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Dietary supplement use in the Netherlands
Current data and recommendations for future assessment

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Abstract

Dietary supplement use in the Netherlands

Few data are available in the Netherlands on the intake of nutrients or potentially harmful components from dietary supplements. However, on average there seems no need for concern about too high intakes of vitamins or minerals. For the future it is recommended to monitor dietary supplement intake within the food consumption surveys and to keep the nutrient data file on available supplements up to date. This information is required to evaluate if supplementation counteracts food deficiencies or leads to excessive intake of specific nutrients or possibly harmful substances. Data from the Dutch National Food Consumption Surveys and several monitoring and cohort surveys performed after 1998 are computed and tabulated in this report. Data comparison was hampered by differences in study methods and lack of information on the nutrient dose of supplements. The use of supplements is apparently rising, with more women than men taking them. The number (percentage) of supplement users increased with a rise in educational level. About half the supplement users take only one kind of supplement per day. On average, there seems to be no cause for concern about too high intakes of individual micronutrients, though this cannot be excluded for a small proportion of supplement users. To monitor supplement use among groups, we recommend combining dietary recall methods with detailed questioning on supplement use. To distinguish between 'ever' and 'never' users, this should be complemented with food frequency questionnaires. In addition an up-to-date data base on the composition of available dietary supplements is needed.

Key words:
dietary supplements, vitamins, minerals, food consumption surveys, supplement users

Rapport in het kort

Het gebruik van voedingssupplementen in Nederland

Er zijn in Nederland weinig gegevens over de inneming van voedingsstoffen of mogelijk schadelijke stoffen uit voedingssupplementen. Reden tot zorg over een grootschalige excessieve inneming van vitamines en mineralen lijkt echter niet nodig. Voor de toekomst wordt aanbevolen om gegevens over het gebruik van voedingssupplementen te verzamelen binnen het voedingspeilingsysteem en een databestand bij te houden van de samenstelling van beschikbare supplementen. Met deze gegevens kan nagegaan worden in hoeverre gebruik van voedingssupplementen mogelijke tekorten in de voeding aanvult, dan wel leidt tot excessieve inneming van microvoedingsstoffen of mogelijk schadelijke stoffen.
In dit rapport zijn gegevens over voedingssupplementgebruik samengebracht uit de Nederlandse voedselconsumptiepeilingen en uit de diverse monitoring en cohortonderzoeken van na 1998. Verschil in onderzoekmethoden en ontbrekende informatie van de dosering maken vergelijkbaarheid van de gegevens lastig. Het percentage supplementgebruikers lijkt toe te nemen, vrouwen gebruiken vaker supplementen dan mannen en het gebruik van supplementen is hoger bij toenemend opleidingsniveau. Ongeveer de helft van de supplementgebruikers beperkt zich tot één supplement per dag. Er lijkt geen reden tot bezorgdheid te zijn voor overschrijding van aanvaardbare maxima aan microvoedingsstofinneming, hoewel dit voor een klein deel van de supplementgebruikers ook niet kan worden uitgesloten. Voor monitoringdoeleinden wordt aanbevolen om supplementgebruik in detail na te gaan voor enkele specifieke dagen waarover ook de voedselconsumptie wordt nagevraagd, aangevuld met informatie uit een frequentievragenlijst om ooit- en nooit-gebruikers te kunnen onderscheiden. Bovendien is een actueel databestand nodig van de samenstelling van beschikbare supplementen.

Trefwoorden:
voedingssupplementen, vitaminen, mineralen, voedselconsumptiepeilingen, supplementgebruikers

Contents

1 Introduction 11

2 Dietary supplement use in the Netherlands 13

2.1 Methods 13
2.1.1 Period 1987 - 1998 13
2.1.2 Period after 1998 14

2.2 Data analysis 15
2.2.1 Food Consumption Survey-2003 16
2.2.2 Doetinchem cohort, Hartslag, CoDAM and Hoorn study 17

2.3 Results 18
2.3.1 Prevalence of supplement use 18
2.3.2 Number of different supplements used 20
2.3.3 Use of specific supplements 21
2.3.4 Frequency of use 26
2.3.5 Micronutrient intake 27
2.3.6 Supplement use by SES 31

3 Assessment of dietary supplement use in dietary monitoring 33

3.1 Introduction 33

3.2 Assessment of dietary supplement use 33

3.3 Supplement composition databases 36

4 Discussion and conclusions 39

Acknowledgements 41

References 43

APPENDICES 47

Appendix I Details of Dutch cohort and monitoring studies 49
Appendix II Nutrient composition of new or revised supplements used in VCP-2003 61
Appendix III Nutrient composition of the 10 mostly used supplements in VCP-2003: recent values compared to CB 2002 data 69
Appendix IV Supplement use in Dutch National Food Consumption Surveys 1987/88, 1992 and 1997/98 71
Appendix V Supplement use in VCP-2003 (young adults) 75
Appendix VI Supplement use in Seneca study 1999 83
Appendix VII Supplement use in CoDAM study 1999-2000 85
Appendix VIII Supplement use in Hoorn study 1999-2001 89
Appendix IX Supplement use in Doetinchem study 1998-2003 95
Appendix X Supplement use in Hartslag study 2003 105
Appendix XI Recommended Dietary Allowances or adequate intake for micronutrients 111

Summary

Supplements are currently being used to increase the intake of one or more micronutrients. Whether supplementation really counteracts food deficiencies or leads to excessive intake of specific micronutrients or possibly harmful substances is unknown. To monitor supplement use of groups of people in the Netherlands, assessment of the dosage, the kind of supplements and the frequency of use per age group is necessary, completed with insight in the contribution of supplements to total micronutrient intake.

Of the many studies that have been carried out, only a few provide suitable and recent food and supplement consumption data. In this report data are computed and tabulated of the Dutch National Food Consumption Surveys (DNFCS) 1987/88, 1992 and 1997/98, DNFCS-2003 among young adults (19-30 years), and of several monitoring and cohort surveys executed after 1998. Altogether data on supplement use could be calculated or derived from ten studies, although micronutrient intake from supplements could only be computed for six studies, of which data from DNFCS-2003 were most powerful. Of some very recent studies data were not available yet.

Two major differences in study methods hamper the comparability of data. Consumption of supplements has been recorded or recalled as observed (actual) consumption on one or two days (short term open studies) or questioned as usual consumption (long term closed studies). Furthermore the number and specificity of inquired supplements differ and the dosage per serving is often unknown.

Apparently the use of supplements is increasing, more women than men seem to use supplements and the percentage of supplement users seems to increase by education. About half of the supplement users only uses one kind of supplement per day.

Micronutrient intake both from supplements and from food has been computed for DNFCS-2003. For four cohort studies in which information was gathered with the EPIC-Food Frequency Questionnaire (Hoorn, Doetinchem, CoDAM and Hartslag), nutrient intake from food and from supplements could be calculated with respect to vitamin C and E. The supply of vitamin C and E from foods appears to be sufficient. Extra supply from supplements does not lead to exceeding upper safe limits. On average there seems no need for concern for too high intakes of individual micronutrients, though this cannot be excluded for a small proportion of supplement users.

To monitor supplement use by groups of people it is recommended to combine food record or recall methods with specific questions on supplement use to distinguish ‘ever’ and ‘never’ users. In order to estimate micronutrient intake from supplements, a detailed, reliable and actual data set of marketed supplements is needed. Because of many, partly unforeseen difficulties with respect to availability, analysis, and (changes in) composition, cooperation between government, industry and research institutes will be necessary. No complete and up to date supplement composition database is currently available in the Netherlands.

1 Introduction

An increasing number of dietary supplements is available on the Dutch market. Most dietary supplements have the potential to contribute significantly to the individual's intake of one or more micronutrients. Therefore, knowledge of the population's supplement use in addition to food consumption data is essential to monitor total micronutrient intake and to assess adequate as well as excessive intakes in the population. Additionally, regarding the relationship between nutrition and disease, assessment of dietary supplement use is important. Of interest are vitamin and mineral supplements, herbal supplements and supplements with other bioactive compounds.

Apart from market sales data, very limited information is available on the amounts and frequency of use of supplements and even less on their contribution to total micronutrient intake of the Dutch population and subpopulations. Micronutrient intake from both supplements and food have only been published for the second Dutch National Food Consumption Survey (DNFCS) in 1992[1 2]. Supplement use has also been recorded in DNFCS 1987/88 and 1997/98, however micronutrient intake was not computed, except for folic acid intake in DNFCS 1997/98[3]. After 1998 information on supplement use was collected in the Dutch Food Consumption Survey-2003 among young adults and in several cohort and monitoring studies. Few of these data have been published[4 5 6].

Central questions of this investigation are:
1. What is known on dietary supplement use in the Netherlands?
2. How can supplement use best be assessed in the future from the perspective of dietary monitoring?

To answer the first question an inventory has been made of the information available on dietary supplement use in the Netherlands (Paragraph 2.1). For the Dutch National Food Consumption surveys (1987/88, 1992, 1997/98 and 2003) and for cohort studies that were performed after 1998, supplement use is computed and tabulated (Paragraphs 2.2, 2.3). For many of the computations crude data were obtained from the researchers.

In Chapter 3 assessment of supplement use in dietary monitoring is considered. Current methods for dietary supplement assessment are evaluated and a literature search on experiences, recommendations and evaluations of the methodology for dietary supplement assessment is performed. The findings are weighed with regard to the feasibility of the applied survey method and data collection within Dutch logistics and with regard to the feasibility to keep up a supplement composition database.

Finally, in Chapter 4, the results are discussed and conclusions are drawn.

2 Dietary supplement use in the Netherlands

2.1 Methods

For the inventory and evaluation of data on dietary supplement use in the Netherlands, the use of vitamin and mineral supplements, herbal supplements and supplements with other bio active compounds was taken into account. To determine the availability of vitamin and mineral supplement consumption data, the search was confined to Dutch cohort and monitoring studies, earlier described in the RIVM (National Institute for Public Health and the Environment) report Post launch Monitoring on Functional Foods[7]. Some studies were added to this list: the Dutch Health Care Consumer Panel of NIVEL (the Netherlands Institute for Health Services Research) and the Dutch Consumer Association (2000[5]), a survey on food consumption of allochthonous populations[8-10] and a recent study on young children (VIO 2002[6]).

In Appendix I the results of this data search are summarised. Dutch cohort and monitoring studies have been classified in three categories: national food consumption surveys, RIVM related studies and external studies. Apart from overall study details like executive research institutes, year(s) of study, food consumption survey method and number, gender and age of the study population, details are registered on supplement questionnaires (method, type of supplements, brand names, frequency of use and amount) and on food consumption. To get detailed information on the impact of supplement use it is important not only to sort out supplement consumption data for the general population, but also for relevant subpopulations (classes of age, gender, SES, urbanisation levels, ethnic groups, pregnant women) and for the time of the year (season). This information is not always available.
For further presentation of actual information on supplement use in the Netherlands relevant studies were selected that satisfy the following conditions: ‘Dutch national food consumption survey’ or ‘executed after 1998’; ‘data on the amounts of supplement use are known and recorded or can be calculated on request by or together with the concerning research institute’.

2.1.1 Period 1987 - 1998

Dutch national food consumption surveys (DNFCS) have been executed in 1987/88, 1992 and 1997/98. With a two-day dietary record method the actual supplement use on two consecutive days has been recorded. Information on supplement use and dietary nutrient intake is reported in the various publications of DNFCS 1987/88[11], DNFCS 1992[12] and DNFCS 1997/98[2 11 13-16]. Published information on supplement use differ per study. Calculations have been made by number and/or % of users per age group, per gender, per group characteristics, per season, of most frequently used supplements per age group or gender, of differentiated supplements per

gender or on supplement use in relation to dietary intake. Most reports are not detailed enough to facilitate computation of micronutrient intake from supplements. Supplement intake in DNFCS 1992 has been reported most extensively by Ronda et al., including estimations of micronutrient intake from supplements by men and women > 22 year and prevalence of combined supplement use[1]. Furthermore Waijers et al. computed folic acid intake from supplement data in DNFCS 1997/98[3].
Though crude data of the three national food consumption surveys are available, reliable supplement composition data are missing. Unfortunately actions on former supplement data collection by the University of Maastricht[14] were not completed because of lack of time.

Apart from the national food consumption surveys in which actual consumption data are collected by means of two-day dietary records, considerably more Dutch cohort and monitoring studies have been executed using food frequency questionnaires, giving an impression of the usual diet. Several of these studies started before 1998 and are still being continued. Study characteristics are summarised in Appendix I. PPHV (Peilstation Project Hart- en Vaatziekten), executed by RIVM (1987-1991) ended before 1998, however, this study was continued in the MORGEN Study (Monitoring Risicofactoren Gezondheid Nederland) (1993-1997); after which part of the cohorts in Doetinchem, Maastricht and Amsterdam were followed in the EPIC-study (European Investigation on Cancer) from 1998 onwards.

2.1.2 Period after 1998

The most recent national food consumption survey in the Netherlands has been executed in 2003 (DNFCS-2003). Unlike former national food consumption surveys, which were representative for the total population, the study group in DNFCS-2003 was limited to young adults (19–30 year). The method used was a two-day dietary recall method, with data collection by EPIC-SOFT, a computer assisted interview method[17]. The information on diet and supplement use of the study group concerns the actual use on two specific days of recall and is rather detailed. In DNFCS-2003 an additional food frequency questionnaire was available for 28 food groups, but not for supplements.
RIVM related studies (see Appendix I) that supply information on supplement use are the Zutphen Elderly Study, the Doetinchem cohort study, Hartslag Limburg and the PIAMA study (Prevention and Incidence of Asthma and Mite Allergy).
The latest survey of the Zutphen Elderly Study was executed in 2000 within a small group of elderly men (n=171). Information on supplement use is limited to overall prevalence of supplements use during the year or in wintertime. In the Doetinchem cohort and in Hartslag Limburg (2003) food consumption data have been collected using the EPIC food frequency questionnaire (FFQ). Questions related to supplements concerned use of supplements ‘yes or no’, frequency of use (per day, week, month or year) and the amounts and concentration of vitamin C and vitamin E supplements. These data have been calculated for this inventory. In

the PIAMA study questions on supplement use have only been incorporated since 2002; data are not available yet.
Of the external studies only the Seneca, Hoorn and CoDAM study and the VIO 2002 study appeared to be appropriate to compute supplement consumption data. Data on supplement use in the VIO 2002 study have been published[6]. The investigators of the Hoorn, Seneca and CoDAM study kindly made their data available for calculating. Moreover, published data of the NIVEL/RIVM questionnaire on supplements and functional foods in the Dutch Health Care Consumer Panel (2000)[5] are included in the results. The ABCD study in Amsterdam and the Generation R study in Rotterdam on pregnant women and their children only started recently, data are not available yet. In the future these studies may be important sources of information. The same accounts for the ERGO Plus study in Rotterdam (study population >55y) and possibly for the Utrecht Health Monitoring Study (Leidsche Rijn Gezondheidsproject). Of the other cohort and monitoring studies recorded in Appendix I as 'external studies' surveys were executed before 1998 or information on supplement use is missing or too limited.

2.2 Data analysis

To get information on supplement use from data that are not yet published, extra data analysis has been carried out. Wageningen University computed the Seneca data. The EMGO Institute of Free University Amsterdam made the Hoorn study data available for analysis. Data of DNFCS-2003, Doetinchem and Hartslag are under control of the RIVM and are specifically analysed on supplement data. The RIVM Centre for Prevention and Health Services Research made available the Doetinchem and Hartslag data, the University Maastricht and RIVM Centre for Health and Disease provided the CoDAM data. Of the nutrient intake survey on young children VIO 2002 (Voedingsstoffen Inname Onderzoek 2002), only published data were available[6].

Altogether data on supplement use could be calculated or derived from ten studies, though micronutrient intake from supplements could only be computed for six studies, of which data of DNFCS-2003 were most complete. Because of lack of information and because of non-computability of micronutrient contribution, herbal supplements and supplements with other bioactive compounds are excluded in the micronutrient calculations.
All analyses are performed using SAS 9.1.

When assessing the adequacy of micronutrient intake the interindividual variation in micronutrient requirement and, if applicable, the fact that intake data may be based on short-term intake rather than usual intake should be taken into account. For the present report this procedure is not applied as it is still under development.[3] As a consequence only rough conclusions on micronutrient adequacy can be drawn.

2.2.1 Food Consumption Survey-2003

The methods and results of the 2003 food consumption survey among young adults (DNFCS-2003) are described by Hulshof et al.[17] The method used was an open, two-day dietary recall method, with the actual consumption of different types of supplements reported for two (not consecutive) survey days. If available, the product name, manufacturer and dosage were recorded for each supplement used. Individuals reporting the use of a dietary supplement on one or both days are considered as supplement users.
For the present report supplements have been divided into 22 groups (see Appendix V.2). To calculate micronutrient intake from supplements a database on nutrient composition of supplements is needed. In 2002 the Dutch consumers' organisation composed a database containing the nutritional value of 372 dietary supplements[18]. Not all DNFCS-2003 supplements were included. This database has been extended, using micronutrient information from supplement manufacturers, from supplement labels and on the internet. The nutrient composition of added supplements is given in Appendix II. Ten most frequently used supplements in DNFCS-2003 are presented in Table 1. Early 2004 the composition of the top 10 supplements is checked with the Dutch Consumers' Organisation database. Out of the top ten supplements three were new on the market, five were unchanged since 2002 and two differed in composition. In one (Dagravit Totaal 30) extra iron was added since the end of 2002; nutrient composition of the second (Trekpleister Multi Vitaminen & Mineralen) appeared to be doubled since 2004 and is not applied for DNFCS-2003. Differences are summarised in Appendix III.

Table 1: Ten most common used dietary supplements in young adults, DNFCS-2003 (n=750)

Brand name	Unit	Frequency
Roter Vitamine C	tablet	35
Davitamon Compleet	coated tablet	23
Kruidvat multivitaminen en mineralen	tablet	23
Dagravit Totaal 30 (multivit/min)	coated tablet	13
Centrum Compleet van A tot Zink (multivit/min)	tablet	12
Davitamon Femfit (multivit/min)	capsule	9
Kruidvat Vitamine B-complex	tablet	7
Kruidvat Vitamine C-60 suikervrij	tablet	7
Etos Vitamine C-250 zuurvrij	tablet	6
Trekpleister Multi Vitaminen & Mineralen	tablet	6

Nutrient intake from food is calculated using an extended Dutch food composition database (in Dutch: NEVO tabel[19]). Nutrient intake from supplements is calculated by linking to the extended Dutch Consumers' Organisation database. If no product name or manufacturer of a recorded supplement was known (for instance: a multi-vitamin tablet) supplements are linked to the product most frequently used in their group. Herbal supplements and supplements with other bio active compounds (brewer's yeast, fibre, echina force, ORS and energy supplements) were excluded from the nutrient intake calculation because of unknown nutritional value. Two

people used a vitamin B12 supplement of which brand name was unknown; no corresponding vitamin B12 supplement with known nutrient composition was available. The composition of fish oil supplements is predominantly limited to fatty acids. Therefore single vitamin B12 supplements and fish oil were also excluded from the nutrient calculation of supplements. Eventually 51 observations were excluded, though users of these supplements were counted as supplement users.
Supplement use on one or both days, the number of different supplements used, supplement use by education, micronutrient intake from food and supplements (mean intake of two days and 90th percentile) and finally the mean contribution of supplements to total intake of micronutrients are calculated (3.2 and Appendix V). The results were not weighed for deviations from the general population.

2.2.2 Doetinchem cohort, Hartslag, CoDAM and Hoorn study

Within the cohort studies 'Doetinchem', 'Hartslag', 'CoDAM' and 'Hoorn' information on food and supplement use was collected via a semi-closed method, the EPIC food frequency questionnaire (EPIC-FFQ)[20].
The Doetinchem cohort study is an ongoing study that started in 1987[21]. Study subjects, men and women aged 20-59y at baseline, complete the EPIC-FFQ every five years since 1993. We analysed the 1998-2003 data by calendar year and by compound group; first observations of eventually duplicate subjects were excluded. Of the Hartslag study (men and women 20-59y at baseline) data collected in 2003 are used[22]. Recorded data of the Hoorn study (men and women, 50-75y at baseline in 1989) were collected from 1999 until 2001[23]. Data for the CoDAM study (men and women, 40-70y at baseline in 1999) were collected in 1999-2000[24].

Within the EPIC-FFQ, frequency information (number of tablets, capsules or drips per week/month/year) was recorded for vitamin A, A/D, B-complex, C, E, multi vitamins, calcium, calcium/vitamin D, iron, garlic, lecithin and 'other supplements'. The nutrient strenght was recorded selectively for vitamin C (in mg) and vitamin E (in international units (IU)).
The percentage of users for each supplement group, the frequency of supplement use, the number of different supplements used, supplement use by education and the intake of vitamin C and E from supplements and food are calculated. If the dose of vitamin C or E was unknown or missing, we assumed the smallest amount was used, 50 mg for vitamin C and 50 IU for vitamin E. Nutrient intake in mg/day for both vitamins is computed (1 mg vit E = 1.49 IE).

2.3 Results

Out of the cohort and monitoring studies as described in 2.1 two kinds of studies could be incorporated in an overview on supplement use in the Netherlands (see Table 2). These are five studies with data on the actual supplement use on one or two days out of 2-day dietary records or recalls (short term open studies): DNFCS 1987/1988, 1992, 1997/1998, DNFCS-2003 and VIO 2002; and five studies in which the usual supplement use has been recorded (long term closed studies): Seneca 1999, Hoorn study 1999/2001, Doetinchem cohort 1998-2003, CoDAM 1999/2000 and Hartslag 2003. In this chapter a selection of data is tabulated and discussed. Specific data per study are presented in Appendices IV-X. Additional information of frequency of use of (some) supplements is available from the NIVEL/RIVM study 2002[5] (see 2.3.4).

2.3.1 Prevalence of supplement use

From the national food consumption surveys it seems that the percentage of supplement users increases over time; from 17% in 1987/1988 to 27% in 2003; not only for the total population, but also within different age groups. In every study there are more female than male supplement users. During lifetime most supplements are used at early age (1-3y); then the intake of supplements decreases until around 22 years, where after supplement use increases again. In DNFCS-2003 young adults use obviously more supplements than comparable age groups in earlier study years (DNFCS 1, 2 and 3). Data of the usual consumption of supplements are generally higher than the observed intake on one or two days. Within the Seneca, Hoorn, Doetinchem, CoDAM and Hartslag data the percentages of supplement users seem to correspond roughly with the DNFCS-2003 data. A higher percentage of female supplement users is obvious, particularly in the CoDAM study. The relatively high percentage of adult supplement users in recent years – like in DNFCS-2003 – is confirmed in the Doetinchem and Hartslag data. No obvious time trend is visible in the long term closed studies, in which overall prevalence of supplement use ranges from 25-32%.

Table 2: Total supplement use in % of age group in different studies

Study	***Population***			***Supplement users***														
	total	***men***	***women***	***total***	***total***	***men***	***women***	***1-3y***	***4-6y***	***7-9y***	***10-12y***	***13-15y***	***16-18y***	***19-21y***	***22-49y***	***50-64y***	***≥ 65 y***	***pregn. women***
	N	**n**	**n**	**n**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**
DNFCS 87/88	**5898**	2788	3110	**1012**	17.2	15.1	18.5	63.0	42.2	20.9	16.1	13.8	9.4	7.9	11.7	16.3	15.9	23.0
DNFCS 92	**6218**	2881	3337	**1375**	22.1	18.5	24.7	76.4	52.9	29.5	20.0	14.7	8.7	9.2	12.1	26.1	23.4	20.7
DNFCS 97/98	**5958**	2789	3169	**1406**	23.6	20.3	26.1	79.9	52.9	34.5	23.3	15.7	9.3	10.1	22.3	23.5	23.4	32.0
														19-30 y				
DNFCS-2003	**750**	352	398	**204**	27.2	20.5	33.2							27.2				
								9 m	***12 m***	***18 m***								
	N	**n**	**n**	**n**	**%**			**%**	**%**	**%**								
VIO 2002	**941**	478	463	**495**	52.6			23.4	52.6	84.8								
	total	***men***	***women***	***total***	***total***	***men***	***women***								***31-50y***	***51-70y***	***70+y***	
	N	**n**	**n**	**n**	**%**	**%**	**%**								**%**	**%**	**%**	
Seneca 1999	**97**	33	64	**29**	29.9	21.2	34.4										29.9	
CoDAM 1999/2000	**574**	352	222	**142**	24.7	16.5	37.8								21.7	25.4	17.6	
Hoorn 1999/2001[$]	**900**	440	443	**256**	28.4	26.1	30.9									27.7	29.9	
Doetinchem 1998-2003 [&]	**4951**	2357	2594	**1376**	27.8	20.0	34.9								27.2	28.0		
Hartslag 2003*	**2414**	1207	1207	**765**	31.7	25.4	37.7								34.8	30.6	24.6	

[$] total count includes 5 persons aged 31-50y, 2 of them are supplement users and 17 persons with missing gender, 4 of them are supplement users

[&] total group includes 83 persons aged 70 and older, 31 of them are supplement users

* total group also contains 10 persons aged 30 years or younger: 3 of them are supplement users

2.3.2 Number of different supplements used

The prevalence of overall use of one or several different supplements is calculated for DNFCS-2003, the Hoorn, Doetinchem, Hartslag and CoDAM studies (Table 3).

Table 3: Number and % of persons that use one or more different supplements for the total population and within age gender groups

	study pop.	all ages			31-50 y				51-70 y				>70 year			
					men		women		men		women		men		women	
	N	n[#]	% of total	% of users	n	%	n	%	n	%	n	%	n	%	n	%
1 supplement																
Hoorn	900	125	13.9	48.8					39	13.4	37	13.0	21	14.5	24	14.5
Doetinchem	4951	716	14.5	52.0	110	10.4	218	17.0	144	11.4	232	18.3				
Hartslag	2414	381	15.8	49.8	60	14.5	88	21.0	83	11.5	134	19.0	3	4.4	10	15.2
CoDAM	574	71	12.4	50.0	1	2.6	4	12.9	29	9.5	36	19.6	0	0.0	1	14.3
DNFCS-2003	750	160	21.3	78.4	60[*]	17.0	100[*]	25.1								
2 supplements																
Hoorn	900	81	9.0	31.6					19	6.5	31	11.0	12	8.3	17	10.2
Doetinchem	4951	433	8.7	31.5	56	5.3	154	12.0	79	6.3	136	10.7				
Hartslag	2414	227	9.4	29.7	33	8.0	58	13.8	51	7.1	74	10.0	7	10.3	4	6.1
CoDAM	574	48	8.4	33.8	4	10.5	4	12.9	12	3.9	27	14.7	1	10.0	0	0.0
DNFCS-2003	750	32	4.3	15.7	9[*]	2.6	23[*]	5.8								
3 supplements																
Hoorn	900	25	2.8	9.8					8	2.7	7	3.0	4	2.8	6	3.6
Doetinchem	4951	145	2.9	10.5	23	2.2	49	3.8	25	2.0	40	3.2				
Hartslag	2414	102	4.2	13.3	16	3.9	21	5.0	18	2.5	40	6.0	3	4.4	4	6.1
CoDAM	574	17	3.0	12.0	0	0.0	2	6.5	9	3.0	6	3.3	0	0.0	0	0.0
DNFCS-2003	750	10	1.3	4.9	3[*]	0.9	7[*]	1.8								
≥4 supplements																
Hoorn	900	25	2.8	9.8					7	2.4	9	3.0	4	2.8	5	3.0
Doetinchem	4951	82	1.7	6.0	6	0.6	21	1.6	16	1.3	36	2.8				
Hartslag	2414	55	2.3	7.2	8	1.9	6	1.4	24	3.3	15	2.0	1	1.5	1	1.5
CoDAM	574	6	1.0	4.2	0	0.0	0	0.0	2	0.7	3	1.6	0	0.0	1	14.3
DNFCS-2003	750	2	0.3	1.0	0[*]	0.0	2[*]	0.5								

[#] if total n exceeds the sum of male and female supplement users, some study persons are beyond the age categories

* concerns 19-30y

About half of the supplement users limits his/her intake to one supplement; for young adults (19-30y) this is the case for more than three-quarter of the supplement users. About one third of the users takes two supplements, of the young adults this is only 15%. Fewer people take more supplements. The overall difference between men and women (more women use supplements) is also apparent in this overview.

2.3.3 Use of specific supplements

To gain insight into specific kinds of supplements used, we present combined tables of the four most frequently used supplements: vitamin AD, multi-vitamins/minerals, vitamin C and vitamin B-complex. The results are presented in Tables 4a - 4d.

Vitamin AD
Use of vitamin AD is the highest among young children. The effect of a change in recommendations for vitamin supplement use among young children can be seen in Table 4a. During the period of 1987 through 1998 it was recommended for young children to use vitamin AD supplements, whereas at present the recommendation is for vitamin D only. This explains the rather low percentages in the VIO 2002 study of 3, 7 and 14% vitamin AD users in age groups of 9, 12 and 18 months. The specific use by young children of vitamin D alone is reported in Breedveld et al.[6], and is much higher: 13%, 40% and 67% respectively for the three age groups of 9, 12 and 18 months. In adults use of vitamin AD is low in all studies, with a maximum of 2% in DNFCS 87/88.

Multi-vitamins & minerals
Women more often use multi-vitamins/minerals than men. In general, the use seems to increase over time, with a use of 2% in young adults in 1992 to 16% in 2003. Multi-vitamins/minerals are used by people in all age groups, with a small peak in the adult groups. The high use by children of 4-9 years in DNFCS 97/98 (11 and 13%) is remarkable.

Vitamin C
Again women use more vitamin C supplements than men. Vitamin C is, together with multi-vitamins/minerals, the most frequently used supplement. Use of vitamin C is especially high in older people. In the Seneca, Hoorn and Hartslag study 14 to 19% of persons older than 70 years used a vitamin C supplement.

Vitamin B-complex
Except for the Hoorn study, again vitamin B-complex is used more by women. Use of vitamin B-complex is low in children and increases by age to 4-6% in people over 70. The use of vitamin B-complex seems stable over the years.

Other supplements
Supplement data of DNFCS 87/88, 92 and 97/98 have been worked out more specifically. (Appendix IV.) The percentage of users of 7-9 supplements is reported per age group. Further differentiation has been made for the total survey groups of DNFCS 87/88, 92 and 97/98 for 26-32 different vitamin, mineral, herbal and other bio active supplements. The use of lecithin, kelp and spirulina seems to decrease, whereas the use of garlic preparations increases (no data available for DNFCS 97/98). However the percentage of users of these specific supplements are too small, to indicate a reliable trend. A definition of the different supplements is missing. More specific supplement data of DNFCS-2003 are reported in Appendix V.

Table 4a: Supplement use of vitamin AD in % of age groups in different studies

Study	***Population***			***Supplement users Vitamin AD***													
1 or 2-day suppl use	***total*** **N**	***men*** **n**	***women*** **n**	***total*** **n**	***total*** **%**	***men*** **%**	***women*** **%**	***1-3y*** **%**	***4-6y*** **%**	***7-9y*** **%**	***10-12y*** **%**	***13-15y*** **%**	***16-18y*** **%**	***19-21y*** **%**	***22-49y*** **%**	***50-64y*** **%**	***≥ 65 y*** **%**	***pregn. women*** **%**
DNFCS 87/88	**5898**	2788	3110					45.5	26.1	6.3	2.8	0.7	-	1.0	0.8*	1.6	0.8	
DNFCS 92	**6218**	2881	3337	**314**	5.0	4.7	5.4	50.7	23.1	4.7	1.6	0.4	0.8	0.5	0.3	0.8	0.8	0.0
DNFCS 97/98	**5958**	2789	3169	**187**	3.0	3.4	2.9	40.6	17.8	3.8	3.0	0.0	0.0	0.8	0.5	0.0	0.7	0.0
DNFCS 97/98 hh≥75y	**292**	96	196	**2**	0.7	0.0	1.0										0.7	
														19-30 y **%**				
DNFCS 2003	**750**	352	398	**2**	0.3	0.3	0.3							0.3				
								9 m **%**	***12 m*** **%**	***18 m*** **%**								
VIO 2002	**941**	478	463	**74**	7.9			3.3	7.2	13.6								
usual suppl use	***total*** **N**	***men*** **n**	***women*** **n**	***total*** **n**	***total*** **%**	***men*** **%**	***women*** **%**								***31-50y*** **%**	***51-70y*** **%**	***70+*** **%**	
CoDAM 1999/2000	**574**	352	222	**5**	0.9	0.9	0.9								0.0	1.0	0.0	
Hoorn 1999/2001 $	**900**	440	443	**9**	1.0	1.1	0.9									0.9	1.3	
Doetinchem 1998-2003 &	**4951**	2357	2594	**34**	0.7	0.5	0.8								0.4	0.9		
Hartslag 2003 #	**2414**	1207	1207	**20**	0.8	0.7	0.9								0.6	1.0	0.7	

***** 22-49y including pregnant women

[#] total group also contains 10 persons aged 30 years or younger: 3 of them are supplement users

[$] total count includes 5 persons aged 31-50 y, 2 of them are supplement users and 17 persons with missing gender, 4 of them are supplement users

[&] total group includes 83 persons aged 70 and older, 31 of them are supplement users

Table 4b: Supplement use of multi-vitamins & minerals in % of age groups in different studies

Study	***Population***			***Supplement users Multi-vitamins & Minerals***													
1 or 2-day suppl use	***total*** **N**	***men*** **n**	***women*** **n**	***total*** **n**	***total*** **%**	***men*** **%**	***women*** **%**	***1-3y*** **%**	***4-6y*** **%**	***7-9y*** **%**	***10-12y*** **%**	***13-15y*** **%**	***16-18y*** **%**	***19-21y*** **%**	***22-49y*** **%**	***50-64y*** **%**	***≥ 65y*** **%**	***pregn. women*** **%**
DNFCS 87/88	**5898**	2788	3110					2.6	2.0	3.2	2.1	1.3	1.0	1.5	1.8*	1.8	1.2	
DNFCS 92	**2881**	3337	314	**312**	5.0	3.9	6.0	2.3	4.3	5.1	5.1	4.0	3.2	3.2	4.6	8.0	6.4	5.2
DNFCS 97/98	**5958**	2789	3169	**444**	7.5	6.2	8.5	4.7	10.9	13.0	9.3	7.5	3.2	3.1	7.3	8.3	6.7	12.0
DNFCS 97/98 hh≥75y	**292**	96	196	**19**	6.5	3.1	8.2										6.5	
														19-30y **%**				
DNFCS 2003	**750**	352	398	**120**	16.0	11.9	19.6							16.0				
								9 m **%**	***12 m*** **%**	***18 m*** **%**								
VIO 2002	**941**	478	463	**21**	2.2			0.3	1.0	7.0								
usual suppl use	***total*** **N**	***men*** **n**	***women*** **n**	***total*** **n**	***total*** **%**	***men*** **%**	***women*** **%**								***31-50y*** **%**	***51-70y*** **%**	***70+*** **%**	
CoDAM 1999/2000	**574**	352	222	**55**	9.6	6.5	14.4								11.6	9.0	17.6	
Hoorn 1999/2001 $	**900**	440	443	**101**	11.2	9.3	12.9									10.9	11.6	
Doetinchem 1998-2003 &	**4951**	2357	2594	**714**	14.4	10.1	17.9								16.5	12.5		
Hartslag 2003 #	**2414**	1207	1207	**435**	18.0	13.9	22.0								22.4	16.0	11.9	

***** 22-49y including pregnant women

[#] total group also contains 10 persons aged 30 years or younger: 3 of them are supplement users

[$] total count includes 5 persons aged 31-50 y, 2 of them are supplement users and 17 persons with missing gender, 4 of them are supplement users

[&] total group includes 83 persons aged 70 and older, 31 of them are supplement users

Table 4c: Supplement use of vitamin C in % of age groups in different studies

Study	***Population***			***Supplement users Vitamin C***														
1 or 2-day suppl use	***total*** **N**	***men*** **n**	***women*** **n**	***total*** **n**	***total*** **%**	***men*** **%**	***women*** **%**	***1-3y*** **%**	***4-6y*** **%**	***7-9y*** **%**	***10-12y*** **%**	***13-15y*** **%**	***16-18y*** **%**	***19-21y*** **%**	***22-49y*** **%**	***50-64y*** **%**	***≥ 65 y*** **%**	***pregn. women*** **%**
DNFCS 87/88	**5898**	2788	3110					5.3	4.3	5.1	5.6	3.6	3.6	2.5	3.2*	2.9	3.7	
DNFCS 92	**2881**	3337	314	**269**	4.3	3.9	4.7	2.8	7.0	5.1	3.9	4.8	3.6	5.0	3.9	4.6	5.4	3.4
DNFCS 97/98	**5958**	2789	3169	**272**	4.6	3.8	5.2	2.4	4.7	5.9	7.2	5.1	2.8	4.3	5.0	3.5	4.0	6.0
DNFCS 97/98 hh≥75y	**292**	96	196	**12**	4.1	1.0	5.6										4.1	
														19-30y **%**				
DNFCS 2003	**750**	352	398	**59**	7.9	6.0	9.5							7.9				
								9 m **%**	***12 m*** **%**	***18 m*** **%**								
VIO 2002	**941**	478	463	**5**	0.5			0.0	0.0	1.7								
usual suppl use	***total*** **N**	***men*** **n**	***women*** **n**	***total*** **n**	***total*** **%**	***men*** **%**	***women*** **%**								***31-50y*** **%**	***51-70y*** **%**	***70+*** **%**	
Seneca 1999	**97**	33	64														18.6	
CoDAM 1999/2000	**574**	352	222	**74**	12.9	9.4	18.5								8.7	13.5	11.8	
Hoorn 1999/2001 $	**900**	440	443	**124**	13.8	13.0	14.7									12.9	15.8	
Doetinchem 1998-2003 &	**4951**	2357	2594	**618**	12.5	9.7	14.5								12.7	12.1		
Hartslag 2003 #	**2414**	1207	1207	**374**	15.5	14.9	16.0								16.7	15.0	14.2	

* 22-49y including pregnant women

[#] total group also contains 10 persons aged 30 years or younger: 3 of them are supplement users

[$] total count includes 5 persons aged 31-50 y, 2 of them are supplement users and 17 persons with missing gender, 4 of them are supplement users

[&] total group includes 83 persons aged 70 and older, 31 of them are supplement users

Table 4d: Supplement use of vitamin B-complex in % of age groups in different studies

Study	***Population***			***Supplement users Vitamin B complex***													
1 or 2-day suppl use	***total*** **N**	***men*** **n**	***women*** **n**	***total*** **n**	***total*** **%**	***men*** **%**	***women*** **%**	***1-3y*** **%**	***4-6y*** **%**	***7-9y*** **%**	***10-12y*** **%**	***13-15y*** **%**	***16-18y*** **%**	***19-21y*** **%**	***22-49y*** **%**	***50-64y*** **%**	***≥ 65 y*** **%**	***pregn. women*** **%**
DNFCS 87/88	**5898**	2788	3110					0.3	0.0	0.4	1.4	0.7	0.6	1.0	1.4*	2.1	2.6	
DNFCS 92	**3337**	314	312	**123**	2.0	3.9	4.6	0.0	0.3	0.4	0.0	0.0	0.4	1.8	2.1*	4.6	2.6	
DNFCS 97/98	**5958**	2789	3169	**93**	1.6	0.9	2.1	0.0	0.4	0.4	0.0	1.2	0.7	0.4	1.9	2.5	2.4	0.0
DNFCS 97/98 hh≥75y	**292**	96	196	**16**	5.5	2.1	7.1										5.5	
														19-30y **%**				
DNFCS 2003	**750**	352	398	**16**	2.1	1.1	3.0							2.1				
usual suppl use	***total*** **N**	***men*** **n**	***women*** **n**	***total*** **n**	***total*** **%**	***men*** **%**	***women*** **%**								***31-50y*** **%**	***51-70y*** **%**	***70+*** **%**	
CoDAM 1999/2000	**574**	352	222	**27**	4.7	2.3	8.6								4.3	4.7	5.9	
Hoorn 1999/2001 $	**900**	440	443	**34**	3.8	4.1	3.6									3.9	3.9	
Doetinchem 1998-2003 &	**4951**	2357	2594	**176**	3.6	1.7	4.8								3.3	3.4		
Hartslag 2003 #	**2414**	1207	1207	**109**	4.5	3.5	5.6								4.6	4.5	4.5	

***** 22-49y including pregnant women

[#] total group also contains 10 persons aged 30 years or younger: 3 of them are supplement users

[$] total count includes 5 persons aged 31-50 y, 2 of them are supplement users and 17 persons with missing gender, 4 of them are supplement users

[&] total group includes 83 persons aged 70 and older, 31 of them are supplement users

2.3.4 Frequency of use

Data of the Hoorn, Doetinchem, CoDAM and Hartslag study are suitable to give insight in the frequency of supplement use. The results are summarised in Tables 5a – 5c (restricted to users of the specific supplements). It should be taken into account that in this way no information is given about the dose or way of supply. Tablets, capsules and drops are all counted as one supplement, irrespective of the nutrient content. Specified full data per study are given in Appendices VII-X.

Table 5a: Average frequency of use in number of times per week among users of supplements

	CoDAM 1999/2000	Hoorn 1999/2001	Doetinchem 1998-2003	Hartslag 2003
vitamin A	9.2	13.2	5.5	15.4
vitamin A/D	4.9	7.3	8.1	8.5
vitamin B	8.3	11.0	7.8	7.2
vitamin C	9.9	11.4	8.5	8.1
vitamin E	8.6	8.8	6.8	7.4
multi-vitamin	6.8	6.9	6.1	6.1
calcium/vitamin D	5.0	8.1	11.2	7.3
calcium	9.6	9.4	10.3	8.3
iron	4.0	6.4	7.4	5.1
garlic	7.6	11.5	11.2	9.6
lecithin	8.3	11.2	9.5	6.1
other supplements	9.8	15.2	11.7	10.1

Among users of the specific supplements the average frequency of use varies between 4.9 and 15.4 times a week, which amounts to 0.5 - 2 times a day. The average use of vitamin A/D, vitamin E, multi-vitamin and iron is about 7 times a week. Other supplements are taken more frequently. Additional information of frequency of use of (some) supplements is available from the NIVEL/RIVM study 2002 with the 'Dutch Health Care Consumer Panel'[5]. The classification of supplements differs and frequency of use is only available in broad categories. Of the 1183 panel members (≥19 y) 9% used calcium tablets and 20% used multi-vitamin and mineral supplements daily; once or several times per week calcium tablets had been used by 3% and multi-vitamins by 9%.
Tables 5b and 5c present frequency information by age group and gender. The high reported frequency of vitamin A supplements by 51-70 aged women of the Hartslag supplement users (33.6 times per week; n=5) is due to an outlier. One women indicated to use vitamin A supplements 140 times per week. The frequency of use of vitamin C and iron used seem to increase at older age.

Table 5b: Frequency of supplement use in number of times per week among users of supplements within age groups 31-50 years

31-50 y	men		women	
Population	**Doetinchem**	**Hartslag**	**Doetinchem**	**Hartslag**
vitamin A	7.0	3.9	5.3	0.0
vitamin A/D	5.8	6.0	11.3	7.0
vitamin B	10.1	5.1	6.8	10.3
vitamin C	6.5	7.0	7.7	7.6
vitamin E	6.3	7.1	7.8	6.4
multi-vitamin	5.4	5.1	6.1	5.7
calcium/vitamin D	7.0	4.3	15.2	8.0
calcium	12.5	5.3	10.5	6.4
iron	2.0	4.5	7.7	2.5
garlic	7.0	7.7	11.5	6.0
lecithin	2.7	4.3	10.8	0.0
other supplements	16.8	18.0	11.2	8.5

Table 5c: Frequency of supplement use in number of times per week among users of supplements within age groups 51-70 years

51-70 y	men				women			
Population	**CoDAM**	**Hoorn**	**Doetinchem**	**Hartslag**	**CoDAM**	**Hoorn**	**Doetinchem**	**Hartslag**
vitamin A	5.5	8.8	5.9	8.6	11.7	7.0	4.7	33.6
vitamin A/D	6.0	10.5	5.5	10.2	3.2	7.0	8.8	8.8
vitamin B	7.6	10.2	7.2	6.3	9.0	9.8	8.4	7.2
vitamin C	8.5	8.2	9.9	9.0	11.1	10.1	9.5	8.0
vitamin E	9.4	6.8	5.9	7.9	8.2	7.6	7.0	7.2
multi-vitamin	7.0	5.7	6.2	6.9	7.1	7.3	6.3	6.2
calcium/ vitamin D	2.1	7.0	9.7	9.0	5.5	7.0	8.7	7.1
calcium	4.0	11.0	10.2	9.0	13.4	9.9	10.3	9.2
iron	4.0	5.0	4.8	7.0	0.0	7.0	7.7	9.3
garlic	6.9	10.7	12.8	9.9	8.8	11.5	10.4	9.4
lecithin	4.0	10.5	13.2	7.0	10.5	14.0	7.1	5.5
other supplements	7.4	27.9	10.5	8.9	14.8	9.7	11.4	9.9

2.3.5 Micronutrient intake

Micronutrient intake both from supplements and from food has been computed for DNFCS-2003 and the EPIC-FFQ studies (Hoorn, Doetinchem, CoDAM and Hartslag), the latter only with respect to vitamin C and E.

Vitamin C intake

Data by gender of vitamin C intake from food, from vitamin C supplements and both are tabulated in Table 6a and 6b for DNFCS-2003 and the cohort studies Hoorn, Doetinchem, CoDAM and Hartslag. Mean intake of vitamin C from food is higher in users compared to non-users. Intake from supplements exceeds intake from food, except for the Doetinchem study. The mean contribution of supplements to total intake of vitamin C is 22-40% in men and 20-42% in

women. In DNFCS-2003 not only vitamin C intake from vitamin C supplements is taken into account, also vitamin C intake from other supplements, like multi-vitamins and minerals. This explains the higher contribution of supplements to total intake in DNFCS-2003.
The mean intake of vitamin C of users as well as non-users reaches the Dutch RDA for adults (70 mg; Appendix XI) from food alone. Mean intake by supplement users reaches 2-3 times RDA. Published results of DNFCS 92 also show a mean intake of about 2.5 times RDA for vitamin C[1]. According to the Dutch nutrient norms of 1989, 10 g of vitamin C a day is a safe upper limit.[25] Also presented in Tables 6a-6b is the 90th percentile of total intake, P90. The highest P90 is found in women in the CoDAM study, 1050 mg/day; still 10 times lower than the safe upper limit.

Table 6a: Intake of vitamin C (mg/day) from food, supplements and both, for men

Men	non-users		users							
	from food		from food		from supplements		total			% *
study	mean	sd	mean	sd	mean	sd	mean	sd	P90	
DNFCS-2003 n=352	97	66	104	69	98#	173	202	202	335	40%
CoDAM n=352	97	39	101	40	116	255	217	258	331	27%
Hoorn n=440	98	46	102	41	102	231	205	232	328	26%
Doetinchem n=2357	99	40	106	46	96	329	202	331	287	22%
Hartslag n=1207	93	42	100	46	132	302	226	290	428	28%

* mean contribution of supplements to total (individual level)
# refers to vitamin C intake from all supplements

Table 6b: Intake of vitamin C (mg/day) from food, supplements and both, for women

Women	non-users		users							
	from food		from food		from supplements		total			% *
study	mean	sd	mean	sd	mean	sd	mean	sd	P90	
DNFCS-2003 n=398	94	58	89	50	150#	429	239	434	331	42%
CoDAM n=222	111	44	113	40	159	309	272	311	1050	28%
Hoorn n=443	108	44	119	49	155	324	275	329	666	28%
Doetinchem n=2594	115	45	116	45	114	318	230	324	402	20%
Hartslag n=1207	108	44	112	43	135	402	249	407	545	21%

* mean contribution of supplements to total (individual level)
# refers to vitamin C intake from all supplements

Vitamin E intake

Table 7a and 7b show the intake of vitamin E from foods, supplements and both for men and women separately. Users and non-users of supplements have a similar intake of vitamin E from foods. No clear trend in intake of vitamin E from supplements is visible. The mean contribution of supplements to the total intake of vitamin E ranges from 7-21% in men to 6-26% in women. As was the case for vitamin C, the mean contribution of supplements to total intake is highest in DNFCS-2003, probably because of the included multi-vitamins and minerals.
The RDA for vitamin E is 5.4 -8.7 mg/day for adults (Appendix XI). Mean intake of users as well as non-users reaches RDA by intake from food alone. Mean intake in supplement users reaches up to 10 times RDA in men (CoDAM study). The safe upper limit for vitamin E is 300 mg/day.[26] This upper limit is not reached. The 90th percentile is highest in men in the Hoorn study, about 80 mg/day. This is a factor 3.7 below the safe upper limit.

Table 7a: Intake of vitamin E (mg/day) from food, supplements and both, for men

Men	non-users		users							
	from food		from food		from supplements		total			% *
Study	mean	sd	mean	sd	mean	sd	mean	sd	P90	
DNFCS-2003 n=352	14.1	7.1	12.9	6.5	4.7#	6.6	17.6	10.4	30.6	21%
CoDAM n=352	14.7	6.1	15.4	6.6	57.2	352.4	72.6	351.4	75.9	14%
Hoorn n=440	13.8	15.4	13.1	5.1	43.6	165.2	57.1	165.5	80.9	16%
Doetinchem n=2357	13.9	5.0	14.6	5.8	7.4	35.1	22.0	35.5	30.9	7%
Hartslag n=1207	13.9	5.2	14.0	4.9	17.5	58.0	30.4	54.7	75.5	13%

* mean contribution of supplements to total (individual level)
# refers to vitamin E intake from all supplements

Table 7b: Intake of vitamin E (mg/day) from food, supplements and both, for women

Women	non-users		users							
	from food		from food		from supplements		total			% *
Study	mean	sd	mean	sd	mean	sd	mean	sd	P90	
DNFCS-2003 n=398	10.0	5.7	10.1	5.2	5.6	8.3	15.7	10.2	31.0	26%
CoDAM n=222	12.2	5.2	12.4	4.7	9.6	40.1	22.0	40.9	22.4	6%
Hoorn n=443	10.5	4.3	11.2	4.1	25.0	94.0	36.2	94.4	76.5	11%
Doetinchem n=2594	12.0	4.3	12.0	3.8	8.9	56.5	20.9	56.5	20.5	6%
Hartslag n=1207	11.6	4.1	12.2	3.9	10.2	40.9	22.5	41.4	23.7	8%

* mean contribution of supplements to total (individual level)
# refers to vitamin E intake from all supplements

Folate intake

In Appendix V intake of micronutrients other than vitamin C and E from supplements and food in DNFCS-2003 is presented, including folate. These results show that folate intake is low in men and women. Mean intake in non-users is less than the RDA of 300 µg/day[27] (Appendix XI), whereas the mean intake of folate equivalents in supplement users is 400±320 µg/day for men and 510± 506 µg/day for women (synthetic folic acid from supplements is expressed as folate equivalents by multiplying by 2). The 90th percentile of folic acid from supplements of 200 and 450 µg/day for male and female supplement users shows that the acceptable maximum intake of 1000 µg/day probably is not exceeded by both men and women. To give an overview of folic acid intake from supplements alone, Table 8 presents results from DNFCS-97/98 (Patricia Waijers, personal communication) and DNFCS-2003. Mean intake of folic acid is calculated for different gender and age groups for users of folic acid-containing supplements (like vitamin B-complex, multivitamins, folic acid supplements). This is in contrast with Appendix V, which presents results for users of all supplements. Children (1-3 years) have an adequate intake from supplements alone, but 10% of the children exceed the acceptable maximum intake (200 µg/day). In the other age groups the average folic acid intake from supplements alone is lower than the adequate intake/RDA.

Table 8: Intake of folic acid (µg/day) from folic acid containing supplements, users only

Study	age group	men n	women n	both n	% of N total	mean	sd	P90
DNFCS-97/98	1-3y			10	4	158	172	450
	4-8y			39	9	114	86	300
	9-13y			33	8	97	43	150
	14-18y			23	5	122	72	200
	19-50y	63			4	143	127	250
	19-50y		123		7	178	147	400
	51-65y	25			6	156	124	300
	51-65y		43		9	151	121	375
	> 65y	9			3	100	13	125
	> 65y		32		8	168	150	400
DNFCS-2003	19-30y	44			13	146	165	250
	19-30y		92		23	237	268	600

Intake of other micronutrients

Intake of other micronutrients in DNFCS-2003 is presented in Appendix V. When comparing the intake data with the RDA there are a few noticeable results.

Vitamin B12 intake in men is almost 6 times RDA. A safe upper limit for vitamin B12 is not yet known.[28] Nutritional values in the used supplements vary from 7-900% RDA, except for one orthomolecular supplement with higher concentrations of vitamin B12.

On average, female non-users don't achieve the RDA of calcium, whereas users do. Mean iron intake by female users and non-users is below RDA.

2.3.6 Supplement use by SES

In Figures 1a and 1b, supplement use is presented by social class in four studies (DNFCS-2003, Hoorn, Hartslag and Doetinchem). Despite differences in definitions of the SES groups between the studies (see Appendix V-X) a clear increase in supplement use by social class is apparent in both men and women. This was also confirmed in the SENECA study, where 47.5% of persons with at least 8 years of education use supplements versus 18.5% of persons with less education (Appendix VI).

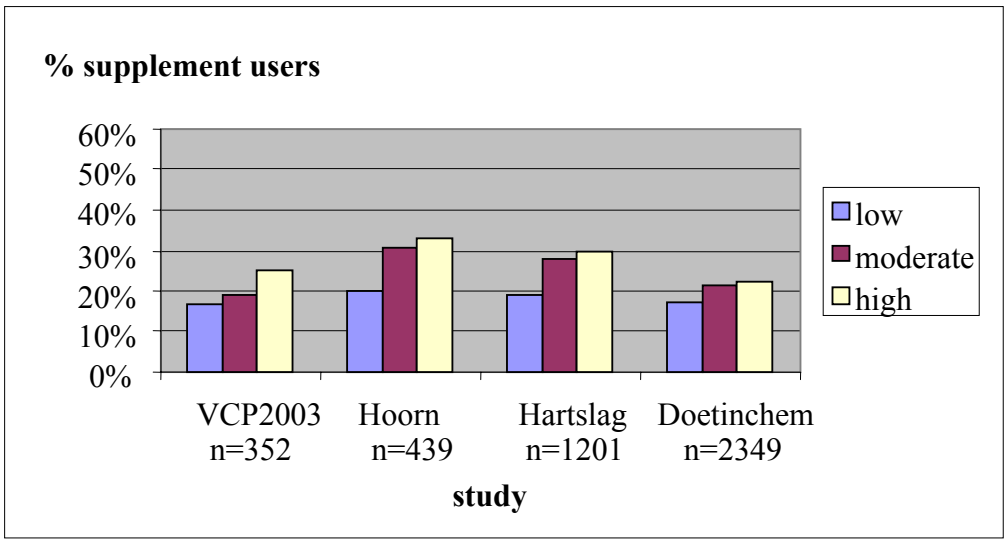

Figure 1a: Supplement use by level of education for men.

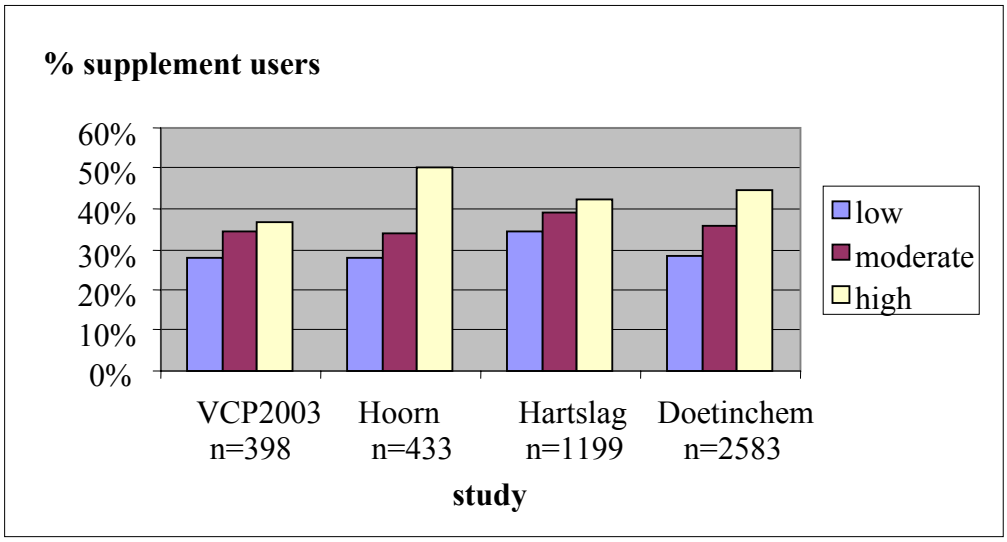

Figure 1b: Supplement use by level of education for women.

3 Assessment of dietary supplement use in dietary monitoring

3.1 Introduction

In Chapter 2, current data on supplement use are reported. Although the prevalence of use in the Dutch population is known for (common) dietary supplements, few data are available to quantify intake of micronutrients and other substances from supplements. This information is vital to estimate the prevalence of micronutrient inadequacy or of excess intake of micronutrients or potential harmful substances. For this reason options to improve the methods for the assessment of dietary supplement use in future Dutch dietary monitoring are discussed; together with the requirements for a reliable estimation of the distribution of micronutrient intake and other potential harmful substances from foods and supplements.

3.2 Assessment of dietary supplement use

Data collection methods for dietary supplements vary across studies, and differ by study aims and by practical and financial considerations.
In general two main types of dietary supplement assessment can be distinguished. First ‘short-term or observed intake’, this is the actual registration (record) or recall of the intake of supplements over a specific short period. Secondly ‘long-term or usual intake’, this is assessed by asking the respondent to indicate usual supplement use over a longer period, like a month or a year. This may be in the form of a food frequency questionnaire or as part of a dietary history interview.
In cohort studies that study nutrient intake in relation to health or disease, dietary supplement intake is typically assessed by asking for the frequency of use of a list of specific dietary supplements, sometimes including an open category of ‘other’ supplements. Often the latter information is not further specified in digital data records, and is as a consequence not easily accessible. In some studies closed answer categories exist (PIAMA, Generation-R, Dutch Consumer Panel), whereas in others the precise consumption frequency can be indicated by day, week, month or year (MORGEN/EPIC). Many of the frequency questionnaires do not include additional questions on amount, duration of use, or brand names. Consequently, intake of micronutrients can only ‘crudely’ be estimated, using standard amounts of supplements and standard compositions. This type of assessment may be useful for ranking subjects, but is insufficient for the estimation of the distribution of the usual intake for a population. For this purpose information on the dosage and strength of the used supplements is required and the food frequency questionnaires seem less suitable.
In some food frequency questionnaires questions of strength, dose and/or brand name are asked. An example is the (MORGEN/)EPIC questionnaire in which the strength of the vitamin C and E supplements is assessed. However, this type of questions as part of a self-administered

questionnaire give many missing values (in the Doetinchem study for example, in 17.3% of the reported vitamin C supplementation and 46.7% of vitamin E supplementation the strength was unknown or missing) and one may question the quality of the information.
The few validation studies that have been conducted only provide information on the validity of ranking subjects or on the specificity and sensitivity of supplement use assessment, not on the absolute amount of intake.[29-35]

In the NHANES diet monitoring programs in the USA, information on long-term (past month) use of dietary supplements is collected as part of an interview at home. If the subject uses supplements, the interviewer asks to see the product container. Informational items collected from the label include product name, manufacturer and address. The interviewer asks participants for how long the product was taken, how often in the past month, and in what amounts on a single day. Strength information is recorded for selected single-ingredient products.[36] Although the time frame is reasonably short, this type of information provides better insight into the distribution of usual intake compared to food frequency questionnaires. The short reference time frame of the past month was chosen to increase accuracy of self-reports. The main disadvantage of this method is that the data cannot be combined with dietary data that are collected with 24-h recalls. Therefore, estimating total micronutrient intake from foods and supplements combined is not possible.[37 38]

In the three nation-wide Dutch food consumption surveys[11 12 12 39], short-term supplement use was registered as part of a two-day dietary record[39]. For eight supplements number and type used was enquired, there was also space to enter information on other supplements. In the Food Intake Study on young children dietary supplement intake was recorded as part of a two-day diet record.[6] Similarly in various foreign monitoring studies short-term intake of supplement use is assessed, either by recall or record (Belgium, UK). In the Dutch 2003 food consumption survey among young adults, supplement use was recalled twice by telephone for a given day[40]. In principle this was an open question by the interviewer. During the computer assisted interview, a list of (types) of dietary supplements was already available. After choosing a given supplement or entering a non-pre-existing one, questions on physical state of the supplement, amount used, and brand name were posed. The disadvantage of telephone interviews is that the interviewer has no access to the information on the product container. Therefore, when detailed information on supplement use is required, it is advisable to conduct interviews at home. Barcode scanning would be helpful, but barcodes are often placed on outer packaging material that is generally not available any more. Asking respondents to bring their supplement containers to a mobile examination centre to be scanned or photographed has been tried and has been proven inefficient because respondents frequently forget to bring them.[37] This is also the case when respondents are asked to send the material to a research institute (own experience of authors).
Dietary supplements inter-brand variability is often extremely large. Vitamin C supplements for example, are available in 50, 60, 100, 180, 200, 500, 1000 and 1500 mg tablets. Especially when interest is taken into the high percentiles of intake, or into the percentage of subjects that are exposed to vitamin intakes above the safe upper levels, it is imperative that survey respondents report not only whether a supplement was taken, but also exactly which one.[41] As for various

brand names supplements in different strengths exist (for instance with brand name Kruidvat: Vitamine C-60 suikervrij, Vitamine C-60 sinaasappelsmaak, Vitamine C-500 met acerola, Vitamine C-500 time-released, Vitamine C 1000 mg and Vitamine C-1000 time released), protocols that only record the brand name of the supplement may misclassify strengths of micronutrients assigned to study participants.[42]
Also, some drugs may contain vitamins or minerals. The use of these drugs should also be queried. In the USA a larger part of the population ingests non-dietary calcium as antacids than as calcium supplements, which highlights the importance of assigning calcium containing antacid use in studies of calcium intake. Also in the Netherlands calcium containing antacids are on the market (Rennies).

For the future it is foreseen that dietary monitoring in the Netherlands will use replicate 24-h recalls as dietary assessment tool. As a consequence it is advised to capture daily supplement intake in the same interview. In this way daily intake of micronutrients from food and supplement sources can be combined. A statistical adjustment method could then be applied to the total daily intakes collected for each of the individuals in the sample and the adjusted distribution would reflect total usual micronutrient intake.[38] However, given the fact that a large proportion of supplement users does not take dietary supplements on a daily basis, the statistical adjustment is problematic[43] since the data do not allow to distinguish between never-users of dietary supplements and users that did not consume a supplement on the specific days of recall/record. Additional data that may allow separating the true zeroes from the occasional zeroes are needed. In this light, a short questionnaire on use or never use of a specific diet supplement or a propensity questionnaire for collecting information on the propensity to consume supplements might provide the information needed to separate true non-consumers from occasional consumers.[38 44] In order to limit the length of the questionnaire it may be necessary to set priorities for the categories of information that have the greatest potential for utility. For example to give priority to micronutrient containing supplements because of the need to calculate total intake of micronutrients.[45] It is recommended that combining this type of information is further investigated, since surprisingly little has been published on this topic.[38]

The objective to estimate (micronutrient intake from) dietary supplements also has implications for the required sample size of the dietary monitoring survey. Especially for those supplements that are used by a small percentage of subjects this will have consequences, because the number of subjects for whom information on the amount and exact type of specific supplements is available is rather low. For the monitoring of energy and nutrient intake from foods about 300 subjects are needed per stratum of age and gender. For supplements that are used by less than five percent of the population such a sample size would mean that data on fewer than 15 people are available. This is too small to make precise estimations of the quantity of use. In Chapter 2 we showed that many specific supplements are used by less than five percent of the population.

For specific non-nutrient containing dietary supplements (like garlic, ginkgo, echinacea or valerian supplements) it is not necessary to combine the information with data on food intake. Moreover, in general fewer people take these products compared to vitamin/mineral

supplements.[45] If interest is taken in monitoring intake of these supplements, it is advised to collect information from a larger study population than the population in which 24-h recall data are obtained. For practical reasons it may be efficient to use a very large internet panel to collect this type of information. Using computer questionnaires, respondents that do not use these products don't need to go through all kind of detailed questions on supplement use. Estimating intake of non-nutrient containing supplements presents a challenge for researchers because no uniform classification system exists. Thus, it is difficult to design questionnaires or to conduct interviews that adequately capture these data.[42] Many supplements are complex mixtures of as many as 20 or more micronutrients, botanical extracts and other biological materials, and no consensus exists among researchers, on how to code these types of products.

3.3 Supplement composition databases

Similar to the need of an accurate food composition table to estimate nutrient intakes from foods, an accurate supplement composition table is needed to estimate nutrient intakes from supplements. The database should include information on product name, serving form, serving size, recommended dosage, source of product information, target group (e.g. for children), and list of ingredients and their quantity per serving.
Because the number of products available continues to increase and existing products are frequently reformulated, maintenance of such a composition table is a very extensive task. Other challenges in creating and using a dietary supplement database include: identifying and classifying products (for instance distinction between supplements, foods, medicines); constructing a database that can be searched for various forms of an ingredient, changes in labelling that are not accompanied by changes in product formulations and vice versa; tracking changes in product formulation, ability to identify and quantify ingredients in schemes for ingredients (botanicals and supplements with animal derived substances may contain many active ingredients that are not all identified). (http://ods.od.nih.gov)

At present in the Netherlands no up to date supplement composition database is available for public research. If estimation of micronutrient intake from dietary supplements is one of the aims for future Dutch dietary monitoring, it is strongly advised to create such a dynamic database. Previously built databases, like the one of the Dutch Consumers' Association or at Maastricht University might be good starting points. The dietary supplement database must be continually updated using procedures similar to those used for formulating a food composition database: transparent documentation, quality control and source information are necessary. Alternatively and probably more cost efficient, the database might be updated based on reported supplements in dietary surveys. In that case it would be important that this update is done during the survey period. Otherwise the composition of the supplements at the time of consumption might not be obtained afterwards.
Partnerships between government and private industry may be necessary to maximise the development of a database. The construction of a national database that could be available to all

researchers in this area would not only be useful to Dutch dietary monitoring but could greatly benefit the scientific community.

Apart from a dietary supplement composition database it is advised to prepare common instructions and tools to help matching reported products with their designators in the database because many products have similar names, and to make standard assumptions in the case of missing information. Examples of these are average strength or dosages in case this information is missing. Insight in market shares of different brands might be valuable to impute missing information.

It is common practice that dietary supplement databases are compiled from label information obtained from the product manufacturers, through the Internet, or from the package label. This is also the case for the Dutch supplement databases of the Dutch Consumer Organisation[18], and of Maastricht University. Supplement labels may not accurately reflect actual supplement content for both nutrient and non-nutrient ingredients.[46] For example it is known that micronutrient concentrations in supplements are usually higher than indicated before the expiration date to compensate for the decline during shelf-life. The degree of error presently occurring for the content of dietary supplements, even for multi-vitamin and mineral supplements in list databases, is unknown. Supplement databases and its utility for the estimation of micronutrient intake form dietary supplements would therefore benefit from a system of analytical verification. Targeted testing of major name brand and private label brand supplements would be a first step towards verification of dietary supplement ingredients.[45]
Several developments in this field, like the harmonisation of analytical methods and the development of reference materials are currently going on at an international level. Also challenges like how to deal with time-released capsules are being addressed.

4 Discussion and conclusions

Dietary supplements in many varieties are now marketed in the Netherlands, including single-ingredient products and various combinations of vitamins, minerals, botanicals and other constituents.

Our findings reported here indicate that from 1987-1997 the use of all kinds of supplements has increased. It is likely that this trend continued after that period. However, due to changes in methodologies of dietary supplement assessment this cannot be concluded from the inventory made. In the more recent studies, 25 to 30% of the adults used dietary supplements, of which vitamin C and multi-vitamins/minerals were most commonly used. About half of the supplement users consumed one type of supplement only, a small proportion used three or more supplements. Among young children supplement use is higher compared to adults. The prevalence of supplement intake in the Netherlands is lower than in the USA where, in 1999-2000, 52% of the adults took dietary supplements during the past month; 35% took a multi-vitamin/mineral supplement.[47] Only a minimum of information is available on the use of herbal supplements.

Despite the lack of comparability between different studies on supplement assessment and analysis it is clear that throughout the past fifteen years, more women than men have used dietary supplements. This finding pertains to many individual supplement types as well as to all adult age groups. Also dietary supplement use is higher among better-educated people in all studies. These associations have not been statistically tested.

Supplements may have a large contribution to total micronutrient intake of individuals, since users have an average frequency of use of 0.5 to 2 supplements per day. However, few data are available to quantify the contribution. Based on the sparse information, there seems little need for concern for too high intakes of individual micronutrients in the general population. The 90th percentile of micronutrient intake from supplements and foods was well below the safe upper limits among adult supplement users. Since reliable estimates for 97.5th or 99th percentile of intake cannot be made, a too high intake cannot be excluded for a small proportion of supplement users. This conclusion was also drawn recently based on two realistic scenarios of supplement consumption.[28] Similarly, too few data are available among specific (vulnerable) subgroups, like children. E.g. for children aged 1-3 years using folate containing supplements, the 90th percentile of intake was above the safe upper limit in the 1997/1998 food consumption survey. Whether this level of intake actually presents a health treat cannot be concluded and needs further study.

Because supplement use is common in the Netherlands, total micronutrient intake can only be captured if supplement use is correctly assessed. For future Dutch dietary monitoring it is advised that intake of micronutrient containing supplements (and drugs) is assessed as part of the 24-h diet recalls.
It would be preferable for the 24-h diet recalls to take place at the home of the respondent, so that the interviewer can obtain information from the supplement container. Diet recalls by telephone

are a second choice in this respect. In the case of telephone interviews, insight in market shares of different brands might be valuable to impute missing information. If 24-h dietary recalls are used to assess dietary supplement use it is advised that a simple questionnaire on the frequency of use of specific micronutrient containing supplements is administered in addition. By combining the information of the 24-h dietary recalls and the short questionnaire, it is possible to estimate the usual intake distribution of total micronutrient intake from foods and supplements.
For this purpose it is essential to set up a continuously updated national supplement composition database. In this respect more insight is needed in the validity of label-based information on supplement content. It may be worthwhile to explore whether supplement analyses conducted by the Food and Consumer Product Safety Authority could be used for this aim.
For non-nutrient containing supplements it is advised to collect information using a structured questionnaire among a very large internet research panel. The best way for the design of such a questionnaire is not yet known. Both cognitive research and validation studies are needed to gain more knowledge on this topic.[37] For the assessment of trends in dietary supplement use standardised survey procedures are required with regard to question phraseology, reference period, and supplement categorisation.

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APPENDICES

Appendix I	**Details of Dutch cohort and monitoring studies**	**49**
Appendix II	**Nutrient composition of new or revised supplements used in VCP-2003**	**61**
Appendix III	**Nutrient composition of the 10 mostly used supplements in VCP-2003: recent values compared to CB 2002 data**	**69**
Appendix IV	**Supplement use in Dutch National Food Consumption Surveys 1987/88, 1992 and 1997/98**	**71**
Appendix V	**Supplement use in VCP-2003 (young adults)**	**75**
Appendix VI	**Supplement use in Seneca study 1999**	**83**
Appendix VII	**Supplement use in CoDAM study 1999-2000**	**85**
Appendix VIII	**Supplement use in Hoorn study 1999-2001**	**89**
Appendix IX	**Supplement use in Doetinchem study 1998-2003**	**95**
Appendix X	**Supplement use in Hartslag study 2003**	**105**
Appendix XI	**Recommended Dietary Allowances or adequate intake for micronutrients**	**111**

Appendix I

Details of Dutch cohort and monitoring studies*

*This overview is composed on behalf of RIVM report 350030005, N.de Jong et al. Postlaunch monitoring of functional foods: methodology development (II) (by order of the Ministry of Public Health, Welfare and Sports).

Study details						Details supplements						Details background diet (all products)					
Study	Research institute	Year(s) of study	Method*	Population	Remarks	Method	Type of supplement	Brand name	Frequency of use	Amount used	Nutrient calculation possible	Type of products**	Brand name	Frequency of use	Amount used	Nutrient calculation possible	References
National food consumption surveys																	
DNFCS 87/88 (VCP-1)	**TNO**	1987/1988	2-day dietary record; 12 item FFQ	ca 6,000 p. random sampling		used today	1)	+	-	+	+	+	+	-	+	+	1 2-4
DNFCS 92 (VCP-2)	**TNO**	1992	2-day dietary record; 12 item FFQ	ca 6,000 p. random sampling		used today	1)	+	-	+	+	+	+	+-	+	+	5-7
DNFCS 97/98 (VCP-3)	**TNO**	1997/1998	2-day dietary record; 2 extensive FFQs	ca 6,000 p. random sampling		used today	1)	+	-	+	+	+	+	+	+	+	8-10
DNFCS 2003 (VCP-2003)	**RIVM/ TNO**	2003	2x24-h recall EPIC-SOFT; 28 item FFQ	750 p, 19-30 y		yester-day	+	+	-	+	+	+	+	+	+	+	11 12 13
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		taking yes/no, during the year or in winter, since when	2)	+	-	- 1960: +	-	+	-	+	+	+	6
PPHV (Peilstation)	**RIVM**	1987-1991	50 items FFQ	>36,000 men and women 20-59 y		taking yes/no/ sometimes ; during the year or in wintertime	3)	-	-	-	-	i)	-	+	milk prods, bread, sand-wich filling	-	14

EPIC-MORGEN (93-97)	**RIVM**	1993-1997	EPIC-FFQ	31,100 men and women 20-59 y	in Doetinchem, Maastricht, Amsterdam (partly ongoing in specific cohort studies)		taking yes/no; vit C+ E in mg/IU	4)	-	+	vit C and E	vit C and E		+	-	+	+	+	[15]
Doetinchem cohort	**RIVM**	1987-91; 1993-97 1998-2002, 2003-present, ongoing	EPIC FFQ from 1993 onward	6,327 men and women 31-70 y (in 1998-2002)			taking yes/no; vit C+ E in mg/IU	4)	-	+	vit C and E	vit C and E		+	-	+	+	+	
Doetinchem cohort follow up (for EPIC)	**RIVM**	2000	VEG questionnaire		special attention to vegetable and fruit use in summer and winter		-	-	-	-	-	-		vege-tables (raw, cooked) potatoes fruit, drinks	-	+	+	+	
EPIC-MORGEN Maastricht respondents	**RIVM**	(continued PPHV/ MORGEN till 1997 +new sampling in 1998	EPIC FFQ	13184 men + women 20-59y at baseline			taking yes/no; vit C+ E in mg/IU	4)	-	+	vit C and E	vit C and E		+	-	+	+	+	
EPIC-MORGEN Maastricht respondents follow up	**RIVM**	2000-2003	EPIC follow up questionnaire	2000:1200p; 2001:800 p; 2002:1100 p			taking yes/no/ don't know; last week	open question	-	+	-	-		alcohol	-	+	-	-	
EPIC-MORGEN Amsterdam respondents follow up	**RIVM**	1998-2002	EPIC follow up questionnaire	1999:2300p; 2000:200p; (total 4622)			taking yes/no/ don't know; last week	open question	-	+	-	-		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…		taking yes/no; vit C+E in mg/IU; last week	4)	-	+	vit C and E	vit C and E		+	-	+	+	+	[16]

Study details						Details supplements						Details diet (all products)					
Study	**Instit.**	**Year(s)**	**Method***	**Population**	**Remarks**	**Method**	**Type**	**Br. name**	**Freq.**	**Quant**	**Nutr. calc.**	**Type****	**Br. name**	**Freq**	**Quant**	**Nutr. calc. *****	**Ref.**
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	since 2002: freq. of use during last month	since 2002: multivit, vit A, C, D, E	-	+	-	-	ii)	-	+	-	-	17
REGENBOOG	**RIVM**	1999-2002 (sample from POLS)	55 item FFQ + medical questionnaire	1284 p >12j		usually taking: no/some-times / regularly; in medical question-naire.:use at this moment	open question	+	-	-	-	+	-	+	+	-	18
External studies																	
ABCD study (pregnant women)	**VUMC/ AMC**	2003/2004, ongoing	limited FFQ during pregnancy; at 3 months and 5 y after birth	8000 pregnant mothers	12 weeks of pregnancy onwards	fish oil, knowledge and use of folic acid suppl	fish oil, folic acid	-	fish oil: +, folic acid suppl: -	-	-	fish	-	+	-	-	
ABCD study (infants and mothers)	**VUMC/ AMC**	2003/2004, ongoing		7000 new born children	duration breast feeding	use during pregnancy trimesters; use by baby's	5) [mother's use]; 6) [baby's use]	-	-	-	-	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		-	-	-	-	-	-	+	-	-	+	+	19 20
CoDAM	**UM**	1999-2000 (partly from PPHV and MORGEN)	EPIC-FFQ	ca 200 p 40-70 y, at risk for DM		taking yes/no; vit C+E in mg/IU	4)	-	+	vit C and E	vit C and E	+	-	+	+	+	

Dutch national survey of general practice	**NIVEL/ RIVM**	1987-1988, 2000-2002	oral questionnaire	12.699 p	no questions on supplements or functional foods	-	-	-	-	-	-	bread, cooking fat, chips, vege-tables, fruit	-	+	-	-	[21]
Dutch Health Care Consumer Panel	**NIVEL/ RIVM**	spring 2000	self-administered questionnaire	1183 p	questions concerning functional foods and dietary supplements	frequency of use per day/week/ month/non e/unknown	multivit and min; Ca	-	+	-	-	-	-	-	-	-	[22]
ERGO – R'dam en ERGO-PLUS	**EUR**	baseline: 1990/1993; ERGO-PLUS: 2000/2001	checklist and semi quantitative 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	use during last 12 m yes/no	open question	+	+	+	+	+	-	+	+	±	[23]
Generation R (mothers)	**EUR**	2002, ongoing	maternal diet at 12 w amenorrhea (FFQ); 3 m after birth (9 item FFQ)	ca 10,000 new born multi ethnic children (born 2002-2004) + parents; to follow until age 20 y	special attention for nuts and nut products during breast feeding	pregnant women: yes/no – since when; during breast feeding yes/no	8), 9)	-	-	-	-	+	dres-sings	+	+	±	
Generation R (children)	**EUR**	2002, ongoing	childhood diet (2, 6, 12 m) [plans for 24, 36 m and yearly thereafter] by FFQ		items in FFQ increase per age group	use yes/no	fluoride, iron, vit A, D, multivit (+ vit K at 2 and 6 m)	-	-	-	-	iii)	+	+	-	-	[24]

Study details						Details supplements						Details diet (all products)					
Study	**Instit.**	**Year(s)**	**Method***	**Population**	**Remarks**	**Method**	**Type**	**Br. name**	**Freq.**	**Quant**	**Nutr. calc.**	**Type****	**Br. name**	**Freq**	**Quant**	**Nutr. calc. *****	**Ref.**
GLAS	**RUL**	1993			no food information	-	-	-	-	-	-	-	-	-	-	-	
GLOBE	**EUR**	1991 during follow up: annually or bi-annually no FFQ), ongoing	58 items FFQ	5667 p 15-74y		-	-	-	-	-	-	+	-	+	+	±	
Hartslag Limburg (see also RIVM related studies)	**RUL/ GVO Maastricht**	1998, 2000, 2003	19 item FFQ (fatlist)+ fruit and vegetable questions	2775 at baseline	very limited information on food	-	-	-	-	-	-	major fat containing food groups; fruit and vegetables	-	+	-	-	16 25
Hoorn study	**VUMC**	1989, 1996-98, 2000-01 (partly newly sampled), 2006, ongoing	89/90: FFQ-TNO; 96/98 idem uitgebr; 2000: EPIC-FFQ	800 p 64-85 y		taking yes/no; vit C+E in mg/IU	4)	-	+	vit C and E	vit C and E	+	-	+	+	+	26
LASA	**VUMC**	1992-93, 1995-96, (1998-99, 2001-02, 2002-03 (new cohort), present, ongoing, but no information on food)	very limited questionnaires	ca 1000 p >55-85 y	92/93: questionnaires on fruit and vegetables; 95/96: on dairy food and medication	daily use yes/no	vitamins, calcium, iron product	-	-	-	-	fruit and vegetables; dairy food	-	+	-	-	27

Leidsche Rijn Gezondheidsproject (Utrecht health monitoring study)	**UMCU**	2000-present, ongoing	very limited FFQ	5500 men and women, 3/4of pop. >18 y	more detailed FFQ is planned to be used later during the study		use during last 3 m yes/no	7)	-	-	-	-		bread, vege-tables, fruit, milk-products alcohol	-	+	-	-	
Monitor VGZ	**GGD/ RIVM**	data collection every 4-5 years, national data avail-able from 2004, ongoing	questionnaires	2000-3000 p 18-65 y; yearly			-	-	-	-	-	-		alcohol, vege-tables, fruit, bread	-	+	+	-	[28]
Netherlands Twin Register	**VUMC**	1986, ongoing	1992: 2 day record diet history (250 twins and some parents)		recently hardly any food consumption questions		-	-	-	-	-	-		milk, coffee, tea	-	-	-	-	[29]
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. questionnaires (sub group n=109 p)		use during last 5 y	open question	+	-	+	+		+	-	+	+	-	[30-32]
PGO-peilingen	**TNO-PG**	1991-present, ongoing	questionnaire 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	-	-	-	-	[33 34]
Prospect-EPIC (Utrecht cohort)	**UMCU/ RIVM**	1993-1997 ongoing	EPIC-FFQ	EPIC cohort Utrecht: ca 17,500 women 50-70 y			taking yes/no; vit C+E in mg/IU	4)	-	+	vit C and E	vit C and E		+	-	+	+	+	35
Prospect-EPIC (Utrecht cohort) calibration study	**UMCU/ RIVM**	1995-1997	24-h recall EPIC-SOFT	2231 women 50-70 y			yesterday	+	+	-	+	+		+	+	-	+	+	36

Study details						Details supplements						Details diet (all products)					
Study	**Instit.**	**Year(s)**	**Method***	**Population**	**Remarks**	**Method**	**Type**	**Br. name**	**Freq.**	**Quant**	**Nutr. calc.**	**Type****	**Br. name**	**Freq**	**Quant**	**Nutr. calc.**	**Ref.**
SENECA	**WUR**	baseline: 1988/89; 1993, 1999	diet. history: 3-day record + checklist on food 1999: only checklist	at baseline: 236 p.; '93:132 men and women (75-80 y)		use yes/no	open question: vitamins/ minerals or tonics	+	+	+	+	+	-	+	+	+	37 38 39 40
Survey on food consumption of allochthonous population	**TNO**	1996 + 97; 1998	'96+'97: 2 x 24 hour recall '98: 24 hour recall	'96: 36 Moroccan women (19-50 y); '97: 42 Surinam men (18-49y); '91 Moroccan, 180 Turkish and 202 Dutch 8y old children and mothers	no information on supplements	-	-	-	-	-	-	+	-	-	+	+	41-43
Vitamins and food supplements 2003	**TNS-NIPO**	1998, 2001, 2003	multi media questionnaire	random sampling of 1993 p >18 y	goal: to check knowledge of brand-names and possession of supplements, freq of use, season differences; no specific intake data	do you know, do you have, do you use	vitamins, minerals, multi's, fibre, garlic, herbs	-	+	-	-	-	-	-	-	-	44
VIO (Nutrient Intake Study)	**TNO**	2002	2 day dietary record	914 children, 9, 12, 18 m		do you use yes/no	vit D, AD, K, B, C, multivit, multivit-minerals, fluoride, tooth-paste with F, other	-	-	-	-	+	+	-	+	+	45

Used symbols in Appendix I

* FFQ = food frequency questionnaire
** + if no differentiation in type of products is given, most (to all) food groups are included
*** ± 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 preparation
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, Echinaforce, digestion stimulating preparations, other preparations, herbs
8) pregnant women: folate + open question on supplements
9) mothers 2 m after birth: 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

Nutrient composition of new or revised supplements used in VCP-2003

Marketing research extra supplements VCP-2003 (data November 2004)

Addition tot composition data of Consumentenbond,April 2002[18]

			Vitamins										
brand	name	unit	A	β-caro-tene	B1	B2	Niacin	Panto thenic acid	B6	Biotin	Fola te	B12	C
			mg	*mg*	*mg*	*mg*	*mg*	*mg*	*mg*	µg	µg	µg	*mg*
A.Vogel	Urticalcin *(geen analysecijfers)*	tabl											
AOV	Dibencozide complex	past									500	1500	
AOV	Magnesiumascorbaat	gram											922
AOV	Zink AC 15 mg (elementair)	tabl											
AOV	Zink glucinaat 30 mg (elementair)	tabl											
AOV	Zink citraat 15 mg (elementair)	caps											
AOV	Zink citraat 50 mg (elementair)	caps											
AOV	Zink-Extra	past											100
Biotics	Bio Multi Plus	caps	0.5		3.33	3.33	6.66	8.33	3.33	100	133	3	33.3
Biotics	Bio Multi Plus iron free	caps	0.5		3.33	3.33	6.66	8.33	3.33	100	133	3	33.3
Biotics	Bio Multi Plus iron and copper free	caps	0.5		3.33	3.33	6.66	8.33	3.33	100	133	3	33.3
Boots	Citrosan	sach											50
Christiaens	Calci-Chew 500 mg	chew											
Christiaens	Calci-Chew 1000 mg	chew											
Christiaens	Calci-Chew D3 500/400	chew											
Centrum	Compleet van A tot Zink *(idem 2004)*	tabl	0.8		1.4	1.6	18	6	2	150	200	1	60
Centrum	Performance	tabl	0.8	2.4	4.2	4.8	36	10	6	40	400	18	120
Country Life	Vitamine K-1	tabl											
DA	B-complex Forte	tabl			2.8	3.2	36	12	4		400	2	
DA	Foliumzuur	tabl			0.3	0.3	3.6	1.2	0.4		400	0.2	
DA	Multi Forte	tabl	0.4	2	10	10	10	10	10	10	200	10	120
DA	Multi Vitamines en Mineralen (50% adh)	tabl	0.4		0.7	0.8	9	3	1		100	0.5	30
Dagravit	Totaal 30 Junior *(idem 2004)*	drag	0.25		0.35	0.4	4.5	1.5	0.5	37.5	50	0.5	24
Dagravit	Totaal 30-multivitamine *(Fe analysis changed end 2002)*	drag	0.4		0.7	0.8	9	3	1	75	100	0.5	30
Dagravit	Vitamine C met vanille-citroensmaak	chew											50
Davitamon	Compleet	drag	0.4		0.7	0.8	9	3	1		100	5	60
Davitamon	Junior dragees *(idem 2004)*	drag	0.25		0.35	0.4	4.5	1.5	0.5		50	0.25	24
Davitamon	Junior kauw	chew	0.25		0.35	0.4	4.5	1.5	0.5		50	0.25	24
dr. Rath	Vitacor Plus*(let op vit E ook in kolom overig)*	tabl		0.333	2.3	2.3	15	13.3	3.3	22	30	67	200
Essential Organics	Vitamine C 500 mg	tabl											500
Essential Organics	Vitamine C 1500 mg	tabl											1500
Etos	Calcium + vitamine D/K	tabl											
Etos	Visoliecapsules	caps											

			Minerals															
D	E	K	Ca	K	Na	P	Fe	Mg	Cu	Se	Zn	Cl	Cr	F	I	Mn	Mo	S
µg	*mg*	*mg*	*mg*	*mg*	*mg*	*mg*	*mg*	*mg*	*mg*	µg	*mg*	*mg*	*mg*	*mg*	*mg*	*mg*	*mg*	*mg*
								78										
											15							
											30							
											15							
											50							
											2							
3.3	6.7	0.012	66.7	33			6.0	33.3	0.66	16	5.0		0.016		0.05	0.66	0.003	
3.3	6.7	0.012	66.6	33				33.3		16	5.0		0.016		0.05	0.66	0.003	
3.3	6.7	0.012	66.6	33				33.3		16	5.0		0.016		0.05	0.66	0.003	
			500															
			1000															
10			500															
5	10	0.03	162	40		125	14	100	2	25	15	36.3	0.025		0.15	2.5	0.025	
5	40	0.025	100	80		48	14	45	2	70	15	72	0.12		0.15	4	0.075	
		0.1																
2.5	20	0.1	150	50		50	5	75	1	50	5		0.05		0.05	2	0.25	
1.7	5		60			45	1	15	0.5	35	3		0.015		0.05	1.5	0.075	
2.5	4		20.0	6		15	4.0	15	0.25	10	2.5		0.01		0.01	0.75	0.01	
2.5	5		60.0	12.5			2.5	22.5	1.00	50	3.0		0.05		0.05	1.5	0.15	
1.6	5		41				7	1.5	0.75	35	6					1.5	0.075	
1.25	4	0.02	30				2	30	0.25	10	1.5				0.025			
1.25	4	0.02	30				2	30	0.25	10	1.5				0.025			
11	29		11.7	6.7		5		13.3	0.11	67	2.3		0.033			0.43	0.013	
3		0.04	400															
		Visolie 1500 mg; waarvan EPA 12%; DHA 18%																

			Vitamins										
brand	name	unit	A	β-caro-tene	B1	B2	Niacin	Panto thenic acid	B6	Biotin	Folate	B12	C
			mg	*mg*	*mg*	*mg*	*mg*	*mg*	*mg*	µg	µg	µg	*mg*
Etos	Vitamine C-60 sinaasappelsmaak	chew											60
Etos	Vitamine C-60 zonder suiker	chew											60
Etos	Vitamine C-250 zuurvrij *(idem 2004)*	tabl											250
Etos	Vitamine C-1000 plus krachtig	tabl TR											1000
Etos	Vitamine C-1000-plus krachtig en compl *(idem 2004)*	tabl TR											1000
Etos	Vitamine C-1000-plus krachtig. sinaasappelsmaak	bruis											1000
Etos	Vitamine C-1500-plus extra krachtig. limoensmaak	bruis											1500
Etos	Q10 krachtig met vit E	tabl											
EuRho	Vital multivitaminen /mineralen	tabl	0.6	1.2	1.4	1.6	18	6	2	150	200	1	60
EuRho	Vitamine C + zink	caps											300
Hema	Gezuiverde zalmolie	softgel											
Hema	Multi Totaal 50% ADH	tabl	0.4		0.7	0.8	9	3	1	38	100	0.5	30
Hema	Multi Totaal *(2004: extra minerals)*	tabl	0.4	1	1.4	1.6	18	6	2	5	100	1	60
Hema	Visoliecapsules/krachtige visolie	softgel											
Hema	Vitamine B-complex-25	tabl			25	25	25	25	25	25	25	25	
Hema	Vitamine B-complex-2.5	tabl			2.5	2.5	25	2.5	2.5		250	2.5	
Hema	Vitamine B-complex-2.5	bruis			2.5	2.5	25	2.5	2.5		250	2.5	
Hema	Vitamine B-complex-100 time-released	tabl			50	100	100	100	100	100	400	100	
Herbalife	N-R-G (Nature's Raw Guarana)	tabl											
Herbalife	Thermo-Bond Fiber Tablets	tabl											
Herbalife	Xtra-Cal	tabl											20
Juvamine	Vitamine Tonus	bruis			0.07								120
Katwijk Farma	Vitamine B-complex Forte	drag			15	15	25	25	5	25		1	
Kring-Apothekers	Foliumzuur 0.5 mg	tabl									500		
Kruidvat	IJzer + Vitamine C *(less Fe in 2004)*	bruis											150
Kruidvat	Multivitaminen en mineralen *(idem 2004)*	bruis	0.345		1.5	1.6	18	6.4	2.5			3	105
Kruidvat	Multivitaminen en mineralen	drag	0.4		0.7	0.8	9	3	1		100	0.5	30
Kruidvat	Oesterextract	caps					15						
Kruidvat	Vitaal Zwanger	tabl		1.2	1.4	1.6	18	6	2		400	1	30
Kruidvat	Vitamine AD	tabl	0.182										
Kruidvat	Vitamine B-complex	tabl			5.6	4.9	72	24	18	-	800	4	
Kruidvat	Vitamine B-50 complex time released *(idem 2004)*	tabl			50	50	50	50	50	500	500	50	

			Minerals															
D	E	K	Ca	K	Na	P	Fe	Mg	Cu	Se	Zn	Cl	Cr	F	I	Mn	Mo	S
µg	mg	mg	mg	mg	mg	mg	mg	mg	mg	µg	mg	mg	mg	mg	mg	mg	mg	mg
			55															
	10																	
5	10	0.03	162	40		100	5	100	1	30	5	36.3	0.06		0.1	2	0.08	
											5							
Visolie 500 mg; waarvan EPA 18%; DHA 12%																		
0.75	5		128			99	1.4	30	0.25	7	1.5		0.013		0.015	0.5	0.016	
1.5	10	0.075	280	25			2.5	0.05	0.5	25	2.5		0.015		0.035	1.5	0.15	
	10	Visolie 1000 mg; waarvan EPA 18%; DHA 12%; borageolie 200 mg waarvan GLA 18%																
			250															
0.75			334					134	0.167		1.7					0.7		
							28											
5	16						10		0.5							1		
1.66	5		60.0						0.5	35	3.0				0.05	1.5	0.075	
											6.0							
6.9	5.4		225				16	45	1.00	50	10.0							
5																		

			Vitamins										
brand	name	unit	A	β-caro-tene	B1	B2	Niacin	Panto thenic acid	B6	Biotin	Folate	B12	C
			mg	*mg*	*mg*	*mg*	*mg*	*mg*	*mg*	µg	µg	µg	*mg*
Kruidvat	Vitamine B-100 Complex *(2004: less B6)*	tabl			100	100	100	100	25	100	100	100	
Kruidvat	Vitamine C-500 met acerola	tabl											500
Kruidvat	Vitamine C-1000 time released	tabl											1000
Kruidvat	Vitamine C-60 suikervrij	tabl											60
Marcus Rohrer	Spirulina	tabl		0.8	0.0075	0.01	0.045	0.0015	0.0015	0	0		
Mijn*apotheek*	VitaLife Super B-100	tabl			100	100	100	100	100	300	400	100	
Optimax	100% Multi	tabl	0.8		1.4	1.6	18	6	2	150	200	1	60
Optimax	Cantassium 2000	tabl	0.4		40	50	50	50	25	125	250	50	150
Optimax	Oesterkalk	tabl											
Optimax	Oesterkalk met magnesium	tabl											
Optimax	Totaalplus	tabl		1.5	10	5	30	25	5	100	500	25	325
Optimax	Totaal 50 plus	caps		2.1	1.4	1.6	18	9	2	150	200	35	60
Orthica	Mineral Max	tabl											
Orthica	Pico-chroom	caps											
Orthica	GTF-chroom	tabl											
Pharma Nord	Bio Ferrron	tabl											
PMT	Optivite for women	tabl	0.625		4.16	4.16	4.16	4.16	50	10	33	10	250
Roter	Vitamine C *(idem 2004)*	tabl											50
Solgar	Calcium citraat met vitamine D	tabl											
Solgar	Calcium magnesium met vitamine D	tabl											
Solgar	Megasorb Vitamine B complex	tabl			50	50	50	50	50	50	400	50000	
Solgar	Vitamine B-complex '100' (veg)	caps			100	100	100	100	100	100	400	100	
Supradyn	Complex forte. hoge dosering(2004)	tabl	0.8		4.2	4.8	54	18	6	450	600	3	180
Supradyn	Complex forte. hoge dosering	bruis	0.8		4.2	4.8	54	18	6	450	600	3	180
Trekpleister	Echinacea	tal											
Trekpleister	Jeneverbessen	caps											
Trekpleister	Multi Vitaminen & Mineralen	drag	0.4		0.7	0.8	9	3	1		100	0.5	30
Trekpleister	Multi Vitaminen & Mineralen *(2004: analysis dubbled!)*	tabl	0.8		1.4	1.6	18	6	2	150	200	1	60
Trekpleister	Vrouw Optimaal	caps	0.2	0.002	2	2	27		3	50	200	1	30
Vitavit	Vitamine C	bruis											180

			Minerals															
D	E	K	Ca	K	Na	P	Fe	Mg	Cu	Se	Zn	Cl	Cr	F	I	Mn	Mo	S
µg	*mg*	*mg*	*mg*	*mg*	*mg*	*mg*	*mg*	*mg*	*mg*	µg	*mg*	*mg*	*mg*	*mg*	*mg*	*mg*	*mg*	*mg*
			1.2	5.31		3	0.15	1.44			1.4					0.011		0.183
5	10	0.03	162	40		125	14	100	2	20	15	36.3	0.025		0.15	2.5	0.025	
2.5	67	0.05	55	1		25	2	20	0.15	25	3		0.02		0.075	0.5	0.05	
5																		
25								100										
1.25	83	0.1	44	4			2	8.4	0.5	50	4.8		0.05			0.5	0.01	
1.5	30	0.08	15				2		0.165	35	3		0.015		0.025	0.7	0.01	
2.5			500	50			10	250	0.5	25	10		0.05		0.05	5		
													0.2					
													0.015					
							18		0.388		0.97							
0.4	10.7		20.8				2.5	41.66		16	4.16				0.0125	1.66		
3.75			250															
			200					100										
								20										
5	10	0.03	120	20.4		126.3	8.0	45	0.9	550	8.0	21	0.025		0.74	1.8	0.045	
5	10	0.03	120	20.4		126.3	8.0	45	0.9	550	8.0	39.2	0.025		0.75	1.8	0.045	
1.66	5		60				-	-								-		
5	10	0.03	162			125	14	100	2	25	15		25		0.15	2.5	0.025	
	10		80	2.5		61.8	5	30	0.2	12.5	5		0.015			0.5		

Appendix III

Nutrient composition of the 10 mostly used supplements in VCP-2003: recent values compared to CB 2002 data

Brandname		1. Roter Vitamine C	4. Dagravit Totaal 30 multivitamine	4. Dagravit Totaal 30 multivitamine*	5. Centrum Compleet van A tot Zink	6. Davitamon Femfit	8. Kruidvat Vitamine C-60 suikervrij	9. Etos Vitamine C-250 zuurvrij	10. Trekpleister Multi Vitaminen & Mineralen	10. Trekpleister Multi Vitaminen & Mineralen**
difference 2002/2004		#	2002	2004	#	#	#	#	2002	2004
nutrient	***unit***	***tabl***	***drag***	***drag***	***tabl***	***capsule***	***tabl***	***tabl***	***tabl***	***tabl***
A	*mg*		0.4	0.4	0.8	0.2			0.4	0.8
betacaroteen	*mg*									
B1	*mg*		0.7	0.7	1.4	2.1			0.7	1.4
B2	*mg*		0.8	0.8	1.6	2.4			0.8	1.6
B3(niacine)	*mg*		9	9	18	27			9	18
B5(pantothenic acid)	*mg*		3	3	6				3	6
B6	*mg*		1	1	2	3			1	2
B8(biotin)	*mg*		0.0750	0.0750	0.1500	0.05			0.0760	0.1500
B11(folate)	*mg*		0.100	0.100	0.200	0.2			0.100	0.200
B12	*mg*			0.0005	0.001	0.0015			0.0005	0.001
C	*mg*	50	30	30	60	30	60	250	30	60
D	*mg*		0.0025	0.0025	0.005	0.0025			0.0025	0.005
E	*mg*		5	5	10	10			5	10
K	*mg*				0.03					0.03
Ca	*mg*		60.0	60.0	162	80				162
K	*mg*		12.5	12.5	40					
Na	*mg*									
P	*mg*				125	61.8				125
Fe	*mg*		6.0	2.5	14	5			6.25	14
Mg	*mg*		23	23	100	30				100
Cu	*mg*		1.00	1.00	2	0.2				2
Se	*mg*		0.050	0.050	0.025	0.013				0.025
Zn	*mg*		3.0	3.0	15	5			3.75	15
Cl	*mg*				36.3					
Cr	*mg*		0.05	0.05	0.025	0.015				25
F	*mg*									
I	*mg*		0.05	0.05	0.15					0.15
Mn	*mg*		1.5	1.5	2.5	0.5			0.625	2.500
Mo	*mg*		0.150	0.150	0.025					0.025
S	*mg*									
Other	*mg*		inositol 2.5; PABA$ 5	inositol 2.5; PABA 5		lecithin 10				

* extra iron was added by the producer at the end of 2002

** double dose of micronutrients since 2004 (not applied for VCP-2003)

composition did not change since 2002

$ par amino benzoic acid

VCP-2003 top ten supplements 2. (Davitamon Compleet), 3. (Kruidvat Multivitaminen en mineralen) and 7. (Kruidvat Vitamine-B complex) are "new" supplements. For analysis of new supplements see Appendix II.

Appendix IV

Supplement use in Dutch National Food Consumptions Surveys 1987/88, 1992 and 1997/98

IV.1 % users of different supplement groups by age
IV.2 % users of specified supplements by sexe
IV.3 % supplement users for personal and demographic characteristics

IV.1 % users of different supplement groups by age (Dutch National Food Consumption Survey 1987/88, 1992 and 1997/98)

		1-3 y	*4-6 y*	*7-9 y*	*10-12 y*	*13-15 y*	*16-18 y*	*19-21 y*	*22-49 y*	*50-64 y*	*>64 y*	*preg. women*
Total supplements												
1987/88	*N=5898*	63.0	42.2	20.9	16.1	13.8	9.4	7.9	11.7	16.3	15.9	23.0
1992	*N=6218*	76.4	52.9	29.5	20.0	15.1	8.7	9.2	12.0	27.3	23.8	20.7
1997/98	*N=5958*	76.5	53.3	34.5	23.3	15.7	9.3	10.1	18.0	22.5	24.9	32.0
Vitamin AD												
1987/88		45.5	26.1	6.3	2.8	0.7	0.0	1.0	0.8	1.6	0.8	-
1992		50.7	23.1	4.7	1.6	0.4	0.8	0.5	0.3	0.8	0.8	-
1997/98		40.6	17.8	3.8	3.0	0.0	0.0	0.8	0.5	0.0	0.7	0.0
Vitamin B												
1987/88		0.3	0.0	0.4	1.4	0.7	0.6	1.0	1.4	2.1	2.6	-
1992		0.0	0.3	0.4	0.0	0.0	0.4	1.8	2.1	4.6	2.6	-
1997/98		0.0	0.4	0.4	0.0	1.2	0.7	0.4	1.9	2.5	2.4	0.0
Vitamin C												
1987/88		5.3	4.3	5.1	5.6	3.6	3.6	2.5	3.2	2.9	3.7	-
1992		2.8	7.0	5.1	3.9	4.8	3.6	5.0	3.8	4.6	5.6	-
1997/98		4.4	4.7	5.9	7.2	5.1	2.8	4.3	5.0	3.5	4.0	6.0
Multivitamins												
1987/88		2.6	2.0	3.2	2.1	1.3	1.0	1.5	1.8	1.8	1.2	-
1997/98		3.0	2.5	1.3	3.8	2.8	1.1	0.4	2.3	2.1	2.9	2.0
Multivitamins/minerals												
1992		1.4	4.3	5.5	4.7	4.8	2.8	1.8	4.3	7.5	6.4	-
1997/98		4.2	10.9	13.0	9.3	7.5	3.2	3.1	7.3	8.3	6.7	12.0
Calcium												
1992		0.3	2.4	0.8	0.4	0.8	0.4	0.5	1.1	3.6	2.6	-
Fluoride												
1987/88		46.5	25.8	10.3	7.3	5.2	1.3	1.0	0.2	-	-	-
1992		56.4	36.5	18.9	11.4	4.4	0.8	0.9	0.4	0.0	0.0	-
1997/98		58.8	32.2	16.0	4.7	0.8	0.0	0.0	0.1	0.0	0.0	0.0
Garlic preparations												
1987/88		0.0	0.0	0.0	0.3	0.0	0.0	0.0	1.2	4.0	4.5	-
1992		0.0	0.0	0.0	1.2	0.0	0.0	0.9	1.4	8.0	8.8	-
1997/98		0.0	0.0	0.0	3.8	0.0	0.0	0.0	0.6	3.4	5.9	0.0
Brewer's yeast												
1987/88		0.0	0.0	0.0	0.0	1.3	2.3	1.5	1.4	1.1	0.2	-
1992		0.0	0.0	0.0	0.4	2.4	0.8	0.5	1.1	1.9	1.2	-
1997/98		0.0	0.0	0.0	3.8	0.4	0.7	0.0	0.7	1.2	1.2	0.0

*uncorrected data[14]
- = unknown

IV.2 % users of specified supplements by gender (Dutch National Food Consumption Survey 1987/88, 1992 and 1997/98)

	total			*Men*			*Women*		
	1987/88	*1992*	*1997/98**	*1987/88*	*1992*	*1997/98**	*1987/88*	*1992*	*1997/98**
Total	**17.2**	**21.8**	**23.6**	**15**	**18.5**	**20**	**19**	**24.7**	**26**
vit A	0.1	0.0		-	0.1		0.1	0.0	
vit AD	4.6	4.7	3.0	4.8	4.3	3.3	4.5	5.1	2.7
vit B	0.3			0.1			0.4		
vit B*		0.2			0.1			0.4	
vit B**			0.5			0.2			0.8
vit B-complex	1.4	2.0	1.5	1.0	1.1	0.9	1.7	2.7	2.0
vit C	3.6	4.3	4.6	3.2	3.9	4.0	3.9	4.6	5.2
vit D	0.2	0.8	1.7	0.3	0.7	1.9	0.2	0.8	1.6
vit E	0.4	0.4	0.2	0.3	0.3	0.1	0.4	0.4	0.3
vit B12 and folic acid		0.0			0.0			0.0	
multivitamins	1.8			1.3			2.3		
1 vitamin/1 mineral combination	0.1			0.0			0.1		
multivitamins and minerals	1.0	4.7	9.6	0.9	4.0	8.4	1.2	5.4	10.6
vit AD fluoride		0.1	0.1		0.1	0.1		0.2	0.1
vit ADC and magnesium		0.1	0.1		0.1	0.0		0.1	0.2
vit ACE and selenium		0.0	0.0		0.0	0.0		0.0	0.0
other vitamin mineral combinations	0.2			0.1			0.3		
calcium	1.0	1.5	1.7	0.8	0.6	0.6	1.2	2.2	2.6
iron	0.4	0.1	0.2	0.2	0.0	0.1	0.6	0.1	0.3
fluoride	4.8	6.8	5.1	5.3	6.6	5.9	4.4	6.9	4.5
selenium		0.0	0.1		0.0	0.0		0.1	0.2
chromium		0.0	0.1		0.0	0.0		0.0	0.2
magnesium		0.1	0.1		0.0	0.0		0.1	0.1
molybdeen			0.0			0.0			0.0
zink		0.0	0.1		0.0	0.1		0.0	0.1
other minerals	0.2			0.1			0.2		
garlic preparations	1.5	2.6		1.3	2.4		1.7	2.8	
brewer's yeast	1.2	1.1	1.4	0.8	0.6	1.2	1.6	1.5	1.5
fibre tablets	0.1	0.0		0.0	0.0		0.0	0.1	
lecithine	0.7	0.3	0.1	0.4	0.2	0.1	0.6	0.3	0.2
fatty acids		0.0	0.1		0.0	0.0		0.0	0.2
antioxidants			0.1			0.1			0.1
kelp	0.5	0.1	0.2	0.4	0.1	0.4	0.6	0.2	0.1
spirulina	0.4	0.3	0.2	0.3	0.1	0.2	0.5	0.4	0.2
wheat-germ oil	0.2	0.1		0.1	0.0		0.2	0.2	
tonicum	0.2	0.0	0.1	0.1	0.0	0.1	0.2	0.1	0.1
ginseng	0.1	0.1	0.1	0.0	0.1	0.1	0.2	0.1	0.2
bee pollen	0.1			0.1			0.1		
fish oil		0.0	0.1		0.0	0.1		0.0	0.1
bone marrow + vit D		0.0			0.0			0.0	
enzyms		0.0	0.2		0.0	0.1		0.0	0.2
silicic acid			0.0			0.0			0.1
health promotors			0.9			0.5			1.2
slimming products			0.0			0.0			0.0
other preparations	0.4		0.0	0.4		0.0	0.5		0.1

* vitamin B1, B2, B6 or B12
* vitamin B1, B2, B6 or folic acid
$ uncorrected data[14]

IV.3 % of supplement users for personal and demographic characteristics (Dutch National Food Consumption Survey 1987/88, 1992 and 1997/98)[14]

Charateristics	Total sampling (N)			Supplement users (%)			
	1987/88	1992	1997/98	1987/88	1992	1997/98	
Total	5,898	6,218	5,958	17.2	21.8	23.4	p<0.001
Gender							
men	2,788	2,881	2,789	15.1	18.5	20.3	p<0.001
women	3,110	3,337	3,169	19	24.7	26.1	p<0.001
Total*	3,984	4,306	4,101	13.2	16.5	19.6	p<0.001
Gender*							
men	1,842	1,947	1,891	10	12.3	14.2	p<0.05
women	2,142	2,359	2,270	16	20	24.4	p<0.001
Age (years)							
1-3 y	303	351	254	63	76.4	79.9	p<0.001
4-7 y	256	329	276	42.2	52.9	52.9	p<0.05
7-10 y	253	254	238	20.9	29.5	34.5	p<0.05
10-13 y	286	255	236	16.1	20	23.3	
13-16 y	305	252	254	13.8	14.7	15.7	
16-19 y	309	253	281	9.4	8.7	9.3	
19-22 y	202	218	258	7.9	9.2	10.1	
22-50 y	2,622	2,857	2,774	11.7	12.1	22.3	
50-65 y	870	950	966	16.3	26.1	23.5	p<0.001
65+ y	492	499	421	15.9	23.4	23.4	p<0.01
Region							
Amsterdam	292	276	247	14.7	22.5	27.5	p<0.05
Den Haag	227	272	198	22.9	24.3	24.3	
Rotterdam	368	401	337	16.3	27.2	25.8	p<0.001
other west	1,601	1,775	1,692	19	24.2	25.2	p<0.001
north	705	733	681	16	22	22.2	p<0.01
east	1,234	1,274	1,289	16.5	21	20.6	p<0.01
south	1,471	1,487	1,514	16	17.8	24.6	
Social class of breadwinner							
A-high	622	665	779	23.8	22.3	28	
B-upper	1,292	1,377	1,596	20.4	24.3	27.1	p<0.05
B-lower	1,165	1,341	1,249	15.5	21.4	24.4	p<0.001
C	2,512	2,581	2,150	15.5	20.8	18.6	p<0.001
D-low	307	254	178	9.4	20.9	21.9	p<0.001
Alternative food habits*							
none	3,889	4,209	4,023	12.9	16.3	19.3	p<0.001
yes	95	97	64	28.4	24.7	35.9	
Smoking habits*							
not smoking	2,329	2,689	2,818	14.6	17.4	19.7	p<0.01
smoking	1,655	1,564	1,339	11.4	15.5	19.5	p<0.001
Dieting*							
no special diet	3,478	3,756	3,741	11.9	15.3	19.1	p<0.001
medical diet	356	359	259	20.8	27.9	28.9	p<0.05
diet at own initiative	150	191	161	26	19.9	26.1	

* ≥22 jaar

Appendix V

Supplement use in VCP-2003 (young adults)

V.1 General characteristics of the population
V.2 Supplement use on both days/one day
V.3 Number of different supplements used, total 2 days
V.4 Supplement use by education, for supplements used by >1 %
V.5 Nutrient intake from foods, dietary supplements and both, men
V.6 Nutrient intake from foods, dietary supplements and both, women

V.1 General characteristics of the population: VCP 2003

	total population (N=750)						supplement users (N=204)					
	total		men (n=352)		women (n=398)		total		men (n=72)		women (n=132)	
	mean	sd	mean	sd	mean	sd	mean	sd	mean	sd	mean	sd
age (y)	25.4	3.6	25.4	3.5	25.5	3.6	25.7	3.4	25.2	3.3	25.9	3.4
weight (kg)	75.1	13.6	79.6	11.6	71.2	14.0	73.4	13.2	79.2	12.2	70.2	12.7
height (cm)	177.1	9.9	184.7	7.2	170.4	6.7	175.6	9.0	184.2	6.9	170.9	6.1
BMI (kg/m^2)	23.9	4.0	23.3	3.2	24.5	4.5	23.8	4.0	23.4	3.5	24.1	4.3
BMI categories	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**
<18.5 kg/m^2	26	3.5	14	4.0	12	3.0	7	3.4	2	2.8	5	3.8
18.5-25 kg/m^2	484	64.5	249	70.7	235	59.1	136	66.7	55	76.4	81	61.4
25-30 kg/m^2	183	24.4	75	21.3	108	27.1	45	22.1	11	15.3	34	25.8
> 30 kg/m^2	57	7.6	14	4.0	43	10.8	16	7.8	4	5.6	12	9.1
Education *	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**
low	170	22.7	65	18.5	105	26.4	40	19.6	11	15.3	29	22.0
moderate	363	48.4	176	50.0	187	47.0	97	47.6	33	45.8	64	48.5
high	217	28.9	111	31.5	106	26.6	67	32.8	28	38.9	39	29.6

*

low= primary school, lower vocational education, lower general secondary education
moderate= intermediate vocational education, higher general secondary education, pre-university education
high= college for higher education, university

V.2 Supplement use on both days/one day: VCP 2003

population	men (n=352)						women (n=398)					
	one or both days		both days		one day		one or both days		both days		one day	
	N	%	N	%	N	%	N	%	N	%	N	%
supplement users	72	20.5	38	10.8	34	9.7	132	33.2	83	20.9	49	12.3
Users of specific supplements												
vitamin A/D	1	0.3	0	0.0	1	0.3	1	0.3	0	0.0	1	0.3
vitamin B complex	4	1.1	3	0.9	1	0.3	12	3.0	8	2.0	4	1.0
vitamin B6	0	0.0	0	0.0	0	0.0	1	0.3	0	0.0	1	0.3
folic acid	1	0.3	0	0.0	1	0.3	6	1.5	5	1.3	1	0.3
vitamin B12	1	0.3	1	0.3	0	0.0	1	0.3	0	0.0	1	0.3
vitamin C	21	6.0	11	3.1	10	2.8	38	9.5	21	5.3	17	4.3
vitamin E	0	0.0	0	0.0	0	0.0	1	0.3	1	0.3	0	0.0
vitamin K	0	0.0	0	0.0	0	0.0	1	0.3	0	0.0	1	0.3
multivitamins/minerals	42	11.9	21	6.0	21	6.0	78	19.6	44	11.1	34	8.5
brewer's yeast	3	0.9	2	0.6	1	0.3	2	0.5	2	0.5	0	0.0
calcium	3	0.9	2	0.6	1	0.3	7	1.8	2	0.5	5	1.3
iron	1	0.3	0	0.0	1	0.3	2	0.5	1	0.3	1	0.3
zinc	2	0.6	1	0.3	1	0.3	0	0.0	0	0.0	0	0.0
other minerals	0	0.0	0	0.0	0	0.0	2	0.5	1	0.3	1	0.3
echina force	3	0.9	1	0.3	2	0.6	7	1.8	1	0.3	6	1.5
energy	1	0.3	0	0.0	1	0.3	2	0.5	1	0.3	1	0.3
fiber supplement	0	0.0	0	0.0	0	0.0	3	0.8	1	0.3	2	0.5
fish oil	2	0.6	1	0.3	1	0.3	2	0.5	1	0.3	1	0.3
ORS	1	0.3	0	0.0	1	0.3	0	0.0	0	0.0	0	0.0
oyster extract	0	0.0	0	0.0	0	0.0	1	0.3	0	0.0	1	0.3
spirulina	0	0.0	0	0.0	0	0.0	1	0.3	1	0.3	0	0.0
other	1	0.3	0	0.0	1	0.3	7	1.8	3	0.8	4	1.0

V.3 Number of different supplements used, total 2 days: VCP 2003

Number of supplements	total	men	women
0	546	280	266
1	160	60	100
2	32	9	23
3	10	3	7
4	2	0	2

V.4 Supplement use by education, for supplements used by >20 persons: VCP 2003

Population	men (n=352)						women (n=398)					
education level *	low (n=65)		moderate (n=176)		high (n=111)		low (n=105)		moderate (n=187)		high (n=106)	
	N	%	N	%	N	%	N	%	N	%	N	%
supplement users	11	16.9	33	18.8	28	25.2	29	27.6	64	34.2	39	36.8
users of specific supplements												
vitamin C	1	1.5	10	5.7	10	9.0	5	4.8	20	10.7	13	12.3
multivitamins/minerals	8	12.3	18	10.2	16	14.4	16	15.2	38	20.3	24	22.6

*
low= primary school, lower vocational education, lower general secondary education
moderate= intermediate vocational education, higher general secondary education, pre-university education
high= college for higher education, university

V.5 Nutrient intake from foods, dietary supplements and both, men, VCP 2003

Men (N=352)	non-users (n=284)		supplement users (n= 68)							
	from food		from food		from supplements		total			% *
	mean	sd	mean	sd	mean	sd	mean	sd	p90	
vitamin A (µg retinoleq)	1208	1144	1052	880	298	359	1350	945	2674	20.8
vitamin B1 (mg)	1.48	0.57	1.49	0.62	1.39	3.55	2.88	3.53	4.30	28.5
vitamin B2 (mg)	1.88	0.80	1.80	0.79	1.48	3.57	3.28	3.63	5.60	26.2
niacin (mg)	#	#	#	#	10.7	14.3	10.7	14.3	28.5	#
vitamin B6 (mg)	2.18	0.91	2.10	0.89	1.74	3.80	3.84	3.88	6.53	27.8
folate equivalents & (µg)	223	116	212	75	188	298	400	320	715	30.9
vitamin B12 (µg)	4.97	6.00	4.38	2.18	13.07	91.10	17.45	91.30	8.98	16.3
vitamin C (mg)	97	66	104	69	98	173	202	202	335	39.8
vitamin D (µg)	4.0	2.2	3.4	2.0	2.1	3.1	5.6	3.9	10.5	28.6
vitamin E (mg a TE)	14.1	7.1	12.9	6.5	4.7	6.6	17.6	10.4	30.6	20.9
vitamin K (mg)	#	#	#	#	0.00	0.01	0.00	0.01	0.02	#
calcium (mg)	1163	511	1125	482	63	168	1188	509	1923	4.4
chrome (mg)	#	#	#	#	0.01	0.02	0.01	0.02	0.03	#
copper (mg)	2.05	2.58	1.65	0.87	0.51	0.76	2.16	1.15	3.71	18.7
iodide (mg)	#	#	#	#	0.02	0.06	0.02	0.06	0.08	#
iron (mg)	12.5	3.7	11.9	3.2	3.9	5.6	15.7	6.4	23.5	18.7
magnesium (mg)	402	127	402	121	15	33	417	125	597	3.4
phosphorus (mg)	1845	537	1803	549	16	43	1819	550	2560	0.9
selenium (µg)	51	19	52	25	25	69	78	74	138	19.3
zinc (mg)	11.2	3.5	10.9	3.2	4.0	6.3	14.9	7.6	21.4	18.9
fiber (g)	23	9	22	8	#	#	22	8	34	#

unknown amount

* mean contribution of supplements to total

& folic acid from supplements is multiplied by 2 to obtain folate equivalents

V.6 Nutrient intake from foods, dietary supplements and both, women, VCP 2003

women (N=398)	non-users (n= 275)		supplement users (n= 123)							
	from food		from food		from supplements		total			% *
	mean	sd	mean	sd	mean	sd	mean	sd	p90	
vitamin A (µg retinoleq)	867	741	889	754	303	383	1192	825	2379	22.9
vitamin B1 (mg)	1.11	0.56	1.16	0.54	2.17	5.80	3.33	5.80	5.94	36.7
vitamin B2 (mg)	1.39	0.68	1.54	0.72	1.60	3.18	3.15	3.25	5.78	34.0
niacin (mg)	#	#	#	#	16.4	34.3	16.4	34.3	36.0	#
vitamin B6 (mg)	1.57	0.76	1.67	0.77	2.77	6.56	4.43	6.60	6.81	37.1
folate equivalents & (µg)	154	56	155	52	356	508	510	506	1106	47.4
vitamin B12 (µg)	3.40	2.04	3.38	1.77	1.57	3.42	4.95	3.89	8.77	20.7
vitamin C (mg)	94	58	89	50	150	429	239	434	331	41.9
vitamin D (µg)	2.8	2.2	2.6	1.6	2.1	2.9	4.7	3.4	8.5	33.1
vitamin E (mg a TE)	10.0	5.7	10.1	5.2	5.6	8.3	15.7	10.2	31.0	25.8
vitamin K (mg)	#	#	#	#	0.00	0.01	0.00	0.01	0.03	#
calcium (mg)	917	418	1044	425	92	196	1136	446	1789	7.2
chrome (mg)	#	#	#	#	0.01	0.02	0.01	0.02	0.03	#
copper (mg)	1.58	2.76	2.66	10.34	0.57	0.80	3.23	10.50	3.58	22.5
iodide (mg)	#	#	#	#	0.03	0.05	0.03	0.05	0.15	#
iron (mg)	9.6	4.2	9.3	3.0	5.0	6.5	14.3	7.4	22.9	26.3
magnesium (mg)	284	99	295	93	22	40	316	102	448	6.0
phosphorus (mg)	1291	397	1375	423	23	46	1398	426	1940	1.7
selenium (µg)	38	15	38	15	20	33	58	34	87.1	25.9
zinc (mg)	8.2	3.3	8.4	2.5	4.7	6.1	13.1	6.7	22.3	26.7
fiber (g)	17	6	17	6	#	#	17	6	24	#

= unknown amount

* mean contribution of supplements to total

& folic acid from supplements is multiplied by 2 to obtain folate equivalents

Appendix VI

Supplement use in Seneca study 1999*

VI.1 General characteristics of the population
VI.2 Supplement users by gender
VI.3 Supplement use by education

*Data kindly provided by Wageningen University and Research Center

VI.1 General characteristics of the population: SENECA 1999

SENECA	total N=97
	mean
Age	83 y
Gender	
men	34%
women	66%
Education	
<8 year	56%
>8 year	41%

VI.2 Supplement users by gender

SENECA	total N=97			men n=33		women n=64	
SUPPLEMENTS	**n**	**%**	**missing**	**n**	**%**	**n**	**%**
users	**29**	**29.9**	**3**	**7**	**21.2**	**22**	**34.4**
vitamin A	12	12.4	5	2	6.1	10	15.6
thiamin	15	15.5	3	4	12.1	11	17.2
riboflavin	14	14.4	4	3	9.1	11	17.2
vitamin B6	15	15.5	4	3	9.1	12	18.8
vitamin B12	16	16.5	4	4	12.1	12	18.8
folic acid	11	11.3	4	1	3.0	10	15.6
vitamin C	18	18.6	4	5	15.2	13	20.3
vitamin D	15	15.5	5	2	6.1	13	20.3
vitamin E	15	15.5	4	4	12.1	11	17.2
calcium	17	17.5	3	4	12.1	13	20.3

VI.3 Supplement use by education

SENECA	<8yr education n=54		>8yr education n=40	
SUPPLEMENTS	**n**	**%**	**n**	**%**
users	**10**	**18.5**	**19**	**47.5**
vitamin A	5	9.3	7	17.5
thiamin	6	11.1	9	22.5
riboflavin	6	11.1	8	20.0
vitamin B6	6	11.1	9	22.5
vitamin B12	6	11.1	10	25.0
folic acid	5	9.3	6	15.0
vitamin C	7	13.0	11	27.5
vitamin D	5	9.3	10	25.0
vitamin E	5	9.3	10	25.0
calcium	4	7.4	13	32.5

Appendix VII

Supplement use in CoDAM study 1999-2000*

VII.1 **General characteristics of the population**
VII.2 **Supplement use by age and gender**
VII.3 **Number of different supplements used**
VII.4 **Average frequency of use in number of times per week among users of supplements**
VII.5 **Intake of vitamin C and E from dietary supplements**

*Data kindly provided by University Maastricht, Department of Internal Medicine and Department of Human Biology, and by RIVM Centre for Nutrition and Health,

VII.1 General characteristics of the population: CoDAM 1999/2000

	total population (N= 574)						supplement users (n = 142)					
	total		men n= 352		women n= 222		total		men n= 58		women n= 84	
	mean	sd	mean	sd	mean	sd	mean	sd	mean	sd	mean	sd
age (y)	59.6	7.0	59.5	6.9	59.8	7.0	60.0	6.8	59.9	6.5	60.1	7..0
weight (kg)	82.6	14.6	87.3	13.4	75.2	13.3	78.0	15.4	85.9	15.3	72.5	13.0
height (cm)	170.9	8.8	176.0	6.3	162.9	5.6	168.3	8.1	175.8	5.4	163.2	5.2
BMI (kg/m^2)	28.6	4.3	28.5	3.8	28.7	5.0	27.7	4.3	28.0	3.9	27.6	4.6
BMI categories	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**
<18.5 kg/m^2	2	0.3	0	0.0	2	0.9	2	1.4	0	0.0	2	2.4
18.5-25 kg/m^2	103	17.9	55	15.6	48	21.6	35	24.6	10	17.2	25	29.8
25-30 kg/m^2	292	50.9	194	55.1	98	44.1	69	48.6	33	56.9	36	42.9
> 30 kg/m^2	177	30.8	103	29.3	74	33.3	36	25.4	15	25.9	21	25.0
age categories	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**
31-50 y	69	12.0	38	10.8	31	14.0	15	10.6	5	8.6	10	11.9
51-70 y	488	85.0	304	86.4	184	82.9	124	87.3	52	89.7	72	85.7
70+ y	17	3.0	10	2.8	7	3.2	3	2.1	1	1.7	2	2.4

VII.2 Supplement use by age and gender: CoDAM

Population	total		31-50 y				51-70 y				>70 year			
	N=574		men (n=38)		women (n=31)		men (n=304)		women (n=184)		men (n=10)		women (n=7)	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%
supplement users	142	24.7	5	13.2	10	32.3	52	17.1	72	39.1	1	10.0	2	28.6
users of specific supplements														
vitamin A	5	0.9	0	0.0	0	0.0	2	0.7	3	1.6	0	0.0	0	0.0
vitamin A/D	5	0.9	0	0.0	0	0.0	3	1.0	2	1.1	0	0.0	0	0.0
vitamin B	27	4.7	0	0.0	3	9.7	8	2.6	15	8.2	0	0.0	1	14.3
vitamin C	74	12.9	3	7.9	3	9.7	29	9.5	37	20.1	1	10.0	1	14.3
vitamin E	16	2.8	2	5.3	0	0.0	8	2.6	6	3.3	0	0.0	0	0.0
multivitamin	55	9.6	4	10.5	4	12.9	18	5.9	26	14.1	1	10.0	2	28.6
calcium/vitamin D	8	1.4	0	0.0	2	6.5	2	0.7	4	2.2	0	0.0	0	0.0
calcium	9	1.6	0	0.0	2	6.5	1	0.3	5	2.7	0	0.0	1	14.3
iron	1	0.2	0	0.0	0	0.0	1	0.3	0	0.0	0	0.0	0	0.0
garlic	22	3.8	0	0.0	0	0.0	9	3.0	12	6.5	0	0.0	1	14.3
lecithin	3	0.5	0	0.0	0	0.0	1	0.3	2	1.1	0	0.0	0	0.0
other supplements	27	4.7	0	0.0	4	12.9	14	4.6	9	4.9	0	0.0	0	0.0

VII.3 Number of different supplements used

population	total		31-50 y				51-70 y				>70 year			
	N=574		men (n=38)		women (n=31)		men (n=304)		women (n=184)		men (n=10)		women (n=7)	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%
0	432	75.3	33	86.8	21	67.7	252	82.9	112	60.9	9	90.0	5	71.4
1	71	12.4	1	2.6	4	12.9	29	9.5	36	19.6	0	0.0	1	14.3
2	48	8.4	4	10.5	4	12.9	12	3.9	27	14.7	1	10.0	0	0.0
3	17	3.0	0	0.0	2	6.5	9	3.0	6	3.3	0	0.0	0	0.0
4+	6	1.0	0	0.0	0	0.0	2	0.7	3	1.6	0	0.0	1	14.3

VII.4 Average frequency of use in number of times per week among users of supplements: CoDAM

population	total	31-50 y		51-70 y		>70 y	
		men	women	men	women	men	women
N	574	38	31	304	184	10	7
vitamin A	9.2	-	-	5.5	11.7	-	-
vitamin A/D	4.9	-	-	6.0	3.2	-	-
vitamin B	8.3 *	-	7.1	7.6 *	9.0	-	7.0
vitamin C	9.9	5.7	7.0	8.5	11.1	28.0	7.0
vitamin E	8.6	7.0	-	9.4	8.2	-	-
multivitamin	6.8	7.0	4.3	7.0	7.1	7.0	7.0
calcium/vitamin D	5.0	-	7.0	2.1	5.5	-	-
calcium	9.6	-	4.0	4.0	13.4	-	7.0
iron	4.0	-	-	4.0	-	-	-
garlic	7.6	-	-	6.9	8.8	-	0.9
lecithin	8.3	-	-	4.0	10.5	-	-
other supplements	9.8	-	7.0	7.4	14.8	-	-

* frequency information of 1 person missing

VII.5 Intake of vitamin C and E from dietary supplements: CoDAM

	male users (n=58)		female users (n=84)	
	mean	sd	mean	sd
vitamin C (mg/day)	116	255	161	311
vitamin E (mg/day)	57.2	352.4	9.7	40.4

* mean contribution of supplements to total

Appendix VIII

Supplement use in Hoorn study 1999-2001*

VIII.1 **General characteristics of the population**
VIII.2 **Supplement use by age and gender**
VIII.3 **Number of different supplements used**
VIII.4 **Average frequency of use in number of times per week among users of supplements**
VIII.5 **Supplement use by education**
VIII.6 **Intake of vitamin C and E from foods, dietary supplements and both**

*Data kindly provided by EMGO Institute, Free University Amsterdam

VIII.1 General characteristics of the population: Hoorn 1999-2001

	total population (N=900)						supplement users (n=256)					
	total #		men (n=440)		women (n=443)		total $		men (n=115)		women (n=137)	
	mean	sd	mean	sd	mean	sd	mean	sd	mean	sd	mean	sd
age (y)	68.0	7.4	67.3	7.7	68.7	7.1	68.2	7.5	67.4	7.8	68.9	7.1
Age categories	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**
missing information	17	1.9	0	0.0	0	0.0	4	1.6	0	0.0	0	0.0
31-50 y	5	0.6	3	0.7	2	0.5	2	0.8	1	0.9	1	0.7
51-70 y	567	63.0	292	66.4	275	62.1	157	61.3	73	63.5	84	61.3
70+ y	311	34.6	145	33.0	166	37.5	93	36.3	41	35.7	52	38.0
Education*	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**
missing information	19	2.1	1	0.2	10	2.3	3	1.2	0	0.0	2	1.5
low	459	51.0	194	44.1	261	58.9	112	43.8	38	33.0	73	53.3
moderate	329	36.6	176	40.0	148	33.4	106	41.4	54	47.0	50	36.5
high	93	10.3	69	15.7	24	5.4	35	13.7	23	20.0	12	8.8

*

low= primary school, lower vocational education
moderate = lower general secondary education, intermediate vocational education, higher general secondary education, pre-university education
high = college for higher education, university

# total count includes 17 persons with missing sex and age
$ total count includes 4 persons with missing sex and age

VIII.2 Supplement use by age, gender: Hoorn

population	total *# (N=900)			51-70 y				70+			
			N	men (n=292)		women (n=275)		men (n=145)		women (n=166)	
	N	%	missing	N	%	N	%	N	%	N	%
supplement users	256	28.4		73	25.0	84	30.5	41	28.3	52	31.3
Users of specific supplements											
vitamin A	9	1.0	5	4	1.4	1	0.4	2	1.4	2	1.2
vitamin A/D	9	1.0	4	2	0.7	3	1.1	3	2.1	1	0.6
vitamin B	34	3.8	4	12	4.1	10	3.6	6	4.1	6	3.6
vitamin C	124	13.8	5	36	12.3	37	13.5	21	14.5	28	16.9
vitamin E	38	4.2	4	12	4.1	12	4.4	9	6.2	5	3.0
multivitamin	101	11.2	5	26	8.9	36	13.1	15	10.3	21	12.7
calcium/vitamin D	18	2.0	4	2	0.7	4	1.5	4	2.8	7	4.2
calcium	30	3.3	4	3	1.0	12	4.4	3	2.1	12	7.2
iron	7	0.8	4	2	0.7	3	1.1	1	0.7	1	0.6
garlic	62	6.9	5	20	6.8	17	6.2	10	6.9	13	7.8
lecithin	5	0.6	4	2	0.7	2	0.7	1	0.7	0	0.0
other supplements	43	4.8	4	13	4.5	22	8.0	6	4.1	2	1.2

* total count includes 5 persons aged 31-50 y, 2 of them are supplement users
# total count includes 17 persons with missing gender, 4 of them are supplement users

VIII.3 Number of different supplements used

population	total *# (N=900)		51-70 y				70+			
			men (n=292)		women (n=275)		men (n=145)		women (n=166)	
	N	%	N	%	N	%	N	%	N	%
0	644	71.6	219	75.0	191	69.5	104	71.7	114	68.7
1	125	13.9	39	13.4	37	13.5	21	14.5	24	14.5
2	81	9.0	19	6.5	31	11.3	12	8.3	17	10.2
3	25	2.8	8	2.7	7	2.5	4	2.8	6	3.6
4+	25	2.8	7	2.4	9	3.3	4	2.8	5	3.0

VIII.4 Average frequency of use in number of times per week among users of supplements: Hoorn

population	total *#	51-70 y		70+	
		men	women	men	women
N	256	73	84	41	52
vitamin A	13.2	8.8	7.0	28.0	10.5
vitamin A/D	7.3	10.5	7.0	5.7	7.0
vitamin B	11.0	10.2	9.8	17.5	8.2
vitamin C	11.4	8.2	10.1	15.9	13.8
vitamin E	8.8	6.8	7.6	13.2	8.5
multivitamin	6.9	5.7	7.3	8.7	6.9
calcium/vitamin D	8.1	7.0	7.0	8.5	9.0
calcium	9.4	11.0	9.9	10.3	8.2
iron	6.4	5.0	7.0	7.0	7.0
garlic	11.5	10.7	11.5	11.5	13.7
lecithin	11.2	10.5	14.0	7.0	0.0
other supplements	15.2	27.9	9.7	8.2	14.0

* total count includes 2 persons aged 31-50 y
# total count includes 4 persons with missing gender

VIII.5 Supplement use by education: Hoorn

population	men (n=440)						women (n=443)					
education level *	low (n=194)		moderate (n=176)		high (n=69)		low (n=261)		moderate (n=148)		high (n=24)	
	N	%	N	%	N	%	N	%	N	%	N	%
supplement users	38	19.6	54	30.7	23	33.3	73	28.0	50	33.8	12	50.0
users of specific supplements												
vitamin B	6	3.1	7	4.0	5	7.2	9	3.4	5	3.4	2	8.3
vitamin C	22	11.3	28	15.9	7	10.1	34	13.0	27	18.2	3	12.5
vitamin E	8	4.1	9	5.1	4	5.8	5	1.9	11	7.4	1	4.2
multivitamin	10	5.2	21	11.9	10	14.5	23	8.8	25	16.9	7	29.2
calcium	1	0.5	3	1.7	2	2.9	10	3.8	12	8.1	2	8.3
garlic	10	5.2	15	8.5	6	8.7	19	7.3	11	7.4	0	0.0
other supplements	5	2.6	11	6.3	3	4.3	13	5.0	9	6.1	2	8.3

total 11 missings: 1 man 10 women
users 2 missings: 2 women

*
low= primary school, lower vocational education
moderate = lower general secondary education, intermediate vocational education, higher general secondary education, pre-university education
high = college for higher education, university

VIII.6 Intake of vitamin C and E from foods, dietary supplements and both: Hoorn

	men (n=440)										women (n=443)									
	non-users (n=324)		users (n=114)								non-users (n=304)		users (n=137)							
	from food		from food		from supplements		total			% *	from food		from food		from supplements		total			% *
	mean	sd	mean	sd	mean	sd	mean	sd	p90		mean	sd	mean	sd	mean	sd	mean	sd	p90	
vit C (mg/day)	98	46	102	41	102	231	205	232	328	26	108	44	119	49	155	324	275	329	666	28
vit E (mg/day)	13.8	15.4	13.1	5.1	43.6	165.2	57.1	165.5	80.9	16	10.5	4.3	11.2	4.1	25.0	94.0	36.2	94.4	76.5	11

* mean contribution of supplements to total
missings men: 1 user, 1 non-user
missings women: 2 non-users

Appendix IX

Supplement use in Doetinchem study 1998-2003*

IX.1 General characteristics of the population
IX.2 Supplement use by age, gender
IX.3 Number of different supplements used
IX.4 Average frequency of use in number of times per week among users of supplements
IX.5 Supplement use by education
IX.6 Intake of vitamin C and E from foods, dietary supplements and both

IX.7 % supplement users 31-50 y: Doetinchem 1998-2003 by calendar year
IX.8 Number of different supplements used 31-50 y (% by calendar year)
IX.9 % supplement users 51-70 y by calendar year
IX.10 Number of different supplements used 51-70 y (% by calendar year)
IX.11 Intake of vitamin C (mg/day) by calendar year
IX.12 Intake of vitamin E (mg/day) by calendar year

*Data kindly provided by RIVM Centre for Prevention and Health Services Research

IX.1 General characteristics of the population: Doetinchem 1998-2003

Doetinchem totaal	total population (N= 4951)						supplement users (N= 1376)					
	total		Men (n= 2357)		Women (n= 2594)		total		Men (n= 471)		Women n= 905)	
	mean	sd	mean	sd	mean	sd	mean	sd	mean	sd	mean	sd
age (y)	51.4	10.3	51.9	10.1	50.9	10.4	51.5	10.7	53.0	10.6	50.8	10.7
weight (kg)	78.1	13.8	85.0	11.8	71.8	12.4	75.5	13.3	84.1	11.2	71.0	12.0
height (cm)	172.2	9.3	179.0	6.9	166.1	6.3	170.7	8.9	179.1	6.8	166.3	6.2
BMI (kg/m^2)	26.3	4.0	26.5	3.4	26.1	4.4	25.9	4.0	26.2	3.2	25.7	4.4
BMI categories	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**
<18.5 kg/m^2	43	0.9	11	0.5	32	1.2	14	1.0	2	0.4	12	1.3
18.5-25 kg/m^2	1952	39.4	775	32.9	1177	45.4	613	44.5	169	35.9	444	49.1
25-30 kg/m^2	2220	44.8	1263	53.6	957	36.9	560	40.7	247	52.4	313	34.6
> 30 kg/m^2	736	14.9	308	13.1	428	16.5	189	13.7	53	11.3	136	15.0
age categories	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**
31-50 y	2339	47.2	1055	44.8	1284	49.5	637	46.3	195	41.4	442	48.8
51-70 y	2529	51.1	1260	53.5	1269	48.9	708	51.5	264	56.1	444	49.1
70+ y	83	1.7	42	1.8	41	1.6	31	2.3	12	2.5	19	2.1
education*	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**
missing information	19	0.4	8	0.3	11	0.4	3	0.2	0	0.0	3	0.3
low	1853	37.4	870	36.9	983	37.9	431	31.3	151	32.1	280	30.9
moderate	1940	39.2	918	38.9	1022	39.4	560	40.7	196	41.6	364	40.2
high	1139	23.0	561	23.8	578	22.3	382	27.8	124	26.3	258	28.5

*
low = primary school, lower vocational education, no education/Koranic school, special primary school
moderate = lower general secondary education, intermediate vocational education, higher general secondary education, pre-university education
high = college for higher education, university

IX.2 Supplement use by age, gender: Doetinchem

population	total * (n=4951)			31-50 y				51-70 y			
				men (n=1055)		women (n=1284)		men (n=1260)		women (n=1269)	
	N	%	N missing	n	%	n	%	n	%	n	%
supplement users	1376	27.8		195	18.5	442	34.4	264	21.0	444	35.0
users of specific supplements											
vitamin A	10	0.2	56	1	0.1	3	0.2	3	0.2	3	0.2
vitamin A/D	34	0.7	56	4	0.4	6	0.5	8	0.6	15	1.2
vitamin B	176	3.6	56	12	1.1	66	5.1	27	2.1	59	4.6
vitamin C	618	12.5	56	102	9.7	196	15.3	126	10.0	181	14.3
vitamin E	120	2.4	56	21	2.0	29	2.3	26	2.1	41	3.2
multivitamin	714	14.4	57	120	11.4	267	20.8	118	9.4	197	15.5
calcium/vitamin D	66	1.3	56	3	0.3	26	2.0	4	0.3	31	2.4
calcium	89	1.8	56	3	0.3	26	2.0	8	0.6	48	3.8
iron	30	0.6	56	1	0.1	16	1.2	5	0.4	7	0.6
garlic	174	3.5	57	14	1.3	21	1.6	59	4.7	73	5.8
lecithin	38	0.8	56	3	0.3	5	0.4	13	1.0	15	1.2
other supplements	330	6.7	57	35	3.3	109	8.5	57	4.5	122	9.6

* total group includes 83 persons aged 70 and older, 31 of them are supplement users

IX.3 Number of different supplements used

population	total * (n=4951)		31-50 y				51-70 y			
			men (n=1055)		women (n=1284)		men (n=1260)		women (n=1269)	
	N	%	n	%	n	%	n	%	n	%
0	3575	72.2	860	81.5	842	65.6	996	79.0	825	65.0
1	716	14.5	110	10.4	218	17.0	144	11.4	232	18.3
2	433	8.7	56	5.3	154	12.0	79	6.3	136	10.7
3	145	2.9	23	2.2	49	3.8	25	2.0	40	3.2
4+	82	1.7	6	0.6	21	1.6	16	1.3	36	2.8

IX.4 Average frequency of use in number of times per week among users of supplements: Doetinchem

population	total *	31-50 y		51-70 y	
		men	women	men	women
N	1376	195	442	264	444
vitamin A	5.5	7.0	5.3	5.9	4.7
vitamin A/D	8.1	5.8	11.3	5.5	8.8
vitamin B	7.8	10.1	6.8	7.2	8.4
vitamin C	8.5	6.5	7.7	9.9	9.5
vitamin E	6.8	6.3	7.8	5.9	7.0
multivitamin	6.1	5.4	6.1	6.2	6.3
calcium/vitamin D	11.2	7.0	15.2	9.7	8.7
calcium	10.3	12.5	10.5	10.2	10.3
iron	7.4	2.0	7.7	4.8	7.7
garlic	11.2	7.0	11.5	12.8	10.4
lecithin	9.5	2.7	10.8	13.2	7.1
other supplements	11.7	16.8	11.2	10.5	11.4

* total group includes 31 persons aged 70 and older

IX.5 Supplement use by education: Doetinchem

gender	men						women					
education level *	low (n=870)		moderate (n=918)		high (n=561)		low (n=983)		moderate (n=1022)		high (n=578)	
	N	%	N	%	N	%	N	%	N	%	N	%
supplement users	151	17.4	196	21.4	124	22.1	280	28.5	364	35.6	258	44.6
users of specific supplements												
vitamin A/D	5	0.6	6	0.7	2	0.4	7	0.7	7	0.7	7	1.2
vitamin B	13	1.5	23	2.5	7	1.2	39	4.0	45	4.4	49	8.5
vitamin C	80	9.2	96	10.5	59	10.5	106	10.8	150	14.7	126	21.8
vitamin E	18	2.1	20	2.2	11	2.0	19	1.9	23	2.3	29	5.0
multivitamin	61	7.0	116	12.6	65	11.6	127	12.9	191	18.7	153	26.5
calcium/vitamin D	1	0.1	5	0.5	1	0.2	13	1.3	31	3.0	15	2.6
calcium	3	0.3	6	0.7	2	0.4	20	2.0	36	3.5	22	3.8
iron	0	0.0	4	0.4	2	0.4	7	0.7	12	1.2	5	0.9
garlic	35	4.0	24	2.6	16	2.9	45	4.6	40	3.9	14	2.4
lecithin	4	0.5	7	0.8	5	0.9	7	0.7	10	1.0	5	0.9
other supplements	34	3.9	30	3.3	32	5.7	69	7.0	100	9.8	64	11.1

total 19 missings: 8 men 11 women
users: 3 missings: 3 women

*
low = primary school, lower vocational education, no education/Koranic school, special primary school
moderate = lower general secondary education, intermediate vocational education, higher general secondary education, pre-university education
high = college for higher education, university

IX.6 Intake of vitamin C and E from foods, dietary supplements and both: Doetinchem

	men (n= 2357)										women (n= 2594)									
	non-users (n=1886)		users (n=471)								non-users (n=1689)		users (n=905)							
	from food		from food		from supplements		total			% *	from food		from food		from supplements		total			% *
	mean	Sd	mean	sd	mean	sd	mean	sd	p90		mean	sd	mean	sd	mean	sd	mean	sd	p90	
vit C (mg/day)	99	40	106	46	96	329	202	331	287	22	115	45	116	45	114	318	230	324	402	20
vit E (mg/day)	13.9	5.0	14.6	5.8	7.4	35.1	22.0	35.5	30.9	7	12.0	4.3	12.0	3.8	8.9	56.5	20.9	56.5	20.5	6

* mean contribution of supplements to total

IX.7 % supplement users 31-50 y: Doetinchem 1998-2003 (by calendar year)

	men						women					
	1998	1999	2000	2001	2002	2003	1998	1999	2000	2001	2002	2003
n	183	235	196	351	151	101	203	249	250	439	190	141
	%	%	%	%	%	%	%	%	%	%	%	%
supplement users	18.0	20.0	14.8	19.4	19.9	16.8	25.1	39.4	30.8	36.7	30.0	34.0
users of specific supplements												
vitamin A	0.5	0.0	0.0	0.0	0.7	0.0	0.0	0.4	0.8	0.0	0.0	0.0
vitamin A/D	0.5	0.4	0.0	0.3	1.3	0.0	0.5	0.4	0.4	0.5	0.5	0.7
vitamin B	2.2	2.1	0.5	0.9	0.7	2.0	3.4	6.8	4.8	5.5	4.2	3.5
vitamin C	10.9	11.5	7.7	8.8	11.9	8.9	10.8	16.9	12.8	15.7	16.8	14.2
vitamin E	4.9	1.7	1.5	1.1	4.0	3.0	0.0	2.8	0.8	2.5	2.6	2.8
multivitamin	10.9	11.9	9.7	12.5	9.9	10.9	11.8	21.3	18.8	23.2	15.8	24.8
calcium/vitamin D	0.5	0.4	0.0	0.0	0.7	1.0	3.0	2.8	1.6	2.1	1.1	2.8
calcium	1.6	0.0	0.5	0.3	0.7	0.0	1.5	1.2	2.8	1.4	3.7	2.1
iron	0.0	0.0	0.0	0.3	0.0	0.0	1.5	3.2	1.2	1.1	0.0	0.0
garlic	1.1	3.8	1.0	0.3	1.3	0.0	1.0	2.8	0.8	1.8	1.6	0.7
lecithin	0.0	0.4	0.5	0.3	0.0	0.0	0.5	0.4	0.0	0.5	1.1	0.0
other supplements	4.4	2.6	3.6	2.0	4.0	7.9	4.4	12.0	8.4	7.5	8.4	6.4

IX.8 Number of different supplements used 31-50 y: Doetinchem 1998-2003 (% by calendar year)

	men						women					
	1998	1999	2000	2001	2002	2003	1998	1999	2000	2001	2002	2003
	%	%	%	%	%	%	%	%	%	%	%	%
0	82.0	80.0	85.2	80.6	80.1	83.2	74.9	60.6	69.2	63.1	70.0	66.0
1	7.7	10.2	7.1	14.0	9.9	5.9	16.3	17.3	16.8	19.1	11.6	18.4
2	4.9	6.0	5.6	4.6	5.3	5.9	5.9	15.3	8.8	12.5	12.6	10.6
3	3.8	3.4	1.5	0.3	4.0	4.0	2.5	5.2	4.0	3.0	4.7	2.8
4+	1.6	0.4	0.5	0.6	0.7	1.0	0.5	1.6	1.2	2.1	1.1	2.1

IX.9 % supplement users 51-70 y: Doetinchem 1998-2003 (by calendar year)

	men						women					
	1998	1999	2000	2001	2002	2003	1998	1999	2000	2001	2002	2003
n	239	303	294	211	179	220	268	282	288	198	198	257
	%	%	%	%	%	%	%	%	%	%	%	%
supplement users	22.2	20.8	21.1	18.0	20.1	23.6	31.7	37.9	30.6	36.4	37.4	33.9
users of specific supplements												
vitamin A	0.0	0.0	0.3	0.0	0.0	0.9	0.0	0.4	0.0	0.5	0.0	0.4
vitamin A/D	0.4	1.0	0.3	0.5	0.6	0.5	2.2	1.1	1.4	1.5	0.5	0.4
vitamin B	1.3	1.7	1.7	2.4	1.7	3.6	6.7	5.7	3.5	5.6	4.5	4.7
vitamin C	10.5	8.9	9.9	9.5	11.7	9.5	12.7	14.9	12.2	16.7	14.6	13.6
vitamin E	0.8	1.7	1.4	1.4	4.5	2.7	3.4	2.8	3.1	5.6	2.5	2.7
multivitamin	7.5	9.2	9.2	7.1	9.5	12.7	12.3	16.0	12.8	15.7	15.7	19.1
calcium/vitamin D	1.7	0.0	0.3	0.0	0.0	0.9	3.4	2.8	3.1	3.5	1.0	1.2
calcium	0.8	0.0	0.0	0.5	0.6	2.7	5.2	5.3	3.5	4.0	2.5	3.1
iron	0.0	0.0	0.3	0.0	0.6	1.4	1.1	0.4	1.0	0.5	0.5	0.0
garlic	4.6	5.3	6.8	2.8	3.4	3.6	8.6	7.4	5.9	4.0	5.1	5.1
lecithin	0.4	0.7	2.0	0.5	0.6	1.4	1.5	1.8	0.3	1.0	0.5	1.9
other supplements	5.9	3.0	3.4	3.8	5.0	7.7	6.3	10.6	8.3	10.1	9.6	10.

IX.10 Number of different supplements used 51-70 y: Doetinchem 1998-2003 (% by calendar year)

Number of supplements	men						women					
	1998	1999	2000	2001	2002	2003	1998	1999	2000	2001	2002	2003
	%	%	%	%	%	%	%	%	%	%	%	%
0	77.8	79.2	78.9	82.0	79.9	76.4	68.3	62.1	69.4	63.6	62.6	66.1
1	13.4	13.5	11.6	10.0	8.4	11.8	15.7	18.4	16.0	19.7	21.7	17.1
2	6.7	4.3	6.8	6.6	7.3	6.4	7.8	12.4	9.0	8.6	12.1	11.3
3	1.3	2.6	1.4	0.5	3.4	2.7	3.7	4.3	3.1	2.5	3.0	1.9
4+	0.8	0.3	1.4	0.9	1.1	2.7	4.5	2.8	2.4	5.6	0.5	3.5

IX.11 Intake of vitamin C (mg/day) Doetinchem 1998-2003 (by calendar year)

	men									women								
	non-users		users							non-users		users						
	from food		from food		from supplements		total		% *	from food		from food		from supplements		total		% *
year	mean	sd	mean	sd	mean	sd	mean	sd		mean	sd	mean	sd	mean	sd	mean	sd	
1998	101	43	105	44	98	227	203	241	23	116	47	120	47	89	229	209	234	19
1999	98	40	96	38	58	131	154	136	21	118	47	115	50	114	290	229	301	20
2000	102	41	109	41	86	213	195	218	22	114	43	116	43	86	232	201	234	20
2001	101	42	107	49	108	350	215	352	21	117	47	113	45	123	393	236	399	20
2002	95	38	108	42	111	613	219	609	20	113	46	117	41	156	399	273	402	24
2003	95	38	112	58	130	284	243	292	25	117	44	124	45	100	235	224	241	20

* mean contribution of supplements to total

IX.12 Intake of vitamin E (mg/day) Doetinchem 1998-2003 (by calendar year)

	men									women								
	non-users		users							non-users		users						
	from food		from food		from supplements		total		% *	from food		from food		from supplements		total		% *
year	mean	sd	mean	sd	mean	sd	mean	sd		mean	sd	mean	sd	mean	sd	mean	sd	
1998	14.7	5.2	14.2	5.5	9.9	34.0	24.0	34.4	9	12.1	4.0	12.3	4.1	4.4	23.1	16.7	23.9	5
1999	14.0	5.4	14.1	5.4	6.8	37.7	20.9	38.6	6	11.6	4.2	11.7	3.7	6.6	30.1	18.3	30.3	6
2000	13.8	4.8	14.5	5.6	10.6	52.9	25.2	53.0	6	11.7	3.9	12.1	3.9	3.7	17.0	15.8	17.9	5
2001	13.9	5.0	14.8	6.2	2.3	10.7	17.2	12.0	4	12.0	4.5	12.4	3.8	15.6	96.6	28.0	96.5	8
2002	14.1	5.1	14.1	6.2	8.6	24.7	22.7	25.8	12	12.4	4.5	11.7	3.9	8.3	40.6	20.0	40.2	6
2003	13.8	4.7	15.6	5.6	10.2	35.0	25.7	34.6	11	12.1	3.9	12.5	3.8	8.8	41.0	21.2	41.1	6

* mean contribution of supplements to total

Appendix X

Supplement use in Hartslag study 2003*

X.1 General characteristics of the population
X.2 Supplement use by age, gender
X.3 Number of different supplements used
X.4 Average frequency of use in number of times per week among users of supplements
X.5 Supplement use by education
X.6 Intake of vitamin C and E from foods, dietary supplements and both

*Data kindly provided by RIVM Centre for Prevention and Health Services Research

X.1 General characteristics of the population: Hartslag 2003

	total population (N= 2414)						supplement users (N= 765)					
	total		Men (n=1207)		Women (n= 1207)		total		Men (n= 308)		Women (n= 457)	
	mean	sd	mean	sd	mean	sd	mean	sd	mean	sd	mean	sd
age (y)	55.0	10.3	55.2	10.2	54.8	10.3	54.2	10.5	54.4	10.5	54.1	10.6
weight (kg)	76.4	14.0	83.2	12.8	69.5	11.6	73.8	13.1	81.7	11.7	68.4	11.2
height (cm)	170.4	9.2	176.7	7.0	164.0	6.2	169.7	8.9	177.0	7.0	164.7	6.2
BMI (kg/m^2)	26.2	3.9	26.6	3.5	25.8	4.3	25.6	3.7	26.0	3.2	25.3	4.0
BMI categories	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**
<18.5 kg/m^2	20	0.8	4	0.3	16	1.3	9	1.2	1	0.3	8	1.8
18.5-25 kg/m^2	960	39.8	400	33.1	560	46.4	360	47.1	123	39.9	237	51.9
25-30 kg/m^2	1067	44.2	610	50.5	457	37.9	308	40.3	151	49.0	157	34.4
> 30 kg/m^2	367	15.2	193	16.0	174	14.4	88	11.5	33	10.7	55	12.0
age categories	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**
19-30 y	10	0.4	4	0.3	6	0.5	3	0.4	1	0.3	2	0.4
31-50 y	834	34.6	415	34.4	419	34.7	290	37.9	117	38.0	173	37.9
51-70 y	1436	59.5	720	59.7	716	59.3	439	57.4	176	57.1	263	57.6
70+ y	134	5.6	68	5.6	66	5.5	33	4.3	14	4.6	19	4.2
Education *	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**
missing information	14	0.6	6	0.5	8	0.7	2	0.3	1	0.3	1	0.2
low	797	33.0	367	30.4	430	35.6	217	28.4	69	22.4	148	32.4
moderate	997	41.3	473	39.2	524	43.4	336	43.9	131	42.5	205	44.9
high	606	25.1	361	29.9	245	20.3	210	27.5	107	34.7	103	22.5

*

low= primary school, lower vocational education

moderate= lower and highergeneral secondary education, intermediate vocational education, grammar school, pre-university education (up to 3 years or finished)

high= college for higher education, university (up to BA or finished)

X.2 Supplement use by age and gender: Hartslag

population	total (N=2414)			31-50 y				51-70 y				>70 year			
				men (n=415)		women (n=419)		men (n=720)		women (n=716)		men (n=68)		women (n=66)	
	N	%	N missing	N	%	N	%	N	%	N	%	N	%	N	%
supplement users	765	31.7		117	28.2	173	41.3	176	24.4	263	37	14	20.6	19	28.8
users of specific supplements															
vitamin A	15	0.6	45	5	1.2	0	0.0	5	0.7	5	1	0	0.0	0	0.0
vitamin A/D	20	0.8	45	3	0.7	2	0.5	6	0.8	8	1	0	0.0	1	1.5
vitamin B	109	4.5	48	18	4.3	20	4.8	24	3.3	41	6	0	0.0	6	9.1
vitamin C	374	15.5	47	62	14.9	77	18.4	109	15.1	106	15	9	13.2	10	15.2
vitamin E	95	3.9	45	15	3.6	13	3.1	34	4.7	27	4	2	2.9	4	6.1
multivitamin	435	18.0	48	74	17.8	113	27.0	85	11.8	145	20	9	13.2	7	10.6
calcium/vitamin D	46	1.9	45	7	1.7	8	1.9	10	1.4	21	3	0	0.0	0	0.0
calcium	64	2.7	45	5	1.2	15	3.6	5	0.7	36	5	1	1.5	2	3.0
iron	16	0.7	46	6	1.4	5	1.2	2	0.3	3	0	0	0.0	0	0.0
garlic	63	2.6	45	8	1.9	3	0.7	19	2.6	30	4	2	2.9	1	1.5
lecithin	16	0.7	45	3	0.7	0	0.0	8	1.1	4	1	1	1.5	0	0.0
other supplements	162	6.7	47	21	5.1	37	8.8	47	6.5	48	7	6	8.8	3	4.5

NB total group also contains 10 persons aged 30 years or younger: 3 of them are supplement users

X.3 Number of different supplements used

Population	total (N=2414)		31-50 y				51-70 y				>70 year			
			men (n=415)		women (n=419)		men (n=720)		women (n=716)		men (n=68)		women (n=66)	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%
0	1649	68.3	298	71.8	246	58.7	544	75.6	453	63	54	79.4	47	71.2
1	381	15.8	60	14.5	88	21.0	83	11.5	134	19	3	4.4	10	15.2
2	227	9.4	33	8.0	58	13.8	51	7.1	74	10	7	10.3	4	6.1
3	102	4.2	16	3.9	21	5.0	18	2.5	40	6	3	4.4	4	6.1
4+	55	2.3	8	1.9	6	1.4	24	3.3	15	2	1	1.5	1	1.5

X.4 Average frequency of use in number of times per week among users of supplements: Hartslag

population	total *	31-50 y		51-70 y		>70 y	
		men	women	men	women	men	women
N	765	117	173	176	263	14	19
vitamin A	15.4	3.9	-	8.6	33.6	-	-
vitamin A/D	8.5	6.0	7.0	10.2	8.8	-	7.0
vitamin B	7.2	5.1	10.3	6.3	7.2	-	7.3
vitamin C	8.1	7.0	7.6	9.0	8.0	11.4	8.8
vitamin E	7.4	7.1	6.4	7.9	7.2	5.3	8.8
multivitamin	6.1	5.1	5.7	6.9	6.2	7.2	8.0
calcium/vitamin D	7.3	4.3	8.0	9.0	7.1	-	-
calcium	8.3	5.3	6.4	9.0	9.2	21.0	7.0
iron	5.1	4.5	2.5	7.0	9.3	-	-
garlic	9.6	7.7	6.0	9.9	9.4	24.5	7.0
lecithin	6.1	4.3	-	7.0	5.5	7.0	-
other supplements	10.1	18.0	8.5	8.9	9.9	5.9	7.0

* total group also contains 3 persons aged 30 years or younger

X.5 Supplement use by education: Hartslag

population	men						women					
education level *	low (n=367)		moderate (n=473)		high (n=361)		low (n=430)		moderate (n=524)		high (n=245)	
	N	%	N	%	N	%	N	%	N	%	N	%
supplement users	69	18.8	131	27.7	107	29.6	148	34.4	205	39.1	103	42.0
users of specific supplements												
vitamin A/D	2	0.5	3	0.6	4	1.1	6	1.4	4	0.8	1	0.4
vitamin B	6	1.6	19	4.0	16	4.4	24	5.6	29	5.5	13	5.3
vitamin C	35	9.5	86	18.2	58	16.1	65	15.1	89	17.0	40	16.3
vitamin E	14	3.8	28	5.9	9	2.5	18	4.2	16	3.1	10	4.1
multivitamin	37	10.1	71	15.0	61	16.9	69	16.0	129	24.6	68	27.8
calcium/vitamin D	5	1.4	7	1.5	5	1.4	11	2.6	14	2.7	4	1.6
calcium	3	0.8	5	1.1	3	0.8	15	3.5	22	4.2	15	6.1
garlic	11	3.0	14	3.0	4	1.1	20	4.7	10	1.9	4	1.6
other supplements	21	5.7	32	6.8	21	5.8	25	5.8	42	8.0	21	8.6

total 14 missings: 6 men 8 women
users: 2 missings 1 man 1 woman

*
low= primary school, lower vocational education
moderate= lower and higher general secondary education, intermediate vocational education, grammar school, pre-university education (up to 3 years or finished)
high= college for higher education, university (up to BA or finished)

X.6 Intake of vitamin C and E from foods, dietary supplements and both: Hartslag 2003

	men (n=1207)										women (n=1207)									
	non-users (n=899)		users (n=308)								non-users (n=750)		users (n=457)							
	from food		from food		from supplements		total			% *	from food		from food		from supplements		total			% *
	mean	sd	mean	sd	mean	sd	mean	sd	p90		mean	sd	mean	sd	mean	sd	mean	sd	p90	
vit C (mg/day)	93	42	100	46	132	302	226	290	428	28	108	44	112	43	135	402	249	407	545	21
vit E (mg/day)	13.9	5.2	14.0	4.9	17.5	58.0	30.4	54.7	75.5	13	11.6	4.1	12.2	3.9	10.2	40.9	22.5	41.4	23.7	8

* mean contribution of supplements to total

Appendix XI

Recommended Dietary Allowances or adequate intake for micronutrients

XI.1 adults

XI.2 children

XI.1 ***RECOMMENDED DIETARY ALLOWANCES OR ADEQUATE INTAKE* adults***

	unit	(ref)	19-50 y men	19-21 y men	19-21 y women	22-49 y men	22-49 y women	19-50 y women	51-70 y men	50-64 y men	50-64 y women	51-70 y women	>65 y men	>65 y women	> 70 y men	> 70 y women	pregnant women	lactating women
		1,2																
		3															pregnant women	lactating women
Vitamin A	RE	3		1000	800	1000	800			1000	800		1000	800			1000	1250
Vitamin B1	mg	1	1.1					1.1	1.1*			1.1*			1.1*		1.4	1.7
Vitamin B2	mg	1	1.5					1.1	1.5			1.1			1.5	1.1	1.4	1.7
Niacin	mg	1	17					13	17			13			17	13	17*	20*
acceptable max		1	35					35	35			35			35	35	35	35
Pantothenic acid	mg	1	5*					5*	5*			5*			5*		5*	7*
Vitamin B6	mg	2	1.5					1.5	1.8			1.5			1.8	1.5	1.9	1.9
acceptable max		2	25					25	25			25			25	25	25	25
Biotin	mcg	1	?					?	?			?			?		?	?
Folate	mcg	2	300					300	300			300			300		400*	400*
acceptable max		2	1000					1000	1000			1000			1000		1000	1000
Vitamin B12	mcg	2	2.8					2.8	2.8			2.8			2.8		3.2	3.8
Vitamin C	mg	3		70	70	70	70			70	70		70	70			90	110
Vitamin D; no sunlight	mcg	1	5*					5*	10*			10*			15*		10*	10*
Vitamin D; min 15 min sunlight	mcg	1	2.5*					2.5*	5* (51-60y) 7.5* (61-70y)			5* (51-60y) 7.5* (61-70y)			12.5*		7.5*	7.5*
acceptable max		1	50					50				50			50		50	50
Vitamin E	alfa-TE	3		8.7	6.7	8.1	6.0			7.4	6.0		6.0	5.4			6.7	8.1
Calcium	mg	1	1000*					1000*	1100*			1100*			1200*	1200*	1000*	1000*
acceptable max		1	2500					2500	2500			2500			2500	2500	2500	2500
Phosphorus	mg	3		700-1400	700-1400	700-1400	700-1400			700-1150	700-1150		700-1150	700-1150			800-1600	900-1800
Iron	mg	3		11	16	9	15			9	8		9	8			11/15/19 (p 3 m)	20 (> 3 m 16)
Magnesium	mg	3		300-350	250-300	300-350	250-300			300-350	250-300		300-350	250-300			300-400	300-400
Copper	mg	3		1.5-3.5	1.5-3.5	1.5-3.5	1.5-3.5			1.5-3.5	1.5-3.5		1.5-3.5	1.5-3.5			2.0-3.5	2.0-3.5
Selenium	mcg	3		50-150	50-150	50-150	50-150			50-150	50-150		50-150	50-150			75-150	75-150

(1) Gezondheidsraad. Voedingsnormen calcium, vitamine D, thiamine, riboflavine, niacine, pantotheenzuur en biotine. Rapportnr 2000/12, Den Haag 2000.

(2) Gezondheidsraad. Voedingsnormen vitamine B6, foliumzuur en vitamine B12. Rapportnr 2003/04, Den Haag 2003.

(3) Voedingsraad. Nederlandse voedingsnormen 1989. Voorlichtingsbureau voor de Voeding, Den Haag 1989 (2e druk in 1992)

XI.2 *RECOMMENDED DIETARY ALLOWANCES OR ADEQUATE INTAKE* children*

	unit	(ref)	*0-5 m*	*6-11 m*	*1-3 y*	*4-8 y*		*9-13 y*		*14-18 y*					*14-18 y*
		3	*0-5 m*	*6-11 m*	*1-3 y*	*4-6 y*	*7-9 y*	*10-12 y*			*13-15 y*		*16-18 y*		
								men	*women*	*men*	*men*	*women*	*men*	*women*	*women*
Vitamin A	RE	3	450	400	400	500	700	1000	800		1000	800	1000	800	
Vitamin B1	mg	1	0.2*	0.2*	0.3*	0.5*		0.8*		1.1*					1.1*
Vitamin B2	mg	1	0.4*	0.4*	0.5*	0.7*		1.0*		1.5*					1.1*
Niacin	mg	1	2*	2*	4*	7*	7*	11*	11*	17*					13*
acceptable max		1			35	35	35	35	35	35					35
Pantothenic acid	mg	1	2*	2*	2*	3*		4*		5*					5*
Vitamin B6	mg	2	0.12*[#] 0.20*[$]	0.2*	0.4*	0.7*		1.1*		1.5*					1.5*
acceptable max		2	2	3	5	8.5		15		23					23
Biotin	mcg	1	4*	?	?	?		?		?					?
Folate	mcg	2	50*	60*	85*	150*		225*		300*					300*
acceptable max		2	85	130	200	350		600		900					900
Vitamin B12	mcg	2	0.4*	0.5*	0.7*	1.3*		2.0*		2.8*					2.8*
Vitamin C	mg	3	35	35	40	45	50	55	55		65	65	70	65	
Vitamin D; no sunlight	mcg	1	10*	10*	10*	5*		5*		5*					5*
Vitamin D; min 15 min sunlight	mcg	1	5*	5*	5*	2.5*		2.5*		2.5*					2.5*
acceptable max		1	25	25	50	50		50		50					50
Vitamin E	alfa-TE	3	2.0[$]	2.7	4.0	5.4	6.0	6.7	6.0		8.1	7.4	8.7	7.4	
Calcium	mg	1	210*	450*	500*	700*		1200*	1100*	1200*		1100*			
acceptable max		1	1500	1500	2500	2500		2500	2500	2500		2500			
Phosphorus	mg	3	35-50[$]	400	400-800	400-800	600-1200	900-1800	700-1400		900-1800	700-1400	800-1600	500-1000	
Iron	mg	3	4mg/kg[$]	5	5	7	8	10	11		15	12	15	15	
Magnesium	mg	3	35-60	35-60	65-75	90-100	125-150	170-200	170-200		225-275	225-275	300-350	250-300	
Copper	mg	3	0.3-0.5	0.3-0.5	0.3-0.7	0.5-1.0	0.6-1.4	1.0-2.5	1.0-2.5		1.5-3.0	1.5-3.0	1.5-3.5	1.5-3.5	
Selenium	mcg	3	10-20	10-20	10-30	15-45	20-60	30-80	30-85		40-110	40-110	45-140	45-140	

[#] recommended or adequate intake* for breast fed children

[$] recommended or adequate intake* for bottle fed children

(1) Gezondheidsraad. Voedingsnormen calcium, vitamine D, thiamine, riboflavine, niacine, pantotheenzuur en biotine. Rapportnr 2000/12, Den Haag 2000.

(2) Gezondheidsraad. Voedingsnormen vitamine B6, foliumzuur en vitamine B12. Rapportnr 2003/04, Den Haag 2003.

(3) Voedingsraad. Nederlandse voedingsnormen 1989. Voorlichtingsbureau voor de Voeding, Den Haag 1989 (2e druk in 1992)