Dietary intake of the water-soluble vitamins B1, B2, B6, B12 and C in 10 countries in the European Prospective Investigation into Cancer and Nutrition

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Objectives: To describe the intake of vitamins thiamine (B1), riboflavin (B2), B6 (pyridoxine), B12 (cobalamine) and C (ascorbic acid) and their food sources among 27 centres in 10 countries participating in the European Prospective Investigation into Cancer and Nutrition (EPIC) study.
Methods: Between 1995 and 2000, 36 034 persons aged between 35 and 74 years were administered a standardized 24-h dietary recall using a computerized interview software programme (EPIC-SOFT). Intakes of the four B vitamins and vitamin C were estimated using the standardized EPIC Nutrient Database (ENDB). Mean intakes were adjusted for age and weighted by season and day of recall.

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Contributors: AO conducted the statistical analysis, prepared tables and wrote the paper, taking into account comments from all co-authors. NS was the overall coordinator of this project and of the EPIC Nutrient Database (ENDB) project. JH, CG, BB, HV, MJ, MB and UE were members of the writing group and gave input on the statistical analysis, drafting of the article and interpretation of results. The other co-authors were local EPIC collaborators who participated in the collection of dietary and other data and in the ENDB project. ER is the overall coordinator of the EPIC study.

Results: Intake of B vitamins did not vary considerably between centres, except in the UK health-conscious cohort, in which substantially higher intakes of thiamine and lower intakes of vitamin B12 were reported compared with other centres. Overall, meat was the most important contributor to the B vitamins in all centres except in the UK health-conscious group. Vitamin C showed a clear geographical gradient, with higher intakes in the southern centres as compared with the northern ones; this was more pronounced in men than in women. Vegetables and fruits were major contributors to vitamin C in all centres, but juices and potatoes were also important sources in the northern centres.
Conclusions: This study showed no major differences across centres in the mean intakes of B vitamins (thiamine, riboflavin, B6, B12), whereas a tendency towards a north–south gradient was observed for vitamin C.

Introduction

The B vitamins, together with vitamin C, constitute the water-soluble group of vitamins. Classic syndromes caused by a deficiency of water-soluble vitamins, such as scurvy (vitamin C) and beriberi (thiamine), are very rare in Western societies, but there is much discussion with regard to whether suboptimal intakes of these vitamins are associated with risk of major chronic diseases such as cancer and heart disease (Huang *et al.*, 2006a; Spinneker *et al.*, 2007). Water-soluble vitamins have generally not been shown to have toxic effects at doses obtainable from diet (www.efsa.europa.eu), and research has therefore focused almost exclusively on the consequences of suboptimal intakes.

Although optimal intakes of water-soluble vitamins have not been established with regard to prevention of chronic diseases, their dietary sources are major issues when it comes to dietary recommendations. Two of the most important sources of water-soluble vitamins—cereals (thiamine, riboflavin, folate and vitamin B6) and fruits/vegetables (thiamine, riboflavin, folate, vitamin B6 and vitamin C)—are the only food groups for which the population is directly recommended to increase intake according to a recent report from WCRF/AICR (2007). The same report recommends a decrease in intake of meat and especially processed meat products that are the most important sources of vitamin B12 and also contain considerable amounts of the other B vitamins (thiamine, riboflavin, niacin, vitamin B6). Although water-soluble vitamins most likely carry some of the beneficial effects of cereals, fruits and vegetables, the potential harmful effects of meat and meat products are probably related to substances other than B vitamins (such as *N*-nitroso compounds, iron and heterocyclic amines) (WCRF/AIRC, 2007).

The European Prospective Investigation into Cancer and Nutrition (EPIC) study is a collaborative study based on 10 European countries (Riboli *et al.*, 2002). With large variations in dietary patterns (Slimani *et al.*, 2002b; Wirfalt *et al.*, 2002) and a considerable sample size, the cohort is very suitable for evaluations of associations between diet and cancer. The EPIC calibration study used a computer-assisted 24-h dietary recall method (EPIC-SOFT) to collect standardized measurements from 36 994 randomly selected EPIC participants. Recently, the EPIC Nutrient Database has harmonized national nutrient databases, making it possible to compare nutrient intake between the 10 participating countries (Slimani *et al.*, 2007).

The purpose of this paper is to describe the intake of water-soluble vitamins in the EPIC calibration study on the basis of the new nutrient database. Intakes are described across centres, age groups and lifestyle parameters—education, smoking status and body mass index (BMI)—and the most important dietary sources of water-soluble vitamins are presented. This paper is restricted to intakes of thiamine, riboflavin, vitamin B6 and vitamin B12, together with vitamin C. Intakes of the remaining B vitamins (niacin, pantothenic acid, biotin and folate) have not been estimated because of little current research interest, missing data in several national food composition tables or because standardization of sufficient quality could not be carried out easily.

Materials and methods

Study cohort

EPIC is an ongoing prospective cohort study designed to investigate the associations between diet, lifestyle and cancer throughout 10 Western European countries: Denmark, France, Germany, Greece, Italy, Norway, Spain, Sweden, the Netherlands and the United Kingdom (Riboli *et al.*, 2002; Riboli and Kaaks, 1997). The cohort includes approximately 370 000 women and 150 000 men aged 20–85 years, who were enrolled between 1992 and 2000. Participants were mostly recruited from the general population residing within defined geographical areas, with some exceptions: women members of a health insurance scheme for state school employees (France); women attending breast cancer screening (Utrecht, the Netherlands; Florence, Italy); blood donors (centres in Italy and Spain) and a cohort consisting predominantly of vegetarians (the 'health-conscious' cohort in Oxford, UK) (Riboli *et al.*, 2002). Nineteen of the 27 EPIC centres had participants of both sexes, and eight centres recruited only women. These 27 centres were redefined from the 23 original EPIC centres for specific purposes of EPIC dietary analyses.

Data presented in this paper were derived from the EPIC calibration study, in which an 8% stratified random sample (36 994 participants) of the total cohort was administered a

standardized, computer-assisted 24-h dietary recall (24-HDR). This random sample has been shown to be a reasonably representative sample of the entire EPIC cohort (Slimani *et al.*, 2002a). A total of 36 034 subjects with 24-HDR data were included in this analysis after a systematic exclusion of 960 subjects under 35 or over 74 years of age because of low participation in these age categories. Approval for the study was obtained from the ethical review boards of the International Agency for Research on Cancer (Lyon, France) and from all local recruiting institutes. All participants provided written informed consent.

Measurements of diet and other lifestyle factors

In addition to information on usual diet collected from all EPIC participants at recruitment using country-specific, validated dietary assessment instruments (Margetts and Pietinen, 1997; Riboli *et al.*, 2002), participants in the calibration study also completed a second dietary measurement in the form of a 24-HDR. The calibration study was designed to improve the comparability of dietary data across centres and to partially correct for dietary measurement error arising from centre-specific bias and random and systematic within-person errors (Ferrari *et al.*, 2004; Willett, 1998). Previous publications outline in detail the rationale, methodology and population characteristics of the 24-HDR calibration study (Kaaks *et al.*, 1994, 1995; Slimani *et al.*, 2002a). The 24-HDR was obtained by face-to-face interview, except in Norway where a telephone interview was conducted (Brustad *et al.*, 2003). A standardized, computerized interview software programme (EPIC-SOFT) was developed for the calibration study (Slimani *et al.*, 1999, 2000).

Intakes of water-soluble vitamins were estimated from the 24-HDRs using country-specific food composition tables, which were standardized across countries to allow calibration at the nutrient level. The EPIC Nutrient Database project outlines in detail the methods used to standardize national nutrient databases across the 10 countries for each selected nutrient; EPIC foods were matched to national databases, the nutrient values of unavailable foods were derived and missing values were imputed (Slimani *et al.*, 2007). This paper covers only water-soluble vitamins from dietary sources; consumption of supplements is described elsewhere (Skeie *et al.*, 2009, in this supplement).

Data on other lifestyle factors, including education level, total physical activity and smoking history, considered in this analysis were collected at baseline through standardized questionnaires and clinical examinations, and have been described elsewhere (Friedenreich *et al.*, 2007; Haftenberger *et al.*, 2002a, b; Riboli *et al.*, 2002, Slimani *et al.*, 2002a). Data on age, as well as on body weight and height, were self-reported by participants during the 24-HDR interview. The mean time interval between these baseline questionnaire measures and the 24-HDR interview varied by country, from 1 day to 3 years later (Slimani *et al.*, 2002a).

Statistical methods

Data are presented as mean (least square means) intakes and standard error (s.e.), stratified by gender, study centre and age group, and ordered according to a geographical south–north gradient. Intakes of vitamin B1 (thiamine), vitamin B2 (riboflavin), vitamin B6, vitamin B12 and vitamin C are also presented according to their main food group sources. Intakes were minimally adjusted for age and were weighted by season and day of the week of recall using generalized linear models to control for different sampling procedures of the 24-HDR interviews across seasons and days of the week.

We examined the independent effect of adjustment for several potential confounders—including height, weight, total energy intake, BMI, smoking status, educational level and physical activity—on centre ranking and on the R^2 of the model as an estimation of the variability of a vitamin mean intake that can be explained by the potential confounder. In 'fully adjusted' models, mean intakes were further adjusted for total energy intake, weight and height (tables with results from 'fully adjusted' models are presented in the Appendix).

We also performed stratified analyses to describe differences in intakes of water-soluble vitamins according to smoking status (never, former, current), BMI category (<25, $25-<30$, $30+$ kg/m^2) and education level (primary school, secondary/technical school, university). These three indicators of lifestyle were selected *a priori* as they are considered the most important for describing variations in water-soluble vitamin intakes between population groups and adjusting for potential confounding in nutritional epidemiology.

In the stratified analysis, 'minimally adjusted' gender- and centre-specific mean intakes are presented across variables of interest. Stratification was also performed for weekday and season of dietary interview. These analyses were adjusted for age and stratified for season or weekday. If fewer than 20 persons were represented in a cross-classification (for example, centre, gender and age group), results were not presented in the tables. Analyses were performed using SAS (version 9.1, SAS Institute, Cary, NC, USA).

Results

Mean intakes of water-soluble vitamins

Tables 1a–e show intake of the five vitamins stratified according to centre, gender and age, and adjusted for age, season and day of the week (see also Figures 1a,b–3a,b). Table 1a presents intake of thiamine. Intakes in all centres, except in the Italian and the UK health-conscious group, were close to 1.50 mg/day for men and 1.20 mg/day for women. In Italy, the intake was markedly lower, and in the UK health-conscious group, it was markedly higher. Men had higher intakes than did women in all centres.

Intakes of riboflavin were around 2.0 mg/day for men and 1.6 mg/day for women (Table 1b). As observed for thiamine,

Table 1a Minimally adjusted[a] mean daily thiamine intakes (mg/day) by centre ordered from south to north, gender and age group

Country and centre	*Men*										*Women*									
	N	*All*		*35–44 years*		*45–54 years*		*55–64 years*		*65–74 years*		N	*All*		*35–44 years*		*45–54 years*		*55–64 years*		*65–74 years*	
		M	*s.e.*	*M*	*s.e.*	*M*	*s.e.*	*M*	*s.e.*	*M*	*s.e.*		*M*	*s.e.*	*M*	*s.e.*	*M*	*s.e.*	*M*	*s.e.*	*M*	*s.e.*
Greece	1311	1.3	0.0	1.5	0.1	1.4	0.0	1.3	0.0	1.2	0.0	1373	1.0	0.0	1.0	0.0	0.1	0.0	1.0	0.0	0.9	0.0
Spain																						
Granada	214	1.6	0.0	—	—	1.6	0.1	1.6	0.1	1.5	0.1	300	1.2	0.0	1.2	0.1	1.4	0.0	1.0	0.0	1.1	0.1
Murcia	243	1.7	0.0	1.9	0.1	1.8	0.1	1.7	0.1	1.5	0.2	304	1.3	0.0	1.4	0.1	1.2	0.0	1.3	0.0	—	—
Navarra	444	1.6	0.0	2.0	0.1	1.8	0.1	1.6	0.0	1.5	0.1	271	1.2	0.0	1.2	0.1	1.2	0.1	1.2	0.0	—	—
San Sebastian	490	1.7	0.0	1.7	0.1	1.8	0.0	1.7	0.1	1.7	0.2	244	1.3	0.0	1.3	0.1	1.3	0.1	1.2	0.1	—	—
Asturias	386	1.7	0.0	1.7	0.1	1.6	0.1	1.7	0.1	1.8	0.1	324	1.2	0.0	1.4	0.1	1.2	0.0	1.2	0.0	1.2	0.1
Italy																						
Ragusa	168	1.0	0.1	—	—	1.0	0.1	1.0	0.1	—	—	138	0.8	0.0	1.0	0.1	0.7	0.1	0.9	0.1	—	—
Naples												403	0.7	0.0	0.9	0.1	0.7	0.0	0.7	0.0	0.7	0.1
Florence	271	1.1	0.0	1.2	0.1	1.1	0.1	1.1	0.1	—	—	784	0.8	0.0	0.8	0.1	0.8	0.0	0.8	0.0	0.8	0.1
Turin	676	1.0	0.0	1.1	0.1	1.0	0.0	1.0	0.0	1.0	0.1	392	0.8	0.0	0.8	0.1	0.8	0.0	0.8	0.0	—	—
Varese	327	1.1	0.0	—	—	1.0	0.1	1.1	0.0	1.1	0.1	794	0.8	0.0	0.8	0.1	0.8	0.0	0.9	0.0	0.8	0.1
France																						
South coast												620	1.2	0.0			1.2	0.0	1.3	0.0	1.2	0.0
South												1425	1.2	0.0			1.2	0.0	1.2	0.0	1.2	0.0
North-East												2059	1.2	0.0			1.2	0.0	1.2	0.0	1.2	0.0
North-West												631	1.2	0.0			1.3	0.0	1.2	0.0	1.2	0.0
Germany																						
Heidelberg	1034	1.5	0.0	1.5	0.1	1.5	0.0	1.5	0.0	—	—	1087	1.1	0.0	1.2	0.0	1.1	0.0	1.0	0.0	—	—
Potsdam	1233	1.5	0.0	1.7	0.1	1.6	0.0	1.5	0.0	1.3	0.1	1061	1.1	0.0	1.1	0.0	1.1	0.0	1.1	0.0	0.8	0.1
The Netherlands																						
Bilthoven	1024	1.3	0.0	1.4	0.0	1.4	0.0	1.3	0.0	—	—	1086	1.0	0.0	1.0	0.0	1.1	0.0	1.0	0.0	—	—
Utrecht												1870	1.1	0.0			1.1	0.0	1.1	0.0	1.0	0.0
United Kingdom																						
General population	402	1.9	0.0	2.0	0.1	2.1	0.1	1.8	0.1	1.7	0.1	570	1.5	0.0	1.6	0.1	1.5	0.0	1.5	0.0	1.4	0.0
Health-conscious	114	2.3	0.1	—	—	2.2	0.1	2.4	0.1	—	—	197	1.7	0.0	1.3	0.1	1.8	0.1	1.9	0.1	1.4	0.1
Denmark																						
Copenhagen	1356	1.3	0.0			1.3	0.0	1.3	0.0	1.3	0.1	1484	1.1	0.0			1.1	0.0	1.0	0.0	1.0	0.1
Aarhus	567	1.4	0.0			1.4	0.0	1.3	0.0	—	—	510	1.1	0.0			1.1	0.0	1.1	0.0	—	—
Sweden																						
Malmö	1421	1.5	0.0			1.6	0.1	1.5	0.0	1.5	0.0	1711	1.2	0.0			1.2	0.0	1.1	0.0	1.2	0.0
Umeå	1344	1.6	0.0	1.8	0.1	1.7	0.0	1.6	0.0	1.6	0.1	1574	1.3	0.0	1.3	0.0	1.3	0.0	1.3	0.0	1.2	0.0
Norway																						
South and East												1004	1.1	0.0	1.1	0.0	1.1	0.0	1.2	0.0		
North and West												793	1.1	0.0	1.2	0.0	1.1	0.0	1.2	0.0		

Abbreviations: M, mean; s.e., standard error; '—' If fewer than 20 persons are present in a certain age group, mean intake is not presented.
[a]Adjusted for age (when not stratified for age) and weighted by season and day of recall.

the Italian centres seemed to have the lowest intake, although the tendency was weak.

Among men, intake of vitamin B6 (Table 1c) was highest in the Spanish and the UK centres. For women, this was also observed in some of the Spanish centres and in both UK centres. Intake was relatively low in the two Norwegian centres (only women). Intake was higher among men (~1.8–2.8 mg/day) than among women (~1.2–2.3 mg/day) in all centres.

Table 1d shows intake of vitamin B12. Here, the UK health-conscious was the group that most evidently differed from the rest; both men and women had intakes less than half of those of most other centres. However, this was expected, as vitamin B12 is found only in foods of animal origin, and the UK health-conscious participants are mainly vegetarians or vegans. Apart from this, men generally had higher intakes than did women. Overall, wide variations in intake were observed (~2–15 μg/day).

Intakes of vitamin C varied from about 80 mg/day to over 230 mg/day (Table 1e) and a geographical gradient was observed, with highest intakes in the southern and lowest in the northern centres. Exceptions to this were Greece (with relatively low intake) and the UK health-conscious group (with a relatively high intake). The south–north gradient was strongest among men. Interestingly, men seemed to have higher intakes of vitamin C than did women in the southern

Table 1b Minimally adjusted[a] mean daily riboflavin intakes (mg/day) by centre ordered from south to north, gender, and age group

Country and centre	*Men*										*Women*									
	N	*All*		*35–44 years*		*45–54 years*		*55–64 years*		*65–74 years*		N	*All*		*35–44 years*		*45–54 years*		*55–64 years*		*65–74 years*	
		M	*s.e.*	*M*	*s.e.*	*M*	*s.e.*	*M*	*s.e.*	*M*	*s.e.*		*M*	*s.e.*	*M*	*s.e.*	*M*	*s.e.*	*M*	*s.e.*	*M*	*s.e.*
Greece	1311	1.6	0.0	1.8	0.1	1.7	0.1	1.5	0.0	1.5	0.0	1373	1.3	0.0	1.4	0.1	1.4	0.0	1.2	0.0	1.2	0.0
Spain																						
Granada	214	1.8	0.1	—	—	1.8	0.1	1.9	0.1	1.7	0.1	300	1.5	0.0	1.5	0.1	1.6	0.1	1.4	0.1	1.5	0.1
Murcia	243	1.7	0.1	1.9	0.2	1.7	0.1	1.7	0.1	1.8	0.2	304	1.5	0.0	1.5	0.1	1.5	0.1	1.4	0.1	—	—
Navarra	444	1.9	0.0	2.1	0.2	1.9	0.1	1.8	0.1	1.5	0.1	271	1.6	0.0	1.6	0.1	1.6	0.1	1.6	0.1	—	—
San Sebastian	490	2.2	0.0	2.2	0.1	2.3	0.1	2.3	0.1	2.0	0.2	244	1.7	0.0	1.8	0.1	1.8	0.1	1.6	0.1	—	—
Asturias	386	2.1	0.0	2.0	0.2	2.1	0.1	2.1	0.1	2.3	0.1	324	1.8	0.0	1.8	0.1	1.7	0.1	1.8	0.1	1.7	0.1
Italy																						
Ragusa	168	1.6	0.1	—	—	1.8	0.1	1.5	0.1	—	—	138	1.2	0.1	1.2	0.1	1.1	0.1	1.3	0.1	—	—
Naples												403	1.2	0.0	1.4	0.1	1.2	0.1	1.2	0.1	1.2	0.1
Florence	271	1.6	0.1	1.7	0.2	1.7	0.1	1.7	0.1	—	—	784	1.4	0.0	1.5	0.1	1.4	0.0	1.4	0.0	1.3	0.1
Turin	676	1.6	0.0	1.7	0.1	1.7	0.1	1.6	0.0	1.5	0.1	392	1.4	0.0	1.3	0.1	1.4	0.1	1.3	0.0	—	—
Varese	327	1.8	0.0	—	—	1.8	0.1	1.8	0.1	1.8	0.2	794	1.4	0.0	1.4	0.1	1.4	0.0	1.4	0.0	1.2	0.1
France																						
South coast												620	1.9	0.0			1.9	0.0	2.0	0.0	1.8	0.1
South												1425	1.8	0.0			1.9	0.0	1.8	0.0	1.7	0.0
North-East												2059	1.9	0.0			1.9	0.0	1.9	0.0	1.8	0.0
North-West												631	1.9	0.0			2.1	0.0	1.9	0.0	1.9	0.1
Germany																						
Heidelberg	1034	1.7	0.0	1.7	0.1	1.8	0.0	1.7	0.0	—	—	1087	1.4	0.0	1.5	0.0	1.4	0.0	1.4	0.0	—	—
Potsdam	1233	1.7	0.0	1.8	0.1	1.7	0.1	1.7	0.0	1.7	0.1	1061	1.3	0.0	1.3	0.0	1.3	0.0	1.3	0.0	1.3	0.1
The Netherlands																						
Bilthoven	1024	1.7	0.0	1.7	0.1	1.8	0.0	1.6	0.0	—	—	1086	1.3	0.0	1.4	0.0	1.4	0.0	1.4	0.0	—	—
Utrecht												1870	1.5	0.0			1.5	0.0	1.5	0.0	1.5	0.0
United Kingdom																						
General population	402	2.4	0.0	2.4	0.1	2.4	0.1	2.3	0.1	2.3	0.1	570	1.9	0.0	1.9	0.1	2.0	0.0	1.9	0.1	1.9	0.1
Health-conscious	114	2.0	0.1	—	—	1.6	0.1	2.0	0.1	—	—	197	1.6	0.0	1.7	0.2	1.6	0.1	1.6	0.1	1.7	0.1
Denmark																						
Copenhagen	1356	2.1	0.0			2.0	0.0	2.1	0.0	1.9	0.1	1484	1.6	0.0			1.6	0.0	1.6	0.0	1.6	0.1
Aarhus	567	2.2	0.0			2.2	0.1	2.1	0.1	—	—	510	1.7	0.0			1.7	0.0	1.7	0.0	—	—
Sweden																						
Malmö	1421	1.9	0.0			2.0	0.1	1.9	0.0	1.8	0.0	1711	1.5	0.0			1.5	0.0	1.5	0.0	1.5	0.0
Umeå	1344	2.1	0.0	2.4	0.1	2.1	0.0	2.0	0.0	2.1	0.1	1574	1.6	0.0	1.6	0.0	1.7	0.0	1.6	0.0	1.6	0.1
Norway																						
South and East												1004	1.4	0.0	1.5	0.1	1.4	0.0	1.4	0.1		
North and West												793	1.4	0.0	1.4	0.1	1.4	0.0	1.3	0.1		

Abbreviations: M, mean; s.e., standard error; '—' If fewer than 20 persons are present in a certain age group, mean intake is not presented.
[a]Adjusted for age (when not stratified for age) and weighted by season and day of recall.

centres, whereas women had higher intakes than did men in the north.

To evaluate whether the observed differences in vitamin intakes could be ascribed to systematic differences in anthropometrics and energy intake between genders and the EPIC centres, further adjustments for body height, weight and total energy intake were carried out (Tables A1a–A1e in Appendix). The most systematic effect was that the estimated mean intakes of all the vitamins were higher in Greek men and women after adjustment compared with the minimally adjusted mean intakes. With regard to vitamin C, adjustment diminished the differences between genders, but the pattern remained consistent. Also with regard to the estimated intakes of B vitamins, adjustment slightly diminished the differences between men and women, although the estimated intakes for men were still higher.

The test for interaction (minimally adjusted analyses) with gender was statistically significant ($P<0.001$) regarding all vitamins.

Intakes of water-soluble vitamins stratified by lifestyle factors

To evaluate the effect of certain lifestyle characteristics on water-soluble vitamin intakes, we performed analyses stratified according to smoking (never, former, current), BMI (<25, $25-<30$, $\geqslant 30\,kg/m^2$), and highest level of education (primary, secondary/technical, university) (Tables 2–6).

Table 1c Minimally adjusted[a] mean daily vitamin B6 intakes (mg/day) by centre ordered from south to north, gender and age group

Country and centre	*Men*										*Women*									
	N	*All*		*35–44 years*		*45–54 years*		*55–64 years*		*65–74 years*		N	*All*		*35–44 years*		*45–54 years*		*55–64 years*		*65–74 years*	
		M	*s.e.*	*M*	*s.e.*	*M*	*s.e.*	*M*	*s.e.*	*M*	*s.e.*		*M*	*s.e.*	*M*	*s.e.*	*M*	*s.e.*	*M*	*s.e.*	*M*	*s.e.*
Greece	1311	2.0	0.0	2.2	0.1	2.2	0.0	2.0	0.0	1.7	0.0	1373	1.4	0.0	1.5	0.0	1.5	0.0	1.4	0.0	1.3	0.0
Spain																						
Granada	214	2.2	0.1	—	—	2.3	0.1	2.3	0.1	2.0	0.1	300	1.7	0.0	1.6	0.1	1.8	0.1	1.6	0.1	1.7	0.1
Murcia	243	2.5	0.1	2.8	0.2	2.3	0.1	2.5	0.1	2.2	0.2	304	2.2	0.0	2.2	0.1	2.1	0.1	2.3	0.1	—	—
Navarra	444	2.1	0.0	2.3	0.2	2.3	0.1	2.1	0.1	1.8	0.1	271	1.6	0.0	1.5	0.1	1.6	0.1	1.6	0.1	—	—
San Sebastian	490	2.7	0.0	2.6	0.1	2.7	0.1	2.8	0.1	2.5	0.2	244	1.9	0.0	2.0	0.1	2.0	0.1	1.8	0.1	—	—
Asturias	386	2.5	0.0	2.6	0.2	2.5	0.1	2.5	0.1	2.4	0.1	324	1.8	0.0	1.9	0.1	1.8	0.1	1.8	0.1	1.8	0.1
Italy																						
Ragusa	168	2.0	0.1	—	—	2.0	0.1	1.9	0.1	—	—	138	1.5	0.1	1.7	0.1	1.2	0.1	1.5	0.1	—	—
Naples												403	1.4	0.0	1.6	0.1	1.4	0.1	1.4	0.0	1.4	0.1
Florence	271	2.0	0.1	2.1	0.2	2.0	0.1	2.2	0.1	—	—	784	1.5	0.0	1.5	0.1	1.5	0.0	1.6	0.0	1.5	0.1
Turin	676	2.0	0.0	2.1	0.1	2.0	0.1	2.0	0.0	2.1	0.1	392	1.6	0.0	1.6	0.1	1.5	0.1	1.6	0.0	—	—
Varese	327	2.0	0.0	—	—	2.0	0.1	2.0	0.1	2.4	0.2	794	1.5	0.0	1.7	0.1	1.5	0.0	1.5	0.0	1.4	0.1
France																						
South coast												620	1.6	0.0			1.6	0.0	1.7	0.0	1.5	0.1
South												1425	1.6	0.0			1.6	0.0	1.7	0.0	1.6	0.0
North-East												2059	1.7	0.0			1.6	0.0	1.7	0.0	1.6	0.0
North-West												631	1.7	0.0			1.7	0.0	1.6	0.0	1.6	0.1
Germany																						
Heidelberg	1034	2.0	0.0	2.0	0.1	2.0	0.0	2.0	0.0	—	—	1087	1.5	0.0	1.5	0.0	1.6	0.0	1.5	0.0	—	—
Potsdam	1233	2.0	0.0	2.1	0.1	2.0	0.0	2.0	0.0	1.9	0.1	1061	1.5	0.0	1.4	0.0	1.5	0.0	1.5	0.0	1.4	0.1
The Netherlands																						
Bilthoven	1024	2.0	0.0	2.1	0.1	2.2	0.0	2.0	0.0	—	—	1086	1.5	0.0	1.5	0.0	1.5	0.0	1.5	0.0	—	—
Utrecht												1870	1.5	0.0			1.5	0.0	1.5	0.0	1.5	0.0
United Kingdom																						
General population	402	2.5	0.0	2.7	0.1	2.6	0.1	2.4	0.1	2.3	0.1	570	1.9	0.0	2.1	0.1	1.9	0.0	1.9	0.0	1.8	0.1
Health-conscious	114	2.4	0.1	—	—	2.1	0.1	2.6	0.1	—	—	197	2.0	0.0	1.7	0.1	2.0	0.1	2.1	0.1	1.7	0.1
Denmark																						
Copenhagen	1356	2.0	0.0			1.9	0.0	2.0	0.0	1.9	0.1	1484	1.5	0.0			1.5	0.0	1.5	0.0	1.5	0.1
Aarhus	567	2.0	0.0			2.0	0.0	2.0	0.0	—	—	510	1.5	0.0			1.6	0.0	1.5	0.0	—	—
Sweden																						
Malmö	1421	2.0	0.0			2.1	0.1	2.0	0.0	1.9	0.0	1711	1.6	0.0			1.7	0.0	1.6	0.0	1.5	0.0
Umeå	1344	2.1	0.0	2.3	0.1	2.2	0.0	2.1	0.0	2.0	0.1	1574	1.7	0.0	1.7	0.0	1.8	0.0	1.7	0.0	1.7	0.1
Norway																						
South and East												1004	1.2	0.0	1.3	0.0	1.2	0.0	1.3	0.0		
North and West												793	1.2	0.0	1.2	0.1	1.2	0.0	1.2	0.1		

Abbreviations: M = mean; s.e., standard error; '—' If fewer than 20 persons are present in a certain age group, mean intake is not presented.
[a]Adjusted for age (when not stratified for age) and weighted by season and day of recall.

No systematic differences in thiamine intake were observed when participants were stratified according to smoking status, BMI or education (Table 2). With regard to riboflavin, no systematic differences were observed after stratification for smoking status or BMI (Table 3), but a slight tendency was observed towards an increased intake with an increase in education level. Smoking status and BMI did not affect vitamin B6 intake (Table 4), but intake seemed to be higher among the most educated women. This was not observed in men and was not consistent in all countries among women either. Intake of vitamin B12 varied between different subgroups, but no clear conclusion could be drawn for any of the three lifestyle factors (Table 5). Vitamin C intake was lower among smokers than among non-smokers for both genders in almost all centres (Table 6), and intakes were rather low (71–97 mg/day) in smokers in the Dutch, British, Danish, Swedish and Norwegian centres. Intake of vitamin C also seemed to be lower among participants with a high BMI, although this was not completely consistent. Furthermore, education tended to be positively associated with vitamin C intake.

Season and day of the week

Intake of water-soluble vitamins was also evaluated according to season and day of 24-HDR. Day of the week did not influence intake of any of the vitamins (results not shown). Regarding season, no systematic variations were observed for

Table 1d Minimally adjusted[a] mean daily vitamin B12 intakes (μg/day) by centre ordered from south to north, gender and age group

Country and centre	*Men*										*Women*									
	N	*All*		*35–44 years*		*45–54 years*		*55–64 years*		*65–74 years*		N	*All*		*35–44 years*		*45–54 years*		*55–64 years*		*65–74 years*	
		M	*s.e.*	*M*	*s.e.*	*M*	*s.e.*	*M*	*s.e.*	*M*	*s.e.*		*M*	*s.e.*	*M*	*s.e.*	*M*	*s.e.*	*M*	*s.e.*	*M*	*s.e.*
Greece	1311	6.3	0.3	9.9	1.0	6.7	0.7	5.7	0.6	5.3	0.5	1373	4.3	0.2	4.9	0.6	3.8	0.4	4.7	0.4	4.0	0.5
Spain																						
Granada	214	7.7	0.8	—	—	7.2	1.6	8.4	1.1	6.3	1.8	300	5.2	0.5	5.2	1.3	5.4	0.8	5.0	0.8	5.7	1.6
Murcia	243	7.7	0.7	6.3	2.3	8.8	1.3	7.1	1.0	10.1	2.5	304	5.6	0.5	5.8	1.0	5.2	0.8	4.9	0.8	—	—
Navarra	444	8.4	0.5	13.6	2.4	9.3	0.9	7.8	0.8	5.7	1.7	271	5.9	0.5	5.8	1.3	6.4	0.8	5.6	0.8	—	—
San Sebastian	490	12.6	0.5	9.1	1.2	13.4	0.7	14.7	1.0	7.4	2.6	244	6.4	0.5	5.7	1.2	7.0	0.9	6.8	0.9	—	—
Asturias	386	11.6	0.6	13.7	2.2	12.3	1.0	10.7	0.9	11.6	1.6	324	7.3	0.5	6.7	1.1	6.6	0.8	8.7	0.8	5.1	1.7
Italy																						
Ragusa	168	8.9	0.9	—	—	11.0	1.3	6.3	1.4	—	—	138	4.8	0.7	4.8	1.2	3.5	1.3	4.3	1.3	—	—
Naples												403	4.7	0.4	5.2	1.4	4.4	0.7	5.2	0.6	3.7	1.4
Florence	271	8.5	0.7	9.2	2.2	9.9	1.2	7.8	1.0	—	—	784	6.7	0.3	6.4	1.0	6.6	0.5	7.0	0.4	4.8	1.2
Turin	676	7.3	0.4	6.2	1.4	9.3	0.7	6.4	0.6	5.0	1.7	392	5.7	0.4	5.2	1.3	6.8	0.7	5.0	0.6	—	—
Varese	327	7.2	0.6	—	—	7.0	1.4	7.3	0.8	5.6	2.1	794	5.0	0.3	4.3	1.0	5.2	0.5	4.9	0.5	5.1	0.9
France																						
South coast												620	6.9	0.3			7.6	0.6	6.6	0.5	6.2	0.7
South												1425	5.6	0.2			5.8	0.3	5.8	0.4	5.2	0.5
North-East												2059	6.5	0.2			6.3	0.3	6.9	0.3	6.1	0.4
North-West												631	7.4	0.3			8.2	0.5	6.5	0.5	7.7	0.8
Germany																						
Heidelberg	1034	7.4	0.4	7.2	0.9	7.8	0.6	7.3	0.5	—	—	1087	5.4	0.3	5.2	0.4	5.4	0.5	5.4	0.4	—	—
Potsdam	1233	7.6	0.3	8.0	0.9	7.5	0.7	7.9	0.4	5.9	1.3	1061	4.8	0.3	4.5	0.5	4.9	0.5	4.9	0.4	4.1	1.6
The Netherlands																						
Bilthoven	1024	5.4	0.4	5.5	0.7	5.9	0.6	5.5	0.6	—	—	1086	4.2	0.3	3.9	0.5	4.1	0.4	4.5	0.5	—	—
Utrecht												1870	4.2	0.2			4.3	0.3	4.2	0.3	4.2	0.4
United Kingdom																						
General population	402	6.2	0.6	5.0	1.9	6.1	1.0	5.4	1.0	7.2	1.0	570	4.7	0.4	4.3	1.1	4.4	0.6	5.0	0.6	5.0	0.8
Health-conscious	114	2.7	1.1	—	—	1.2	1.7	2.0	1.6	—	—	197	2.4	0.6	3.2	1.9	1.8	1.0	2.0	0.9	4.5	1.7
Denmark																						
Copenhagen	1356	8.3	0.3			7.8	0.5	8.6	0.4	8.1	1.6	1484	5.7	0.2			5.3	0.4	5.9	0.3	6.4	1.0
Aarhus	567	7.8	0.5			8.2	0.7	7.6	0.7	—	—	510	5.5	0.4			5.3	0.5	5.7	0.5	—	—
Sweden																						
Malmö	1421	7.8	0.3			9.0	0.9	7.3	0.5	7.3	0.4	1711	5.8	0.2			5.8	0.4	5.9	0.3	5.9	0.3
Umeå	1344	8.7	0.3	7.9	1.1	8.7	0.6	8.8	0.4	8.5	0.9	1574	6.8	0.2	6.4	0.5	7.2	0.4	6.6	0.3	6.8	0.7
Norway																						
South and East												1004	5.7	0.3	6.1	0.6	5.5	0.3	6.2	0.7		
North and West												793	5.7	0.3	5.3	0.7	5.9	0.4	5.3	0.8		

Abbreviations: M, mean; s.e., standard error; '—' If fewer than 20 persons are present in a certain age group, mean intake is not presented.
[a]Adjusted for age (when not stratified for age) and weighted by season and day of recall.

any of the B vitamins, but there seemed to be a fluctuation with regard to vitamin C for both men and women, with the lowest intake in autumn and the highest in winter and spring. This seasonal variation can primarily be ascribed to the intake of citrus fruits that are mainly eaten during winter and are important sources of vitamin C (results not shown).

Dietary sources

Table 7 shows the food groups contributing to the intake of the four B vitamins in men and women.

Vegetables, fruits, dairy products, cereals, meat, fish, eggs and potatoes together accounted for 83–92% of thiamine intake for both men and women in all centres except in the UK health-conscious group. Cereals and/or meat were the main contributors in all centres. Cereals were, however, the single main source in Greece and especially in the UK health-conscious group.

With regard to riboflavin, consumption of vegetables, fruits, dairy products, cereals, meat, fish, eggs and potatoes accounted for 74–94% of intake (again except in the UK health-conscious group). Dairy products were by far the best source of riboflavin (22–52% of intake), followed by meat and cereals.

For both thiamine and riboflavin, the UK health-conscious group was characterized by the relatively low percentage

Table 1e Minimally adjusted[a] mean daily vitamin C intakes (mg/day) by centre ordered from south to north, gender and age group

Country and centre	*Men*										*Women*									
	N	*All*		*35–44 years*		*45–54 years*		*55–64 years*		*65–74 years*		N	*All*		*35–44 years*		*45–54 years*		*55–64 years*		*65–74 years*	
		M	*s.e.*	*M*	*s.e.*	*M*	*s.e.*	*M*	*s.e.*	*M*	*s.e.*		*M*	*s.e.*	*M*	*s.e.*	*M*	*s.e.*	*M*	*s.e.*	*M*	*s.e.*
Greece	1311	126.1	2.6	115.6	7.9	125.8	5.4	143.9	4.8	117.3	4.2	1373	111.4	2.3	116.9	6.2	115.3	4.0	113.4	4.1	100.4	4.6
Spain																						
Granada	214	158.4	6.4	—	—	180.3	13.4	148.1	8.7	166.3	14.5	300	160.4	4.8	166.7	12.5	181.2	8.2	142.7	7.6	149.6	15.6
Murcia	243	187.4	6.0	232.9	18.7	174.3	10.8	182.5	8.4	207.5	20.8	304	166.4	4.8	156.7	9.7	169.3	8.1	171.2	8.0	—	—
Navarra	444	140.3	4.4	108.4	19.4	141.6	7.4	139.5	6.3	155.0	13.6	271	138.0	5.1	104.1	13.4	139.1	8.4	142.0	7.8	—	—
San Sebastian	490	152.5	4.3	141.7	10.0	147.4	5.9	171.9	8.1	105.9	21.3	244	147.3	5.4	146.9	11.5	166.7	8.7	129.5	9.1	—	—
Asturias	386	120.0	4.8	95.3	17.9	114.6	8.0	132.9	7.1	102.9	12.9	324	112.8	4.7	103.8	11.3	100.7	7.6	128.4	7.5	114.2	17.2
Italy																						
Ragusa	168	122.4	7.2	—	—	125.9	10.7	113.1	11.3	—	—	138	102.3	7.2	84.3	11.9	83.9	13.3	137.4	12.8	—	—
Naples												403	108.4	4.2	108.2	13.6	98.8	6.6	120.1	6.4	96.7	13.6
Florence	271	131.2	5.7	127.3	17.9	130.6	9.7	134.7	8.1	—	—	784	113.3	3.0	107.0	10.1	112.0	5.2	113.5	4.2	126.2	11.7
Turin	676	141.5	3.6	119.7	11.7	138.6	6.0	145.4	5.1	153.9	13.8	392	141.9	4.2	120.0	13.4	142.5	7.1	140.7	5.9	—	—
Varese	327	125.5	5.2	—	—	140.6	11.5	119.7	6.2	151.5	17.4	794	110.2	3.0	104.7	9.6	94.3	5.0	127.4	4.5	97.6	9.0
France																						
South coast												620	109.5	3.4			107.9	5.6	114.5	5.3	102.8	7.0
South												1425	111.0	2.2			110.7	3.5	115.3	3.5	102.8	5.0
North-East												2059	111.9	1.9			110.4	2.9	113.9	2.9	110.9	4.3
North-West												631	118.6	3.3			124.3	5.3	117.9	5.1	106.7	8.0
Germany																						
Heidelberg	1034	114.8	2.9	104.7	7.8	111.8	4.6	118.4	4.3	—	—	1087	118.4	2.6	119.9	4.4	118.9	4.7	117.5	4.3	—	—
Potsdam	1233	127.5	2.7	124.0	7.7	126.7	5.4	129.1	3.5	118.8	10.4	1061	137.5	2.6	125.6	5.1	144.2	5.0	138.7	3.8	167.5	16.3
The Netherlands																						
Bilthoven	1024	98	3.0	96.1	5.7	97.8	4.5	96.7	5.1	—	—	1086	98.3	2.6	96.6	4.5	97.0	4.0	102.6	4.9	—	—
Utrecht												1870	112.8	2.0			109.9	3.3	116.9	3.0	109.4	3.9
United Kingdom																						
General population	402	104.5	4.7	108.6	15.3	114.3	8.3	100.6	8.5	97.6	8.5	570	105.7	3.5	107.8	10.6	112.0	5.8	107.5	6.4	91.5	7.5
Health-conscious	114	147.8	8.7	—	—	151.1	14.3	144.1	13.5	—	—	197	130.6	6.0	108.7	18.9	144.3	9.8	132.0	9.4	104.3	16.5
Denmark																						
Copenhagen	1356	100.1	2.5			92.8	4.1	104.1	3.3	111.3	12.8	1484	107.0	2.2			113.7	3.6	103.0	2.8	104.2	10.4
Aarhus	567	98.5	3.9			96.9	5.6	99.4	5.6	—	—	510	100.5	3.7			105.0	5.2	97.5	5.4	—	—
Sweden																						
Malmö	1421	84.2	2.6			84.7	7.4	87.8	3.9	84.0	3.5	1711	92.0	2.1			92.2	4.2	95.6	3.4	88.4	3.2
Umeå	1344	88.2	2.5	92.2	8.6	90.7	4.8	87.2	3.5	85.0	7.6	1574	95.5	2.1	94.0	5.1	98.1	3.8	95.5	3.2	89.4	6.8
Norway																						
South and East												1004	102.0	2.7	105.8	6.4	102.1	3.2	98.0	6.6		
North and West												793	96.4	3.0	81.0	6.8	99.5	3.6	103.4	7.8		

Abbreviations: M, mean; s.e., standard error; '—' If fewer than 20 persons are present in a certain age group, mean intake is not presented.
[a]Adjusted for age (when not stratified for age) and weighted by season and day of recall.

(<70%) of their intake that was covered by the food groups included. When additional sources of thiamine and riboflavin were evaluated for this special population group, the miscellaneous food group (consisting primarily of special vegan/vegetarian food items such as soy products, non-dairy 'cheeses' and creamers) was found to account for 17% of thiamine in men and 18% in women (intake from this food group was very low in all other centres). For riboflavin, the miscellaneous food group, together with non-alcoholic beverages and sauces, accounted for close to 30% of intake in both genders among the health-conscious group. Results for these specific food subgroups are not shown in Table 7.

Vegetables, fruits, dairy products, meat and potatoes were the most important sources of vitamin B6, with fish and eggs contributing smaller amounts. For men, the most important source was meat (17–34% of intake) in all centres except in the UK health-conscious group, in which it was cereals. No single source could be identified as being the most important for women.

A very high proportion of vitamin B12 intake came from only four dietary sources: dairy products, meat, fish and, to a lesser extent, eggs. Intake from plant sources was negligible (a very small contribution from cereals and none from vegetables, fruits or potatoes). Although dairy products, meat and fish were all major contributors, meat tended to be

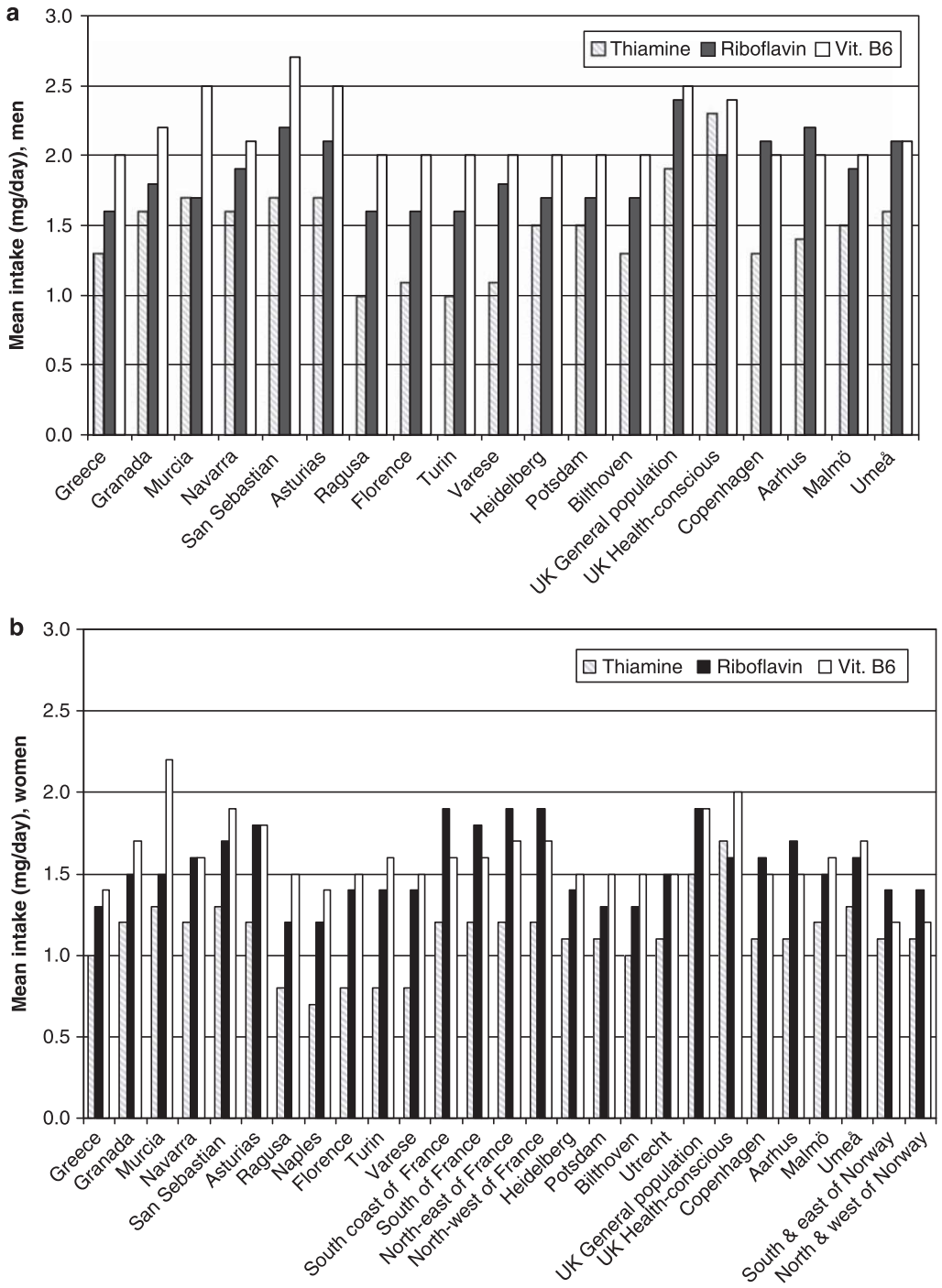

Figure 1 Minimally adjusted mean intakes of thiamine, riboflavin and vitamin B6 (mg/day) by centre ordered from south to north (**a**) men and (**b**) women. (Adjusted for age and weighted by season and day of recall.)

the most important source in most centres for both sexes, although fish was also an important source in Norway, Denmark and some of the southern centres, and dairy products were the most important in both UK cohorts.

Dietary contributors to vitamin C intake are presented in Table 8. Fruits and vegetables were by far the most important sources of vitamin C. These two food groups provided about 80% of the total vitamin C intake in the southern centres

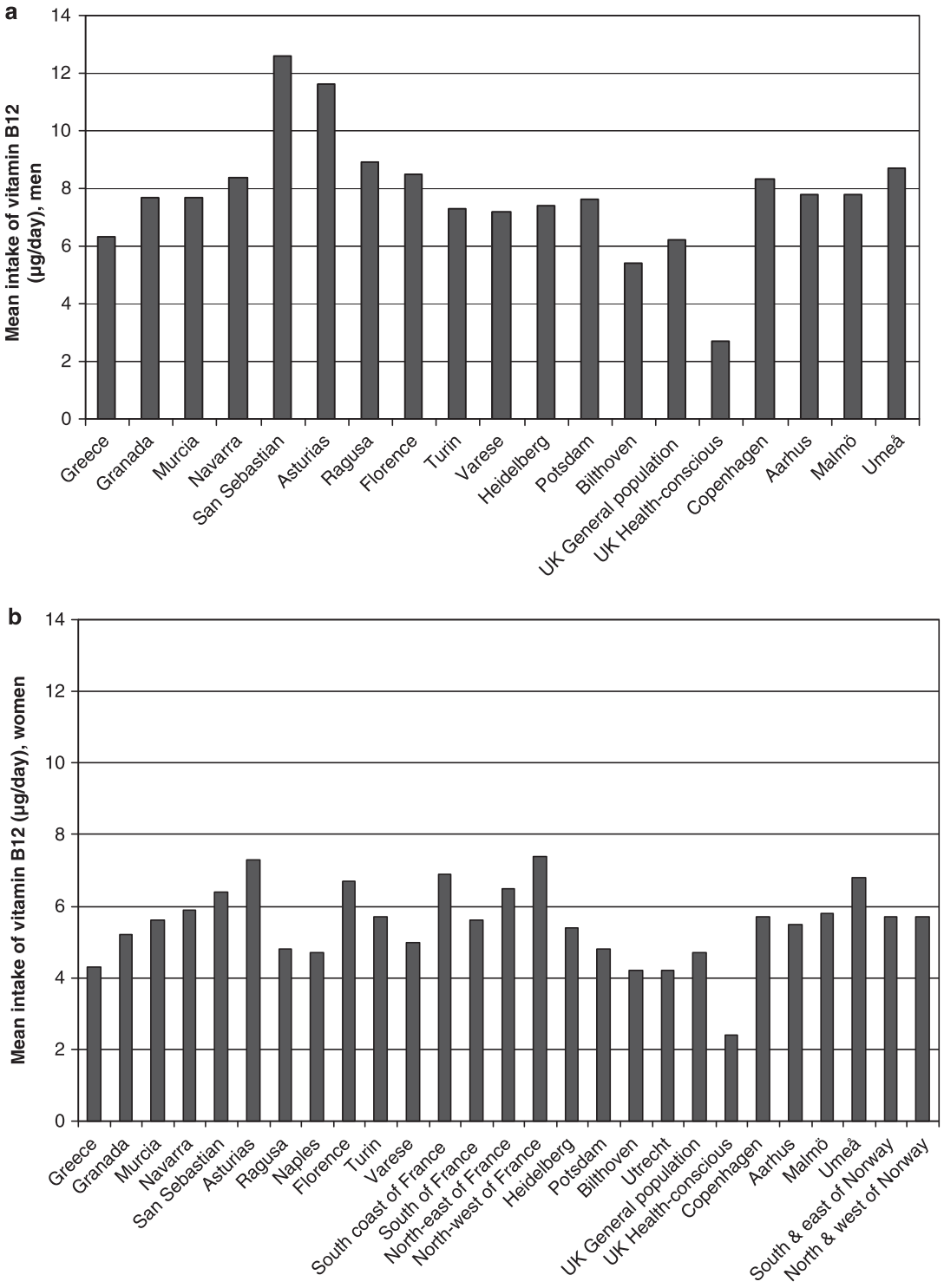

Figure 2 Minimally adjusted mean intake of vitamin B12 (mg/day) by centre ordered from south to north (**a**) men and (**b**) women. (Adjusted for age and weighted by season and day of recall.)

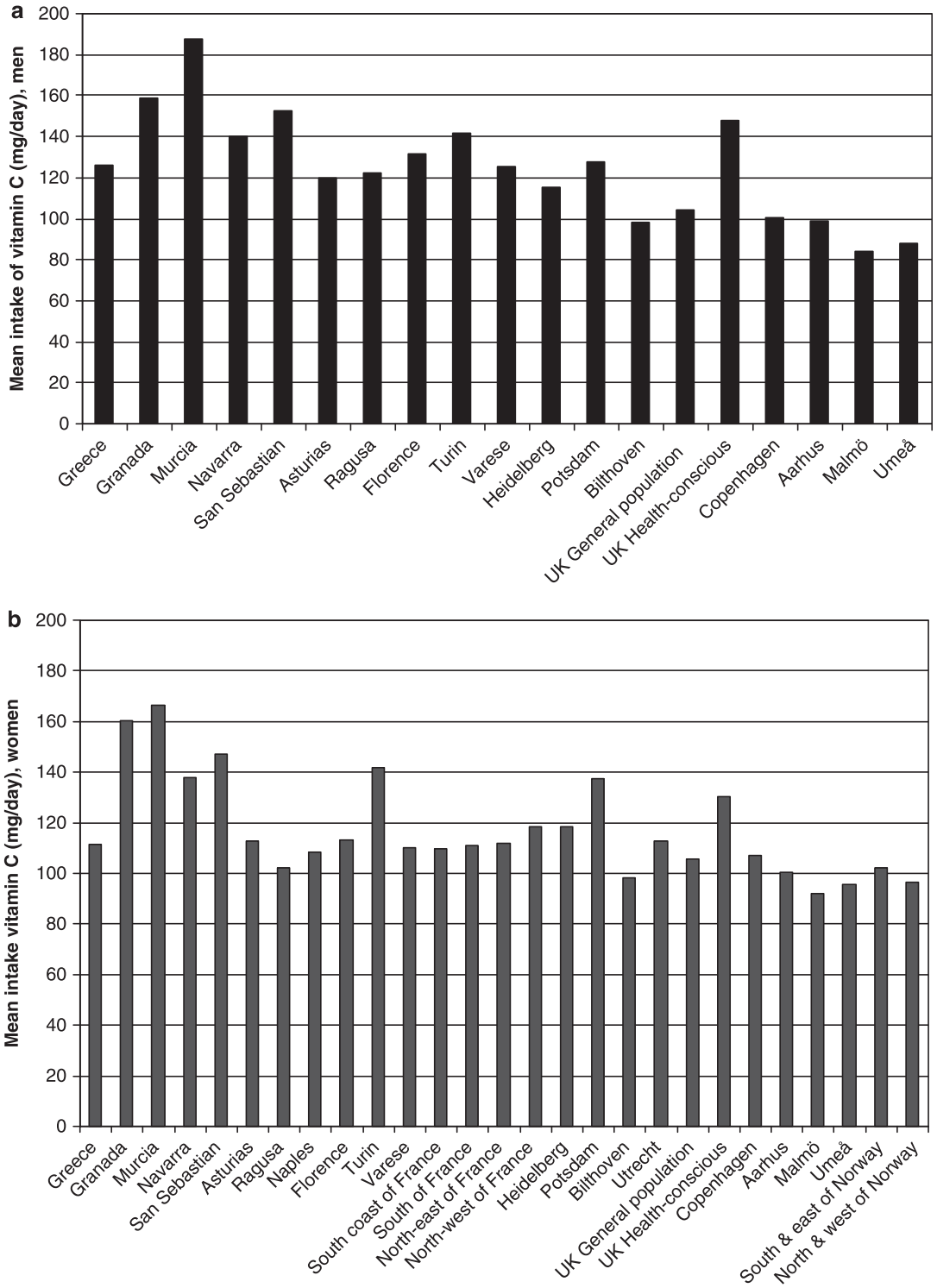

Figure 3 Minimally adjusted mean intake of vitamin C (mg/day) by centre ordered from south to north (**a**) men and (**b**) women. (Adjusted for age and weighted by season and day of recall.)

Table 2 Minimally adjusted[a] mean daily intake of thiamine (mg/day) by centre, according to cigarette smoking status, BMI and education

Country and centre	*Smoking*						*BMI (kg/m²)*						*Education*					
	Men			*Women*			*Men*			*Women*			*Men*			*Women*		
	Never	*Former*	*Current*	*Never*	*Former*	*Current*	*<25*	*25–<30*	*30+*	*<25*	*25–<30*	*30+*	*Primary*	*Secondary/ technical*	*University*	*Primary*	*Secondary/ technical*	*University*
Greece	1.4	1.3	1.4	1.0	0.9	1.0	1.4	1.3	1.3	1.0	1.0	0.9	1.3	1.3	1.3	1.0	1.0	1.0
Spain																		
Granada	1.5	1.6	1.6	1.2	—	1.3	1.6	1.5	1.7	1.2	1.2	1.1	1.6	1.6	1.5	1.2	1.3	—
Murcia	1.9	1.8	1.6	1.3	1.5	1.4	1.6	1.8	1.7	1.3	1.4	1.1	1.7	1.7	1.7	1.3	1.5	1.3
Navarra	1.7	1.7	1.6	1.2	1.1	1.2	1.7	1.6	1.7	1.2	1.1	1.3	1.7	1.7	1.6	1.2	1.1	1.6
San Sebastian	1.8	1.7	1.6	1.3	1.2	1.2	1.7	1.7	1.6	1.3	1.2	1.2	1.7	1.8	1.4	1.2	1.4	—
Asturias	1.8	1.6	1.6	1.2	1.2	1.2	1.6	1.7	1.6	1.3	1.2	1.1	1.8	1.6	1.5	1.3	1.2	1.2
Italy																		
Ragusa	1.0	1.0	0.9	0.8	0.7	1.0	1.0	1.0	1.0	1.0	0.7	0.7	1.0	1.1	1.0	0.7	1.0	0.9
Naples				0.7	0.7	0.8				0.8	0.7	0.7				0.7	0.7	0.8
Florence	1.1	1.0	1.1	0.8	0.9	0.8	1.1	1.0	1.1	0.8	0.8	0.8	1.1	1.0	1.1	0.8	0.9	0.8
Turin	1.0	1.0	1.0	0.8	0.8	0.7	1.0	1.0	1.1	0.8	0.8	0.8	0.9	1.0	1.1	0.8	0.8	0.8
Varese	1.2	1.1	1.0	0.8	0.8	0.8	1.1	1.1	1.0	0.8	0.9	0.8	1.1	1.1	—	0.8	0.8	0.9
France																		
South coast				1.3	1.1	1.0				1.2	1.2	1.1				1.2	1.2	1.2
South				1.2	1.2	1.1				1.2	1.2	1.1				1.1	1.3	1.2
North-East				1.2	1.3	1.3				1.2	1.2	1.3				1.2	1.2	1.2
North-West				1.2	1.2	1.1				1.2	1.2	1.1				1.1	1.2	1.3
Germany																		
Heidelberg	1.4	1.5	1.5	1.1	1.0	1.1	1.4	1.5	1.5	1.1	1.1	1.2	1.6	1.4	1.5	1.2	1.1	1.1
Potsdam	1.5	1.5	1.6	1.1	1.1	1.0	1.5	1.5	1.6	1.1	1.1	1.1	1.5	1.6	1.5	1.1	1.1	1.1
The Netherlands																		
Bilthoven	1.4	1.3	1.3	1.0	1.0	1.0	1.3	1.3	1.3	1.0	1.0	1.0	1.3	1.3	1.3	1.0	1.0	1.0
Utrecht				1.1	1.1	1.0				1.1	1.1	1.1				1.1	1.1	1.1
United Kingdom																		
General population	2.0	1.8	1.9	1.5	1.4	1.6	1.9	1.9	1.9	1.5	1.5	1.5	1.8	1.9	1.8	1.6	1.5	1.4
Health-conscious	2.3	2.3	—	1.8	1.7	—	2.3	2.0	2.6	1.8	1.7	1.5	—	2.2	2.2	—	1.9	1.6
Denmark																		
Copenhagen	1.3	1.3	1.3	1.1	1.1	1.0	1.3	1.3	1.3	1.0	1.1	1.1	1.4	1.3	1.3	1.1	1.0	1.1
Aarhus	1.3	1.4	1.3	1.2	1.1	1.0	1.3	1.3	1.5	1.1	1.1	1.1	1.4	1.4	1.3	1.1	1.1	1.1
Sweden																		
Malmö	1.6	1.5	1.5	1.2	1.2	1.1	1.6	1.5	1.5	1.2	1.1	1.2	1.6	1.6	1.5	1.2	1.2	1.1
Umeå	1.6	1.6	1.7	1.3	1.3	1.3	1.7	1.6	1.6	1.3	1.3	1.3	1.6	1.6	1.6	1.2	1.3	1.3
Norway																		
South and East				1.1	1.1	1.1				1.1	1.1	1.1				1.1	1.1	1.2
North and West				1.1	1.1	1.1				1.2	1.0	1.0				1.1	1.1	1.2

Abbreviations: M, mean; s.e., standard error; '—' If fewer than 20 persons are present in a certain age group, mean intake is not presented.
[a]Adjusted for age and weighted by season and day of recall.

Table 3 Minimally adjusted[a] mean daily intake of riboflavin (mg/day) by centre, according to cigarette smoking status, BMI and education

Country and centre	*Smoking*						*BMI (kg/m²)*						*Education*					
	Men			*Women*			*Men*			*Women*			*Men*			*Women*		
	Never	*Former*	*Current*	*Never*	*Former*	*Current*	*<25*	*25–<30*	*30+*	*<25*	*25–<30*	*30+*	*Primary*	*Secondary/ technical*	*University*	*Primary*	*Secondary/ technical*	*University*
Greece	1.7	1.5	1.6	1.2	1.3	1.4	1.8	1.6	1.5	1.5	1.3	1.2	1.5	1.6	1.7	1.1	1.4	1.5
Spain																		
Granada	1.7	1.8	1.9	1.5	—	1.6	—	1.8	1.8	1.5	1.5	1.5	1.8	1.8	1.8	1.5	1.6	—
Murcia	1.8	1.6	1.7	1.5	1.7	1.5	1.6	1.7	1.9	1.5	1.6	1.4	1.7	1.9	1.8	1.5	1.6	1.5
Navarra	1.9	1.8	1.9	1.7	1.5	1.5	1.9	1.8	1.9	1.7	1.7	1.5	1.8	1.9	1.8	1.6	1.5	1.9
San Sebastian	2.3	2.3	2.2	1.7	1.8	1.7	2.2	2.3	2.2	1.8	1.7	1.8	2.3	2.2	2.2	1.7	1.8	—
Asturias	2.2	2.1	2.1	1.8	1.8	1.7	2.1	2.1	2.1	1.8	1.8	1.6	2.2	2.0	1.9	1.8	1.8	1.8
Italy																		
Ragusa	1.7	1.6	1.8	1.2	1.3	1.1	1.8	1.7	1.3	1.2	1.1	1.2	1.6	1.7	1.6	1.2	1.1	1.5
Naples				1.2	1.2	1.2				1.3	1.2	1.2				1.2	1.3	1.3
Florence	1.7	1.6	1.7	1.4	1.5	1.3	1.6	1.6	1.7	1.4	1.4	1.3	1.6	1.7	1.7	1.4	1.4	1.3
Turin	1.6	1.6	1.6	1.3	1.5	1.2	1.6	1.6	1.6	1.4	1.4	1.2	1.5	1.7	1.8	1.3	1.4	1.4
Varese	1.9	1.7	1.8	1.4	1.3	1.3	2.0	1.7	1.8	1.3	1.4	1.3	1.9	1.8	—	1.4	1.3	1.4
France																		
South coast				2.0	1.9	1.8				1.9	1.9	2.3				1.8	2.0	1.8
South				1.8	1.8	2.0				1.8	1.9	1.7				1.7	1.8	1.8
North-East				1.9	2.0	2.1				1.9	1.9	2.0				1.7	2.0	1.9
North-West				2.0	1.9	1.9				2.0	1.9	2.0				1.9	1.9	2.1
Germany																		
Heidelberg	1.7	1.8	1.7	1.4	1.4	1.4	1.7	1.7	1.8	1.4	1.4	1.4	1.7	1.7	1.8	1.3	1.4	1.6
Potsdam	1.7	1.7	1.8	1.3	1.3	1.3	1.8	1.7	1.7	1.3	1.3	1.3	1.7	1.8	1.7	1.3	1.3	1.4
The Netherlands																		
Bilthoven	1.7	1.7	1.6	1.4	1.4	1.3	1.7	1.7	1.5	1.4	1.3	1.3	1.6	1.7	1.6	1.3	1.3	1.4
Utrecht				1.6	1.5	1.5				1.5	1.5	1.5				1.5	1.5	1.6
United Kingdom																		
General population	2.4	2.4	2.3	2.0	1.9	1.8	2.4	2.4	2.3	1.9	2.0	1.9	2.4	2.4	2.2	2.0	2.0	1.9
Health-conscious	1.9	2.0	—	1.6	1.6	—	1.9	2.3	—	1.6	1.7	—	—	1.8	2.0	—	1.6	1.7
Denmark																		
Copenhagen	2.1	2.1	2.1	1.6	1.6	1.6	2.1	2.1	2.1	1.6	1.6	1.5	2.1	2.1	2.1	1.5	1.6	1.7
Aarhus	2.0	2.2	2.2	1.7	1.7	1.7	2.1	2.1	2.4	1.7	1.7	1.6	2.1	2.2	2.2	1.6	1.7	1.7
Sweden																		
Malmö	1.9	1.8	1.9	1.5	1.5	1.5	1.9	1.9	1.8	1.5	1.5	1.4	1.9	1.9	1.9	1.4	1.5	1.6
Umeå	2.1	2.0	2.1	1.6	1.6	1.7	2.2	2.0	2.1	1.7	1.6	1.6	2.1	2.1	2.1	1.6	1.6	1.7
Norway																		
South and East				1.4	1.4	1.4				1.4	1.3	1.3				1.3	1.4	1.5
North and West				1.5	1.3	1.3				1.4	1.3	1.4				1.4	1.4	1.5

Abbreviations: M, mean; s.e., standard error; '—' If fewer than 20 persons are present in a certain age group, mean intake is not presented.
[a]Adjusted for age and weighted by season and day of recall.

Table 4 Minimally adjusted[a] mean daily intake of vitamin B6 (mg/day) by centre, according to cigarette smoking status, BMI and education

Country and centre	*Smoking*						*BMI (kg/m²)*						*Education*					
	Men			*Women*			*Men*			*Women*			*Men*			*Women*		
	Never	*Former*	*Current*	*Never*	*Former*	*Current*	*<25*	*25–<30*	*30+*	*<25*	*25–<30*	*30+*	*Primary*	*Secondary/ technical*	*University*	*Primary*	*Secondary technical*	*University*
Greece	2.1	1.9	2.0	1.4	1.4	1.5	2.1	2.0	1.9	1.5	1.5	1.3	1.8	2.1	2.2	1.3	1.5	1.6
Spain																		
Granada	2.2	2.2	2.3	1.7	—	1.7	—	2.2	2.3	1.7	1.7	1.6	2.2	2.2	2.1	1.6	1.9	—
Murcia	2.5	2.8	2.2	2.1	2.7	2.1	2.2	2.5	2.6	2.3	2.2	2.0	2.5	2.4	2.5	2.1	2.1	2.5
Navarra	2.2	2.2	2.1	1.6	1.4	1.5	2.2	2.1	2.1	1.6	1.6	1.5	2.1	2.2	2.1	1.5	1.6	1.9
San Sebastian	2.8	2.6	2.6	1.9	1.8	1.9	2.6	2.7	2.6	2.0	1.8	1.8	2.7	2.7	2.2	1.9	1.9	—
Asturias	2.6	2.5	2.3	1.8	1.7	1.8	2.4	2.5	2.6	1.8	1.8	1.7	2.6	2.3	2.3	1.8	1.7	1.7
Italy																		
Ragusa	2.0	2.0	2.0	1.4	1.3	1.6	2.1	2.0	1.9	1.6	1.3	1.4	1.9	2.1	1.9	1.3	1.6	1.6
Naples				1.4	1.3	1.4				1.4	1.4	1.4				1.4	1.4	1.5
Florence	2.0	2.0	2.2	1.5	1.6	1.5	2.1	2.0	2.2	1.5	1.5	1.6	2.2	2.0	2.0	1.5	1.6	1.5
Turin	2.1	1.9	2.0	1.6	1.6	1.5	2.1	2.0	2.0	1.6	1.5	1.5	2.0	2.0	2.2	1.5	1.6	1.7
Varese	2.1	2.0	1.9	1.5	1.5	1.4	2.0	2.1	1.7	1.5	1.5	1.5	2.1	1.9	—	1.5	1.5	1.4
France																		
South coast				1.7	1.5	1.5				1.6	1.6	1.7				1.6	1.7	1.6
South				1.6	1.6	1.6				1.6	1.6	1.6				1.6	1.6	1.6
North-East				1.7	1.7	1.6				1.6	1.7	1.8				1.5	1.7	1.7
North-West				1.7	1.6	1.5				1.7	1.7	1.8				1.7	1.6	1.8
Germany																		
Heidelberg	1.9	2.1	1.9	1.5	1.5	1.4	1.9	2.1	1.9	1.5	1.4	1.5	2.0	1.9	2.0	1.5	1.5	1.6
Potsdam	2.0	2.0	2.1	1.5	1.4	1.4	2.0	2.0	2.1	1.5	1.5	1.5	2.0	2.1	1.9	1.5	1.5	1.5
The Netherlands																		
Bilthoven	2.1	2.0	2.0	1.5	1.5	1.4	2.0	2.0	2.0	1.5	1.4	1.5	2.0	2.1	2.0	1.4	1.5	1.5
Utrecht				1.6	1.5	1.5				1.6	1.5	1.5				1.5	1.5	1.6
United Kingdom																		
General population	2.5	2.5	2.3	1.9	1.9	1.9	2.5	2.5	2.4	1.9	1.9	1.9	2.5	2.5	2.3	2.0	1.9	1.9
Health-conscious	2.3	2.4	—	2.0	1.9	—	2.4	2.4	—	2.0	2.0	—	—	2.3	2.3	—	2.0	2.0
Denmark																		
Copenhagen	2.0	1.9	1.9	1.5	1.5	1.4	1.9	1.9	2.0	1.5	1.5	1.4	2.0	1.9	2.0	1.4	1.5	1.6
Aarhus	2.0	1.9	2.0	1.6	1.5	1.5	2.0	2.0	2.1	1.5	1.5	1.6	1.9	2.0	2.0	1.5	1.6	1.6
Sweden																		
Malmö	2.1	2.0	2.0	1.6	1.6	1.5	2.1	2.0	1.9	1.6	1.6	1.6	2.0	2.0	1.9	1.5	1.7	1.7
Umeå	2.1	2.1	2.1	1.7	1.7	1.7	2.2	2.1	2.1	1.8	1.7	1.6	2.1	2.1	2.2	1.6	1.7	1.8
Norway																		
South and East				1.2	1.2	1.2				1.2	1.3	1.2				1.1	1.3	1.3
North and West				1.2	1.2	1.2				1.2	1.1	1.1				1.2	1.2	1.3

Abbreviations: M, mean; s.e., standard error; '—' If fewer than 20 persons are present in a certain age group, mean intake is not presented.
[a]Adjusted for age and weighted by season and day of recall.

Table 5 Minimally adjusted[a] mean daily intake of vitamin B12 (μg/day) by centre, according to cigarette smoking status, BMI and education

Country and centre	*Smoking*						*BMI (kg/m²)*						*Education*					
	Men			*Women*			*Men*			*Women*			*Men*			*Women*		
	Never	*Former*	*Current*	*Never*	*Former*	*Current*	*<25*	*25–<30*	*30+*	*<25*	*25–<30*	*30+*	*Primary*	*Secondary/ technical*	*University*	*Primary*	*Secondary/ technical*	*University*
Greece	7.7	6.1	5.5	4.3	3.5	4.5	8.0	6.0	5.9	5.2	4.1	3.9	5.4	7.4	7.0	4.0	4.6	4.6
Spain																		
Granada	8.0	7.2	8.1	5.1	—	7.2	—	7.7	8.4	6.1	4.7	5.5	8.3	8.4	5.9	4.9	7.5	—
Murcia	7.3	6.0	9.3	5.3	5.1	7.2	5.3	7.2	11.6	5.1	6.6	4.9	7.0	11.8	8.3	5.5	7.6	5.2
Navarra	8.1	7.6	8.9	6.0	5.7	5.5	9.2	8.1	8.6	6.2	5.7	5.6	8.0	9.6	8.3	5.9	6.0	5.9
San Sebastian	12.0	11.8	13.4	6.3	6.3	7.5	11.7	12.5	13.8	5.9	6.3	8.9	13.1	11.7	11.8	6.8	5.7	—
Asturias	11.6	12.8	10.3	7.3	11.0	6.0	12.9	10.6	13.1	7.1	7.7	6.5	11.2	14.1	8.8	7.1	10.3	5.6
Italy																		
Ragusa	9.4	5.1	16.2	4.7	4.8	5.0	16.3	7.8	4.6	5.2	4.2	4.9	9.7	9.0	6.7	5.2	4.4	4.5
Naples				4.3	4.9	5.3				4.6	4.8	4.7				4.0	5.4	4.8
Florence	6.6	9.5	8.8	6.8	7.7	5.7	6.8	9.7	8.6	6.7	7.0	6.0	8.2	9.4	6.8	7.8	6.2	4.6
Turin	6.2	7.2	8.5	4.3	9.3	5.8	6.5	8.0	5.6	4.7	7.9	4.3	7.1	7.0	9.3	6.5	4.6	4.2
Varese	9.1	5.7	7.0	5.0	4.8	4.9	9.2	6.2	5.0	5.2	4.4	5.6	8.9	5.6	—	5.2	4.8	4.3
France																		
South coast				7.0	6.8	6.0				6.9	6.2	8.3				5.6	7.8	6.1
South				5.8	5.1	5.8				5.7	5.6	5.5				6.2	5.8	5.1
North-East				6.3	6.9	7.2				6.2	7.1	6.6				5.7	6.5	6.5
North-West				8.1	5.8	5.8				7.5	7.1	6.9				8.3	7.3	7.2
Germany																		
Heidelberg	6.8	7.9	7.2	5.1	5.2	6.1	6.7	7.2	9.2	5.4	5.4	5.3	8.3	6.7	7.2	5.2	4.9	6.4
Potsdam	7.0	7.5	8.8	4.8	4.7	4.9	7.9	7.2	8.2	4.8	4.6	5.2	8.1	8.1	7.1	5.1	4.6	4.8
The Netherlands																		
Bilthoven	5.2	5.5	5.5	4.2	4.1	4.4	4.8	5.9	4.7	4.1	4.4	4.4	7.0	5.5	4.5	5.7	4.0	3.8
Utrecht				4.1	4.1	4.6				4.0	4.3	4.6				4.3	4.2	4.2
United Kingdom																		
General population	5.7	6.7	5.7	4.9	4.7	4.2	5.6	6.3	7.1	4.6	4.9	4.6	5.8	6.5	5.3	5.2	4.8	4.4
Health-conscious	1.7	3.5	—	2.1	2.4	—	2.1	4.4	—	2.1	2.9	—	—	2.1	2.2	—	2.2	2.9
Denmark																		
Copenhagen	8.0	8.1	8.8	5.8	5.6	5.5	8.1	8.3	8.8	5.5	6.0	5.5	8.3	8.3	8.2	5.7	5.6	5.9
Aarhus	7.4	7.7	8.0	5.0	6.1	5.6	7.1	7.9	9.0	5.3	5.6	6.1	7.1	8.2	8.0	5.4	5.5	5.9
Sweden																		
Malmö	7.8	7.6	8.1	6.0	5.2	6.3	7.6	7.9	8.0	6.1	5.6	5.6	7.3	8.3	8.0	5.9	5.8	5.9
Umeå	8.9	8.3	9.1	6.7	6.6	7.3	8.9	8.1	10.9	7.1	6.6	6.1	8.9	8.7	8.4	6.9	6.9	6.4
Norway																		
South and East				6.1	5.7	5.4				5.7	5.9	5.5				5.9	5.7	5.5
North and West				5.6	6.0	5.7				5.9	5.0	6.7				5.4	5.7	6.4

Abbreviations: M, mean; s.e., standard error; '—' If fewer than 20 persons are present in a certain age group, mean intake is not presented.
[a]Adjusted for age and weighted by season and day of recall.

Table 6 Minimally adjusted[a] mean daily intake of vitamin C (mg/day) by centre, according to cigarette smoking status, BMI and education

Country and centre	Smoking						BMI (kg/m^2)						Education					
	Men			Women			Men			Women			Men			Women		
	Never	Former	Current	Never	Former	Current	<25	25–<30	30+	<25	25–<30	30+	Primary	Secondary/ technical	University	Primary	Secondary/ technical	University
Greece	137	127	115	110	112	121	129	126	125	121	108	109	114	122	148	105	115	123
Spain																		
Granada	172	164	131	162	—	165	—	165	137	180	157	148	150	187	153	153	182	—
Murcia	215	188	167	171	177	139	197	186	183	153	173	173	190	172	186	171	139	165
Navarra	171	148	114	145	122	118	137	143	138	134	137	148	135	161	144	137	97	180
San Sebastian	164	153	142	154	133	128	155	147	169	161	140	115	152	157	159	152	131	—
Asturias	131	123	103	111	126	114	121	122	115	120	109	113	120	112	133	110	127	103
Italy																		
Ragusa	123	117	130	118	68	103	111	127	118	95	119	93	113	115	174	112	90	117
Naples				115	108	97				117	107	102				98	112	129
Florence	117	135	140	116	111	111	134	131	125	114	113	112	115	137	158	106	123	113
Turin	147	142	131	145	141	132	140	136	168	144	134	153	137	144	155	135	145	168
Varese	130	135	95	117	99	90	123	129	110	109	112	109	109	137	—	107	112	132
France																		
South coast				111	108	113				109	110	107				98	109	110
South				113	106	114				112	110	103				90	113	113
North-East				113	109	112				112	111	110				106	110	116
North-West				119	124	109				117	124	118				105	117	127
Germany																		
Heidelberg	114	123	98	128	109	109	113	120	105	125	110	111	108	120	119	106	120	134
Potsdam	134	125	125	141	135	122	117	130	137	139	141	130	130	125	129	142	135	141
The Netherlands																		
Bilthoven	112	97	89	105	104	86	108	96	84	99	98	99	85	98	108	85	100	108
Utrecht				122	110	97				116	111	106				98	114	127
United Kingdom																		
General population	112	104	94	109	111	71	106	106	94	103	105	117	85	111	107	98	110	114
Health-conscious	140	142	—	129	138	—	145	162	—	131	137	—	—	170	140	—	122	143
Denmark																		
Copenhagen	113	104	84	113	117	84	102	98	103	112	103	99	89	98	113	87	111	127
Aarhus	101	108	87	110	93	92	99	101	86	98	98	119	97	94	109	88	106	105
Sweden																		
Malmö	92	84	77	95	97	82	83	85	83	97	89	83	80	82	90	80	96	102
Umeå	95	82	79	99	98	80	90	88	85	100	98	75	78	87	105	76	97	113
Norway																		
South and East				97	111	97				105	99	88				86	104	119
North and West				96	102	87				103	87	81				88	101	97

Abbreviations: M, mean; s.e., standard error; '—' If fewer than 20 persons are present in a certain age group, mean intake is not presented.
[a]Adjusted for age and weighted by season and day of recall.

Table 7 Percentage contribution of main food groups to the intake of thiamine, riboflavin, vitamin B6 and vitamin B12, adjusted for age and weighted for day of the week and season

Country and centre	*Dietary food groups (Percentage contribution of each food group to total intake of the nutrient)*																	
	Men									*Women*								
	Vegetables	*Fruits*	*Dairy products*	*Cereals and products*	*Meats and products*	*Fish/ shellfish*	*Eggs and products*	*Potatoes*	*Total*	*Vegetables*	*Fruits*	*Dairy products*	*Cereals and products*	*Meats and products*	*Fish/ shellfish*	*Eggs and products*	*Potatoes*	*Total*
									Thiamine									
Greece	9.7	11.2	9.0	38.8	14.9	3.7	0.7	3.7	91.8	10.2	13.3	11.2	34.7	12.2	2.0	1.0	3.1	87.8
Spain																		
Granada	7.6	11.4	9.5	21.5	29.1	4.4	1.3	5.1	89.9	9.3	14.4	12.7	18.6	25.4	3.4	0.8	4.2	89.0
Murcia	9.8	15.5	5.2	20.7	29.9	2.9	1.1	4.6	89.7	15.5	15.5	10.1	15.5	24.0	3.1	1.6	4.7	89.9
Navarra	7.9	10.3	6.7	22.4	33.9	3.6	1.8	3.6	90.3	8.3	14.2	13.3	16.7	28.3	3.3	1.7	4.2	90.0
San Sebastian	7.6	10.5	8.2	18.7	31.6	4.7	2.3	4.7	88.3	9.5	13.5	12.7	15.9	23.8	4.0	1.6	4.8	85.7
Asturias	5.3	8.3	10.1	18.9	32.5	5.3	1.8	5.9	88.2	4.8	12.9	14.5	15.3	26.6	4.8	1.6	5.6	86.3
Italy																		
Ragusa	8.9	12.9	5.0	33.7	18.8	2.0	1.0	5.0	87.1	8.3	14.3	6.0	21.4	29.8	2.4	1.2	2.4	85.7
Naples										12.5	15.3	9.7	19.4	20.8	2.8	1.4	4.2	86.1
Florence	10.5	13.3	7.6	22.9	21.9	2.9	1.0	4.8	84.8	12.0	13.3	9.6	21.7	21.7	1.2	1.2	3.6	84.3
Turin	13.1	13.1	7.1	22.2	22.2	3.0	1.0	5.1	86.9	15.2	15.2	8.9	20.3	20.3	2.5	1.3	3.8	87.3
Varese	10.0	11.8	9.1	20.0	29.1	0.9	0.9	3.6	85.5	9.6	14.5	10.8	21.7	21.7	2.4	1.2	3.6	85.5
France																		
South coast										12.4	10.7	11.6	18.2	24.0	2.5	0.8	3.3	83.5
South										9.8	9.8	10.7	18.0	24.6	2.5	0.8	4.9	81.1
North-East										9.8	9.8	10.7	17.2	25.4	2.5	0.8	5.7	82.0
North-West										9.9	9.9	9.9	16.5	27.3	3.3	0.8	7.4	85.1
Germany																		
Heidelberg	6.0	6.0	5.4	16.1	47.7	1.3	0.7	6.0	89.3	8.2	9.1	8.2	16.4	35.5	0.9	0.9	6.4	85.5
Potsdam	5.3	7.3	6.0	14.6	46.4	1.3	0.7	6.6	88.1	8.3	11.0	8.3	14.7	33.9	0.9	0.9	6.4	84.4
The Netherlands																		
Bilthoven	6.0	6.0	9.8	21.8	30.8	0.8	0.8	9.8	85.7	7.8	6.8	11.7	22.3	23.3	1.0	1.0	8.7	82.5
Utrecht										7.3	8.3	13.8	22.9	21.1	0.9	0.9	7.3	82.6
United Kingdom																		
General population	10.6	3.7	9.0	31.9	18.6	1.1	0.5	10.6	86.2	12.1	5.4	10.1	28.9	16.1	1.3	0.7	9.4	83.9
Health-conscious	10.6	8.4	3.5	31.3	2.6	0.0	0.4	9.7	66.5	13.7	10.9	5.1	26.9	2.9	0.6	0.0	9.7	69.7
Denmark																		
Copenhagen	6.1	3.8	10.7	31.3	29.0	4.6	0.8	3.8	90.1	7.6	6.7	10.5	30.5	22.9	4.8	1.0	2.9	86.7
Aarhus	5.9	4.4	11.0	32.4	27.9	4.4	0.7	3.7	90.4	7.2	7.2	10.8	31.5	22.5	3.6	0.9	2.7	86.5
Sweden																		
Malmö	3.2	3.2	8.4	28.4	35.5	2.6	0.6	5.2	87.1	5.2	6.0	9.5	25.9	30.2	2.6	0.9	4.3	84.5
Umeå	2.5	3.7	11.1	32.1	27.2	1.9	0.6	6.8	85.8	3.9	5.5	10.9	29.7	25.8	2.3	0.8	5.5	84.4
Norway																		
South and East										5.4	9.9	12.6	30.6	16.2	2.7	0.9	5.4	83.8
North and West										5.4	8.9	12.5	29.5	16.1	3.6	0.9	6.3	83.0
									Riboflavin									
Greece	8.2	4.4	44.7	9.4	15.7	5.0	2.5	1.3	91.2	9.4	4.7	50.0	7.8	11.7	3.9	2.3	0.8	90.6
Spain																		
Granada	6.1	6.7	40.0	7.8	17.2	6.7	5.0	1.7	91.1	6.8	8.2	46.9	6.1	14.3	6.1	4.1	1.4	93.9
Murcia	7.0	10.5	26.9	8.2	23.4	5.8	5.3	1.8	88.9	7.4	9.4	40.3	5.4	18.1	4.7	4.7	1.3	91.3
Navarra	8.6	5.4	28.6	7.6	26.5	7.0	7.6	1.1	92.4	8.0	7.4	43.6	4.9	17.8	5.5	4.9	1.2	93.3
San Sebastian	5.8	5.8	27.7	5.4	32.1	6.7	8.0	1.3	92.9	6.4	6.9	41.6	5.2	19.1	5.2	6.4	1.2	91.9
Asturias	3.8	5.7	36.8	6.1	24.5	7.1	6.1	1.9	92.0	3.4	6.2	49.2	5.1	17.5	4.5	5.1	1.7	92.7
Italy	7.9	9.1	22.6	19.5	23.2	2.4	1.8	1.2	87.8									
Ragusa										9.3	11.0	27.1	14.4	17.8	4.2	2.5	0.8	87.3
Naples										10.6	8.9	35.0	12.2	13.8	2.4	2.4	0.8	86.2
Florence	11.0	8.5	25.6	14.0	20.7	2.4	1.8	1.2	85.4	11.5	8.6	30.2	11.5	20.9	1.4	1.4	0.7	86.3

Table 7 *Continued*

Country and centre	Dietary food groups (Percentage contribution of each food group to total intake of the nutrient)																	
	Men									Women								
	Vegetables	Fruits	Dairy products	Cereals and products	Meats and products	Fish/ shellfish	Eggs and products	Potatoes	Total	Vegetables	Fruits	Dairy products	Cereals and products	Meats and products	Fish/ shellfish	Eggs and products	Potatoes	Total
Turin	13.0	8.6	24.7	13.6	19.8	2.5	1.9	1.2	85.2	14.1	9.6	28.9	11.1	18.5	1.5	2.2	0.7	86.7
Varese	9.8	7.1	29.0	10.9	24.0	1.1	1.1	1.1	84.2	10.2	9.5	33.6	10.9	16.8	1.5	1.5	0.7	84.7
France																		
South coast										9.3	5.2	36.3	7.8	16.6	3.1	2.6	0.5	81.3
South										7.6	5.4	34.8	8.2	15.8	2.7	3.3	1.1	78.8
North-East										7.3	4.7	34.9	7.3	16.7	2.6	3.1	1.0	77.6
North-West										7.7	4.6	31.8	7.2	16.4	3.6	3.1	1.5	75.9
Germany																		
Heidelberg	6.4	4.1	25.1	8.8	24.6	1.2	1.8	2.9	74.9	7.8	5.7	33.3	8.5	17.7	1.4	2.1	2.8	79.4
Potsdam	5.2	5.2	26.0	8.1	24.9	2.3	1.7	3.5	76.9	7.6	7.6	33.6	7.6	16.8	2.3	2.3	3.1	80.9
The Netherlands																		
Bilthoven	5.4	2.4	38.9	9.0	16.8	1.8	3.6	4.2	82.0	6.0	3.0	45.5	8.2	12.7	2.2	3.7	3.7	85.1
Utrecht										5.9	3.3	51.6	7.2	9.8	2.0	3.9	3.3	86.9
United Kingdom																		
General population	2.6	2.1	38.3	15.7	12.8	1.7	2.1	1.3	76.6	2.6	3.1	41.5	14.5	10.9	2.1	2.1	1.0	77.7
Health-conscious	4.5	6.5	22.4	20.4	3.0	0.5	1.5	1.0	59.7	6.2	8.1	28.6	16.1	1.9	1.2	1.2	1.2	64.6
Denmark																		
Copenhagen	4.3	1.9	30.0	11.4	22.4	3.8	3.3	2.9	80.0	5.7	3.2	33.1	12.1	16.6	3.8	3.8	2.5	80.9
Aarhus	4.6	2.3	31.0	12.0	19.9	3.7	3.2	3.2	80.1	5.3	4.1	33.7	12.4	15.4	3.0	4.1	2.4	80.5
Sweden																		
Malmö	3.2	2.6	29.1	12.7	26.5	2.6	3.2	3.2	83.1	4.0	4.6	31.8	11.3	21.9	2.6	4.0	2.6	82.8
Umeå	2.4	2.4	35.9	13.4	21.5	1.9	3.3	2.9	83.7	3.6	4.2	35.8	12.7	20.0	1.8	3.0	2.4	83.6
Norway																		
South and East										2.9	3.6	37.9	11.4	16.4	4.3	5.0	0.7	82.1
North and West										2.2	3.6	39.1	11.6	14.5	5.8	4.3	1.4	82.6
	Vitamin B6																	
Greece	14.6	13.1	13.1	16.2	17.2	8.6	0.5	6.1	89.4	15.4	15.4	15.4	14.7	15.4	7.0	0.7	6.3	90.2
Spain																		
Granada	12.7	11.3	10.0	8.6	22.2	12.7	1.4	8.1	86.9	17.5	15.1	12.0	7.2	17.5	11.4	1.2	7.8	89.8
Murcia	22.7	14.6	5.3	7.7	20.2	9.3	1.2	7.7	88.7	34.6	12.4	7.8	5.1	15.2	7.4	0.9	6.9	90.3
Navarra	12.6	10.7	7.0	7.9	30.2	10.7	1.9	7.0	87.9	13.5	14.1	12.2	6.4	23.7	10.9	1.3	7.1	89.1
San Sebastian	11.3	10.2	6.4	5.7	33.6	11.7	1.9	7.2	87.9	15.4	12.2	10.1	6.9	25.0	10.1	1.6	7.4	88.8
Asturias	7.3	10.9	9.3	7.3	27.5	13.4	1.6	9.7	87.0	7.3	14.0	15.7	7.3	23.0	9.6	1.7	9.6	88.2
Italy																		
Ragusa	8.6	17.2	5.1	16.2	25.8	5.6	0.5	11.1	89.9	8.9	22.6	6.2	11.6	27.4	6.2	0.7	6.2	89.7
Naples										12.9	17.9	9.3	12.9	22.9	5.7	0.7	8.6	90.7
Florence	10.7	17.1	6.3	13.7	24.4	6.8	0.5	9.3	88.8	12.3	18.8	8.4	12.3	25.3	3.9	0.6	7.8	89.6
Turin	13.4	18.8	5.9	12.9	23.8	5.4	0.5	9.4	90.1	16.7	21.2	7.7	10.9	23.1	3.8	0.6	7.1	91.0
Varese	9.4	16.3	8.4	12.8	30.0	3.0	0.5	8.4	88.7	10.6	19.9	9.9	11.9	23.2	4.6	0.7	8.6	89.4
France																		
South coast										16.4	10.9	9.1	15.8	23.6	7.9	0.6	4.2	88.5
South										13.0	11.7	8.6	16.0	24.1	6.2	1.2	6.8	87.7
North-East										13.3	10.8	9.6	13.9	24.1	7.2	1.2	7.8	88.0
North-West										11.9	10.7	8.9	13.7	24.4	8.9	1.2	9.5	89.3
Germany																		
Heidelberg	9.1	8.6	6.1	12.6	28.3	3.0	0.5	12.6	80.8	11.9	13.2	8.6	13.2	21.9	3.3	0.7	12.6	85.4
Potsdam	8.5	10.5	6.5	11.5	27.0	3.5	0.5	14.5	82.5	12.8	15.5	8.8	11.5	19.6	4.1	0.7	14.2	87.2
The Netherlands																		
Bilthoven	6.9	8.4	6.9	15.3	19.3	2.0	1.0	17.8	77.7	9.5	10.9	8.8	16.3	17.0	2.7	0.7	16.3	82.3
Utrecht										8.4	12.3	11.0	16.2	17.5	1.9	0.6	14.9	83.1

Table 7 *Continued*

Country and centre	Dietary food groups (Percentage contribution of each food group to total intake of the nutrient)																	
	Men									Women								
	Vegetables	Fruits	Dairy products	Cereals and products	Meats and products	Fish/ shellfish	Eggs and products	Potatoes	Total	Vegetables	Fruits	Dairy products	Cereals and products	Meats and products	Fish/ shellfish	Eggs and products	Potatoes	Total
United Kingdom																		
General population	7.7	6.9	10.1	20.2	19.4	3.2	0.4	17.0	85.0	10.5	10.5	11.5	20.4	17.8	4.2	0.5	14.1	89.5
Health-conscious	11.1	15.2	5.3	24.2	2.9	0.8	0.4	17.6	77.5	15.2	19.7	6.6	19.7	3.5	1.5	0.5	16.7	83.3
Denmark																		
Copenhagen	8.7	8.7	9.2	15.9	25.6	7.7	1.0	8.7	85.6	11.3	14.6	9.3	15.9	20.5	7.9	1.3	7.9	88.7
Aarhus	8.1	10.2	9.1	16.2	23.9	6.6	1.0	9.6	84.8	11.0	15.6	9.7	16.2	20.1	5.8	1.3	7.8	87.7
Sweden																		
Malmö	6.5	8.5	7.5	17.0	29.0	6.0	1.0	10.5	86.0	8.7	14.3	8.1	14.9	24.2	5.6	1.2	8.7	85.7
Umeå	5.2	9.9	9.9	17.9	24.1	5.2	0.9	12.3	85.4	7.6	15.7	9.3	16.3	20.9	5.8	0.6	9.3	85.5
Norway																		
South and East										8.1	15.4	10.6	13.0	17.9	9.8	0.8	8.1	83.7
North and West										7.6	15.1	10.9	12.6	15.1	12.6	0.8	10.9	85.7
									Vitamin B12									
Greece	—	—	22.5	0.2	35.1	37.3	2.4	—	97.5	—	—	29.7	0.2	31.9	32.1	3.0	—	97.0
Spain																		
Granada	—	—	19.8	0.1	24.3	35.7	4.8	—	84.7	—	—	25.6	0.0	19.7	40.6	4.6	—	90.5
Murcia	—	—	12.1	0.1	42.0	32.7	4.7	—	91.6	—	—	20.1	0.2	32.6	34.9	5.0	—	92.7
Navarra	—	—	11.6	0.0	41.1	34.2	7.3	—	94.2	—	—	21.8	0.0	35.3	33.0	6.0	—	96.1
San Sebastian	—	—	9.6	0.1	55.3	24.9	6.0	—	95.9	—	—	20.5	0.3	37.2	30.2	7.0	—	95.2
Asturias	—	—	13.0	0.1	35.7	42.0	4.8	—	95.6	—	—	21.3	0.1	34.8	33.9	5.3	—	95.5
Italy																		
Ragusa	—	—	12.7	1.6	56.1	21.7	2.8	—	94.8	—	—	17.3	1.0	37.0	35.5	4.6	—	95.4
Naples										—	—	30.6	1.7	25.7	28.1	4.2	—	90.3
Florence	—	—	15.1	0.5	43.0	31.6	2.9	—	93.2	—	—	17.6	0.7	56.2	17.2	2.8	—	94.6
Turin	—	—	17.9	1.2	46.8	25.9	3.4	—	95.3	—	—	19.9	1.2	50.1	19.9	4.1	—	95.2
Varese	—	—	20.3	0.7	58.6	12.7	1.8	—	94.2	—	—	22.6	1.0	40.4	24.6	3.8	—	92.4
France																		
South coast										—	—	21.9	0.7	48.9	22.8	2.5	—	96.8
South										—	—	24.8	0.9	43.2	23.9	3.2	—	95.9
North-East										—	—	23.3	0.5	46.5	22.7	2.8	—	95.7
North-West										—	—	18.6	0.5	44.6	30.6	2.6	—	96.9
Germany																		
Heidelberg	—	—	17.8	0.5	55.8	8.0	2.7	—	84.8	—	—	26.5	0.6	46.6	12.9	3.0	—	89.6
Potsdam	—	—	18.0	0.1	51.3	14.8	2.8	—	87.0	—	—	26.3	0.2	41.1	18.0	3.8	—	89.4
The Netherlands																		
Bilthoven	—		22.3	0.0	52.4	14.5	4.5	—	93.7	—	—	26.4	0.0	46.9	15.5	5.2	—	94.0
Utrecht										—	—	34.1	0.0	40.0	14.0	4.7	—	92.9
United Kingdom																		
General population	—	—	36.4	2.4	31.4	19.7	3.4	—	93.4	—	—	39.3	2.7	28.3	19.5	3.6	—	93.4
Health-conscious	—	—	44.4	6.3	20.7	10.7	5.6	—	87.8	—	—	51.3	3.8	6.4	25.0	3.8	—	90.3
Denmark																		
Copenhagen	—	—	20.5	0.1	41.8	28.4	3.6	—	94.5	—	—	24.3	0.0	33.7	32.3	4.0	—	94.4
Aarhus	—	—	24.2	0.0	39.3	26.6	3.7	—	93.8	—	—	28.1	0.0	32.8	27.5	4.7	—	93.1
Sweden																		
Malmö	—	—	21.6	0.3	47.0	21.9	3.5	—	94.2	—	—	24.4	0.2	42.1	22.1	4.3	—	93.0
Umeå	—	—	24.3	0.3	48.4	17.5	3.3	—	93.9	—	—	23.5	0.3	48.0	18.6	3.1	—	93.5
Norway																		
South and East										—	—	24.4	0.2	32.8	31.9	3.8	—	93.2
North and West										—	—	24.3	0.2	26.8	37.7	3.7	—	92.6

Table 8 Percentage contribution of main food groups to the intake of vitamin C, adjusted for age and weighted for day of the week and season

Country and centre	*Dietary food groups (Percentage contribution of each food group to total intake of the nutrient)*									
	Men					*Women*				
	Vegetables	*Fruits*	*Juice*	*Potatoes*	*Total*	*Vegetables*	*Fruits*	*Juice*	*Potatoes*	*Total*
					Vitamin C					
Greece	42.9	36.9	8.6	5.7	94.1	35.4	38.0	16.2	4.8	94.5
Spain										
Granada	30.5	42.8	9.7	6.6	89.5	31.6	47.7	8.1	4.5	91.9
Murcia	28.5	55.3	5.5	5.7	95.1	30.9	52.8	6.2	4.8	94.7
Navarra	36.3	46.2	4.6	5.9	92.9	28.1	56.6	4.5	4.1	93.3
San Sebastian	33.0	47.2	4.2	7.0	91.5	33.4	49.4	4.3	5.1	92.3
Asturias	24.7	45.4	8.9	12.0	91.0	19.5	51.8	10.4	8.8	90.4
Italy										
Ragusa	28.7	53.9	3.0	6.8	92.4	25.5	59.3	2.3	3.2	90.4
Naples						34.7	49.8	6.2	4.1	94.8
Florence	34.8	47.6	5.6	6.0	94.0	32.0	50.8	7.1	4.6	94.5
Turin	37.5	45.6	5.6	5.8	94.5	35.1	50.2	7.1	3.6	96.1
Varese	29.1	53.4	6.0	4.5	93.0	28.7	54.8	5.5	4.7	93.8
France										
South coast						33.6	37.6	13.7	3.6	88.5
South						29.6	39.4	15.1	5.9	90.0
North-East						27.7	38.5	16.5	6.6	89.3
North-West						23.8	41.2	17.1	7.7	89.8
Germany										
Heidelberg	31.5	24.8	17.1	10.8	84.3	31.3	32.5	16.5	7.9	88.2
Potsdam	26.7	33.5	15.9	11.7	87.9	30.6	36.3	15.7	7.8	90.3
The Netherlands										
Bilthoven	23.8	30.4	15.5	11.2	80.9	23.4	30.7	23.3	7.4	84.8
Utrecht						19.9	37.0	22.2	6.4	85.5
United Kingdom										
General population	26.6	23.3	22.4	10.7	82.9	26.9	29.7	22.9	7.0	86.4
Health-conscious	25.0	34.3	23.6	7.2	90.1	30.6	33.6	18.6	7.5	90.2
Denmark										
Copenhagen	28.6	27.3	20.8	11.3	87.9	28.7	35.5	18.2	7.1	89.4
Aarhus	24.9	33.1	19.7	10.6	88.4	27.8	41.1	15.4	6.2	90.5
Sweden										
Malmö	27.9	25.1	16.8	13.7	83.6	30.0	31.1	17.3	8.1	86.5
Umeå	22.7	27.0	13.5	17.6	80.8	27.6	34.2	13.1	10.2	85.0
Norway										
South and East						23.9	29.6	26.5	7.9	87.9
North and West						24.3	31.4	21.0	10.2	86.9

(Greece, Spain and France) and about 60% in the remaining centres; a clear tendency towards a higher intake of vitamin C from juices was observed in northern centres, for example, 26.5% in women in South and East Norway vs 2.3% in women in Ragusa (Sicily). When intake of different types of fruits was evaluated, there was a slight tendency indicating that the north–south gradient was stronger for citrus fruits than for other fruits (results not shown). Vitamin C intake from potatoes also seemed to follow a geographical gradient, with a higher intake in northern centres (that is, 17.6% in women from Umeå, Sweden vs 4.5% in women from Varese, Italy).

Discussion

In this study, intake of thiamine, riboflavin, vitamin B6 and vitamin B12 did not show very systematic differences between the 27 centres included in the EPIC cohort, despite wide differences in the consumption of their main food sources (Slimani *et al.*, 2002b). However, the UK health-conscious group, as a distinct EPIC population group, had substantially higher intakes of thiamine and lower intakes of vitamin B12. The most systematic variation identified was that intakes of all the B vitamins were substantially higher among men than among women in almost every centre. The main reason for this is most likely that men have a higher total energy intake as they consume more of all food groups apart from fruit (higher intake in women) and dairy products (no gender differences) (Slimani *et al.*, 2002b). Adjustment for energy intake and body composition (height and weight), however, changed the result only slightly, which means that other factors must also differ between genders.

Higher meat consumption of men seemed to be important for the intake of B vitamins. When dietary sources were evaluated (Table 7), meat contributed a higher percentage of B vitamins for men than for women in almost all centres. As B vitamins are found in several heterogeneous food groups (cereals, fish, meat, dairy products, vegetables, etc.), and consequently a few food items do not affect total intake of this nutrient crucially, our finding that intake did not differ largely between populations with different dietary patterns was expected. The only exception to this was the UK health-conscious cohort, because of their very low meat intake. This group had, however, a high intake of cereal products, an excellent source of thiamine and a fairly good source of the other B vitamins (except vitamin B12). The dietary habits of this special health-conscious group have been described in detail previously (Davey *et al.*, 2003).

With regard to vitamin C, a south–north gradient was observed more evidently among men than among women. The association between gender and vitamin C intake differed between centres. In the southern centres, there was very little difference between men and women, but in the northern centres (Germany, Denmark and Sweden), intakes were slightly higher in women than in men. When dietary sources of vitamin C were evaluated (Table 8), it was clear that this was caused by the fact that, in the southern centres (Greece, Spain and Italy), men had much higher intakes from vegetables and especially from fruits than did German, Danish and Swedish men. Men in northern centres had higher intakes of vitamin C from juices and potatoes, but this was not sufficient to compensate for the low intake from fruits and vegetables. Vitamin C intakes from vegetables and fruits were also higher in the southern than in the northern centres among women, but the gradient was not nearly as marked as that for men.

No generally accepted European recommendations for intake of water-soluble vitamins exist because different countries have different recommended daily allowances (RDA), although an EU Council Directive has defined RDA-labelling values to facilitate inter-European trade (www.eur-lex.europa.eu), and a general report on RDA has been published by WHO/FAO (2004). In this study, the mean intakes in most centres were well above the levels recommended by WHO. Nevertheless, in all Italian centres, both men and women had mean intakes of thiamine below the WHO recommendations, which are 1.2 mg/day for men and 1.1 mg/day for women; the same was observed for Norwegian women with regard to vitamin B6 (WHO recommendations: men 1.3 mg/day (19–50 years), 1.7 mg/day (51+ years); women 1.3 mg/day (19–50 years), 1.5 mg/day (51+ years)), especially among those who were overweight or obese. Mean intakes of riboflavin (WHO recommendations: men 1.3 mg/day, women 1.1 mg/day) and vitamin B12 (WHO recommendation for both sexes: 2.4 μg/day) were well within the RDA in all groups, except for several subgroups of the UK health conscious cohort. Vitamin C intake was not found to be below the WHO recommendation (45 mg/day for both men and women) in any centre (WHO/FAO, 2004). The latter is, however, lower than the Nordic Nutrition Recommendations, for example, which advise vitamin C intake of 75 mg/day for both men and women (Alexander *et al.*, 2004). Mean intakes were not below the Nordic recommendation in any centre but, when stratified according to lifestyle factors, they were close to this limit in current smokers and obese women in several northern centres (UK, Sweden and Norway).

There is no strong evidence that suboptimal intakes of thiamine, riboflavin, vitamin B6 or vitamin B12 are related to major chronic diseases such as cancer or heart disease (Huang *et al.*, 2006b), although an effect on these diseases cannot be completely excluded (Powers, 2003; Spinneker *et al.*, 2007). The most discussed health issue is whether a suboptimal intake of B vitamins may be linked to age-related neurocognitive disorders (Balk *et al.*, 2006). For the EPIC respondents included in this study, intake of the vitamin B group does not seem to be a health issue, as intakes based on reported diet are mostly well within recommended levels (WHO/FAO, 2004). However, adverse effects due to interactions between nutrients or with specific lifestyle factors cannot be completely rejected, and a few of the subgroups did have mean intakes below the recommendations. It is,

however, very important to consider that this study was based on a single dietary measurement per individual and that intake consequently can only be considered at the group level.

The role of vitamin C in chronic diseases such as cancer and heart disease has been much discussed (Jacob and Sotoudeh, 2002; Li and Schellhorn, 2007), but it is generally accepted that intake of around 75 mg/day is probably sufficient in most healthy adults (Jacob and Sotoudeh, 2002). Some evidence, however, indicates that a low intake of vitamin C (and/or dietary items with high vitamin C content such as citrus fruits) increases the risk of lung cancer and that smokers consequently have higher vitamin C requirements than do non-smokers (Ruano-Ravina *et al.*, 2006; WCRF/AICR, 2007). The lower mean intake of vitamin C observed among smokers, which has also been reported elsewhere (Schröder *et al.*, 2002), requires particular attention, as this group is potentially vulnerable to insufficient vitamin C intake with potential impacts on diet–disease associations.

This is the largest study to date describing intake of water-soluble vitamins across several European countries. The subsample used for this study has been shown to be representative of EPIC populations (Slimani *et al.*, 2002b) but, because not all EPIC populations were population-based, the findings cannot be extrapolated to the general population of each region. Another limitation of this study is that each person contributed only one 24-HDR, hence variations in intakes cannot be evaluated at the individual level. In addition, this paper considers only intakes of water-soluble vitamins from dietary sources. Dietary supplements are likely to be considerable sources of these vitamins in some participating centres, as indicated elsewhere in this special issue (Skeie *et al.*, 2009, in this supplement), and it should be borne in mind that users of supplements may differ from non-users with regard to both dietary and lifestyle characteristics (Lyle *et al.*, 1998; Kirk *et al.*, 1999).

The data in this study show intake of dietary water-soluble vitamins among 27 regions in 10 European countries, according to gender, age and central lifestyle factors. These descriptive data will be valuable for future aetiological studies conducted on the role of vitamins B and C in health and disease.

Conflict of interest

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Appendix

Table A1a Fully adjusted[a] mean daily thiamine intakes (mg/day) by centre ordered from south to north, gender and age group

Country and Centre	*Men*										*Women*									
	N	*All*		*35–44 years*		*45–54 years*		*55–64 years*		*65–74 years*		N	*All*		*35–44 years*		*45–54 years*		*55–64 years*		*65–74 years*	
		M	*s.e.*	*M*	*s.e.*	*M*	*s.e.*	*M*	*s.e.*	*M*	*s.e.*		*M*	*s.e.*	*M*	*s.e.*	*M*	*s.e.*	*M*	*s.e.*	*M*	*s.e.*
Greece	1311	1.5	0.0	1.6	0.0	1.5	0.0	1.5	0.0	1.5	0.0	1373	1.1	0.0	1.1	0.0	1.1	0.0	1.1	0.0	1.1	0.0
Spain																						
Granada	214	1.6	0.0	—	—	1.5	0.1	1.6	0.1	1.5	0.1	300	1.2	0.0	1.3	0.1	1.4	0.0	1.2	0.0	1.2	0.1
Murcia	243	1.7	0.0	1.8	0.1	1.7	0.1	1.6	0.1	1.6	0.1	304	1.3	0.0	1.4	0.1	1.2	0.0	1.2	0.0	—	—
Navarra	444	1.6	0.0	1.7	0.1	1.6	0.0	1.5	0.0	1.6	0.1	271	1.2	0.0	1.2	0.1	1.2	0.0	1.2	0.0	—	—
San Sebastian	490	1.6	0.0	1.5	0.1	1.6	0.0	1.6	0.0	1.7	0.1	244	1.2	0.0	1.2	0.1	1.2	0.0	1.2	0.0	—	—
Asturias	386	1.6	0.0	1.6	0.1	1.5	0.0	1.6	0.0	1.7	0.1	324	1.2	0.0	1.4	0.1	1.2	0.0	1.2	0.0	1.3	0.1
Italy																						
Ragusa	168	1.0	0.0	—	—	0.9	0.1	1.0	0.1	—	—	138	0.8	0.0	0.9	0.1	0.8	0.1	0.8	0.1	—	—
Naples												403	0.7	0.0	0.8	0.1	0.7	0.0	0.8	0.0	0.7	0.1
Florence	271	1.0	0.0	1.0	0.1	1.0	0.1	1.0	0.0	—	—	784	0.9	0.0	0.8	0.1	0.9	0.0	0.9	0.0	0.8	0.1
Turin	676	1.0	0.0	1.0	0.1	0.9	0.0	1.0	0.0	1.0	0.1	392	0.8	0.0	0.8	0.1	0.8	0.0	0.8	0.0	—	—
Varese	327	1.0	0.0	—	—	1.0	0.1	1.0	0.0	0.9	0.1	794	0.8	0.0	0.8	0.1	0.8	0.0	0.9	0.0	0.8	0.0
France																						
South coast												620	1.2	0.0			1.1	0.0	1.2	0.0	1.2	0.0
South												1425	1.2	0.0			1.2	0.0	1.2	0.0	1.2	0.0
North-East												2059	1.2	0.0			1.2	0.0	1.2	0.0	1.1	0.0
North-West												631	1.2	0.0			1.2	0.0	1.1	0.0	1.1	0.0
Germany																						
Heidelberg	1034	1.5	0.0	1.4	0.0	1.5	0.0	1.5	0.0	—	—	1087	1.1	0.0	1.1	0.0	1.1	0.0	1.1	0.0	—	—
Potsdam	1233	1.5	0.0	1.5	0.0	1.5	0.0	1.5	0.0	1.3	0.1	1061	1.1	0.0	1.1	0.0	1.1	0.0	1.1	0.0	0.8	0.1
The Netherlands																						
Bilthoven	1024	1.3	0.0	1.2	0.0	1.3	0.0	1.3	0.0	—	—	1086	1.0	0.0	1.0	0.0	1.0	0.0	1.1	0.0	—	—
Utrecht												1870	1.0	0.0			1.0	0.0	1.1	0.0	1.0	0.0
United Kingdom																						
General population	402	1.9	0.0	1.9	0.1	2.1	0.0	1.9	0.1	1.9	0.1	570	1.5	0.0	1.7	0.1	1.5	0.0	1.6	0.0	1.5	0.0
Health conscious	114	2.4	0.1	—	—	2.4	0.1	2.5	0.1	—	—	197	1.7	0.0	1.4	0.1	1.8	0.1	1.9	0.0	1.3	0.1
Denmark																						
Copenhagen	1356	1.3	0.0			1.2	0.0	1.3	0.0	1.2	0.1	1484	1.0	0.0			1.0	0.0	1.0	0.0	1.0	0.1
Aarhus	567	1.3	0.0			1.3	0.0	1.2	0.0	—	—	510	1.0	0.0			1.0	0.0	1.0	0.0	—	—
Sweden																						
Malmö	1421	1.6	0.0			1.6	0.0	1.6	0.0	1.6	0.0	1711	1.2	0.0			1.1	0.0	1.2	0.0	1.2	0.0
Umeå	1344	1.6	0.0	1.6	0.1	1.7	0.0	1.6	0.0	1.6	0.0	1574	1.3	0.0	1.3	0.0	1.3	0.0	1.3	0.0	1.2	0.0
Norway																						
South and East												1004	1.1	0.0	1.1	0.0	1.1	0.0	1.2	0.0		
North and West												793	1.1	0.0	1.1	0.0	1.1	0.0	1.2	0.0		

Abbreviations: M, mean; s.e., standard error; '—' If a group comprised fewer than 20 persons, mean intake is not presented.
[a]Adjusted for age (when not stratified for age), total energy intake, weight and height and weighted by season and day of recall.

Table A1b Fully adjusted[a] mean daily riboflavin intakes (mg/day) by centre ordered from south to north, gender and age group

Country and centre	*Men*										*Women*									
	N	*All*		*35–44 years*		*45–54 years*		*55–64 years*		*65–74 years*		N	*All*		*35–44 years*		*45–54 years*		*55–64 years*		*65–74 years*	
		M	*s.e.*	*M*	*s.e.*	*M*	*s.e.*	*M*	*s.e.*	*M*	*s.e.*		*M*	*s.e.*	*M*	*s.e.*	*M*	*s.e.*	*M*	*s.e.*	*M*	*s.e.*
Greece	1311	1.8	0.0	1.8	0.1	1.9	0.0	1.7	0.0	1.8	0.0	1373	1.5	0.0	1.5	0.0	1.5	0.0	1.4	0.0	1.4	0.0
Spain																						
Granada	214	1.8	0.1	—	—	1.8	0.1	1.9	0.1	1.7	0.1	300	1.6	0.0	1.6	0.1	1.6	0.1	1.5	0.1	1.6	0.1
Murcia	243	1.7	0.0	1.8	0.2	1.6	0.1	1.6	0.1	1.8	0.2	304	1.5	0.0	1.4	0.1	1.5	0.1	1.4	0.1	—	—
Navarra	444	1.8	0.0	1.8	0.2	1.7	0.1	1.9	0.1	1.7	0.1	271	1.6	0.0	1.6	0.1	1.6	0.1	1.7	0.1	—	—
San Sebastian	490	2.1	0.0	1.9	0.1	2.1	0.0	2.1	0.1	1.9	0.2	244	1.7	0.0	1.7	0.1	1.7	0.1	1.7	0.1	—	—
Asturias	386	2.0	0.0	1.9	0.1	2.0	0.1	2.1	0.1	2.2	0.1	324	1.8	0.0	1.8	0.1	1.7	0.1	1.9	0.1	1.8	0.1
Italy																						
Ragusa	168	1.6	0.1	—	—	1.7	0.1	1.5	0.1	—	—	138	1.2	0.1	1.1	0.1	1.3	0.1	1.2	0.1	—	—
Naples												403	1.3	0.0	1.4	0.1	1.2	0.0	1.3	0.0	1.2	0.1
Florence	271	1.6	0.0	1.4	0.1	1.6	0.1	1.6	0.1	—	—	784	1.4	0.0	1.4	0.1	1.4	0.0	1.4	0.0	1.3	0.1
Turin	676	1.6	0.0	1.6	0.1	1.6	0.0	1.6	0.0	1.5	0.1	392	1.4	0.0	1.3	0.1	1.5	0.1	1.4	0.0	—	—
Varese	327	1.7	0.0	—	—	1.7	0.1	1.7	0.1	1.6	0.1	794	1.4	0.0	1.3	0.1	1.4	0.0	1.5	0.0	1.3	0.1
France																						
South coast												620	1.9	0.0			1.9	0.0	1.9	0.0	1.8	0.1
South												1425	1.8	0.0			1.8	0.0	1.8	0.0	1.7	0.0
North-East												2059	1.8	0.0			1.8	0.0	1.9	0.0	1.8	0.0
North-West												631	1.9	0.0			2.0	0.0	1.8	0.0	1.8	0.1
Germany																						
Heidelberg	1034	1.7	0.0	1.7	0.1	1.7	0.0	1.7	0.0	—	—	1087	1.4	0.0	1.4	0.0	1.4	0.0	1.4	0.0	—	—
Potsdam	1233	1.7	0.0	1.6	0.1	1.7	0.0	1.7	0.0	1.6	0.1	1061	1.3	0.0	1.3	0.0	1.3	0.0	1.4	0.0	1.3	0.1
The Netherlands																						
Bilthoven	1024	1.6	0.0	1.5	0.0	1.6	0.0	1.6	0.0	—	—	1086	1.3	0.0	1.3	0.0	1.3	0.0	1.4	0.0	—	—
Utrecht												1870	1.5	0.0			1.4	0.0	1.5	0.0	1.5	0.0
United Kingdom																						
General population	402	2.4	0.0	2.3	0.1	2.5	0.1	2.4	0.1	2.4	0.1	570	2.0	0.0	1.9	0.1	2.0	0.0	2.0	0.0	2.0	0.1
Health conscious	114	2.1	0.1	—	—	1.8	0.1	2.1	0.1	—	—	197	1.6	0.0	1.7	0.1	1.6	0.1	1.5	0.1	1.7	0.1
Denmark																						
Copenhagen	1356	2.0	0.0			2.0	0.0	2.1	0.0	1.9	0.1	1484	1.5	0.0			1.5	0.0	1.5	0.0	1.6	0.1
Aarhus	567	2.0	0.0			2.0	0.0	2.0	0.0	—	—	510	1.6	0.0			1.6	0.0	1.6	0.0	—	—
Sweden																						
Malmö	1421	1.9	0.0			2.0	0.1	2.0	0.0	1.9	0.0	1711	1.5	0.0			1.5	0.0	1.5	0.0	1.5	0.0
Umeå	1344	2.1	0.0	2.1	0.1	2.1	0.0	2.1	0.0	2.1	0.1	1574	1.6	0.0	1.6	0.0	1.6	0.0	1.7	0.0	1.6	0.0
Norway																						
South and East												1004	1.4	0.0	1.4	0.0	1.4	0.0	1.4	0.0		
North and West												793	1.4	0.0	1.4	0.0	1.4	0.0	1.3	0.1		

Abbreviations: M, mean; s.e., standard error; '—' If a group comprised fewer than 20 persons, mean intake is not presented.
[a]Adjusted for age (when not stratified for age), total energy intake, weight and height and weighted by season and day of recall.

Table A1c Fully adjusted[a] mean daily vitamin B6 intakes (mg/day) by centre ordered from south to north, gender and age group

Country and centre	*Men*										*Women*									
	N	*All*		*35–44 years*		*45–54 years*		*55–64 years*		*65–74 years*		N	*All*		*35–44 years*		*45–54 years*		*55–64 years*		*65–74 years*	
		M	*s.e.*	M	*s.e.*	M	*s.e.*	M	*s.e.*	M	*s.e.*		M	*s.e.*	M	*s.e.*	M	*s.e.*	M	*s.e.*	M	*s.e.*
Greece	1311	2.2	0.0	2.3	0.1	2.3	0.0	2.2	0.0	2.0	0.0	1373	1.6	0.0	1.7	0.0	1.7	0.0	1.6	0.0	1.5	0.0
Spain																						
Granada	214	2.2	0.0	—	—	2.2	0.1	2.3	0.1	2.0	0.1	300	1.8	0.0	1.7	0.1	1.8	0.1	1.7	0.0	1.8	0.1
Murcia	243	2.4	0.0	2.6	0.1	2.2	0.1	2.5	0.1	2.3	0.1	304	2.1	0.0	2.1	0.1	2.0	0.1	2.2	0.1	—	—
Navarra	444	2.1	0.0	1.9	0.1	2.1	0.1	2.1	0.0	2.0	0.1	271	1.6	0.0	1.5	0.1	1.6	0.1	1.6	0.0	—	—
San Sebastian	490	2.5	0.0	2.4	0.1	2.4	0.0	2.6	0.1	2.4	0.1	244	1.8	0.0	1.9	0.1	1.9	0.1	1.8	0.1	—	—
Asturias	386	2.4	0.0	2.5	0.1	2.4	0.1	2.4	0.1	2.3	0.1	324	1.8	0.0	1.8	0.1	1.8	0.0	1.8	0.0	1.8	0.1
Italy																						
Ragusa	168	1.9	0.1	—	—	1.9	0.1	1.9	0.1	—	—	138	1.5	0.0	1.6	0.1	1.4	0.1	1.4	0.1	—	—
Naples												403	1.4	0.0	1.5	0.1	1.4	0.0	1.4	0.0	1.3	0.1
Florence	271	2.0	0.0	1.8	0.1	2.0	0.1	2.1	0.1	—	—	784	1.6	0.0	1.5	0.1	1.5	0.0	1.6	0.0	1.6	0.1
Turin	676	2.0	0.0	2.0	0.1	2.0	0.0	2.0	0.0	2.1	0.1	392	1.6	0.0	1.6	0.1	1.6	0.0	1.6	0.0	—	—
Varese	327	1.9	0.0	—	—	1.9	0.1	1.8	0.0	2.2	0.1	794	1.5	0.0	1.6	0.1	1.5	0.0	1.6	0.0	1.5	0.1
France																						
South coast												620	1.6	0.0			1.6	0.0	1.6	0.0	1.5	0.0
South												1425	1.6	0.0			1.5	0.0	1.6	0.0	1.5	0.0
North-East												2059	1.6	0.0			1.5	0.0	1.6	0.0	1.6	0.0
North-West												631	1.6	0.0			1.7	0.0	1.6	0.0	1.6	0.1
Germany																						
Heidelberg	1034	2.0	0.0	1.9	0.1	1.9	0.0	2.0	0.0	—	—	1087	1.5	0.0	1.5	0.0	1.5	0.0	1.5	0.0	—	—
Potsdam	1233	2.0	0.0	1.9	0.1	2.0	0.0	2.0	0.0	1.9	0.1	1061	1.5	0.0	1.4	0.0	1.5	0.0	1.6	0.0	1.4	0.1
The Netherlands																						
Bilthoven	1024	2.0	0.0	1.9	0.0	2.0	0.0	2.0	0.0	—	—	1086	1.4	0.0	1.4	0.0	1.5	0.0	1.5	0.0	—	—
Utrecht												1870	1.5	0.0			1.5	0.0	1.5	0.0	1.5	0.0
United Kingdom																						
General population	402	2.5	0.0	2.6	0.1	2.6	0.1	2.6	0.1	2.5	0.1	570	2.0	0.0	2.1	0.1	1.9	0.0	2.0	0.0	1.9	0.0
Health conscious	114	2.6	0.1	—	—	2.3	0.1	2.8	0.1	—	—	197	2.0	0.0	1.7	0.1	2.0	0.1	2.0	0.1	1.7	0.1
Denmark																						
Copenhagen	1356	1.9	0.0			1.8	0.0	1.9	0.0	1.8	0.1	1484	1.5	0.0			1.5	0.0	1.5	0.0	1.5	0.1
Aarhus	567	1.8	0.0			1.8	0.0	1.9	0.0	—	—	510	1.4	0.0			1.4	0.0	1.4	0.0	—	—
Sweden																						
Malmö	1421	2.1	0.0			2.1	0.1	2.1	0.0	2.1	0.0	1711	1.6	0.0			1.7	0.0	1.6	0.0	1.6	0.0
Umeå	1344	2.1	0.0	2.1	0.1	2.1	0.0	2.1	0.0	2.0	0.1	1574	1.7	0.0	1.7	0.0	1.7	0.0	1.7	0.0	1.7	0.0
Norway																						
South and East												1004	1.2	0.0	1.2	0.0	1.2	0.0	1.3	0.0		
North and West												793	1.2	0.0	1.1	0.0	1.2	0.0	1.3	0.0		

Abbreviations: M, mean; s.e., standard error; '—' If a group comprised fewer than 20 persons, mean intake is not presented.
[a]Adjusted for age (when not stratified for age), total energy intake, weight and height and weighted by season and day of recall.

Table A1d Fully adjusted[a] mean daily vitamin B12 intakes (μg/day) by centre ordered from south to north, gender and age group

Country and centre	*Men*										*Women*									
	N	*All*		*35–44 years*		*45–54 years*		*55–64 years*		*65–74 years*		N	*All*		*35–44 years*		*45–54 years*		*55–64 years*		*65–74 years*	
		M	*s.e.*	*M*	*s.e.*	*M*	*s.e.*	*M*	*s.e.*	*M*	*s.e.*		*M*	*s.e.*	*M*	*s.e.*	*M*	*s.e.*	*M*	*s.e.*	*M*	*s.e.*
Greece	1311	7.1	0.3	10.0	0.9	7.0	0.6	6.7	0.6	6.5	0.5	1373	4.8	0.2	5.4	0.6	4.2	0.4	5.3	0.4	4.7	0.5
Spain																						
Granada	214	7.7	0.8	—	—	7.1	1.6	8.4	1.0	6.5	1.7	300	5.5	0.5	5.4	1.2	5.3	0.8	5.5	0.8	6.1	1.5
Murcia	243	7.5	0.7	5.5	2.2	8.2	1.3	7.0	1.0	10.2	2.5	304	5.4	0.5	5.5	1.0	4.9	0.8	4.6	0.8	—	—
Navarra	444	8.1	0.5	12.1	2.3	8.3	0.9	7.8	0.8	6.6	1.6	271	5.8	0.5	5.8	1.3	6.4	0.8	5.5	0.8	—	—
San Sebastian	490	11.8	0.5	8.1	1.2	12.3	0.7	14.0	1.0	7.1	2.6	244	6.2	0.5	5.2	1.1	6.4	0.9	7.0	0.9	—	—
Asturias	386	11.2	0.6	13.1	2.1	11.8	1.0	10.4	0.9	11.3	1.5	324	7.3	0.5	6.6	1.1	6.6	0.8	8.6	0.7	5.2	1.7
Italy																						
Ragusa	168	8.8	0.9	—	—	10.7	1.3	6.3	1.4	—	—	138	4.8	0.7	4.2	1.2	3.9	1.3	4.1	1.3	—	—
Naples												403	4.7	0.4	4.8	1.3	4.4	0.7	5.3	0.6	3.3	1.3
Florence	271	8.3	0.7	8.0	2.1	9.7	1.2	7.5	1.0	—	—	784	6.8	0.3	6.4	1.0	6.7	0.5	7.2	0.4	4.8	1.2
Turin	676	7.2	0.4	5.8	1.4	9.1	0.7	6.4	0.6	5.2	1.7	392	5.8	0.4	5.1	1.3	6.9	0.7	5.2	0.6	—	—
Varese	327	6.7	0.6	—	—	6.6	1.4	6.8	0.7	4.9	2.1	794	5.0	0.3	4.2	1.0	5.3	0.5	5.0	0.4	5.3	0.9
France																						
South coast												620	6.6	0.3			7.4	0.6	6.3	0.5	6.1	0.7
South												1425	5.5	0.2			5.6	0.3	5.6	0.4	5.1	0.5
North-East												2059	6.2	0.2			5.9	0.3	6.6	0.3	5.9	0.4
North-West												631	7.2	0.3			7.9	0.5	6.4	0.5	7.5	0.8
Germany																						
Heidelberg	1034	7.4	0.4	6.9	0.9	7.5	0.6	7.4	0.5	—	—	1087	5.3	0.3	5.0	0.4	5.3	0.5	5.5	0.4	—	—
Potsdam	1233	7.4	0.3	7.1	0.9	7.2	0.6	7.8	0.4	5.9	1.2	1061	4.8	0.3	4.6	0.5	4.8	0.5	4.9	0.4	4.1	1.6
The Netherlands																						
Bilthoven	1024	5.1	0.4	4.6	0.7	5.3	0.5	5.2	0.6	—	—	1086	4.1	0.3	3.5	0.5	4.0	0.4	4.6	0.5	—	—
Utrecht												1870	4.0	0.2			4.1	0.3	3.9	0.3	4.2	0.4
United Kingdom																						
General population	402	6.5	0.6	4.7	1.8	6.2	1.0	5.9	1.0	7.9	1.0	570	5.0	0.3	4.4	1.0	4.4	0.6	5.4	0.6	5.6	0.7
Health conscious	114	3.5	1.1	—	—	2.4	1.7	2.6	1.6	—	—	197	2.3	0.6	3.3	1.9	1.8	1.0	1.8	0.9	4.4	1.6
Denmark																						
Copenhagen	1356	7.9	0.3			7.5	0.5	8.2	0.4	8.0	1.5	1484	5.5	0.2			5.2	0.4	5.7	0.3	6.6	1.0
Aarhus	567	7.2	0.5			7.5	0.7	7.0	0.7	—	—	510	5.0	0.4			4.7	0.5	5.3	0.5	—	—
Sweden																						
Malmö	1421	8.0	0.3			9.0	0.9	7.8	0.5	8.0	0.4	1711	5.9	0.2			5.8	0.4	6.1	0.3	6.1	0.3
Umeå	1344	8.6	0.3	6.9	1.0	8.6	0.6	9.0	0.4	8.7	0.9	1574	6.7	0.2	6.3	0.5	7.1	0.4	6.7	0.3	6.8	0.7
Norway																						
South and East												1004	5.8	0.3	6.0	0.6	5.5	0.3	6.3	0.7		
North and West												793	5.8	0.3	5.1	0.7	6.0	0.4	5.4	0.8		

Abbreviations: M, mean; s.e., standard error; '—' If a group comprised fewer than 20 persons, mean intake is not presented.
[a]Adjusted for age (when not stratified for age), total energy intake, weight and height and weighted by season and day of recall.

Table A1e Fully adjusted[a] mean daily vitamin C intakes (mg/day) by centre ordered from south to north, gender and age group

Country and centre	*Men*										*Women*									
	N	*All*		*35–44 years*		*45–54 years*		*55–64 years*		*65–74 years*		N	*All*		*35–44 years*		*45–54 years*		*55–64 years*		*65–74 years*	
		M	*s.e.*	*M*	*s.e.*	*M*	*s.e.*	*M*	*s.e.*	*M*	*s.e.*		*M*	*s.e.*	*M*	*s.e.*	*M*	*s.e.*	*M*	*s.e.*	*M*	*s.e.*
Greece	1311	134.0	2.6	116.7	7.7	130.3	5.3	153.5	4.8	129.8	4.2	1373	122.7	2.3	124.8	6.0	123.1	3.9	126.7	4.1	116.4	4.7
Spain																						
Granada	214	160.2	6.3	—	—	180.8	13.2	150.1	8.6	170.3	14.2	300	168.1	4.8	172.5	12.3	183.8	8.0	153.8	7.5	159.1	15.3
Murcia	243	187.7	5.9	228.1	18.4	172.0	10.6	183.4	8.3	211.8	20.6	304	167.4	4.8	154.0	9.5	168.6	8.0	172.5	7.9	—	—
Navarra	444	140.2	4.4	97.4	19.1	135.8	7.3	141.9	6.3	164.9	13.4	271	140.6	5.0	103.1	13.1	140.6	8.2	145.7	7.6	—	—
San Sebastian	490	147.9	4.2	134.2	9.9	139.6	5.8	167.4	7.9	105.2	21.0	244	146.7	5.3	140.7	11.3	161.4	8.6	134.1	8.9	—	—
Asturias	386	118.8	4.7	91.5	17.7	111.9	7.9	132.3	7.0	103.0	12.7	324	115.7	4.6	103.5	11.1	102.6	7.4	131.7	7.4	118.3	16.8
Italy																						
Ragusa	168	123.8	7.1	—	—	124.9	10.6	115.9	11.1	—	—	138	106.1	7.0	80.1	11.7	92.8	13.1	137.3	12.5	—	—
Naples												403	112.7	4.1	103.5	13.3	102.5	6.5	126.4	6.3	99.7	13.3
Florence	271	130.2	5.6	116.1	17.6	128.9	9.6	132.7	8.0	—	—	784	115.8	2.9	104.2	9.9	113.8	5.1	117.1	4.1	130.3	11.5
Turin	676	142.2	3.6	115.7	11.5	137.5	5.9	146.3	5.1	156.4	13.6	392	145.0	4.2	120.4	13.1	144.5	6.9	144.0	5.8	—	—
Varese	327	121.7	5.1	—	—	137.8	11.3	116.3	6.1	146.8	17.2	794	112.9	2.9	102.6	9.4	95.9	4.9	130.7	4.4	104.3	8.8
France																						
South coast												620	105.1	3.3			103.5	5.5	109.7	5.2	102.0	6.9
South												1425	107.7	2.2			106.9	3.4	112.2	3.5	102.1	4.9
North-East												2059	106.8	1.8			103.9	2.8	109.7	2.9	109.2	4.2
North-West												631	114.9	3.3			119.2	5.2	115.9	5.0	104.8	7.9
Germany																						
Heidelberg	1034	114.6	2.9	100.7	7.7	108.8	4.6	119.2	4.2	—	—	1087	117.4	2.5	114.0	4.3	115.9	4.6	118.7	4.2	—	—
Potsdam	1233	126.2	2.6	115.5	7.6	124.8	5.3	128.6	3.4	119.1	10.2	1061	139.2	2.5	124.2	5.0	143.7	4.9	141.3	3.7	171.0	15.9
The Netherlands																						
Bilthoven	1024	94.9	3.0	87.1	5.7	91.9	4.5	94.3	5.0	—	—	1086	96.9	2.6	89.3	4.5	94.0	3.9	104.0	4.8	—	—
Utrecht												1870	109.2	1.9			106.3	3.3	113.5	2.9	109.8	3.9
United Kingdom																						
General population	402	106.4	4.6	104.3	15.1	114.3	8.2	103.9	8.4	103.3	8.3	570	108.8	3.4	107.6	10.4	112.1	5.6	111.9	6.2	100.2	7.4
Health conscious	114	151.7	8.7	—	—	157.9	14.1	147.2	13.3	—	—	197	128.0	5.9	107.5	18.5	143.2	9.6	126.9	9.2	102.4	16.2
Denmark																						
Copenhagen	1356	96.1	2.5			89.0	4.1	100.0	3.3	109.9	12.6	1484	104.1	2.2			110.1	3.6	101.2	2.8	106.0	10.2
Aarhus	567	92.9	3.9			90.2	5.5	93.9	5.5	—	—	510	93.3	3.7			96.0	5.1	92.2	5.3	—	—
Sweden																						
Malmö	1421	84.9	2.6			83.3	7.3	90.5	3.9	88.8	3.5	1711	91.9	2.0			90.7	4.1	97.4	3.3	91.8	3.1
Umeå	1344	86.4	2.5	82.4	8.5	87.7	4.7	87.6	3.5	86.3	7.5	1574	94.8	2.1	90.9	5.0	96.0	3.7	96.6	3.2	90.9	6.7
Norway																						
South and East												1004	99.8	2.7	100.4	6.3	98.3	3.2	96.6	6.4		
North and West												793	95.8	3.0	74.7	6.7	97.8	3.6	103.5	7.7		

Abbreviations: M, mean; s.e., standard error; '—' If a group comprised fewer than 20 persons, mean intake is not presented.
[a]Adjusted for age (when not stratified for age), total energy intake, weight and height and weighted by season and day of recall.