol enriched spreads were not met by the consumers. The VIO 2002 study with children aged 9, 12, and 18 months showed (among users) total dietary intake to amply meet the recommendations. In neither study did intakes generally exceed the safe Upper Levels, with very few exceptions in the 90th percentile of the intake distributions. Since results are based on observed intakes and not on usual intakes, they are only indicative.

Key words:
Post Launch Monitoring, functional foods, cohort studies, monitoring studies, food consumption

Het rapport in het kort

Postlaunch monitoring van functionele voedingsmiddelen – methodologie ontwikkeling (II)

Consumptiegegevens over functionele voedingsmiddelen zijn beperkt beschikbaar, ondanks de vele monitoring- en cohortstudies die in Nederland zijn en worden uitgevoerd. Voor het adequaat uitvoeren van postlaunch monitoring (PLM) van functionele voedingsmiddelen en het signaleren van mogelijke problemen echter, zijn op persoonsniveau te koppelen voedselconsumptiegegevens essentieel. Innemingsdata zoals verzameld in de voedselconsumptiepeiling (VCP) lijken het meest waardevol. Aandacht is gewenst voor specifieke doel- en risicogroepen voor functionele voedingsmiddelen en supplementen, voor informatie over de voedings- en gezondheidstoestand van de populatie, alsook voor databestanden nodig voor de berekening van de nutriëntenvoorziening.
Twee studies (een bij jongvolwassenen en een bij kinderen van 9, 12 en 18 maanden) zijn nader bekeken op consumptie van functionele voedingsmiddelen. Onder gebruikers bleek de nutriëntenvoorziening (in sommige gevallen ruimschoots) te worden gehaald. Alleen de foliumzuurvoorziening bij jongvolwassenen schoot veelal tekort en de aanbevolen hoeveelheid van met phytosterolen/-stanolen verrijkte margarines werd niet gehaald. In beide studies werden de veilig geachte bovengrenzen niet overschreden, met uitzondering van enkele overschrijdingen door gebruikers die zich in de bovenste 10 procent van de verdeling bevinden. De resultaten zijn slechts indicatief omdat deze bevindingen zijn gebaseerd op de waargenomen inneming en niet op de gebruikelijke inneming.

Trefwoorden:
Post Launch Monitoring, functionele voedingsmiddelen, cohort studies, monitoring studies, voedselconsumptie

Contents

Summary

Despite the availability of numerous cohort and monitoring studies in different populations in the Netherlands, on the whole the information on functional foods consumption available from these studies is rather limited. Several causes should be mentioned within this respect: among others an obvious delay in getting accurate data due to a fast changing supply and consumption of these types of foods. Also, the limited number of consumers of functional foods and the limited consumption data (e.g. only frequency of consumption is recorded and not the absolute amount of intake) do not contribute to a solid database within this respect. Unfortunately, food intake data are vital for the execution of Postlaunch Monitoring (PLM) of functional foods. Data gathered within the framework of the Dutch National Food Consumption Survey (DNFCS) appear to be most appropriate at this stage. For future national surveys it will be important to link these data to other registries on an individual level. Also, it will be important to focus the survey on special target and risks groups for functional food consumption.

To obtain experience with the available data, two studies have been investigated more thoroughly: the DNFCS 2003 and the VIO 2002 (Nutrient Intake Study). In the DNFCS 2003 the study participants were aged 19 to 30 years. In this study the recommended dietary allowances were generally met, however in several cases the folic acid recommendations and the recommended amounts for the phytosterol/-stanol enriched spreads were not met by the consumers. In general, the total dietary intake did not exceed the safe Upper Levels. One exception on this was observed: women finding themselves in the upper part of the distribution (P90) using micronutrient enriched margarine exceeded the limits for calcium and vitamin A in the two days their food had been recorded. The VIO 2002 was performed in children aged 9, 12, and 18 months. Again the total dietary intake among the users amply met the recommendations and in general the established safe Upper Levels were not exceeded with a few exceptions for vitamin A and zinc intake in especially the upper ten percent of users. However, final conclusions on this cannot be drawn as for both studies a few remarks are in place for interpretation purposes: the data presented in this report may not be as representative as we would have liked as usage numbers of functional foods are sometimes fairly low. Also, the figures presented in this report are based on two days of recording and not on usual intake figures. In case usual intake figures would be at disposal the upper and lower ends of the distribution would become less extreme and thus the observations in the P90 category would be influenced. On the other hand, supplement use could not be taken into account which could have led to an underestimation of results among specific users. The results are therefore only indicative for future topics of monitoring for future admittance policy.

1 Introduction

1.1 Background

Consumption of functional foods may constitute beneficial health effects which are often communicated by manufacturers through specific claims accompanying the product. Nevertheless, potential safety hazards of functional food consumption should not be disregarded: e.g. health issues through risks of over consumption of specific ingredients, the risk of interaction effects with other nutrients and/or active constituents in drugs, unclear long-term effects, or potential harmful effects in specific risk groups within the population. The manufacturer is responsible for the safety of the specific marketed product, whereas the government has to protect public health, and is therefore responsible for the safety of the overall food supply for the whole population. A Postlaunch Monitoring (PLM) system may be needed in order to carry out this governmental task with respect to functional foods, as not all possible adverse effects will be predictable based on the information assessed before market introduction of a new functional food. The *objective* of a PLM system is to systematically monitor (unexpected) health effects of functional food consumption after marketing and under customary conditions of use. On commission of the Dutch Ministry of Health, Welfare and Sport, we presented a theoretical proposal for a PLM methodology in an earlier report (3). Special attention has been paid to the theoretical necessities of such a system. Also, in this earlier report an inventory was compiled about available cohort and monitoring studies that might constitute suitable data for PLM purposes.

In short, PLM may consist of the following phases:
a) passive signaling of consumer complaints through for example consumer care telephone lines;
b) active signaling of hazardous effects based on active investigation of (pre- and postmarket) research data;
c) assessment of the relevance of the data from a and b;
d) quantification of the hazardous effects on a population (group) level;
e) balancing the beneficial (positive) and the hazardous (negative) effects, i.e. risk-benefit analyses;
f) regulation.

Investments in the organisational structure will be necessary to establish decision-making criteria for the different phases of PLM as to whether to proceed to a next phase. Besides, expert committees for assessments, and methods and frameworks for data analyses, scenario building and modeling techniques are to be established. And last but not least the item ‘who is responsible for what’ should be addressed for each PLM phase. For a detailed description of the different phases, the challenges and necessary investments we would like to refer to this earlier report (3). Once a theoretical PLM framework has been agreed upon, a case-by-case approach is advised in order to test and evaluate the suitability of the system, and to be able to adapt the system if necessary in due course.

To further build the PLM structure and to extend our experience for PLM related activities, we will focus in this report on a detailed description of the dietary assessmentmethods of the available Dutch cohort and monitoring datasets that may suit the PLM related activities. In addition, we will describe two case studies in which the exposure to functional foods and/or functional ingredients in subgroups of the Dutch population has been assessed. With the execution of these case studies a methodology will be investigated to further assess the ranges of intake and the associated risks on excess intake of functional foods in parts of the population. Moreover the boundaries of what can be explored in the currently existing databases will be sought.

1.2 Demarcation and approach

For our inventory on and evaluation of data availability and dietary assessment methods (chapter 2) we kept in mind two types of novel foods, i.e. those with specific bio-active components and the exotic foods. Also, we have taken into account the enriched foods and the micronutrient supplements. Genetically modified foods and phyto therapeutics have not been taken into account as there are different premarket (EU) regulations for these types of products which may require a different PLM system. Furthermore, we limited ourselves initially to the studies described in our earlier report (3) excluding two studies without any dietary information and including a few additional studies of potential interest. For readability, we have used the generic terms functional foods and supplements in this report. We investigated in our case studies (chapter 3 and 4), functional food use in general as well as functional ingredient use. In addition we attempted to gather the information from two different datasets, e.g. one in-home and one external, in order to obtain experience on the accessibility of different types of data. In these case studies we did not focus on supplement use, as this is a topic with again special difficulties regarding the availability of data. This will be described in an analogous RIVM report by Ocké et al. (15) on the data availability of supplement consumption in the Netherlands on commission of the Dutch Food and Consumer Product Safety Authority. Our report is finalized in chapter 5 with our concluding remarks.

2 Dietary assessment methods

2.1 Introduction

The important goals of the inventory on dietary assessment methods used in the Dutch cohort and monitoring studies were a) to gather knowledge about what data are available in the Netherlands in general and b) to find the appropriateness of these existing data for PLM purposes. For these monitoring purposes one is especially interested in those parts of the population distribution that reach upper or lower limits; e.g. excess intakes or inadequacies. However, available dietary data are often limited with respect to exposure information on functional foods and/or supplements. Either there is insufficient information with respect to the frequency or amounts of intake of functional foods or supplements consumed and/or there are no or insufficient up-to-date nutrient databases available to calculate the daily nutrient intake delivered by functional foods or supplements. Another limitation often encountered is the low number of users of functional foods or supplements in the various studies, which makes it impossible to study the specific users as a separate group of interest. Because of these power problems only cohort and/or monitoring studies of respectable sample size are of interest for PLM purposes. To overcome gaps in our knowledge concerning the dietary data, the use of biomarkers has been suggested to assess nutrient intake and status of specific functional food and/or supplement users (6). An important drawback of using biomarkers is that for many functional food ingredients there are no or unspecific biomarkers available. Furthermore, the source of the active ingredient will still be unknown and also only very few biomarkers truly represent absolute levels of intake. In addition gathering, storage, and analyses of blood samples also introduces a lot of practical, financial, and ethical hurdles. It seems therefore that up till now, the use of thorough food consumption data is the best alternative for general purposes. In special cases, these data may need to be completed with biochemical data. In this chapter we will give an overview of potential datasets suitable for PLM purposes with respect to dietary intake.

2.2 Methods

The starting point of our inventory was the overview of cohort and monitoring studies presented in the appendix of our earlier report (3). Three extra studies have been added to the original overview, namely the VIO (Nutrient Intake Study 2002 (in Dutch: Voedingsstoffen Inname Onderzoek), the Dutch Health Care Consumer Panel (NIVEL/Consumentenbond) survey performed in 2000, and a Survey on Food Consumption of allochtonous Population (TNO). The VIO study has been performed in 2002 by TNO among children of 9, 12 and 18 months of age on commission of the Dutch infant feeding company ‘Nutricia’ and contains quite some detailed information about the nutritional intake of the study group (1). The Dutch Health Care Consumer Panel survey has been performed in a representative sample of the Dutch adult population in 2000. The survey focused on opinions on functional foods and supplements and subsequently recorded frequency of usage of some functional foods and supplements (2). Two other surveys (GLAS and POLS) have been excluded for this report as no dietary data were available from these studies.

In theory the ideal intake dataset should contain the following information:
1) For a specific functional food:
- Exact identification of the functional food (contents, physical appearance, brand name etcetera);
- Frequency of usage/pattern of usage;
- Amount used;
- Details on the nutrients/ingredients delivered by the functional food;
- Details on the background diet.

2) For a specific supplement:
- Method of questioning, as this may vary considerably among different studies;
- Exact identification of the supplement (contents and physical appearance, brand name, standard supply unit etcetera.);
- Frequency of usage/pattern of usage;
- Amount used;
- Details on the nutrients/ingredients delivered by the supplement;
- Details on the background diet.

3) In general:
- Demographic descriptors;
- Preferably: nutritional and health status descriptors;
- Biochemical indicators or access to blood samples to determine biochemical indicators of potential PLM interest.

With respect to the frequency of usage one might be interested in the usual intake, in the actual (observed) intake, or in both, depending on the question to be answered, but in general data on usual intake may be preferred for monitoring longer term purposes.

Through further reading of the available literature on the particular studies and contacting the responsible persons for the particular studies more detailed information on the dietary assessment methods was gathered. With this knowledge at our disposal we could retrieve and describe the data that can be calculated from the available studies. The main topics of our investigation were the items described above at 1) and 2). The type of information mentioned at 3) has been briefly described in our earlier report and was not the topic of research of the current report.

2.3 Results

2.3.1 Functional foods

In Appendix I an overview is given of our inventory on the cohort and monitoring studies that might be of use for PLM purposes. Apart from the general study descriptors about the name of the study, the executive research institutes involved, year(s) of study, population descriptors and a general description about the methods used, specific information is retrieved on details of the background diets, functional food use and supplement use (among others information on type of products, brand names, frequency and amount of usage).

In general, studies on dietary assessment are to be distinguished in methods either investigating the observed intake on the short term (recalls or records) or the (usual) long term (food frequency questionnaires or dietary histories). These methods have been described in Appendix I in the fourth column. Another classification of the different methods could be the distinction between open methods (every item will be recorded: this is the case in recalls, records and dietary histories) or closed methods (food frequency questionnaire: only a limited number of foods are of interest). The closed method has been covered in our table by describing the foods of interest in a particular study either in the table or in the footnotes.

It appears from this table in Appendix I that the number of studies constituting any information on functional food use is rather limited. Below we will discuss the most important studies in the light of PLM purposes.

Dutch National Food Consumption Survey

The Dutch National Food Consumption Surveys (DNFCS, 1-3) still remain the most valuable and complete source of information with respect to food intake in the general population. Many reports have appeared that describe the results of these surveys, among others (4). The first three surveys have used a 2-day dietary record which supplies us with information on the actual intake of food. For a limited number of food groups a food frequency list has also been collected. The three surveys have been performed over 10 years; i.e. 1987/88, 1992, and 1997/1998. It is anticipated that functional food use during these years was not very common. The DNFCS 2003 has been performed more recently, but in a limited study population (men and women aged between 19 and 30 years) and has used the 2x24 h recall method which again retrieves a lot of information on the actual intake by an open method of questioning.

For PLM purposes, the most important drawbacks of these surveys are the limited background information of the participants (on socio-demographic details and/or health and nutritional status), the cross-sectional character of the surveys, the limited number of functional food users, and the limited information on frequency of usage, and thus usual intakes. Under certain conditions the observed intake can be reverted to usual intake with special computerisation methods. However, for functional food use which is characterised by erratic use or no use the calculation from observed to usual intake might be a problem. The addition of focused (functional) food frequecy lists would therefore be an advantage within this respect. Also, the addition of modules focusing on specific user groups (either target groups or risks groups) would be a strong advantage for PLM.

RIVM related studies

In the RIVM related studies the information as retrieved with the EPIC Food Frequency Questionnaire is predominant (8; 9). Through this FFQ for most foods and nutrients a rather general picture of the dietary intake of the study population is obtained. In the category of spreads, cooking oils and fats, the so-called functional food bread spreads of the phytosterol/-stanol enriched type (e.g. Benecol® and Becel pro.activ®) have been coded separately in this questionnaire. Studies that have used this EPIC questionnaire deliver information on the frequency of use as well as the amounts used for consumption for bread spreads. Participants are asked to tick the type of bread spreads they most commonly use. The phytosterol/-stanol enriched bread spreads could be recorded by the participant as a special type. The type of information on these bread spreads is quite useful for PLM purposes as amounts and frequency of consumption are available. Also, in many RIVM related studies detailed background information on study participants is available, e.g. socio-demographic details, details about the nutritional and health status and some biochemical parameters. The disadvantage of the EPIC FFQ is the fact that the list is not flexible: other types phytosterol/-stanol enriched foods that have appeared on the market in the meantime are not and cannot be included. Also information on other functional foods cannot be retrieved from this questionnaire. Power problems with respect to a low absolute number of functional food users also remain a difficult issue in these surveys.

There are a few studies that have used a different method to investigate food intake: the Zutphen Elderly Study, the PIAMA study, and the MORGEN calibration study. With respect to the first, the Zutphen Elderly Study, a small part of the study population has filled out a 3-day dietary record which should also contain functional food information on portion sizes during those 3 days (but not on frequency of use), if participants had been using those. However, the latest follow-up has been in 2000 and it is anticipated that these very old men have not been major users of these types of food at that time.

The PIAMA study contains very limited general food frequency information of children born in 1996/97. In the questionnaires special attention is paid to the frequency of use of probiotics in addition to the use of organic and ecological food products from 2004 onwards. Data collection is still ongoing at the time of writing of this report. Again no information on amounts daily consumed will be available in the PIAMA cohort. The advantage of this study is that longer term detailed information is available on the demographics and health status of the children involved.

The calibration part of the MORGEN study performed by RIVM also supplies us with detailed food intake information based on 24 h recalls. This again implies that a lot of information should be available on absolute intake levels during those days of recalling, however the lack of frequency data hampers an easy extrapolation to usual intakes for individuals. Unfortunately, the calibration part of the study has only been performed in 1995 until 1997, a period in which the consumption of functional foods had not been established firmly. The MORGEN study has been continued in Doetinchem, Maastricht, and Amsterdam. In these follow-up studies the EPIC food frequency questionnaire has been used with again frequency information about phytosterol/-stanol enriched bread spread use only.

External studies

With respect to the external studies there are a few that have used the same EPIC food frequency questionnaire (CoDAM, Hoorn, Prospect-EPIC (Utrecht cohort) that retrieves dietary data in general as well as information about phytosterol/-stanol enriched bread spread use as described above. Initially, the Prospect-EPIC study (Utrecht cohort), and then especially the calibration part of the overall study supplied us with detailed food intake information based on 24 h recalls. Again, this calibration part of the study has only been performed in 1995 until 1997, a period in which the consumption of functional foods had not been established firmly. The overall Prospect-EPIC study is still ongoing, but only uses the EPIC food frequency questionnaire with again information about phytosterol/-stanol enriched margarine use only. The latter accounts for CoDAM and Hoorn as well.

The Generation R study contains limited information on functional food intake of pregnant mothers (type of bread spread, breakfast drinks, dairy products with extra calcium and vitamins, sweeteners and sports drinks), and their offspring (type of bread spread). The disadvantage is that only food frequencies have been questioned. There is no information on brand names (bread spreads excluded) and amounts of consumption. The Generation R study has only started recently and data from this study are not available yet. The same accounts for the ABCD study. This study on pregnant women and their offspring has also started only recently. Questionnaires used in this study however do not retrieve any information on functional foods.

The cross-sectional Dutch Health Care and Consumer Panel study retrieves information on the frequency of use of a few specific functional foods: i.e. yoghurt with lactic acid bacteria, cholesterol lowering bread spreads, vitamin/mineral enriched syrups and sweets and foods enriched with calcium. Also a few indicator questions on background diet have been included in order to categorise participants in healthy or unhealthy eaters.

There are a few studies with potentially more information on dietary intake in general and functional food use. These concern the AGAHLS (the Amsterdam Growth and Health Longitudinal Study), the SENECA study and the VIO study. The AGAHLS performed by the EMGO VUMC is a longitudinal study which started in 1977 with measurements in children at 13 years of age. The last measurement has been performed in 2004 with the children having grown into adulthood (aged late thirties/early forties). Detailed information about actual and usual food intake is available through usage of the cross-check dietary history method plus 24 h recalls. Through these measurement methods, information on portion sizes is available. In this study, information on socio-demographic variables and health and nutritional status has been documented, which is important for future PLM purposes. Another strong advantage of this study is it's longitudinal character. At the time of writing of this report the 2000 data of the AGAHLS study were available. Analyses of these data seemed, however, not to be a fruitful option yet as the launch of most enriched foods and other functional foods happened after this time period.

The next study of interest is the SENECA study, performed in elderly people by WUR during 1988/89, 1993, and 1999. A special dietary history method has been used in which 3-day dietary records were completed with a special checklist. Potentially, information on amounts consumed and frequency of consumption, and thus observed and usual intake should be available. The drawback of this dataset is that for the final measurement which has been performed in 1999, only a checklist of foods has been used. In addition, the dataset has already been gathered 5 years ago, and the year 1999 accounts for a time period in which functional food consumption in elderly people had not yet been established firmly. Positive aspects of the SENECA study for PLM purposes are the longitudinal aspect and the fact that a lot of background information is available about the study participants.

The last study of potential interest is the VIO study performed in 2002 by TNO. Approximately, 900 children aged 9, 12 and 18 months have been included and parents have filled out a 2-day dietary record. This implies the availability of actual data on amounts consumed, but no data on usual consumption. It must be remarked that this study concerns a very specific age group within the total population which might be an advantage as well as a disadvantage. The dataset is unique in its sort and provides us at least some information on functional food use in this vulnerable group. The disadvantage of this study is that detailed background information on nutritional and health status of the children has not been gathered. Also the data are gathered on commission of an industrial partner which implies some restrictions with respect to further data-analyses.

In many other studies (the Dutch National Survey of General Practice, LASA, Utrecht Health Monitoring Study – Leidsche Rijn Gezondheidsproject, Netherlands Twin Register, PGO-peilingen, Vitamins and foods supplements 2003) only very limited information on dietary intakes have been gathered and no specific information on functional food use appeared to be available. In a few other studies (ERGO and ERGO plus, GLOBE, Monitor VGZ, NLCS, REGENBOOG) details about functional bread spreads, cooking oils and fat appears to be available at some extent in addition to general dietary information based on FFQ or in the cases of Monitor VGZ only a few focused questions.

2.3.2 Supplements

The situation for supplements may appear to be somewhat brighter (Appendix I), however, in general, a very basic route of questioning has been applied (taking supplements: yes or no, during the year or in wintertime). This type of questioning does not reveal information on amounts and frequency of use. As a consequence in many cases it is not possible to calculate the nutrient intake derived from these supplements without making assumptions. If standard or median amounts of consumption of supplements are taken as an assumption one may be able to rank subjects as has been done in the RIVM report 'Ons eten gemeten' (11), but for detailed monitoring purposes one would need additional information as described in paragraph 2.2. Below we will discuss briefly the main observations with respect to the availability of supplement usage data based on the table in Appendix I. For further details and discussion on supplement usage in the Netherlands we would like to refer to an analogous RIVM report by Ocké et al. (15).

Dutch National Food Consumption Survey
Again a good source of information on observed intake figures on a population level is the Dutch National Food Consumption Survey. The method of investigation (dietary record or 24 h recall) leaves room for a detailed recording of supplement intake. However, the same disadvantages as for functional foods intake account for the supplement intake. In addition the Dutch food composition database (in Dutch: NEVO tabel (13)) does not contain information on the contents of the available supplements. As such a special database has to be constructed, and as a consequence at the time of writing of this report intake data on supplement use from this survey were not available.

RIVM related studies
RIVM related studies and external studies that have used the EPIC food frequency questionnaire (see Appendix I) have detailed information on vitamin C and E consumption and otherwise have some frequency information (e.g. number of tablets per day/per week/ per month/per year) on 10 other (multi)vitamins and minerals, garlic and lecithin supplements (Appendix I). Another RIVM related study that has partially focused on supplement intake is the PIAMA study. Frequencies of intake of multivitamins, vitamin A, C, D and E had been recorded for the children participating. In REGENBOOG open ended questions on actual use have been used in the medical questionnaire which might provide information of sufficient detail.

External studies
With respect to the external studies, the ABCD study has focused on supplement use by (pregnant) women and their offspring and will continue to follow the children. Again no frequencies and/or amounts of supplement use have been recorded in this study. The same accounts for the Generation R study which focuses on the same study population. As stated before, the Generation R study as well as the ABCD study only started recently and the complete data are not available yet. The VIO 2002 study has asked about usage (yes/no) with the help of a list of vitamins and minerals. The cross-sectional Dutch Health Care and Consumer Panel study retrieves information on the frequency of use of a few supplements: multivitamin/-mineral supplements, calcium supplements, and Echinacea supplements, but does not retrieve a lot of information on all other sorts of aspects of PLM interest. The investigation of TNS-NIPO on vitamins, minerals, fibre, garlic and herbs retrieves some information on household level and also questions about which members of the household actually use supplements, however the principal goals of this study was to check knowledge and possession of supplements in addition to usage frequency. Additional information is lacking.

A rather detailed picture seems to be available from the ERGO-plus study on elderly people from EUR. Usage during the last 12 months has been recorded together with brand name, amounts and frequencies. The NLCS (National Cohort Study on Diet and Cancer) from TNO/UM has asked about supplement usage over the last five years and also provides information on the amounts used and on brand names. Calculation of nutrients derived from supplements is therefore possible with this dataset, though the five year period is too long to get information of sufficient quality. Then again the Prospect-EPIC calibration study (UMCU/RIVM) has detailed information on supplement usage based on a 24 h recall. But again this study has only been performed in 1995 until 1997, and is therefore already rather ‘outdated’, in the fast changing field. The overall Prospect-EPIC study is still ongoing, but only uses the EPIC food frequency questionnaire with limited information on supplement use (see above).

Last but not least the SENECA study of WUR should be mentioned again. This study in elderly people has used a special dietary history method consisting of a 3-day dietary record completed with a food checklist. Apparently, the food checklist provides frequency data on supplement use. The combination of both methods should enable us to calculate the amounts of nutrients derived from supplements based on true data. The problem of this dataset is that for the final measurement which has been performed in 1999, only a checklist of foods has been used.

In several other cases no supplement usage information has been gathered at all (i.e. PGO peilingen, Monitor VGZ, Netherlands Twin Register, GLOBE, Dutch National Survey of General Practice, AGAHLS).

3 Case study 1

In our first case study we took the most recent Dutch National Food Consumption Survey (2003) as database. This database contains the most detailed and most recent information on functional food and supplement use (see also the table in Appendix I) in the Netherlands at the moment. Our case study was an exploratory examination about the 'state-of-the art' of functional food use in the target group of the survey: i.e. 750 men and women aged 19 to 30 years. For the Dutch National Food Consumption this age group was chosen for various reasons which were not specifically related to functional food use (10). Nevertheless, it was anticipated that functional food use was also prevalent in this age group.

3.1 Approach

In first instance, an overview was compiled of which functional foods had been recorded during the 2 x 24 h recalls. In total, 83 different codes for functional foods were distinguished, with the 'diet' products included (5). Accordingly, we have checked the Dutch Food Composition Table 2001 on actuality and correctness of the nutrient data for the functional foods of interest by checking the actual labels of the products and consulting of the manufacturers involved. Especially in this fast changing area, the contents of products are continuously changing and in some cases products were very new and were not part of the extended 2001 Food Composition Table. Also the contrary could have happened: products that were coded during the survey last year, were already removed from the market at the time of writing of this report. We made a supplement to the original Food Composition Table 2001 regarding changed contents of some of the enriched breakfast cereals and of the micronutrient enriched margarine. We excluded the typical products designed for dieting (e.g. meal replacers). Furthermore, we partially excluded three persons that had consumed non-traceable enriched breakfast cereals. These breakfast cereals had probably been on the market for only a short period of time and we could not trace the exact content anymore. Therefore these persons were taken into account in the frequency tables, but not in the tables in which nutrient intakes and percentage of users of functional foods are presented. We defined seven categories of functional foods based on 76 codes: probiotics, phytosterol enriched spreads, enriched breakfast cereals, enriched biscuits and cakes, enriched (fruit) juices, enriched dairy products, and micronutrient enriched spreads. The enriched breakfast cereals, biscuits and cakes, (fruit) juices, and dairy products were enriched with micronutrients and/or fibre. It was decided not to adjust for representativeness as the purpose of this report was to describe the observed functional food users and their intake patterns. We calculated the frequency of consumption and the distribution of intakes (mean, median, 90th percentile) of the seven categories of functional foods based on the recorded data. For two product categories i.e. enriched breakfast cereals and enriched cakes and biscuits the number of male users appeared to be too low to present a complete distribution of the intake data. This was in fact also the case for male and female users of phytosterol enriched margarines. For several added nutrients we have compared the distribution of the intakes with the Dutch RDA (Recommended Dietary Allowances) for this age group and the UL (safe Upper Levels), and have calculated the percentage of nutrients delivered by the specific functional foods compared to the total intake. Based on the details we had, we have described the consumers in comparison to the total population and tried to identify potential risk groups for toxicity.

3.2 Results and discussion

In Table 1 the number of users per functional food category is shown. In Table 2 a description of the users compared to the total population is presented. From these tables we conclude that 42% of the participating men and 53% of the women used at least one functional food on one or two days. There was no difference in percentage of users according to age: i.e. the distribution of users in the older age category (25-30 years) appeared to be same compared to the distribution in the younger age category (19-24 years). Totally, 25 males (7% of the total male population) and 41 females (10% of the total female population) used 2 different types of functional foods concurrently (mainly dairy products and fruit juices), and 3 males and 10 females used 3 types of functional foods (all sorts of combinations).

Table1: Number of users of at least one functional food presented in seven categories of functional foods in the Dutch National Food Consumption Survey 2003 (total population: n=750, aged 19-30 years)

Type of food	*Total users (n=356)*		*Male users (n=147)*		*Female users (n=209)*		*Total population (n=750)*
	n	*%**	*n*	*%**	*n*	*%**	*%*
Probiotics	59	17	26	18	33	16	8
Phytosterol enriched spreads	12	3	6	4	6	3	2
Breakfast cereals**	19	5	6	4	13	6	3
Biscuits and cakes**	29	8	8	5	21	10	4
Fruit juices**	180	51	69	47	111	53	24
Dairy products**	95	27	38	26	57	27	13
Nutrient enriched spreads**	54	15	25	17	29	14	7

* percentage of total, male or female users

** all enriched with macro-and/or micronutrients and/or other ingredients like fibre

Table 2: Characteristics of the users vs. the total population

	Functional food users			*Total population*		
	total (n=356)	*men (n=147)*	*women (n=209)*	*total (n=750)*	*men (n=352)*	*women (n=398)*
	n (%)	*n (%)*	*n (%)*	*n (%)*	*n (%)*	*n (%)*
Age (years)						
19-24	153 (43)	57 (39)	96 (46)	322 (43)	153 (43)	169 (42)
25-30	203 (57)	90 (61)	113 (54)	428 (57)	199 (57)	229 (58)
Marital status						
Single	56 (16)	13 (9)	43 (21)	106 (14)	30 (9)	76 (19)
Married/co-habiting	83 (23)	50 (34)	33 (16)	178 (24)	101 (29)	77 (19)
Family with children	72 (20)	18 (12)	54 (26)	154 (21)	45 (13)	109 (27)
Living at home with parents	145 (41)	66 (45)	79 (38)	312 (42)	176 (50)	136 (34)
Degree of urbanisation						
High	45 (13)	15 (10)	30 (14)	111 (15)	46 (13)	65 (16)
Strong	99 (28)	41 (28)	58 (28)	208 (28)	99 (28)	109 (27)
Moderate	80 (22)	35 (24)	45 (22)	154 (21)	72 (20)	82 (21)
Little	76 (21)	32 (22)	44 (21)	164 (22)	78 (22)	86 (22)
None	56 (16)	24 (16)	32 (15)	113 (15)	57 (16)	56 (14)
Region						
3 big cities	54 (15)	17 (12)	37 (18)	122 (16)	43 (12)	79 (20)
Rest Western	104 (29)	38 (26)	66 (32)	227 (30)	98 (28)	129 (32)
Northern	40 (11)	18 (12)	22 (11)	87 (12)	46 (13)	41 (10)
Eastern	80 (22)	31 (21)	49 (23)	154 (21)	74 (21)	80 (20)
Southern	78 (22)	43 (29)	35 (17)	160 (21)	91 (26)	69 (17)

(Table 2 continued)

	Functional food users				*Total population*		
	total (n=356)	*men (n=147)*		*women (n=209)*	*total (n=750)*	*men (n=352)*	*women (n=398)*
	n (%)	*n (%)*		*n (%)*	*n (%)*	*n (%)*	*n (%)*
Education							
Low	77 (22)	27 (18)		50 (24)	170 (23)	65 (18)	105 (26)
Intermediate	177 (50)	74 (50)		103 (49)	363 (48)	176 (50)	187 (47)
High	102 (29)	46 (31)		56 (27)	217 (29)	111 (32)	106 (27)
Country of birth							
Netherlands	343 (96)	138 (94)		205 (98)	720 (96)	336 (95)	384 (96)
Surinam	1 (0)	0 (0)		1 (0)	3 (0)	0 (0)	3 (1)
Turkey	0 (0)	0 (0)		0 (0)	1 (0)	1 (0)	0 (0)
Other country	12 (3)	9 (6)		3 (1)	26 (3)	15 (4)	11 (3)
BMI							
<18.5	12 (3)	5 (3)		7 (3)	26 (3)	14 (4)	12 (3)
18.5-25	225 (63)	106 (72)		119 (57)	484 (65)	249 (71)	235 (59)
25-30	90 (25)	29 (20)		61 (29)	183 (24)	75 (21)	108 (27)
≥30	29 (8)	7 (5)		22 (11)	57 (8)	14 (4)	43 (11)
Alcohol use							
Never	65 (18)	15 (10)		50 (24)	125 (17)	37 (11)	88 (22)
No, stopped	2 (1)	0 (0)		2 (1)	4 (1)	0 (0)	4 (1)
< 1 glass/week	129 (36)	36 (24)		93 (44)	258 (34)	72 (20)	186 (47)
Yes, ≥ 1 glasses/week	159 (45)	96 (65)		63 (30)	360 (48)	242 (69)	118 (30)
Unknown	1 (0)	0 (0)		1 (0)	3 (0)	1 (0)	2 (1)
Smoking							
Yes	112 (31)	54 (37)	37	58 (28)	237 (32)	114 (32)	123 (31)
No, stopped	43 (12)	14 (10)	10	29 (14)	103 (14)	45 (13)	58 (15)
No, never smoked	201 (56)	79 (54)	54	122 (58)	409 (55)	192 (55)	217 (55)
Unknown	0 (0)	0 (0)	0	0 (0)	1 (0)	1 (0)	0 (0)

There were no relevant differences in the most important socio-demographic descriptors between the users group and the total population. This again (as concluded earlier, see: (2)) makes it less obvious to typically characterise the general functional food consumer. Instead characterisation should take place per functional food category.

Table 3: Mean amounts (g/day) ± sd consumed over two days per functional food category for men and women

Type of food	*Men (n=147)*				*Women (n=209)*			
	n	*mean ± sd*	*min*	*max*	*n*	*means ± sd*	*min*	*max*
Probiotics	26	162 ± 116	33	538	33	158 ± 95	65	491
Phytosterol enriched spreads	6	14 ± 10	6	33	6	7 ± 7	2	18
Breakfast cereals*	6	31 ± 15	20	60	13	18 ± 10	8	40
Biscuits and cakes*	8	37 ± 27	11	80	21	23 ± 9	10	41
Fruit juices*	69	278 ± 216	8	1015	111	306 ± 250	5	1333
Dairy products*	38	325 ± 234	63	1000	57	184 ± 139	5	830
Nutrient enriched spreads*	25	20 ± 14	3	60	29	12 ± 9	2	38

In the Tables 7a to 13a (men) and 7b to 13b (women) (see Appendix II) the mean concentration and the distribution of intake of important micronutrients delivered by the several functional food groups are presented. Only those men and women who had used a functional food in the particular category have been taken into account for these tables. The contribution of each functional food group to the total intake has been calculated. As well, a comparison has been made with the Dutch Recommended Dietary Allowances and the European safe Upper Levels for the specific age group.

For many nutrients in all categories of functional food groups the mean total dietary intake met the Recommended Dietary Allowances in males as well as in females (Tables 7a, 7b, 9a -13b). However, folic acid intake appeared to be reasonably low in several of the usage categories. An amply sufficient supply of nutrients (at least 1.5 RDA) was observed for:

Male users:
- vitamin B12 (probiotics)
- vitamins B1, B6 and B12 (breakfast cereals)
- vitamins D, B6, B12 (cake and biscuits)
- vitamins D, B1, B6, B12, C (fruit juice)
- vitamins B1, B2, B6, B12, C (dairy products)
- vitamins D, B1, B6, B12 (micronutrient enriched spreads)

Female users:
- vitamin B2 (breakfast cereals)
- vitamin C (fruit juice)
- vitamins B2, C (dairy products)
- vitamins B2, B12, C (micronutrient enriched spreads)

Only males using enriched breakfast cereals and dairy products exceeded for one nutrient (vitamin B12 and vitamin C respectively) two times the RDA. The total dietary intake of the users did not exceed the established safe Upper Levels with one exception. The total dietary intake of the upper ten percent of female users of micronutrient enriched spreads exceeded the safe Upper Levels for vitamin A and calcium (Table 13b). Of course the values reached in this upper part of the female user population is determined by only a very limited number of women on only the recorded data. It might be a smoke signal for further follow-up. For the sterols (Tables 8a and 8b), results are somewhat difficult to interpret, among others because of a very low number of users. The level of phytosterols/-stanols in the background diet is regarded as negligible compared to the recommended daily consumption of 1.5-2.0 g/d and is therefore not taken into account (7). The mean intake of sterols through the enriched spreads compared to the recommended amounts appears to be too low and certainly does not exceed the proposed safety limit.

With respect to the mean contribution of each specific functional food to the total dietary intake (Tables 7a, 7b, 9a-13b), in male users, especially fruit juice contributed to the vitamin C intake (35%), dairy products to the vitamin B2 intake (31%) and calcium intake (26%), and micronutrient enriched spreads to the vitamin D intake (32%) and vitamin E intake (31%). In female users especially fruit juice contributed to the vitamin C intake (37%), dairy products to the vitamin B2 intake (31%) and micronutrient enriched margarines to the vitamin D intake (28%). It would have been preferable to perform these calculations on usual intake figures instead of recorded (actual) intake figures, so the percentages presented give an indication only. Finally, we compared the micronutrient intake of the users with the non-users. For males we found that the mean total intake of all micronutrients was higher among users compared to the non-users with the exception of folic acid and vitamin B12. For calcium, iron, vitamin B1, B2, B6, C and E the differences were statistically significant (t-test; $p < 0.05$). Compared to the non-users, the female users had also higher mean total intakes of micronutrients with the exception of iron, vitamin A, B12, and D. For calcium, vitamin B1, B2, B6, C and E the differences were statistically significant (t-test; $p < 0.05$).

4 Case study 2

For our second case study we chose the VIO database. The VIO study focused on a very specific study group, namely children aged 9 (8-10), 12 (11-13) and 18 (17-19) months. The study has been performed by TNO on commission of Nutricia Nederland B.V. The reason for our choice to examine the VIO data is that the study contains rather up to-date data on multiple functional foods as it has been carried out in 2002 with a broad perspective, i.e. gaining a clear understanding of the food consumption of toddlers. The study group is a very vulnerable group as there is rapid physical and mental growth and development in this age category. Nonetheless, there is relatively little known about the intake of toddlers, which is all the more reason to monitor the intake of functional foods in this group. Details of the VIO study have been described elsewhere (1).

4.1 Approach

Based on a published overview (1) of enriched foods as had been recorded during the two days of investigation a generic list of interesting functional food categories was compiled for this case study: enriched breakfast cereals, fruit juices/-drinks, syrups, biscuits and cakes, fruit products, complete meals, dairy products, milk products either or not enriched with pre- and/or probiotics, and micronutrient enriched spreads. With the consent of Nutricia Nederland B.V. and the Dutch Ministry of Public Health, Welfare and Sports, TNO was asked to perform the requested statistical analyses. For a description of the general statistics of VIO we would like to refer to the VIO publication (1). In general, the nutritional data have been calculated with the Dutch Food Composition Table 2001 (13) which had been extended with data of 164 special toddler products. Of all products consumed by the study group (693 in total) 150 (22%) appeared to be enriched with one or more vitamins and minerals (retrieved from (1)). Supplements and foods with artificial sweeteners have been excluded for our case study as intake details will be reported elsewhere by TNO on the account of the Ministry of Public Health, Welfare and Sports. With respect to the dairy products enriched with prebiotics and probiotics a literature and internet search has been performed in order to find out which brands do contain these types of non-nutrients. After consultation of the manufacturers to confirm our listings and to provide additional information on the specific timing of enrichments we finalised this list and included products that contained prebiotics and/or probiotics before January 2002 to the best of our knowledge.

The frequency of consumption and the distribution of intake (mean, median, 90th percentile) of the defined categories of functional foods have been calculated for each of the three age categories (9, 12, 18 months) based on the recorded intake data. For several product categories e.g. milk products containing pre- and/or probiotics and complete meals in the oldest age category the number of users appeared to be too low to present a complete distribution of the intake data. For many added nutrients we compared the distribution of the intakes with the Dutch RDA (Recommended Dietary Allowances: mainly based on Adequate Intake figures) and the UL (safe Upper Levels) for this age group, and calculated the percentage of nutrients delivered by the specific functional foods compared to the total intake. Based on the details, we have tried to identify potential risk groups for toxicity. It appeared not to be useful to compare users with non-users as almost all children used one or more enriched food products.

4.2 Results and discussion

In Table 4 the number of functional food users in the VIO 2002 study are presented according to the three age categories.

Table 4: Number of users of functional foods in the VIO study 2002 presented in ten functional food categories (total population: n=941, aged 9, 12, 18 months)

Type of food**	*Toddlers 9 mo (n= 333)*		*Toddlers 12 mo (n=306)*		*Toddlers 18 mo (n=302)*	
	n	*%**	*n*	*%**	*n*	*%**
Breakfast cereals	226	68	211	69	151	50
Fruit juices/drinks	35	11	29	9	62	21
Syrups	187	56	177	58	155	51
Biscuits and cakes	227	68	217	71	132	44
Fruit products	182	55	122	40	29	10
Complete meals	47	14	29	9	4	1
Dairy products	133	40	82	27	16	5
(Milk) formula without pre/probiotics	300	90	201	66	37	12
Pre/probiotics	20	6	7	2	1	0.3
Nutrient enriched spreads	45	14	49	16	75	25

* percentage of users within the specific age category
** all enriched with macro-and/or micronutrients with the exception of pre/probiotics

Among the youngest children especially enriched (milk) formula without pre/probiotics (90%), enriched breakfast cereals (68%), and enriched biscuits and cakes (68%) were used. In the 12-month old group especially enriched biscuits and cakes (71%), and enriched breakfast cereals (69%) were popular, and in the 18-month old group enriched syrups (51%), and again enriched breakfast cereals (50%) were used. On average, the absolute number of 18-month old children who used enriched foods was less compared to the younger groups. Almost all children used at least one enriched food product: 333 children in the 9-month old group (100%), 304 children in the 12-month old group (99%), and finally 276 children in the 18-month old group (91%).

Artificial sweeteners, for example, to be used in sweet hot drinks, and foods containing artificial sweeteners were not added to this list as that information will be reported elsewhere by TNO. Nonetheless, we are able to report that artificial sweeteners to sweet hot drinks have not been used frequently during the study period. Only one child per age category has reported usage of those (total n=3). Fruit juices/drinks with artificial sweeteners have been used by 10 children aged 9 months, 17 children aged 12 months, and 47 children aged 18 months. Dairy products containing artificial sweeteners have not been used in the youngest age category, by one child in the middle age category and by two children in the oldest age category.

*Table 5: A few socio-demographic characteristics of the users of at least one enriched food product**

	Toddlers 9 mo (n= 333)	*Toddlers 12 mo (n=306)*	*Toddlers 18 mo (n=302)*
	n (%)	*n (%)*	*n (%)*
Education of the mother			
low	59 (18)	62 (20)	49 (16)
intermediate	169 (51)	146 (48)	144 (48)
high	104 (31)	96 (34)	83 (27)
unknown	1 (0)	-	-
Regional distribution			
north	36 (11)	31 (10)	28 (9)
east	68 (20)	59 (19)	49 (16)
west	150 (45)	139 (45)	126 (42)
south	79 (24)	75 (25)	73 (24)
Gender			
male	164 (49)	157 (51)	137 (45)
female	169 (51)	147 (49)	139 (46)

* percentages calculated based on the total population

In Table 5 a brief description of the users is presented. As stated earlier a comparison between users and non-users has not been done as almost all children used one or more functional foods. There were no relevant differences in the most important socio-demographic descriptors among the three different age categories (not statistically tested). Within each specific age category it appears that children having mothers with an intermediate education and living in the western part of the country represent a larger part of the study group (not statistically tested). However, according to the principal investigators the study group forms a representative group of the toddler population in the Netherlands. In Table 6 the mean absolute amounts of functional foods consumed per category per day among users are presented together with the minimum and maximum intake. There is a fair difference between the mean amounts of consumption of milk (formula) with and without pre-/probiotics, with the latter consumed in higher amounts. Perhaps, those toddlers experiencing gastro-intestinal problems on conventional formula try the pre-/probiotic enriched products, but still consume less milk-based products on average. Mean amounts in grams per day increase corresponding with the different age categories for enriched fruit juices/drinks, enriched syrups, and enriched dairy products other than the (milk) formula. Amounts of intake for the other food groups either remain equal or decrease according to age.

Table 6: Mean amounts (g/day) ± sd consumed over two days of recording per functional food category for the three age categories of toddlers

Type of food	Toddlers 9 mo (n=333)				Toddlers 12 mo (n=306)				Toddlers 18 mo (n=302)			
	n	*means ± sd*	*min*	*max*	*n*	*means ± sd*	*min*	*max*	*n*	*means ± sd*	*min*	*max*
Breakfast cereals	226	22 ± 11	1	70	211	23 ± 11	0	84	151	25 ± 13	1	71
Fruit juices/drinks	35	59 ± 31	10	125	29	105 ± 107	5	435	62	138 ± 108	13	469
Syrups	187	17 ± 18	0	188	177	23 ± 21	1	107	155	28 ± 24	0	125
Biscuits and cakes	227	9 ± 7	1	41	217	11 ± 7	1	39	132	10 ± 6	1	34
Fruit products	182	117 ±53	20	300	122	110 ± 51	38	225	29	101 ± 55	15	225
Complete meals	47	113 ± 54	19	200	29	114 ± 50	25	200	4	98 ± 73	-	-
Dairy products	133	51 ± 29	15	175	82	67 ± 65	8	450	16	155 ± 177	25	545
(Milk) formula without pre/probiotics	300	534 ± 149	94	1050	201	460 ± 188	25	1188	37	329 ± 195	73	990
(Milk) formula with Pre/probiotics	20	461 ± 167	94	660	7	345 ± 152	175	590	1	240	-	-
Nutrient enriched spreads	45	7 ± 5	1	25	49	8 ± 5	2	24	75	10 ± 7	1	29

In the Tables 14a to 23a (9 month old toddlers), 14b to 23b (12 month old toddlers), and 14c to 23c (18 month old toddlers) (see Appendix III) the mean intake and the distribution of intake of important micronutrients out of ten different functional food groups and total diet are presented by group of users. Only those toddlers who had used a functional food in the particular category have been taken into account for these tables. The contribution of each functional food to the total intake has been calculated. Furthermore, a comparison has been made with the Dutch Recommended Dietary Allowances (which are mainly based on the established Adequate Intakes for these specific age groups) and with the safe Upper Levels as far as they are established for these young age groups. For many nutrients in all categories of functional foods the mean total dietary intake amply met the Recommended Dietary Allowances in all three age categories studied. In some cases the mean total vitamin D and iron intake were marginal compared to the RDA which was already mentioned in the earlier report on VIO 2002 (1). In order to categorize some of the observations with respect to the RDA, we took an arbitrary cut-off point of 3 times the RDA. The following was observed:

Mean total dietary intake of 9 month old users exceeding 3 times the RDA:
- vitamins B1, B2, B6, B12, magnesium (breakfast cereals)
- vitamins B1, B2, B6, B12 (fruit juice)
- vitamins B1, B6, B12 (syrups)
- vitamins B1, B6, B12 (cake and biscuits, fruit products, complete meals, dairy products, enriched (milk) formula with or without pre/probiotics)
- vitamins B1, B2, B6, B12, magnesium (bread spreads)

Mean total dietary intake of 12 month old users exceeding 3 times the RDA:
- vitamins B2, B12 (fruit juice)
- vitamin B12 (breakfast cereals, syrups, cake and biscuits, fruit products, complete meals, dairy products, bread spreads)
- vitamins B1, B2, B6, B12, magnesium ((milk) formula without pre/probiotics)
- vitamin B12 ((milk) formula with pre/probiotics)

Mean total dietary intake of 18 month old users exceeding 3 times the RDA:
- vitamins B12 (breakfast cereals, syrups, fruit products, complete meals,)
- vitamins B1, B2, B12 (fruit juice)
- vitamins B2, B12 (cake and biscuits)
- vitamins B1, B2, B12 (dairy products)
- vitamins B1, B2, B6, B12, magnesium ((milk) formula without pre/probiotics)
- vitamins B2, B12 (bread spreads)

Among the B-vitamins especially for vitamin B12 the intakes were much higher, up to 5 times, than the current recommendations. As the Upper Levels for the B-vitamins could either not be determined because of lack of evidential data on potential negative effects (in case of vitamin B1, B2 and B12) or were not reached (in case of vitamin B6, folic acid) no conclusions with respect to safety aspects are to be drawn.

In general, the total dietary intake of the enriched product users did not exceed the established safe Upper Levels with two exceptions. The total dietary intake of the upper ten percent of users in all age categories and in most functional food categories exceeded the safe Upper Levels for vitamin A and zinc (marked bold-faced in the tables in Appendix III). Also, for the 9-month old toddlers the mean intakes for vitamin A exceeded the safe UL. However, the values reached in the upper part (P90) of the user population is determined by a limited number and the figures presented are based on recorded intake instead of usual intake. Therefore, we cannot put firm conclusions about these findings. Also, the fact that part of the total vitamin A intake is determined by carotenoid intake might influence the final risk on overdosing. For ß-carotene for example no UL has been established and in the determination of the toxicity of high intakes of vitamin A, the pro-vitamin A properties of carotenoids are assumed not to contribute significantly (12). These data might be a smoke signal for further follow-up, but a more detailed investigation is needed for this aspect.

With respect to the mean contribution of each specific functional food to the total dietary intake (Tables 14a-23c) some points of interest are to be noted. In 9-month old users, especially the (milk) formula with or without pre-/probiotics contributed to the total intake of energy and micronutrients (ranging from 52% to 91%). Also, enriched fruit products substantially contributed to the vitamin C intake (20%), breakfast cereals to the vitamin B6 intake (23%), and the enriched complete meals to the vitamin B6 intake (20%). Among the 12-month old users again the (milk) formula with or without pre-/probiotics were important suppliers of energy and micronutrients (ranging from 14% to 87%). In this age category also enriched breakfast cereals were an important supplier of vitamin B1 (23%), and enriched fruit juices were an important supplier of vitamin C (20%). With respect to the 18-month old toddlers the contribution out of each enriched functional food group to the total dietary intake of the using group was as follows: again especially the (milk) formula with or without pre-/probiotics substantially contributed to the total intake of energy and micronutrients (up to 84%). Enriched bread spreads considerably contributed to the vitamin D intake (42%), enriched dairy products to the intake of vitamin D (25%), vitamin B2 (21%), calcium (22%), enriched syrups and fruit products to the intake of vitamin C (22%), enriched breakfast cereals to the intake of vitamin B1 (23%) and iron (27%), and finally enriched fruit juices the intake of vitamin A (25%), vitamin B1 (25%), vitamin B6 (22%), and vitamin C (26%). Again these data are indicative only as calculations have been based on recorded data.

5 Discussion and conclusion

Despite the availability of numerous cohort and monitoring studies in different population groups and in different timeframes, on the whole the amount of information available in the Netherlands on functional food use and/or supplement use is sadly limited. Important limitations for usage for PLM purposes are long-standing (old) data or data that are too recent to have entered a database, limited data (e.g. only frequency of use known and no amounts of consumption available, or only information available on very specific (enriched) functional foods or supplements), differences in applied study methods, limited power of the studies (low absolute number of participants or focus on specific population groups only), and/or last but not least poor accessibility of the data.

5.1 Methods

With respect to the dietary survey method in general, the most complete picture of functional food use may be obtained by a (repeated) 24 h recall dietary method, dietary record and/or dietary history preferably combined with a (focused) food frequency questionnaire for specific information on usual intake. The first two methods supply us with information on actual intake through open ended questions; the latter method also uses an open ended technique and gives among others more details on longer term intake. This method is, however, quite labour intensive for both the respondent and interviewer and is therefore not used very often in the studies discussed in the current report. The suitability of an FFQ is determined by the focus of the questionnaire. If certain functional foods are included than useful information on usual intake may be obtained. Therefore, the type of FFQ determines the suitability of the information. For example, the EPIC questionnaire provides some data on the use of phytosterol enriched spreads: also with respect to amounts consumed. But the most recent market introduction of phytosterol enriched milk and yoghurt will not be covered through this questionnaire. The most recent questions in the PIAMA cohort provide some frequency data on probiotics usage, and also some specific questions for the mothers in the Generation R study provide limited information on usage of some functional foods in this specific study group. In many cases however, data on amounts, brand names and other information specifying intake is lacking. We have to conclude that just a general FFQ will not be suitable for estimating functional food or supplement intake.

This future Dutch National Food Consumption Survey will most probably use 24 h recalls as dietary assessment method (report in preparation). The DNFCS potentially offers a rather complete picture of the observed dietary intake data, provided that attention is paid to careful registration of the required details described in paragraph 2.2. The outcomes are limited by the fact that they describe the recorded intake at a given moment in time. In case, however, it is possible to transform the recorded data to usual intake data. For most ingredients this adjustment is possible through applied statistical techniques. However, these may not be available for data that are characterised by erratic use or no use at all; as may be the case for functional food or supplement use and for some nutrients. An additional focused FFQ should therefore be recommended for the specific products of interest to overcome this problem. It would also be an advantage if the Dutch National Food Consumption Survey could be dynamically extended to cover specific population groups (including sufficient target groups and potential risk groups). As is concluded from the case studies, the number of users for specific functional foods may be rather limited, which hampers the interpretation and also extrapolation of the findings. It seems therefore prudent to use a special design for functional foods and supplements users in addition to the general DNFCS. To reach larger samples, internet panels have been suggested as an example. It would also be helpful to have more data on nutritional and health status of the participants, and to have the possibility to link these data to other registries (disease registries or medication registry) for identification and quantification purposes within future PLM activities.

Attention should be paid not only to have the Dutch Food Composition Table up-to-date for keeping track of the functional foods on the market, but also to have an accurate, up-to-date nutrient database for supplements at disposal. At this moment it is quite labour intensive to calculate functional food and supplement usage and derived nutrient intakes as a lot of preliminary work needs to be done before the first calculation can be done. At the moment the existing databases are incomplete, inaccurate, not geared to one another, or not easily accessible for functional foods and supplements. Updating and fitting the tables for data-analyses regarding functional foods and supplements often comes at the bottom of the list and the availability of a database which is among others easily accessible, convenient, and easily to be adjusted and extended may help to get a better estimate of the total nutrient intake of the population of interest.

5.2 Timeframe

With respect to the timeframe, many study efforts have been executed before or around 1999/2000. It was only in 1999 that foods were allowed to be enriched with several vitamins and minerals in the Netherlands and it was also around this time period that several other functional foods (e.g. some examples of phytosterol enriched foods and probiotics) were launched. Through these relatively recent developments, several studies have only limited information available as usage rates for the successful functional food products will increase only some time after market launch. With ongoing trials this aspect will be elucidated in the future. Another aspect, already briefly mentioned, is the issue of long term effects. To study this type of effects, we should be able to use cohort data. The way it is designed till now the Dutch National Food Consumption Survey will fulfil a 'smoke' detecting role regarding dietary intake, but is not planned for studying (other) long term effects. We have to rely on other often smaller scale studies for quantifying longer term aspects, e.g. the Doetinchem cohort (phytosterol/-stanol enriched spreads). These longer term aspects might focus on dietary intake and the risk of overdosing, but also on physiological aspects and the (change in) nutritional and health status. A facet that might help us with this issue in the future is the usage of biomarkers that represent longer term (historical) intake of specific components, but power problems remains a problematic issue here.

5.3 Practical issues

During the writing of this report we came across several practical hurdles. The nutrient content databases behind the food consumption records are quickly out of date in this fast changing field of functional foods and supplements. Many enriched foods or supplements are launched and many also disappear quickly from the market without any central notification or registration. Also the concentrations of active ingredients in the foods are subject to change and sometimes difficult to retrieve from labels or manufacturer's specifications. Especially with respect to the supplements there is a gap in our knowledge and a lacuna in the availability of up-to-date and correct nutrient content databases (see also (11) and Ocké et al. (15). It is therefore recommended to invest in the building of such databases for especially functional foods and supplements to obtain a more complete and reliable picture of the total dietary intake of the population under study. Sometimes, data access to recent data with respect to the intake of functional foods or supplements is a problem, as these data may be in the possession of third parties. A governmental mandate for urgent PLM purposes might be necessary in special cases.

A last practical aspect we would like to mention here concerns potential ethical issues. To study longer term effects one might want to link to certain morbidity and/or mortality registries. These linkage exercises have not been performed on a large scale yet, and might induce ethical problems in many studies as participants did not consent for that.

5.4 In summary

The DNFCS may fulfill a signaling role for PLM purposes. The power of the DNFCS may be increased by dynamic modules focusing on use of (specific types of) functional foods and/or supplements in the general population. If considered necessary, the DNFCS should have such a structure that it can potentially be extended for an investigation among specific target and risk groups. The considerations with respect to this potential extension should be made within the PLM framework and the decision making procedures with respect to potential side-effects (3). The construction of a decision model will be the topic of next year's report. The addition of (specific) focused food frequency lists to the recalls performed to gather information on usual intake in addition to the observed intake records will be an important supplement as the currently available statistical techniques may not be suitable for adjustment of recorded (actual) intake to usual intake. The option of large internet panels should be explored in order to reach a sufficient number of users, either or not belonging to the target group, of functional foods. In the proposal for a new outline of the DNFCS a regular large scale focus on special foods, among others functional foods, is recognized (report in preparation). The exact outline and design of these modules should be developed and tested along with the final design of the new DNFCS. At least, the items mentioned in paragraph 2.2 should be incorporated into the new design. In the near future it should also be investigated whether the addition of nutritional and health status information to the DNFCS intake data is feasible. With the help of focused longer term surveys (like for example the PIAMA study (probiotics in children) and the Doetinchem cohort (phytosterol/-stanol enriched margarine use among 20 – 60 year old persons) we may welcome an addition to the basic survey for data on certain specific functional foods and/or supplements intake, their users and their nutritional and health status. Also these specific surveys might help us to monitor longer term consumption and their (physiological) effects over time. In addition, the availability and accuracy of the Food and Supplement Composition databases are to be optimised for functional foods and supplements. Apart from the optimisation of the contents of these tables (see paragraph 2.2), also organisation matters should be dealt with, such as responsibilities (government vs. manufacturers), accessibility, and maintenance. For the later future, we would like to recommend an investigation to linkage possibilities to disease and medication registries.

5.5 Outcome of the 1st case study

With respect to the type of information revealed from the first case study, the Dutch National Food Consumption Survey 2003 we observed that the safe Upper Levels were generally not exceeded, with one exception in the female micronutrient enriched margarine users group. The total dietary intake of a few women using this margarine exceeded the Upper Levels for vitamin A and calcium. However, we cannot speculate about a potential toxicity problem here as the results are based on recorded data of a very few women. For vitamin A a few additional issues hamper the interpretation of the observations (see paragraph 5.6). For several micronutrients the Upper Levels have not been established, so for these nutrients conclusions can also not be drawn. In several cases the Dutch RDA was amply met especially with respect to the B-vitamins and vitamin D in males, and vitamin C in females. On the contrary folic acid intake appeared in many functional food user categories to be quite low. Functional foods that especially contributed to the mean total micronutrient intake in males were fruit juices (vitamin C), dairy products (vitamin B2, calcium) and micronutrient enriched spreads (vitamin D and E). In females the same was observed: especially fruit juices (vitamin C), dairy products (vitamin B2) and micronutrient enriched spreads (vitamin D) contributed. In total 35% (males) to 37% (females) of the mean total vitamin C intake was delivered by fruit juice in the enriched fruit juice using persons. Again, it would be preferable to perform these calculation on usual intake figures instead of observed intake figures, so firm conclusions cannot be drawn. The recommended amounts of use for phytosterol/-stanol enriched spreads were not met. In general we may conclude that the total intakes in this study group with respect to Upper Levels for several micronutrients are not alarmingly high. As supplement usage has not been taken into account this conclusion may change if we are able to do so.

5.6 Limitations of the 1st case study

A drawback of the case study was the limited availability of the supplement data, which could have directed us to an underestimation of the outcomes. Intake figures had been recorded, but at the time of writing of this report the data were not complete as the database containing the concentrations of the supplements used by the participants of the Dutch National Food Consumption Survey 2003 was not finalised. As a consequence, we could for example not compare the total micronutrient consumption of the participants to the Dutch RDA or the UL, but had to limit ourselves to calculation of the micronutrient consumption through the normal diet together with the functional foods. If the supplement data would have been taken into account, intake figures would have been higher as supplements generally contain a substantial amount of nutrients. It is difficult to speculate on the exact heightening of the data as the people investigated might on average find themselves among the ‘largest’ eaters, but especially the 19-30 year old males are only ‘small’ supplement users compared to other population groups. It is unknown to what extent the proportion of functional food use in this group compares to functional food use in other groups of the population.

Another limitation of this first case study is that for some functional food categories the number of users was very low and may not be representative for the whole group under study. Especially, the figures presenting the upper 10 percent of the user population has only been based on a few persons who were measured on one or two days. The extrapolation from recorded intake to usual intake figures was not available for most micronutrients at the time of writing of this report and as a consequence firm conclusions cannot be drawn based on these figures. It is expected that for most micronutrients the adjustment to usual intakes will not change the mean intake results, however results at the upper and lower parts of the distribution may change. Especially these ‘tails’ of the distribution play an important role in functional food and supplement intake because of erratic use or no use. The statistical adjustment techniques available today have not found a solution for this yet. The results are therefore only indicative for future topics of research.

5.7 Outcome of the 2nd case study

With respect to the type of information revealed from the second case study, the VIO Study 2002 (Nutrient Intake Study) among toddlers we observed that the safe Upper Levels were on average not exceeded. Vitamin A and zinc intake appeared to be exceptions in especially the 9 and 12-month old children, however several remarks are to be made within this respect. As stated earlier the comparison between levels of nutrient intake and RDA and UL should be performed preferably on the basis of usual intake data instead of observed intake data. Also, the number of users finding themselves in the upper part of the distribution is for most functional food groups low. Furthermore, the vitamin A intake is expressed as retinol equivalents (RE). Part of these retinol equivalents are determined by the carotenoid concentration, which induces several problems. First, the formula to calculate RE is from 1989 and needs an update according to new insights in bio-availability of carotenoids. This influences the RDA figures too (14). Second, the UL, expressed in RE is established for vitamin A. In the determination of the toxicity of high intakes of vitamin A, the pro-vitamin A properties of carotenoids are assumed not to contribute significantly (12). Therefore, the fact that the UL for vitamin A was reached does not imply a risk on toxicity. For several micronutrients the Upper Levels have not been established, so for these nutrients conclusions could not be drawn. In most cases the Dutch RDA was amply met especially with respect to vitamins B1, B2, B6 and B12. In case of the latter vitamin, in some cases up to 5 times the RDA was consumed. Functional foods that especially contributed to the mean total micronutrient intake in all age categories were not surprisingly the (milk) formula with or without pre-/probiotics. Also enriched fruit products and enriched breakfast cereals were contributors to some of the micronutrient intakes. In general we conclude that the total intakes in the study group with respect to Upper Levels established so far are not alarmingly high. Further investigation is however recommended, especially in combination with available data on supplement usage.

5.8 Limitations of the 2nd case study

Again, the drawback that can be mentioned was the limited availability of the supplement data, which may have led to an underestimation of the outcomes. Supplement intake figures had been recorded, but at the time of writing of this report the data were not available to us. It is difficult to speculate on the exact heightening of the nutrient intake data. In the VIO report (1) some figures on supplement use have been presented. On average approximately half of the participants used one or more supplements with the majority of users in the 18-month old group. Especially vitamin D supplements were used, as is also recommended by the Dutch National Health Council (39% usage in the total group) in case no special milk formula for toddlers is used. Supplements containing both vitamin A and D were used in 8% of the children, followed by fluoride (3%), and multivitamin supplements (2%).

Again, for some functional food categories the number of users was very low and may not be representative for the whole group under study. Especially, the figures presenting the upper 10 percent of the user population has sometimes been based only on a few children whose intake was recorded during two days only. The comparison of mean intake figures with the Dutch RDA and European UL for children is also something to be discussed here. The established RDA's for the micronutrients in children are based on figures representing adequate intakes as no sufficient data are available to establish a real RDA. The common practice is to establish the adequate intake figures based on an interpolation from adult figures based on body weights. It is anticipated that the adequate intake figures are in the same order of magnitude as an RDA would be in the case sufficient data would have been available. Finally, the extrapolation from recorded intake to usual intake figures could not be made for this case report and as a consequence firm conclusions cannot be drawn based on the figures currently presented. It is expected that for most micronutrients the extrapolation to usual intake will not change the mean intake results, however results at the upper and lower parts of the distribution may become less extreme. Equal to the first case study, the results of this case study are therefore only indicative for future topics of research.

Acknowledgements

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APPENDIX I: Overview of the cohort and monitoring studies

Study	Insti-tute	Study year(s)	Method	Pop.	Remarks	Details background diet (all products)				
						type of pro ducts*	brand name	freq. of use	amount used	nutrient calc. possible
National food consumption surveys										
DNFCS (VCP-1)	**TNO**	1987/1988	2-day dietary record	ca 6,000 p. random sampling		+	+	-	+	+
DNFCS (VCP-2)	**TNO**	1992	2-day dietary record;12 item FFQ	ca 6,000 p. random sampling		+	+	+	+	+
DNFCS (VCP-3)	**TNO**	1997/1998	2-day dietary record;20 item FFQ	ca 6,000 p. random sampling		+	+	+	+	+
DNFCS (VCP 2003)	**RIVM/ TNO**	2003	2x24-h recall EPIC-SOFT	750 p, 19-30 y		+	+	+	+	+
RIVM related studies										
Zutphen Elderly Study	**RIVM**	1960, ’65, ’70; baseline study: 1985; follow up: 1990, ’95; 2000	cross check diet history; from 1985 onwards: FFQ	1960: 876; 1985: 555; follow up: 560; 351; 171 men 65-100y		+	-	+	+	+
PPHV (peilstation)	**RIVM**	1987-1991	50 items FFQ	>36,000 men and women 20-59 y		i)	-	+	milk products, bread, sand-wich filling	-
MORGEN (93-96)	**RIVM**	PPHV, 1993-1997	EPIC-FFQ	31,100 men and women 20-59 y	in Doetinchem, Maastricht, Amsterdam (partly ongoing in specific cohort studies)	+	-	+	+	+
EPIC-Doetinchem cohort	**RIVM**	1998-2002, 2003-present, ongoing	EPIC FFQ	6,327 men and women 31-70 y (in 2001)		+	-	+	+	+

Explanation of symbols see page 60

(table continued from p. 48)

Details functional foods/ingredients					Details supplements						Ref/ info
type of FF	brand name	frequency of use	amount used	nutrient calc. possible	method	type of suppl.	brand name	freq. of use	amount used	nutrient calc. possible	
if applicable	+	-	+	+	used today	1)	+	-	+	+	(2;22; 24;26)
if applicable	+	+	+	+	used today	1)	+	-	+	+	(3;36)
if applicable	+	+	+	+	used today	1)	+	-	+	+	(4;5)
if applicable	+	-	+	+	yesterday	+	+	-	+	+	(28;32;33)
if applicable	+	-	+	+	taking yes/no, during the year or in wintertime, since when	2)	+	-	- (1960 +)	-	(29)
spreads, cooking oils and fat**	cooking oils and fat	-	spreads	-	taking yes/no/ sometimes; during the year or in wintertime	3)	-	-	-	-	(41)
spreads, cooking oils and fat	+	+	+	+	taking yes/no; vit C+E in mg/IU	4)	-	+	vit C and E	vit C and E	(7)
spreads, cooking oils and fat	+	+	+	+	taking yes/no; vit C+E in mg/IU	4)	-	+	vit C and E	vit C and E	

Study	Insti-tute	Study year(s)	Method	Pop.	Remarks	Details background diet (all products)				
						type of pro ducts*	brand name	freq. of use	amount used	nutrient calc. possible
EPIC-Doetinchem cohort follow up	**RIVM**	2000	VEG question-naire		special attention to vegetable and fruit use in summer and winter	vegeta-bles (raw, cooked) potatoes, fruit, drinks	-	+	+	+
EPIC-Maastricht cohort	**RIVM**	(continued PPHV/MORGEN till 1997+new sampling in 1998	EPIC FFQ	13184 men + women 20-59y at baseline		+	-	+	+	+
EPIC-Maastricht cohort follow up	**RIVM**	2000-2003	EPIC follow up question-naire	2000:1200p; 2001:800 p; 2002:1100 p		alcohol	-	+	-	-
EPIC-Amsterdam cohort follow up	**RIVM**	1999-2203	EPIC follow up question-naire	1999:2300p; 2000:200p (total 4622)		alcohol	-	+	-	-
Hartslag Limburg (see also external studies)	**RIVM**	1998, 2000, 2003	1998, 2003: EPIC-FFQ	2300	2000: healthy food questions; 2003: special attention to functional foods: knowledge of ff and type of bread spread used since…	+	-	+	+	+
PIAMA	**RIVM**	1996/1997 (baseline) - 2004/2005 (yearly)	baseline: 7 food item FFQ; 1997-2005: 40 item FFQ	> 3000 children born in 96/97	special attention to organic and ecological products	ii)	-	+	-	-
REGENBOOG	**RIVM**	1999-2002 (sample from POLS)	55 item FFQ	1284 p >12j		+	-	+	-	-

Explanation of symbols see page 60

(table continued from p. 50)

Details functional foods/ingredients					Details supplements						Ref/ info
type of FF	brand name	frequency of use	amount used	nutrient calc. possible	method	type of suppl.	brand name	freq. of use	amount used	nutrient calc. possible	
-	-	-	-	-	-	-	-	-	-	-	
spreads, cooking oils and fat	+	+	+	+	taking yes/no; vit C+E in mg/IU	4)	-	+	vit C and E	vit C and E	
-	-	-	-	-	taking yes/no/don't know; last week	open ques- tion	-	+	-	-	
-	-	-	-	-	taking yes/no/don't know; last week	open ques- tion	-	+	-	-	
spreads, cooking oils and fat	+	+	+	+	taking yes/no; vit C+E in mg/IU; last week	4)	-	+	vit C and E	vit C and E	(35)
probiotics (asked since 2004)	-	+	-	-	since 2002: frequency during last month	since 2002: multi- vitamins, vitamin A, C, D, E	-	+	-	-	(43)
spreads, cooking oils and fat	+	+	-	±***	usually taking: no / sometimes / regularly; in medical questionn.: use at this moment	open ques- tion	+	-	-	-	(42)

Study	Insti-tute	Study year(s)	Method	Pop.	Remarks	Details background diet (all products)				
						type of pro ducts*	brand name	freq. of use	amount used	nutrient calc. possible
External studies										
ABCD study (pregnant women)	**VUMC /AMC**	2003/2004 ongoing	limited FFQ during pregnancy; at 3 m. and 5 y after birth	8000 pregnant mothers	12 weeks of pregnancy onwards	fish	-	+	-	-
ABCD study (infants and mothers)	**VUMC /AMC**	2003/2004 , ongoing		7000 new born children	duration breast feeding	(moth-ers: only drugs) baby's: breast or bottle fed	+	+	-	-
AGAHLS	**EMGO VUMC**	1977-81, 1985, 1991, 1996, 2000, 2004	cross check diet history (+24 h recall)	2 cohorts 13-32 y: 164 p regularly examined; 90 p twice		+	-	-	+	+
CoDAM	**UM**	1999-2000 (partly from PPHV and MORGEN)	EPIC-FFQ	ca 200 p 40-70 y, at risk for DM		+	-	+	+	+
Dutch national survey of general practice	**NIVEL /RIVM**	1987-1988, 2000-2002	oral question-naire	12.699 p	no questions on supplements or functional foods	bread, cooking fat, chips, vege-tables, fruit	-	+	-	-
Dutch Health Care Consumer Panel	**NIVEL /RIVM**	spring 2000	self-administered question-naire: frequency of use by day/week month/none/ unknown	1183 p	questions concerning functional foods and dietary supplements	-	-	-	-	-
ERGO – R'dam en ERGO-PLUS	**EUR**	baseline: 1990/1993 ; ERGO-PLUS: 2000/2001	checklist and semi quantita-tive FFQ	baseline: 5,395 p. > 55 y Rotterdam; follow up: 1220 (new) p >55 y Ommoord (R'dam)	special attention for vegetable use in summer and winter	+	-	+	+	+

Explanation of symbols see page 60

(table continued from p. 52)

Details functional foods/ingredients					Details supplements						Ref/ info
type of FF	brand name	frequency of use	amount used	nutrient calc. possible	method	type of suppl.	brand name	freq. of use	amount used	nutrient calc. possible	
-	-	-	-	-	fish oil, knowledge and use of folic acid suppl	fish oil, folic acid	-	fish oil: +, folic acid suppl. -	-	-	abcd@ gggd. amster dam.nl
-	-	-	-	-	use during pregnancy trimesters; use by baby's	5) [mother's use]; 6) [baby's use]	-	-	-	-	
if applicable	-	-	+	+	-	-	-	-	-	-	(6;20)
spreads, cooking oils and fat	+	+	+	+	taking yes/no; vit C+E in mg/IU	4)	-	+	vit C and E	vit C and E	
-	-	-	-	-	-	-	-	-	-	-	(31)
yoghurt with lactic acid bact.; chol lowering spreads, vit/min enriched lemonade or sweets, foods with extra Ca	-	+	-	-	frequency of use by day/week/ month/non e/unknown	multivit and min; Ca	-	+	-	-	(19)
spreads, cooking oils and fat	+	+	+	+	use during last 12 m yes/no	open questio n	+	+	+	+	(25) j.heer inga@ erasm us mc.nl

Study	Institute	Study year(s)	Method	Pop.	Remarks	Details background diet (all products)				
						type of pro ducts*	brand name	freq. of use	amount used	nutrient calc. possible
Generation R (pregnant mothers)	**EUR**	2002, ongoing	maternal diet at 12 w ameno-rrhoe (FFQ)	ca 10,000 newborn multi ethnic children (born 2002-2004)+ parents; follow-up until age 20 y		+	dres-sings	+	based on mean servings	±
Generation R (young mothers)	**EUR**	2002, ongoing	maternal diet at ca. 2 m after birth (9 item FFQ)	(see above)	special attention for nuts and nut products during breast feeding	vegeta-bles, fruit, meat, fish, eggs, milk, milk products, nuts, nut products	-	+	-	-
Generation R (children)	**EUR**	2002, ongoing	childhood diet (2, 6, 12 m) [plans for 24, 36 m and yearly thereafter] by FFQ	(see above)	number of food items in FFQ increase per age group	iii)	+	+	bottle fed 2 m: + ; 6 and 12 m: -	-
GLOBE	**EUR**	1991 (during follow up: annually or bi-annually no FFQ), ongoing	58 items FFQ	5667 p 15-74y		+	-	+	based on mean servings	±
Hartslag Limburg (see also RIVM related studies)	**RUL/ GVO Maast richt**	1998, 2000, 2003	19 item FFQ (fatlist)+ fruit and vegetable questions	2775 at baseline	very limited information on food	major fat contai-ning food groups + fruit and vegeta -bles	-	+	-	-
Hoorn study	**VUMC**	1989, 1996-98, 2000-01 (partly newly sampled), 2006, ongoing	89/90: TNO-FFQ; 96/98 extended TNO-FFQ; 2000: EPIC-FFQ	800 p 64-85 y	dataset 2000 for use in Dialog	+	-	+	+	+

Explanation of symbols see page 60

(table continued from p. 54)

Details functional foods/ingredients					Details supplements						Ref/ info
type of FF	**brand name**	**frequency of use**	**amount used**	**nutrient calc. possible**	**method**	**type of suppl.**	**brand name**	**freq. of use**	**amount used**	**nutrient calc. possible**	
enriched milk and yoghurt drinks; breakfast drinks; sport drinks; spreads, cooking oils and fat	+	+	+	+	use yes/no - since when	8)	-	-	-	-	s.e. bleeker @erasmusmc. nl
-	-	-	-	-	during breast feeding yes/no	9)	-	-	-	-	
12 m: spreads	+	+	-	-	use yes/no	fluoride, iron, vit A, D, multivit (+ vit K at 2 and 6 m)	-	-	-	-	(27)
spreads, cooking oils and fat	+	+	-	-	-	-	-	-	-	-	iKatrina Giskes (k.giskes @erasmusmc.nl)
-	-	-	-	-	-	-	-	-	-	-	(35)
spreads, cooking oils and fat	+	+	+	+	taking yes/no; vit C+E in mg/IU	4)	-	+	vit C and E	vit C and E	(9)

Study	Insti-tute	Study year(s)	Method	Pop.	Remarks	Details background diet (all products)				
						type of pro ducts*	brand name	freq. of use	amount used	nutrient calc. possible
LASA	**VUMC**	1992-93, 1995-96, (1998-99, 2001-02, 2002-03 (new cohort), present, ongoing, but no information on food)	very limited question-naires	ca 1000 p >55-85 y	92/93: question-naires on fruit and vegetables; 95/96: on dairy food and medication	fruit and vegeta-bles; dairy food	-	+	-	-
Leidsche Rijn Gezondheid sproject (Utrecht health monitoring study)	**UMC U**	2000-present, ongoing	very limited FFQ	5500 men and women, 3/4 > 18 y	more detailed FFQ is planned to be used later during the study	bread, vege-tables, fruit, milk product s, alcohol	-	+	-	-
Monitor VGZ	**GGD/ RIVM**	data collection every 4-5 years, national data available from 2004, ongoing	question-naires	2000-3000 p 18-65 y; yearly		alcohol, vege-tables, fruit, bread	-	+	+	-
Netherlands Twin Register	**VUMC**	1986, ongoing	1992: 2-day diet history (250 twins and some parents)		recently hardly any food consumption questions	milk, coffee, tea	-	-	-	-
NLCS	**TNO/ UM**	1986-present (sub cohort of 5000 ongoing)	175 item FFQ	baseline: 120,825 men and women 55-69 y	1987/88: validation study on dietary suppl. question-naires (sub group n=109)	+	-	+	+	-
PGO-peilingen	**TNO-PG**	1991-present, ongoing	question-naire on milk food infants; 93/94: FFQ 4-18 y	6000 children	method used in 93/94 not specified in this table	breast fed or bottle fed	-	-	-	-
Prospect-EPIC (Utrecht cohort)	**UMC U/RIV M**	1993-1997 ongoing	EPIC-FFQ	EPIC cohort Utrecht: ca. 17,500 women 50-70 y		+	-	+	+	+

Explanation of symbols see page 60

(table continued from p. 56)

Details functional foods/ingredients					Details supplements						Ref/ info
type of FF	brand name	frequency of use	amount used	nutrient calc. possible	method	type of suppl.	brand name	freq. of use	amount used	nutrient calc. possible	
-	-	-	-	-	daily use yes/no	vitamins, calcium, iron	-	-	-	-	(21)
-	-	-	-	-	use during last 3 m yes/no	7)	-	-	-	-	M.E. Numans @med. uu.nl
spreads, cooking oil and fat	+	-	-	-	-	-	-	-	-	-	(40)
-	-	-	-	-	-	-	-	-	-	-	(8)
spreads, cooking oil and fat	+	+	+	+	use during last 5 y	open question	+	-	+	+	(1;23; 38)
-	-	-	-	-	-	-	-	-	-	-	(11;12)
spreads, cooking oils and fat	+	+	+	+	taking yes/no; vit C+E in mg/IU	4)	-	+	vit C and E	vit C and E	(30)

Study	Insti-tute	Study year(s)	Method	Pop.	Remarks	Details background diet (all products)				
						type of pro ducts*	brand name	freq. of use	amount used	nutrient calc. possible
Prospect-EPIC (Utrecht cohort) calibration study	**UMCU /RIVM**	1995-1997	24-h recall EPIC-SOFT	2231 women 50-70 y		+	+	-	+	+
SENECA	**WUR**	baseline: 1988/89; 1993, 1999	dietary history: 3-day record + checklist on food	at baseline: 236 p.; 1993: 132 men and women (75-80 y)		+	-	+	+	+
Survey on food consumptio n of allochtho-nous population	**TNO**	1996 + 97; 1998	96+'97:2x2 4 h recall; '98: 24 h recall	1996: 36 Moroccan women (19-50y); 1997: 42 Surinam men (18-49y); 1998: 91 Moroc., 180 Turkish and 202 Dutch mothers and 8y old children	no information on supplements	+	-	-	+	+
Vitamins and food supple-ments 2003	**TNS-NIPO**	1998, 2001, 2003	multi media question-naire	random sampling of 1993 p >18y	goal: to check knowledge of brand names and possession of supple-ments, freq. of use, season differences; no specific intake data	-	-	-	-	-
VIO (Nutrient Intake Study)	**TNO**	2002	2 day dietary record	914 children, 9, 12 and 18 month		+	+	-	+	+

Explanation of symbols see page 60

(table continued from p. 58)

Details functional foods/ingredients					Details supplements						Ref/ info
type of FF	**brand name**	**frequency of use**	**amount used**	**nutrient calc. possible**	**method**	**type of suppl.**	**brand name**	**freq. of use**	**amount used**	**nutrient calc. possible**	
if applicable	+	-	+	+	yesterday	+	+	-	+	+	(37)
if applicable	+	+	+	+	do you use	open ques-tion: vita-mins/ miner-als or tonics	+	+	+	+	(15-18)
if applicable	-	-	-	-	-	-	-	-	-	-	(13;14; 39)
-	-	-	-	-	do you know, do you have, do you use	vita-mins, mine-rals, multi's, fibre, garlic, herbs	-	+	-	-	(34)
enriched cereals, childrens' milk, yoghurt drinks, fruit drinks, biscuits	-	-	+	+	do you use yes/no	vit D, AD, K, B, C, multivit, multivit and mineral s, fluoride, tooth-paste with F, other	-	-	-	-	(10)

Used symbols:

*	+ if no differentiation in type of products is given, most (to all) food groups are included
**	specifical information on phytosterol/-stanol enriched foods is available
***	± nutrient calculation can be made based on mean servings

1) vitamin A/D, B-complex, C, multivitamins, multivit/minerals, garlic pills, brewer's yeast pills, fluoride, other preparations
2) 1960: vitamins, calcium, levertraan; later: vitamin AD/ B-complex, C, E, multivitamins, other food or reform preparations
3) vitamin A/D, B-complex, C, multivitamins, garlic, sweeteners, lecithine, calcium, iron, other preparations
4) vitamin A, A/D, B-complex, multivitamins, calcium, calcium/vit D, iron, garlic, lecithine, other preparations…
5) Gravitamon, Davitamon totaal 30, Dagravit totaal 30, Matrilon, vitamin A, D, A/D, B-complex, C, E, calcium, iron, fish oil, folic acid, other…
6) vitamin K, D, A/D, other…
7) vitamins, minerals, tonics, iron, Echinacea, digestion stimulating preparations, other preparations, herbs
8) folate + open question on supplements
9) folate, iron, calcium, multivit, vit AD, D, C, other

i) milk products(11), vegetables(9), fruit(3), meat(beef, pork), chicken, fish, eggs, bread (white,brown,dark), spreads, sandwich filling, coffee, tea, alcohol, sweets, snacks
ii) milk products(7), bread (white,brown/dark), spreads, sandwich fillings, fruit, vegetables (raw,cooked), eggs, meat, fish, soy products, drinks, sweets, snacks
iii) breast and bottle milk, milk products, bread (white/brown, dark), spreads, sandwich filling, fruit, vegetables, potatoes, rice, pasta, meat, fish, soy products, eggs, sauces, drinks, sweets

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APPENDIX II: Intake tables based on the Dutch National Food Consumption Survey 2003

Table 7a: Intake and the distribution of intake compared with the Dutch RDA and UL for male probiotics consumers (n=26)

	Daily intake through total diet*			Daily intake through probiotics only			mean contribution probiotics to total	Dutch RDA	safe UL	% mean intake of RDA	% mean intake of UL
	mean ± sd	P50	P90	mean ± sd	P50	P90					
Vitamins											
vitamin A (µg RE)	878 ± 687	959	1452	5.2 ± 5.1	3.3	13.6	1	1000	3000	88	29
vitamin D (µg)	3.7 ± 1.9	5.0	6.0	0 ± 0	0	0	0	2.5	50	148	7
vitamin E (mg α TE)	14.2 ± 8.7	19.0	23.2	0.01 ± 0.01	0.01	0.02	0.1	11.8 – 13.0	300	115	5
vitamin B1 (mg)	1.5 ± 0.7	2.0	2.4	0.04 ± 0.03	0.04	0.08	3	1.1	not established	136	-
vitamin B2 (mg)	1.8 ± 0.8	2.3	3.0	0.2 ± 0.2	0.19	0.4	14	1.5	not established	120	-
vitamin B6 (mg)	2.0 ± 1.0	2.7	3.3	0.05 ± 0.03	0.04	0.08	3	1.5	25	133	8
folic acid (µg)	190 ± 73	258	300	7.3 ± 5.4	5.6	14.4	4	300	1000	63	19
vitamin B12 (µg)	4.3 ±1.8	5.0	5.5	0.4 ± 0.3	0.3	0.6	10	2.8	not established	154	-
vitamin C (mg)	99 ± 61	133	176	1.6 ± 1.2	1.3	2.9	3	70	in preparation	141	-
Minerals											
calcium (mg)	1048 ± 390	872	1517	169 ± 123	136	301	16	1000	2500	105	42
iron (mg)	11.8 ± 4.1	10.4	18.3	0.07 ± 0.05	0.05	0.12	1	9.0-11.0	not established	118	-

* all foods included

Table 7b: Intake and the distribution of intake compared with the Dutch RDA and UL for female probiotics consumers (n=33)

	Daily intake through normal diet*			Daily intake through probiotics only			mean contribution probiotics to total	Dutch RDA	safe UL	% mean intake of RDA	% mean intake of UL
	mean ± sd	P50	P90	mean ± sd	P50	P90					
Vitamins											
vitamin A (µg RE)	712 ± 358	578	1152	7.2 ± 9.4	3.5	18.2	1	800	3000	89	24
vitamin D (µg)	3.5 ± 4.4	2.6	5.2	0	0	0	0	2.5	50	140	7
vitamin E (mg α TE)	9.8 ± 5.7	8.8	14.9	0.01 ± 0.01	0.01	0.01	0.1	9.3 – 9.9	300	102	3
vitamin B1 (mg)	1.0 ± 0.4	0.9	1.5	0.04 ± 0.03	0.03	0.09	5	1.1	not established	91	-
vitamin B2 (mg)	1.6 ± 0.6	1.4	2.5	0.24 ± 0.16	0.17	0.45	15	1.1	not established	145	-
vitamin B6 (mg)	1.5 ± 0.5	1.5	2.1	0.05 ± 0.03	0.03	0.09	3	1.5	25	100	6
folic acid (mg)	154 ± 51	145	222	8.0 ± 6.6	5.8	14.6	5	300	1000	51	15
vitamin B12 (µg)	3.3 ± 1.5	3.0	5.5	0.4 ± 0.3	0.3	0.8	13	2.8	not established	118	-
vitamin C (mg)	93 ± 55	94	170	1.7 ± 1.3	1.3	2.8	2	70	in preparation	133	-
Minerals											
calcium (mg)	1107 ± 406	1053	1759	166 ± 106	123	306	16	1000	2500	111	44
iron (mg)	8.9 ± 2.1	9.0	11.3	0.07 ± 0.04	0.05	0.1	1	15.0-16.0	not established	57	-

* all foods included

Table 8a: Intake and the distribution of intake compared with the Dutch RDA and UL for male phytosterol/-stanol enriched margarine consumers (n=6)

	Daily intake through total diet*			Daily intake through spreads only**			Dutch RDA**	safe UL	% mean intake of RDA	% mean intake of UL
	mean ± sd	P50	P90	mean ± sd	P50	P90				
Other										
margarine (g)	-	-	-	14 ± 10	11	-	20 – 25	-		
phytosterols/-stanols (g)	-	-	-	1.1 ± 0.8	0.9	-	1.5-3.0	4.0***	0.73	0.28

* all foods included, but amount of phytosterols/-stanols in normal diet negligible
** 100 g of margarine contains 8 g of free phytosterols/-stanols, RDA is based on amount free phytosterols/-stanols
*** see comments in text

Table 8b: Intake and the distribution of intake compared with the Dutch RDA and UL for female phytosterol/-stanol enriched margarine consumers (n=6)

	Daily intake through total diet*			Daily intake through spreads only**			Dutch RDA**	safe UL	% mean intake of RDA	% mean intake of UL
	mean ± sd	P50	P90	mean ± sd	P50	P90				
Other										
margarine (g)				7 ± 7	3	-	20 – 25			
phytosterols/-stanols (g)	-	-	-	0.6 ± 0.6	0.2	-	1.5-3.0	4.0***	0.40	0.15

* all foods included, but amount of phytosterols/-stanols in normal diet negligible
** 100 g of margarine contains 8 g of free phytosterols/-stanols, RDA is based on amount free phytosterols/-stanols
*** see comments in text

Table 9a: Intake and the distribution of intake compared with the Dutch RDA and UL for male breakfast cereals consumers (n=5)

	Daily intake through total diet*			Daily intake through breakfast cereals only			mean contribution cereals to total	Dutch RDA	safe UL	% mean intake of RDA	% mean intake of UL
	mean ± sd	P50	P90	mean ± sd	P50	P90					
Vitamins											
vitamin A (µg RE)	698 ± 183	648	-	0	0	-	0	1000	3000	70	23
vitamin D (µg)	3.4 ± 1.8	2.8	-	0	0	-	0	2.5	50	136	7
vitamin E (mg α TE)	15.5 ± 6.3	15.9	-	0.5 ± 1.1	0	-	3	11.8 – 13.0	300	125	5
vitamin B1 (mg)	1.8 ± 0.4	1.9	-	0.3 ± 0.2	0.3	-	20	1.1	not established	164	-
vitamin B2 (mg)	2.2 ± 1.0	2.2	-	0.3 ± 0.2	0.3	-	14	1.5	not established	147	-
vitamin B6 (mg)	2.4 ± 0.3	2.5	-	0.6 ± 0.3	0.5	-	23	1.5	25	160	10
folic acid (µg)	192 ± 50	190	-	47 ± 33	44	-	24	300	1000	64	19
vitamin B12 (µg)	5.8 ± 2.6	6.2	-	0.2 ± 0.2	0.2	-	5	2.8	not established	207	-
vitamin C (mg)	50 ± 29	50	-	3.0 ± 6.7	0	-	6	70	in preparation	71	-
Minerals											
calcium (mg)	1201 ± 426	1102	-	96 ± 103	71	-	8	1000	2500	120	48
iron (mg)	14.0 ± 3.0	13.2	-	2.8 ± 1.2	2.4	-	19	9.0-11.0	not established	140	-

* all foods included

Table 9b: Intake and the distribution of intake compared with the Dutch RDA and UL for female breakfast cereals consumers (n=11)

	Daily intake through total diet*			Daily intake through breakfast cereals only			mean contribution cereals to total	Dutch RDA	safe UL	% mean intake of RDA	% mean intake of UL
	mean ± sd	P50	P90	mean ± sd	P50	P90					
Vitamins											
vitamin A (μg RE)	643 ± 634	517	773	0	0	0	0	800	3000	80	21
vitamin D (μg)	2.5 ± 1.2	1.9	4.0	0	0	0	0	2.5	50	100	20
vitamin E (mg α TE)	10.0 ± 4.5	8.6	13.3	0.3 ± 0.7	0	0.3	2	9.3 – 9.9	300	104	3
vitamin B1 (mg)	1.3 ± 0.3	1.4	1.8	0.2 ± 0.1	0.2	0.3	14	1.1	not established	118	-
vitamin B2 (mg)	1.7 ± 0.6	1.6	3.0	0.1 ± 0.1	0.1	0.3	8	1.1	not established	154	-
vitamin B6 (mg)	1.7 ± 0.4	1.7	2.6	0.2 ± 0.2	0.2	0.5	14	1.5	25	113	7
folic acid (μg)	161 ± 61	162	238	20 ± 21	14	50	12	300	1000	54	16
vitamin B12 (μg)	3.7 ± 1.6	2.8	6.7	0.1 ± 0.1	0.1	0.3	3	2.8	not established	132	-
vitamin C (mg)	63 ± 35	55	114	1.4 ± 4.5	0	0	1	70	in preparation	90	-
Minerals											
calcium (mg)	1102 ± 402	1069	1494	40 ± 49	8.1	107	4	1000	2500	110	44
iron (mg)	10.1± 2.7	10.3	12.7	1.4 ± 1.1	0.8	3.2	14	15.0-16.0	not established	65	-

* all foods included

Table 10a: Intake and the distribution of intake compared with the Dutch RDA and UL for male cake and biscuits consumers (n=8)

	Daily intake through total diet*			Daily intake through cake and biscuits only			mean contribution cake and biscuits to total	Dutch RDA	safe UL	% mean intake of RDA	% mean intake of UL
	mean ± sd	P50	P90	mean ± sd	P50	P90					
Vitamins											
vitamin A (µg RE)	1252 ± 990	882	-	2.8 ± 3.1	2.4	-	0.4	1000	3000	125	42
vitamin D (µg)	4.7 ± 3.5	3.8	-	0.03 ± 0.03	0.01	-	0.8	2.5	50	188	9
vitamin E (mg α TE)	14.0 ± 6.8	15.6	-	0.4 ± 0.4	0.2	-	3	11.8 – 13.0	300	113	5
vitamin B1 (mg)	1.4 ± 0.4	1.4	-	0.04 ± 0.05	0.03	-	3	1.1	not established	127	-
vitamin B2 (mg)	1.9 ± 0.4	1.9	-	0.04 ± 0.08	0.01	-	2	1.5	not established	127	-
vitamin B6 (mg)	2.3 ± 0.8	2.3	-	0.4 ± 0.3	0.3	-	16	1.5	25	153	9
folic acid (µg)	179 ± 56	150	-	0	0	-	0	300	1000	60	18
vitamin B12 (µg)	5.0 ± 2.2	5.1	-	0	0	-	0	2.8	not established	178	-
vitamin C (mg)	79 ± 38	78	-	0	0	-	0	70	in preparation	113	-
Minerals											
calcium (mg)	1185 ± 326	1107	-	114 ± 101	44	-	11	1000	2500	119	47
iron (mg)	14.2 ± 4.3	13.0	-	2.6 ± 1.9	1.2	-	18	9.0-11.0	not established	140	-

* all foods included

Table 10b: Intake and the distribution of intake compared with the Dutch RDA and UL for female cake and biscuits consumers (n=21)

	Daily intake through total diet*			Daily intake through cake and biscuits only			mean contribution cake and biscuits to total	Dutch RDA	safe UL	% mean intake of RDA	% mean intake of UL
	mean ± sd	P50	P90	mean ± sd	P50	P90					
Vitamins											
vitamin A (μg RE)	870 ± 715	568	2193	1.6 ± 1.7	1.1	4.1	0.4	800	3000	109	29
vitamin D (μg)	2.1 ± 1.1	2.0	3.5	0.01 ± 0.01	0	0.02	0.4	2.5	50	84	4
vitamin E (mg α TE)	9.0 ± 4.7	7.4	14.2	0.3 ± 0.3	0.3	0.6	4	9.3 – 9.9	300	94	3
vitamin B1 (mg)	0.9 ± 0.3	1.0	1.3	0.04 ± 0.04	0.04	0.08	4	1.1	not established	82	-
vitamin B2 (mg)	1.4 ± 0.7	1.4	1.9	0.02 ± 0.03	0.02	0.09	2	1.1	not established	127	-
vitamin B6 (mg)	1.6 ± 0.8	1.6	2.1	0.2 ± 0.1	0.2	0.4	15	1.5	25	107	6
folic acid (μg)	148 ± 55	150	206	0.2 ± 0.5	0	1.0	0.1	300	1000	49	15
vitamin B12 (μg)	3.0 ± 1.6	2.7	4.0	0	0	0	0	2.8	not established	107	-
vitamin C (mg)	101 ± 79	75	190	0	0	0	0	70	in preparation	144	-
Minerals											
calcium (mg)	1023 ± 401	921	1418	58 ± 33	57	99	6	1000	2500	102	41
iron (mg)	10.7 ± 2.9	10.2	14.5	1.5 ± 0.6	1.5	2.4	15	15.0-16.0	not established	69	-

* all foods included

Table 11a: Intake and the distribution of intake compared with the Dutch RDA and UL for male fruit juice consumers (n=69)

	Daily intake through total diet*			Daily intake through fruit juice only			mean contribution fruit juice to total	Dutch RDA	safe UL	% mean intake of RDA	% mean intake of UL
	mean ± sd	P50	P90	mean ± sd	P50	P90					
Vitamins											
vitamin A (µg RE)	1442 ± 1062	1188	2766	252 ± 402	14	935	17	1000	3000	144	48
vitamin D (µg)	3.9 ± 2.4	3.5	6.3	0	0	0	0	2.5	50	156	78
vitamin E (mg α TE)	14.8 ± 5.6	13.4	24.1	1.8 ± 3.0	0.3	5.7	10	11.8 – 13.0	300	119	5
vitamin B1 (mg)	1.8 ± 0.6	1.8	2.8	0.4 ± 0.4	0.2	0.9	18	1.1	not established	164	-
vitamin B2 (mg)	2.2 ± 0.9	2.0	3.6	0.3 ± 0.4	0.07	1.0	11	1.5	not established	147	-
vitamin B6 (mg)	2.6 ± 0.9	2.5	4.0	0.5 ± 0.6	0.2	1.3	15	1.5	25	173	10
folic acid (µg)	227 ± 77	210	333	16 ± 25	4.9	51	7	300	1000	76	23
vitamin B12 (µg)	4.9 ± 2.1	4.3	8.4	0.2 ± 0.3	0	0.6	4	2.8	not established	175	-
vitamin C (mg)	136 ± 75	133	209	46 ± 39	37	102	35	70	in preparation	194	-
Minerals											
calcium (mg)	1218 ± 491	1112	1842	28 ± 31	18	60	3	1000	2500	122	49
iron (mg)	12.8 ± 3.4	12.8	16.7	0.5 ± 0.5	0.3	1.1	4	9.0-11.0	not established	128	-

* all foods included

Table 11b: Intake and the distribution of intake compared with the Dutch RDA and UL for female fruit juice consumers (n=111)

	Daily intake through total diet*			Daily intake through fruit juice only			mean contribution fruit juice to total	Dutch RDA	safe UL	% mean intake of RDA	% mean intake of UL
	mean ± sd	P50	P90	mean ± sd	P50	P90					
Vitamins											
vitamin A (μg RE)	946 ± 717	703	1957	274 ± 547	3	838	19	800	3000	118	32
vitamin D (μg)	2.4 ± 1.4	2.1	4.0	0	0	0	0	2.5	50	96	5
vitamin E (mg α TE)	10.6 ± 5.9	8.8	18.0	1.9 ± 3.9	0.1	5.5	14	9.3 – 9.9	300	110	4
vitamin B1 (mg)	1.2 ± 0.7	1.1	1.9	0.3 ± 0.6	0.07	0.9	18	1.1	not established	109	-
vitamin B2 (mg)	1.5 ± 0.8	1.4	2.5	0.3 ± 0.6	0.04	1.0	13	1.1	not established	136	-
vitamin B6 (mg)	1.8 ± 1.0	1.7	2.9	0.5 ± 0.9	0.1	1.3	19	1.5	25	120	7
folic acid (μg)	152 ± 57	149	224	18 ± 31	8	50	11	300	1000	51	15
vitamin B12 (μg)	3.0 ± 1.8	2.7	5.4	0.2 ± 0.4	0.01	0.6	7	2.8	not established	107	-
vitamin C (mg)	110 ± 63	97	183	45 ± 47	33	111	37	70	in preparation	157	-
Minerals											
calcium (mg)	887 ± 380	834	1468	31 ± 32	16	80	4	1000	2500	89	35
iron (mg)	9.0 ± 2.9	8.8	12.7	0.5 ± 0.7	0.3	1.1	5	15.0-16.0	not established	58	-

* all foods included

Table 12a: Intake and the distribution of intake compared with the Dutch RDA and UL for male dairy products consumers (n=38)

	Daily intake through total diet*			Daily intake through dairy products only			mean contribution dairy products to total	Dutch RDA	safe UL	% mean intake of RDA	% mean intake of UL
	mean ± sd	P50	P90	mean ± sd	P50	P90					
Vitamins											
vitamin A (µg RE)	895 ± 565	814	1597	22 ± 22	18	40	3	1000	3000	90	30
vitamin D (µg)	3.7 ± 2.0	3.3	6.4	0.05 ± 0.1	0	0.2	1	2.5	50	148	7
vitamin E (mg α TE)	15.3 ± 7.6	14.7	26.5	0.6 ± 1.6	0.02	3.1	4	11.8 – 13.0	300	123	5
vitamin B1 (mg)	1.8 ± 0.6	1.7	2.9	0.3 ± 0.4	0.1	0.9	16	1.1	not established	164	-
vitamin B2 (mg)	2.5 ± 1.0	2.3	4.5	0.8 ± 0.6	0.6	1.4	31	1.5	not established	167	-
vitamin B6 (mg)	2.7 ± 1.0	2.5	4.5	0.5 ± 0.5	0.2	1.3	16	1.5	25	180	11
folic acid (µg)	232 ± 74	224	342	22 ± 20	15	46	10	300	1000	77	32
vitamin B12 (µg)	4.7 ± 1.6	4.5	7.0	0.7 ± 0.8	0.6	1.7	15	2.8	not established	168	-
vitamin C (mg)	142 ± 75	133	209	34 ± 32	26	79	24	70	in preparation	203	-
Minerals											
calcium (mg)	1437 ± 657	1387	2176	382 ± 304	298	600	26	1000	2500	144	57
iron (mg)	12.7 ± 4.2	11.9	17.7	0.2 ± 0.2	0.1	0.4	1	9.0-11.0	not established	127	-

* all foods included

Table 12b: Intake and the distribution of intake compared with the Dutch RDA and UL for female dairy products consumers (n=57)

	Daily intake through total diet*			Daily intake through dairy products only			mean contribution dairy products to total	Dutch RDA	safe UL	% mean intake of RDA	% mean intake of UL
	mean ± sd	P50	P90	mean ± sd	P50	P90					
Vitamins											
vitamin A (μg RE)	861 ± 585	693	1672	12 ± 13	8.4	31	2	800	3000	108	29
vitamin D (μg)	2.5 ± 1.4	2.3	4.1	0.00 ± 0.02	0	0	0	2.5	50	100	5
vitamin E (mg α TE)	9.4 ± 4.6	8.0	15.2	0.4 ± 2.1	0	0.3	3	9.3 – 9.9	300	98	3
vitamin B1 (mg)	1.2 ± 0.5	1.1	1.8	0.1 ± 0.3	0.05	0.4	10	1.1	not established	109	-
vitamin B2 (mg)	1.7 ± 0.6	1.6	2.5	0.6 ± 0.5	0.4	1.0	31	1.1	not established	155	-
vitamin B6 (mg)	1.9 ± 0.8	1.7	2.7	0.4 ± 0.6	0.2	0.8	17	1.5	25	127	8
folic acid (μg)	165 ± 52	161	235	16 ± 14	11	39	11	300	1000	55	17
vitamin B12 (μg)	3.0 ± 1.5	2.8	5.4	0.3 ± 0.3	0.3	0.6	14	2.8	not established	107	-
vitamin C (mg)	113 ± 64	94	206	18 ± 18	15	38	18	70	in preparation	161	-
Minerals											
calcium (mg)	1067 ± 365	1017	1476	213 ± 160	173	373	21	1000	2500	107	43
iron (mg)	9.4 ± 2.5	9.1	12.8	0.1 ± 0.2	0.07	0.2	1	15.0-16.0	not established	61	-

* all foods included

Table 13a: Intake and the distribution of intake compared with the Dutch RDA and UL for male micronutrient enriched margarine consumers (n=25)

	Daily intake through total diet*			Daily intake through micronutrient enr. spreads only			mean contribution micronutr. enr. spreads to total	Dutch RDA	safe UL	% mean intake of RDA	% mean intake of UL
	mean ± sd	P50	P90	mean ± sd	P50	P90					
Vitamins											
vitamin A (μg RE)	1189 ± 736	1006	2511	159 ± 113	120	324	16	1000	3000	119	40
vitamin D (μg)	4.0 ± 1.6	3.7	6.7	1.2 ± 0.9	0.9	2.5	32	2.5	50	160	8
vitamin E (mg α TE)	15.6 ± 6.4	15.0	24.2	5.0 ± 3.5	3.8	10.1	31	11.8 – 13.0	300	126	5
vitamin B1 (mg)	1.9 ± 0.6	1.9	3.0	0.3 ± 0.2	0.2	0.6	15	1.1	not established	173	-
vitamin B2 (mg)	2.1 ± 0.8	2.1	3.0	0.3 ± 0.2	0.2	0.6	15	1.5	not established	140	-
vitamin B6 (mg)	2.5 ± 0.9	2.3	3.7	0.4 ± 0.3	0.3	0.8	16	1.5	25	167	10
folic acid (μg)	219 ± 87	195	318	0	0	0	0	300	1000	73	22
vitamin B12 (μg)	4.3 ± 1.7	4.2	5.9	0.2 ± 0.1	0.2	0.4	5	2.8	not established	154	-
vitamin C (mg)	101 ± 66	95	170	0	0	0	0	70	in preparation	144	-
Minerals											
calcium (mg)	1253 ± 486	1204	2071	119 ± 85	90	243	10	1000	2500	125	50
iron (mg)	12.3 ± 3.0	12.0	17.5	0 ± 0	0	0	0	9.0-11.0	not established	123	-

* all foods included

Table 13b: Intake and the distribution of intake compared with the Dutch RDA and UL for female micronutrient enriched margarine consumers (n=29)

	Daily intake through total diet*			Daily intake through micronutrient enr. spreads only			mean contribution micronutr. enr. spreads to total	Dutch RDA	safe UL	% mean intake of RDA	% mean intake of UL
	mean ± sd	P50	P90	mean ± sd	P50	P90					
Vitamins											
vitamin A (µg RE)	1152 ± 1059	867	**3255**	93.7 ± 71.8	72	180	13	800	3000	144	38
vitamin D (µg)	3.0 ± 2.0	2.6	5.3	0.7 ± 0.6	0.6	1.4	28	2.5	50	120	6
vitamin E (mg α TE)	12.4 ± 5.7	12.0	18.0	2.9 ± 2.2	2.3	5.6	24	9.3 – 9.9	300	129	4
vitamin B1 (mg)	1.4 ± 0.7	1.3	2.4	0.2 ± 0.1	0.1	0.3	12	1.1	not established	127	-
vitamin B2 (mg)	2.0 ± 0.9	1.8	3.3	0.2 ± 0.1	0.1	0.4	11	1.1	not established	182	-
vitamin B6 (mg)	2.2 ± 1.1	2.1	3.3	0.2 ± 0.2	0.2	0.5	12	1.5	25	147	9
folic acid (µg)	162 ± 54	161	323	0	0	0	0	300	1000	54	16
vitamin B12 (µg)	4.4 ± 2.1	4.2	6.7	0.1 ± 0.1	0.1	0.2	3	2.8	not established	157	-
vitamin C (mg)	107 ± 65	95	177	0	0	0	0	70	in preparation	153	-
Minerals											
calcium (mg)	1204 ± 631	1098	**2558**	70 ± 54	54	135	7	1000	2500	120	48
iron (mg)	10.3 ± 3.8	9.0	15.9	0	0	0	0	15.0-16.0	not established	66	-

* all foods included

APPENDIX III: Intake tables based on the Dutch Nutrient Intake Study 2002

Table 14a: Intake and the distribution of intake compared with the Dutch RDA and UL for toddlers aged 9 months consuming enriched breakfast cereals (n=226)

	Daily intake through total diet*			Daily intake through enriched breakfast cereals only^			mean contribution enr. breakfast cereals to total	Dutch RDA	safe UL	% mean intake of RDA	% mean intake of UL
	mean ± sd	P50	P90	mean ± sd	P50	P90					
Energy (kcal)	997 ± 187	984	1228	76 ± 36	75	125	8				
Vitamins											
vitamin A (µg RE)	**887** ± 415	**805**	**1377**	-	-	-	-	400	800**	221	111
vitamin D (µg)	10.4 ± 3.3	10.8	14.1	-	-	-	-	5-10	25[@]	139	42
vitamin B1 (mg)	0.7 ± 0.2	0.7	1.0	0.2 ± 0.1	0.2	0.3	23	0.2	not established	350	-
vitamin B2 (mg)	1.2 ± 0.3	1.1	1.4	0.02 ± 0.01	0.02	0.04	2	0.4	not established	300	-
vitamin B6 (mg)	0.9 ± 0.2	0.8	1.2	0.06 ± 0.04	0.06	0.11	7	0.25	5**	360	18
folic acid (µg)	127 ± 29	124	161	10 ± 5	9	16	8	45-65	200**	231	64
vitamin B12 (µg)	2.1 ± 0.9	1.8	3.5	-	-	-	-	0.6	not established	350	-
vitamin C (mg)	95 ± 25	92	125	-	-	-	-	35	in preparation	271	-
Minerals											
calcium (mg)	732 ± 168	731	965	9 ± 7	8	14	1	450	2500[@]	163	29
magnesium (mg)	145 ± 30	142	202	23 ± 12	22	39	16	35-60	not established	305	-
iron (mg)	9.7 ± 2.3	9.8	13.3	0.5 ± 0.3	0.5	0.9	6	7	not established	138	-
zinc (mg)	6.8 ± 1.4	6.7	**9.2**	0.5 ± 0.2	0.5	0.8	7	4	7**	170	97

* all foods included, ^ numbers of users in this column may vary according to the presence of the micronutrients in the food, ** as determined for 1-3 year old children by the EU-SCF, [@] as reported by VIO 2002

Table 14b: Intake and the distribution of intake compared with the Dutch RDA and UL for toddlers aged 12 months consuming enriched breakfast cereals (n=211)

	Daily intake through total diet*			Daily intake through enriched breakfast cereals only^			mean contribution enr. breakfast cereals to total	Dutch RDA	safe UL	% mean intake of RDA	% mean intake of UL
	mean ± sd	P50	P90	mean ± sd	P50	P90					
Energy (kcal)	1090 ± 215	1051	1352	80 ± 39	78	124	7				
Vitamins											
vitamin A (µg RE)	834 ± 433	765	**1460**	-	-	-	-	400	800**	209	104
vitamin D (µg)	7.0 ± 4.9	7.5	12.8	-	-	-	-	5-10	50@	93	14
vitamin B1 (mg)	0.8 ± 0.2	0.8	1.1	0.2 ± 0.1	0.2	0.3	23	0.3	not established	267	-
vitamin B2 (mg)	1.3 ± 0.3	1.2	1.7	0.02 ± 0.01	0.02	0.03	2	0.5	not established	260	-
vitamin B6 (mg)	1.0 ± 0.3	0.9	1.4	0.06 ± 0.04	0.06	0.1	7	0.72	5**	139	20
folic acid (µg)	130 ± 32	127	173	10 ± 5	9	15	9	60-90	200**	173	65
vitamin B12 (µg)	2.6 ± 1.0	2.5	3.8	-	-	-	-	0.6	not established	433	-
vitamin C (mg)	88 ± 31	84	130	-	-	-	-	40	in preparation	220	-
Minerals											
calcium (mg)	810 ±208	773	1066	11 ± 15	9	16	1	500	2500@	162	32
magnesium (mg)	168 ± 39	165	215	25 ± 12	23	39	15	60-70	not established	258	-
iron (mg)	8.8 ± 3.6	8.6	12.8	0.8 ± 0.7	0.6	1.6	11	7	not established	126	-
zinc (mg)	6.3 ± 1.7	6.1	**8.7**	0.5 ± 0.3	0.5	0.8	8	4	7**	158	90

* all foods included, , ^ numbers of users in this column may vary according to the presence of the micronutrients in the food, ** as determined for 1-3 year old children by the EU-SCF, @ as reported by VIO 2002

Table 14c: Intake and the distribution of intake compared with the Dutch RDA and UL for toddlers aged 18 mo. consuming enriched breakfast cereals (n=151)

	Daily intake through total diet*			Daily intake through enriched breakfast cereals only^			mean contribution enr. breakfast cereals to total	Dutch RDA	safe UL	% mean intake of RDA	% mean intake of UL
	mean ± sd	P50	P90	mean ± sd	P50	P90					
Energy (kcal)	1151 ± 230	1128	1455	84 ± 45	80	133	7				
Vitamins											
vitamin A (µg RE)	687 ± 407	599	**1204**	-	-	-	-	400	800**	172	86
vitamin D (µg)	1.8 ± 1.9	1.3	3.2	-	-	-	-	5-10	50@	24	4
vitamin B1 (mg)	0.8 ± 0.3	0.8	1.2	0.2 ± 0.1	0.2	0.3	23	0.3	not established	267	-
vitamin B2 (mg)	1.4 ± 0.4	1.4	1.8	0.02 ± 0.02	0.02	0.04	2	0.5	not established	280	-
vitamin B6 (mg)	1.1 ± 0.4	1.0	1.5	0.07 ± 0.04	0.07	0.11	7	0.72	5**	153	22
folic acid (µg)	112 ± 32	109	159	9 ± 5	8	16	8	60-90	200**	149	56
vitamin B12 (µg)	3.1 ± 1.0	3.0	4.4	-	-	-	-	0.6	not established	517	-
vitamin C (mg)	76 ± 32	71	127	-	-	-	-	40	in preparation	190	-
Minerals											
calcium (mg)	867 ± 206	845	1108	11 ± 21	6	17	12	500	2500@	173	35
magnesium (mg)	187 ± 40	186	236	24 ± 13	22	39	13	60-70	not established	288	-
iron (mg)	6.8 ± 2.5	6.7	9.9	2.0 ± 1.5	1.7	4.0	27	7	not established	97	-
zinc (mg)	5.3 ± 1.2	5.4	6.8	0.6 ± 0.3	0.5	0.9	10	4	7**	133	76

* all foods included, , ^ numbers of users in this column may vary according to the presence of the micronutrients in the food, ** as determined for 1-3 year old children by the EU-SCF, @ as reported by VIO 2002

Table 15a: Intake and the distribution of intake compared with the Dutch RDA and UL for toddlers aged 9 months consuming enriched fruit juices/-drinks (n=35)

	Daily intake through total diet*			Daily intake through enriched fruit juices/drinks only^			mean contribution enr. fruit juices /drinks to total	Dutch RDA	safe UL	% mean intake of RDA	% mean intake of UL
	mean ± sd	P50	P90	mean ± sd	P50	P90					
Energy (kcal)	1034 ± 226	1001	1294	24 ± 13	23	44	2			-	-
Vitamins											
vitamin A (µg RE)	**896** ± 417	**839**	**1403**	29 ± 87	6	17	3	400	800**	224	112
vitamin D (µg)	9.6 ± 4.0	10.6	14.7	-	-	-	-	5-10	25[@]	128	38
vitamin B1 (mg)	0.7 ± 0.2	0.7	0.9	0.1 ± 0.1	0.1	0.2	9	0.2	not established	350	-
vitamin B2 (mg)	1.2 ± 0.3	1.2	1.5	0.1 ± 0.1	0.1	0.2	8	0.4	not established	300	-
vitamin B6 (mg)	0.9 ± 0.3	0.9	1.3	0.1 ± 0.1	0.1	0.2	12	0.25	5**	360	18
folic acid (µg)	122 ± 31	124	153	4 ± 3	4	7	4	45-65	200**	222	61
vitamin B12 (µg)	2.1 ± 1.1	1.8	3.8	0.1 ± 0.1	0.1	0.1	5	0.6	not established	350	-
vitamin C (mg)	92 ± 26	85	129	9 ± 6	7	18	10	35	in preparation	263	-
Minerals											
calcium (mg)	732 ± 185	758	927	6 ± 5	6	12	1	450	2500[@]	163	29
magnesium (mg)	141 ± 34	139	185	3 ± 2	2	6	2	35-60	not established	297	-
iron (mg)	9.3 ± 2.9	9.9	12.9	0.1 ± 0.2	0.1	0.3	2	7	not established	133	-
zinc (mg)	6.4 ± 1.7	6.5	**9.0**	0 ± 0	0	0	0	4	7**	160	91

* all foods included, , ^ numbers of users in this column may vary according to the presence of the micronutrients in the food, ** as determined for 1-3 year old children by the EU-SCF, [@] as reported by VIO 2002

Table 15b: Intake and the distribution of intake compared with the Dutch RDA and UL for toddlers aged 12 months consuming enriched fruit juices/drinks (n=29)

	Daily intake through total diet*			Daily intake through fruit juices/drinks only^			mean contribution enr. fruit juices /drinks to total	Dutch RDA	safe UL	% mean intake of RDA	% mean intake of UL
	mean ± sd	P50	P90	mean ± sd	P50	P90					
Energy (kcal)	1133 ± 223	1063	1304	45 ± 47	26	114	4				
Vitamins											
vitamin A (µg RE)	**824** ± 32*9	796	**1222**	40 ± 77	15	78	6	400	800**	206	103
vitamin D (µg)	5.5 ± 4.6	3.2	12.8	-	-	-	-	5-10	50@	73	11
vitamin B1 (mg)	0.8 ± 0.2	0.8	1.1	0.1 ± 0.1	0.1	0.4	16	0.3	not established	267	-
vitamin B2 (mg)	1.5 ± 0.5	1.5	2.3	0.2 ± 0.1	0.1	0.5	18	0.5	not established	300	-
vitamin B6 (mg)	1.1 ± 0.3	1.1	1.6	0.2 ± 0.2	0.1	0.5	14	0.72	5**	153	22
folic acid (µg)	124 ± 33	119	186	6 ± 6	3	15	5	60-90	200**	165	62
vitamin B12 (µg)	2.8 ± 1.2	2.7	4.8	0.1 ± 0.1	0.1	0.3	5	0.6	not established	467	-
vitamin C (mg)	95 ± 33	89	140	10 ± 9	8	26	13	40	in preparation	238	-
Minerals											
calcium (mg)	868 ±235	868	1283	10 ± 12	5	32	1	500	2500@	174	35
magnesium (mg)	172 ± 37	169	233	4 ± 5	2	11	2	60-70	not established	265	-
iron (mg)	7.7 ± 2.9	7.3	12.9	0.3 ± 0.9	0.1	0.5	4	7	not established	110	-
zinc (mg)	5.9 ± 1.3	5.6	**8.4**	0 ± 0	0	0.1	1	4	7**	148	84

* all foods included, , ^ numbers of users in this column may vary according to the presence of the micronutrients in the food, ** as determined for 1-3 year old children by the EU-SCF, @ as reported by VIO 2002

Table 15c: Intake and the distribution of intake compared with the Dutch RDA and UL for toddlers aged 18 months consuming enriched fruit juices and drinks (n=62)

	Daily intake through total diet*			Daily intake through fruit juices/drinks only^			mean contribution enr. fruit juices /drinks to total	Dutch RDA	safe UL	% mean intake of RDA	% mean intake of UL
	mean ± sd	P50	P90	mean ± sd	P50	P90					
Energy (kcal)	1210 ± 255	1195	1550	54 ± 45	36	108	4				
Vitamins											
vitamin A (µg RE)	746 ± 494	587	**1310**	207 ± 254	80	464	25	400	800**	187	93
vitamin D (µg)	1.9 ± 1.8	1.4	3.5	-	-	-	-	5-10	50[@]	25	4
vitamin B1 (mg)	0.9 ± 0.4	0.8	1.3	0.3 ± 0.4	0.2	0.7	25	0.3	not established	300	-
vitamin B2 (mg)	1.6 ± 0.5	1.6	2.2	0.3 ± 0.4	0.2	0.8	17	0.5	not established	320	-
vitamin B6 (mg)	1.3 ± 0.6	1.2	2.0	0.4 ± 0.5	0.2	1.0	22	0.72	5**	181	26
folic acid (µg)	109 ± 34	99	164	10 ± 5	10	17	10	60-90	200**	145	55
vitamin B12 (µg)	3.1 ± 0.9	3.0	4.3	0.2 ± 0.2	0.1	0.5	8	0.6	not established	517	-
vitamin C (mg)	88 ± 38	81	133	22 ± 18	16	53	26	40	in preparation	220	-
Minerals											
calcium (mg)	896 ± 264	890	1197	13 ± 19	7	26	1	500	2500[@]	179	36
magnesium (mg)	187 ± 45	187	233	6 ± 6	4	15	3	60-70	not established	288	-
iron (mg)	6.3 ± 2.5	5.9	10.2	0.3 ± 0.3	0.2	0.8	5	7	not established	90	-
zinc (mg)	5.1 ± 1.3	5.2	6.5	0.1 ± 0.1	0.0	0.1	1	4	7**	128	73

* all foods included, , ^ numbers of users in this column may vary according to the presence of the micronutrients in the food, ** as determined for 1-3 year old children by the EU-SCF, [@] as reported by VIO 2002

Table 16a: Intake and the distribution of intake compared with the Dutch RDA and UL for toddlers aged 9 months consuming enriched syrups (n=187)

	Daily intake through total diet*			Daily intake through enriched syrups only^			mean contribution enr. syrups to total	Dutch RDA	safe UL	% mean intake of RDA	% mean intake of UL
	mean ± sd	P50	P90	mean ± sd	P50	P90					
Energy (kcal)	978 ± 176	963	1166	42 ± 45	31	83	4				
Vitamins											
vitamin A (µg RE)	**891** ± 411	**806**	**1403**	4 ± 13	0	12	0	400	800**	222	111
vitamin D (µg)	10.1 ± 3.1	10.4	13.7	-	-	-	-	5-10	25@	135	40
vitamin B1 (mg)	0.7 ± 0.2	0.6	0.9	0.1 ± 0.1	0.1	0.2	12	0.2	not established	350	-
vitamin B2 (mg)	1.1 ± 0.3	1.1	1.4	0.1 ± 0.1	0.1	0.2	9	0.4	not established	275	-
vitamin B6 (mg)	0.9 ± 0.2	0.8	1.2	0.1 ± 0.1	0.1	0.2	5	0.25	5**	360	18
folic acid (µg)	122 ± 29	119	159	0 ± 0	0	0	0	45-65	200**	222	164
vitamin B12 (µg)	2.1 ± 0.9	1.8	3.4	0.1 ± 0.1	0.1	0.2	3	0.6	not established	350	-
vitamin C (mg)	96 ± 24	94	126	12 ± 12	9	27	13	35	in preparation	274	-
Minerals											
calcium (mg)	712 ± 139	700	887	5 ± 5	3	10	1	450	2500@	158	28
magnesium (mg)	137 ± 30	135	176	3 ± 4	2	8	3	35-60	not established	288	-
iron (mg)	9.5 ± 2.2	9.6	12.7	0.2 ± 0.8	0.1	0.2	2	7	not established	136	-
zinc (mg)	6.6 ± 1.4	6.6	**8.4**	0 ± 0	0	0	1	4	7**	165	94

* all foods included, , ^ numbers of users in this column may vary according to the presence of the micronutrients in the food, ** as determined for 1-3 year old children by the EU-SCF, @ as reported by VIO 2002

Table 16b: Intake and the distribution of intake compared with the Dutch RDA and UL for toddlers aged 12 months consuming enriched syrups (n=177)

	Daily intake through total diet*			Daily intake through syrups only^			mean contribution enr. syrups to total	Dutch RDA	safe UL	% mean intake of RDA	% mean intake of UL
	mean ± sd	P50	P90	mean ± sd	P50	P90					
Energy (kcal)	1079 ± 204	1069	1304	57 ± 52	43	126	5				
Vitamins											
vitamin A (µg RE)	**853** ± 421	**804**	**1418**	4 ± 12	0	11	1	400	800**	213	107
vitamin D (µg)	6.5 ± 4.7	7.1	12.2	-	-	-	-	5-10	50@	87	13
vitamin B1 (mg)	0.7 ± 0.2	0.7	1.0	0.1 ± 0.1	0.1	0.2	11	0.3	not established	233	-
vitamin B2 (mg)	1.3 ± 0.4	1.2	1.8	0.1 ± 0.1	0.1	0.2	7	0.5	not established	260	-
vitamin B6 (mg)	1.0 ± 0.3	0.9	1.3	0.1 ± 0.1	0.0	0.2	5	0.72	5**	139	20
folic acid (µg)	121 ± 31	119	160	0 ± 0	0	0	0	60-90	200**	161	61
vitamin B12 (µg)	2.6 ± 1.0	2.5	4.1	0.1 ± 0.1	0.0	0.1	3	0.6	not established	433	-
vitamin C (mg)	91 ± 31	89	130	17 ± 17	11	39	18	40	in preparation	228	-
Minerals											
calcium (mg)	799 ±200	758	1065	7 ± 10	4	17	1	500	2500@	160	32
magnesium (mg)	164 ± 40	158	214	4 ± 5	3	11	3	60-70	not established	252	-
iron (mg)	8.3 ± 3.5	8.1	12.3	0.3 ± 2.0	0.1	0.3	2	7	not established	119	-
zinc (mg)	6.0 ± 1.5	5.9	**7.8**	0 ± 0.1	0	0.1	1	4	7**	150	86

* all foods included, , ^ numbers of users in this column may vary according to the presence of the micronutrients in the food, ** as determined for 1-3 year old children by the EU-SCF, @ as reported by VIO 2002

Table 16c: Intake and the distribution of intake compared with the Dutch RDA and UL for toddlers aged 18 months consuming enriched syrups (n=155)

	Daily intake through total diet*			Daily intake through syrups only^			mean contribution enr. syrups to total	Dutch RDA	safe UL	% mean intake of RDA	% mean intake of UL
	mean ± sd	P50	P90	mean ± sd	P50	P90					
Energy (kcal)	1181 ± 257	1147	1546	67 ± 58	50	154	6				
Vitamins											
vitamin A (µg RE)	688 ± 415	589	**1249**	9 ± 21	2	21	2	400	800**	172	86
vitamin D (µg)	2.2 ± 2.1	1.5	4.5	-	-	-	-	5-10	50@	29	4
vitamin B1 (mg)	0.8 ± 0.3	0.7	1.1	0.1 ± 0.1	0.1	0.2	14	0.3	not established	267	-
vitamin B2 (mg)	1.4 ± 0.4	1.4	1.9	0.2 ± 0.1	0.1	0.3	10	0.5	not established	280	-
vitamin B6 (mg)	1.1 ± 0.4	1.1	1.6	0.1 ± 0.2	0.1	0.3	9	0.72	5**	153	22
folic acid (µg)	111 ± 36	109	164	0 ± 0	0	0	0	60-90	200**	148	56
vitamin B12 (µg)	3.0 ± 0.9	3.0	4.3	0.1 ± 0.1	0.1	0.2	3	0.6	not established	500	-
vitamin C (mg)	84 ± 34	81	137	19 ± 21	12	42	22	40	in preparation	210	-
Minerals											
calcium (mg)	854 ± 231	853	1103	8 ± 16	3	17	1	500	2500@	171	34
magnesium (mg)	185 ± 44	182	242	4 ± 5	1	10	2	60-70	not established	285	-
iron (mg)	6.5 ± 2.7	5.9	11.3	0.2 ± 1.0	0.0	0.2	3	7	not established	93	-
zinc (mg)	5.3 ± 1.3	5.3	6.8	0.0 ± 0.0	0.0	0.1	1	4	7**	133	76

* all foods included, , ^ numbers of users in this column may vary according to the presence of the micronutrients in the food, ** as determined for 1-3 year old children by the EU-SCF, @ as reported by VIO 2002

Table 17a: Intake and the distribution of intake compared with the Dutch RDA and UL for toddlers aged 9 months consuming enriched cakes and biscuits (n=227)

	Daily intake through total diet*			Daily intake through enriched cakes and biscuits only^			mean contribution enr. cakes and biscuits to total	Dutch RDA	safe UL	% mean intake of RDA	% mean intake of UL
	mean ± sd	P50	P90	mean ± sd	P50	P90					
Energy (kcal)	1001 ± 198	989	1262	35 ± 27	30	73	4				
Vitamins											
vitamin A (µg RE)	**953** ± 458	**848**	**1622**	0	0	0	0	400	800**	238	119
vitamin D (µg)	10.4 ± 3.2	10.8	14.0	0	0	0	1	5-10	25[@]	139	42
vitamin B1 (mg)	0.7 ± 0.2	0.7	0.9	0.0 ± 0.0	0.0	0.1	5	0.2	not established	350	-
vitamin B2 (mg)	1.2 ± 0.3	1.1	1.4	0.0 ± 0.0	0.0	0.1	2	0.4	not established	300	-
vitamin B6 (mg)	0.9 ± 0.2	0.8	1.2	0.0 ± 0.0	0.0	0.1	3	0.25	5**	360	18
folic acid (µg)	127 ± 31	124	165	4 ± 6	1	10	3	45-65	200**	231	64
vitamin B12 (µg)	2.2 ± 1.0	1.9	3.5	-	-	-	-	0.6	not established	367	-
vitamin C (mg)	95 ± 25	92	129	-	-	-	-	35	in preparation	271	-
Minerals											
calcium (mg)	727 ± 166	712	916	12 ± 13	8	29	2	450	2500[@]	162	29
magnesium (mg)	138 ± 33	137	180	2 ± 2	2	5	2	35-60	not established	291	-
iron (mg)	9.8 ± 2.3	9.9	12.8	0.4 ± 0.3	0.3	0.9	4	7	not established	140	-
zinc (mg)	6.7 ± 1.5	6.6	**8.7**	0 ± 0	0	0	1	4	7**	168	96

* all foods included, , ^ numbers of users in this column may vary according to the presence of the micronutrients in the food, ** as determined for 1-3 year old children by the EU-SCF, [@] as reported by VIO 2002

Table 17b: Intake and the distribution of intake compared with the Dutch RDA and UL for toddlers aged 12 months consuming enriched cakes and biscuits (n=217)

	Daily intake through total diet*			Daily intake through enriched cakes and biscuits only^			mean contribution enr. cakes and biscuits to total	Dutch RDA	safe UL	% mean intake of RDA	% mean intake of UL
	mean ± sd	P50	P90	mean ± sd	P50	P90					
Energy (kcal)	1092 ± 211	1063	1352	47 ± 31	42	88	4				
Vitamins											
vitamin A (µg RE)	**865** ± 406	**837**	**1481**	0 ± 0	0	0	0	400	800**	216	108
vitamin D (µg)	7.1 ± 4.8	7.4	12.5	0 ± 0	0	0	0	5-10	50[@]	95	14
vitamin B1 (mg)	0.7 ± 0.2	0.7	1.0	0.1 ± 0.1	0.0	0.1	7	0.3	not established	233	-
vitamin B2 (mg)	1.3 ± 0.4	1.2	1.8	0.0 ± 0.0	0.0	0.1	2	0.5	not established	260	-
vitamin B6 (mg)	1.0 ± 0.3	0.9	1.4	0.0 ± 0.0	0.0	0.1	2	0.72	5**	139	20
folic acid (µg)	124 ± 32	120	163	4 ± 7	1	11	3	60-90	200**	165	62
vitamin B12 (µg)	2.6 ± 1.0	2.4	3.9	-	-	-	-	0.6	not established	433	-
vitamin C (mg)	89 ± 30	85	130	-	-	-	-	40	in preparation	223	-
Minerals											
calcium (mg)	819 ± 228	759	1125	17 ± 17	12	41	2	500	2500[@]	164	33
magnesium (mg)	164 ± 41	158	214	3 ± 3	2	6	2	60-70	not established	252	-
iron (mg)	8.7 ± 3.2	8.7	12.7	0.6 ± 0.5	0.5	1.2	7	7	not established	124	-
zinc (mg)	6.3 ± 1.6	6.1	**8.2**	0.0 ± 0.0	0.0	0.1	1	4	7**	158	90

* all foods included, , ^ numbers of users in this column may vary according to the presence of the micronutrients in the food, ** as determined for 1-3 year old children by the EU-SCF, [@] as reported by VIO 2002

Table 17c: Intake and the distribution of intake compared with the Dutch RDA and UL for toddlers aged 18 months consuming enriched cakes and biscuits (n=132)

	Daily intake through total diet*			Daily intake through enriched cakes and biscuits only^			mean contribution enr. cakes and biscuits to total	Dutch RDA	safe UL	% mean intake of RDA	% mean intake of UL
	mean ± sd	P50	P90	mean ± sd	P50	P90					
Energy (kcal)	1192 ± 252	1152	1550	41 ± 25	40	71	3				
Vitamins											
vitamin A (µg RE)	711 ± 444	622	**1227**	3 ± 2	3	6	0	400	800**	178	89
vitamin D (µg)	2.2 ± 2.6	1.5	4.5	0.0 ± 0.0	0.0	0.0	1	5-10	50@	29	4
vitamin B1 (mg)	0.8 ± 0.3	0.8	1.1	0.0 ± 0.0	0.0	0.1	5	0.3	not established	267	-
vitamin B2 (mg)	1.5 ± 0.4	1.4	1.9	0.0 ± 0.0	0.0	0.1	1	0.5	not established	300	-
vitamin B6 (mg)	1.1 ± 0.4	1.1	1.6	0.0 ± 0.0	0.0	0.1	2	0.72	5**	153	22
folic acid (µg)	114 ± 36	110	161	2 ± 3	1	3	1	60-90	200**	152	57
vitamin B12 (µg)	3.1 ± 1.0	3.0	4.5	-	-	-	-	0.6	not established	517	-
vitamin C (mg)	79 ± 35	72	133	-	-	-	-	40	in preparation	198	-
Minerals											
calcium (mg)	900 ± 212	868	1134	19 ± 21	10	44	2	500	2500@	180	36
magnesium (mg)	191 ± 44	187	250	3 ± 2	2	6	2	60-70	not established	294	-
iron (mg)	7.1 ± 2.7	6.8	11.3	0.6 ± 0.4	0.5	1.1	9	7	not established	101	-
zinc (mg)	5.4 ± 1.3	5.3	**7.1**	0.1 ± 0.1	0.0	0.2	1	4	7**	135	77

* all foods included, , ^ numbers of users in this column may vary according to the presence of the micronutrients in the food, ** as determined for 1-3 year old children by the EU-SCF, @ as reported by VIO 2002

Table 18a: Intake and the distribution of intake compared with the Dutch RDA and UL for toddlers aged 9 months consuming enriched fruit products (n=182)

	Daily intake through total diet*			Daily intake through enriched fruit products only^			mean contribution enr. fruit products to total	Dutch RDA	safe UL	% mean intake of RDA	% mean intake of UL
	mean ± sd	P50	P90	mean ± sd	P50	P90					
Energy (kcal)	985 ± 179	953	1202	82 ± 38	72	139	9				
Vitamins											
vitamin A (µg RE)	879 ± 397	789	**1394**	9 ± 8	6	18	1	400	800**	220	110
vitamin D (µg)	10.8 ± 2.7	11.1	14.0	0	0	0	0	5-10	25[@]	144	43
vitamin B1 (mg)	0.7 ± 0.2	0.6	0.9	0.0 ± 0.0	0.0	0.1	5	0.2	not established	350	-
vitamin B2 (mg)	1.1 ± 0.2	1.1	1.4	0.0 ± 0.0	0.0	0.1	3	0.4	not established	275	-
vitamin B6 (mg)	0.8 ± 0.2	0.8	1.1	0.1 ± 0.1	0.1	0.2	13	0.25	5**	320	16
folic acid (µg)	118 ± 28	115	151	5 ± 3	5	10	5	45-65	200**	215	59
vitamin B12 (µg)	2.0 ± 0.9	1.8	3.2	0.1 ± 0.0	0.1	0.1	3	0.6	not established	333	-
vitamin C (mg)	96 ± 23	94	126	18 ± 8	15	30	20	35	in preparation	274	-
Minerals											
calcium (mg)	723 ± 139	714	908	30 ± 23	27	62	4	450	2500[@]	161	29
magnesium (mg)	133 ± 31	130	171	13 ± 6	12	23	10	35-60	not established	280	-
iron (mg)	9.7 ± 1.9	9.6	11.9	0.3 ± 0.2	0.3	0.6	3	7	not established	139	-
zinc (mg)	6.7 ± 1.3	6.6	**8.4**	0.2 ± 0.2	0.1	0.6	3	4	7**	168	96

* all foods included, , ^ numbers of users in this column may vary according to the presence of the micronutrients in the food, ** as determined for 1-3 year old children by the EU-SCF, [@] as reported by VIO 2002

Table 18b: Intake and the distribution of intake compared with the Dutch RDA and UL for toddlers aged 12 months consuming enriched fruit products (n=122)

	Daily intake through total diet*			Daily intake through enriched fruit products only^			mean contribution enr. fruit products to total	Dutch RDA	safe UL	% mean intake of RDA	% mean intake of UL
	mean ± sd	P50	P90	mean ± sd	P50	P90					
Energy (kcal)	1083 ± 211	1041	1352	77 ± 38	70	138	7				
Vitamins											
vitamin A (µg RE)	**821** ± 403	791	**1406**	10 ± 10	7	25	2	400	800**	205	103
vitamin D (µg)	7.5 ± 4.7	7.9	12.8	0.0 ± 0.0	0.0	0.1	1	5-10	50@	100	15
vitamin B1 (mg)	0.7 ± 0.2	0.7	1.0	0.0 ± 0.0	0.0	0.1	4	0.3	not established	233	-
vitamin B2 (mg)	1.3 ± 0.4	1.2	1.8	0.1 ± 0.1	0.0	0.1	4	0.5	not established	260	-
vitamin B6 (mg)	0.9 ± 0.3	0.9	1.3	0.1 ± 0.1	0.1	0.2	11	0.72	5**	125	18
folic acid (µg)	118 ± 33	115	158	5 ± 3	4	10	4	60-90	200**	157	59
vitamin B12 (µg)	2.5 ± 1.0	2.3	3.9	0.1 ± 0.0	0.1	0.1	3	0.6	not established	417	-
vitamin C (mg)	91 ± 26	90	128	17 ± 9	15	30	20	40	in preparation	228	-
Minerals											
calcium (mg)	806 ± 207	754	1117	26 ± 20	19	53	3	500	2500@	161	32
magnesium (mg)	157 ± 37	154	205	12 ± 7	10	22	8	60-70	not established	242	-
iron (mg)	8.7 ± 3.3	8.6	12.6	0.3 ± 0.2	0.3	0.5	4	7	not established	124	-
zinc (mg)	6.4 ± 1.7	6.1	**8.7**	0.2 ± 0.2	0.1	0.6	3	4	7**	160	91

* all foods included, , ^ numbers of users in this column may vary according to the presence of the micronutrients in the food, ** as determined for 1-3 year old children by the EU-SCF, @ as reported by VIO 2002

Table 18c: Intake and the distribution of intake compared with the Dutch RDA and UL for toddlers aged 18 months consuming enriched fruit products (n=29)

	Daily intake through total diet*			Daily intake through enriched fruit products only^			mean contribution enr. fruit products to total	Dutch RDA	safe UL	% mean intake of RDA	% mean intake of UL
	mean ± sd	P50	P90	mean ± sd	P50	P90					
Energy (kcal)	1153 ± 291	1144	1725	70 ± 39	68	125	6				
Vitamins											
vitamin A (μg RE)	698 ± 441	603	**1249**	7 ± 5	6	13	2	400	800**	175	87
vitamin D (μg)	3.2 ± 3.4	1.5	9.3	0.0 ± 0.0	0.0	0.0	-	5-10	50[@]	43	6
vitamin B1 (mg)	0.7 ± 0.3	0.7	1.1	0.0 ± 0.0	0.0	0.0	3	0.3	not established	233	-
vitamin B2 (mg)	1.3 ± 0.4	1.3	2.0	0.0 ± 0.0	0.0	0.1	2	0.5	not established	260	-
vitamin B6 (mg)	1.0 ± 0.3	1.0	1.5	0.1 ± 0.1	0.1	0.2	9	0.72	5**	139	20
folic acid (μg)	101 ± 37	99	164	29 ± 4	4	8	4	60-90	200**	135	51
vitamin B12 (μg)	2.8 ± 1.2	2.7	4.5	-	-	-	-	0.6	not established	467	-
vitamin C (mg)	90 ± 33	88	140	16 ± 9	15	30	20	40	in preparation	225	-
Minerals											
calcium (mg)	900 ± 212	868	1134	20 ± 21	8	50	3	500	2500[@]	180	36
magnesium (mg)	191 ± 44	187	250	10 ± 7	9	23	6	60-70	not established	294	-
iron (mg)	7.1 ± 2.7	6.8	11.3	0.2 ± 0.2	0.2	0.5	4	7	not established	101	-
zinc (mg)	5.4 ± 1.3	5.3	**7.1**	0.2 ± 0.2	0.1	0.5	3	4	7**	135	77

* all foods included, , ^ numbers of users in this column may vary according to the presence of the micronutrients in the food, ** as determined for 1-3 year old children by the EU-SCF, [@] as reported by VIO 2002

Table19a: Intake and the distribution of intake compared with the Dutch RDA and UL for toddlers aged 9 months consuming enriched complete meals (n=47)

	Daily intake through total diet*			Daily intake through enriched complete meals only^			mean contribution enr. complete meals to total	Dutch RDA	safe UL	% mean intake of RDA	% mean intake of UL
	mean ± sd	P50	P90	mean ± sd	P50	P90					
Energy (kcal)	951 ± 168	932	1172	88 ± 45	75	158	9				
Vitamins											
vitamin A (µg RE)	**879** ± 315	**867**	**1345**	97 ± 75	72	207	12	400	800**	220	110
vitamin D (µg)	9.6 ± 2.5	9.6	12.7	0.1 ± 0.1	0.1	0.2	1	5-10	25@	128	38
vitamin B1 (mg)	0.7 ± 0.2	0.6	0.9	0.1 ± 0.0	0.1	0.1	12	0.2	not established	350	-
vitamin B2 (mg)	1.1 ± 0.2	1.1	1.4	0.1 ± 0.0	0.1	0.1	5	0.4	not established	275	-
vitamin B6 (mg)	0.8 ± 0.3	0.8	1.2	0.2 ± 0.1	0.2	0.3	20	0.25	5**	320	16
folic acid (µg)	113 ± 24	112	150	8 ± 4	7	14	7	45-65	200**	205	57
vitamin B12 (µg)	2.0 ± 0.7	1.9	2.9	0.2 ± 0.1	0.2	0.4	10	0.6	not established	333	-
vitamin C (mg)	87 ± 26	84	123	6 ± 3	6	11	7	35	in preparation	249	-
Minerals											
calcium (mg)	668 ± 139	650	843	36 ± 24	30	70	5	450	2500@	148	27
magnesium (mg)	127 ± 32	123	176	13 ± 7	11	23	11	35-60	not established	261	-
iron (mg)	9.1 ± 1.8	8.9	11.3	0.7 ± 0.4	0.6	1.4	8	7	not established	130	-
zinc (mg)	6.3 ± 1.3	6.3	**8.1**	0.6 ± 0.3	0.5	1.1	10	4	7**	158	90

* all foods included, , ^ numbers of users in this column may vary according to the presence of the micronutrients in the food, ** as determined for 1-3 year old children by the EU-SCF, @ as reported by VIO 2002

Table 19b: Intake and the distribution of intake compared with the Dutch RDA and UL for toddlers aged 12 months consuming enriched complete meals (n=29)

	Daily intake through total diet*			Daily intake through enriched complete meals only^			mean contribution enr. complete meals to total	Dutch RDA	safe UL	% mean intake of RDA	% mean intake of UL
	mean ± sd	P50	P90	mean ± sd	P50	P90					
Energy (kcal)	990 ± 132	995	1197	90 ± 42	75	164	9				
Vitamins											
vitamin A (µg RE)	**821** ± 429	799	**1514**	95 ± 74	72	208	13	400	800**	205	103
vitamin D (µg)	7.8 ± 4.1	8.2	13.5	0.1 ± 0.1	0.1	0.2	2	5-10	50[@]	104	16
vitamin B1 (mg)	0.8 ± 0.2	0.8	1.1	0.1 ± 0.0	0.1	0.1	9	0.3	not established	267	-
vitamin B2 (mg)	1.2 ± 0.2	1.2	1.5	0.1 ± 0.0	0.1	0.1	5	0.5	not established	240	-
vitamin B6 (mg)	1.0 ± 0.3	0.9	1.5	0.2 ± 0.1	0.2	0.3	17	0.72	5**	139	20
folic acid (µg)	117 ± 25	116	155	8 ± 4	7	14	7	60-90	200**	156	59
vitamin B12 (µg)	2.4 ± 0.8	2.2	3.4	0.2 ± 0.1	0.2	0.3	8	0.6	not established	400	-
vitamin C (mg)	89 ± 30	90	136	7 ± 4	7	12	10	40	in preparation	223	-
Minerals											
calcium (mg)	772 ± 147	750	1012	38 ± 30	25	87	5	500	2500[@]	154	31
magnesium (mg)	152 ± 28	154	192	14 ± 7	12	24	9	60-70	not established	234	-
iron (mg)	9.0 ± 2.2	9.1	12.4	0.6 ± 0.5	0.5	1.2	7	7	not established	129	-
zinc (mg)	6.2 ± 1.4	6.3	**8.0**	0.5 ± 0.3	0.5	0.9	9	4	7**	155	89

* all foods included, , ^ numbers of users in this column may vary according to the presence of the micronutrients in the food, ** as determined for 1-3 year old children by the EU-SCF, [@] as reported by VIO 2002

Table 19c: Intake and the distribution of intake compared with the Dutch RDA and UL for toddlers aged 18 months consuming enriched complete meals (n=4)

	Daily intake t0. hrough total diet*			Daily intake through enriched complete meals only^			mean contribution enr. complete meals to total	Dutch RDA	safe UL	% mean intake of RDA	% mean intake of UL
	mean ± sd	P50	P90	mean ± sd	P50	P90					
Energy (kcal)	977 ± 171	-	-	77 ± 54	-	-	9				
Vitamins											
vitamin A (µg RE)	758 ± 302	-	-	73 ± 47	-	-	12	400	800**	190	95
vitamin D (µg)	3.5 ± 2.8	-	-	0.1 ± 0.0	-	-	1	5-10	50@	47	7
vitamin B1 (mg)	0.8 ± 0.1	-	-	0.1 ± 0.1	-	-	8	0.3	not established	267	-
vitamin B2 (mg)	1.3 ± 0.3	-	-	0.1 ± 0.1	-	-	6	0.5	not established	260	-
vitamin B6 (mg)	1.1 ± 0.2	-	-	0.1 ± 0.1	-	-	13	0.72	5**	153	22
folic acid (µg)	93 ± 34	-	-	7 ± 5	-	-	9	60-90	200**	124	47
vitamin B12 (µg)	3.0 ± 1.1	-	-	0.1 ± 0.1	-	-	5	0.6	not established	500	-
vitamin C (mg)	83 ± 23	-	-	5 ± 2	-	-	7	40	in preparation	208	-
Minerals											
calcium (mg)	835 ± 150	-	-	28 ± 18	-	-	4	500	2500@	167	33
magnesium (mg)	144 ± 34	-	-	13 ± 7	-	-	10	60-70	not established	222	-
iron (mg)	7.5 ± 0.9	-	-	0.6 ± 0.4	-	-	8	7	not established	107	-
zinc (mg)	4.9 ± 1.3	-	-	0.4 ± 0.4	-	-	8	4	7**	123	70

* all foods included, , ^ numbers of users in this column may vary according to the presence of the micronutrients in the food, ** as determined for 1-3 year old children by the EU-SCF, @ as reported by VIO 2002

Table 20a: Intake and the distribution of intake compared with the Dutch RDA and UL for toddlers aged 9 months consuming enriched dairy products (n=133)

	Daily intake through total diet*			Daily intake through enriched dairy products only^			mean contribution enr. dairy products to total	Dutch RDA	safe UL	% mean intake of RDA	% mean intake of UL
	mean ± sd	P50	P90	mean ± sd	P50	P90					
Energy (kcal)	1000 ± 180	995	1221	67 ± 37	68	135	7				
Vitamins											
vitamin A (µg RE)	**934** ± 416	**844**	**1523**	21 ± 12	22	44	3	400	800**	234	117
vitamin D (µg)	11.2 ± 2.9	11.3	14.3	0.7 ± 0.4	0.8	1.5	8	5-10	25@	149	45
vitamin B1 (mg)	0.7 ± 0.2	0.6	0.9	0.0 ± 0.0	0.0	0.0	3	0.2	not established	350	-
vitamin B2 (mg)	1.1 ± 0.3	1.1	1.4	0.1 ± 0.1	0.1	0.3	11	0.4	not established	275	-
vitamin B6 (mg)	0.8 ± 0.2	0.8	1.2	0.0 ± 0.0	0.0	0.0	3	0.25	5**	320	16
folic acid (µg)	127 ± 31	124	166	7 ± 4	8	15	6	45-65	200**	231	64
vitamin B12 (µg)	2.0 ± 0.9	1.8	3.2	0.1 ± 0.1	0.1	0.2	6	0.6	not established	333	-
vitamin C (mg)	95 ± 25	93	125	1 ± 1	1	1	1	35	in preparation	271	-
Minerals											
calcium (mg)	750 ± 175	740	902	79 ± 43	80	160	11	450	2500@	167	30
magnesium (mg)	138 ± 31	137	174	7 ± 4	7	14	5	35-60	not established	291	-
iron (mg)	10.0 ± 2.0	10.1	12.7	0.4 ± 0.2	0.5	0.9	5	7	not established	143	-
zinc (mg)	6.9 ± 1.4	6.8	**8.8**	0.3 ± 0.2	0.3	0.7	5	4	7**	173	99

* all foods included, , ^ numbers of users in this column may vary according to the presence of the micronutrients in the food, ** as determined for 1-3 year old children by the EU-SCF, @ as reported by VIO 2002

Table 20b: Intake and the distribution of intake compared with the Dutch RDA and UL for toddlers aged 12 months consuming enriched dairy products (n=82)

	Daily intake through total diet*			Daily intake through enriched dairy products only^			mean contribution enr. dairy products to total	Dutch RDA	safe UL	% mean intake of RDA	% mean intake of UL
	mean ± sd	P50	P90	mean ± sd	P50	P90					
Energy (kcal)	1106 ± 222	1070	1437	76 ± 49	68	135	7				
Vitamins											
vitamin A (µg RE)	**898** ± 403	**834**	**1481**	26 ± 26	22	44	4	400	800**	225	112
vitamin D (µg)	9.1 ± 5.3	9.8	13.9	0.8 ± 0.6	0.8	1.5	13	5-10	50@	121	18
vitamin B1 (mg)	0.7 ± 0.2	0.7	1.0	0.0 ± 0.1	0.0	0.1	4	0.3	not established	233	-
vitamin B2 (mg)	1.3 ± 0.4	1.2	1.9	0.2 ± 0.2	0.1	0.3	12	0.5	not established	260	-
vitamin B6 (mg)	1.0 ± 0.4	0.9	1.5	0.0 ± 0.1	0.0	0.1	4	0.72	5**	139	20
folic acid (µg)	128 ± 33	125	174	9 ± 9	8	15	8	60-90	200**	171	64
vitamin B12 (µg)	2.3 ± 1.0	2.1	3.8	0.1 ± 0.2	0.1	0.3	6	0.6	not established	383	-
vitamin C (mg)	92 ± 30	92	133	2 ± 5	1	2	3	40	in preparation	230	-
Minerals											
calcium (mg)	824 ± 245	750	1222	104 ± 91	80	210	13	500	2500@	165	33
magnesium (mg)	160 ± 45	150	214	10 ± 9	7	19	6	60-70	not established	246	-
iron (mg)	9.6 ± 3.7	9.1	13.4	0.5 ± 0.4	0.5	0.9	6	7	not established	137	-
zinc (mg)	6.7 ± 1.9	6.4	**8.6**	0.4 ± 0.3	0.3	0.7	6	4	7**	168	96

* all foods included, , ^ numbers of users in this column may vary according to the presence of the micronutrients in the food, ** as determined for 1-3 year old children by the EU-SCF, @ as reported by VIO 2002

Table 20c: Intake and the distribution of intake compared with the Dutch RDA and UL for toddlers aged 18 months consuming enriched dairy products (n=16)

	Daily intake through total diet*			Daily intake through enriched dairy products only^			mean contribution enr. dairy products to total	Dutch RDA	safe UL	% mean intake of RDA	% mean intake of UL
	mean ± sd	P50	P90	mean ± sd	P50	P90					
Energy (kcal)	1314 ± 274	1282	1668	90 ± 72	68	255	7				
Vitamins											
vitamin A (µg RE)	707 ± 401	554	**1393**	25 ± 19	22	56	4	400	800**	177	88
vitamin D (µg)	2.2 ± 1.8	1.7	3.5	0.5 ± 0.3	0.4	0.8	25	5-10	50@	29	4
vitamin B1 (mg)	1.0 ± 0.5	0.8	1.7	0.1 ± 0.2	0.0	0.2	9	0.3	not established	333	-
vitamin B2 (mg)	1.7 ± 0.5	1.6	2.6	0.4 ± 0.5	0.2	1.2	21	0.5	not established	340	-
vitamin B6 (mg)	1.4 ± 0.6	1.1	2.7	0.2 ± 0.3	0.0	0.3	9	0.72	5**	194	28
folic acid (µg)	125 ± 34	124	170	13 ± 13	8	33	10	60-90	200**	167	63
vitamin B12 (µg)	3.0 ± 0.7	2.9	3.9	0.5 ± 0.6	0.1	1.1	15	0.6	not established	500	-
vitamin C (mg)	91 ± 36	94	137	9 ± 17	1	44	7	40	in preparation	228	-
Minerals											
calcium (mg)	835 ± 150	-	-	232 ± 280	81	600	22	500	2500@	167	33
magnesium (mg)	144 ± 34	-	-	19 ± 21	8	60	8	60-70	not established	222	-
iron (mg)	7.5 ± 0.9	-	-	0.3 ± 0.2	0.2	0.5	4	7	not established	107	-
zinc (mg)	4.9 ± 1.3	-	-	0.6 ± 0.6	0.3	1.8	11	4	7**	123	70

* all foods included, , ^ numbers of users in this column may vary according to the presence of the micronutrients in the food, ** as determined for 1-3 year old children by the EU-SCF, @ as reported by VIO 2002

Table 21a: Intake and the distribution of intake compared with the Dutch RDA and UL for toddlers aged 9 months consuming enriched (milk) formula without pre-and/or probiotics (n=300)

	Daily intake through total diet*			Daily intake through enr. (milk) formula without pre/probiotics only^			mean contribution enr. (milk) formula without pre / probiotics to total	Dutch RDA	safe UL	% mean intake of RDA	% mean intake of UL
	mean ± sd	P50	P90	mean ± sd	P50	P90					
Energy (kcal)	978 ± 195	947	1201	381 ± 107	383	512	40				
Vitamins											
vitamin A (µg RE)	**904** ± 428	**813**	**1440**	390 ± 125	384	554	51	400	800**	226	113
vitamin D (µg)	10.8 ± 2.8	11.0	14.1	9.9 ± 2.8	9.9	13.4	91	5-10	25@	144	43
vitamin B1 (mg)	0.7 ± 0.2	0.6	0.9	0.3 ± 0.1	0.3	0.4	43	0.2	not established	350	-
vitamin B2 (mg)	1.1 ± 0.3	1.1	1.4	0.7 ± 0.2	0.7	0.9	60	0.4	not established	275	-
vitamin B6 (mg)	0.8 ± 0.2	0.8	1.2	0.2 ± 0.1	0.2	0.3	28	0.25	5**	320	16
folic acid (µg)	125 ± 31	121	163	55 ± 16	56	74	46	45-65	200**	227	63
vitamin B12 (µg)	1.9 ± 0.8	1.7	2.9	0.8 ± 0.2	0.8	1.1	49	0.6	not established	317	-
vitamin C (mg)	95 ± 25	92	126	46 ± 14	46	64	50	35	in preparation	271	-
Minerals											
calcium (mg)	720 ± 160	707	899	452 ± 131	450	616	63	450	2500@	160	29
magnesium (mg)	136 ± 33	134	176	37 ± 12	37	53	29	35-60	not established	286	-
iron (mg)	9.8 ± 2.1	9.7	12.6	6.3 ± 1.9	6.2	8.8	64	7	not established	140	-
zinc (mg)	6.7 ± 1.5	6.7	**8.7**	4.3 ± 1.4	4.3	6.0	62	4	7**	168	96

* all foods included, , ^ numbers of users in this column may vary according to the presence of the micronutrients in the food, ** as determined for 1-3 year old children by the EU-SCF, @ as reported by VIO 2002

Table 21b: Intake and the distribution of intake compared with the Dutch RDA and UL for toddlers aged 12 months consuming enriched (milk) formula without pre-and/or probiotics (n=201)

	Daily intake through total diet*			Daily intake through enr. (milk) formula without pre/probiotics only^			mean contribution enr. (milk) formula without pre / probiotics to total	Dutch RDA	safe UL	% mean intake of RDA	% mean intake of UL
	mean ± sd	P50	P90	mean ± sd	P50	P90					
Energy (kcal)	1071 ± 199	1032	1328	338 ± 141	327	500	32				
Vitamins											
vitamin A (µg RE)	**921** ± 397	**864**	**1551**	320 ± 139	301	502	40	400	800**	230	115
vitamin D (µg)	9.5 ± 3.6	9.0	13.3	8.4 ± 3.6	8.3	12.5	87	5-10	25@	127	38
vitamin B1 (mg)	0.7 ± 0.2	0.7	1.0	0.3 ± 0.1	0.2	0.4	35	0.2	not established	350	-
vitamin B2 (mg)	1.2 ± 0.3	1.1	1.7	0.6 ± 0.3	0.6	0.9	51	0.4	not established	300	-
vitamin B6 (mg)	1.0 ± 0.3	0.9	1.3	0.2 ± 0.2	0.2	0.3	24	0.25	5**	400	20
folic acid (µg)	127 ± 30	124	163	47 ± 19	46	69	37	45-65	200**	231	64
vitamin B12 (µg)	2.2 ± 0.8	2.1	3.2	0.8 ± 0.4	0.7	1.2	40	0.6	not established	367	-
vitamin C (mg)	96 ± 27	94	130	41 ± 20	38	62	44	35	in preparation	274	-
Minerals											
calcium (mg)	763 ± 192	733	1007	415 ± 181	402	607	55	450	2500@	170	31
magnesium (mg)	151 ± 33	149	195	34 ± 16	31	51	23	35-60	not established	318	-
iron (mg)	9.9 ± 2.7	9.5	13.2	5.6 ± 2.4	5.4	8.6	55	7	not established	141	-
zinc (mg)	6.7 ± 1.6	6.4	**8.9**	3.8 ± 1.7	3.6	5.9	55	4	7**	168	96

* all foods included, , ^ numbers of users in this column may vary according to the presence of the micronutrients in the food, ** as determined for 1-3 year old children by the EU-SCF, @ as reported by VIO 2002

Table 21c: Intake and the distribution of intake compared with the Dutch RDA and UL for toddlers aged 18 months consuming enriched (milk) formula without pre-and/or probiotics (n=37)

	Daily intake through total diet*			Daily intake through enr. (milk) formula without pre/probiotics only^			mean contribution enr. (milk) formula without pre / probiotics to total	Dutch RDA	safe UL	% mean intake of RDA	% mean intake of UL
	mean ± sd	P50	P90	mean ± sd	P50	P90					
Energy (kcal)	1147 ± 263	1121	1486	237 ± 138	216	393	21				
Vitamins											
vitamin A (µg RE)	771 ± 461	603	**1393**	225 ± 149	200	365	33	400	800**	193	96
vitamin D (µg)	6.4 ± 3.4	6.4	9.3	5.4 ± 3.4	5.3	9.3	80	5-10	25@	85	26
vitamin B1 (mg)	0.8 ± 0.2	0.8	1.1	0.3 ± 0.2	0.2	0.6	31	0.2	not established	400	-
vitamin B2 (mg)	1.2 ± 0.3	1.2	1.7	0.4 ± 0.3	0.4	0.8	37	0.4	not established	300	-
vitamin B6 (mg)	1.1 ± 0.4	1.0	1.7	0.3 ± 0.3	0.2	0.9	27	0.25	5**	440	22
folic acid (µg)	114 ± 46	108	178	30 ± 19	28	49	26	45-65	200**	207	57
vitamin B12 (µg)	2.7 ± 1.1	2.7	4.4	0.9 ± 0.7	0.6	2.2	35	0.6	not established	450	-
vitamin C (mg)	103 ± 37	105	143	41 ± 28	31	92	39	35	in preparation	294	-
Minerals											
calcium (mg)	831 ± 230	834	1123	361 ± 221	313	737	43	450	2500@	185	33
magnesium (mg)	166 ± 44	158	234	33 ± 22	26	73	20	35-60	not established	349	-
iron (mg)	9.5 ± 3.2	9.4	12.7	4.3 ± 2.6	4.0	7.7	43	7	not established	136	-
zinc (mg)	6.3 ± 1.9	6.1	**8.6**	2.8 ± 1.6	2.5	5.0	42	4	7**	158	90

* all foods included, , ^ numbers of users in this column may vary according to the presence of the micronutrients in the food, ** as determined for 1-3 year old children by the EU-SCF, @ as reported by VIO 2002

Table 22a: Intake and the distribution of intake compared with the Dutch RDA and UL for toddlers aged 9 months consuming (milk) products containing pre-and/or probiotics (n=20)

	Daily intake through total diet*			Daily intake through pre/probiotics only^			mean contribution pre/probiotics to total	Dutch RDA	safe UL	% mean intake of RDA	% mean intake of UL
	mean ± sd	P50	P90	mean ± sd	P50	P90					
Energy (kcal)	941 ± 184	889	1219	333 ± 121	361	465	36				
Vitamins											
vitamin A (µg RE)	**962** ± 378	**861**	**1592**	387 ± 140	420	542	47	400	800**	241	120
vitamin D (µg)	9.8 ± 2.9	10.2	13.1	8.8 ± 3.2	9.5	12.3	87	5-10	25@	131	39
vitamin B1 (mg)	0.6 ± 0.2	0.6	0.9	0.2 ± 0.1	0.3	0.3	40	0.2	not established	300	-
vitamin B2 (mg)	1.0 ± 0.2	1.0	1.2	0.5 ± 0.2	0.6	0.7	53	0.4	not established	250	-
vitamin B6 (mg)	0.8 ± 0.3	0.7	1.1	0.2 ± 0.1	0.2	0.3	25	0.25	5**	320	16
folic acid (µg)	115 ± 28	115	149	46 ± 17	50	65	41	45-65	200**	209	58
vitamin B12 (µg)	3.7 ± 1.0	3.8	4.8	2.5 ± 0.9	2.8	3.6	69	0.6	not established	617	-
vitamin C (mg)	93 ± 20	90	124	38 ± 14	42	54	42	35	in preparation	266	-
Minerals											
calcium (mg)	692 ± 148	693	878	424 ± 154	460	593	61	450	2500@	154	28
magnesium (mg)	128 ± 31	125	167	31 ± 11	34	44	25	35-60	not established	269	-
iron (mg)	9.1 ± 1.9	9.1	11.6	5.5 ± 2.0	6.0	7.7	59	7	not established	130	-
zinc (mg)	6.2 ± 1.2	6.0	**8.0**	3.7 ± 1.3	4.0	5.2	58	4	7**	155	89

* all foods included, , ^ numbers of users in this column may vary according to the presence of the micronutrients in the food, ** as determined for 1-3 year old children by the EU-SCF, @ as reported by VIO 2002

Table 22b: Intake and the distribution of intake compared with the Dutch RDA and UL for toddlers aged 12 months consuming products containing pre-and/or probiotics (n=7)

	Daily intake through total diet*			Daily intake through pre/probiotics only^			mean contribution pre/probiotics to total	Dutch RDA	safe UL	% mean intake of RDA	% mean intake of UL
	mean ± sd	P50	P90	mean ± sd	P50	P90					
Energy (kcal)	1151 ± 328	1073	-	249 ± 109	234	-	24				
Vitamins											
vitamin A (µg RE)	**853** ± 272	699	-	290 ± 127	273	-	39	400	800**	213	107
vitamin D (µg)	8.2 ± 2.0	8.2	-	6.6 ± 2.9	6.2	-	78	5-10	50@	109	16
vitamin B1 (mg)	0.8 ± 0.2	0.8	-	0.2 ± 0.1	0.2	-	23	0.3	not established	267	-
vitamin B2 (mg)	1.1 ± 0.1	1.1	-	0.4 ± 0.2	0.4	-	35	0.5	not established	220	-
vitamin B6 (mg)	1.1 ± 0.4	1.0	-	0.1 ± 0.1	0.1	-	14	0.72	5**	153	22
folic acid (µg)	129 ± 29	116	-	34 ± 15	33	-	29	60-90	200**	172	65
vitamin B12 (µg)	3.5 ± 1.0	3.4	-	1.9 ± 0.8	1.8	-	56	0.6	not established	583	-
vitamin C (mg)	88 ± 37	77	-	29 ± 13	27	-	37	40	in preparation	220	-
Minerals											
calcium (mg)	765 ± 78	761	-	317 ± 139	299	-	43	500	2500@	153	31
magnesium (mg)	174 ± 64	152	-	23 ± 10	22	-	16	60-70	not established	268	-
iron (mg)	9.4 ± 2.0	8.6	-	4.1 ± 1.8	3.9	-	47	7	not established	134	-
zinc (mg)	6.8 ± 0.9	6.4	-	2.8 ± 1.2	2.6	-	42	4	7**	170	97

* all foods included, , ^ numbers of users in this column may vary according to the presence of the micronutrients in the food, ** as determined for 1-3 year old children by the EU-SCF, @ as reported by VIO 2002

Table 22c: Intake compared with the Dutch RDA and UL for a toddler aged 18 months consuming products containing pre-and/or probiotics (n=1)

	Daily intake through total diet*			Daily intake through pre/probiotics only			mean contribution pre/probiotics to total	Dutch RDA	safe UL	% mean intake of RDA	% mean intake of UL
	mean ± sd	P50	P90	mean ± sd	P50	P90					
Energy (kcal)	1220	-	-	173	-	-	14				
Vitamins											
vitamin A (μg RE)	**992**	-	-	202	-	-	20	400	800**	-	-
vitamin D (μg)	5.4	-	-	4.6	-	-	84	5-10	50@	-	-
vitamin B1 (mg)	0.7	-	-	0.1	-	-	17	0.3	not established	-	-
vitamin B2 (mg)	1.3	-	-	0.3	-	-	20	0.5	not established	-	-
vitamin B6 (mg)	1.0	-	-	0.1	-	-	10	0.72	5**	-	-
folic acid (μg)	110	-	-	24	-	-	22	60-90	200**	-	-
vitamin B12 (μg)	4.1	-	-	1.3	-	-	32	0.6	not established	-	-
vitamin C (mg)	83	-	-	20	-	-	24	40	in preparation	-	-
Minerals											
calcium (mg)	991	-	-	221	-	-	22	500	2500@	-	-
magnesium (mg)	158	-	-	16	-	-	10	60-70	not established	-	-
iron (mg)	6.6	-	-	2.9	-	-	44	7	not established	-	-
zinc (mg)	6.3	-	-	1.9	-	-	31	4	7**	-	-

* all foods included, ** as determined for 1-3 year old children by the EU-SCF, @ as reported by VIO 2002

Table 23a: Intake and the distribution of intake compared with the Dutch RDA and UL for toddlers aged 9 months consuming enriched bread spreads (n=45)

	Daily intake through total diet*			Daily intake through enriched bread spreads only^			mean contribution enr. bread spreads to total	Dutch RDA	safe UL	% mean intake of RDA	% mean intake of UL
	mean ± sd	P50	P90	mean ± sd	P50	P90					
Energy (kcal)	1021 ± 227	995	1294	24 ± 16	19	47	2				
Vitamins											
vitamin A (µg RE)	**918** ± 382	752	**1565**	59 ± 41	48	117	7	400	800**	230	115
vitamin D (µg)	11.1 ± 3.9	11.7	15.3	0.6 ± 0.4	0.5	1.1	6	5-10	25[@]	68	44
vitamin B1 (mg)	0.7 ± 0.2	0.7	0.8	-	-	-	-	0.2	not established	350	-
vitamin B2 (mg)	1.2 ± 0.3	1.1	1.5	-	-	-	-	0.4	not established	300	-
vitamin B6 (mg)	0.8 ± 0.2	0.9	1.1	-	-	-	-	0.25	5**	320	16
folic acid (µg)	126 ± 28	128	165	-	-	-	-	45-65	200**	229	63
vitamin B12 (µg)	2.1 ± 1.0	1.7	3.2	-	-	-	-	0.6	not established	350	-
vitamin C (mg)	95 ± 26	91	123	-	-	-	-	35	in preparation	271	-
Minerals											
calcium (mg)	809 ± 227	756	1060	36 ± 24	29	70	5	450	2500[@]	180	32
magnesium (mg)	143 ± 32	142	183	-	-	-	-	35-60	not established	301	-
iron (mg)	9.7 ± 2.8	10.0	13.6	-	-	-	-	7	not established	138	-
zinc (mg)	6.7 ± 1.8	6.4	**9.3**	-	-	-	-	4	7**	168	96

* all foods included, , ^ numbers of users in this column may vary according to the presence of the micronutrients in the food, ** as determined for 1-3 year old children by the EU-SCF, [@] as reported by VIO 2002

Table 23b: Intake and the distribution of intake compared with the Dutch RDA and UL for toddlers aged 12 months consuming enriched bread spreads (n=49)

	Daily intake through total diet*			Daily intake through enr. bread spreads only^			mean contribution enr. bread spreads to total	Dutch RDA	safe UL	% mean intake of RDA	% mean intake of UL
	mean ± sd	P50	P90	mean ± sd	P50	P90					
Energy (kcal)	1110 ± 203	1096	1304	26 ± 15	24	50	2				
Vitamins											
vitamin A (µg RE)	**969** ± 421	**908**	**1613**	65 ± 39	60	126	8	400	800**	242	121
vitamin D (µg)	7.8 ± 5.4	8.2	13.6	0.6 ± 0.4	0.6	1.2	18	5-10	50@	104	16
vitamin B1 (mg)	0.8 ± 0.2	0.8	1.1	-	-	-	-	0.3	not established	267	-
vitamin B2 (mg)	1.4 ± 0.4	1.3	1.9	-	-	-	-	0.5	not established	280	-
vitamin B6 (mg)	1.0 ± 0.3	1.0	1.4	-	-	-		0.72	5**	139	20
folic acid (µg)	129 ± 35	123	187	-	-	-	-	60-90	200**	172	65
vitamin B12 (µg)	2.7 ± 1.0	2.4	4.3	-	-	-	-	0.6	not established	450	-
vitamin C (mg)	97 ± 30	92	149	-	-	-	-	40	in preparation	243	-
Minerals											
calcium (mg)	866 ±230	836	1248	39 ± 23	36	76	5	500	2500@	173	35
magnesium (mg)	164 ± 41	158	241	-	-	-	-	60-70	not established	252	-
iron (mg)	8.7 ± 3.0	8.7	12.9	-	-	-	-	7	not established	124	-
zinc (mg)	6.4 ± 1.7	6.2	**9.0**	-	-	-	-	4	7**	160	91

* all foods included, , ^ numbers of users in this column may vary according to the presence of the micronutrients in the food, ** as determined for 1-3 year old children by the EU-SCF, @ as reported by VIO 2002

Table 23c: Intake and the distribution of intake compared with the Dutch RDA and UL for toddlers aged 18 months consuming enriched bread spreads (n=75)

	Daily intake through total diet*			Daily intake through enr. bread spreads only^			mean contribution enr. bread spreads to total	Dutch RDA	safe UL	% mean intake of RDA	% mean intake of UL
	mean ± sd	P50	P90	mean ± sd	P50	P90					
Energy (kcal)	1191 ± 257	1163	1557	32 ± 21	27	67	3				
Vitamins											
vitamin A (µg RE)	714 ± 511	522	**1368**	79 ± 54	68	168	14	400	800**	179	89
vitamin D (µg)	2.1 ± 1.8	1.6	3.4	0.7 ± 0.5	0.6	1.6	42	5-10	50@	28	4
vitamin B1 (mg)	0.8 ± 0.3	0.8	1.2	-	-	-	-	0.3	not established	267	-
vitamin B2 (mg)	1.5 ± 0.5	1.4	2.1	-	-	-	-	0.5	not established	300	-
vitamin B6 (mg)	1.1 ± 0.4	1.1	1.6	-	-	-	-	0.72	5**	153	22
folic acid (µg)	110 ± 39	105	164	-	-	-	-	60-90	200**	147	55
vitamin B12 (µg)	3.0 ± 1.1	2.9	4.7	-	-	-	-	0.6	not established	500	-
vitamin C (mg)	81 ± 43	67	142	-	-	-	-	40	in preparation	203	-
Minerals											
calcium (mg)	904 ± 239	873	1206	48 ± 32	41	101	5	500	2500@	181	36
magnesium (mg)	184 ± 50	181	242	-	-	-	-	60-70	not established	283	-
iron (mg)	6.4 ± 2.5	5.8	10.3	-	-	-	-	7	not established	91	-
zinc (mg)	5.1 ± 1.3	5.0	6.8	-	-	-	-	4	7**	128	73

* all foods included, , ^ numbers of users in this column may vary according to the presence of the micronutrients in the food, ** as determined for 1-3 year old children by the EU-SCF, @ as reported by VIO 2002