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Reported Dietary Intake and Food Sources of Zinc, Selenium, and Vitamins A, E and C in the Spanish Population: Findings from the ANIBES Study

With the participation of:

Spanish Nutrition and Food Sciences Academy (AEN)

Spanish Nutrition Society (SEN)

Spanish Society of Community Nutrition (SENC)

Spanish Foundation for Nutritional Research (FIN)

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Improvement of Health by Fitness, Nutrition and Exercise Research Group

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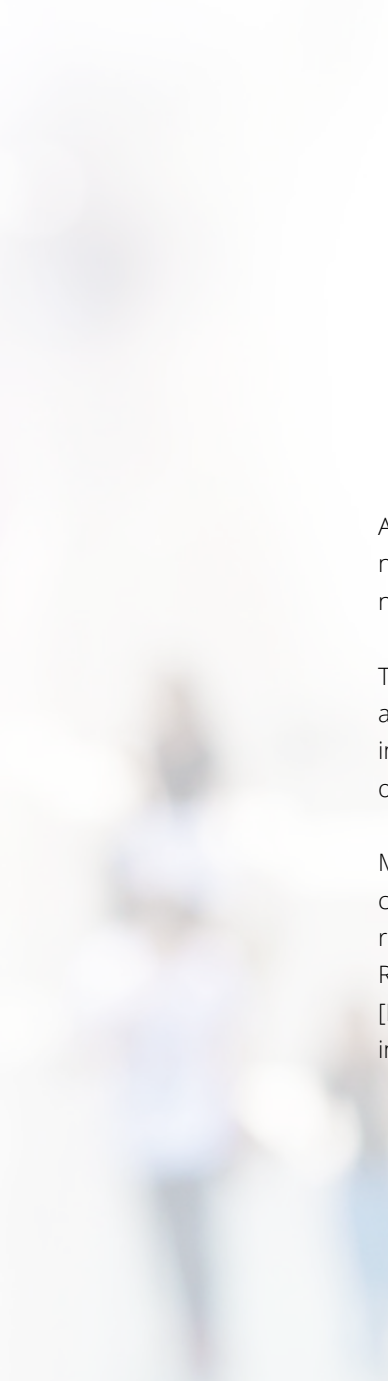
Introduction

In the last few decades, there has been an increase in the prevalence of nutrition-related non-communicable diseases, including obesity, cardiovascular diseases, and type 2 diabetes mellitus. It has been suggested that this could be the result of a nutrition transition characterised by changes in the dietary pattern towards an unbalanced and unhealthy diet, accompanied by an unhealthy lifestyle that includes physical inactivity and sedentary behaviour.

The Food Consumption Survey by the Ministry of Agriculture, Food and Environment (MAGRAMA), evaluates the food consumption and dietary patterns in the Spanish population. The results of this survey have shown that the above mentioned social and economic changes have led to substantial modifications in food patterns in the last decades, moving the Spanish diet away from the traditional Mediterranean Diet pattern.



Adequate nutrition is one of the pillars of public health, and knowing the population's nutritional situation, before designing national guidelines, it is essential to improve the nutrition of the population.

This new scientific work within the ANIBES Study analyses the daily intake of zinc, selenium, and vitamins A (retinol and carotenes), E and C, which have in common biological functions involved in the antioxidant defence system and important implications for the prevention of inflammatory chronic diseases and in particular of cardiovascular illnesses.

More specifically, the reported intake of zinc, selenium, and the vitamins A (retinol and carotenes), E, and C was analysed in the whole population, and in the plausible energy reporters separately (following EFSA harmonised approach to identify misreporting). Reported intake data were compared with national [Carbajal A. et al, 2013] and European [EFSA] daily recommendations. In addition, the food that contributes to their sources of intake was assessed.

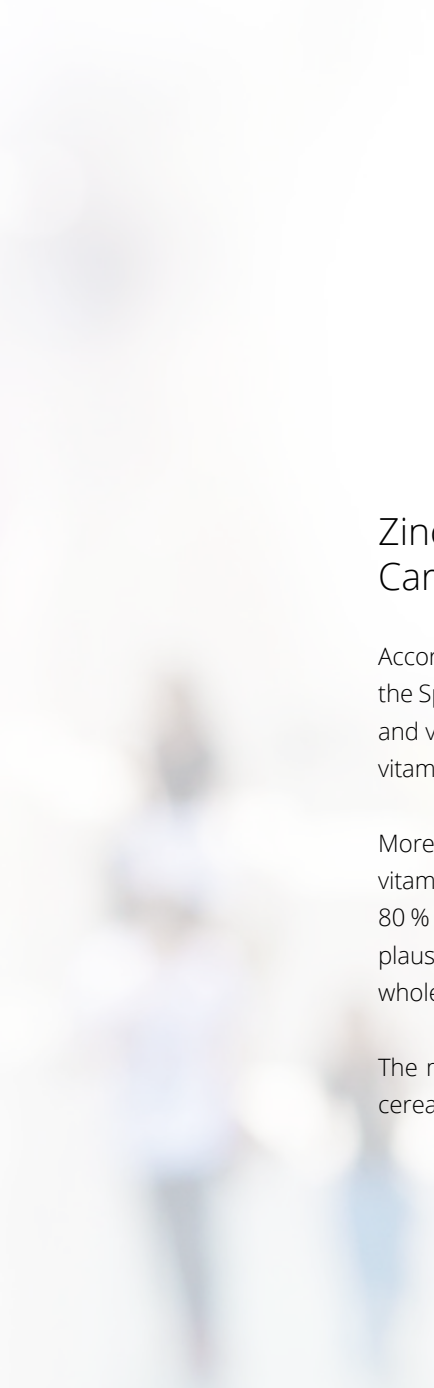
Materials and Methods

The design, protocol and methodology of the ANIBES Study have been already described in detail in Ruiz E. et al, 2015 and Varela-Moreiras G. et al, 2015.

The methodology used for the assessment of plausible energy intake reporters and non-plausible energy intake reporters is detailed in a previous scientific work belonging to the ANIBES Study, particularly in Olza J. et al, 2017.

Lastly the disparity between reported consumption and the level needed for adequacy was calculated comparing with 80 % of the Spanish dietary reference value (DRV) and EFSA population reference intake (PRI) or adequate intake (AI).

The final sample comprised 2,009 individuals aged 9–75 years (1,013 men, 50.4 %; 996 women, 49.6 %).



Zinc, Selenium, and Vitamins C, A (Retinol and Carotenes), and E Intake in the Whole Population

According to this new scientific work within the ANIBES Study, a significant percentage of the Spanish ANIBES population does not meet the recommended intakes for zinc, vitamin A and vitamin E; a reasonable percentage of people does not meet the recommendations of vitamin C; and a low percentage of people does not meet the selenium recommendations.

More specifically, in the whole studied group, 92 % and 83 % for zinc, 74 % and 60 % for vitamin A, and 80 % and 80 % for vitamin E, of the population had reported intakes below 80 % of the Spanish and European recommended daily intakes, respectively; even when the plausible energy reporters were analysed, whose reported intakes were higher than the whole population, these percentages remained above 39 %.

The main food source intakes for zinc were meat and meat products; for selenium were cereals and grains; for vitamin E oils and fat; and for vitamins A and C vegetables.

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Daily zinc, selenium, vitamin A, retinol, carotenes, vitamin E and vitamin C reported intake by plausible energy reporters, non-plausible energy reporters, sex and age group

	Total 9-75 Years		Children 9-12 Years		Adolescents 13-17 Years		Adults 18-64 Years		Elderly 65-75 Years	
	n	Mean ± SEM	n	Mean ± SEM	n	Mean ± SEM	n	Mean ± SEM	n	Mean ± SEM
Zinc (mg/day)										
Total	2,009	8.1 ± 0.1	213	8.3 ± 0.2	211	8.6 ± 0.2	1,655	8.2 ± 0.1	206	7.4 ± 0.2
Plausible energy reporters	543	9.8 ± 0.1*	120	9.0 ± 0.2*	76	10.3 ± 0.3*	433	10.0 ± 0.1*	45	9.5 ± 0.4*
Men	232	11.0 ± 0.2§	68	9.4 ± 0.2	48	11.0 ± 0.3	158	11.6 ± 0.2	24	10.2 ± 0.7
Women	311	8.9 ± 0.1†	52	8.6 ± 0.3	28	9.0 ± 0.4	275	9.0 ± 0.1	21	8.7 ± 0.4
Non-Plausible energy reporters	1,466	7.5 ± 0.1	93	7.3 ± 0.2	135	7.6 ± 0.2	1,222	7.5 ± 0.1	161	6.9 ± 0.2
Men	781	8.2 ± 0.1	58	7.6 ± 0.3	89	8.2 ± 0.2	640	8.2 ± 0.1	75	7.4 ± 0.3
Women	685	6.7 ± 0.1	35	6.7 ± 0.3	46	6.5 ± 0.2	582	6.7 ± 0.1	86	6.4 ± 0.2
Selenium (µg/day)										
Total	2,009	75 ± 1	213	77 ± 2	211	80 ± 2	1,655	76 ± 1	206	70 ± 2
Plausible energy reporters	543	90 ± 1*	120	83 ± 2*	76	96 ± 3*	433	91 ± 2*	45	93 ± 4*
Men	232	101 ± 2§	68	85 ± 3	48	102 ± 4	158	104 ± 2	24	101 ± 7
Women	311	82 ± 2†	52	81 ± 3	28	84 ± 5	275	83 ± 2	21	84 ± 5
Non-Plausible energy reporters	1,466	70 ± 1	93	69 ± 2	135	71 ± 2	1,222	70 ± 1	161	63 ± 2
Men	781	79 ± 1	58	72 ± 4	89	75 ± 3	640	77 ± 1	75	67 ± 3
Women	685	63 ± 1	35	65 ± 4	46	64 ± 4	582	63 ± 1	86	59 ± 2
Vitamin A (µg RE/day)										
Total	2,009	668 ± 19	213	664 ± 43	211	570 ± 33	1,655	672 ± 21	206	658 ± 61
Plausible energy reporters	543	790 ± 31*	120	724 ± 62*	76	685 ± 59*	433	779 ± 30*	45	1,124 ± 209*
Men	232	860 ± 56§	68	756 ± 66	48	709 ± 74	158	866 ± 63	24	1,133 ± 304
Women	311	737 ± 34†	52	681 ± 115	28	644 ± 100	275	729 ± 31	21	1,115 ± 290
Non-Plausible energy reporters	1,466	622 ± 23	93	587 ± 58	135	504 ± 38	1,222	635 ± 27	161	527 ± 47
Men	781	641 ± 34	58	638 ± 80	89	514 ± 49	640	655 ± 39	75	571 ± 93
Women	685	601 ± 31	35	502 ± 77	46	489 ± 58	582	613 ± 36	86	489 ± 35
Retinol (µg/day)										
Total	2,009	364 ± 18	213	420 ± 42	211	343 ± 29	1,655	363 ± 20	206	309 ± 57
Plausible energy reporters	543	423 ± 29*	120	451 ± 62*	76	422 ± 51*	433	405 ± 27*	45	597 ± 212*
Men	232	491 ± 53§	68	483 ± 63	48	433 ± 62	158	467 ± 57	24	633 ± 306
Women	311	372 ± 31†	52	409 ± 116	28	403 ± 90	275	369 ± 27	21	555 ± 298
Non-Plausible energy reporters	1,466	341 ± 22	93	381 ± 56	135	298 ± 34	1,222	348 ± 26	161	228 ± 41
Men	781	372 ± 33	58	434 ± 78	89	320 ± 46	640	378 ± 38	75	274 ± 85
Women	685	307 ± 30	35	293 ± 73	46	256 ± 47	582	315 ± 34	86	189 ± 20

Results are expressed as the mean ± standard error of the mean.
*t-test or Mann-Whitney U test: significant differences between plausible and non-plausible energy reporters in the whole population, ($p < 0.05$).
§Significant differences between plausible and non-plausible energy reporters men in the whole population ($p < 0.05$).
†Significant differences between plausible and non-plausible energy reporters women in the whole population ($p < 0.05$).
There were significant differences between plausible and non-plausible energy reporters within sexes into each age group ($p < 0.05$).

Daily zinc, selenium, vitamin A, retinol, carotenes, vitamin E and vitamin C reported intake by plausible energy reporters, non-plausible energy reporters, sex and age group

(Table continued from previous page)

	Total 9-75 Years		Children 9-12 Years		Adolescents 13-17 Years		Adults 18-64 Years		Elderly 65-75 Years	
	n	Mean ± SEM	n	Mean ± SEM	n	Mean ± SEM	n	Mean ± SEM	n	Mean ± SEM
Carotenes (µg/day)										
Total	2,009	1,735 ± 35	213	1,331 ± 78	211	1,254 ± 79	1,655	1,760 ± 39	206	2,082 ± 122
Plausible energy reporters	543	2,080 ± 75*	120	1,472 ± 109*	76	1,468 ± 141*	433	2,119 ± 84*	45	3,111 ± 348*
Men	232	2,077 ± 118§	68	1,419 ± 144	48	1,561 ± 199	158	2,250 ± 150	24	2,857 ± 361
Women	311	2,083 ± 98+	52	1,542 ± 167	28	1,309 ± 174	275	2,044 ± 99	21	3,402 ± 625
Non-Plausible energy reporters	1,466	1,607 ± 38	93	1,149 ± 108	135	1,133 ± 94	1,222	1,633 ± 43	161	1,794 ± 113
Men	781	1,525 ± 48	58	1,122 ± 143	89	1,047 ± 105	640	1,559 ± 54	75	1,815 ± 153
Women	685	1,700 ± 59	35	1,194 ± 165	46	1,299 ± 185	582	1,713 ± 67	86	1,776 ± 164
Vitamin E (mg α-TE/day)										
Total	2,009	7.0 ± 0.1	213	7.4 ± 0.3	211	7.5 ± 0.3	1,655	7.1 ± 0.1	206	5.9 ± 0.2
Plausible energy reporters	543	9.0 ± 0.2*	120	8.3 ± 0.4*	76	9.7 ± 0.6*	433	9.2 ± 0.2*	45	8.3 ± 0.4*
Men	232	9.8 ± 0.3§	68	8.3 ± 0.5	48	9.8 ± 0.7	158	10.2 ± 0.3	24	8.5 ± 0.5
Women	311	8.5 ± 0.2+	52	8.4 ± 0.6	28	9.6 ± 1.2	275	8.7 ± 0.2	21	8.0 ± 0.7
Non-Plausible energy reporters	1,466	6.3 ± 0.1	93	6.2 ± 0.3	135	6.3 ± 0.3	1,222	6.4 ± 0.1	161	5.3 ± 0.2
Men	781	6.6 ± 0.1	58	6.3 ± 0.4	89	6.4 ± 0.4	640	6.7 ± 0.2	75	5.6 ± 0.3
Women	685	5.9 ± 0.1	35	6.1 ± 0.6	46	6.1 ± 0.5	582	6.0 ± 0.1	86	5.0 ± 0.2
Vitamin C (mg/day)										
Total	2,009	84.4 ± 1.4	213	66.4 ± 3.2	211	61.6 ± 3.1	1,655	84.8 ± 1.5	206	106.6 ± 4.8
Plausible energy reporters	543	100.7 ± 3.3*	120	72.5 ± 4.3*	76	74.8 ± 56*	433	103.0 ± 3.8*	45	142.0 ± 12.9*
Men	232	102.9 ± 5.3§	68	74.2 ± 5.4	48	77.7 ± 7.7	158	112.5 ± 7.1	24	144.1 ± 16.1
Women	311	99.0 ± 4.2+	52	70.2 ± 6.8	28	69.8 ± 7.5	275	97.5 ± 4.3	21	139.7 ± 21.2
Non-Plausible energy reporters	1,466	78.4 ± 1.4	93	58.6 ± 4.6	135	54.2 ± 3.6	1,222	78.4 ± 1.5	161	96.8 ± 4.6
Men	781	77.4 ± 2.0	58	54.5 ± 4.7	89	54.5 ± 4.6	640	78.5 ± 2.2	75	98.2 ± 7.7
Women	685	79.6 ± 1.9	35	65.5 ± 9.3	46	53.8 ± 6.0	582	78.3 ± 2.1	86	95.4 ± 5.5

Results are expressed as the mean ± standard error of the mean.

*t-test or Mann-Whitney U test: significant differences between plausible and non-plausible energy reporters in the whole population, ($p < 0.05$).

§Significant differences between plausible and non-plausible energy reporters men in the whole population ($p < 0.05$).

+Significant differences between plausible and non-plausible energy reporters women in the whole population ($p < 0.05$).

There were significant differences between plausible and non-plausible energy reporters within sexes into each age group ($p < 0.05$).

According to age and sex

Separately by age groups, lower reported intake of zinc, selenium and vitamin E were observed in the elderly group (65-75 years) compared with the other three age groups (9-12, 13-17, and 18-64 years). Opposite to this, the reported intakes of carotenes and vitamin C increased with age. Likewise, intakes of zinc, selenium, retinol and vitamin E were higher in men than in women in the whole population, as well as for zinc in all age groups.

The mean reported intake of selenium was higher in men than in women, in adolescents, adults and elderly groups, for retinol in children and adults and for vitamin E, only in adults. The reported intake of carotenes and vitamin C was lower in men than in women in the entire population. No differences were found for vitamin A.

In the case of selenium, children and adolescents showed an adequate intake, and only 11 % of adults and 7 % of elderly showed an inadequate intake according to Europe references.

Daily zinc, selenium, vitamin A, retinol, carotenes, vitamin E and vitamin C reported intake by sex and age group

	Total 9 -75 Years		Children 9 - 12 Years		Adolescents 13 - 17 Years		Adults 18 - 64 Years		Elderly 65 - 75 Years	
	n	Mean ± SEM	n	Mean ± SEM	n	Mean ± SEM	n	Mean ± SEM	n	Mean ± SEM
Zinc (mg/day)										
Total	2,009	8.1 ± 0.1	213	8.3 ± 0.1[a]	211	8.6 ± 0.2[a]	1,655	8.2 ± 0.1[a]	206	7.4 ± 0.2[b]
Men	1,013	8.8 ± 0.1*	126	8.6 ± 0.2*	137	9.2 ± 0.2*	798	8.9 ± 0.1*	99	8.1 ± 0.3*
Women	996	7.4 ± 0.1	87	7.8 ± 0.2	74	7.4 ± 0.3	857	7.5 ± 0.1	107	6.8 ± 0.2
Selenium (µg/day)										
Total	2,009	75 ± 1	213	77 ± 2[a]	211	80 ± 2[a]	1,655	76 ± 1[a]	206	70 ± 2[b]
Men	1,013	81 ± 1*	126	79 ± 2	137	85 ± 2*	798	82 ± 1*	99	75 ± 3*
Women	996	69 ± 1	87	74 ± 2	74	71 ± 3	857	70 ± 1	107	64 ± 2
Vitamin A (µg RE/day)										
Total	2,009	668 ± 19	213	664 ± 43	211	570 ± 33	1,655	672 ± 21	206	658 ± 61
Men	1,013	691 ± 29	126	702 ± 51	137	582 ± 42	798	697 ± 34	99	708 ± 104
Women	996	644 ± 24	87	609 ± 75	74	546 ± 53	857	650 ± 26	107	612 ± 67
Retinol (Mg RE/day)										
Total	2,009	364 ± 18	213	420 ± 42[a]	211	343 ± 29[a]	1,655	363 ± 20[b]	206	309 ± 57[c]
Men	1,013	399 ± 28*	126	461 ± 50*	137	359 ± 37	798	395 ± 33*	99	361 ± 98
Women	996	327 ± 23	87	362 ± 75	74	312 ± 45	857	333 ± 25	107	261 ± 61
Carotenes (µg/day)										
Total	2,009	1,735 ± 35	213	1,331 ± 78[a]	211	1,254 ± 79[a]	1,655	1,760 ± 39[b]	206	2,082 ± 122[c]
Men	1,013	1,652 ± 46*	126	1,283 ± 102	137	1,227 ± 100	798	1,696 ± 54	99	2,068 ± 151
Women	996	1,820 ± 51	87	1,402 ± 121	74	1,303 ± 132	857	1,819 ± 56	107	2,095 ± 189
Vitamin E (mg α-TE/day)										
Total	2,009	7.0 ± 0.1	213	7.4 ± 0.3[a]	211	7.5 ± 0.3[a]	1,655	7.1 ± 0.1[a]	206	5.9 ± 0.2[b]
Men	1,013	7.3 ± 0.1*	126	7.4 ± 0.4	137	7.6 ± 0.4	798	7.4 ± 0.2*	99	6.3 ± 0.3
Women	996	6.7 ± 0.1	87	7.5 ± 0.4	74	7.4 ± 0.6	857	6.8 ± 0.1	107	5.6 ± 0.3
Vitamin C (mg/day)										
Total	2,009	84.4 ± 1.4	213	66.4 ±3.2[a]	211	61.6 ± 3.1[a]	1,655	84.8 ± 1.5[b]	206	106.6 ± 4.8[c]
Men	1,013	83.2 ± 2.0*	126	65.1 ± 3.7	137	62.6 ± 4.1	798	85.2 ± 2.3	99	109.4 ± 7.3
Women	996	85.6 ± 1.9	87	68.3 ± 5.5	74	59.9 ± 4.7	857	84.5 ± 2.0	107	104.1 ± 6.2

Results are expressed as the mean ± standard error of the mean (SEM); (*) t-test or Mann–Whitney U test was used to evaluate differences by sex within the whole population and within each age group. ANOVA or Kruskal–Wallis tests was used to calculate differences among age groups. $p < 0.05$ was considered statistically significant.

Adequacy to recommended intakes and food sources of Zinc, Selenium, Retinol, Carotenes, and the Vitamins A, E and C

Zinc

The intake of this nutrient is inadequate when comparing with the Spanish and European recommendations. In the whole studied group, 83 % of the population had reported intakes below 80 % of the European recommended daily intakes.

The main sources of zinc for the entire population were meat and meat products (28.5 %), cereals and grains (25.5 %), and milk and dairy products (15.8 %). This last group provided higher percentages to the children. Fish (5.7 %), vegetables (5.2 %), and ready-to-eat meals (4.8 %) complete the list to reach more than the 85 % of the total intake of zinc.

Fish and vegetables afforded a higher percentage to the older groups while ready-to-eat meals did so for the younger groups.

Zinc dietary sources (%) from food and beverage groups and subgroups

Selenium

In all studied groups, the reported intake of selenium met almost the totality of the Spanish as well as the European recommendations. Only 15 % and 25 % of the population had reported intakes below 80 % of the Spanish and European recommended daily intakes respectively.

The largest source of selenium for the whole population was the group of cereals and grains (46.5 %), with a higher contribution for the adolescents (50.8 %). Fish meant 16.7 %, meat and meat products 14.9 %, and milk and dairy products 7.2 % of the total selenium daily intake.

Fish afforded a higher percentage to the older groups while meat and meat products and milk and dairy products contributed to a lower percentage only for the elderly group. All these groups afforded in more than 85 % to the selenium intake.

Selenium dietary sources (%) from food and beverage groups and subgroups

Vitamin A

The reported intakes of vitamin A in the present study were lower than the Spanish and European recommendations, in both the whole population and the plausible energy reporters. More specifically there is 60 % of the Spanish ANIBES population not meeting the EFSA recommended intakes.

Vegetables were the main source of vitamin A for the whole population (31.3 %), contributing in higher proportions in the older groups. Milk and dairy products provided 21.7 % to the entire population, contributing more to the younger groups. Eggs ranked third (11 %) and fruits fourth (6.9 %); this last food group provided less among younger groups and much more to the elderly.

Oils and fats supplied 5.6 %, ready-to-eat meals 5.5 %, and cereals and grains 4.5 % to the vitamin A intake for the whole population; these last two food groups contributed more to the adolescents and less to the elderly. All these groups supplied more than 85 % of the total vitamin A intake.

Vitamin A dietary sources (%) from food and beverage groups and subgroups

Retinol

Milk and dairy products were the main source of retinol (38.7 %) for the whole population, although it contributed much less to the older adults group. Eggs provided 22.6 % and fish 11.4 %, these last two food groups contributed in a higher proportion for the elderly group. Finally, oils and fats afforded 8.8 % to complete the list that contributes more than 85 % of the total daily retinol intake.

Retinol dietary sources (%) from food and beverage groups and subgroups

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Carotenes

Vegetables afforded more than half of carotenes intake for the entire population (52.7 %), contributing to a much higher percentage for the older groups compared with the younger groups. Fruits ranked second (13.5 %) and sauces and condiments third (8.4 %). Fruits provided more percentage to the elderly, while sauces and condiments did so to the younger groups. Milk and dairy products contributed 7.5 % and ready-to-eat meals 7.4 %. All these groups afforded more than 85 % to the carotenes intake.

Carotenes dietary sources (%) from food and beverage groups and subgroups

Vitamin E

The data from the ANIBES study indicates that 80 % of the whole adult population and 62 % of the plausible energy reporters have inadequate intake of vitamin E.

Oil and fats were the main contributors (45.7 %) to the vitamin E intake, followed by vegetables (11.4 %), fish (9.7 %), and fruits (4.8 %). These three last food groups increased their contribution to the vitamin E intake with age. Ready-to-eat meals, milk and dairy products, and eggs, contributed 4.4 %, 4.4 %, and 4.3 %, respectively, to the intake of this vitamin. All these groups afforded in more than 85 % to the vitamin E intake.

The reported intakes of vitamin E in the ANIBES study for all studied groups, in both the whole population and the plausible energy reporters, were much lower than the Spanish and European recommendations.

Vitamin E dietary sources (%) from food and beverage groups and subgroups

Vitamin C

When the inadequate intake of vitamin C was calculated in the ANIBES study, it was observed that 29 % and 56 % of the whole adult population did not meet the Spanish and European recommendations, respectively. Separately by age groups, 7 % and 20 % of the older plausible energy reporters had reported intakes below 80 %, respectively. Even considering only the plausible energy reporters, the recommendations were not met (19 % and 44 %).

Nevertheless, it is interesting to highlight that the inadequate intake of vitamin C in the elderly group was only 15 % and 7 % in the entire and plausible energy reports, respectively, according to the Spanish recommendations.

For the whole population, vegetables (50.6 %) and fruits (20 %) contributed to more than 70 % to the intake of vitamin C. Milk and dairy products and non-alcoholic beverages ranked third and four, contributing in 8.9 % and 8.7 %, respectively. All these groups supplied more than 85 % to the total vitamin C intake.

These data reflect the vitamin C intake of the older groups. For the younger groups, vegetables were also the main contributors to the intake of vitamin C; however, for children, this food group represented 39.9 %, second in the rank was fruits (15.2 %), third was non-alcoholic beverages (15.7 %) and fourth was milk and dairy products (14.7 %). For adolescents, vegetables afforded 45.1 %, milk and dairy products 13.3 %, fruits 12.8 % and non-alcoholic beverages 12.7 %.

Vitamin C dietary sources (%) from food and beverage groups and subgroups

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Population with inadequate intake of zinc, selenium and vitamins A, E and C for the whole population and for the plausible energy reporters by age (%)

	Total 9 -75 Years		Children 9 - 12 Years		Adolescents 13 - 17 Years		Adults 18 - 64 Years		Elderly 65 - 75 Years	
	Spain	EFSA	Spain	EFSA	Spain	EFSA	Spain	EFSA	Spain	EFSA
Zinc (%)										
Whole population	92	83	82	31	89	65	92	86	96	92
Men	86	69	80	30	85	59	86	72	93	84
Women	97	96	85	33	95	77	97	99	99	100
Plausible energy reporters	80	65	75	15	75	38	81	73	84	78
Men	64	31	74	15	69	27	59	31	75	58
Women	93	90	77	15	86	57	93	97	95	100
Selenium (%)										
Whole population	15	25	2	4	4	16	16	26	22	32
Men	16	18	2	5	3	12	18	19	22	22
Women	14	32	3	3	7	24	14	33	21	41
Plausible energy reporters	4	9	0	0	0	3	4	11	4	7
Men	3	3	0	0	0	0	3	3	4	4
Women	5	14	0	0	0	7	5	16	5	10
Vitamin A (%)										
Whole population	74	60	57	36	78	64	74	61	75	60
Men	78	64	57	33	80	66	80	57	80	65
Women	69	56	57	41	73	62	69	66	70	56
Plausible energy reporters	58	39	51	23	68	46	59	42	47	24
Men	63	40	53	18	71	46	66	44	63	33
Women	54	38	48	31	64	46	56	40	29	14
Vitamin E (%)										
Whole population	80	80	62	66	72	76	80	79	90	91
Men	78	82	63	69	72	79	78	82	89	92
Women	82	77	60	62	70	70	82	76	92	90
Plausible energy reporters	62	59	51	57	54	61	62	58	76	76
Men	56	61	53	59	54	65	52	58	79	83
Women	67	59	48	54	54	54	67	57	71	67
Vitamin C (%)										
Whole population	29	56	41	37	47	67	29	58	15	42
Men	32	60	39	37	48	69	31	62	19	44
Women	27	52	45	38	46	64	27	53	11	40
Plausible energy reporters	20	42	36	29	36	55	19	45	7	20
Men	21	42	29	26	35	56	19	44	8	17
Women	20	42	44	33	36	54	19	45	5	24

Results are expressed in percentage. Recommended daily intakes for Spain and Europe. Adequacy was calculated comparing with 80 % of the Spanish DRV and EFSA PRI or AI.

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The final protocol of the ANIBES scientific study was previously approved
by the Clinical Research Ethics Committee of the Autonomous Region of Madrid (Spain).


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